ICD 08237

# CQ VHF

## Ham Radio Above 50 MHz

March 1998


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**VHF News: HOT Winter DX on 6&2**

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  Kenwood TM-261A 2-Meter Transceiver
  MFJ-224 2-Meter FM Analyzer

On the Cover: Jim Vogler, WA7CJO, of Phoenix, Arizona, with his 900-watt, 10-GHz amplifier tube. Details on page 16.

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# Why pay more for 2 meter/440 Performance?

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*"Overall, if you want a full-featured radio with some novel features, the Alinco DJ-G5TH is worth your attention. With ample output power and receive sensitivity, this HT held its own in every operating environment we tested."*

—QST Product Review, July, 1997

## DR-605T/TQ 2 meter + 440 Mobile/Base

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- "Set and forget" squelch control
- MARS/CAP capability

The DR-605T is an affordable performer that,s easy to program and operate. Check the low price at you Alinco dealer!

*"...there's little left out in the way of features, making this relatively inexpensive dualbander quite a rig....Nice radio, Alinco!"*

—CQ VHF Review December 1996

## DJ-G5T 2 meter + 440 HT

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***Boost your 2 Meter handheld or multimode (like ICOM 706) to a super powerful 100 watts . . . All modes: FM, SSB, CW . . . 15 dB GaAsFET receive preamp . . . Reverse polarity protection . . . Silent cooling fan . . . Free HT-to-amp coax and mobile bracket***

*In Stock at ham dealers everywhere!*

*Call your dealer for your best price*

**$199**

B-310-G Suggested Retail

NEW!


MIRAGE RUGGED!

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

***For an incredibly low $199, you can boost your 2 Meter handheld to a super powerful 100 watt mobile or base!***

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

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

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

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

### *Low noise GaAsFET pre-amp*

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

### *Fully Protected*

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

### *Compact but Powerful*

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

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**$159.95** BD-35 Suggested Retail

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|---|---|---|---|---|---|---|---|
| *Watts Out (2Meters)* | *30* | *40* | *45* | *45+* | *45+* | *45+* | *45+* |
| *Watts Out (440 MHz)* | *16* | *26* | *32* | *35+* | *35+* | *35+* | *35+* |
| *Watts In* | *1* | *2* | *3* | *4* | *5* | *6* | *7* |

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

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

### *Full Duplex Operation*

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

### *Mirage is the Best! Here's why . . .*

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- ***Single input connector and single output connector for both bands*** -- easy to use with dual band radios and antennas
- ***First-class strip-line techniques*** -- superb RF performance and reliability
- ***Custom wrap-around heatsink*** -- runs cool
- ***Reverse Polarity Protection*** -- saves your amp if you connect power backward
- ***Automatic RF sense Transmit/Receive switch*** -- makes operation easy
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- ***Small size:*** just 5x1¾x5 inches
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# 35 Watts for 2 Meter HTs

B-34-G

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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.


# 160 Watts on 2 Meters!

B-5016-G

**$299**

Suggested Retail


MIRAGE RUGGED!

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

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

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

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**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.

Prices and specifications subject to change. © *1996 Mirage Communications*

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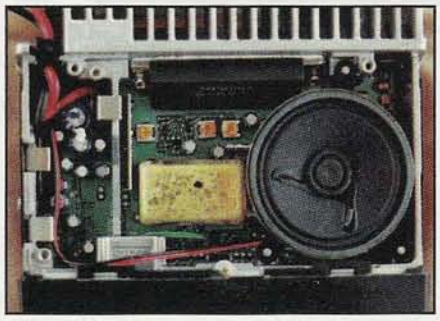

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### FT-8100R 2M/440 Mobile

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# A Dying Hobby (Not)


The prophets of doom are at it again, warning of ham radio's imminent demise. But the numbers—and our history—tell a different story.

Ham radio is dying. Just ask the "old-timers" on your local repeater, at a club meeting, or anywhere else, and they'll be all too happy to tell you the bad news. Nobody builds anything anymore, they'll tell you. We've become a hobby of "appliance operators." We're not attracting young people anymore, they'll tell you. It's becoming a hobby of old men. Our growth rate is down dramatically, they'll tell you. We're in *big* trouble. The Internet will be the death of ham radio.

But there's a little problem with the picture that these pessimists paint: they've been painting it for at least 40 years now! The "appliance operator" argument was first heard in the 1950s. So was the age argument. And the growth rate figures are much more closely related to the sunspot cycle than to the Internet or any other competitor for potential hams. Another problem: the basic argument is flawed. If ham radio is dying, then why has the number of licensed amateurs *more than doubled* in the past 20 years? Let's take a closer look.

## Appliance Operators

Back in the 1920s, every ham was a builder, a tinkerer, an experimenter—by necessity. There were no commercially manufactured ham rigs and the size of the hobby wasn't big enough to make it worthwhile. If you wanted to be a ham, you built your rig. Period.

The 1930s introduced the commercially built ham rig, and such venerable (and venerated) names as National, Hammarlund, and Hallicrafters came on the scene. Many hams began buying these "appliances," but the construction culture was still strong, and a lot of homebrewing was still required to hook everything together and build a station out of the various pieces of equipment.

When ham radio came back on the air after World War II, the commercially built rig became king. The main homebrewing activity was converting surplus military gear for use on the ham bands. And, by the early 1950s, the ham magazines were printing letters from readers complaining that the end of the homebuilt station would be the end of amateur radio. It's been nearly 50 years since those dire predictions began to be heard, and it still hasn't happened.

## The Age Question

Young people are staying away from the hobby in droves. This is an argument I've been hearing ever since I became a ham over 25 years ago (at age 15, I might note). Now, I don't have access to age figures going back that far, but the *CQ Amateur Radio Almanac* has regularly published a breakdown of licensees by year of birth. I typed the statistics for 1993, 1994, 1995, and 1996 into my spreadsheet program and came up with some very interesting results. Over that four-year period, there was steady growth in all age segments except for those hams born in 1908 and earlier. Yes, the biggest age "bump" is in the 40 to 50 range, but the greatest rate of growth in those four years was among those age 30 and younger. In fact, the 25 to 30 group showed increases of greater than 40% between 1993 and 1996. So much for not attracting young people.

## Slow Growth

"Amateur Radio Growth Continues to NOSEDIVE!" That's how fellow ham Fred Maia, W5YI, headlined a report last September in his *W5YI Report* newsletter. "Up until August, 1995, the Amateur Service had been expanding at an average rate of 7%," he reported. "It came to a screeching halt last year when the growth rate slipped to 1.8%. It is even less in 1997." Pretty alarming, huh?

Consider this, from the same report: "The Amateur Service grew by only 1.1% (8,002) last year....The total number of Codeless Technician Amateurs, however, grew by 12.8% (or 20,069)." Now wait a minute! If there were only 8,000 new hams in 1997, how could 20,000 of them be Technicians?

It took a few months, but Fred was finally able to put these numbers into better perspective in a similar report in his January 1, 1998 issue (the numbers are slightly different because he's using December 1 statistics versus August 1 statistics in the earlier report): "The good news is that there are 18,636 (or 11.6%) more Technician Class amateurs than a year ago. The bad news is that the total amateur service only grew by 7,797 amateurs—a scant 1.1%. That of course means that the other license classes (with the exception of the Extra Class) are declining." Fred also pointed out that the earlier growth figures were artificially inflated by the five-year period (from 1989 to 1993) during which no licenses expired because of the shift from five-year to 10-year licenses.

But, in the same issue, Fred published 20 years of FCC licensing statistics, broken down by license class, from 1978 to 1997. And there's some very interesting information there. First and foremost, on December 1, 1978, there was a total of 353,162 licensed amateurs in the U.S. On December 1, 1997, the total was 719,341:

By Rich Moseson, W2VU, Editor

***"If there were only 8,000 new hams in 1997, how could 20,000 of them be Technicians?"***

an increase of 366,179, or more than 103%! Not bad for a dying hobby!

Next, excluding the five-year period in which there were no license expirations, the amateur service grew, on average, by about 12,400 hams per year. This translates to a 3.5% increase over the 1978 total...but only a 1.7% increase over the 1997 total. Why? Because there were twice as many hams to begin with, so the same numerical increase represents a percentage growth only half as large. So let's look at the actual numbers. According to my spreadsheet, total actual growth from 1996–1997 was 7,582—significantly below the average and alarmingly below the banner growth years such as 1994–95 (41,344), 1993–94 (34,014) and 1980-81 (24,011). But it also represents an increase from 1995–96, when the service grew by only 5,765 people, and it is significantly *better* than the virtually no-growth years of the early '80s, such as 1981–82 (2,727), 1982–83 (2,135), 1984–85 (2,719), and the rock-bottom year of 1983–84, when the total number of hams increased by only *44 people*—yes, 44. Now *that's* a growth rate to worry about.

What accounts for these wild swings in the growth figures over a 20-year period, from a low of 44 to a high of more than 40,000? Well, here's a hint: The lowest growth figure overall was in 1983-84. The lowest figure in recent years was in 1995–96. How many years apart is that? Let's see...95 minus 84 equals...*eleven*! And how many years are there in the sunspot cycle? Could it be...*eleven*? Hmmm. What do these low-growth years have in common? *They're both at the bottom of the sunspot cycle!*

Could there be a relationship? Well, I'll let you decide, but I'd like to share with you one other perspective on the situation—that of our publisher, Dick Ross, K2MGA, who's been in and around the ham radio business since 1960. The following is a draft of a letter he's been working on for reluctant advertisers, offering the benefit of his 35+ years in the business:

The year is 1964.*

Sunspot cycle 19 is at its low point. The bands are dead. And the specter of the dreaded "Incentive Licensing" looms over amateur radio. Thousands have lost some operating privileges and are disillusioned with ham radio. The experts are predicting the end of the amateur radio hobby and business.

Surprise! It didn't happen. Two years later, the sunspots were back, propagation was cooking on all bands, and the ham market was burbling along very nicely, thank you.

The year is 1975.

Sunspot cycle 20 is at its low point. The bands are dead. And the specter of the dreaded "CB Radio" looms over amateur radio. Who will ever want to get a ham license to talk on the radio when CB is universally available? The experts are predicting the end of the amateur radio hobby and business.

Surprise! It didn't happen. Two years later, the sunspots were back, propagation was cooking on all bands, and the ham market was again burbling along very nicely, thank you.

The year is 1986.

Sunspot cycle 21 is at its low point. The bands are dead. And the specter of the dreaded "Cellular Telephone" looms over amateur radio. No one will need to communicate by amateur radio anymore. The experts are predicting the end of the amateur radio hobby and business.

Surprise! It didn't happen. Two years later, the sunspots were back, propagation was cooking on all bands, and the ham market was again burbling along very nicely, thank you.

The year is 1997.

Sunspot cycle 22 is at its low point. The bands are dead. And the specter of the dreaded "Internet" looms over amateur radio. Why would anyone need to communicate by amateur radio anymore? The experts are predicting the end of the amateur radio hobby and business.

Hey! Hold on just a cotton-pickin' minute! I'm beginning to see a pattern here...

## Reinventing Ham Radio

Last year, I wrote about "revolutions" that changed the face of ham radio every 10 years or so...single sideband (mid-1950s), transceivers and transistors (mid-'60s), FM repeaters (mid-'70s), and packet radio (mid-'80s). Well, after reading what Dick wrote above, I realized that I'd been wrong. It wasn't every 10 years: it was every 11 years! Is there a pattern here? Of course. Each time the sunspots go away, growth drops, hams and the ham industry panic, and the hobby reinvents itself. It is a process that is necessary to our survival. Like forests that need occasional fires to generate new growth—our 11-year doldrums provide the boost that is necessary to advance our hobby into its next generation.

How will we reinvent ham radio this time around? Well, it's too early to be sure, but the word "digital" is almost certain to be part of the answer. Digital signal processing is working its way into nearly everything, and, as we pointed out here a few months back, the first ham-rig-in-a-computer is already on the market (too bad it's an HF rig). I'm not sure what ham radio will look like eleven years from now—it probably won't look like it does today, but I'm certain it'll still be here, and that there'll be a lot more than 719,000 of us to enjoy it.

## Is There a Pattern Here?

So...the year is 1998. Are the sunspots coming back? Yes! Exciting DX opportunities are returning to the HF bands every day. Does it mean anything for VHF operators? Yes! Just ask the hams in the southwestern U.S. who worked New Zealand on 6 meters on New Year's Day! Via $F_2$ propagation, something 6 meters sees only when the sunspots are hopping! Or the hams who worked the wild double-hop sporadic-*E* opening the same day between the central U.S. and Cuba...or the 2-meter FAI (Field Aligned Irregularities) opening that followed the big openings on six. The excitement becomes contagious. More hams tell more stories of great contacts. More non-hams become hams, make great contacts, and tell their friends about them.

Hey! Hold on just a cotton-pickin' minute! I'm beginning to see a pattern here...

### Help Wanted

If you're involved with a project or activity that you think would be of interest to your fellow *CQ VHF* readers, we'd like to hear from you. Article submissions are welcome, as are "Op-Ed" opinion pieces if you have a point of view you'd like to share about a VHF-related topic. You can contact us by mail at 76 N. Broadway, Hicksville, NY 11801 (send an SASE for writers' guidelines), by e-mail to <CQVHF@aol.com>, or via our World Wide Web page, <http://members.aol.com/cqvhf/>. We look forward to hearing from you.

* *According to the* New Shortwave Propagation Handbook *(CQ, 1995), the actual lows of the preceding four sunspot cycles were 1964, 1976, 1986, and 1996/97 (predicted), respectively. But conditions are pretty dismal for a year on either side, although the upward climbs tend to be much sharper than the (longer) declines.*

# VHF News

## Big New Year's Band Openings

The weather may have been icy in early January, but 6 and 2 meters were *hot!* It all started on December 31 with a sporadic-*E* opening on 6 meters from Florida and Cuba to Virginia and West Virginia; then a double-hop opened the path to California, Arizona, New Mexico, and Texas. A few hours later, on January 1 (UTC), six opened up between the southwestern U.S. and New Zealand! Stations in Texas, Arizona, and California worked ZL3TIC, ZL2TPY, and ZL3NW. The ARRL quoted one of its propagation gurus, Dean Straw, as suggesting the ZL opening was probably a result of double-hop $F_2$ propagation *combined* with sporadic-*E*. (The *E*s and *F*s refer to the layer of the ionosphere off of which the signals are bounced back to Earth.)

But it didn't stop there. Later on New Year's Day, WB2QLP in Florida worked Brazil and Colombia on six, and N7DB in Oregon worked California, Nevada, Arizona, New Mexico, and Texas. And then 2 meters opened up with an FAI (Field Aligned Irregularities) path from Texas to Colorado and Arizona. (FAI on two often follows a strong sporadic-*E* opening on six).

Wait! There's more! Another big double-hop sporadic-*E* opening on January 11 provided coast-to-coast contacts on 6 meters and the *E*-skip even went as high as 2 meters, resulting in 2-meter contacts from Washington State to Colorado; from Texas to Arizona and Nevada in one direction and to the Bahamas in the other; and all capped off by SSB contacts between W4WHN in the Florida Keys and two stations in Arizona: KE4OJN/7 and WB8LNG/7! And yes, you're reading this right—*Florida to Arizona on 2 meters*! And you thought 2 meters was only good for line of sight!

## ARRL Considers Weak-Signal Protection

The ARRL Board of Directors (which will have met by the time you read this) was scheduled to consider requests from the VHF weak-signal community to support an FCC rules change to prohibit FM operation below certain points on the VHF/UHF bands. This, amid growing complaints from weak-signal operators that an increasing number of FM operators are interfering with their operations at the low ends of the bands (see also January's "Line of Sight" and this month's "Letters" and "Weak Signal News"). Watch next month's "VHF News" for more on the ARRL January Board meeting.

## Other ARRL News

The ARRL's Audio News Service now has a telephone dial-up number from which the weekly reports may be downloaded. Previously, the reports were available only via RealAudio from the ARRL Web site. The new phone number is (860) 594-0384.

And, *QEX*, the ARRL's magazine for experimenters, is changing from a monthly to a bi-monthly publication schedule and is increasing subscription rates to $18/year for ARRL members and $30/year for non-members. Editor Rudy Severns, N6LF, says each bi-monthly issue will be either 48 or 64 pages long and that there will be no decrease in the total amount of material that subscribers get each year.

## Mir Crossband Experiment Scuttled

Interference problems on 2 meters caused the crew members of the Mir space station to abandon a 70-centimeter-to-2-meter crossband experiment, according to MIREX (Mir Amateur Radio Experiment) spokesman Dave Larsen, N6CO. At last report, U.S. Astronaut Dave Wolf, KC5VPF, was operating—only occasionally—on 145.985 MHz FM.

Wolf was scheduled to be replaced on Mir in mid-January by Astronaut Andy Thomas, KD5CHF, and two new Russian crew members, also both hams, were due to be on board by the end of January. Thomas is the last U.S. astronaut slated to live on Mir, but the ARRL says Russian officials recently extended Mir's time in orbit until the first components of the International Space Station are in place sometime next year.

## Mir Gets New Packet Modem

At press time, the hams aboard Mir were testing a new Kantronics KPC-9612 packet modem that was delivered to them by a Russian supply ship last September. The 9612, purchased for the MIREX program by *CQ VHF*, supports both 1200- and 9600-baud operation and has a 100-kilobyte mailbox storage capacity. MIREX officials say they'll notify the ham community when the new system is ready for general access.

## RS-12 Now in Mode KA

AMSAT reports that the RS-12 satellite is now operating in Mode KA, meaning that its uplink is on 2 meters (145.91- to 145.95-MHz SSB or CW ONLY), and that it now has a downlink on two bands: 10 and 15 meters. The 10-meter downlink frequencies are 29.41 to 29.45 MHz, and the 15-meter downlink is from 21.21 to 21.45 MHz.

## RS-17 Declared Dead

The hand-launched scale model of the original Sputnik satellite, known variously as RS-17, Sputnik PS2, and Sputnik 40, stopped transmitting on December 29, 1997. According to the ARRL, the one-third scale model of Sputnik 1 operated for 55 days, more than two weeks longer than expected, sending down its widely monitored beacon signals on 145.820 MHz.

A 6 x 9-inch color certificate will be sent to anyone mailing in a confirmed reception report, which should be in the form of a letter with a 6 x 9-inch SAE (self-addressed envelope) and two (2) International Reply Coupons (IRCs).

There is some confusion as to the address for QSLs, however. The satellite was a joint project of students at Jules Reydellet College in Reunion Island and students at the Polytechnic Laboratory of Nalchik Kabardine in Russia. Both groups have issued addresses to which reception reports should be mailed. You can take your pick:

*Option #1*: FR5KJ Radio Club, 103 Rue de la Republique, 97 489 Saint Denis Cedex, Reunion Island;

Compiled by the CQ VHF Staff

*Option #2*: Sergej Samburov, P.O. Box 73, Korolev-10 City, Moscow Area, 141070, Russia.

Envelopes sent to the Russian address should be well-sealed and should not contain any cash or display amateur radio callsigns.

## First Gate 4 Vanity Calls Issued

The FCC in early January issued more than 600 new callsigns under the so-called "Gate 4" of the vanity callsign program, the final "gate" under which any licensed amateur may now apply for a callsign of his/her choice. According to the ARRL, the first group of Gate 4 calls was issued on January 7.

## New Owner for AES

Milwaukee-based Amateur Electronic Supply was sold as of January 1 to a prominent Wisconsin businessman, according to the ARRL. Founder Terry Sterman, W9DIA, sold the company to the newly formed Amateur Electronic Supply LLC, headed by businessman Phil Majerus, who apparently is not a ham. AES was founded in 1957. A spokesman says no changes in staff or management are anticipated.

## New Publisher for ATVQ

*Amateur Television Quarterly* magazine, commonly known as *ATVQ*, is now being published by Harlan Technologies of Rockford, Illinois. Owners Gene (WB9MMM) and Shari (KB9SH) Harlan purchased the magazine from its founder and previous publisher, Henry Ruh, KB9FO, of Crown Point, Indiana. The Harlans previously published *Cyberham* magazine, which was merged last year with *SKIP* magazine. *ATVQ* has been published since 1988.

Subscription rates for one year are $18/U.S., $20/Canada, and $26/elsewhere, all in U.S. dollars. For more information, contact *ATVQ*, c/o Harlan Technologies, 5931 Alma Dr., Rockford, IL 61108; Phone: (815) 398-2683; Fax: (815) 398-2688; Orders: (800) 557-9469; e-mail: atvq@aol.com; WWW: <http://www.cris.com/~Gharlan>.

## Wanna Be an "E-Mail Elmer"?

The Miami Valley FM Association of Ohio has come up with a new way for hams to take advantage of the Internet. According to the ARRL, the Dayton-based club has introduced an "E-mail Elmer" program, in which new hams, or those trying something new, may send an e-mail assistance request to a central club address. Volunteer mentors, or "Elmers," will provide an e-mail response, generally within a few days.

MVFMA President Fred Peerenboo, KE8TQ, told the ARRL, "Today, many hams prepare for their license exams through classroom programs, and the individual Elmer's touch isn't as common as it once was." The program, he said, "is an attempt to restore this long tradition."

Hams in southwestern Ohio may pose questions to the E-mail Elmers by sending a message to <elmer@febo.com> and asking for the information they're looking for. To volunteer as an E-mail Elmer, or to find out more about the program (perhaps to duplicate it for *your* club), contact KE8TQ at <ke8tq@febo.com>.

## QSL/QTH/SWL.NET Celebrates First Birthday

The Internet service that offers callsign e-mail addresses and free personal Web pages to hams around the world celebrated its first birthday at the end of December. Founder Al Waller, K3TKJ, reports that as of the service's birthday, it hosted 4,100 Web pages, 21,000 listserver users, and had an average of over 49,000 accesses *every day*!

In addition to the listservers (e-mail mailing lists) for each ham band and for owners of various brands of ham equipment, Waller says he has now introduced a listserver for each *state* and is looking for volunteers to administer each state list. To join your state list, send an e-mail message to <majordomo@qth.net>, leave the subject line blank (or don't; it's ignored, but some services require you to put something there), and in the message text, type: "subscribe xxham" (without the quotes), with "xx" being replaced by your state's two-letter abbreviation.

For information on the service's many other lists and how to join them, point your Web browser to <http://www.qth.net>. Waller says that the $2,000 in donations he received in 1997 covered only about 1/4 of his total costs. Additional donations should be addressed to Al at Rt. 3, Box 314B, Road 497, Laurel, DE 19956.

(*Editor's Note: Thank you to Al and all of your volunteers. You are performing an important service for amateur radio.*)

## On-Air Band Opening Maps?

"What would you say if I were to tell you that you could have *graphical, real-time* plots of band openings, right on your computer, while you were on the air taking advantage of them?...When propagation paths open, your computer would sound a brief alarm to alert you, and position the opening on a map, right on your screen."

That's how Rochester VHF Group Chairman Ev Tupis, K2IV, described his proposal for an on-air network to monitor VHF band openings in an e-mail to the Internet VHF reflector. Project PropNET, as described by Tupis, would operate on 6-meter packet, but would eventually be able to track openings on other bands as well. The introductory message was described as a "teaser" to gauge the level of real interest in setting up such a network. Participants would need a TNC, a 6-meter FM transceiver, an omnidirectional 6-meter antenna, and a 286 or higher IBM-compatible computer. In addition, said Tupis, "you will need to be able to work collaboratively during the 'pilot' phase, and serve as a mentor to others, once we have worked the wrinkles out."

Tupis says he will pursue the project only if there's a sufficient level of serious interest. If you are interested in being part of this project, contact K2IV via e-mail at <evman@ix.netcom.com>.

## AMSAT-UK Call for Papers

AMSAT-UK has issued a call for papers, on topics related to amateur radio space and associated activities, to be delivered at the 13th AMSAT-UK Colloquium in Surrey, England, from July 31 to August 2, 1998. "We normally prefer authors to present the papers themselves rather than having someone else read them in the author's absence," notes the AMSAT-UK announcement, quoted by the AMSAT News Service, "but we also welcome 'unpresented' papers for the [*Proceedings*] document."

Offers of papers, along with requests for a list of program topics, should be submitted as quickly as possible to the Colloquium Program Organizer, Richard Limebear, G3RWL, at any of the following addresses:

*Standard Mail*: R. W. L. Limebear, G3RWL, 60 Willow Rd., Enfield EN1 3NQ, United Kingdom;

*E-mail*: <g3rwl@amsat.org>;

*Packet*: <G3RWL@GB7HSN.#32.GBR.EU>;

*Satellite*: AO 16/19/22/23/25.

## Free Logging Software Offered

Mark Hoersten, N8VEA, is offering his VHF logging software for free on the World Wide Web. According to the AMSAT News Service, the program, called VHF-DX 4.0, is compatible with Windows 95®, covers all aspects of VHF, UHF, and satellite logging, including VHF contests. It also tracks several awards, including the ARRL's VUCC (VHF/UHF Century Club), WAS (Worked All States), and DXCC (DX Century Club). For satellite contacts, it logs the name of the satellite and both the up/down modes.

The free program may be downloaded from N8VEA's Web site at <http://www.qsl.net/n8vea>.

## ARRL Says "No" (Again) to Electronic QSLs

If you contacted T49C in Cuba on terrestrial VHF or via satellite during last year's CQ World Wide DX (CW) Contest and you want a QSL card that counts toward DXCC, you'll have to do it the "old-fashioned way." The ARRL DXCC Desk will not accept the electronic QSLs offered from the T49C server on the World Wide Web. The AMSAT News Service quotes the League's Bill Kennamer, K5FUV, as explaining that such confirmations are prohibited by DXCC rules and that he'd tried out the server himself and found that the QSLs it produces are easy to modify, another reason that makes them unacceptable for award credit. To get a card that will count for DXCC, send your QSL to the T49C manager, SKØUX, in Sweden.

## Internet Fee Rumor Untrue

If you've seen reports on the Internet that the FCC is considering charging by the minute for net access, *ARRL Letter* Editor Rick Lindquist, NR1L, says "it ain't so..."

"Please be advised that there is no petition from telephone companies before the FCC to charge by the minute for Internet access. This is, in a word, old news that someone has resurrected."

Lindquist says the FCC did issue a Notice of Inquiry on this topic in late 1996 (with a reply comment deadline in February 1997), but subsequently rejected the idea. The FCC now has posted a message to this effect on its Web site (<http://www.fcc.gov/Bureaus/Common_Carrier/Factsheets/ispfact.html>):

"There is no open comment period in this proceeding. If you have recently seen a message on the Internet stating that in response to a request from local telephone companies, the FCC is requesting comments to isp@fcc.gov by February 1998, be aware that this information is inaccurate."

# Letters

## Your Spot to Speak Out

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

*Responses to WB6NOA's Editorial*

*Editor's Note: In his January, 1998, guest editorial, Senior Contributing Editor Gordon West, WB6NOA, called for supporting a proposal to amend the FCC rules to recognize and strongly recommend compliance with voluntary band plans. But he didn't feel it was necessary (yet) to put the band plans themselves into the rules. Here's a sampling of reader opinion on the topic.*

Dear *CQ VHF*:

I am a retired Illinois Bell Telephone employee and I am 74 years young. I have been interested off and on with radio activities since 1937. I am finally a licensed ham (KF4SIW) after almost 60 years.

I would like to comment on January's "Line of Sight" by Gordon West, on band plans. The article was excellent. When I first received my Tech license, I hesitated calling CQ because I felt like a beginner, not knowing what I should do, even though I have many manuals, and equipment, etc.

Thanks to ARRL, *QST*, *CQ*, and *CQ VHF* magazines, I was able to find the calling frequency. So, I ventured a CQ on 6 meters and, lo and behold, I made my first contact with KC4ZVO and my second with KF4TYB. Both of these radio hams gave me operating and technical advice and gave me courage to press on. I respect and admire Radio Hams because for the most part Hams are decent, law abiding citizens.

I am not much of a believer in government interventions, but rules and compliance of band plans are required, not because of the many, but because of the few. We need more emphasis [in license exams] on operating procedures, rules and regulations as well as technical skills.

Respectfully,

Joe Pocius, KF4SIW
Safety Harbor, Florida

Dear *CQ VHF*:

I have written on this subject in the pages of the *Great Lakes VHF/UHF Newsletter*, but since the *CQ VHF* readership is now addressing it, I'd like to offer my viewpoint for consideration. I am fundamentally opposed to heaping unnecessarily restrictive guidelines on folks. A good and comprehensive set of enforceable guidelines is more than adequate, especially when it comes to extracurricular activities.

Many of our fellow hams have forgotten that what we are enjoying is a hobby. A casual scanning of most VHF reflectors on the Internet will quickly reveal this. There is frequent arguing about band plans, mode preferences, who makes the best and worst radios, QSL practices, what publications you should or should not read, and you name it. One topic discussed was the band plan issue.

When the voluntary band plan issue was discussed, it seemed to go farther than Gordon (WB6NOA) went in the January "Line of Sight" column. Not only was "what mode" discussed, but also "calling frequencies" as needing further legislation. Gordon seemed to cleverly dodge the bullet on that one by addressing the mode-type interference alone. I think this was a wise move.

Most of the time, I can read the reflector comments on a debated subject and muster up enough tolerance to avoid jumping into the middle of it, but I did join in on this one. Weak-signal VHF and UHF operators have demonstrated that they are most able to "get along." Sure, any time there are as many participants in an activity as we have, there are bound to be conflicts, but most of them are resolved by moving up or down the band a bit. I see no need for further legislation regarding a move of the calling frequencies. Especially if we are proposing to move it so far as to require calibration of one's station (including antenna system) to operate on the domestic frequencies and a re-calibration to work DX in the CW window.

Cross-mode interference is another issue. While many of our SSB/CW enthusiasts will occasionally jump "up the band" to work friends on FM, few of our FM friends have equipment capable of checking for a weak-signal station on the bottom end of the VHF/UHF bands. Cross-mode interference may include spread-spectrum, packet, ATV, even voice communications in the CW window.

Gordon did a super job of presenting the need for further *mode* enforcement. I just hope the "change the calling frequency" bunch doesn't spoil the good proposal by adding to it.

Dave Bostedor Jr., N8NQS
Jackson, Michigan
vhfuhf@voyager.net

*(The writer is editor of the* Great Lakes VHF/UHF Newsletter.*)*

Dear *CQ VHF*:

Regarding Gordon West's editorial of January 1998:

I can totally agree with the feelings expressed by Mr. West. However (and it's a big "however"), we must first come to terms with the divergent "band plans" existent within our ranks. I offer the following "for instance":

The "Yuma Digital Users Group" is a small group of amateurs who are actively involved in packet radio. A few of us have chosen to erect multi-frequency packet switches in order to interconnect the various 2-meter packet frequencies in this area—southwestern Arizona and southeastern California—via high-speed UHF backbones. As dictated by "...good amateur practice" (97.101(a)), we attempted to coordinate our packet switches with the frequency coordinators for Arizona. Therein was the "snag"...the VHF-Hi frequency for one packet switch was set for a linked packet system in southern California (So. Calif is literally "on our doorstep," less than two miles from my QTH), which actually is closer to us than anything else here in Arizona.

CQ VHF Ham Radio Above 50 MHz

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Guess what? That *coordinated* (in California) packet system operates on a frequency which—in Arizona—is part of the weak-signal portion of the band plan. "Good amateur practice"? I think not! That station was *not* coordinated, as you might surmise, because of the "potential for interference" with weak-signal operators 200 miles and a couple of mountain ranges away!

Taken to the most literal extent, anybody working those southern California packet stations from southwestern Arizona is not operating under "...good amateur practice," as they are operating FM packet on a frequency which is earmarked in Arizona for weak-signal use.

I do not, under any circumstances, advocate disregard for bandplans. In fact, as a fledgling weak-signal fan myself, I applaud Mr. West's proposals. However, I believe we must first encourage our frequency coordinators to actually *coordinate* their efforts with those of their neighbors. If the independent amateur community does not make this effort on their own, we may find ourselves being "helped" in this matter—perhaps with less than happy consequences. 73.

Jim Allen, KC7BDP
KC7BDP@JUNO.COM

Dear *CQ VHF*:

In response to Gordon West's editorial in January's "Line of Sight," I think the FCC has to step in to set the rules. The "new" breed of radio operators do not think it is important to accept a gentlemen's agreement as to the mode to work in parts of the 6-meter and 2-meter bands.

I, for one, would not go on SSB on 52.525 or 146.52, as we accept these as frequencies for FM simplex operations. This is a two-way street. Why can't the FMers just operate in their part of the 6- and 2-meter bands, and leave the lower parts to us nuts who work SSB or RTTY, as I do? They should stay above 52.000 and 145.000 with FM, and then we would not have all this back-and-forth talk about where one mode starts and the other ends.

If the FMers want to talk to me, wait till I'm on 52.525 or 146.52 FM. If they cannot, then they should buy multimode rigs and look for me on 50.125 SSB, 50.400 AM, 144.200 SSB, or 144.300 AM. If they cannot agree with this, then I am in favor of the FCC putting it on the line in the rule book. 73,

Anthony "Skip" Oliva, WB2HEB
Holbrook, New York

*Anthony—Isn't it too bad that so much of ham radio today has become a matter of "us versus them"—HFers versus VHFers, pro-code versus no-code, FMers versus weak-signal ops? We all need to remember that we're all hams and we're all in this together.*

*In his "Weak Signal News" column this month, Tim Marek, K7XC, offers his opinion on the issue of band plans and cross-mode interference. He basically agrees with you that the FCC needs to protect weak-signal modes in the rules, but he's also embarked on an education campaign to introduce "FMers" to the world beyond repeaters on VHF, UHF, and above.*

### *6 Meters & the Internet*

Dear *CQ VHF*:

Your "6-Meter AM Experiment on the World Wide Web" article in the January, 1998, issue was very interesting, and I, too, had an amazing 6-Meter/Internet experience this past Christmas evening. I had the unique opportunity, as did others, to carry on a QSO with a New Zealand station (David Challis, ZL2TQM) while using an Alinco DJ-580 handheld in Northern California.

The 6-meter band was open that evening and the DX was rolling in. I could hear a QSO between ZL2TQM and NØTFI (Jess Gypin, Broomfield, Colorado) coming in via a local 440 repeater linked to 52.525 MHz. A few moments later NØTFI began fielding calls from all over west coast and introducing ZL2TQM, *who was hooked up to NØTFI's station via the Internet using real time audio*. I was among these stations from the west coast and had an excellent conversation with both Jess and David just using my Alinco HT going through the 440 repeater link on 52.525 MHz. Many other amateurs also shared these contacts, either using links or 6 meters.

What I found most exciting was not the QSO with New Zealand in and of itself, but rather the means and methods used to achieve this contact! Just think, the Internet phone allows you to transport your voice through the Internet and pop it out on 6 meters anywhere in the world. Without these means, David and I would not have met that night.

Paul L. Owen, KF6KXX
Modesto, California

*Paul—That sounds really great! Now check this out: less than a week later, on*

*New Year's Eve, K6SIX worked ZL3NW on 6-meter SSB* direct; *and on New Year's Day, ZL3TIC/ZL3SIX, worked a half dozen U.S. stations on six—the band's first really long-haul $F_2$ openings of sunspot cycle 23. You'll be interested, by the way, in this month's "Op-Ed," which also promotes increased use of the Internet for repeater linking.*

Dear *CQ VHF*:

I think it is a shame that the 33-centimeter ham band (902 to 928 MHz) is underused, especially in southern California, where I no longer work 2 meters because of the crowding. I can only speak for myself, but I'm attracted to "one-off" things, such as 33 centimeters. Sure, *CQ VHF* has published articles on how to modify cellular phones (don't get me wrong, I'm glad you printed them), and rumors abound of bootlegged UHF multiband-radio modules designed for 33-centimeter operation, although I am not convinced that such modules exist. The Motorola Spectra 9000 has become something of a legend in the world of 33-centimeter hamming, but anyone who's got one is hanging onto it.

Recently, when a ham buddy and I performed the CAP/MARS mod on a Yaesu FT-41, I accidentally stumbled upon an interesting characteristic of this radio: the display can be made to read from 900 to 950 MHz. This made me wonder whether the FT-41 was designed with the Japanese "UHF CB" band (a simplex version of our 33 centimeters) in mind.

I hope this letter will inspire other hams who have the technical know-how to take a crack at converting a Yaesu FT-41 to gain an inroad to 33 centimeters. I would imagine this would entail slipping a doubler into the circuit and switching the filters and finals, but this is only my guess as to how a ham might attempt to follow through on this. Of course, the radio would probably no longer work on 70 centimeters unless it is later restored.

Thank you very much for the informative articles in *CQ VHF* and for other readers who share their ideas and help to make hamming interesting. 73,

Marty Goss, KE6WNH
Culver City, California

*Marty —The 33-centimeter band is underutilized across the country, not just in southern California. But you've got an ally in our new microwave columnist, Kent Britain, WA5VJB. Kent devotes a significant part of his first "Final Frontier" column, elsewhere in this issue, to reasons why more of us should be using 902 to 928.*

*I asked Chip Margelli, K7JA, at Yaesu, about your questions on the FT-41. Chip says it's a good question, but no, the radio was not designed with the Japanese CB band in mind and it will not do anything at all above about 700 MHz due to limitations of the local oscillator. "We use the same digital display with many radios," Chip explained, but the FT-41 has no circuitry to make it work on those frequencies. While the rig will display those frequencies, it does not, and cannot, receive there. And forget about transmitting. What you're describing entails virtually designing and building a new radio...it might be more practical to use the FT-41 as the IF for a 33-centimeter transverter.* ■

# Product Update

## Yaesu FT-847 HF/VHF/UHF Transceiver

Imagine an FT-736, with HF and 6 meters added, all packed into a super-compact package (10.2 x 3/4 x 10.6 inches), and you've got Yaesu's newest ham transceiver: the FT-847. It puts out 100 watts on 160 to 6 meters and 50 watts on 2 meters and 70 centimeters, and the HF section includes general coverage receive capability. The rig comes with four independent antenna ports, one each for HF, 6 meters, 2 meters, and 70 centimeters.

Major features of the FT-847 include crossband full-duplex capability with normal/inverted tracking for satellite work, built-in low-noise preamplifiers, DSP (digital signal processing) noise reduction and digital speech processor, notch and bandpass filters, an AFSK (audio frequency shift keying) port for HF digital work, and a 1200/9600 bps jack for VHF/UHF packet. In addition, the radio features a built-in CW keyer and adjustable CW pitch/sidetone, built-in CTCSS/DCS encode/decode for repeater operation, direct keyboard frequency entry, and a high-speed (up to 57600 bps) port for external computer control. The FT-847 is scheduled to be available in February, 1998, at Yaesu dealers. A list price had not been announced at press time.

For more information, see your authorized Yaesu dealer, or contact Yaesu USA, 17210 Edwards Rd., Cerritos, CA 90703; Phone: (562) 404-2700; WWW: <http://www.yaesu.com>.

## Stainless Steel for "Hamstick" Tri-Magnetic Antenna Mount

Lakeview Company, Inc., which manufactures the "Hamstick" antenna line, has announced that its Tri-Magnetic Mount, Catalog Number 375, now comes with all stainless steel hardware. This mount holds all Hamstick antennas and many others, with three black-powder-coated magnets that have over 400 pounds of holding power. The aluminum construction and stainless steel hardware will eliminate rust.

The 375 comes with standard 3/8-inch by 24 thread mounting and 15 feet of RG-58 coax with a PL-259 installed. The mount has a 12 x 14-inch footprint. The cost is $39.95. The mount is also available with an NMO and SO-239 configuration for an additional $5.

For more information or to order, call (864) 226-6900, fax (864) 225-4565, or visit your local Lakeview dealer or the company's Web site at <http://www.hamstick.com>. Mail orders may be sent to Lakeview Co., Inc., 3620-9 Whitehall Road, Anderson, SC 29626 or e-mailed to <hamstick@hamstick.com>. Add $7 shipping and handling.

*Circle 100 on reader service card*

## MFJ-4035MV DC Power Supply

MFJ Enterprises, Inc., has introduced the new MFJ-4035MV 35/30 Amp Adjustable Regulated DC power supply. The heavy-duty supply features 35 amps surge and 30 amps continuous; voltage output is front-panel-adjustable from 1 to 14 VDC with detent set at 13.8 VDC. The power supply has lighted front panel meters and an ON/OFF switch.

Three different output terminals include a five-way binding post for HF/VHF radio, two pairs of quick connects for low-current accessories, and a cigarette lighter socket for mobile accessories.

The voltmeter and ammeter monitor the load continuously, and there's a front-panel fuse holder for convenient fuse replacement. Plus, a quiet internal cooling fan generates a tremendous airflow, keeping components cool. And the unit includes built-in circuit protection that will automatically shut down the power supply when it is drawing too much current.

The new MFJ-4035MV 35/30 Amp Adjustable Regulated DC Power Supply comes with a one-year limited warranty and sells for $149.95. To order, or for the location of your nearest dealer, call (800) 647-1800; Fax: (601) 323-6551; e-mail: <mfj@mfjenterprises.com>; or check out dealer and ordering information at the company's Web site: <http://www.mfjenterprises.com>.

*Circle 101 on reader service card*

## Gateway Electronics Belt Case

A new belt case designed for the Yaesu VX-1R mini handheld radio is now available at Gateway Electronics. The fully adjustable case features an elastic side slot to store a spare battery or alkaline case. The durable polypro web construction and heavy duty Velcro closure keep the radio secure yet accessible. The case fits several other radios, including the VXF-1 FRS radio. It is available at all

three Gateway Electronics locations, or may be ordered by calling toll-free 1-800-669-5810. Additional information is available at Gateway's Web site: <http://www.gatewayelex.com>.

*Circle 102 on reader service card*

## ANI-1 Miniature ANI Encoder

Want to find your rig if it's stolen? Communications Specialists' ANI-1 miniature ANI encoder is a microprocessor-based printed circuit board that provides instant identification of mobile and portable two-way radios. The ANI-1 uses a high-speed, multi-tone sequence for data transmission on an RF channel. Incoming unit ID and status message transmissions can be decoded and displayed on a personal computer by using the ANI-2 station decoder. It is compatible with links and repeater systems. The ANI-1 measures 1.13 x .66 x .22 inches with easy interface connector.

The ANI Automatic Numbering Identification system is available from stock and carries a five-year warranty. A catalog is available on request.

For more information, contact Communications Specialists, Inc., 426 West Taft Street, Orange, CA 92865-4296; Phone: (800) 854-0547; Fax: (800) 850-0547 (U.S./Canada); elsewhere, Phone: (714) 998-3021; Fax: (714) 974-3420.

*Circle 103 on reader service card*

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# Microwave Radio... European Style!

Last month, we gave you a broad introduction to microwave hamming as a warm-up to this month's microwave special, including a new bi-monthly column—"The Final Frontier"—plus plans for a 10-GHz transverter and this look at microwave hamming in Europe.

By Simon Lewis, GM4PLM*

Microwave radio is one of amateur radio's more interesting aspects and recent *CQ VHF* articles have not only shown how easy it is to get active on the higher bands, but also described some of the amazing propagation that takes place at centimeter and millimetric wavelengths (see "10-GHz: A Good Band for a Rainy Day," February '97 *CQ VHF*). You haven't heard anything until you've heard a 10-GHz rainscatter QSO! It's unreal!

Microwave hamming is growing in popularity in the U.S., but the microwave bands are already very active in Europe. Although the Internet has gone a long way in publicizing our efforts on this side of "the pond," I decided that *CQ VHF* readers might like an update on our microwave activities over here.

## In the Beginning...

The European microwave bands have been active since the early 1970s, but recent advances in microwave engineering have produced some useful and very flexible components, which have allowed the design and construction of some highly sophisticated amateur transverters. These are now at such a level that the metalwork and plumbing that was once required to build any microwave equipment has almost been removed.

**Simon Lewis, GM4PLM, is Editor of* The European Microwave News.

Early microwave activity was usually based on Gunn oscillators and mixer diode wideband FM (WBFM) transceivers. Various IF strips were pressed into service, and it was not unusual to find a small pocket VHF broadcast transistor radio used as the IF receiver! Transmit powers were normally in the 10-milliwatt range, and the most popular antenna was a small 18-inch dish using a splash plate feed, known over here as a "penny feed" (the splash plate being the size of an old British penny!). The popularity of this dish and feed combination increased when the UK ham magazine *Practical Wireless* ran a design for a WBFM transceiver called the PW EXE, and hundreds of dishes were spun and sold via *PW* to match the project. Many of these dishes survived the garage or loft (*that's British for "attic"—ed.*) and are still in use on 10 GHz today.

Narrowband technology arrived during the early 1980s in the form of the *image recovery transverter* designed by Mike Walter, G3JVL. This unique design produced the first stable narrowband transmissions on the band. It was waveguide-based and transverted from 2 meters to 10 GHz. The "JVL" transverter became the usual route to narrowband from wideband operation, even though it was a little difficult for beginners to build. The JVL transverter also appeared in a 5.7-GHz version.

Activity was usually from hilltop sites, and wideband contacts were normally

***"Microwave activity in Europe today is spread over all bands from 1.2 GHz to 146 GHz..., but the main area of activity is still the 10-GHz band."***

along line-of-sight paths, the longest path being some 250 kilometers from Snowdon Mountain in Wales to a peak in southern Scotland called Cairnsmore of Cairsphain. Narrowband equipment extended this range, but path lengths were still limited by equipment performance.

In the early 1990s, a group of amateurs led by Charlie Suckling, G3WDG, produced the first linear printed circuit board (pcb)-based transverters, which were designed to use surplus GaAsFETs from a UK supplier (*In case you're wondering, GaAsFET stands for Gallium Arsenide Field Effect Transistor. See why it's just called a GaAsFET?—ed.*). These separate receive and transmit mixer strips, along with a 2.4-GHz local oscillator (LO) source developed by Sam Jewell, G4DDK, created a reproducible and affordable route to narrowband 10-GHz operation, which I'll explain in detail in the following article. The boards are simple to build, use a low component count and are *fairly* simple to align. Many hundreds of these boards have been produced and sold via the Microwave Component Service (see sidebar of the same name in

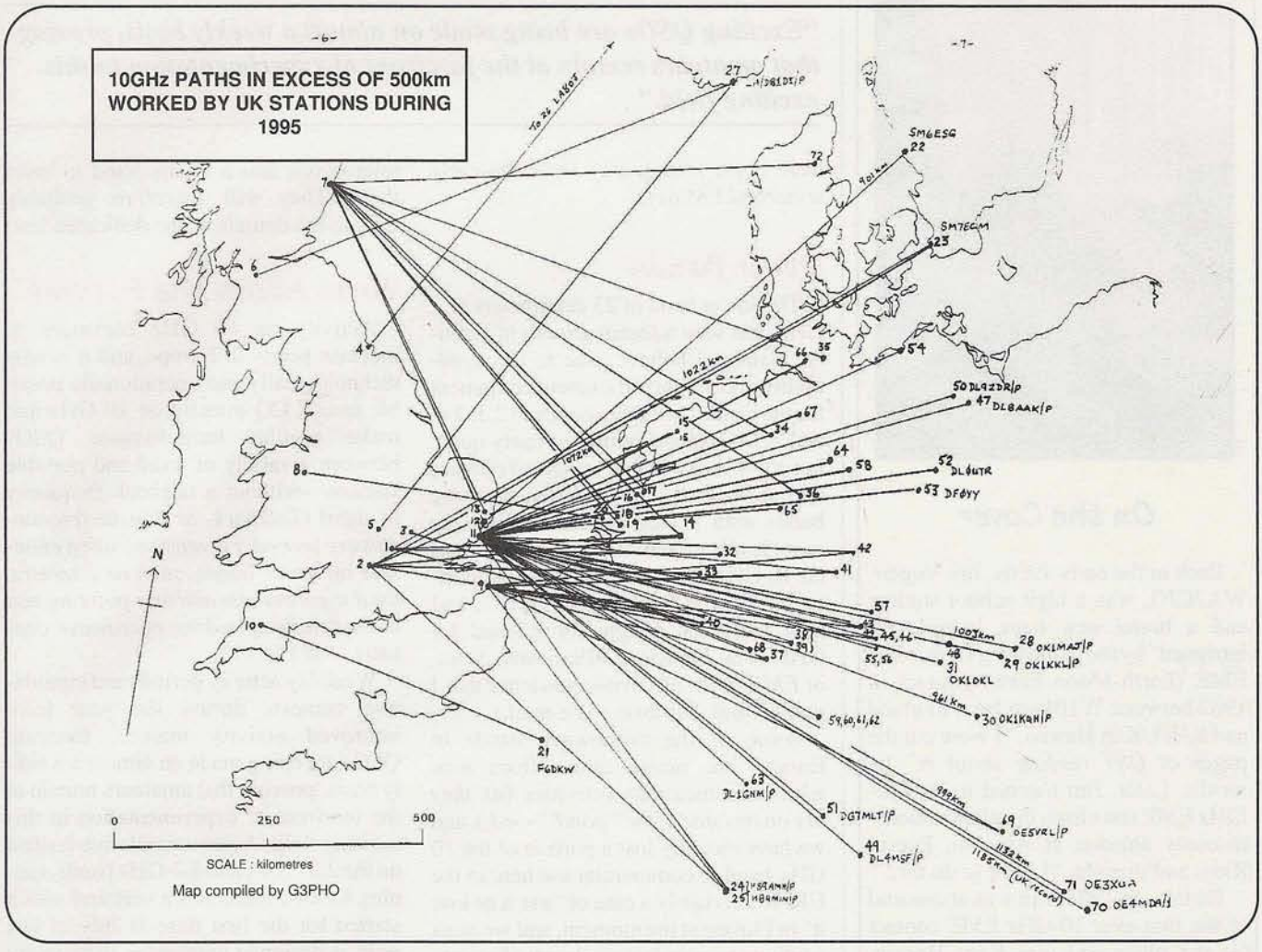



*Figure. Microwave DX is becoming more and more common in Europe. As you can see from this map of 10-GHz contacts greater than 500 kilometers (about 300 miles) made from the UK in 1995 alone, the microwave bands certainly are not limited to line-of-sight contacts.*

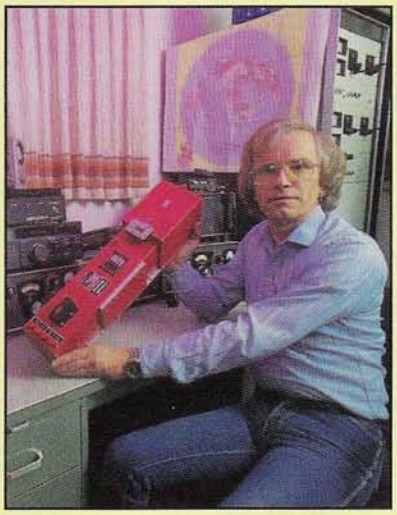
the next article in this magazine) and produced a massive influx of activity on the 10-GHz band in Europe. Charlie and his gang also produced a set of "add-ons" for the transverters in the form of low noise HEMT (High Electron Mobility Transistor) preamps, linear amplifiers, and IF switches.

Hams on 10 GHz now had a high-performance system available that would produce some amazing contacts over paths and terrain previously thought impossible (see Figure). The new 10-GHz technology also spurred activity on the other microwave bands, with pcb-based designs arriving for all of the lower bands and eventually for 24 GHz and above. In Germany, DB6NT and his crew have probed the higher reaches and produced a range of transverters and mixers for bands as high as 146 GHz. And, as technology improves, the distances covered in Europe have been extending on a yearly basis.

## Microwaving Today

Microwave activity in Europe today is spread over all bands from 1.2 GHz to 146 GHz (with experiments being conducted even higher), but the main area of activity is still the 10-GHz band. The G3WDG transverter has remained the main route for many, transverting from 144 MHz using the many FT290s and IC202s available cheaply on the secondhand markets across Europe. The WDG transverter has also been widely used on the recent 10-GHz EME trials and has proved itself more than worthy of a place in the shack of any amateur interested in microwave operation. The WDG transverter system is still available and remains the primary method of entry to the 10-GHz band for European hams today.

The large influx of amateurs to the European microwave bands has also helped to show that there are many unusual propagation methods available to the microwave operator. As more fixed stations have became active, hilltopping expeditions have started to become limited to contests, but we now see many openings occur on the bands that would have previously gone unnoticed. A recent near-world record, 24-GHz QSO on a mid-week morning between Petra Suckling, G4KGC (Charlie's wife) and Ari Dogterom, PAØEZ, in the Netherlands, would have never been completed if we had not had the technology in place that allows regular long distance QSOs to be made between fixed stations. Things



## On the Cover

Back in the early 1960s, Jim Vogler, WA7CJO, was a high school student and a brand new ham, "absolutely intrigued" by the pioneering 1296-MHz EME (Earth-Moon-Earth) contact in 1962 between W1BU in New England and KH6UK in Hawaii. "I wore out the pages of *QST* reading about it," he recalls. Later, Jim listened in on 432-MHz EME tests from the giant radioastronomy antenna at Arecibo, Puerto Rico, and thought, "I want to do this."

He has...in 1988, Jim was at one end of the first-ever 10-GHz EME contact (at the other end was Kent Britain, WA5VJB, who joins our staff this month as micro-wave and antenna columnist). In fact, notes Jim, "the first signals I ever heard on X-band [10 GHz] at my home station were my own echoes off the moon!" Today, Jim's Phoenix, Arizona, station can operate on all bands from 50 MHz to 24 GHz, and he's getting ready to do 24-GHz EME tests in the near future.

Professionally, Jim is a consultant specializing in spacecraft and satellite antenna systems, expertise he has also provided to fellow hams—designing "some long Yagis" for KLM, and, several years back, working with Tom Clark, W3IWI, to design the receivers on AMSAT's microsat satellites.

And what about the tube in the photo? Jim says that's a 900-watt Varian amplifier tube that he's planning to put on 10 GHz...just as soon as he can come up with a power supply for it. Meanwhile, he's limping along at 300 watts, a power level matched only by one other ham on 10 GHz—in France! (Cover photo by Larry Mulvehill, WB2ZPI)

***"Exciting QSOs are being made on almost a weekly basis, proving that amateurs remain at the forefront of experimentation in this exciting field."***

have come a long way since the early wideband FM days!

## Other Bands

The lower band of 23 centimeters (1.2 GHz) has seen a recent growth in activity, mainly, I believe, due to the availability of commercial amateur equipment for the band. The higher bands of 2.3, 3.4, and 5.7 GHz have remained fairly quiet, but the *European Microwave News* has chosen to center its attention on these bands with a view to establishing the same levels of activity on them as exists on 10 GHz. This has also been supported by Charlie Suckling, G3WDG, and new additional designs for 2.3 and 3.4 GHz. (*The European Microwave News*, or *EMN*, is an electronic newletter that I publish and distribute via e-mail.)

Some of the microwave bands in Europe are under threat from new telecommunications activities (*as they are on this side of the "pond"—ed.*), and we have recently lost a portion of the 10 GHz-band to commercial use here in the UK. It's certainly a case of "use it or lose it" in Europe at the moment, and we must continue to populate the bands if we are not to lose more of them in the future. To encourage this activity, single-board pcb-based transverters are a must, not only for their ease of construction but also because of their relatively low cost. Many amateurs across Europe do not have large amounts of money to spend, but the single board option remains one of the cheapest and easiest forms of entry into the microwave scene.

Activity on the higher bands has been rather limited in the UK, but regular activity now takes place on 24 GHz, mainly due to the availability of equipment from the continent and from the recent sale of ex-telecommunications equipment, which has been pressed into service as 24-GHz linear transverters. Equipment on bands above 24 GHz remains as simple as mixer/multiplier strips with only a few milliwatts of transmit power available. Some long distance QSOs have been made on these bands, chiefly by amateurs on the European mainland. The problem on the higher bands is that these transverters need a microscope and a steady hand to build them! They will, therefore, probably remain the domain of the dedicated few!

## What About the Future?

Activity on 10 GHz continues to increase yearly in Europe, and it is now technologically and operationally possible to call CQ directly on 10 GHz and make regular long-distance QSOs between a variety of fixed and portable stations—without a talkback frequency in sight! (*Talkback, or liaison, frequencies are secondary communication channels on lower bands, such as 2 meters, used to coordinate antenna-pointing and other details of making microwave contacts.—ed.*)

Weekday activity periods and cumulative contests during the year have improved activity tenfold. Exciting QSOs are being made on almost a weekly basis, proving that amateurs remain at the forefront of experimentation in this exciting field. A new cumulative contest on the 2.3-, 3.4-, and 5.7-GHz bands, running for two weekends a year and which started for the first time in July of last year, is designed to increase the activity on these bands in Europe. And first signs seem to be encouraging, with more stations building for these bands and planning activities on them. Things are definitely looking up!

Contact with other parts of the globe is also very important for Europe. Paul Wade, N1BWT, has been a great help in feeding information over the Atlantic via e-mail and by letter. A 3.4-GHz single-board transverter design by Zack Lau, W1VT (formerly KH6CP/1), has recently been covered by the *European Microwave News*, and N1BWT's own 5.7-GHz single-board design will be publicized as soon as it appears in the ARRL's experimenters' magazine, *QEX*.

## European Microwave Information

The exchange of information between countries is highly important, and there are a number of ways U.S. amateurs can see up-to-date information from Europe. There is an increasing number of

European amateurs with Internet homepages dedicated to microwave operating. These pages reflect much of the activity currently under way in Europe and are well worth a visit. Some of the more popular URLs are listed under "Resources."

In addition, as mentioned earlier, I publish *EMN*, which is available free by subscription and covers all aspects of microwave radio above 1 GHz. All I ask in return is that subscribers e-mail a regular report to the newsletter detailing their interests, activities, and news. The newsletter also covers other microwave items of interests, such as equipment designs, component availability, and news from across Europe on microwave activity. There are sections for band reports and for sales and wanted adverts (*another "Brit-icism," it means "want ads"—ed.*). The newsletter is also supported by a homepage (see "Resources"), which is regularly updated with a wide variety of information and links to other places of interest on the Internet. A Web version of the *EMN* can be also be found on the site. Subscriptions are available by sending an e-mail to <emn@pacsat.demon.co.uk> with your e-mail address in the text and the word SUBSCRIBE as the message title.

Peter Day, G3PHO, also has a great Web site for European microwaving and it is well worth a visit. Peter is the editor of the Radio Society of Great Britain's (RSGB) *Microwave Newsletter*. Follow the link from the EMN page or go directly by the URL shown under "Resources."

Paper-based communication is still available for many amateurs, who for one reason or another, do not want access to the net. There are three main microwave publications of interest in Europe, *DUBUS* (published in German and English), *VHF Communications* (the English-language version of the German publication, *UKW Berichte*), and the RSGB's *Microwave Newsletter*. All of the above publications can also be found on the Internet.

## Finally...

Microwave radio remains one of Europe's fastest-growing segments of amateur radio. It offers the amateur a chance to build simple equipment and then experiment in an area of radio that still offers a unique challenge. Modern technology has improved our capabilities tenfold and now represents a level never before achieved in amateur radio. Equipment capabilities coupled with activity levels have shown that microwaving is no longer a hilltop activity, but that regular long-distance QSOs are possible, even from poorly sited fixed stations. EME and satellite operation are now regular modes for microwave operations, EME microwave activity continues to expand, and the inclusion of microwave uplink and downlink transponders on the AMSAT Phase 3D spacecraft (hopefully due for launch shortly) will offer new and exciting possibilities for the microwave bands.

It is indeed an exciting area to be involved with, and I hope that the flow of information across the Atlantic will continue to be beneficial both for European hams and for our colonial cousins on the other side of the world! Enjoy your radio and see you on air! ■

### Resources

The Internet provides many of the best sources of information about ham radio microwaving in Europe. Here are some of the more popular sites:

<http://www.pacsat.demon.co.uk/main.htm> (This is my Web site)
<http://www.geocities.com/SiliconValley/Vista/7012/ghz.htm> (G3PHO's site)
<http://www.geocities.com/SiliconValley/Vista/8063/> (G4KNZ)
<http://members.aol.com/g6der/> (G6DER)
<http://df6na.mayn.de/> (DF6NA)

The *European Microwave News* homepage is located at: <http://www.pacsat.demon.co.uk>

N1BWT's Web site, which is a good starting point for U.S. microwave information, is at <http://www.tiac.net/users/wade>.

# The G3WDG 10-GHz Narrowband Transverter System

The G3WDG transverter system is the mainstay of 10-GHz narrowband operation in Europe, providing a relatively cheap and easy way to use a 2-meter SSB/CW rig on 10 gigs. We're pleased to share it with you here.

By Simon Lewis, GM4PLM*

During the late 1980s, 10 GHz was still a domain for the wideband enthusiast. There was some activity on narrowband, but this was limited to waveguide-based G3JVL image recovery style transverters, which required a great deal of metalwork and alignment skills (see previous article in this magazine). To try to overcome this problem, Charlie Suckling, G3WDG, and a group of other microwave enthusiasts designed a linear, printed-circuit-board (pcb)-based, narrowband transverter system for 10 GHz using a series of surplus GaAsFETs (Gallium Arsenide Field Effect Transistors) that were available at low cost from a UK surplus supplier (*If you're not familiar with transverters, see "What's a Transverter, Anyway?" elsewhere in this article.—ed.*)

The G3WDG transverter is almost perfect in every way! It's a simple design, reproducible by anyone who can follow simple instructions, contains no "odd" components, and is fairly easy to align. What followed revolutionized 10-GHz operation in Europe. Hundreds of WDG transverters have been built and it probably classifies as one of the most popular pieces of homebrew design.

So what makes the WDG system so popular? Simply that a great deal of design and thinking went into it, making it very hard to construct one that does not work, as long as you follow some simple instructions and are capable of handling

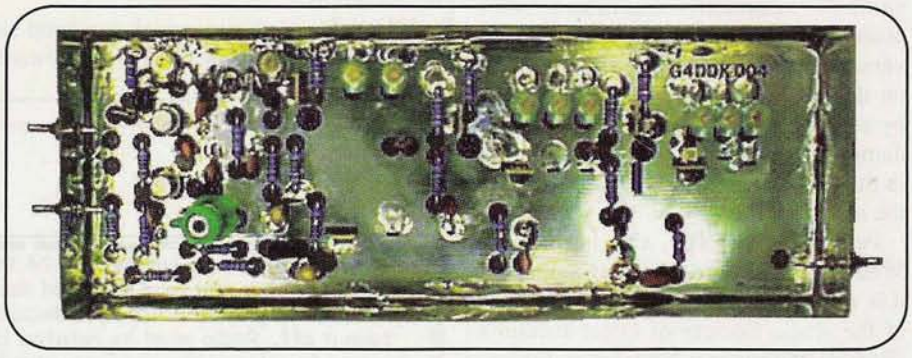



*Photo A. The "heart" of the system: the G4DDK local oscillator (LO) board. This and all other modules are housed in tinplate enclosures.*

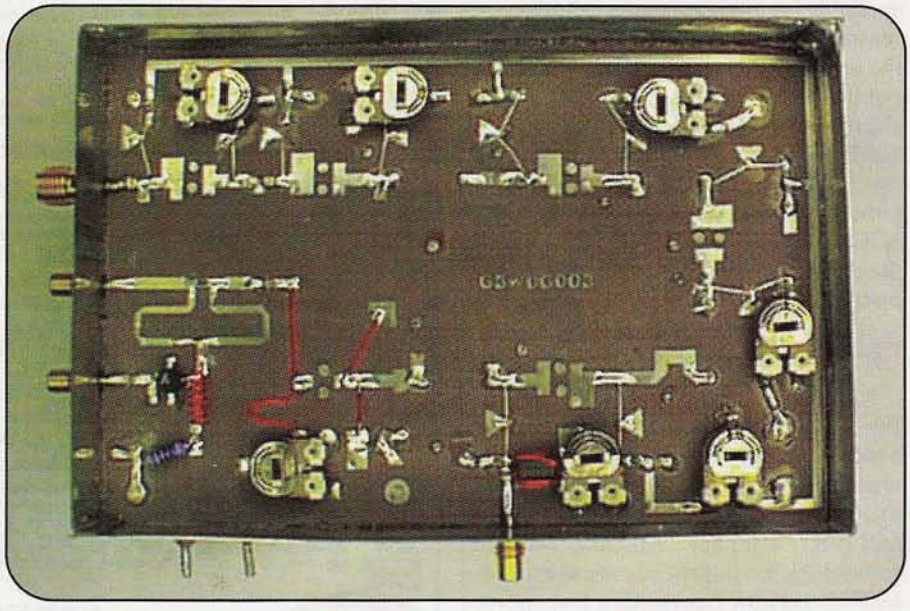


*Photo B. The G3WDG transmit mixer module. Here, the outputs of the 2-meter IF rig and the LO are mixed to create a 10-GHz signal.*

**Simon Lewis, GM4PLM, is Editor of* The European Microwave News.

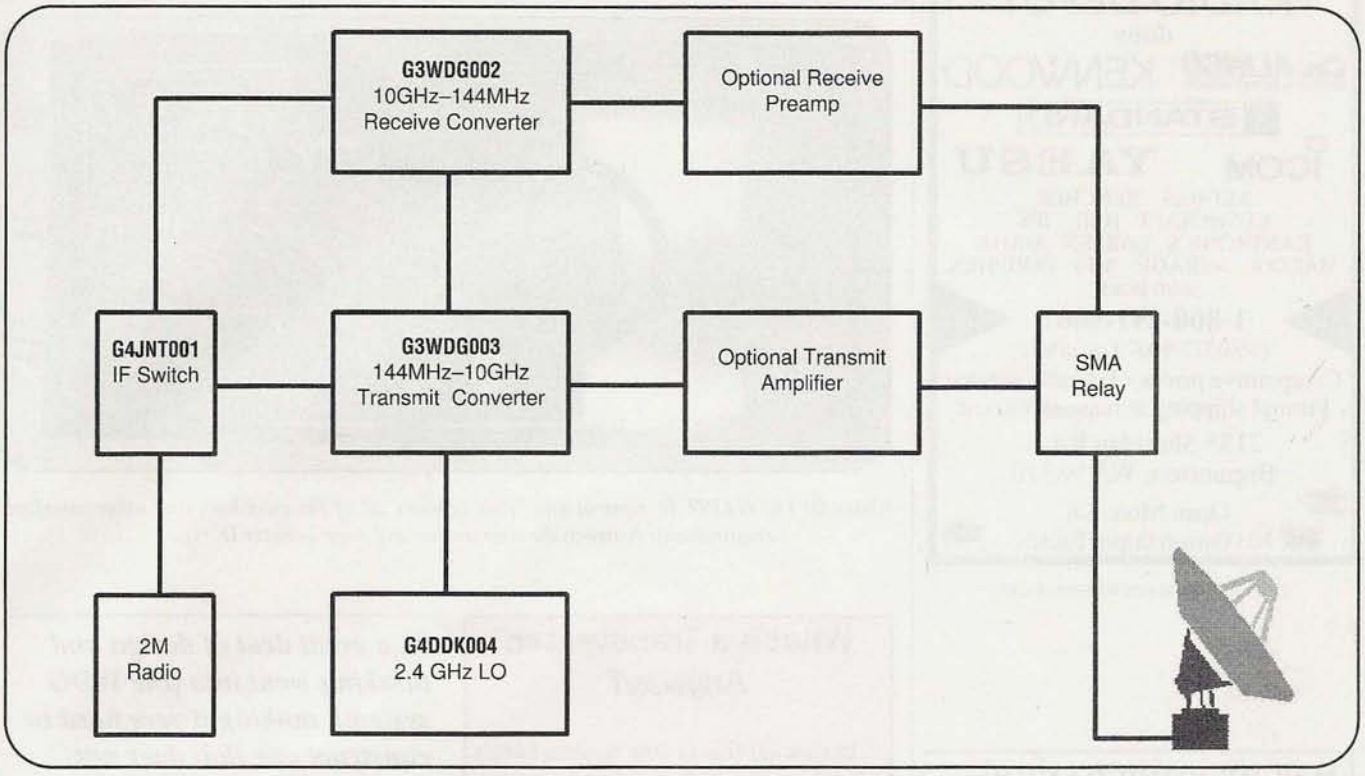



*Figure. Block diagram of a typical G3WDG 10-GHz transverter system. Individual components of the system may be modified to meet the individual operator's specific needs.*

a small soldering iron. So let's take a look at what's involved in the system and how we can produce an excellent, high quality, and, more importantly, high performance 10-GHz narrowband transverter.

## System Description

The Figure shows a block diagram of a typical configuration of a WDG design. I say typical because each of us will require different modules for whatever task we want the transverter for, but, in general, this is what you would want for terrestrial-based DXing.

At the heart of the system is the local oscillator (LO), the G4DDK004, which was designed by Sam Jewell, G4DDK. Sam's LO is another gem of microwave design. It uses simple, discrete components and low-cost transistors, along with a microstrip pcb design, to produce an output of around 10 milliwatts (mW) at 2556 MHz. G4DDK004 pc boards and kits are available from the Microwave Component Service (see "Resources"). Photo A shows a completed G4DDK004 board housed in its tinplate enclosure.

The output from the G4DDK004 LO is connected to the transmit mixer module and is fed into a pcb microstrip power divider and MMIC amplifier. Some of the LO signal is fed into the TX (transmit) mixer, and the rest is output to an SMA socket for use in the receive (RX) converter. The 2556-MHz LO signal in the TX mixer is fed to a GaAsFET multiplier (where it's multiplied four times to 10224 MHz), and it's then filtered using small silver plate cavities with vero pin probes (vero pins are small terminal pins used for through-the-board connections). These filters are the key to the design and have produced a small, compact TX mixer module. The 10224-MHz signal is mixed with a 1-mW 144-MHz signal to its final frequency of 10.368 GHz (10244 + 144 = 10368) and is then amplified and filtered up to a final output of around 50 to 80 mW. The pcb is etched on a PTFE (PolyTetraFluoroEthylene—the slipperiest substance known to man) board and is mounted in a small tin-plated case measuring 74 x 111 x 30 millimeters (2.9 x 4.37 x 1.2 inches). Photo B shows a completed G3WDG TX module in its tinplate enclosure.

The receive mixer is based on the same form of construction as the transmit mixer and measures 37 x 111 x 30 millimeters (1.45 x 4.37 x 1.2 inches). Again, it is housed in a small tin-plated case. In the receive converter, the LO signal from the transmit mixer is applied to a GaAsFET X4 multiplier and then filtered by a cavity filter. This is applied to a high-performance Alpha series microwave mixer diode. Incoming RF on 10 GHz is fed via

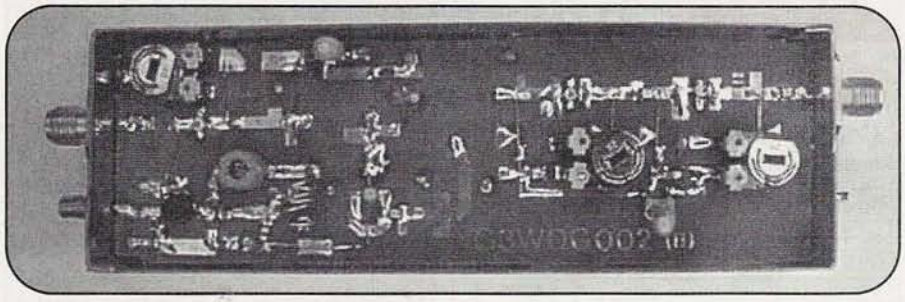


*Photo C. The G3WDG receive mixer. This performs the opposite function of the TX module, converting the received 10-GHz signal to 144 MHz.*

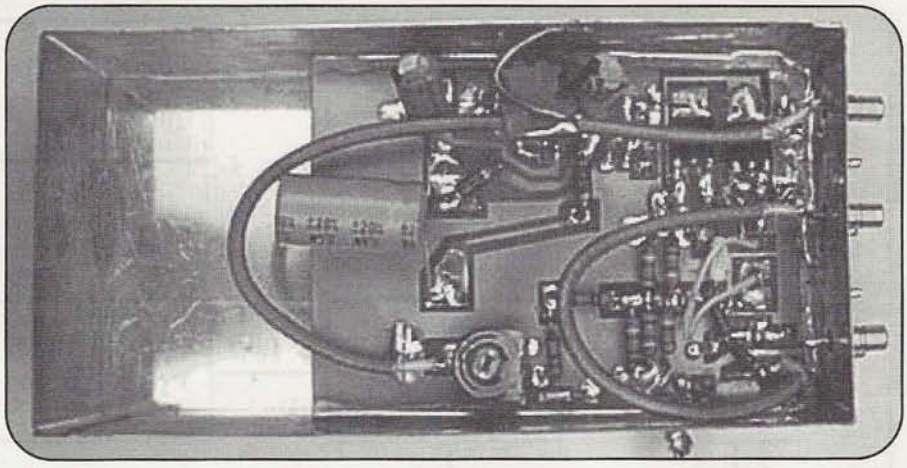


*Photo D. The G4JNT IF control unit. This handles all of the switching and other interface requirements between the transverter and your 2-meter IF rig.*

## What's a Transverter, Anyway?

In case all this is new to you, here's a brief explanation of how a transverter works. Think of your typical cable TV "box," in which all of the cable channels are converted to channel 3 or channel 4 on your TV. A transverter basically does the same thing, except that it does it for both transmit and receive, and it does it kind of backwards in relation to the cable box. For watching TV, you leave the tuner on your set on one channel and tune with the box. In most ham transverters, you continue to use the tuning dial on your rig (which is now known as the "IF," or *intermediate frequency* radio). But the signals going out are converted to the (generally) higher frequency band, and signals coming in on that band are converted to your "IF" band.

In this case, we're dealing with a 2-meter-to-10-GHz transverter. You start with a 2-meter multimode rig and run it into the transverter instead of an antenna (the antenna attaches to the transverter). A signal on 144.000 MHz is translated to 10368.000 MHz, and a signal on 10368.100 MHz is converted down to 144.100 MHz. It's all a matter of frequency mixing, and the only caution we have to offer is that most transverters operate on a *very* small amount of input power, so you have to be careful not to overload the transverter with too much power out from your 2-meter "IF" rig.

—W2VU

***"...a great deal of design and thinking went into [the WDG system], making it very hard to construct one that does not work, as long as you follow some simple instructions and are capable of handling a small soldering iron."***

a dual-stage GaAsFET amplifier and single cavity filter into the mixer diode. Output from the mixer (at 144 MHz) is fed to a single-stage, low-noise IF amplifier and out to the 2-meter radio. The final converter performance should give a noise figure of around 2.5 dB, with a conversion gain of 25 dB. The noise figure can be lowered by adding an outboard preamp (specifics are given later). Photo C shows a G3WDG RX module, again with the typical tinplate case.

## Control Unit

To complete a simple transverter, all that is now required is some form of transmit/receive switching and 144-MHz IF interfacing, to bring the nominal 3 watts from an FT-290 or IC-202 (or similar 2-meter multimode rig) down to the 1 mW required by the transmit mixer. An answer is provided in the form of Andy Talbot, G4JNT's control unit: the G4JNT001. This small board gives all the interfacing you will need for your transverter. It switches the receive and transmit lines when driven by an FT-290 or IC-202's antenna switching voltage, and

## The Microwave Component Service

The Microwave Component Service (MCS) is run by Petra Suckling, G4KGC. The service was originally run under the Radio Society of Great Britain's control, but, when RSGB decided to close the service, Petra took over the stock and business and ran it privately, rather than see the service close. The MCS also provides a source of low-cost microwave components which can sometimes be hard to find. In addition to individual components, the MCS supports a range of kits and modules, particularly for the G3WDG 10-GHz transverter system. The G3WDG kits are supplied as "short kits," i.e. they contain all the hard to get parts, a pcb, and a comprehensive instruction book. Easily obtained components are not supplied in order keep kit costs down.

The MCS also supplies other items of microwave interest and a catalogue and price list can be found on the *European Microwave News* Web site at <http://www.pacsat.demon.co.uk>, or a printed list may be obtained by writing to the MCS address listed under "Resources." Petra does a great job running the MCS and is willing to help with any microwave component queries, backed up by the microwave "guru" himself, Charlie, G3WDG. Petra is also a very good microwave operator herself and recently completed a near-world-record 24-GHz contact between her home QTH in Northampton, England, and Ari Dogterom, PAØEZ, in the Netherlands.

***"All of the modules are easily constructed and aligned. No special tools are required and there are no 'odd' components needed, as most of the parts are already supplied with the kits."***

it has an onboard adjustable TX attenuator to bring the 3 watts down to 1 mW. The board also houses a 12- to 20-volt power supply, which can be used to switch small surplus 28-volt SMA relays used for antenna switching. Photo D shows a G4JNT IF unit.

To improve the basic performance of the transverter, you can add small modules to include a high-performance HEMT (High Electron Mobility Transistor) receive preamp and to increase the basic output power from 50 mW to 1 watt. One watt may not sound like a lot, but this puts you on a par with the "big guns" on 10 GHz; and with a small 60-centimeter (2-foot) dish antenna, you have an ERP (effective radiated power) of over 1 kW!

All of the modules are easily constructed and aligned. No special tools are required and there are no "odd" components needed, as most of the parts are already supplied with the kits. The builder simply has to add tinplate boxes, connectors, a few parts for bias generators, the GaAsFETS, and some patience.

I mentioned earlier that the GaAsFETs were originally available as surplus items, and their source has now dried up. However, there's no problem. The devices used can be replaced by using MGF1302s, easily obtained in both the UK and U.S.

The final constructed transverter will hold its own again anything available. It has an excellent spec and is easy to build, what more could you want? It's your ticket to 10-GHz!

## For Further Information

More information on the G3WDG, G4DDK, and G4JNT modules and their construction, as well as on other G3WDG and G4DDK equipment, can be found on the *European Microwave News* Web pages, along with an online version of the Microwave Component Service catalogue and price list. Alternatively, you can contact the MCS at their UK address shown below. Please remember there's a time difference!

73 and see you on 3 cms!

## Resources

*European Microwave News* Web page: <http://www.pacsat.demon.co.uk/main.htm>

The Microwave Component Service is run by Petra Suckling, G4KGC, 314A Newton Road, Rushden, Northants, NN10 0SY, UK. Telephone: 0933 411446 (From the U.S., dial 011-44-933-411446).

# A Few "Facts" About Microwaves

A lot of people think they know a lot about microwave operating—even though they've never tried it and even though a lot of these "facts" are really "myth-information." So let's get started by setting the record straight...then get you on the air!

*We're pleased to introduce a new column and a new columnist to* CQ VHF. *"The Final Frontier" will help you get started—and keep going—on ham radio's microwave bands. Columnist Kent Britain, WA5VJB, will alternate monthly between this column and one on antennas that will premier in our April issue. Kent does a pretty good job of introducing himself down below, from a technical and operating perspective (even though he forgot to mention that he's also Editor of the North Texas Microwave Society's newsletter,* Feed Point*). But his technical expertise is only one reason I asked Kent to become a* CQ VHF *columnist. The others are his unstoppable enthusiasm about the things he enjoys, plus his ability to explain just about anything to just about any audience.*

*I've listened to Kent make highly technical presentations at VHF conferences (and have been amazed that I actually understood what he was talking about) and I've seen him write about antennas for CBers. When you read something Kent writes, you do more than learn: you understand. That's our goal for every article in* CQ VHF, *of course, but Kent manages to succeed at it about 99.99% of the time. We welcome him to our staff, and we hope you'll find his columns to be both educational and entertaining.*

*—W2VU*

I would like to thank the staff at *CQ VHF* for this opportunity to tell everyone about microwave equipment and operations. Rich Moseson, W2VU, has been trying to talk me into writing for *CQ VHF* for some time now. Well, he finally figured out how, and, according to our agreement, my children should be released by this printing.

I have a bit of background in microwaves (that's me in Photo A). I made my first microwave QSO in 1969 on our 5.7-GHz band. In 1988, I was one end of the first-ever 10-GHz EME (moonbounce) QSO with WA7CJO—see this issue's cover— (my thanks for considerable help from KF5N and KY7B on that QSO). I currently have a 1.8- to 24192-MHz SSB station, all ham bands, and have seven states and 11 countries worked on 10 GHz. Yeah, I know, 11 countries on 10 gigs is hardly notable these days. Two other Texans, WB5LUA and AA5C, have more countries on 10 GHz than I do, and Jim, WA7CJO, is now pushing 30 countries confirmed on the band. If we can get someone on 10-GHz EME in South America, Jim will have a 10-GHz WAC (Worked All Continents).

*Photo A. The author with one of his microwave dish antennas. Kent is as interested in antennas as he is in microwaves, which is why he'll be alternating between a column on microwaves (this one) and one on antennas (starting next month).*

## Facts and Fiction

I'd like to start out this first column by discussing a few "facts" that everyone "knows" about microwaves:

- Microwaves are line of sight
- The equipment is expensive, and
- You need a Ph.D. to understand/operate microwaves

## Microwaves Are Line of Sight

Well, let's start with "What is line of sight?" Taking a look at Photo B, we see a photo of a Texas sunset. The sun goes down, the world instantly turns completely BLACK! Well....doesn't it? I don't know about you, but down here in Texas, I don't start mowing the yard until *after* the sun goes down! Sure, there's 20 dB of attenuation of the sunlight, but it's not completely black.

Back in days when microwave pioneers ran $^{1}/_{100}$-watt modulated oscillators as transmitters, and diodes in a piece of waveguide as the receiver, yeah, line

By Kent Britain, WA5VJB

***"Good microwave stations have a typical range of 200 miles, any time of the day or night. Throw in a weather front and QSOs have been made out to thousands of miles."***

of sight was about the best they could do. But today, we have microwave receivers that are 10 to 25 times more sensitive than the best HF rigs. And without all that HF static and noise, it's all usable sensitivity. (I challenge you HF types to build up two 1/100-watt modulated oscillators with diode receivers for 75 or 20 meters and see how far you can get!)

As for transmit power, 10-watt *Traveling Wave Tube*, or *TWT*, amplifiers are fairly common today. In addition, 10- and sometimes even 20-watt solid state amplifiers are showing up on the surplus market. Add in a two-foot dish and you have 20 to 50 *Kilowatts* Effective Radiated Power (ERP). Hey, that's more power than most of the Big HF DXers run! With modern receivers and good power, that weak glow on the horizon is now an S9+ signal! Good microwave stations have a typical range of 200 miles, any time of the day or night. Throw in a weather front and QSOs have been made out to thousands of miles.

During contests, I've operated mobile (yes, in motion, not start-and-stop) on all of our microwave bands up to 10 GHz. Umm, sounds like 24 GHz mobile needs to be a spring project. Each band has its own propagation characteristics, but time and time again, I've had my 5-watt, 10-GHz SSB mobile alongside my 160-watt, 2-meter SSB mobile, and 10 GHz was easily out-talking 2 meters. These microwave bands propagate just fine.

Care for the more exotic? Well, 10 watts and a good 10-foot dish can just hear echoes off the moon! Now you've got an EME station and can chase DX all over the world. (More on this and how to get a lot more than 10 watts out of 10-watt TWTs in later columns).

## Microwaves Are Expensive

Like the hams engaged in any other aspect of our hobby, we microwave operators can never have big enough stations. But at the other end of the price spectrum, I'll be showing you in future columns how to build 10-GHz rigs of out old police radar detectors and laser stations out of CD players. The true scrounger can get on 10-GHz FM for under $50; laser systems can cost even less.

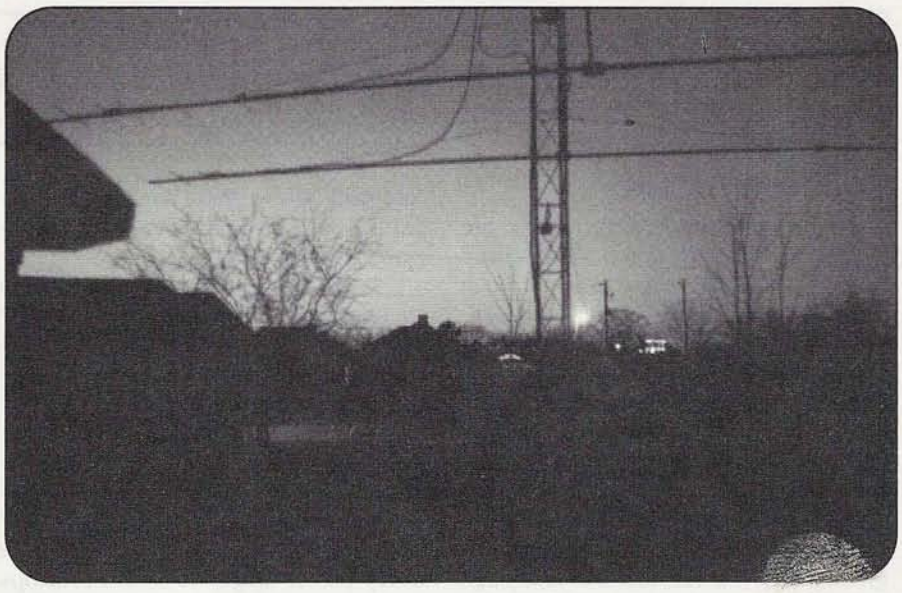


*Photo B. If microwaves were only good for line-of-sight communication, then you wouldn't be able to see this Texas sunset (even if you were in Texas), since light waves are micro-microwaves. The light you see before sunrise and after sunset is an example of forward scatter, which you can also use to extend your microwave range.*

## You Need a Ph.D.

Some 10 years ago, I remember the first ARRL 10 GHz Contest. Seven of us got together for fun, travel, and 10-GHz operating. We were a diverse lot, including a minister, machinists, an efficiency expert, a sewer engineer for the EPA, inventory control specialists, an optics engineer, and a junior EE (electrical engineering) student from Texas A&M. Not one of us had a degree in electronics. Guess if we had, we would have been too smart to go out running around the countryside bouncing 10 GHz off of all kinds of things. We would have known that what we were doing was impossible. No, you don't need an advanced degree in electronics to have fun on our higher frequency bands, just a healthy interest in experimenting and an interest in communicating via microwaves.

## The Potential of Our Microwave Bands

*There's enough bandwidth to give every amateur in North America his own private channel.* This is the potential of our microwave bands. How about those new DBS (Direct Broadcast Satellite) systems? Hundreds of TV and audio channels all coming down to a small dish on the roof. Those DBS systems operate at 10.7 GHz, just on the edge of our 10- to 10.5-GHz ham band. I can easily imagine a future AMSAT transponder sending MPEG-II compressed video down to thousands of old (and easily modified) Primestar and RCA DBS systems. And I'm sure you can think of a few uses for those hundreds of digital audio channels.

*But we are going to have to fight to keep these bands.*

Five years ago, a petition was submitted to the FCC to take 26 MHz away from the hams. We fight and argue over a few kHz on 2 meters, or a little elbow room on HF, yet for 26 MHz of spectrum, only one—yes, only one—amateur filed comments with the FCC in opposition to the petition. Enough bandwidth for several TV channels, over 600 repeaters, or many other services, went virtually undefended. (This was PacTel's petition to ban amateur operation from 902 to 928 MHz, and I was the one amateur who filed in opposition. I was able to help delay action

***"I can easily imagine a future AMSAT transponder sending MPEG-II compressed video down to thousands of old (and easily modified) Primestar and RCA DBS systems."***

on that petition with several technical challenges until other services could bring their law offices into the fight.)

## Potential of 902 to 928 MHz

While *microwave* frequencies are strictly defined as those above 1000 MHz, the 902-MHz band behaves much more like a microwave band than a UHF band, so I'm going to include it under this column's umbrella. The potential growth of our 33-centimeter band will probably not be in voice repeaters, but in the digital area. Cellphones can be, and have been, converted to 900-MHz FM, but the surgery is extensive and a new microprocessor operating system must be programmed. It's a considerable challenge (*but if you're interested, see KD3NC's article, "902 FM—UHF's Final Frontier," in the August, 1997, issue of* CQ VHF.—*ed.*). On the other hand, in the digital area, 900-MHz spread-spectrum transceivers can be purchased off-the-shelf from computer dealers. All we have to do is add a modest beam, and we have 900-MHz data links on the air.

We still have some issues to resolve about hams using spread-spectrum, but this low-cost equipment is available right now and needs no modifications. With an S.T.A. (Special Temporary Authorization) from the FCC, a spread-spectrum packet node is operating in the Dallas, Texas, area. I'll be talking more about that system in the coming months. Another 915-MHz data system is sold by RF Monolithics. The complete transmitter and its companion receiver look like two 14 pin IC's. The transmitter is a low-power *SAW (Surface Acoustic Wave) resonator* with a companion "*Ash*" receiver. The "Ash" receiver is named for its inventor and co-founder of RF Monolithics, Darrell Ash, and is a modernized and updated version of the *TRF (Tuned RF)* receiver that was popular in the 1920s.

These chips are designed for computers to chat with each other around the office. FCC Part 15 regulations limit their power output. But, hey, we're hams. There's nothing in the regulations to keep us from boosting the power to a kilowatt. Just add an MMIC (Monolithic Microwave Integrated Circuit) amp and a beam antenna, and the range goes from feet to miles. Or throw in a brick amp from that old cell phone, and the range is as good as most 2-meter packet systems.

***"...time and time again, I've had my 5-watt, 10-GHz SSB mobile alongside my 160-watt, 2-meter SSB mobile, and 10 GHz was easily out-talking 2 meters."***

As I said before, there's a lot of potential for our 900-MHz band as a digital stomping ground.

Our greatest resource on 900 MHz is not the cellphones themselves, but rather the cell *sites*. First, second, and even third generation cellular telephone cell sites are being dismantled and scrapped at this time. These surplus bonanzas have everything we need to build first-class 900-MHz SSB, FM, and FM-ATV systems. Circulators, power amps, high IP3 preamps, and filters by the ton are available. Every power amp I've tested preamps typically works, without modification, over the 902- to 928-MHz range. The circulators and filters are easily retuned for the 902-MHz band. And those preamps designed to be almost impossible to overload...well, they put out about 2 watts if you just use them as low-power amps. I'll be devoting an entire column to cellphone surplus in the near future.

## Microwave Update '98

Each year, the North Texas Microwave Society (NTMS) hosts Microwave Update. This is a three-day conference with technical presentations, swapfests, and eyeball QSOs. Microwave Update '98 will be hosted by Bill McCaa, KØRZ, and John Anderson, WD4MUO/0 in Longmont, Colorado, over the last weekend in September. Longmont is some 20 minutes north of the new Denver International Airport. I look forward to seeing you there.

Farther on down the road, Microwave Update '99 will be hosted by N4MW and W4TJ in the Virginia area. And the year 2000 will find the conference hosted either by the "Pack Rats" in or near Philadelphia, Pennsylvania, or back in the Dallas, Texas, area, hosted by WB5LUA and yours truly, WA5VJB.

## Operating News

In November, W5ZN worked WB5LUA on 5760 MHz EME. What made this EME QSO unusual was not that it was the first microwave EME contact from Arkansas (which it was), or the fact that W5ZN was using a 20-watt solid-state amplifier, but that Joel, W5ZN, is an ARRL vice president! As the EMEers like to say, "If it ain't a half million miles, it ain't DX!"

Another notable EME contact was on 10 GHz in December, between WB5LUA and N4MW, who was using only 8 watts and an eight-foot offset feed dish. It shows just how low you can go (power-wise, that is) on microwave EME. (My personal best on 10-GHz EME was a QSO two years ago with PA3CSG in the Netherlands. He was running 18 watts into a nine-foot dish.)

Finally, from the Pack Rats, there's news of three new microwave beacons on the air from Center City Philadelphia, Pennsylvania (FM29JW). The new W3CCX/B beacons are on 3456.220 MHz with 5 watts into a 16-slot waveguide antenna; 5760.200 MHz with 5 watts into a 32-slot waveguide antenna; and 10368.200 MHz with .5 watts (yes, *point-five*) into a 32-slot waveguide antenna. Well-equipped stations should be able to reliabily hear these beacons out to almost 200 miles with average propagation conditions.

## Next Month: Antennas

Well, that's about all we have room for this month. If you haven't already done so, be sure to check out GM4PLM's articles elsewhere in this issue to learn about microwave hamming in Europe and building a 10-GHz transverter that can get you on this great band quickly and easily if you already have a 2-meter multimode rig.

Finally, as noted at the beginning of this column, I'll be introducing a column on antennas next month (*we're still working on some camp-but-catchy title—ed.*). Then we'll alternate, with microwaves in the odd-numbered months and antennas in the even-numbered months, except when we do microwave antennas (like the one in Photo B), and then all bets are off!

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### Resources

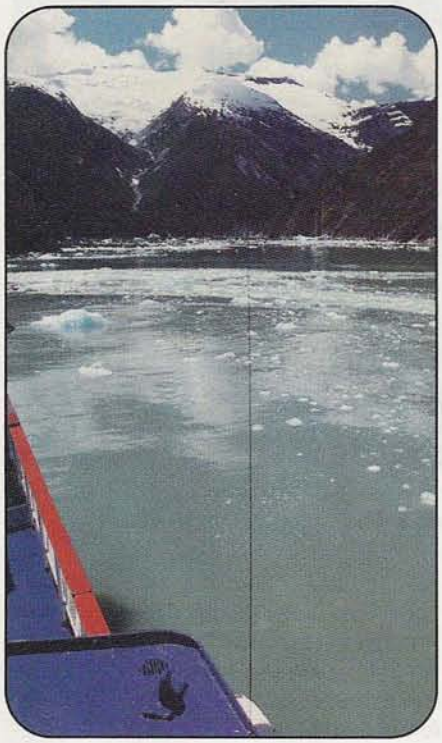
RF Monolithics, Inc., 4441 Sigma Rd., Dallas, TX 75244; Phone: (800) 704-6079 or (972) 448-3700; Fax: (972) 387-8148; Internet: <http://www.rfm.com>.

# Picture This!

"Phun Photos"

*Now hear this! Cliff Dunning, KBØYUV, should have no trouble hearing anything with his row of six speakers built into his operating position. "All these radios have speakers facing up or down and never out front," Cliff explains. "The speaker column/radio shelf was a project of mine last summer....Voilá, front-firing extension speakers plus an extra shelf on the desk for mounting radios."*

*The radios, in case you're interested, are a Midland 73-005 2-meter HT on the top shelf; hanging radios are a TRC-465 "11-meter" SSB rig and a Standard triband C-5900 V/UHF FM rig; and the two receivers on the bottom shelf are a RadioShack DX-394 and a RadioShack Pro-2035. Now here's someone who enjoys* all *forms of hobby radio!*



*No, this isn't the Titanic, but it* is *a steamship and, yes, that* is *a glacier—reader Joe Hypnarowski, W6VNR, persuaded the captain of the cruise ship on which he was traveling, the "Spirit of '98," to let him operate 2 meters while he and about 100 other passengers explored Alaska's "Inner Passage." That's Sawyer Glacier, by the way. And Joe says he was able to make many contacts along the way. Any polar bears, Joe?*

If you've got a cool snapshot to share with us, but don't have a whole article to build around it, send it in to "Picture This," along with a brief description of who and what we're seeing. If we like it, too, and have the space, we'll print it (no pay, just glory). Send your color prints to *CQ VHF*, 76 N. Broadway, Hicksville, NY 11801. Please *don't* write on the front of the photos or use ballpoint pen on the back. If you'd like your photo(s) returned to you, please tell us so and include an SASE (self-addressed, stamped envelope) with sufficient postage. Thanks!

# An NiMH Warning: Don't Toast Your Battery!

WARNING! Using a fast-charger designed for NiCd batteries with a new NiMH pack could toast your battery and start a fire!

By Gordon West, WB6NOA*

Nickel metal hydride (NiMH) batteries are becoming very popular replacement packs for ham radio handhelds, mostly because they hold nearly twice as much energy as the common rechargeable nickel cadmium (NiCd) battery. This allows your handheld to take a similar-sized battery pack and play for almost twice as long between recharges. But there are real dangers of permanent battery damage and fire if you don't use the right chargers.

"How you charge a nickel metal hydride battery is a lot different than how we presently charge NiCds," comments a representative from one radio company. "And attempting to fast-charge a nickel metal hydride battery pack on one of our NiCd fast chargers could lead to some real problems." This is one reason ham radio handheld manufacturers have not yet switched to this new technology, despite its widespread use in cellular telephones and laptop computers (*For a detailed comparison of NiMH and NiCd batteries, see "Battery Test: NiMH and NiCd Packs Go Head to Head," in the July, 1997, issue of* CQ VHF.—*ed.*).

*Putting an NiMH battery pack in a fast-charger designed for NiCd cells can have unplanned consequences—such as setting off your smoke detector! (Photos by the author)*

## Buyer Beware!

It's not just "newbies" who are getting "caught," either. Listen to what happened to Amateur Extra class operator Mary Williams, AB6CZ:

"When they sold me the battery at the ham store, they told me it would last about twice as long as my similar sized nickel cadmium battery," said Williams. "The store personnel didn't think there would be any problem in charging it with my drop-in charger, so that's just what I did. I dropped the new battery pack in the rapid-charger and didn't think there would be a problem."

Thirty minutes later, her smoke detector went off, and when she went in to investigate, her brand new NiMH battery pack was giving off smoke, and the plastic around her charger was beginning to go into meltdown.

When she went back to the ham store, the folks there said it looked like the battery pack had been overcharged. Really? "You don't say," commented Williams.

Yaesu USA has been constantly warning its dealers and customers that NiMH batteries are *not* compatible with most fast-chargers, especially Yaesu chargers.

"The charging characteristics of a nickel metal hydride battery are a lot different than the characteristics for charging a nickel cadmium battery," comments Chip Margelli, K7JA, of Yaesu. "Dropping a nickel metal hydride battery pack into one of our fast-chargers is absolutely not recommended."

## Design Differences

Most manufacturers' fast-chargers are designed specifically for nickel cadmium batteries. As the NiCd pack is brought up to a full charge, there's a specific tem-

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

*While the Maha (left) and Periphex (right) "universal chargers" look identical and will each safely charge just about any type of NiMH or NiCd battery, there are minor differences in the circuitry. See text for details.*

perature and voltage change that might be detected on the battery terminals. Some chargers will cycle down when they detect this change, but others don't have this level of protection. They have pick-up tabs for rapid-charging the NiCd pack for a specific amount of time. These time-based chargers will then cycle down to a trickle charge after a predetermined time limit. But a fast-charger on a timer, without voltage and temperature monitoring, can sometimes lead to problems with any kind of battery pack. Suppose it fast-charges for exactly 30 minutes. At minute 29, you pull your roastie-toastie battery pack and handheld out of the charger, make a quick call, and then put it back in the charger. The timer starts all over again at minute zero. If you do this a couple of times in a row, that battery pack will probably go into meltdown.

Most manufacturers include a *thermistor* (a temperature-sensitive resistor) in series with the charger input circuit or inside the battery pack itself to create an open circuit when battery temperature reaches a specific level. You may have discovered this on a timed charger if you pulled the unit out, felt that the battery pack was very hot, and found that your transceiver would not turn on. This is because the thermistor is in the open position, and everything is shut down until the internal cells begin to cool off. After they cool off, your pack begins to function normally and your radio now works. Don't blame the radio—it was the battery pack getting overcharged.

***"Dropping a nickel metal hydride battery pack into one of our fast-chargers is absolutely not recommended."—Chip Margelli, K7JA, Yaesu USA***

## Slow Charging OK

If you charge a NiCd battery or a NiMH pack on one of those small "wall wart" chargers, there should be no problem. Chances are that the "wall wart" is delivering less than 95 milliamps of current. "If the charge current is less than 1/10th of the battery capacity, there will be no major heating of the cells or damage," comments a spokesman for Maha Communications, a supplier of both NiCd and NiMH batteries for both ham rigs and cellular phones.

"Simply look on the battery and see what its capacity is—such as 1200 mAh," adds the Maha spokesman, "and then take 1/10th of this at 120 mA as the maximum amount of slow-charge current."

## Surging Popularity

Despite the charging problems, the popularity of NiMH battery packs is surging. "They fly off of our tables at ham shows," comments a representative of W & W Associates, who echoes the precautions against rapid-charging NiMH packs with a NiCd charger. A spokesman for DC Ace Electronics adds that "it appears that the reliability of the newer generation cells and packs, especially the Periphex and Maha brands, are really giving NiCds a serious run for their money.... The sales of NiCds are still up there as well, but NiMH is coming on strong!"

Why are these batteries becoming so popular? Well, besides their nearly double "playing power" between charges, NiMH packs have several advantages over NiCds, including:

- Disposal is less toxic to environment;
- No "memory effect" with repeated recharging at less than full discharge;
- Uniform voltage from cell to cell within a pack;
- Faster charging time with smart-chargers; and
- Flat discharge curve (meaning it operates at nearly full power until the charge is nearly exhausted)

Jack Kimbrough, WB6BBZ, a proponent of the NiMH batteries, comments, "I have seen 50 percent to 100 percent increase in amateur handheld operating time over NiCd battery packs. I have a same-sized pack that will run my ham set almost twice as long."

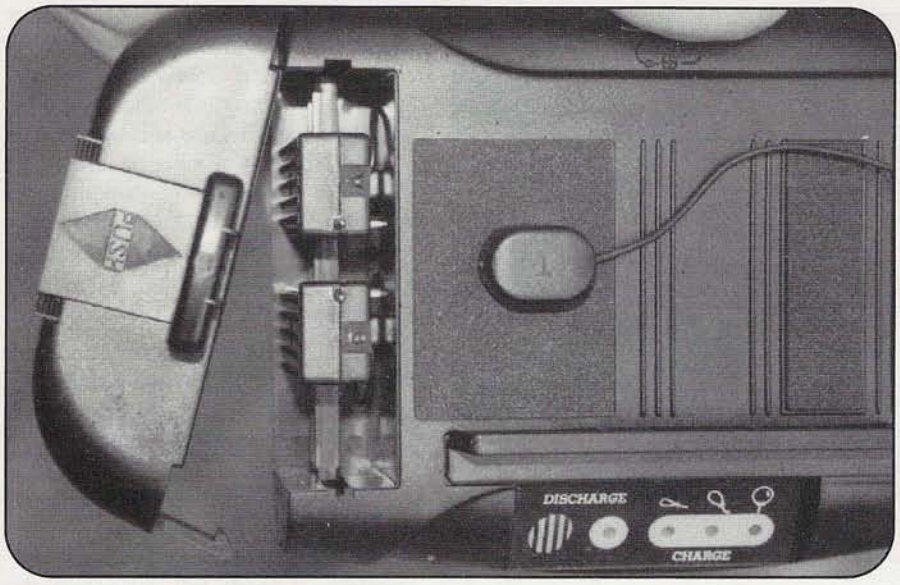
## Smarter Charging Circuits

So what's the drawback? The performance of NiMH batteries depends on "effective" charging. "Effective charging means to choose an appropriate charging method, and an appropriate charging control, under a limiting temperature," comments a spokesman for NEXcell Battery Company, which manufactures the batteries that Maha sells. "The rise in both temperature and pressure emphasize the need of charge control at a high rate of charging—higher capacity usually can be achieved by extended overcharge, but at the expense of cycle life."

"Proper charging is critical not only to obtain maximum capacity, but also to avoid cell heat-up and pressure build-up, which could cause shorter cycle life," the spokesman continued. "Because nickel metal hydride cells are more sensitive to over-charging than nickel cadmium cells, caution should be exercised when using the charging techniques for NiCds to charge nickel metal hydride."

## Smart Chargers

So-called "smart chargers," designed specifically for NiMH batteries, work on the principle of voltage drop, also known




*The charging pins on both the Maha and Periphex universal "smart" chargers may be moved to line up with the contacts on just about any battery pack. Periphex offers an optional "tall pin" circuit board for improved contact on some packs.*

as -*Delta V*. With this technique, the voltage during charge is monitored and the charge is ended or dropped to a trickle as a voltage drop is detected. That's right—voltage *drop*!

There is a distinctive point on the charging curve "seen" by a constant-current charger where the battery pack goes from full charge into over-charge. NiMH cells have a shallow charge curve, and a chip in the charger monitors for that peak, and then dip, in voltage. This chip is what makes a "smart charger" smart.

Caution: Some "smart chargers" designed for NiCds have similar circuits, but because NiCds have a sharper charge curve than NiMHs, they may miss the very subtle voltage drop in an NiMH pack (see Figure). Again, it's important to be sure that your charger is designed for NiMH batteries. And don't worry, the NiMH "smart chargers" have no problem charging up your NiCd packs as well.

## "Universal" Chargers

Both Maha and Advanced Battery Systems (Periphex) import a universal charger that can work for fast-charging both types of batteries: NiMH as well as traditional NiCds. These universal chargers work with all manufacturers' battery packs and can charge any pack with a voltage of 4.8 volts to 12 volts. Plus, they both run on 117 volts AC as well as 12 volts DC for use in the car or in the field.

Advanced Battery Systems calls its model a "universal charger/conditioner," and Maha calls its version the "universal desktop rapid charger/conditioner." Both devices sell in the $50 to $60 range. While the two companies' products may look alike, they are not identical, and Maha says its charger has improved current limiting and trickle-charge circuits designed specifically for amateur radio battery systems.

Both units feature a series of light-emitting diodes to keep you posted on charge status: one LED on the left shows 30 percent charge, two LEDs on the left show 50 percent charge, all three LEDs lit show 80 percent charge, and one LED lit on the right shows full charge.

For double protection, these universal chargers have a magnetic temperature sensor that will command the circuit to cut off charging current if it detects that the battery pack is overheating.

"The temperature change with time is monitored in this method," explains the NEXcell spokesman. "When the slope of temperature rise reaches the preset value, the charge is stopped. The effect of ambient temperature is reduced. The cell normally exhibits a longer cycle life if charged under this technique, since an overcharging is mostly minimized."

W&W Associates offers three different types of chargers, which they claim will charge NiCd as well as NiMH. I've tried them and they work very well. And the E.H. Yost Company, known as "Mr. NiCD," carries NiMH cells, too.

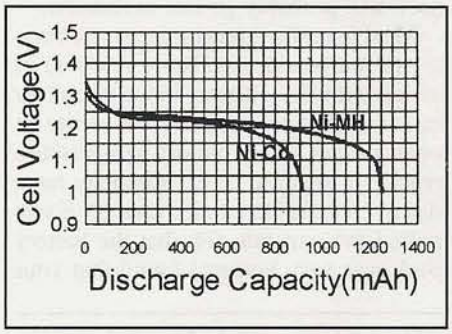
## Customizing for Your Batteries

Since this is a "universal" battery charging system, each battery pack that you have from different manufacturers may require its own way of sitting on the universal charger and of sliding around the little gold pins to get the right pick-up points.

Both Periphex and Maha include photocopied sheets on how to get their chargers to work with virtually any ham radio battery pack. Maha notes that, with some battery packs, the pins must be removed from the holder bar and turned around to split wide enough to contact the bottom of the battery pack terminals.

Periphex has optional circuit boards that extend the little pins to contact certain battery packs more firmly. Maha doesn't see a problem, but I have found that some battery packs need to be moved around a little bit to assure a nice positive contact with the charging pins.

Both chargers are also equipped with reverse-polarity protection. If you should get the voltage reversed, you'll hear a continuous beep that means the polarity is incorrect. The chargers also both allow for *battery conditioning*. This discharges the battery almost completely before starting the charge cycle and helps extend battery life. You have to start this process manually by pressing the DISCHARGE button briefly after you place a battery pack in the charger. It then beeps and a discharge indicator lights. The discharge cycle takes anywhere from two to five




*The charging curves of NiCd and NiMH batteries. NiCds have a much more pronounced voltage "elbow" at full charge, and some "smart chargers" designed for NiCds may miss the smaller change in the NiMH curve. (Graph courtesy NEXcell Battery Co., Ltd.)*

*"These universal chargers work with all manufacturers' battery packs and can charge any pack with a voltage of 4.8 volts to 12 volts."*

hours, at which point the charger beeps again and automatically begins rapid-charging the battery pack.

## Trying Them Out

While this article is not intended as a product review, I did try both the Maha and Advanced Battery Systems universal chargers on several different ham battery packs, NiMH as well as traditional NiCd. None went into meltdown, and *all* received a good full charge in just a matter of an hour or so. I also liked the ability of these chargers to run from a vehicle's 12-volt power source, as well as from house current, for charging "in the field".

But I caution you not to expect to just grab a battery pack and drop it into one of these universal chargers. You need to fuss around with several different adjustments until you get everything just right. And in case you can't get the adjustments right, they furnish a little pigtail for red-to-positive, black-to-negative terminal connections. But of course, how are you going to get alligator clips to hang onto the silver contacts on your battery pack? I sure don't know!

It's a little complicated, but if you have several different handhelds from different manufacturers and a host of batteries that all have different pick-up points, these multi-manufacturer battery chargers should take good care of your charging needs.

## Into the Future?

When will we see manufacturers of ham radio equipment switch to improved battery technology, such as NiMH or lithium ion? Yaesu, despite its resistance to NiMH batteries, already has a lithium ion cell in its new micro-VX1 dual-band ham transceiver (see review, January, 1998, *CQ VHF*). Plus, part of the "package" when you buy the Yaesu set is a sophisticated "wall wart" lithium ion charging system that rapidly brings the cell back up to a full charge without overcharge. It probably won't be long before the other manufacturers follow the lead of Yaesu and the accessory dealers and allow more hams to safely take advantage of the added flexibility these new types of batteries provide.

So get set for big improvements in both battery capacity and battery charging techniques as the new technology gains a foothold in the amateur market. But make sure you've got the right type of charger so you don't cook those brand new batteries! ■

## Resources

Here's how to contact the manufacturers and dealers mentioned in this article. And please tell them you read about their products in *CQ VHF*:

*Advanced Battery Systems, Inc.* (Periphex), 300 Centre St., Holbrook, MA 02343; Phone: (800) 634-8132; Fax: (617) 767-4599; Internet: <http://home.navisoft.com/periphex>.

*DC Ace Electronics, Inc.*, P.O. Box 364, Lincolnshire, IL 60069; Phone/Fax: (847) 821-8122; e-mail: <DCACE1@aol.com>.

*E.H. Yost Company*, 2211-D Parview Rd., Middleton, WI 53562; Phone: (608) 831-3443; Fax: (608) 831-1082; e-mail: <ehyost@midplains.net>.

*Maha Communications*, 2841-B Saturn St., Brea, CA 92821; Phone: (800) 376-9992; Fax: (714) 985-9221; Internet: <http://www.maha-comm.com/>.

*NEXcell Battery Co.*, Ltd. (U.S. office), 1251 S. Shamrock Ave., Monrovia, CA 91016; Phone: (818) 358-0121; Fax: (818) 358-5322; Internet: <http://www.battery.com.tw/>.

*W&W Associates*, 800 South Broadway, Hicksville, NY 11801; Phone: (800) 221-0732 or (516) 942-0011; Fax: (516) 942-1944; Internet: <http//www.wwassociates.com>.

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

# Kenwood TM-261A 2-Meter FM Mobile

If you're looking for a high-power, single-band FM mobile rig, the TM-261A certainly deserves a long, hard look.

By Rich Moseson, W2VU*
cqvhf@aol.com

"What does this radio do that others like it don't?" That's the key question I try to answer whenever I write a review. And for several months now, I've been trying without success to answer that question about Kenwood's TM-261A. And then it struck me—the answer is "nothing"—and that's why I like the radio so much! This is the sort of radio that sets a standard, the sort of radio to which others will be compared: "What does the Whatzit-2000 do that the TM-261 doesn't?"

## A Little of Everything

The Kenwood TM-261A is a 50-watt, single-band 2-meter FM transceiver, suitable for mobile use or base operation (with a 12-volt power supply). It has 63 memory channels (62 regular and one "call channel"), each of which will store frequency, offset, CTCSS tone, DTSS tone (more on this later), and an alphanumeric tag. It gives you a choice of three power levels, 50 (High), 10 (Medium) and 5 (Low) watts, but does not let you store power settings in memory (the European version, the TM-261E, runs 10, 1, and .5 watts and transmits only on 144 to 146 MHz). There are also 10 DTMF (touch-tone) memories for making autopatch calls and an easy-to-read backlit display (see Photo A).

The radio also has expanded receive coverage, starting with the 118- to 136-MHz (AM) aircraft band. It automatically switches over to FM at 136 MHz and monitors everything between 136 and 174 MHz, including public service and NOAA Weather Radio at 162 MHz (you may manually select AM on any frequency, but it's for receive only). There are also several scanning options, plus a variety of ways to customize the radio to your operating style and preferences. Versatility and flexibility are hallmarks of this radio. And just about everything makes sense, both inside and out. Layout of parts and workmanship are straightforward and neat (see Photos B and C), and the sequences of programming keystrokes for the various functions are clear and sensible.

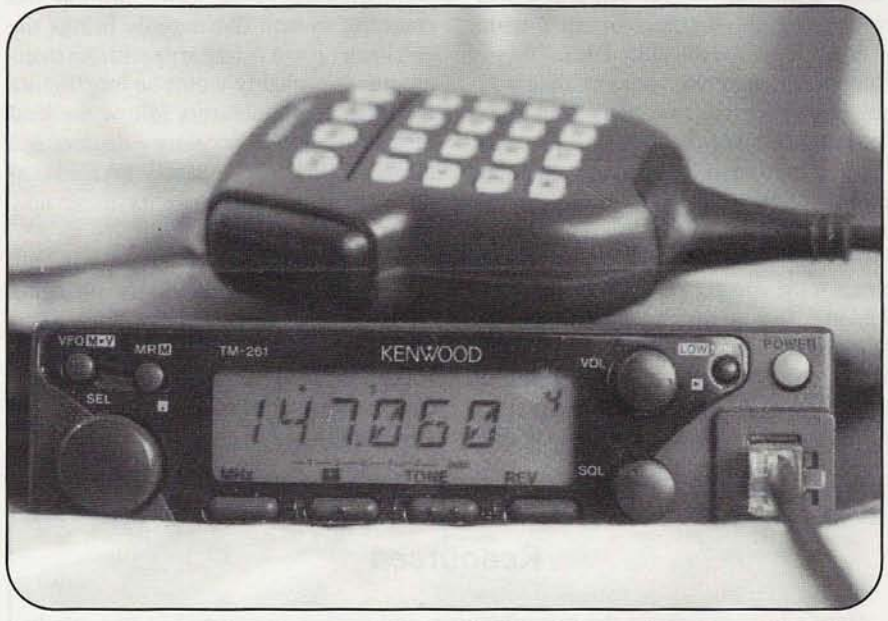



*Photo A. The Kenwood TM-261A features 50 watts of output power, more than 60 memories, intuitive programming, and an easy-to-read backlit LCD display.*

## Easy to Use

Two of the things I like most about the TM-261A are the intuitive nature of its programming and its ease of use. If you want to operate simplex on 146.52 or to use a repeater with a standard offset and no CTCSS ("PL") tone, you can do it right away, even before you read the manual. This is thanks to factory-default settings of a 600-kHz "split" and a feature called *automatic repeater offset*, or *ARO*. Using this feature, the radio will automatically pick the offset direction (plus, minus, or simplex), based on the most common practice for the receive frequency you've

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

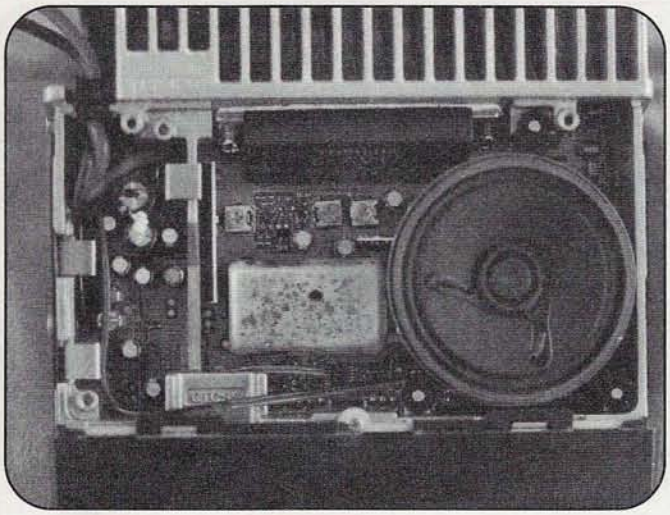


*Photo B. Top interior view of the TM-261A. Note the neat and uncluttered parts layout, which will make servicing easier.*

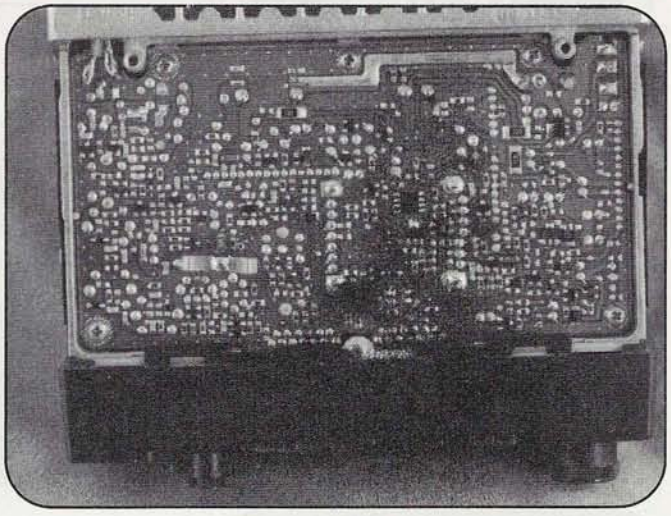


*Photo C. Bottom interior view of the TM-261A. All of the soldering is neat and professionally done.*

chosen. If the radio "isn't sure," it will default to simplex and you'll have to pick the offset manually.

Making programming changes is easy. To store a memory channel, for example, you just dial up the receive frequency you want, make sure the CTCSS tone is set correctly (also easy, but you *will* have to read the manual to learn how to do it), then press the F key and turn the main dial to the number of the memory in which you want to store this frequency. Next, press MR (for *Memory Recall*) and hold it in for a second. A "+/-" appears on the screen and you can then dial in the transmit frequency. Finally, press MR again and all of your information is stored. Once you get the hang of it, it's quick and easy.

Several other factors contribute to the TM-261A's ease of use. For example, when you're tuning through the memories, the radio beeps each time you change frequencies (unless you've shut off the beeps). But when you come all the way around to channel 1, the beep has a different tone. Same with the power control. Medium and low power have one tone when you switch to them; high power has a different one. These varying beep tones allow some extent of "eyes-free" operating, letting you change memories or power levels without taking your eyes off the road. (It's also a great help for the visually impaired ham.)

## "PF" the Magic Button

Another excellent feature of this radio is a mic button labeled PF. It stands for *Programmable Function*, and you can pick one of several options for what it will do. The default setting is the "MHz" function, which lets you tune the VFO in 1-MHz increments. I set up mine to allow direct keypad entry of frequencies. And, if you read the manual carefully, you'll learn that PF's companion keys on the microphone, marked VFO and MR, are also programmable. If the VFO and memory recall functions don't suit your needs, you may reprogram these keys to do a variety of other things (you'll have to read the manual for specifics).

Yet another example of the TM-261A's flexibility is giving the operator a choice of frequency steps. You can choose 5, 12.5, 10, 15, 20, or 25 kHz per click of the tuning dial. Why is this important? First of all, half of the U.S. uses 15-kHz repeater spacing on 2 meters, and the other half uses 20-kHz spacing. Many rigs offer 15- *or* 20-kHz tuning steps, but not both. So if you're in the wrong part of the country for that radio, you're stuck using 5-kHz steps. With the TM-261, you can tune from one repeater frequency to the next with a single click, no matter where in the U.S. you are. Secondly, some satellites, such as AO-27, operate on an "in-between" frequency, such as 145.9875 MHz. Even the "standard" 5-kHz step won't get you there, but the 12.5-kHz step can (just make sure you're on an "even" frequency, such as 145.9750, before switching to the 12.5-kHz setting).

## Additional Features

The TM-261A has just about every feature you can think of for a single-band FM rig, so I can't list them all here. Among my favorites are alphanumeric labeling of memory channels, which lets you program in a club name or repeater location (see Photo D) if remembering frequencies isn't your thing; direct selection of CTCSS frequencies (CTCSS, by the way, stands for *Continuous Tone-Coded Squelch System*, but is more commonly referred to by Motorola's trademarked name for it, "PL," which stands for *Private Line*®); a variety of scanning options; and three different types of tone options—CTCSS, DTMF, and DTSS.

DTMF stands for *Dual-Tone Multi-Frequency* and was first made popular by AT&T in its Touch-Tone® push-button phones. Of course, the most common ham use of DTMF tones is for making phone calls via repeater *autopatch* systems. The TM-261A makes this easy for you by offering 10 special DTMF memories (separate from the frequency memories), each of which can hold up to 16

***"This is the sort of radio that sets a standard, the sort of radio to which others will be compared: 'What does the Whatzit-2000 do that the TM-261 doesn't?' "***


*Photo D. Alphanumeric labeling of memory channels lets you put in a club name, location, or whatever else you can say in six letters/numbers instead of the frequency readout.*

digits. These *autodialer* memories let you make autopatch calls with a minimum of distraction from other tasks, like driving down the highway.

The manual doesn't spell out what DTSS means, but it looks like it should stand for *Dual Tone Selective Signaling*. When DTSS is activated, your radio remains squelched until a pre-programmed, three-digit DTMF code is received. This means you can keep your radio turned on in the office or kitchen and not be bothered by the normal chit-chat, but when someone specifically wants to call you (and knows your code), he or she can punch in your DTSS code and your radio "wakes up and talks to you."

DTSS can also be used for group calls, such as for emergency callups. The radio also offers three selectable delay times (350, 550, or 750 milliseconds) to make sure the tones are properly relayed by repeaters that may have long key-up times. In addition, if you get the optional CTCSS tone *decoder* (the *encoder* is standard), you can combine CTCSS and DTSS to keep your radio squelched until a signal containing the correct CTCSS tone *and* the right three-digit DTMF combination is received.

***"These varying beep tones allow some extent of 'eyes-free' operating, letting you change memories or power levels without taking your eyes off the road. (It's also a great help for the visually impaired ham.)"***

## Hot Under the Collar

I have yet to find the perfect radio (but I'm still looking), and even the TM-261, which is basically an excellent unit, has a few flaws. The two most noticeable ones are heat buildup and a super-sensitive SWR protection circuit.

As in any of today's 50-watt radios, which are smaller than my 10-watt radio of 15 years ago, power creates heat and heat has to be dissipated somewhere. Nearly half of the TM-261's body is heatsink (see Photo E), and, when you're operating at high power for more than, say, a half-hour, even in a normal QSO, the radio gets really hot.

For instance, my commute to the *CQ VHF* office is about an hour. If I'm talking to people all along the way and using a repeater that requires high power, I need to shut down the radio five to 10 minutes before I arrive at the office, or I'll risk burning my hand when I disconnect it to take it inside with me (I like to be sure I have it for the return trip).

Solution: The FCC says use only the power you need for communication. If I were you, I'd leave the TM-261 on the medium power setting (10 watts) as a default and change it (up or down) only as needed. Heat buildup is not a problem at the 10-watt level. Also, be sure to mount the radio in a place with plenty of air circulation.


*Photo E. Half of the TM-261A is heatsink (the fins on the right) and even that's not enough to keep the radio from getting very hot to the touch after extended operating at high power. The black cable at the right front is the coax "pigtail" to which your antenna feedline gets connected. Be careful to keep it relatively straight and away from the hot fins of the heat sink.*

***"Two of the things I like most about the TM-261A are the intuitive nature of its programming and its ease of use."***

The super-sensitive SWR circuit has driven me crazy. First of all, this is a good circuit to have: it shuts down the transmitter in the face of a high SWR rather than risk damage to the final amplifier transistor. But it seems that nearly any variation in the SWR of the antenna system will set it off.

At first, I thought it was a problem with the radio, but over the course of several months, I talked to three different people at Kenwood about it, and they all agreed that it has to be an SWR problem. I've gone through three antennas and a variety of feedlines, have had the problem both at home and in the car, and still run into it occasionally. It seems to be totally unpredictable. The only component of the antenna system that has been unchanged throughout is the coax "pigtail" coming out of the back of the radio (see Photo E again) and connecting to an SO-239, to which you then connect your feedline. And I haven't been able to test the SWR on that little piece of cable.

The radio is also very sensitive to its own RF field. If your antenna is directly overhead and you're running on high power, you're likely to get a vibrating kind of sound when you key up, and you'll find that the transmitter never really came on. If this happens, reduce power and the problem should go away. For a permanent solution, try mounting the antenna as far from the radio as possible.

My final gripe is that the default frequency on which the radio powers up is 144.000 MHz. The inexperienced operator who turns on the radio for the first time and keys up the mic could conceivably end up in trouble from the start—the frequencies between 144.000 and 144.100 MHz are reserved (in the FCC rules) for CW only, and modulating an FM signal at 144.000 will result in out-of-band signals, since the modulation will take the frequency both up and down from the center (which is what's on the display). A default power-up frequency in the middle of the band at, say, 146.000 MHz is a safer option.

## All in All...

Despite its few quirks, the TM-261A is an excellent radio packed with useful features. As long as you keep the rig and antenna well separated and maintain a low SWR, it should provide years of excellent service. List price is $380. ■

## Resources

For additional information, or to purchase a TM-261A, see your favorite Kenwood dealer or contact Kenwood Communications Corp., P.O. Box 22745, Long Beach, CA 90801-5745; Phone: (310) 639-5300; Internet: <http://www.kenwood.net>.

# The MFJ-224 2-Meter FM Analyzer

Need to check your FM deviation, measure your antenna gain or feedline loss, but can't afford a commercial service monitor? Check out MFJ's 2-meter FM SignalAnalyzer™. Here's K1ZJH's evaluation.

By Peter J. Bertini, K1ZJH*

Most of us can't afford a commercial-grade service-monitor for our home workshops. These versatile instruments start at around $3,000 for a basic low-cost model. But for the casual needs of budget-minded FM or packet enthusiast, MFJ's FM SignalAnalyzer (model MFJ-244), a small handheld instrument priced at $159.95, helps bridge the gap.

I had the opportunity to evaluate two MFJ-224 units. The first was an early prototype provided by its designer, Rick Littlefield, K1BQT. The second was a later production run model picked at random from the MFJ production line. Since I'm involved with the commercial two-way radio field, I was able to directly compare the MFJ-224's performance against three commercial service monitors: an IFR 1200S and Cushman models CE5 and CE3. But before delving into the nitty-gritty of the technical specifications, let's discuss what the MFJ-224 does, and, more importantly, why you might need one.

## FM Audio Problems

Have you noticed that some folks on your local repeater or FM simplex channel sound louder or softer than others? Or how two people can sound very different from each other, even when using the same rig? Here's why: Your radio is set at the factory for best *average* performance for the microphone provided with the unit. Unfortunately, in the real world, some of us speak softly, while others tend to bellow out their words and talk closely to the microphone!

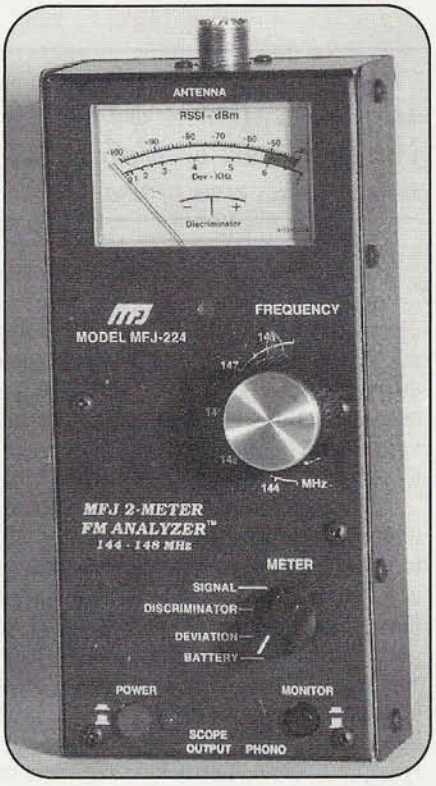
Another factor that influences how someone sounds is the *deviation* level. All amateur FM radios have an internal *FM deviation* control. These are factory-set for 5-kHz deviation—so no matter how loudly you yell or speak into the microphone, the transmitter will not exceed 5-kHz deviation. This is done by "clipping" the excess audio to a preset limit in an earlier audio stage. Too much clipping makes your audio sound bassy or distorted; too little and folks driving noisy cars will have to crank up their volume controls to hear you over ambient background noise.

It's rare that you'll find a second-hand radio in which a previous owner hasn't twiddled with the deviation or mic controls. The MFJ-224 is handy for returning those to units back to better-than-factory settings.

## Enter the Microphone Gain Control

Most radios also provide a microphone gain control. For soft-spoken individuals, the audio can be increased to permit higher peak deviations nearing 5 kHz. For us folks who like to close-talk the mic and have fairly strong voices, the control can be backed off a tad.

Setting up a packet TNC and mating it to a 2-meter rig can be a daunting and frustrating challenge. For packet, it's best to set the deviation control for a 5-kHz maximum and then use the microphone gain control (or the audio level pot in the TNC) to set the deviation to between 3 and 3.5 kHz. Too much audio will drive the tones to the limit set by the deviation control, causing clipping. This results in no connections, excessive retries, or poor range. Ditto for too little audio. Too-low audio may not be decoded by other TNCs, or, at best, your signal-to-noise ratio will be poor at distant nodes, yielding poor




*The MFJ-224 2-Meter FM SignalAnalyzer lets you measure audio levels, FM deviation, antenna gain, and signal strength—all for a price that's about 1/20th of what you'd pay for a commercial service monitor.*

*Peter Bertini, K1ZJH, is Senior Technical Editor of our sister magazine, Communications Quarterly.

***"The front panel meter has a discriminator position, allowing you to precisely 'center-tune' to a signal. The deviation position allows monitoring of the signal's deviation peaks up to 7 kHz."***

connections. The MFJ-224 is the tool you need to properly set your TNC's transmit audio levels.

## What Is an MFJ-224?

The MFJ-224 is a tunable, 2-meter FM receiver covering from 143.5 to 148.5 MHz. It's a small, battery-powered handheld unit, easily transported to digipeater sites or out to your mobile. The front panel meter has a *discriminator* position, allowing you to precisely "center-tune" to a signal. The *deviation* position allows monitoring of the signal's deviation peaks up to 7 kHz.

An earphone jack and scope monitor jack are provided. Hooking up an oscilloscope provides a good visual presentation of what is happening as you adjust the mic and deviation controls. Clipping is easily seen, and the scope is a bit better than the meter for catching deviation peaks on voice. A little clipping is OK for voice communications, too much is not.

There is no internal speaker, so you'll need the headphones to monitor your audio. The MFJ-224 is not intended for extended monitoring; the battery life is limited, the receiver is not sensitive, it has no squelch, and it tends to drift. But it is good enough to monitor signals in the your immediate neighborhood. I could copy signals in the 2-μV range. Accurate deviation readings require signal levels that are at least 20 μV.

## RSSI Signal Strength Readings

Besides its value for touching up the audio in your 2-meter voice or packet station, the meter also sports a signal-strength scale. This is taken from the Receiver Signal Strength Indicator (RSSI) output of the Motorola MC13135 receiver IC. The MFJ meter is calibrated in dBm from -40 dBm to -100 dBm in 1-dBm steps, for a total range of 60 dB. I tested both MFJ-224s on my Wavetek 3000-200 precision, lab-grade generators and was pleasantly surprised at the accuracy of the dBm readings! The worst error across the full 60-dB range was within plus/minus 2 dB! This occurred at the extreme limits of the meter range; between -50 to -90 dBm, both MFJ analyzers corresponded exactly to the Wavetek output meter.

## Your Personal Antenna Test Range

Ever wonder if a particular 2-meter beam or mobile antenna outperforms another? Perhaps you're interested in building small quads or beams. How can you tune the antenna for best gain or for best front-to-back ratio? Which design works the best?

While it's difficult to produce the same accuracies afforded by professional

antenna range test sites, you can still use the MFJ-224 to make some valid comparisons for front-to-back ratios of beams or for relative forward gain readings. A large suburban parking lot (on a quiet day) provides acres of clear open space for making these readings. The "trick" is to take many readings at varying distances. This will help average out in consistencies caused by reflections.

## Making Antenna Gain Measurements

The Fall 1997 issue of *Communications Quarterly* shows how to build a simple "reference" 2-meter dipole antenna**. A reference dipole will allow you calculate the gain of your homemade Yagi or quad against a known standard. This will show your antenna's gain over a dipole's performance (dBd) and its front-to-back rejection in dBd.

Remember that these readings are influenced by many factors; the reference and test antenna height, surrounding objects, and ground reflections can make your readings look better or worse than they really are. Another useful application of the signal strength readings is to aim linked Yagis at digipeater sites.

## Device Limitations

The MFJ-224 is a highly useful device, but it's not a lab- or commercial-quality unit. The tuning tends to drift for the first few minutes of use, so the unit should be allowed to "warm up" for a few minutes before you try taking measurements. Even after warmup, you'll have to be quick when taking readings; you need to frequently check the discriminator reading and retune every so often. Since 5 MHz of spectrum is covered by four turns of a vernier tuning drive, the tuning tends to be a tad "jumpy." Precisely tuning a signal to the desired "0" discriminator reading requires a steady hand.

I've already mentioned the accuracy of the RSSI scale readings. They were better than I'd have imagined possible from such a simple device. However, the deviation accuracy leaves something to be desired. Both MFJ-224 meters gave very good and accurate readings at the 5- and 4-kHz deviation calibration points, but at 3-kHz deviation, the meters tended to start reading on the high side. Much below 3 kHz, the meter scale becomes very compressed and hard to read.

Also, the units' meter scale doesn't offer fine enough resolution for setting CTCSS (PL) tones, which are normally set at 600-Hz deviation. I did find that using the scope output on my Tektronix 465 provided readings that seemed to be more linear, and it offered a better feel for setting tone levels (the scope is better for seeing peak deviation and audio clipping). The accuracy was entirely adequate for setting voice or packet deviation.

## Alignment

The manual covers several alignment points. The RSSI range and calibration may be touched up in the field. The dial frequency calibration is set by the VFO coil, and the quad detector coil is also adjustable and is easily set with a voltmeter. "Zeroing" the discriminator meter is also a trimpot adjustment. There is no calibration correction provided for the deviation readings, which are set by fixed-value resistors. Besides alignment, the manual has several pages devoted to operating the unit.

## The Bottom Line

I found the MFJ-224 to be a useful adjunct to my test equipment arsenal. It does have some limitations, but it also does the job for which it was designed. The RSSI signal strength feature is an added bonus, and ardent antenna experimenters will find it a very useful and informative tool. I haven't gone on a 2-meter foxhunt in a while, but I suspect that the MFJ-224 and small quad would be a dynamite combo for closing in on and capturing that elusive fox! ■

## Resources

To order the MFJ-224, or for more information, contact your favorite MFJ dealer or MFJ Enterprises, Inc., Box 494, Mississippi State, MS 39762; Phone: (800) 647-1800 or (601) 323-5869; Fax: (601) 323-6551; e-mail: <mfj@mfjenterprises.com>; Web: <http://www.mfjenterprises.com>

**Communications Quarterly, *Fall, 1997 issue, Tech Notes: "A Reference Dipole for 2-Meters," by Rick Littlefield, K1BQT, pp. 90–91.*

CQ VHF Ham Radio Above 50 MHz

# Reader Survey—March, 1998

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

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

*As an incentive, we'll pick one respondent every month and give that person a complimentary one-year subscription (or subscription extension) to* CQ VHF.

*For the next few months, we're going to repeat our questions from a year ago, to learn whether, and in what ways, the makeup of our readership has changed.*

**A. Tell us about yourself:**

| **1. If you are...** | **Circle Reader Service #** |
|---|---|
| Male | 1 |
| Female | 2 |
| Single | 3 |
| Married | 4 |
| **2. If your age is...** | |
| Under 18 | 5 |
| 18–24 | 6 |
| 25–34 | 7 |
| 35–44 | 8 |
| 45–54 | 9 |
| 55–64 | 10 |
| 65–74 | 11 |
| 75 or over | 12 |
| **B. Tell us about your ham radio activities:** | |
| **1. If you've been a ham...** | |
| Less than a year | 13 |
| 1-2 years | 14 |
| 3-5 years | 15 |
| 6-10 years | 16 |
| 11-25 years | 17 |
| over 25 years | 18 |
| **2. What class of license do you hold? If...** | |
| Novice | 19 |
| Technician | 20 |
| Technician-Plus | 21 |
| General | 22 |
| Advanced | 23 |
| Extra | 24 |
| Not currently licensed | 25 |
| **3. Please indicate all bands on which you are active...** | |
| 50–54 MHz (6 meters) | 26 |
| 144-148 MHz (2 meters) | 27 |
| 222-225 MHz (1.25 meters) | 28 |
| 420-450 MHz (70 centimeters) | 29 |
| 902 MHz and above (microwaves) | 30 |

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

## What You've Told Us...

The responses to our December survey on your ham radio shopping plans and preferencess hould have our advertisers smiling: it looks like an overwhelming majority of you are in a buying mood...and you're looking for big-ticket items.

A whopping 84% of you said you'd made at least one amateur radio purchase in the past 12 months, and an even bigger 89% of you plan to do so in the *next* 12 months! And you're not in the market for beginner's handhelds. *The biggest single group of you (19%) either has bought or is planning to buy a VHF/UHF multimode rig*; followed by dual/multiband FM handhelds (17%); dual/multi-band FM mobiles (16%); a tie between HF/VHF mobile/base rigs and single-band FM handhelds (15% each); followed by single-band FM mobiles (10%) and HF-only rigs (9%).

What's most important to you in buying a new rig? Features come first (35%), followed by price (26%), manufacturer's reputation (14%), model's reputation (13%), personal service (6%), dealer reputation (3%), and ease of purchasing, such as an 800-number (2%). Curiously, even though dealer-related choices ranked at the bottom on the previous question, 47% said they prefer to buy from a dealer at a store, 43% from a dealer via mail-order, only 8% directly from the manufacturer. and a minuscule 2% prefer to buy via the Internet.

This month's winner of a free one-year *CQ VHF* subscription is Philip Koban of Greeley, Colorado. As always, thanks for sharing your views with us.

# VHF Updates from "Down South"

We don't mean South Dakota or even South Carolina, but waaay down south—Australia and South Africa, to be precise. Here's what we're hearing from our correspondents in the southern hemisphere.

*The following information was posted on the Internet 6-meter reflector (50mhz@qth.net) by VK2KFJ and forwarded to us by Robert Homuth, KB7AQD. Tnx to both.*

## 6-Meter FM Down Under

Here are some details about 6-meter FM in Australia (VK), not that you would be likely to work VK from USA, but worth knowing if you should visit Australia or elsewhere in the S.W. Pacific, e.g., on DXpeditions.

**FM Simplex:**

- 52.525 MHz—DX calling frequency, majority of simplex activity.
- Alternate 53.500 MHz—VK calling freq. (never seems to be used)

**Repeaters:**

I think there are approximately 20 6-meter FM repeaters in VK, spread across the continent; some are linked to other bands e.g., 2 meters or 70 centimeters.

- 1 MHz offsets.
- Outputs: 25 kHz channels, between 53.550 and 53.975 MHz
- Inputs: 25 kHz channels, between 52.550 and 52.975 MHz

**Packet:**

- 53.100 MHz—a couple of packet repeaters & BBSs in different areas, such as VK2 and VK3.

Regards,

Steve, VK2KFJ

*(Editor's Note: Don't be too sure about not being able to work Australia from the U.S.—there have already been at least two $F_2$ openings reported between the U.S. and New Zealand, and, while FM contacts are less likely, they're not impossible.)*

———— • • • ————

*The following update on VHF beacons in South Africa (ZS) was written by Shawn Baris, ZR1EV, and originally posted on the* SIX@ZAF *packet group. It was forwarded to us by Johan le Roux, ZR1AEZ. Tnx to both.*

## South African Beacon News

I am pleased to report that both the ZS6DN beacon on 50.050 and the ZS2SIX beacon on 50.005 are once again fully operational.

According to Paul, ZS6PJS, the ZS6DN beacon now has a keyer. Mike, ZS2FM, informed me that the ZS2SIX beacon had a severed coax cable and that a radial on the antenna had broken off. All has now been replaced and should once again put out a good signal like that we had grown accustomed to in the past.

The ZS2SIX beacon is located on the University of the Eastern Cape buildings and they had to work very quickly to get all the work done before the university closed down for the Summer break. Fortunately, they met the deadline with only hours to spare!

## Tuning Tips

Once I was told that I was hearing "ghosts" on the band and got the nickname "5/9." I have found that many stations in the past used to complain that they were unable to hear anything while signals at my QTH were 5/9 (HI HI). I then realized that they were attempting to receive signals directly on the published frequencies. *This does not work.* Because most beacons here use either FSK or CW, the "home" or "rest" frequency is directly on, say, 50.050 MHz. These are either keyed on/off for a CW beacon, or, shifted *down* in frequency by 800 Hz in the case of the FSK types.

So all I do is keep the rig in USB mode and then simply tune 800 Hz *lower* on the dial. Then you cannot miss either type of keyer. Once you hear a beacon, you can switch to CW mode and jot down the actual dial frequency on which you hear it best, for future reference. On VHF rigs, not all CW modes are created equal, hence the above method. (ZS6TWB/b is a CW beacon while V51VHF and ZS2SIX are FSK beacons.)

## Current Beacon List

Last, but not least, I am including the updated list of beacons active in Southern Africa. (Credit and thanks to Paul, ZS6PJS and Mike, ZS2FM) ■

### 6-Meter Beacons on the Air in S. Africa and Namibia

| Frequency (MHz) | Call | Antenna | Power (Watts) | Locator (Grid) | City |
|---|---|---|---|---|---|
| 50.005 | ZS2SIX | Dipole | 25 | KF25 | Port Elizabeth |
| 50.0185 | V51VHF | Vertical | 60 | JG87 | Windhoek |
| 50.044 | ZS6TWB/B | 6ele | 30 | KG46rd | Pietersburg |
| 50.050 | ZS6DN/B | 5ele | 100 | KG44 | Pretoria |

# Reader FEEDBACK!

Dear *CQ VHF*:

Thanks for the review of the Yaesu VX-1R dual-band HT (*CQ VHF*, January, 1998). I share Gordon West's enthusiasm for the compact little rig. However, I must disagree with the statement in the article that "It's a Super Scanner, Too." A major limitation for scanning discussed on Usenet (rec.radio.amateur.equipment) is that the radio can only scan one "band" at a time. This means that you cannot simultaneously scan a frequency in the VHF range (e.g., 146.52 MHz) and the UHF range (e.g., 462.750 MHz).

In addition, the receive sensitivity drops off on various frequencies...much more than a real scanner would provide. In particular, the radio with standard antenna is deaf on the AM broadcast band. A user who expects to walk around listening to AM with the radio in his/her pocket will be disappointed (the use of a larger external antenna and other tricks can aid reception).

Even with these shortcomings, the radio is great for amateur radio use. My own mini-review of the radio is available at on the World Wide Web at <http://members.aol.com/RobtWitte>.

Bob Witte, KBØCY
<RobtWitte@aol.com>

## VHF/UHF Articles in the New Communications Quarterly

The Winter, 1998, issue of our sister magazine, *Communications Quarterly*, includes several articles of interest to VHF/UHF operators, including:

- "A Single Conversion FM Receiver"—Wireless data communication on the 902- to 928-MHz ISM band, by Harry Swanson;
- "Radio Communication Via the Moon"—The early days of EME, by John Evans, N3HBX, and
- "Tech Notes"—Build the Nor'easter 6-meter AM transceiver, by Rick Littlefield, K1BQT.

*Communications Quarterly—The Journal of Communications Technology* is the "spiritual successor" to *Ham Radio* magazine and is one of the few totally technical magazines in amateur radio today. Single copies are $9.95. Look for *Communications Quarterly* on your newsstand or contact CQ Communications, Inc., 76 N. Broadway, Hicksville, NY 11801; Phone: (516) 681-2922; Fax: (516) 681-2926.

# A Super-System Wish List

What's your vision of a "dream" repeater system? WA6ITF has some ideas, some questions for you to answer...and a challenge to go out and DO IT!

By Bill Pasternak, WA6ITF*
wa6tif@juno.com

Ever dream of picking up your HT, punching a few keys, calling "CQ," and being answered by a station on Saipan or Gibraltar? Or punching in the numbers 3876 and signing into a "County Hunters Net" a few states away? How about punching a few more keys and finding yourself on one of the OSCAR satellites? Now think of doing all this while lazing on an air-raft floating in your swimming pool?

Being a swimmer and spending a lot of my summer months poolside (note: our summer in southern California starts in early April and ends in late October), I've often dreamed of doing all this. Alas, the money has never been there. Nor the time, even if I had the money. But nothing stops people from dreaming, and I'm not the only one.

James Dean, NØJSR, is the trustee of the Connecticut Valley FM Association. His group already operates the 146.76-MHz machine on Mt. Ascutney, Vermont, and the 147.24 repeater on Moose Mountain, New Hampshire. As this is written, the CVFMA folks are at work designing a new system to operate on 147.18 from Mt. Sunapee, New Hampshire. Obviously, these people know repeaters and how to make them survive the rigors of a New England winter.

Recently, James posted a scenario to the Repeater Owners Reflector on the Internet. In it, James outlined the plans for the new system. Along with it, James included a hypothetical wish list for a proposed new repeater with every "bell and whistle" that his group could imagine. He then challenged others on the list to design a super-system around his post. Even though he left out some of the more exotic things like an all-mode HF remote-base and a satellite gateway, I found it interesting in that it makes a person think very seriously about the survivability of any repeater which must face the challenge of "Mother Nature," year in and year out...and this while continuing to perform flawlessly.

I figured that many of you might be interested in the system design challenge that James presented, but I had to make a few changes to deal with one small problem. His outline was region-specific to New England, so it takes into account snow and ice, but not desert heat. As this is a national/international magazine, I decided to use James' concept as a beginning and re-write it for a broader audience.

I think I now have a scenario that fits almost every locality from the flat-lands of the midwestern U.S. to the hills of New England and the mountains of the west. Depending on the Amateur Service reg-

***"[In his Internet posting] James included a hypothetical wish list for a proposed new repeater with every 'bell and whistle' that his group could imagine. He then challenged others on the list to design a super-system around his post."***

**Bill Pasternak, WA6ITF, is Executive Producer of "Newsline," a weekly ham radio news show carried over repeaters across the country, and a regular contributor to* CQ VHF.

ulations of other nations, it might be applicable in some other nations as well. It also adds in some very esoteric stuff that is rare to find right now, but which may be commonplace in a few short years. Keeping in mind that you (and your users) will be legally required to operate such a system within the Part 97 Amateur Service rules, put on your rose-colored glasses, open your mind to the impossible, and here we go!

## The Plan

Your objective (along with your support group) is to design, build, and install a new, state-of-the-art, "do-everything" repeater/remote base at a fairly isolated site. To get everyone started on an equal footing, you each have the following to make your dream come true:

1) Coordinated frequency pairs that have no interference for at least a 75-mile radius on each of the following VHF/UHF bands: 6 meters, 2 meters, 1.25 meters, and 70 centimeters.

2) An all-mode/all-band HF remote base from your 1.25-meter and 70-centimeter systems.

3) A remote base that uses remotely rotatable antennas on the upper HF bands (30-20-15-10 meters); dipoles on the lower HF bands (160–75/80–40 meters).

4) The ability to tie the system to a remotely-controlled satellite gateway to permit users to make OSCAR contacts.

5) A site that is located above all surrounding terrain.

6) A 500-foot tower at the site. (This is strictly a number I pulled out of thin air, but a lot of broadcast towers in the U.S. exceed that height. I've been on top of a number of them.)

7) Permission to install your equipment in a secure equipment vault at the base of the tower. There is floor space for racks, duplexers, etc.

8) Permission to install one antenna for each band on the tower. This includes the rotatable beams for the upper HF bands and satellite gateway.

9) Weather conditions that range from severe ice and snow in winter to high heat, severe humidity, and lots of foliage in the summer.

10) Separately fused AC power mains (but you would like a UPS, or uninterruptible power supply, switched backup with 24-hour capability.

11) A desire for CTCSS access, link capability, CW ID, voice ID, digital voice recording announce; voice-mail messaging; voice signal strength report, voice weather conditions, etc.

12) Infrequent access to the site and almost no access in winter unless you charter a helicopter.

13) A restriction on the type of feedline you may use (no cheapo junk).

14) Telephone-line access.

15) No telephone line access (just to make sure that we consider this option for truly isolated sites).

16) A lot of local volunteer talent in your group for converting and retrofitting equipment, installing the repeater, and its antennas.

17) An unlimited budget (but you want to spend as little as possible).

***"Keeping in mind that you (and your users) will be legally required to operate such a system within the Part 97 Amateur Service rules, put on your rose-colored glasses [and], open your mind to the impossible...."***

## Questions to Consider

Now, here are some questions for you to address. These are real-life questions that anyone deciding exactly what should go into a repeater system has to answer:

1) What would you buy, make, retrofit, etc. for such an installation?

2) What brand of repeater would you buy/build for each band and why?

3) What brand/model of HF radio would you buy for your HF remote and why?

4) What brand/model of VHF/UHF SSB/CW transceiver would you buy for your satellite gateway?

5) What brand/model of antenna would you use for each band?

6) What type/brand of feedline would you use for each band?

7) What brand/model of rotors would you buy for the HF remote and satellite gateway antennas?

8) What brand/model of repeater controllers would you buy and why?

9) If mobile radios are to be converted to repeaters, where would you go for modification instructions?

10) Would you have a club member convert them or pay a two-way service shop to do it?

11) Being that your uppermost antenna would be 500 feet above average terrain, would you perform your own antenna installation on the tower or hire a professional installer?

12) As the site is isolated and hard to reach in winter months, would you consider a solar generator as a back-up power source?

13) Would you run each system as an independent repeater or would you tie them all together to function as a single super-repeater?

14) On what bands, if any, would you provide open autopatch?

15) On what bands would you provide closed autopatch to club members only?

16) What level of overall system control would you give your users?

17) Even if site rental were free, now would you raise the additional funds to pay ongoing monthly expenses?

## The Challenge

At this point you may be saying that a system such as this can never be realized. "It's nothing more than a pipe dream," you say. "Why am I wasting my time on this?" Surprise. I know of at least a half dozen repeater systems that in one way or another closely resemble the foregoing. Most of them are super-private, with owners who deny their very existence.

One system that *is* public is the "WA6TWF Super System." This is a "closed" category repeater/remote base (meaning that you have to be a member to use the system) in Orange County California, with hundreds of member-users and remote links as far away as Hawaii! Also, prior to his relocation to the St. Louis area, VHF pioneer Bob Heil, K9EID, had a linked system with many of these features operational from southeastern Illinois. And, back in the late '60s, a broadcast engineer at one of the networks had his own HF remote atop Mt. Wilson—5,000 feet above Los Angeles. I'm told that he operated mainly CW with it, using a remotely rotatable tri-band beam and a full kW, controlled and keyed on a 70-centimeter link.

So the real challenge isn't whether it's possible to build such a system, only who will be *next* to do it! If it's you, please consider good coverage of Santa Clarita, California, and give me a call when you get it on the air. You will find me poolside, with my HT! ■

# A Call to Arms

It's time to take a stand, says K7XC, to protect weak-signal frequencies...but it'll take more than shouting. Educating our fellow hams is the key, along with changing FCC rules to provide real protection.

The time has come for the "weak-signal" community to take a stand and fight for what is ours: the "right" to "our" part of the spectrum, however small it might be. Pressure from explosive growth has plenty of the FM folks looking for a quiet part of the band to call home, and many unknowingly end up in the middle of the "weak-signal" band segments. Only after being told of their mistake is when most learn for the first time that there is more to VHF than FM. Education, along with a rewrite of Part 97, is key to protecting the "weak-signal" band segments from being overrun by the HT-toting masses.

## Spread the Word

Where to start? Even if you don't use its repeater, join the local VHF club and spread the word about "weak-signal" work. Set up demonstrations of the various propagation modes and how they're used to make fabulous contacts most hams would think improbable.

By attending only three meetings of the University of Nevada, Reno "Radio Pack," presenting a slide show on VHF mountaintop contesting and sharing my experiences of MS (meteor scatter) and EME (Earth-Moon-Earth) propagation, four folks have come forward wanting to know more. I might even have enough interest to mount a large scale multi-op for the June contest this year. Granted, we'll be in training mode, but we all have to start somewhere.

At one meeting, I brought a laser pointer I'm converting for use on CW, explained how simple it is to modulate and decode the beam, and demonstrated its range in the university parking lot. Three of the guys got so excited, they each stopped at Costco on the way home to purchase one of their own.

*More photos from the 1997 Western States Weak Signal Society Conference (which arrived too late for last month's issue). Things got started before the conference with a tour of M² Antennas in Fresno, California, by owner Mike Staal, K6MYC (at left in photo). A lot of time was spent on the roof, where Mike led an impromptu seminar on VHF antenna design. (K7XC photos)*

Jim Moss, N9JIM, of the San Francisco Bay Area, has a wonderful Web page full of laser resources, including his "Cheapo Laser System," of which our group is planning to build many. With any luck and plenty of persistence, we might have a few laser VUCCs by the end of summer. All this because I started attending the local club meetings and began passing on what I've learned. Enthusiasm is infectious and can spread like wildfire! You can do it, too!

## Taking It to Washington

Another avenue to pursue is amending FCC Part 97 regulations to prohibit "non weak-signal modes" from access to the spectrum we currently occupy under the national ARRL bandplans. VHF has been treated as a local issue for the most part, a holdover from the FM mentality. In reality, VHF has regional, national, and even international issues that need to be addressed if we are to continue with our exploration of what's possible using advanced weak signal techniques.

From Northern Nevada on 144 MHz, I have worked Arkansas on meteor scatter, Hawaii on tropo, Mexico on tropo scatter, New Mexico on FAI (Field Aligned Irregularities), British Columbia on Aurora, and Europe, Asia, and North America on EME. Several times during my "weak-signal" career, I've almost been denied contacts due to people on FM keying up on top of me thinking my CW was just some guy fooling around. Only after informing them of what I was doing, and asking them to take their FM activity above 144.300, did the interference subside.

"Weak-signal" awareness is not taught in order to gain access to the VHF and

By Tim Marek, K7XC (K7XC@vhf.reno.nv.us)


*Into the forest primeval...really. K7XC heads into the ancient redwood forest en route to the conference at Montecito Sequoia Lodge.*

above bands, but we, the "weak-signal" community, have to deal those who end up here through ignorance or, worse, arrogance. If it became a violation of Part 97 regulations to operate FM or unattended/automatic transmissions in a "weak signal" subband, we'd have the weight of law on our side when it came to dealing with these incursions. FM and SSB can't occupy the same spectrum—it just doesn't work. The SSB segments are so small that making them exclusive "weak-signal" subbands should not threaten anyone. Quite the opposite, it would encourage growth and activity, something we all want.

## The Spread Spectrum Debate

Many here in the west are up in arms over spread spectrum (S/S) and the way the whole affair of temporary operating and testing has been handled. The S/S operators test in secret, claiming rising noise floor won't effect anyone. And if it *does* interfere with existing users, there's no way to let the offending S/S station know on the air because the two modes are incompatible.

Don't get me wrong, I'm all for developing new and advanced communication techniques, but not at the expense of existing users of the medium. The testing should be made public and limited to a group of frequencies outside of the current "weak-signal" band segments. The microwave bands have hundreds and hundreds of megahertz of room in which to roam. It only makes sense to allocate part of that spectrum for testing new technologies...without the current users having to pay the price.

What can we do as a group of interested "weak-signal" operators, experimenters, contesters, and enthusiasts? Make our views known to the FCC and the ARRL. Each can go a long way to helping resolve the problem. The longer we wait, the worse it will get and the harder to deal with it will become.

*(Editor's Note: The opinions expressed above do not necessarily reflect those of* CQ VHF *or its publisher, CQ Communications, Inc. For other viewpoints on this topic, see this month's "Letters" column and WB6NOA's "Line of Sight" editorial in our January, 1998, issue.)*

# Activity Reports

## Geminids Meteor Shower

From Andy, KØSM EN10:

I heard plenty of pings on 144.200 but that was what they were—pings. I completed two HSMS [high-speed meteor scatter] skeds: KØGU, DN70: Since we were around 450 mi. apart, we both pointed toward DN92 and worked on the "bounce path." It worked great. I heard him in the first minute, he heard me in the second....we completed in 8 min at 4:38 Z. VE5UF/DO61: For this one, Doug and I wanted a challenge...amps off! I was running 5 W and Doug was running 7 W. We completed in about 15 min.!!! Sending speed on both skeds was 4000 LPM (800 wpm).

I monitored a sked last night between KD5BUR/EM23 and VE5UF/DO61. I found that listening for the HSMS burst makes a *great* beacon. I pointed at EM23 and waited for a burn. The second I heard one I jumped to .200 and made a call. I got someone to come back, but the burns were just too short. Anyway, if I can find a way to hook my mic and my HSMS audio up simultaneously, it may be possible to get a second of data from your sked partner on HSMS, and then jump to .200 to try to make a quick random. This shouldn't upset the HSMS sked since the sequences are 1 minute long.

From Ed, KI7WB CN94:

I completed 7 contacts for 13 attempts. The best times seemed to be 0500–0700 Z each evening. A lot of 2-second burns were heard, and a few in the 15-second range. I made no random contacts. I liked the Leonids a whole lot more!

From K6ZX CN82gm:

0507 Z—Good one with KG6EG. Took 7 minutes. 0500 Z appears to be the peak. By 0530 Z things were much quieter. Also heard K7JA twice in the 0430–0530 Z period. One Q [QSO] makes the day.

From Jerry, KØCQ:

Did anyone notice a blue zinger path about 0205 Z Saturday (GMT) Friday night U.S. time? It was white when I saw its light on the window casing, though some report seeing it being blue or green. It was visible over Iowa, Missouri, and southern Minnesota.

## Sporadic-E (Es) and $F_2$

The sunspots are returning! A short-but-intense winter *Es* season was capped off with the first 6-meter $F_2$ contacts of Cycle 23 between New Zealand (ZL) and the U.S.! Read on...

From WP4O FK68:

12/18/97–12/19/97—I worked the following stations on 50.110 or 50.125 from 2333 Z to 0020 Z: WB4OQX, PY5CC GG54, KJ4E EL98, KD4LCO EM90, N4RFN TAMPA FLA, AJ4Y EL97, K4GTU FL, KØ4JJ, KD4RDW, KF4KSN, W3BTX EL98, KF4TYB EL98, W4CHA EL88 (tried 2 m w/him but no luck) KB3NR EL89, K4FCW EL89. Signals where usually 56–59 and rapid QSB [*fading*]; after 0020 Z signals dropped very quickly so I shut down.

From Kevin Bishop, N8ZJN EM79xk:

12/10/97–12/17/97—Well, after a few days of rest, we had a great time in the Bahamas. 2 m was very poor, only had 3 completed skeds W1LP, W3ZZ, and K8TQK and 10 Qs in all. On the other hand, 6 m was very good. We had propagation somewhere almost every day. There were about 400 QSOs in all on 6 m, all back into the States, except one with V31FD in Belize. Total Qs for the trip was about 8000 on 160–2 m. All QSLs via SASE to John Walker WZ8D. Others on the trip were Byron, WA8NJR; Joe, WA8GEX; and Jerry, WA8R. More info is available on my Web page.

From Mark, N7EIJ CN85:

12/25/97—From 0100 Z to 0236 Z on 50 MHz, I worked EM13, 22, 30, 40, 50, and 52. DM56, 59, 68, 95, and DN40. A Great winter opening!

From Don, N6KBX CM98jq:

12/25/97—Santa delivered big time on 6 meters! The band opened at 1630 Z to AZ & NM including DM34, DM65, DM56, & DM41, lasting until 1800 Z. Except for a brief opening to DN27 at 2000 Z, the band was quiet until 0200 Z (12/26). The evening opening was much stronger than the earlier one. Most signals in the morning were 53–57, while every signal in evening was 59+. I turned off the 400-W brick [amplifier] in the evening & it seemed to make little difference. I did have a brief double-hop opening to EL49 & EL59 but all other contacts were single-hop. Grids worked included DM48, DM68, DM79, EM25, EM21, EM09, DM78, DM67, DM65 & DN71. I called it quits at 0319 Z but the band was still going strong.

From Jordan, WB2QLP EL96:

12/26/97—Well, another present from Santa tonight. Six meters was open for a few hours. List of stations worked on SSB include: WP4O FK68, WA5UUD EL49, W4UDH EM51, KP3AA FK68, KD4JQW EM21, KC5IHX EM33, WB4IUY FM05, WA4PTZ EM66, KE4OQJ FM07, KF4KEF EM77, KE4LGL EM77, KE4UOD FM07, & KE4DQX FM16. I Heard PY5CC, TI5KD, WT7D/5 & W5OZI/B. Almost every Christmas +/- one day, 6 meters opens to somewhere; same for New Year's Day.

From Oscar, CO2OJ EL83:

12/27/97—Saturday at 1735 Z, I worked TI5KD EJ79 on 50.110 MHz. A little later, TI5GAX EK70 on 50.105 MHz. At 2045 Z, 6 m came alive to the north. In less than 2 hours, I worked 70 stations in 28 Grids. (EL, EM, FM & FN) Almost all signals were 59+++. Good Saturday afternoon!!! Who says that 6 m is not the Magic Band? From 2300 Z to 0130 Z (12/28) I worked 28 stations running only 100 milliwatts (!!) into a 4-element Yagi. Best DX: N8QNR/QRP (4 watts) EN91 1,246 miles; best distances: W2DRZ FN02 1,329 miles; WV1R EN82 1,309 miles; KU8Y EN61 1,262 miles; W8ZH & WA8TLJ in EN91 1,246 miles; N2UAH FN20 1261 miles; KE5CM EM25 1096 miles. I don't know if there is some record, but I really had a lot of FUN!

From Bruce, K2RTH EL95:

12/27/97—Six was open all evening, one of the most intense short-skip openings of the year. I thought 144 should have been open for hours, but I heard only one short 2-minute opening to the NW from Miami when I worked W4UDH (running only 10 watts!) in EM52 at 0047 Z. Fairly short for 144 MHz. Heard some other stations, a 3?, a lot of QRM, and then the band closed. W4WHN heard an EM27 station. I did a lot of calling with automatic keyer on CW & SSB all evening on 144.200 and I put out a report on the OH2BUA Webcluster within 5 minutes.

From Cap, W6CAP DM14:

12/28/97—We had pretty good *Es* this a.m. on half a dozen meters into Florida and Texas, starting at 1800 Z, or sooner, until 1840 Z. Most signals were strong and steady 59+. They were still going on sporadically at 1950 Z. Some of the stations worked were: WA2LXG EL89, KA4PGW EL98, N5VGS EM22, AF4GK EL98 & W4UE EM90 on CW. Stations were spread out on the band, thereby not overloading 50.125. A good sign.

From John, W4UE EM90gc:

12/28/97—Had a short 2-meter *E* opening this evening from 0155 Z to about 0210 Z. I had been hearing 6 meters shorten up and started calling on 2 meters. At 0155 Z, I worked KBØYKI EM49, and then ABØAX EM49 at 0156 Z. I moved off the calling frequency & at 0158 Z worked KØKD EN31 S9+. Signals started fading about 0205 Z. After that, it was impossible to hear anything weak due to stations ragchewing on the calling frequency. I could hear stations under them, but just too much QRM from the ragchewers. Wonder how many good contacts are missed because stations won't move off the calling frequency? Oh well, I made 3 good contacts anyway.

From Pat, WA5IYX EL09ql:

12/29/97—Due to the magnitude of the Dec. 29–30 *Es* events, this will be a short-form summary. 2210 Z first TV *Es* noted to SW, along with XE2UZL 50-MHz beacon. 2250 Z *Es* MUF on rapid rise thru Ch 4 TV. 2315 Z *Es* hits FM band, then most every state in Mexico along an arc from Puebla, across DF, Morelos, Jalisco, Sonora, and the Bajas. The MUF was up to 107.9 MHz a few times, though checks on the Omnigator for VOR/ILS signals didn't find anything there. 0205 Z finally some FM *Es* paths into San Diego-Tijuana, but the bulk still remained below the U.S. border. 0450 Z likely last of FM *Es* into Mexico; XE2UZL 6-m beacon still strong. 0540 Z probably the finale of Ch 2 and 3, still into northern Mexico.

During this event, our local Ch 4 & 5 signals (@ 25-mi SE) were all but obliterated for a few hours, with all sorts of the Azteca Net "ID's" visible in their VBIs as they drifted (or sometimes locked!) across the screen. Some of the FM channels were 2 or even 3 deep with various Mexican stations. (Most of the S and SW distances for these are at around 600–800 miles so high MUFs are implied.)

In nearly 40 years at the TV (and 25+ at the FM) this had to rank as perhaps the most intense and protracted *Es* event noted from here into Mexico—and this was a winter-season creation. As suspected, this Dec. was a record here for me in the amount of time for FM Es, besting 1987's by some 30% (that year itself was my best, not a poor one like 1997 had been).

From Dave, N7DB CN85:

12/30/97—Interesting 6-m opening last night. The first tip-off was the geomagnetic activity Monday night. I really was expecting more of a N-S type opening. First word came from K7RWT saying 10 m was alive with *Es*. On six, I heard NØLL/B weakly at 0224 Z. Then the double hop appeared from the NE. KN4SM & K4WYS FM16 0235 Z. Partial with N2ODU FN02 0245Z, K8TQK & KE8FD EM89 0254 Z.

Although I have heard double-hop *Es* in the winter, it has been a long time since I have


*Showing the flag. Arriving WSWSS members unfurl the Western States Weak-Signal Society banner outside the conference hotel.*

*A peaceful transfer of power...incoming WSWSS President Larry Hogue, W6OMF, enjoys a chat with his predecessor, Pat Coker, N6RMJ.*

heard one along the northern tier. Signals were not that strong, rough copy on most. Seems like I was hearing the DX stations better than they were hearing me and I was running a kW at the time. I worked WØSD EN13 0301 Z, WAØTDK EN04 0310 Z & WØOSP EN17 0348 Z. I heard W7GJ DN27 rather well @ 0415 Z.

The only other beacon heard last night was VE4VHF/B. Also heard NØXX CN84 on back scatter @ 0341 Z. The *new* one to look for now is VE7CUP. Rick moved up near New Hazelton, BC, recently and caught his first opening last night. I worked him at 0512 Z. Not quite sure of the GS (grid square), looks like CO65. With his '706 & dipole, the signals were great, 5/9 at times. Many were looking for KL7NO, but K7RWT called and got his answering machine. Oh well, sure had a strong first hop north.

*One of the two swapmeets held as part of the WSWSS conference. The way we figure it, the Sunday session gave folks the chance to unload what they'd bought on Saturday...or to pick up "accessories"!*

From Rick, K6SIX:

12/31/97—I thought it was pretty amazing to be working ZF1DC in EK99, but that was nothing. I worked ZL3NW in RE66—New Zealand—on 50.125 at 00:33 Z. Amazing! Happy New Year!

From Wes, N7WS DM42jh:

1/2/98—I began checking 2 m at 0140 Z after noting fairly strong interference with local channel 6 TV. I heard Ned, AA7A DM43 working many stations on 144.2, but I could not hear anything from the other end. Because of the apparent ease with which Ned was working, I assumed he was using *Es*. Also heard Tommy, W7RV DM43, work many of the same stations. At 0145 Z, I tuned 144.205 and heard KK6IT EM11 calling CQ on CW with typical FAI quality. I worked him and returned to listening.

***"12/31/97—I thought it was pretty amazing to be working ZF1DC in EK99, but that was nothing. I worked ZL3NW in RE66—New Zealand—on 50.125 at 00:33 Z Amazing! Happy New Year!"—K6SIX***

At 0152 Z, I worked K5YT EM22 on 2-m CW. Later I worked KD5BUR EM23 also on 2-m CW. Other stations were heard on 144.2 but not worked because of QRM and/or SSB flutter. The amazing thing was that KK6IT was still heard calling CQ at 0230 Z on 144.205 with no takers. All stations were worked with a beam heading offset from the great circle path of about 25–30 degrees to the north.

From Mike Foubister, ZL3TIC RE66:

01/01/98—Well it has happened, the first ZL [New Zealand] to Stateside opening, I could not believe it!!!! 0010 Z 50.525 American Samoa 5/5; 0040 Z FO5DR/B 50.050 5/1; 0045 Z W5WUB 50.1063 5/5; 0047 Z W5IUA 50.1063 5/1; 0048 Z W5VY 50.1063 5/5; 0049 Z W7CI 50.1063 5/5; 0056 Z W5EU 50.1063 5/7; 0057 Z W6KV 50.1063 5/5. I heard lots of others, including a W2 and a XE2. This is a good New Year's present!!!!

## Till Next Time

The Winter *Es* season, though short-lived, sure proved lively! Keep all the reports coming in. Without your input, I could not do this column, Thanks! Tim Marek, K7XC, 360 Prestige Ct., Reno NV 89506; Phone: (702) 972-4722; Fax: (702) 972-5011; e-mail: <K7XC@VHF.RENO.NV.US>.

73 from DM09bp de Tim K7XC/R

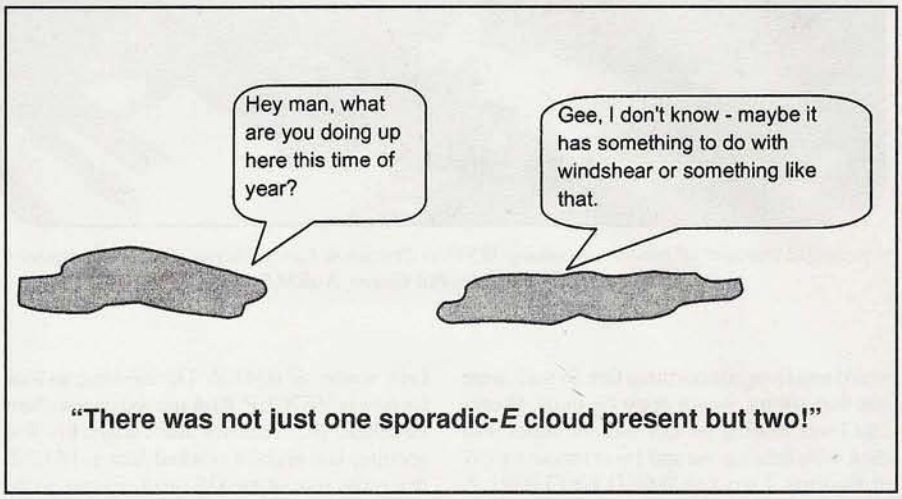
# A March Sporadic-E Opening!

March is traditionally the worst month of the year for sporadic-E on 6 meters. But not always...

After being on 6 meters for more than a few years, I noticed that sporadic-*E* activity was always sparse during the fall and spring equinoxes. Once in a great while, I would catch a brief opening in September, usually during the ARRL VHF contest, but I never saw an opening at any time during the month of March.

I talked with veteran 6-meter operators throughout the U.S. and in other parts of the world, and I would always ask them the same question: Had they ever experienced a sporadic-*E* opening on 6 meters in March? The answer always seemed to be "no."

As a part of my research into how the sporadic-*E* phenomenon behaves, I examined years' worth of hourly ionosonde data that had been collected by stations such as the NOAA facility in Boulder, Colorado (for more on ionosonde research, see my article, "Rockets Into the Ionosphere," in the December, 1997, issue of *CQ VHF*). The data showed the same thing for March—virtually nothing, *except* for a few MUF (Maximum Usable Frequency) readings that may have reached as high as 10 meters during the time of the solar minimum. Could there be a connection?




**"There was not just one sporadic-*E* cloud present but two!"**

## Bottoming Out

The year 1996 was about as low as you could get in the sunspot cycle (the bottom of Cycle 22), and I continued to monitor the 6-meter band through the months of February and March, even though I believed that the chances of a sporadic-*E* opening were practically nil. My standard practice during the winter months was to check 10 meters for any activity before checking six (sporadic-*E* openings tend to work their way up from lower frequencies). On February 20, I remember having an exceptionally bad day at work and coming home and hearing a very high noise level on 10 and 6 meters at around 5:00 p.m. Then, six opened up for nearly two hours and I worked stations in five states—Minnesota, Michigan, Wisconsin, Illinois, and Indiana—from my home in New York. This was the latest winter sporadic-*E* opening I had ever heard during my time on 6 meters!

Then I thought...could this be the year that I would catch a 6-meter sporadic-*E* opening in March? I monitored the bands every day and heard a brief opening on 10 meters on March 9, and I actually heard KD4LCO from Florida briefly break through on the 6-meter SSB calling frequency. Well, I thought, it would stand to reason that any openings that happened in March would have to be very brief. I would be proven totally wrong in just 10 days.

## Success at Last!

On March 19, I came home from work and turned on the radio, just as I had every other day. I heard nothing before 5:00 p.m., but when I checked about a half hour later, I heard midwest stations on 10 meters with very strong signals. Then 6 meters started to open! And what an opening! Not only were signals coming in from the midwest, but I was also hearing double-hop sporadic-*E* signals such as those from W5FF in New Mexico! There was not just one sporadic-*E* cloud present, but *two!*

I worked KBØOCM (EN31) at 5:23 using 150 watts. But, by then, the opening had become so strong that I switched to 10 watts and worked NØAEI (EN11), N9TZZ (EN52), and KØKTP (EN43). There were other double-hop signals coming in, and Clint, N1KTM (now W1LP), in Massachusetts, was working stations in Arizona, New Mexico, and even California, where Clint worked Will, AA6DD, in DM13. The midwest hams were in the middle of the fun, working stations both to the east and the west.

This was—so far—the only true sporadic-*E* opening that I've ever encountered on 6 meters during the month of March (and it was a double-hop event at that). But now that I know that sporadic-*E is* possible on six in March, I believe that almost anything is possible, in terms of propagation or how far you can work...on the Magic Band. ■

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

By Ken Neubeck, WB2AMU

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# Magical Moments

Is there one special experience in your personal ham history that made you say, "Yes! This is what being a ham is all about!"? Here's one from WB9OMC's memory banks, and we encourage you to submit yours as well.

By Duane Mantick, WB9OMC*

*Editor's Note: Reader Duane Mantick, WB9OMC, wrote in an "Op-Ed" piece last July about the apparent shortage of "Elmers" to help new hams discover the magic and true meaning of amateur radio. More recently, he sent us an e-mail saying, in part, "It occurs to me that since I was [complaining] about a lack of Elmers, I should 'put up or shut up.' I am thinking of a feature...." Duane had an idea for a column, based on first-person experiences, in which readers could share some special experience, either something that taught them a lesson about ham radio, or demonstrated the "magic" that makes it all worthwhile.*

*To get us started, Duane sent us his reflections on a "Magical Moment" that happened to him about 13 years ago...*

I've been thinking about a propagation event that occurred some years back, in June, 1985. I got only one QSL card out of several sent. It disappointed me at the time and still does somewhat—it seems that, even under exceptional circumstances, many hams have a notion that sending a QSL card for a 2-meter contact is some sort of heresy. Too bad.

It was June 9, 1985 (in UTC, at least). I was single then, sharing an apartment with another single guy who also happened to be a ham. I had just bought a used HT from a friend, and my roomie had this neat little 2-meter mag-mount antenna. I was looking for a better antenna to use with the HT, so he concocted the idea of setting the mag-mount on top our refrigerator! You know, it worked! And one evening, while messing around the with the HT, I noticed that I was hearing a *lot* of repeater activity, unusual because these repeaters were between 50 and 100 miles away and were not generally heard so easily. Even more interesting was that *I* was able to work into most of them with just my HT and that refrigerator-mounted antenna.

Then I hit paydirt! I latched onto the 145.25 repeater in Indianapolis (I was in Lafayette, Indiana, about 60 miles to the northwest) and, because it was a pretty potent repeater, I was able to hear stations from hundreds of miles away. I really wanted to get in on the action, so I keyed up and IDed just to see what would happen. And with my HT and fridge-mount (is that anything like a "fridge magnet"?), I had an immediate reply! I was amazed and started talking to the guys in Indianapolis. Now that's not all that far on 2 meters, but the next station I heard was from Owasso, Oklahoma! He was able to work into that repeater in Indy, and quite clearly, too. I think that's pretty good in just about anyone's book. As evening progressed, the DX signals moved east and the distances got shorter: Huntsville, Alabama; Cincinnati, Ohio; Fort Wayne, Indiana.

I got a QSL card from WD8NMY in Cincinnati. Our QSO lasted 15 minutes, according to the card. The opening must have been as good in Ohio as it was in Indiana, since he wrote that he worked "9 states and 14 new counties" with just 12 watts. Interesting propagation, indeed!

## A Weather Connection?

If my memory serves correctly, I was also watching a weather front of some kind moving slowly across the midwest (courtesy of The Weather Channel, I believe) and it struck me that this very long and apparently potent frontal system might just be having major effects on the propagation. As the front moved east, so did the band opening. The whole thing finally died out after a couple hours, but I was ecstatic. To hear such signals, much less *work* them, on 2-meter FM was unheard of to me at that time. It was probably this incident that kept me from dropping out of ham radio at a time when it seemed like I'd be stuck on 2 meters for the rest of my life.

Since then, I have branched out a bit, but I've never forgotten the lessons from that evening 13 years ago: First, don't ever be *too* surprised at what can happen in a given band. Two, it's a *bad* idea to get overly complacent just because everyone tells you that a given band is only good for "local" communications and little else. It ain't necessarily so. Three, it is amazing now and then what you can do with very modest equipment and antennas under the right circum-

*Duane Mantick, WB9OMC, still lives in Lafayette, Indiana. A ham since 1974, he's active on 2, 6, and 10 meters. He recently upgraded to General and hopes to be using his new privileges soon.

***"It seems that certain kinds of ham radio events get 'burned' into your memory. And you can use that knowledge and apply it to future radio work."***

stances. And above all, even if you *are* stuck on 2 meters for lack of money to buy other radios or due to other reasons, it isn't always bad. With patience, perseverance, and, admittedly, some plain old dumb luck, you *can* do some pretty amazing things on 2 meters.

## Epilogue

Years later, when the FCC grandfathered "old" Technicians into Tech Pluses and we got voice privileges on 10 meters as part of "novice enhancement," I would rag chew about these kinds of things and I found quite a few hams who remembered that specific evening. It seems that certain kinds of ham radio events get "burned" into your memory. And you can use that knowledge and apply it to future radio work.

I still run a fairly modest station, mostly by economic necessity. But I get QSL cards from around the world from 10-meter contacts in spite of that modest gear because I recognized a basic truth about amateur radio from one evening of unusually excellent conditions on 2 meters—you *can* make DX contacts; you *can* be amazed by this aspect of nature (radio wave propagation); and, by being observant, you *can* achieve what you had perhaps only dreamed of before.

You don't need a tower the size of Mount Everest. You don't need enough wattage out to take down your entire state's power grid. What you *do* need is your mind, working and thinking and scheming about how to take advantage of opportunities as they arise, making the most out of what station you have. Make ham radio magic happen for you! ■

*We encourage you to tell us about your own "Magical Moment" (and if you have pictures, all the better). Please send your submissions to "Magical Moments," c/o CQ VHF, 76 N. Broadway, Hicksville, NY 11801, or via e-mail to <cqvhf@aol.com>. Sorry, we cannot return unpublished submissions. We will return photos upon request if you include an SASE with sufficient postage.*

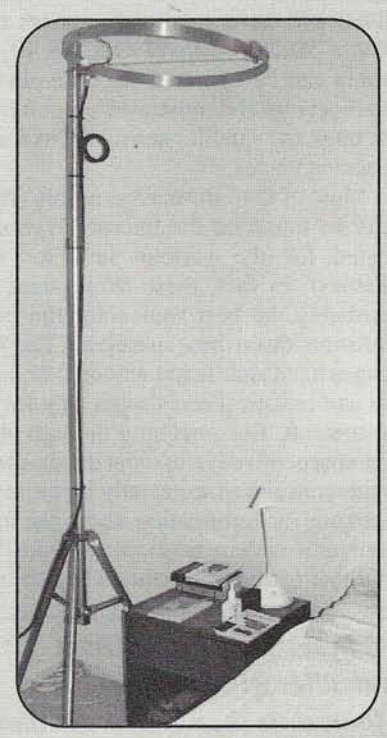
# Reader Snapshot!

*NØYXE on the air from his new 6-meter station. Welcome to the Magic Band, Terrence!*

## Magic Band Magic for Terrence Glass, NØYXE

Here are some pictures of my home QTH in Leawood, Kansas. This past December, I made the transition to 6 meters. I placed my station in my home business office and set up my antenna across from my desk by the side of my bed because the local homes association strictly prohibits outside antennas.

My station was ready to go on the afternoon of December 30, but I decided to wait to transmit until my wife was home to see our new station in operation. Within three minutes of operation, I met WA2RQC in Johnstown, New York. I then proceeded to work two more New York stations, N2ODU and WA2PJP; a New Jersey station, K2MLB; and concluded with VA3GBC in Ontario, Canada! It was a fantastic experience for my first time on 6 meters with brand new gear.



*Despite an antenna-hostile homeowners' association, Terrence was able to get excellent results from this nifty indoor antenna.*

*If you'd like to be considered for our "Reader Snapshot" column, please tell us about yourself in 150 words or less and mail, along with a photo, to:* CQ VHF *Reader Snapshot, 76 N. Broadway, Hicksville, NY 11801. Entries become our property and cannot be returned. If we publish your "snapshot," we'll give you a one-year gift subscription (or extension) to* CQ VHF.

# Future "Little LEO" Amateur Satellites

Several new low-altitude amateur satellites are being developed, including one scheduled for launch this month. These spacecraft will have different capabilities, varying from entry level to sophisticated. This month, we'll take a look at six of them.

While many satellite-active hams are anticipating the yet-to-be-rescheduled launch of AMSAT's high-altitude Phase 3D satellite, there are other satellites being developed that will provide low-altitude satellite access. These *LEO*s, or *Low Earth Orbit*, satellites, will have smaller footprints than Phase 3D and AMSAT OSCAR 10, but some can be operated with simple FM transceivers and most won't require you to track the satellite across the sky with beam antennas.

Most of the information in this article can be found on the Internet Web sites listed for the various satellites (see Tables). In fact, these Web pages are probably the best source for the latest information on these spacecraft. The Web pages have significant amounts of history and technical and design data for the spacecraft. But searching through all of the spacecraft development details can be time-consuming, especially if you're just looking for information about the amateur radio communications payloads. The purpose of this article, therefore, is to give you a brief summary of these new satellites, emphasizing their amateur communications features.

***"These...Low Earth Orbit satellites will have smaller footprints than Phase 3D and AMSAT OSCAR 10, but some can be operated with simple FM transceivers and most won't require you to track the satellite across the sky with beam antennas."***


*Upcoming low-orbit amateur satellites were a major part of the agenda at last October's AMSAT Space Symposium in Toronto. Here, Robert Hillman of the University of Alabama in Huntsville discusses progress on the SEDSAT-1 satellite. (W2VU photos)*

By the way, the satellites are summarized alphabetically by name since I don't want to promote any personal favorites. (*South Africa's SUNSAT, toward the bottom of the list alphabetically, is scheduled for launch this month. Check "VHF News" or the SUNSAT Web site for any updates.—ed.*)

## ASUSat

The *Arizona State University Satellite* (ASUSat) began as a challenge from a co-founder of the Orbital Sciences Corporation (OSC) to do meaningful science with a very small satellite. Its small size and low weight were driven by constraints dictated by the Pegasus booster, since OSC is donating the launch. ASUSat 1 is a 4.5-kilogram (10-pound) cylindrical satellite about 10 inches tall and 14 inches in diameter, with a scientific mission as well as an amateur radio mission. ASUSat 1 will provide amateur radio operators with a part-time FM voice repeater. Table 1 has the ASUSat 1 highlights.

Its scientific mission is photographing the Earth's surface with four video cameras and making satellite position and

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

## Table 1. ASUSat 1 Summary

| | |
|---|---|
| Built By: | Arizona State University, Tempe Arizona |
| Launch: | Mid 1998, Taurus or Pegasus Booster |
| Orbit: | 550-km altitude sun-synchronous (97.6° inclination) |
| Frequencies: | Uplink: 145.990 MHz, Downlink: 436.700 MHz |
| Transponder Type: | Part-time FM Voice Repeater |
| Web Page: | <http://www.eas.asu.edu/~nasasg/asusat/asusat.html> |

velocity measurements with an on-board GPS receiver. This mission is tied in with the amateur radio communications equipment since the transponder provides a 2-meter VHF command uplink and a 70-centimeter UHF data downlink. The FM repeater also has a separate 2-meter VHF voice uplink receiver that transmits on the common UHF downlink.

The FM repeater will operate when the radios are not needed for the scientific mission. It will be available much of the time the satellite is in the sunlight (except when commands are being uploaded or data is being downloaded). The FM repeater will *not* be available when the spacecraft is in its low-power mode during the 36 minutes of each orbit that it's not in the sunlight (i.e., in eclipse). When the sun is blocked by the Earth's shadow, the solar cells do not make electricity. The satellite's storage battery only has enough electrical power for essential systems, such as the on-board computer so, in the low-power mode, there is not enough electrical power to operate the satellite's transceiver. Even with these minor limitations, ASUSat should provide amateurs with a new crossband FM repeater that doesn't require any special satellite equipment.

## Maelle

The *Maelle* spacecraft is a 50-kilogram (110-pound) microsat being developed by AMSAT France. Maelle's main mission is to improve the packet radio satellite (PACSAT) system, adding a new store-and-forward satellite. Maelle's secondary mission is the POLLUX experiment: an amateur astronomy sensor intended to measure sources of "light pollution" (i.e., light that interferes with astronomical observation). Table 2 has the Maelle highlights.

Maelle will carry two amateur packet radio transponders, including a conventional link and an experimental high-speed link. The conventional transponder will have four uplink frequencies in the 2-meter band with 9600 and 19200 bits-per-second (bps) speeds available. This transponder will have either one or two downlink frequencies in the 70-centimeter band.

***"...ASUSat should provide amateurs with a new crossband FM repeater that doesn't require any special satellite equipment."***

The experimental high-speed transponder will have its uplink frequency in the 1.2-GHz band and its downlink frequency in the 2.4-GHz band. This transponder will operate its "super modem" in various experimental communications protocols, at speeds up to 500 kbps.

Like other PACSATs, Maelle will provide direct satellite communication as well as a tie-in with local packet radio networks. The connection to the local packet networks is by satellite gateway stations. Gateway stations send and receive files by direct communication with the satellite. Since each gateway station is connected to its local packet system, the satellite acts as a quick relay between your local packet network and the packet networks connected to other satellite gateways around the world.

For the radio amateur, Maelle will be a high performance packet radio satellite. It will be compatible with current PACSAT stations, but its experimental transponder will test the feasibility of very high-speed digital communications.

## PANSAT

The *Petite Amateur Navy Satellite* (PANSAT) is being developed by the U.S. Naval Postgraduate School in Monterey, California. This spacecraft will have a half-duplex AFSK store-and-forward amateur packet radio transponder using spread-spectrum. PANSAT is a candidate for launch from the Space Shuttle under the "Hitchhiker" program. Table 3 has the PANSAT highlights.

The PANSAT 9600-bps packet transponder will use Direct Sequence Spread Spectrum (DSSS) modulation with a 436.5-MHz center operating frequency. DSSS modulation spreads a conventional narrowband signal over a wide range of frequencies, quickly "hopping" from one frequency to another. A computer program makes a pseudo-random number sequence that dictates the transponder's frequency hopping order. The frequencies will seem to follow a purely random order and the transponder will dwell for very little time on any one frequency.

An outside observer monitoring the satellite's downlink frequencies would probably not sense any transmission and would likely conclude that the frequencies were not being used. To copy information from the satellite's downlink, a ground station needs to be synchronized with the satellite's transponder so they are hopping to the same frequencies at the same time.

By its nature, DSSS modulation resists interference (so it's very difficult to jam)

## Table 2. Maelle Summary

| | |
|---|---|
| Built By: | AMSAT France |
| Launch: | 1999 |
| Orbit: | Pending |
| Frequencies: | Packet BBS<br>Uplink: 2 meters (4 frequencies), Downlink: 70 centimeters (1 or 2 frequencies)<br>Experimental High-Speed Packet<br>Uplink: 1.2 GHz, Downlink: 2.4 GHz (1 frequency each) |
| Transponder Type: | Packet BBS: 9.6/19.2 kbps<br>High-Speed Packet: up to 500 kbps |
| Web Page: | <http://ourworld.compuserve.com/homepages/AMSAT_F/index2.htm> |

## Table 3. PANSAT Summary

| | |
|---|---|
| Built By: | Naval Postgraduate School, Monterey, California |
| Launch: | Pending, possibly as a Space Shuttle "Hitchhiker" |
| Orbit: | Pending |
| Frequencies: | 436.5 MHz center |
| Transponder Type: | 9600-bps Direct Sequence Spread Spectrum store and forward AFSK packet messages |
| Web Page: | <http://www.sp.nps.navy.mil/pansat/pansat.html> |

and, because the frequencies sound unused, DSSS is also very difficult to detect. PANSAT will provide a low-cost way for the U.S. Navy to demonstrate this type of spread-spectrum communications. Because of the low chances of an outsider detecting the signal, DSSS has potential applications for downed military pilots to relay their position to rescue crews without giving away their location to the enemy. For the radio amateur, it will provide one more satellite, plus added opportunity to experiment with spread-spectrum communications.

## SAPPHIRE

The *Stanford Audio Phonic Photographic Infrared Experiment* (SAPPHIRE) is the Stanford University Satellite Systems Development Laboratory's (SSDL's) first spacecraft. While a launch has not yet been set, this spacecraft is designed to operate in a 500-kilometer altitude polar orbit. SAPPHIRE will carry a digital camera and a voice synthesizer amateur payload. Table 4 has the SAPPHIRE highlights.

SAPPHIRE's voice synthesizer will have a 2-meter uplink and a 70-centimeter downlink. This payload accepts digital text (typed from a computer keyboard) on the 2-meter packet uplink. The voice synthesizer converts the text into simulated human speech that is transmitted on the 70-centimeter FM audio downlink. The SAPPHIRE voice synthesizer is intended mainly as an educational tool.

SAPPHIRE will also have a modified commercial Logitech Fotoman Plus digital camera aboard. This camera will take pictures of the Earth's surface at a 496 x 360 pixel resolution at 256 gray levels. The pictures will be compressed using the standard Joint Photographic Experts Group (JPEG) image file format. Both the pictures and the spacecraft telemetry will be transmitted on the satellite's 70-centimeter downlink, using standard 1200-baud AFSK packet radio protocol.

The SAPPHIRE satellite will provide radio amateurs with some unconventional satellite communications opportunities. However, this satellite will only require a standard 70-centimeter FM radio and an ordinary TNC (for downloading pictures and telemetry).

## SEDSAT

The SEDSAT spacecraft is a project of the University of Alabama at Huntsville. Originally scheduled for launch on the STS-85 Space Shuttle flight, the satellite was named for its deployment mechanism, the *Small Expendable Deployer System* (SEDS). The SEDS was to deploy the satellite from a canister, reeling it out on a 20-kilometer (approximately 12-mile) tether. The orbital and tether dynamics would have been used to release the satellite to an orbit with an altitude significantly higher than the Shuttle. However, problems with the tether on an earlier Shuttle flight caused NASA to cancel the tether system for SEDSAT.

The backup plan to deploy SEDSAT at the Shuttle's orbital altitude would have resulted in only a few months of operation before aerodynamic drag forces would have caused the orbit to decay and the satellite to reenter the atmosphere. Instead, the SEDSAT team chose an alternative, accepting a ride on a Delta II booster that is scheduled for launch this coming July. Table 5 has the SEDSAT highlights.

SEDSAT will carry a high resolution video imagery camera and two amateur radio transponders. The "Mode A" linear transponder will allow uplinks in a 60-kHz portion of the 2-meter VHF band and will support SSB, CW, FM, and AM. The downlinks cover a corresponding 60-kHz portion of the 10-meter HF band. The Mode A transponder will be mainly a voice and Morse code communications repeater for amateur operators. The "Mode L" linear transponder will allow uplinks in a 150-kHz portion of the 1.2-GHz (23-centimeter) amateur band with the downlinks in the 70-centimeter band. The Mode L transponder will support Frequency Shift Keying (FSK) digital packet communications at 9.6, 19.2, 38.4, and 57.6 kbps. The Mode L transponder will also allow you to download digital imagery taken by the on-board camera.

SEDSAT's primary limitation will be the Earth surface coverage of its orbit. Since a compromise launch opportunity was taken to prolong its life, the satellite will only directly overfly latitudes within 31 degrees of the equator. This means that if your latitude is higher than 31 degrees, you'll have shorter communications opportunities. The satellite's maximum usable latitude will be somewhere around 50 degrees.

The bottom line on SEDSAT is that it will provide excellent communications opportunities for both analog and digital satellite operators. Unfortunately, the less-than-optimal orbit will shorten or preclude these opportunities for higher latitude stations.

## SUNSAT

SUNSAT is being developed by graduate students at Stellenbosch University in South Africa. Most of the electronics and about half of the structural components were designed and built by the students. SUNSAT will have a high resolution color camera and several amateur

## Table 4. SAPPHIRE Summary

| | |
|---|---|
| Built By: | Satellite Systems Development Laboratory (SSDL), Stanford University |
| Launch: | Pending |
| Orbit: | Designed for a 500-km altitude polar orbit |
| Frequencies: | Uplink: 145.945 MHz, Downlink: 437.100 MHz |
| Transponder Type: | 1200-bps AFSK packet radio (command and images), FM Digitalker voice synthesizer |
| Web Page: | <http://aa.Stanford.edu/~ssdl> |

## Table 5. SEDSAT Summary

| | |
|---|---|
| Built By: | University of Alabama at Huntsville |
| Launch: | July 1998 Delta II Booster |
| Orbit: | 500 km x 1000 km, 31° inclination |
| Frequencies: | Mode A Transponder<br>Uplink: 145.915–145.975 MHz;<br>Downlink: 29.350–29.410 MHz<br>Mode L Transponder<br>Uplink: 1268.250–1268.110 MHz;<br>Downlink: 437.850–438.000 MHz |
| Transponder Type: | Mode A: Linear (SSB/CW/FM/AM)<br>Mode L: high-speed FSK packet<br>(9.6/19.2/38.4/57.6 kbps) |
| Web Page: | <http://www.seds.org/sedsat/> |

## Table 6. SUNSAT Summary

| | |
|---|---|
| Built By: | University of Stellenbosch, South Africa |
| Launch: | 08-MAR-98, Delta Booster |
| Orbit: | 520 km x 850 km altitude Sun-Synchronous (96° inclination) |
| Frequencies: | 2-meter and 70-centimeter Uplinks and Downlinks;<br>L-Band (1.2 GHz) uplink; S-band (2.4 GHz) downlink |
| Transponder Type | Parrot FM digital repeater,<br>Store and forward packet (PSK and AFSK) |
| Web Page: | <http://sunsat.ce.sun.ac.za/index_n3.htm> |

radio transponders. Table 6 has the SUNSAT highlights.

SUNSAT has a VHF/UHF and a Mode S (1.2-GHz uplink; 2.4-GHz downlink) amateur transponder for store-and-forward packet radio communications. The VHF/UHF transponder will use 1200- and 9600-baud AFSK packet protocol, allowing communications with a standard Terminal Node Controller (TNC). This transponder has both transmitters and receivers for each band. It can be configured for a 2-meter uplink and 70-centimeter downlink or vice versa.

The Mode S transponder will use high-speed Phase Shift Keying (PSK) packet radio communications, requiring a PACSAT-type modem in conjunction with the TNC. The Mode S transponder will provide a way to download the pictures taken by the high resolution camera.

The VHF transmitter and receiver can also be set up as a 2-meter FM "Parrot" repeater. This mode is intended mainly as an educational tool by which students will be able to hear the satellite repeat back their voice transmissions like a parrot. This mode has a digital recorder with enough memory to store up to five minutes of speech. In addition to the educational uses, the "Parrot" repeater will also give basic 2-meter FM satellite access to "ordinary" radio amateurs.

SUNSAT is scheduled to be launched on March 8, 1998, into a polar orbit with a 520- by 850-kilometer altitude. This will be a special type of polar orbit known as "Sun-Synchronous." Sun-Synchronous orbits take advantage of orbital plane precession (a gradual shift in orbit) caused by the Earth's flattened mass distribution (i.e., the Equatorial bulge). The precession can be controlled by selecting the right orbital inclination.

To get a Sun-Synchronous orbit, you choose the orbital inclination so the orbital plane precesses at the same rate that the Earth orbits the Sun. Controlled precession positions the satellite for consistent ground illumination on each revolution. Consistent illumination makes Sun-Synchronous orbits particularly desirable for satellites like SUNSAT that photograph the Earth's surface.

## In Summary

Table 7 lists each of the satellites and checks off each of the offered communications modes or capabilities. Some of these satellites have reserved a spot on a launch booster and some even have a launch date scheduled. Others are in some stage of negotiating their rides into orbit. Once these satellites get into orbit, they'll all fly at low enough altitudes that you'll be able to work their VHF and UHF transponders with simple fixed antennas. Plus, you'll be able to work the satellites that have FM transponders with a standard dual-band rig.

With these spacecraft, the day when satellite communication is truly available and accessible to *all* amateurs is just that much closer. ■

## Table 7. Future Satellite Operating Modes

| Future Satellite | Voice Modes | | Packet Radio | | | Spread Spectrum | Digital Imaging |
|---|---|---|---|---|---|---|---|
| | Linear | FM | AFSK | PACSAT | High Speed | | |
| ASUSAT | | ✓ | | | | | ✓ |
| MAELLE | | | | ✓ | ✓ | | |
| PANSAT | | | ✓ | | | ✓ | |
| SAPPHIRE | | ✓ | ✓ | | | | ✓ |
| SEDSAT | ✓ | ✓ | | ✓ | ✓ | | ✓ |
| SUNSAT | | ✓ | ✓ | ✓ | | | ✓ |

# Lost and Found—Hams Helping Search & Rescue

A growing number of Search and Rescue organizations are looking to ham radio for communications support. In order to help, we need to speak their language and read their maps. Here's more on "UTM," the map system used by most Search and Rescue groups

*Editor's Note: Last month, we got ourselves all turned around in terms of telling you which UTM reading comes first. Standard cartographic (mapping) practice is to report a north-south reading first, followed by an east-west reading. UTM, however, is based on a military standard that's just the opposite: east first, then north. We apologize for any confusion...but then we were pretty confused by the whole thing ourselves!*

Giving directions. An easy enough task. Go down to the corner of Main Street and make a right turn onto Market Street. Take I-95 North to Rt. 73 West. All very simple...when things are normal. But if you're in a flooded area where street signs are covered, it's no longer quite so simple. And if you're in the middle of the forest or in the mountains, there are no street signs to use as landmarks. Now what do you do?

The early explorer might have used the sun or a compass to find his way. You or I might use a map. But the days of using map and compass to pace off distances are gone (except maybe for Boy Scouts). Today there are hi-tech (but fairly low-cost) tools that make finding your way with a map very easy. As Apollo 17 Astronaut Eugene Cernan, the last man to walk on the moon, recently said, "there are more electronics under the dash of a car today than there were in the Apollo spacecraft that went to the moon."

These days, the primary tool for helping with direction-finding is the Global Positioning System, or GPS, which can pinpoint a location to within six yards of the mark! Last month, we talked about a GPS system being used in a Search and Rescue (SAR) mission. But, instead of using latitude and longitude to identify locations, the SAR team used a system known as *Universal Transverse Mercator*, or *UTM*.

This month, we'll take a closer look at this somewhat unfamiliar way of determining your location on a map. To learn more about UTM ourselves, *CQ VHF* contacted the U.S. Geological Survey's Earth Science Information Center (ESIC) and the Bay Area Search and Rescue Council (BASARC).

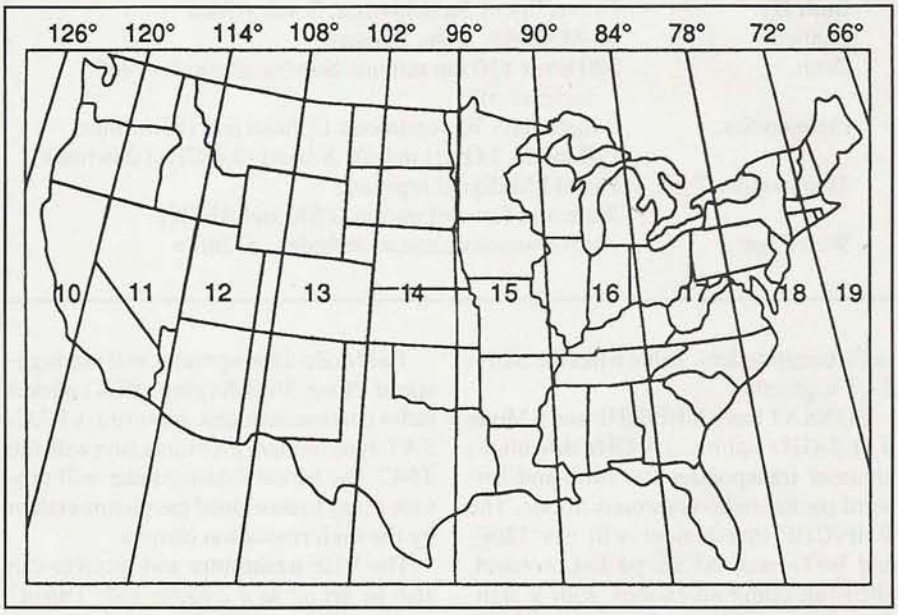



*Figure 1. The Universal Transverse Mercator grid that covers the continental 48 states comprises 10 zones: from zone 10 on the West Coast through Zone 19 in New England. Courtesy U.S. Geological Survey Earth Science Information Center (ESIC).*

## Some UTM Basics

We've all seen reference lines on a map. The most basic of these are called parallels of latitude and meridians of longitude. The equator is the base line for latitude and the numbers go north and south from there. The base line for longitude, the prime meridian, runs through Greenwich, England, and longitude is measured east or west of Greenwich.

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

## UTM—The BIG Picture

In the main part of this article, we mentioned that the globe was divided into zones. If everyone is working off of the same map, there's no need to talk about the big picture or the entire UTM coordinates. If not, however, more information will be needed to communicate location.

This is similar to how packet addresses work. For example, a short packet address would be my own WA3PZO@WB3JOE. And, as long as you're somewhere near WB3JOE, your home BBS will know how to route a message to me. But if you're in, say, Indiana—or India—your BBS will need more information. There is, therefore, a longer address to provide that information. For me, it would be WA3PZO@WB3JOE.PA.USA.

In UTM terms, a full address would read 18T 0397235 5024750. The 18 indicates the UTM Zone (see Figure 1). The letter, T, in this case, references how far north or south of the equator you are. In normal use, you can disregard the zone number and letter. The 0397235 is the *easting* from the Zone 18 meridian (a center point in the zone). The center point is arbitrarily given a coordinate of 500,000 meters, so 0397235 (indicating 397,235 meters) would be *west* of the meridian and would indicate a distance east of the western zone boundary. That number would be rounded off to 972 by dropping the 03 at the beginning (millions and hundred-thousands of meters) and 35 (tens of meters and single meters) at the end. The larger units are dropped because it's assumed that everyone working together will know what part of the world they're starting out in. And the smallest units are dropped because most maps are not reliably accurate to measurements under 100 meters. Likewise, the northern number—5,024,750 meters north of the equator—would be rounded off to 247, making the UTM coordinates 972 247.

One final note for us hams used to dealing in big Maidenhead grid squares: a six-digit UTM coordinate will repeat in every zone. So this system really is intended for use in a relatively small area in which everyone is familiar with the common starting point.

On most modern maps, these lines appear curved, since the Earth is basically a sphere. But an early mapmaker, by the name of Mercator, developed a flattened projection that straightened out those curved lines and made it easier to use the maps. These are the maps most of us remember from school. On a Mercator projection, lines of latitude and longitude appear as a rectangular grid consisting of two set of straight, parallel lines, uniformly spaced, with the sets perpendicular to each other. The grid is designed so that any point on the map can be referenced by the latitude and longitude or by its grid coordinates, and a reference given in one system can be converted to a reference in the other.

## The UTM Grid

Using the Mercator projection as a basis, the U.S. Defense Mapping Agency adopted a special grid, more precise than degrees of latitude and longitude, for military purposes throughout the world. It's been used since at least World War II to designate targets, meeting points, etc., and is known as the Universal Transverse Mercator system, or UTM. According to ESIC, the UTM grid divides the world into 60 north-south zones, each covering a strip 6° wide in longitude. These zones are numbered consecutively, beginning with zone 1, between 180° (the International Date Line) and 174° West longitude, and progressing eastward to zone 60, between 174° East and 180°. The continental U.S. comprises 10 zones, from Zone 10 on the west coast through zone 19 in New England (see Figure 1).

## U.S. Geological Survey Maps

Many of us are familiar with these topographic maps, which are used not only for hiking but for determining the height above average terrain for repeater antennas. They can also be used to determine your UTM location. Two of the most popular USGS (U.S. Geological Survey) maps are the 7.5-minute quadrangle (with a 1:24,000 scale, meaning that one inch on the map equals 24,000 inches on the ground) and the 15-minute quadrangle (a *minute* here referring to $^1/_{60}$ of a degree of latitude or longitude). The 15-minute quadrangle maps may have map-to-ground scales of 1:50,000, 1:62,500; or 1:63,360 (there are 63,360 inches in a mile).

On these maps, the UTM grid lines are indicated at intervals of 1,000 meters, either by blue ticks in the margins of the map or by full grid lines. The 1,000-meter value is shown for every tick or grid line. In addition, the actual meter value is shown for tick marks nearest the southeast and northwest corners of the map.

If you have access to a USGS map, why not pull it out and find those UTM markers? If there's no UTM grid on your map, you can draw your own by connecting the matching UTM tics (blue on the USGS maps) from top to bottom and side to side. This will give you a grid of 1,000-meter (1 kilometer) squares, as shown in Figure 2.

To find locations more precisely than to the kilometer, you'll either need to estimate, as in Figure 2, or to use a "grid overlay," (see "Resources"). A map with tic marks at 1,000-meter intervals will need a grid overlay of 10 x 10 100-meter squares. Other maps may have a grid overlay with 1,000-meter squares. To make it easier, BASARC member John Carnes, KA5OCA, created a Web page which has UTM templates scaled for different maps. Check out the BASARC Web page (again, see "Resources") and download John's templates.

Even with the templates, it's much easier if everyone is using the same map, and in team efforts, it's just about mandatory.

## Let's Find Something!

Finding your UTM location is actually fairly easy. Let's start by going back to latitude and longitude. Let's say, for example, that your base camp is at N39° 52' 30" W75° 22' 30" (using the popular degrees, minutes, seconds coordinates). This places us in the Philadelphia area. The UTM coordinates are easy to figure out since all the information is on USGS and Canadian topographical maps, but you can't figure it out directly from latitude and longitude without doing some math. You'll need to use a map with UTM markings. A map scaled at 1:24,000 will have numbers such as 067000 and 4513000 by the UTM tic marks. Note that two digits are physically larger than the others; these become the first two numbers in your UTM coordinate, with the third digit coming from a grid template (or your practiced estimate).

On a 1:24,000 scale map, the UTM

reading for the latitude/longitude location above would be 679 138. This 6-digit reading should be accurate enough to pinpoint your location within 100 meters (see "UTM: The Big Picture," for an explanation of how the numbers are determined). The first three of the six digits designate a point on a line running east and west known as the "*easting*" coordinate; the second three designate a point on a line running north and south, known as the "*northing*" coordinate. Read the numbers going across first and then those going from bottom to top, or as Carnes often tells his students, "read right up." Carnes also recommends that when reading the map location, you recite each number separately, with a pause between the first and second "triplet." Do not insert decimal points in the triplet. For example, 679 138 would be read Six Seven Nine (Pause) One Three Eight.

## Ready to Hit the Trail...

Most people experienced in SAR operations would suggest that you have a GPS receiver with spare batteries before heading out into the field. If you don't own a GPS unit, then make sure you have a compass. And, if it's your first outing, you should both of those as well as a map—the map being the least useful of the three.

But wait a minute! How can the map be "the least useful" item if it's necessary for determining your UTM position? Simple: the map isn't necessary...if you have a GPS that provides a direct UTM readout in addition to latitude and longitude (this is much more common than GPS receivers that provide ham radio grid readouts). And the GPS receiver will lead you to your destination *without* a map How do they do this? Let's take a closer look at GPS.

## Inside GPS

As we explained earlier, GPS is an acronym for Global Positioning System. Developed for the military for navigation and surveying, the GPS can be used to determine location very precisely (within centimeters given the correct controls and proper use). GPS relies on satellites and ground stations for precise determination of location.

There are about 25 navigation satellites in orbit. Each satellite travels in a specific orbit and, based on references to stations on land, it "knows" exactly where it is at any given time. Your GPS receiver locks onto signals from various satellites (between five and eight at any given time), and uses *their* locations and the time differential from its own clock to determine where *you* are. Since the GPS unit relies on several satellites, it's best to take a reading in the clear away from trees or other obstructions.

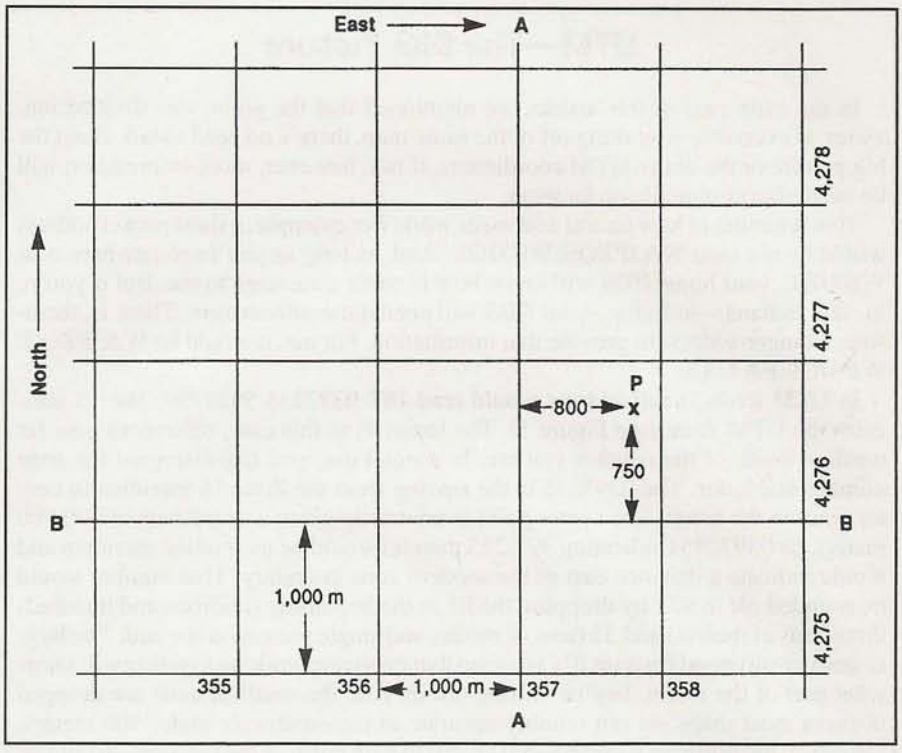



*Figure 2: Finding a UTM location on a grid. The grid value of the line A-A is 357,000 meters east (of the zone boundary). The grid value of line B-B is 4,276,000 meters north (of the equator). Point P is 800 meters east and 750 meters north of the grid lines. Therefore, the grid coordinates of point P are east 357,800 and north 4,276,750. Translated into the six-digit coordinates explained in the text, this location would be 578 767. Courtesy USGS ESIC.*

What should you look for in a GPS receiver? First, how many satellites can it track simultaneously? Generally, five satellites are more than enough for the average user. You'll also want to consider the number of satellites that can be *processed* at any one time. A GPS unit that's able to process several satellites at one time will give a more accurate reading than a unit that has to process one satellite's signal at a time.

Another key feature to check for is the number of *waypoints* that can be logged. What's a waypoint? Simply put, it's a chosen point along the trail or road you're on. The first thing you would do is take a reading of your base station location and enter it into your GPS unit. As you set out on the trail you would take periodic readings and mark them accordingly. For example, as you walk down a road, your waypoints might be R1, R2, R3, etc.; on the trail, they might me T1, T2, T3, etc.

With a GPS unit, a person can explore unfamiliar areas without having to worry about returning to base. The GPS will tell you the distance and direction of all waypoints, give you a compass course to follow, and update it as necessary when you turn on the unit. Remember, it's not necessary to keep the unit on all of the time. After all, you want to save your batteries.

## Importance of Amateur Radio in Search and Rescue Operations

It's interesting to know how SAR teams use UTM to find specific locations. But how relevant is it to the average ham active in public service? Quite a bit, according to SAR officials who say ham radio is becoming an increasingly important part of their operations.

"Many of our SAR team members are also hams," explains BASARC's John Carnes. "Most non-ham SAR communications is done on simplex VHF frequencies in the special emergency allocation. There is nothing like having a well maintained repeater on a moun-

## About BASARC

The Bay Area Search And Rescue Council (BASARC) was formed in 1990 to provide a platform for the exchange of ideas and information, establish working groups to develop common training, communications and management skills, and to promote professionalism in the SAR community. Made up of the more than 1,000 volunteer members, BASARC represents 20 separate SAR organizations in the San Francisco Bay Area.

tain top when you really need to talk to search base! As the prices of GPS units drop, more hams and SAR folks will own them. We've found the need to provide both education and tools to GPS users. In our business, a user blunder that leads to a bogus coordinate can endanger lives."

Michael Cummings, KE6IIC, of the Alameda County (CA) Office of Emergency Services (OES) Search and Rescue Unit, has been involved in emergency services for over 20 years. He has served with teams in the bay area for the last four years and has been a ham for about three of those years. According to Cummings, it appears that the role of amateur radio operators in the Bay area is on the rise.

He says his own interest in becoming a ham was based on SAR missions in which his team members could contact their search base via a ham repeater when their public service radios were ineffective. "Since then," he says, "I have seen more and more SAR team members get their ticket because [ham radio] is the most consistent and dependable form of wide-area communications within a team or for mutual aid missions to other counties."

The use of ham radio varies from county to county depending on the organization, number of hams on each unit, available equipment, coordination with RACES groups, and other factors. Cummings says,

"I have found that most units within BASARC have ham operators who are *first* trained in all aspects of SAR (medical, search tactics, technical rescue, agency communications, K-9, etc.) and then they go on to get their ticket to add to the resources that they can pull from."

He continues,

"In Marin County, where I served for three years, there are a series of UHF/VHF repeaters owned by Dale Westerterp, WB6TMS, who makes these normally-closed machines available to all hams on SAR teams during all actual missions. I recently moved and transferred over to the Alameda County OES SAR unit, where the county owns the VHF repeater which our Communications Unit (mostly hams) operate off of. It is this repeater that our SAR unit has begun using more often in addition to our own county trunked 800 (MHz) system."

## Ham Radio and SAR—Perfect Together

BASARC offers an opportunity to coordinate many aspects of SAR, including communications. It is through this forum that Mike elected to publish a request from all BASARC members for their own ham information and then make it, once organized, available on the Web page to support the growth and training in this resource. He believes that the future of hams in SAR will involve more team members getting their ticket, more inter-team coordination, and possibly more involvement by existing RACES and County Communications teams with the tactical units in their respective areas.

Hams and SAR—another example of amateur radio serving the community...in the Public Interest.

Do you have a story to tell of amateur radio public service activity in your area? Drop a note to *CQ VHF* at CQVHF@aol.com or Bjosuweit@aol.com. ■

## Resources

For UTM templates and information, plus local amateur radio participation in SAR in the San Francisco Bay area, check out the BASARC Web site at <http://www.basarc.org>.

Another site with excellent UTM information is <http://www.paddles.com/users/gps>. Readers may also contact any of the U.S. Geological Survey's Earth Science Information Centers (ESIC) or call 1-800-USA-MAPS. The USGS Web site is at <http://www.usgs.gov>. A directory of ESIC locations may be found at <http://mapping.usgs.gov/esic/esic_index.html>.

# Build a Solar-Powered Charger for Your FM Handheld

Why pay the electric company every time you need to recharge your battery pack? This easy-to-build charger uses plentiful—and free—energy from the sun!

This month's column is a bit different, somewhat unique, and quite exciting in several ways. How so? Rather than simply presenting exact "copy this" details on a single-purpose item, I'm going to explain related design and operating concepts, in plain language, so you can custom-tailor the project to fit your own needs and preferences. Also included is plenty of beneficial information on battery packs and voltage regulation devices, plus a basic introduction to using alternate energy systems.

Who knows? After building this small solar charger (see Photo A), you may become inspired to set up a large natural energy system to power a big rig or even your whole house! More and more folks are breaking free of commercial power lines every day, and so can you! We have some fascinating ground to cover, so let's get started!

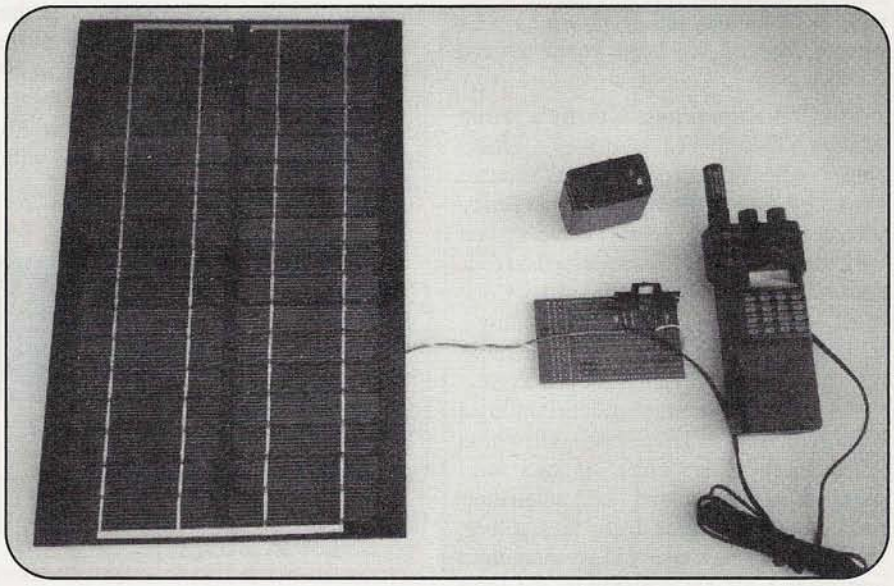


*Photo A. The basic items used to make a solar-powered charger are one or more solar panels (left), a small charge controller (middle), and the battery pack(s) to be charged (right).*

## Harnessing Solar Energy

The concept of using solar power is often misunderstood, so let's briefly consider some basic facts of what's involved. First, you must realize that "sunlight" contains more than just light. The most obvious, and perhaps most important, additional ingredient is *heat*. But what *is* heat? Heat is a form of *energy*. And as far back as the Industrial Revolution (perhaps even earlier), we learned that it's possible to convert one form of energy into another in order to perform a specific task.

So what if we could turn *solar* energy into *electrical* energy? We can. Electronic devices known as *photovoltaic* or *solar cells* can take *photon energy* from light and convert it to an electrical current. A bunch of solar cells tied together in a *solar panel* can produce a usable amount of electrical current.

## What Are Solar Cells and Solar Panels?

A large number of small solar cells are usually mounted on a solar panel and wired in a combination series and parallel arrangement to produce a specific output voltage and current. Overall, we can say solar panels convert photon energy from the sun into Direct Current (DC). The amount of voltage and current obtainable is proportional to the panel's size. For instance, a 1 by 2 or 3-inch panel typically produces only a couple of volts at a few milliamps (mA), whereas a 1 by 2 or 3-foot panel can produce 13 to 18

***"Modern solar panels are flexible, lightweight, and surprisingly durable. They are ideal for applications requiring low to medium amounts of current, from battery packs for handhelds to full battery banks for alternate energy-powered homes...."***

By Dave Ingram, K4TWJ

***"If you're going to use solar energy to recharge your batteries, you need a stable voltage level....My goal for this month is to show you how to do just that."***

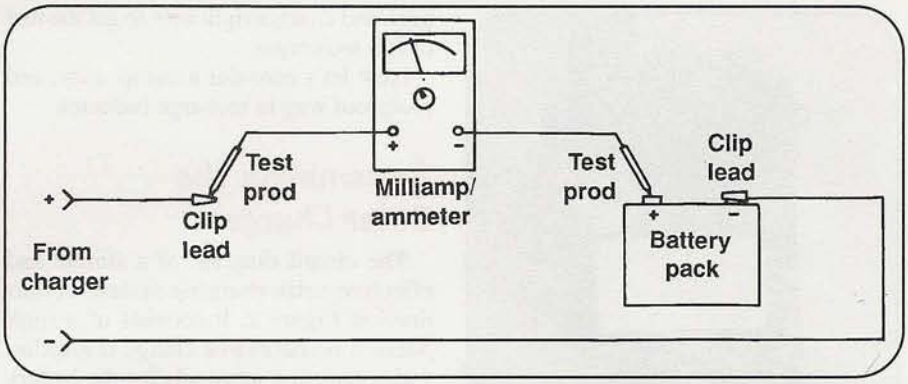



*Figure 1. The proper way to connect a milliamp meter in series with a battery pack to measure charging current. If the meter reads backwards or opposite polarity, it indicates that the battery pack is being discharged rather than charged.*

volts at 1 to 3 amperes, or 13 to 50 watts of power.

Any number of solar panels can be wired in parallel to obtain more current, they don't "run out," and they can often last for 10 to 15 years when protected from damaging elements like wind and hail. Modern solar panels are flexible, lightweight, and surprisingly durable. They're ideal for applications requiring low to medium amounts of current, from battery packs for handhelds to full battery banks for alternate energy-powered homes (see Photo B).

But solar energy is not a continuously available resource. Photon energy from the sun is abundant on bright summer and cloudy winter days alike, but not at night. Likewise, a solar panel's output may vary from low on heavily-overcast days to quite high on bright sunny days. If you're going to use solar energy to recharge your batteries, you need a stable voltage level. To get this, you'll need to build a simple, yet effective, charge controller and connect it between a solar panel and your battery pack. My goal for this month is to show you how to do just that. Now let's discuss some typical characteristics of battery packs.

## Battery Packs and Charge Rates

Most rechargeable nickel-cadmium battery packs used with FM handhelds and portable rigs are marked with their voltage and current rating (Photo C). The battery packs are normally recharged at $^1/_{10}$ their milliamp-hour (mAh) rating for 10 hours, plus an additional $^1/_2$ to 1 hour to overcome charging losses. The normal charge rate for a 450-mAh pack, for example, is 45 mA for 10.5 to 11 hours (assuming the pack was fully discharged). Most of today's battery packs can also be rapid-charged at their full mAh rating for one hour, plus a few minutes more to overcome charging losses.

Other recharge rates can also be used, provided charge time is adjusted accordingly. Using our previous example, a 450-mAh pack can be recharged at 220 to 240 mA for approximately 2 hours, or at 110 mA for approximately 4-$^1/_2$ hours, or even at 150 mA for 3 hours and a few minutes. In other words, charging parameters are simply a matter of *mA times hours*. You must bear in mind, however, that "unattended" rapid charging (not monitoring/adjusting voltage and/or periodically checking cell temperatures) can cause cell overheating and permanently damage the pack. Likewise, rapid charge rates above a pack's rating for less than an hour should be avoided in home-brewed chargers. (*For more on heat and handhelds, see "An NiMH Warning: Don't Toast Your Battery," by Gordon West, WB6NOA, elsewhere in this issue, as well as "Hot Topic: Heat and Your HT" by Jim Goralski, AC6PD, in our December, 1997, issue—ed.*).

Two additional considerations warrant mention at this point. First, a voltage level slightly above a battery pack's full-charge rating is required for current to flow *into* the pack being recharged. Second, we can determine whether a battery pack is being recharged (and its rate) or discharged (through the charging circuit) by placing a multimeter/milliamp meter in series with a battery lead (see Figure 1).

Since the charging circuit's output voltage is slightly more than the battery pack's voltage, the meter's positive lead connects to the charger's positive lead and the meter's negative lead connects to

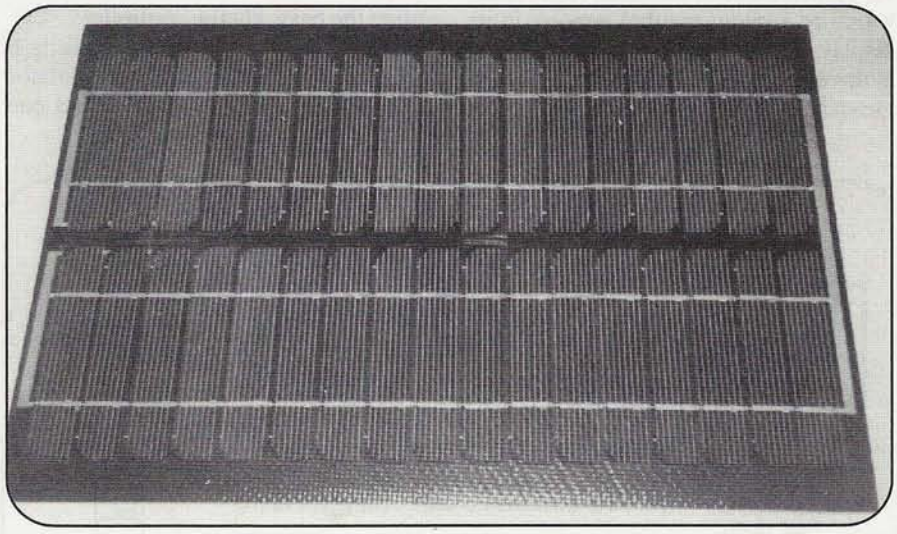


*Photo B. A solar panel is made of numerous small photovoltaic cells mounted on a support frame and internally wired in a combination series/parallel arrangement to obtain a desired output. Panels, in turn, can be externally wired in series and/or parallel to obtain a desired voltage and current. (Photo courtesy Alternative Energy Engineering Co.)*

*Photo C. By applying simple mathematical calculations to a battery pack's marked voltage and current ratings, a variety of charge times and current rates can be determined. You then use these figures to determine the specifics of the solar charger you can build based on this article.*

the battery's *positive* lead (which is less positive, with respect to the charger). To check charging status, connect the *milliamp* meter leads as shown—remember to use the *mA* sockets and switch position on your meter and do not accidentally short the wires. Blown fuses are aggravating to replace. If the meter reads backwards or a minus symbol appears in its display, it indicates that the battery pack is discharging rather than charging. Try measuring your rig's existing battery pack and charger right now to get the feel of this technique.

Now let's consider a cheap, easy, and foolproof way to recharge batteries.

## Assembling the Solar Charger

The circuit diagram of a simple and effective solar charging system is outlined in Figure 2. It consists of a solar panel, a homebrewed charge controller, and connection terminals for the battery pack(s) to be charged. Placing the solar panel (but not the controller or battery pack!) near or in front of a window that receives a maximum number of sunlight hours each day usually produces enough energy (voltage and current) for charging one pack while you're using another. The key here is always having one pack charging and a spare one ready for use.

The charge controller's purpose is to limit charging current to the battery pack during periods of bright/full sunlight and to prevent the pack from discharging back through the charging circuit during periods of no sun. It does this by using a power transistor-looking three terminal regulator (mounted on a heatsink) and a reverse current-protected diode, each selected for your particular battery pack's full charge voltage.

Suppose, for example, your handheld's battery pack is rated at 12 volts, 500 mAh. A 15-volt, 1.5-ampere regulator (like Mouser Electronics' 511-L7815CV) and one or two 1N4001 50-volt, 10-ampere diodes (like Mouser's 583-1N4001) constitute the basic charge controller.

If your handheld's battery pack is 6 volts, an 8-volt, 1.5-ampere regulator (like Mouser's 511-L7808CV) and one or two 1N4001 diodes should drop the charging current into your desired range.

Likewise, if your handheld uses a 4.5-volt battery pack, an 8-volt, 1.5-ampere regulator plus "X number" of 1N4001 diodes will drop voltage and charging current into a desired range. For 3-volt packs, you can use a 5-volt, 1.5-ampere regulator (Mouser 511-L7805CV), or add more reverse current-protecting diodes to "X number" of 1N4001 diodes with the 8-volt regulator. Adding or subtracting diodes decreases or increases charge current accordingly.

I say "X number" rather than specifying exactly how many because you know better than I do the charge rate and time you desire. Instead, I'll explain the "easy calculate method" behind this complete charger (and its "X number" of diodes) so you can select the appropriate parts, design, and assemble it to fit your needs. Stick with me, friends; the calculations are actually quite simple. Refer back to Figure 2 as we continue.

## Easy-Figure Math

First, select a solar panel with an average output of 3 to 8 volts *more* than your selected regulator's output to provide the necessary "headroom" for proper regulator operation. Second, choose a regulator with an output of 2 to 5 volts *more* than your battery pack's full-charge voltage. Third, bear in mind that each reverse current-protecting diode produces a .7-volt drop—and that charging voltage must always be *higher* than a battery pack's voltage. Now simply "tie all these ends together" (isn't learning fun?).

Let's assume you're using a solar panel with an average output of 18 volts and a 15-volt regulator plus one reverse current-protecting diode to charge a 12-volt battery pack. Eighteen volts into the regulator gives 3 volts "headroom" (15 volts out minus the .7 volt drop across the diode = 14.3 volts). This should yield a charging current of between 100 and 400 mA, depending on your pack (check it with your milliamp meter!). If necessary, add a second diode to drop charging voltage to 13.6 and lower the mA charge rate for "trickle charging." Or, if you're charging a lower-voltage battery pack, you may want to add a third diode; output will then be 12.9 volts. Get the idea?

As mentioned earlier, the charge controller's regulator should be mounted on a heatsink to avoid overheating. A small 1 by 2-inch finned sink like Mouser's

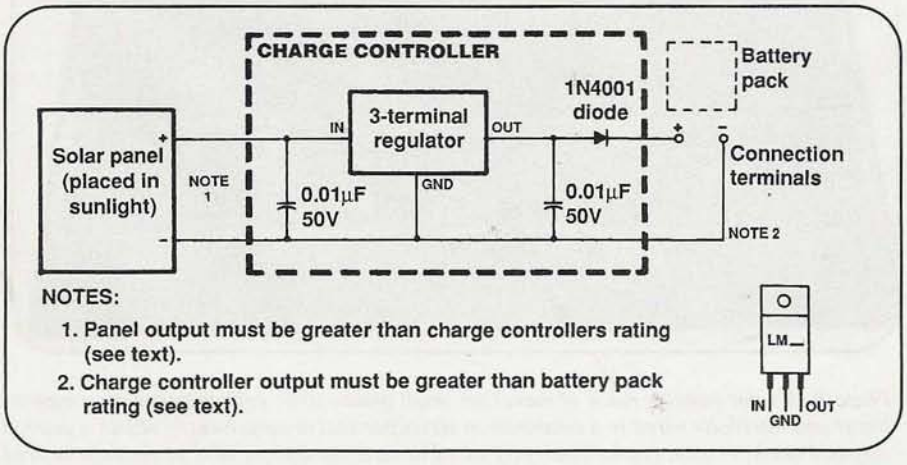



*Figure 2. Circuit diagram of solar charging system. See discussion in text.*

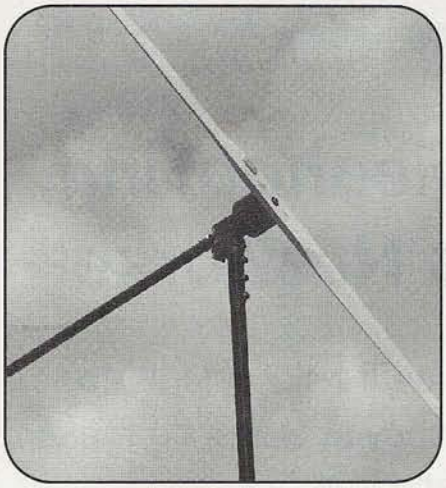


*Photo D. Have you ever considered powering your big rig or entire house by alternative energy? A few large solar panels and a wind generator, like the "Whisper" unit shown here, plus a hefty charge controller, inverter, and battery bank will do the job! (Photo courtesy Alternative Energy Engineering)*

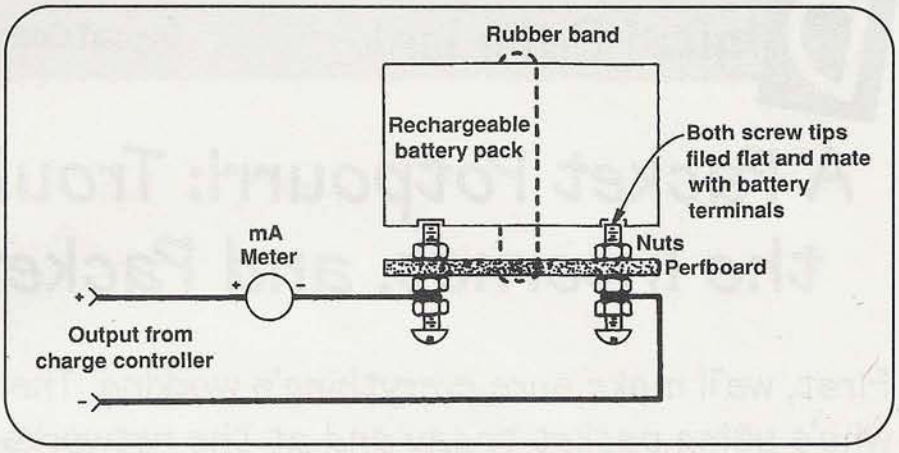



*Figure 3. Outline of an "easy brew" connector/clip for charging a battery pack. Connector/clip assembly can be mounted in base of a talkie stand or holder, or even held in place with just a simple rubber band.*

532-50700B00 is usually adequate, or you can mount the regulator directly to the side of a metal box for heat sinking (use Mouser's 534-4724 mounting kit with insulating washers so the regulator will not short out to the sink/box). Also, apply a small amount of heatsink compound to the back/metal side of the regulator and/or the sink. Don't go overboard here: too much is worse than too little. A very thin layer is fine (it shouldn't "squeeze out" when you tighten the regulator's mounting screw).

I'll leave the physical arrangement of "connection terminals" for the battery pack to your own ingenuity. In my case, I simply filed the tips of a couple of screws bolted to perfboard materials and positioned them to mate with my battery pack's terminals (Figure 3). The perfboard can be glued to the bottom of a talkie holder for "drop-in" charging, or simply secured in position on a battery pack with a rubber band.

## Going "Big Time"

After getting your feet wet with this small charger, you might consider powering your whole station or home by alternate energy. Actually, the setup is just a "sized up" version of this system. Several medium-to-large banks of solar cells are mounted on a wooden frame in the yard or on a roof and connected to a high current charge controller that, in turn, feeds a big bank of deep cycle storage batteries. A heavy-duty inverter is added to change 12 or 24 volts DC to 120 volts AC for operating conventional gear, appliances, etc., and a switchbox is included for shifting between the commercial power grid and alternate energy system (*Be sure to have a licensed electrician install this switchbox, and check with your power company about "cogeneration" credits: some utilities will* pay you *for feeding your excess energy back into their system, with appropriate safeguards for the power network, of course.—ed.*).

For backup charging or supplementing solar energy during periods of no sun, a lightweight wind generator, like the "Whisper" unit pictured in Photo D, is an ideal choice. Or, if you live near a stream and get proper guidance to avoid upsetting natural wildlife, installing a small hydroelectric generator is also an interesting possibility for an alternative energy source. These ideas open yet another door of discussion and may be featured in a future column.

Meanwhile, get cracking on solar charging your battery packs and be prepared for any emergency in the future!

73, Dave, K4TWJ

## Resources

An excellent source of solar panels from small to large is *Alternative Energy Engineering*, P.O. Box 339, Redway, CA 95560; Phone: (800) 777-6609. Alternative Energy Engineering has everything from solar panels to wind and water/hydro-generators plus power inverters, charge controllers, energy-efficient stoves, heaters, and much more. Their catalog is free.

For the small electronic parts like regulators, heatsinks and diodes, I listed part numbers from *Mouser Electronics,* one of several sources of these parts. You can get a catalog or order parts by contacting Mouser Electronics at 958 N. Main, Mansfield, TX 76063; Phone: (800) 346-6873.

Additional parts sources include:

*All Electronics Corp.*, P.O. Box 567, Van Nuys, CA 91408; Phone: (800) 826-5432; Fax: (818) 781-2653.

*Surplus Sales of Nebraska,* 1502 Jones St., Omaha, NE 68102; Phone: (800) 244-4567; Fax: (402) 346-2939.

*Tech America,* P.O. Box 1981, Fort Worth, TX 76101-1981; Phone: (800) 877-0072; Fax (800) 813-0087.

*Finally, Dave didn't want to blow his own horn, but he has a whole chapter devoted to alternate energy sources (plus a lot of stuff on ham radio) in his new book,* Guide to Survival Communications, *published by Universal Electronics, Inc., 4555, Groves Rd., Suite 12, Columbus, OH 43232; Phone: (614) 866-4605; Fax: (614) 866-1201. The book is $20 + $4 shipping. Dave says it will also be carried by several large chain bookstores.*

# A Packet Potpourri: Troubleshooting, the Internet, and Packet Networks

First, we'll make sure everything's working. Then we'll take a look at who's using packet today and at the networks they're using to make it work, as we begin the third year of "Digital Data Link."

Sometimes, it's the little stuff that gets you. For instance, I hear about all sorts of problems, usually revolving around TNC parameters or radio mods for 9600 baud. I heard about one the other day, though, that made me stop and wonder.

This story was related to me by Burt Lang, VE2BMQ. Burt had built a new link using a pair of Kantronics KPC-9612 TNCs and two Motorola MAXAR commercial transceivers retuned to the ham band. The problem concerned some bad audio. On the bench, both the TNC and radio checked out fine. But when installed at the site, it didn't seem to work. Oh, the radio was transmitting, and the TNC seemed to be doing its job, but the data wasn't moving. Lacking any serious test equipment (just a voltmeter and HT), there was little to do but bring it all back home again.

## Troubleshooting Techniques

Part of the problem was that this particular system was running at 9600 baud. That complicates things a little, because the audio sounds a lot like white noise—just a different *kind* of noise—compared to the noise you hear on an unsquelched FM receiver. Your best piece of test equipment—your ears—are unreliable in this case, while at 1200 baud, they work fairly well. Looking further into the problem revealed a serious audio-frequency oscillation that was present on one of the units, but not on the other. Burt swapped TNCs, but the problem stayed with the radio, so that's where he went next.

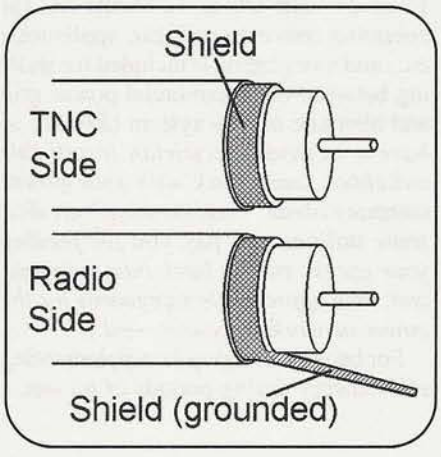



*Figure. The correct way to dress a coaxial audio cable. The shield should be grounded only at one end, with the other end trimmed flush and insulated, to prevent ground loops.*

Connecting the suspect radio to the communications monitor showed no problem, so he connected everything together again. When he found the problem still remained, he was briefly stumped...until he started fiddling with the TNC-to-radio cable. When he disconnected the shield ground at the TNC end, the problem went away. As some of you have already guessed, Burt had witnessed a classic case of Ground Loop. Let me quote Burt:

Ground loops (or rather their prevention) are a very important factor in low-level audio design. A ground loop is created when the outside shield of a shielded wire is grounded at both ends to ground points that have different residual voltages. A current will flow in the shield between the two ground points. Any AC component of this current will be coupled to the center conductor. This can cause considerable hum, or noise oscillations, in the circuitry. In the particular MAXAR radio I was working on, the receive audio circuit was left active as an aid to monitoring. The heavy current drawn by the audio output stage contributed to the AC voltage differences on the pc board ground and caused the oscillation.

Of course, this problem isn't limited to 9600-baud applications, but, at these higher speeds, you're supposed to use shielded cable for audio interconnections to take advantage of both the lower noise that the shielding offers, as well as the "clean" impedance of the wire itself, minimizing phase distortions. When you use plain old wire, as is common (and fine) for 1200 baud, the current flowing in the ground wire isn't as easily coupled to the signal wire.

One way to reduce this problem is by brute force: simply ground everything to one common point with heavy braid, ensuring that all equipment is at the same voltage potential. This concept, known as "bonding," doesn't completely eliminate the problem. The simple solution, of course, is to connect only one end of the shield to ground (I recommend connecting it at the radio side—see Figure). The other end of the shield is trimmed flush with the outer covering and insulated,

***"When he disconnected the shield ground at the TNC end, the problem went away. As some of you have already guessed, Burt had witnessed a classic case of Ground Loop."***

By Don Rotolo, N2IRZ (73227.2644@compuserve.com)

totally unconnected. The audio signal will use the (conventional) TNC ground wire as its return path, instead of the outer shield, eliminating the ground loop. Burt also mentioned that this issue is not covered in any of the TNC documentation he has seen.

## TNC Audio Interfacing

In general, the audio interfacing between a TNC and a radio is easy and straightforward. Always use conventional wire for control signals (such as PTT, DCD, and Ground). For baud rates below 4800, you can also use conventional wire for the audio signals. At 4800 baud and above, you should use shielded wire, such as single-conductor microphone wire or thin coaxial cable (RG-174, for example). Whenever you use shielded wire, make sure that *only one end* of the shield is grounded; the other end should be left disconnected and insulated. Don't use the shield as a ground path, or you may end up with a ground loop.

• • •

## Packet and the Internet

This column marks the beginning of the third year of the "Digital Data Link." In my first column some two years ago, I wrote about the future of packet, as I saw it then, describing the efforts of a few groups of hams who were trying to turn the packet network into another Internet.

Looking around, I don't notice anyone seriously pursuing that idea anymore. Oh, sure, there are some folks who have cobbled together some software originally meant for the Internet and applied it to packet. However, the reality remains that amateur packet simply doesn't have the bandwidth to be a reasonable facsimile of the Internet. As I've written before, it's senseless to try and duplicate the Internet on radio—our way is slower, more expensive, and not as good. But it sure is a lot of fun.

Packet radio has reached a plateau of sorts. The Internet, which many hams blame for the "decline" of the packet networks, is actually a godsend. It has taken all those half-hearted hams, who weren't really interested in packet but used it because it was the only game in town, and sent them away. In that sense, we've lost a few people to the "net."

In another way, though, it has been a wonderful thing because the packeteers who are left these days are the ones who are really interested in packet for what it is—a place to experiment and learn. Actually, this is much like the HF bands. Nobody thinks of amateur radio as serious competition for the telephone system, but it *was* at one time, when phones were scarce. Now, we use our spectrum for experimentation and learning. Even DXCC and contesting teach you something, don't they?

***"Packet radio has reached a plateau of sorts. The Internet, which many hams blame for the 'decline' of the packet networks, is actually a godsend."***

## Ham Netscape (Not)

Today, we can take an old 80386 computer, usually for free, load LinuX onto it, and create a very powerful (compared to a TNC) TCP/IP router and server. Connect a bunch of those together with radios, and you've got a robust TCP/IP network. You can configure your Winsock to "think" of your TNC as just another phone modem and play Netscape to your heart's content.

Notice, however, that nobody's bothered to do that. Why not? I can't profess to know all the answers, but I have a guess: No person or group can build up enough interest to get a "critical mass"—a large enough users' group to make it interesting and worthwhile to participate. Face it, after a short while, a group of 15 people doesn't come up with many new ideas, and hanging out online with them loses its appeal...especially when the Internet offers such diversity. I'm sure there are some other reasons, but it seems to me that that's the big one.

But, interestingly, as we see fewer participants, we're also seeing more interesting (and higher-technology) projects. For example, TAPR (Tucson Amateur Packet Radio) is designing a spread-spectrum radio and plans to sell it (probably as a semi-kit) to you and me. From what I understand about the project, this will allow anyone to build a faster-than-ISDN network with fairly little effort or expense.

## A Preview...

Over the next few months, I am planning to take a look at the major types of networking firmware. I'll start this month with a brief overview of each of them, then get into the gory details with a step-by-step guide to getting a network node on the air.

To set up for next month, let's take a quick look at what's out there. These are necessarily brief and simplified, but before you fire off an e-mail that I forgot this or that, wait until the full-blown article.

## TheNET

By far, the most commonly used networking software is TheNET, especially in its TheNET X1 (by G8KBB) and the older TheNET Plus (by NJ7P and N7OO) flavors. This software is designed to run only in a Z-80 TNC-2 or compatible clone. You configure the basic default parameters and load the software into an EPROM memory chip, which is plugged into the TNC.

Once you switch the TNC on, it sends out a message over the radio and RS-232 ports, announcing that it's there. Other nodes hear this "broadcast" and add the new node to its list of partners. The new node also hears the broadcasts of other nodes, and it starts building its list of partners. If you do nothing, the individual nodes eventually configure themselves and start working as a network. Of course, the sysop can, and usually should, intervene a little to optimize performance.

From the user's point of view, you simply connect to your nearest node, and hop from neighbor to neighbor until you reach their destination. The network will also automatically route a multi-hop connection, if it has heard (indirectly) the destination station's broadcast message. The path that the broadcast message takes helps determine the path the connect request will take.

## G8BPQ

Similar to TheNET, but designed to run under DOS, is the G8BPQ network switch (written by, oddly enough, G8BPQ). It functions in much the same manner as TheNET, and, for now, that's all I'll say about it. We'll cover the differences later.

## ROSE

Although it has declined in popularity, the ROSE switch is still fairly popular, especially overseas. Written by W2VY,

it's also designed for the TNC-2 and also resides on an EPROM. Very much *unlike* TheNET, it depends entirely upon the sysop to learn its place in the network. Sending no broadcasts, all neighbor and routing information is entered manualy by the sysop.

The creation of these routing tables used to be a sysop's worst nightmare, especially at a large site. Taking the easy way out, NX2P worked long and hard to create a Windows-based graphical network configurator for ROSE. You simply draw the network with icons, fill in some details, and it creates all of the routing tables in an instant. These are uploaded over the air to each TNC in the network.

The user cannot hop from node to node, instead issuing a command for the entire connection in one shot by specifying the entry and exit points from the network. Much like the telephone network when you dial a number, the network takes care of making the connection, invisible to the user. Again, the sysop's routing tables determines the route the connect request will take.

## FPAC

Much like G8BPQ, FPAC is a version of ROSE that's designed to run under DOS. Written by a team in France (in cooperation with, and using source code from, W2VY), FPAC is much like ROSE; again, there's little else to say for now.

## FlexNet

FlexNet comes in three (soon four) versions: DOS, Windows 95, RMNC, and (soon) LinuX. They all work the same and are completely interchangeable in the network; the only difference is the hardware platform. Since DOS and Win95 are understood, let's look at RMNC. This is a TNC-like card, based on the 6809 processor, which joins with other cards on a passive backplane to create a node cluster. The software resides in an EPROM.

Similar to TheNET, FlexNet essentially configures itself to the existing network through broadcasts. Unlike TheNET, there are few parameters that the sysop can change, as the network uses the broadcasts and other measures of channel activity to automatically adjust all parameters to an optimal value for that moment. As conditions change, so do the parameters, making for a robust network.

The user can let the network route the entire connection, like ROSE, or can do it hop by hop, like TheNET, or anything in between. It can even find someone by looking in Heard lists for a specific callsign. As its name implies, it is very flexible and powerful. See my June, 1997, column for more details.

## TCP/IP or NOS

Not really a separate and distinct packet network per se, it's nothing like any of the above. This is really a wire-line networking protocol (actually, a suite of protocols) which makes up the basis for the Internet. TCP/IP is really good at moving traffic and at routing connect requests, but sub-optimal in dealing with RF paths. While the LinuX implementation is fairly complete, there are a number of DOS implementations (NOS, JNOS, TNOS, etc....) as well.

Most often, we see a TCP/IP network where the computers are providing the services (the "servers"), and a more conventional TNC-based network provides the transport and, sometimes, the routing as well, from server to user. All of the network systems mentioned here support TCP/IP operations, passing the server data to users.

Refer to my February and March, 1997, columns for the details about setting up and using JNOS, one of the DOS versions of TCP/IP. I've also heard about a new flavor of NOS called MFNOS, which I'll be writing about soon—its advantage is that, unlike most other NOS derivatives, it sets up very easily.

## Others

There are a few other minor players, notably the Vancouver and Ottawa groups, as well as the Gracilis boxes, which are popular in some areas, but never seemed to catch on in a big way. I can't omit TexNet or Nord><Link, either. Placing them in the "other" category doesn't mean that they are somehow inferior—on the contrary, they're generally innovative—it's just that I can only touch upon the systems with large user bases here. In any case, I'll be mentioning these when comparing other systems.

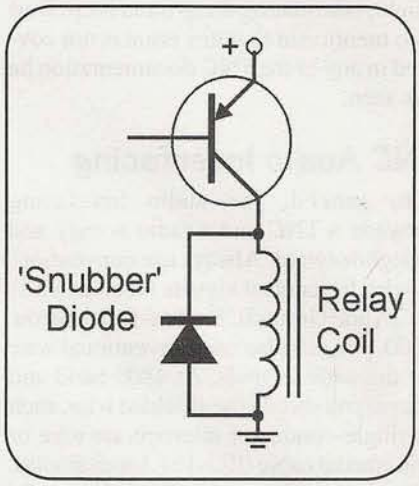
## Did I Miss Any?

Gee, I hope I didn't forget anything. Oh, sure, there are some networks out there that I've never heard of, especially likely as you get further from North America. If you know of one, please drop me a line, I'd like to hear about it, even if you don't have many details.

That's all the room I have for this month. Next month, as promised, we'll take a deep look into setting up one of these networks for yourself, as well as a list of networking resources for you to investigate. Until then, 73. ■

## Battery Protection Revisited

I've received some correspondence about the battery deep-discharge protection circuit which appeared in the November 1997 issue, and I want to clarify two things. First, the ground was inadvertently omitted; the center pin of the 78L08 (and the other components shown connected to it) should be connected to the negative terminal of the battery. Second, the circuit will work as it is, but it is far from optimum. Probably the most important change would be to add a diode across the relay's coil, to protect the transistor from the reverse EMF that appears when the coil is switched off. This so-called "snubber" diode will conduct any voltage spikes and render them harmless. The *ARRL Handbook* covers this fairly well—look in the index under "Transistors as Switches."




*A "snubber" diode across a relay's coil will help protect the switching transistor from damaging back EMF spikes.*

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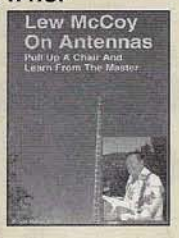


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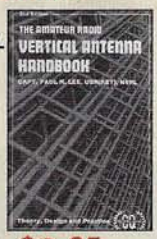


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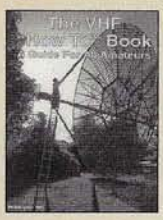


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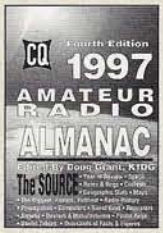


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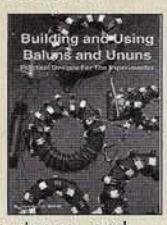


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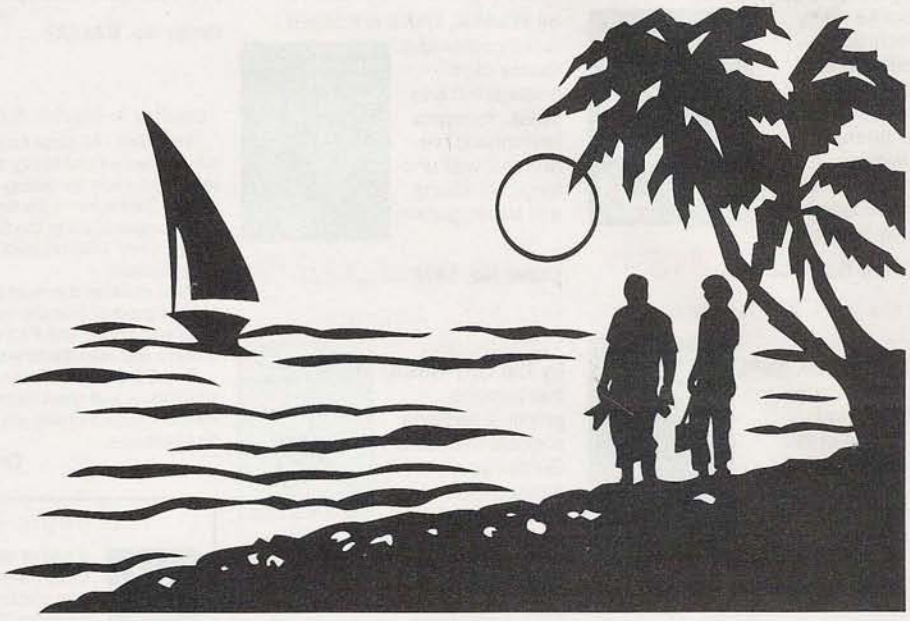
# "Are You a Ham?"

It's a question you might hear in the most unexpected places. But it's nearly always an opening to the friendship and brotherhood for which our hobby is deservedly famous.



My girlfriend, Wendy, and I were standing on the beach watching the sun dissolve, like a giant neon Alka Seltzer, into the Gulf of Mexico. It's breathtaking and awe inspiring—and really inexpensive entertainment. Somehow, we started talking about the illusion of the sun going down and what someone on the other side of the world would be perceiving as the sun rising. I waxed into some rather obscure technical issues, as I often do from time to time.

A stranger was listening in on our conversation. Soon, she moved closer and introduced herself. Then she asked me how I knew so much about the movement of the sun. Wendy chimed in that "it has something to do with all those years he's played with his ham radio. I think it has affected his brain."

"Are you a ham?" the stranger asked me enthusiastically.

"What?" I replied. I know it's a prejudice of mine, but I just didn't expect a pretty young woman standing on the beach watching the sun sink into the Gulf to have such a strong interest in our hobby.

"Are you a ham?" she repeated.

That started a long conversation that continued on to a nearby coffee shop. It was almost as if fate had guided the three of us to the beach that evening to watch the sunset. The young lady goes by the nickname J.D.—no idea what it stands for. She and her husband are amateur sailors and have plans of sailing a small boat around the world in the next couple of years.

J.D.'s father was a ham, too (he died when she was just a child). He had served in WW II and told her all sorts of stories about passing traffic using Morse code. She thinks it's romantic, and wants to learn the code. But she is also determined to have her ham license so that she can take a rig with her on their round-the-world voyage. Not a bad idea.

"I saw *Titanic*," J.D. noted. "My one complaint was that they should have shown more of the attempts to get help via the radio. Why didn't some other ship pick up her signals?"

"J.D., things were quite different back then. Radio communication was pretty new and raw at the time. A lot of ships didn't have a radio. The ones that did didn't always man the station 24 hours-a-day. Radio was still in its infancy then."

"I just can't imagine being out on the high seas without a radio these days."

"I don't think that you should be. Getting a ham license is easy. It'll take a little work, but you won't have any difficulty with it."

"I bet if I get my license and have some trouble on the sea that there will be some ham there to help me one way or another."

"Absolutely. Hams are always helping each other out. And it's a heck of a good way to make new friends. You'll meet some really interesting new people when you get on the air."

J.D. smiled.

Wendy has done a lot of sailing, too, so the conversation bounced back and forth around sailing and radio and where to get the best Buffalo wings in town. Finally, we realized it was time to call it an evening. J. D. stopped by our house long

***"I know it's a prejudice of mine, but I just didn't expect a pretty young woman standing on the beach watching the sun sink into the Gulf to have such a strong interest in our hobby."***

By Peter O'Dell, WB2D

***"It never ceases to amaze me how quickly hams make friends. I think we sometimes neglect to mention our hobby simply because we think that 'regular' people wouldn't be interested."***

enough for me to give her some extra copies of ham magazines (mostly *CQ VHF*), a book for the would-be ham by some obscure WB2, a copy of the new *CQ Amateur Radio Equipment Buyer's Guide*, and an old copy of the *ARRL Handbook*. That ought to be enough to get her started.

It never ceases to amaze me how quickly hams make friends. I think we sometimes neglect to mention our hobby simply because we think that "regular" people wouldn't be interested. Go ahead, and make a quip about your hobby when you meet new people. You don't have to hit them over the head with it. Just mention it. You'll be surprised how many will show some level of interest in it.

## Another Beach, Another Ham

The next evening, Wendy and I went back to watch another sunset. They're all different—each one more spectacular than the last. Feeling the warm sand beneath my feet, I thought about another ham standing on a different beach more than a half century ago. He was watching something sink into the sea, too. But it wasn't the sun.

The jungle was hot and heavy and close. Almost no beach—the tide was in. Just jungle and water. Jones's wet clothes clung to him, but he was alive. That thought had run through his mind over and over as he watched his wounded fighter sink into the shark-infested sea a hundred yards off shore of this unnamed, uncharted island. Would he be rescued? Didn't matter, he was alive. If only he had been able to pull out the transmitter before the plane started sinking! He could make an antenna out of a wet vine or something, but first he needed a radio. Even a ham could only do so much.

What resources did he have? His sidearm—a Colt .45 automatic—a knife, and a three-year-old copy of *QST* magazine. The pages were wet now, but they would dry out.

Jones was sure he was alone on this swamp somewhere in South Pacific off Midway. If the Navy couldn't find him, chances were good that the Japanese wouldn't, either. Nonetheless, he couldn't risk building a fire. In this heat, he would dry out soon enough anyway.

The single, metallic "click" brought him to his senses. As he raised his hands and slowly turned around, the magazine fell out of his shirt into the sand. Regular Japanese Army. Short. Mustache. Rifle aimed at his chest. For a moment their eyes locked, and Jones knew his life was over. This man would not take a prisoner. He was amazed at how calm he felt staring death in the eye.

His captor dropped his eyes to the ground where the *QST* had fallen. Jones knew that when the Japanese soldier looked back up, he would pull the trigger. He wondered what he would feel. Pain? Burning? Or maybe blackness. Nothing. Do the lights just go out? But there was no shot. Just a question:

"Are you a ham?"

"What?"

"Are you a ham!"

"Yes. I'm K6..."

They exchanged callsigns and recalled working each other. Yoshi had studied at Berkeley before the war and spoke perfect English.

"What are we going to do? The soldiers in my unit will kill you if they find you...Oh. I'm sorry," he mumbled, looking embarrassed as he dropped the barrel of his rifle and uncocked the firing pin.

Jones was stunned, but he understood. He couldn't kill a fellow ham, either. Hell, he had Yoshi's QSL card on his wall at home. It would be like shooting his own brother. Nothing made sense any longer. Somewhere deep inside, he knew the war was over for him, even if by some miracle he was rescued.

"I haven't read that issue of *QST*. Could I borrow it, please?"

"Of course. You can have it. I've read it cover-to-cover about 50 times in the last year alone."

The story goes that Yoshi kept Jones hidden away from the other Japanese soldiers until the war ended. He ate half his food and smuggled the other half to the American ham. Jones caught fish, and Yoshi taught him to love sushi.

Did it really happen? Probably not. But it could have. This legend has been floating around ham radio circles for over 50 years now. Like a lot of other modern myths, it's always told as something that happened to a friend of a friend.

## Fast-Forward 50 Years

But ham radio has the mystical ability to bring together the far corners of the Earth. The most unusual ham conversation that I ever heard came as the Soviet Union was collapsing and the Berlin Wall was coming down. I was tuning across the bottom of the 20-meter phone band when I came across a QSO that sounded interesting. A W1 in Maine was chatting with a ham in one of the Baltic countries—I think it was Estonia. A year earlier, the Estonian would certainly have lost his license and maybe his life for engaging in such a conversation.

They were talking about how the Wall had come down. The W1 related how some entrepreneurs in his town had gone to Berlin and salvaged very large chunks of what had been the Wall. They had returned to Maine and were selling small pieces of it as souvenirs. The Estonian laughed and said that he would love to be able to buy a piece of the Wall himself.

"Give me your address," said the W1. "I'll buy a small piece and send it to you. It's pretty inexpensive—maybe $10 or so. No big deal." For those of us who grew up in the cold war, survived the bomb-shelter craze, and laughed at the utter madness of *Dr. Strangelove*, it was a moment to savor. But all along, there was a camaraderie among the hams that transcended the political bickering and maneuvering that our leaders went through.

I remember a small incident that happened over a decade before the Wall came down, but then, it's those little things that let us know that we're all human. I was working the CQ WPX Phone contest as a single op and had been sitting at the radio

***"His captor dropped his eyes to the ground where the QST had fallen. Jones knew that when the Japanese soldier looked back up, he would pull the trigger....But there was no shot. Just a question: 'Are you a ham?' "***

## Oops...

Perfection continues to be elusive...

• "East is east, and west is west, and never the twain shall meet." So goes the old saying—except in UTM (Universal Transverse Mercator) map grids, in which there's only north and east, and we managed to mix them up in our two articles last month that dealt with the topic, "Going Global for Grids" and "In the Public Interest." In both of those articles, we said that in UTM, you report the "northing" coordinate first, followed by the "easting" coordinate (standard cartographic practice is to report north-south position first, then east-west, as in latitude, then longitude). Well, we had it backwards. UTM does it the other way around: you report "easting" first, then "northing."

It's interesting that very few general mapping experts really know much about UTM, including people at map companies, the Library of Congress and even the U.S. Geological Survey, all of whom we called while trying to figure out which way was up in UTM. Finally, WA3PZO was able to tap into more specialized information on the Internet, and reports on it in detail in this month's "In the Public Interest." We think we've got it right this time.

• Also in last month's "In the Public Interest," we accidentally cropped NØHZN out of the right-hand photo on page 56 (except for his legs, that is). Sorry, John...but then, he did get the whole left-hand photo to himself!

• And speaking of last month's pictures, we had the wrong one on page 32, in "Microwaves: Ham Radio's Final Frontier." What was supposed to be Kent Britain, WA5VJB, testing the gain of a W6OAL 15-turn microwave helix wasn't. The correct photo is pictured here.

*Now, this is Kent Britain, WA5VJB, testing the gain of a W6OAL 15-turn microwave helix at the 1997 Central States VHF Society Conference antenna range. In case you're wondering, the gain was +15 dBic (decibels over isotropic, with the "c" noting that it's circular).*

• Plus, in "A 6-Meter AM Experiment on the World Wide Web" in January's issue, we weren't particularly specific about identifying the 6-meter Halo antenna on the author's car (photo, page 41). Just to clarify, that's a KB6KQ loop antenna, made by KB6KQ Antennas of Carson City, Nevada. See their ads here in *CQ VHF* for contact information.

• Finally, a personal apology from W2VU to any of you who sent in subscription-related messages via e-mail in November or December. All mail to cqvhf@aol.com *was* coming to me, and I would forward non-editorial messages to the appropriate party. Well, I got really backlogged and it stopped happening. Now, the circulation department is regularly checking the e-mail directly, so I won't be able to bollux things up anymore.

with the headphones since Friday night at 7:00—and it was Sunday afternoon now as I sat calling CQ and working Europeans. The roar had been virtually non-stop, and my brain was mush.

There was a weak Swiss station who had answered, but I kept missing the second letter of his suffix. Finally, there was a booming signal and a deep voice that said "Echo, it's echo, roger?" I rogered the Echo and signed with the Swiss station. Oddly enough, the next station I worked was a UA3—a Russian—with a booming signal and deep voice...and a chuckle.

## Borders of the Mind

Ham radio cuts across all sorts of borders; some of them are political and geographical, but others are social of one sort or another. Even if you have no interest at all of ever getting on the DX bands, you'll find that your radio cuts across many boundaries.

Unless you live in a really small, isolated rural town, chances are that there are a number of ethnic groups and religions represented on your local repeater. When you hear a voice coming out of the speaker, you probably don't stop and wonder about what color the owner's skin is. Or what his or her religion is. Maybe the person is a quadriplegic or is blind. Does it make any difference? No. Everyone is equal on the radio.

But it is more than equality. We are at once anonymous and close. Hams are brothers and sisters. We are family. ■

### Resources

The "book for the "would-be ham by some obscure WB2" would be Ham Radio Horizons: the Book, by the ever-modest Peter O'Dell, WB2D, published jointly by CQ and the ARRL. There's also a "Ham Radio Horizons" companion video produced by CQ by the never-modest Rich Moseson, W2VU (then NW2L). Both are excellent introductions to ham radio and are available (as are the other references Peter mentioned) from the CQ Bookstore, 76 N. Broadway, Hicksville, NY 11801; Phone: (516) 681-2922; Fax: (516) 681-2926.

# Q & A

## Questions and Answers About Ham Radio Above 50 MHz

*Editor's Note: This month, we've got only answers for you...replies to our request in January's "Q&A" for information on an unusual-looking antenna called the Spiral Ray that reader Ron Harris, KB8TIC, was trying to learn more about. Thank you to all who replied. Here are two of the more informative answers.*

*From "JeRB," K8WPI, Kalamazoo, Michigan:*

The ubiquitous "SPIRALRAY" (one word, not two) was manufactured by TELREX of Asbury Park, New Jersey. This antenna first appeared in their literature in the early '60s and was featured in one of their last catalogues, August of 1977.

Directly from the catalogue...

Telrex 'spiralray' antennas are basically parasitic yagi's [sic] with skewed dipoles, tuned and matched, to provide an unusually effective circular-polarized array, with extremely high gain, and a reliability of performance not possible before with any other circular-polarized antenna.

Many governmental, commercial and advanced amateur station operators have acclaimed the exceptional linear response which has provided a rewarding experience and a reliability of signal strength not subject to extreme variations due to changes in propagation modes or ducting phenomena.

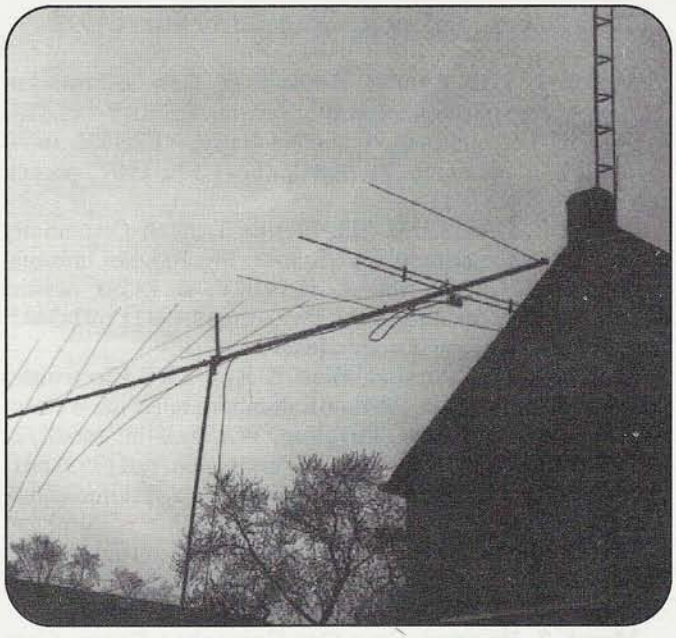
No other circular-polarized array known to the art today can provide the reliability, the linearity, and/or gain per element, and pound of metal.

The model 2SR1114 featured 15 dBd gain, F/B ratio of 23 dB and a beamwidth of 36 degrees. Price was $99.00. The standard Telrex model numbers would indicate this antenna offers 11 elements on a 14 foot boom.

For those unfamiliar with Telrex, they were a leading pioneer and manufacturer of very high quality antennas from 1921 until their demise in the late 1970s. Although today, descriptive phrases such as "Big Bertha" and "Christmas Tree" are commonplace adjectives, both were actually models of antennas, or, more accurately, "arrays" sold by Telrex. The product line ran from three elements on 80 meters to 15 elements on 440 MHz. Between the extremes, they made over 30 models of Yagis for amateur service, and nearly as many dipole antennas. The commercial line included dish-type antennas for space communication, as well as more commonplace terrestrial antennas.

In addition to antennas, Telrex also made rotors, including one for the original "turn the tower, not the antennas" approach, used on their "Big Bertha." The rotor for this array developed 18,000 inch-pounds of torque, offered (as did all of their rotors) 380 degrees of rotation, and weighed a mere 145 pounds after you took it out of the shipping container.

Keeping an eye open at swapmeets, their dipoles and baluns are occasionally seen, and it is not extremely rare to hear a Telrex Yagi on the air. Not bad for a company that has been out of business for over 20 years. As for the Spiralray, I would give something just short of a body part to play with one. Wow!



*The Spiralray antenna by Telrex. This unique antenna was circularly polarized and apparently was quite an excellent performer despite its unusual appearance.*

*From Jeff, Goldman, K3DUA:*

The antenna shown on page 23 of the January '98 issue of *CQ VHF* is (I believe) the "SPIRALRAY" manufactured by TELREX in the early 1960s. There were three versions of the antenna. They were all 11-element, with boom lengths of 27, 36, and 47 feet, and having gains of 16.5, 17.8, and 19.0 dB, respectively. The prices back then were $48.75, $95.00, and $195.00.

Telrex also made a set of three antennas in which all the elements were in one plane in the conventional fashion: same boom lengths and gains and price. The Telrex catalog that I have shows the antenna with the driven element and all other elements rotated from that shown in the picture—the driven element is about 45 degrees from horizontal. Hope this helps.

Do YOU have a question about any aspect of "Ham Radio Above 50 MHz"? We'll do our best to give you a clear, concise answer—or if it's not a question that has just one easy answer, then we'll invite readers to offer their solutions. Send your questions to: Q & A, *CQ VHF* magazine, 76 N. Broadway, Hicksville, NY 11801; via e-mail to <CQVHF@aol.com> or <72127.745@compuserve.com>; or via our Web page at <http://members.aol.com/cqvhf/>. Please be sure to specify that it's a question for "Q & A."

# Hamfest Calendar

The following hamfests are scheduled for March, 1998:

**March 1, 11th Annual Fleamarket**, New Westminster Armories, **New Westminster, BC**. Talk-in: VE7RBY 145.35(-) or 442.85. For information, contact Harry, VE7HNC, (604) 530-3962, or Graham, VE7ABC, (604) 530-1907, packet: <VE7ABC@VE7KIT>.

**March 7, HAMCOM '98**, Florida Tringali Community Center, **East Englewood, FL**. Talk-in: 146.700. For information, contact George Shreve, KA4JKY, at 13591 Martha Avenue, Port Charlotte, FL 33981, or call (941) 697-3445; e-mail: <gshreve@ewol.com>. (exams)

**March 7, 17th Annual Mike & Key ARC Electronics Show and Fleamarket**, Pavilion Exhibition Hall of the Western Washington Fairgrounds, **Puyallup, WA**. Talk-in: 146.82/22 (PL103.5) & 146.58 Simplex. For information, call (253) 631-3756 (eves/weekends only); e-mail: <mwdink@eskimo.com>. (exams)

**March 7, Springfest '98 Hamfest**, Holy Spirit High School, Absecon, NJ. For information, write SPARC, P.O. Box 142, **Absecon, NJ** 08201, or call Eva, KB2QXU, (609) 407-2923.

**March 7, Hamfest**, Cave City Convention Center, **Cave City, KY**. Talk-in: 146.34/94. For information, contact Bill "Tate" Wilkinson, KE4KRN, 113 St. Marys Court, Glasgow, KY 42141, or call (502) 651-6561; <bwilkinson@glasgow-ky.com> or <www.scrtc.blue.net/mcare/>. (exams)

**March 7, Hamfest Under the Sun**, Ridgewood High School, **New Port Richey, FL**. Talk-in: 146.64. For information, call Rick, KF4GXS, (813) 836-3900 or (813) 842-2127.

**March 8, Indiana Hamfest & Computer Show**, Indiana State Fairgrounds, East Pavilion Building, **Indianapolis, IN**. Talk-in: 147.060 repeater. For information, call Dennis Baurenfiend, WB9ZNZ at (317) 996-3782, or e-mail: <dbauernfiend@cleveland.Dfas.mil>.

**March 13–14, Hamfest**, Maxwell Convention Center, **Tulsa, OK**. Talk-in: 145.310 or 443.75 open autopatch 146.88. For information, call (918) 622-2277 voice or fax; e-mail: <megriftin@ionnet.net>; Web site: <www.greencountry.cohamfest>; or write to P.O. Box 470132, Tulsa, OK 74147-0132; or call (918) 808-5377. (exams)

**March 14, 5th Annual Hamfest & Computer Show**, National Guard Armory, **Avon Park, FL**. Talk-in: 147.270 repeater. For information, contact Dennis Koranda, KF4JTM, (941) 382-9560; WWW: <www.strato.net/~hamradio>.

**March 14, HAMBASH '98**, Ararat Temple, **Kansas City, MO**. For information, contact Steve Dowdy, WJØI, 12411 Olive, Kansas City, MO 64146, call (816) 941-3392; Fax: (816) 941-3208; e-mail: <sdowdy@qni.com>. (exams)

**March 14, Kerbela Hamfest**, Kerbela Shrine Temple, **Knoxville, TN**. Talk-in: 144.83/145.43 or 146.52 simplex. For information, contact Paul Baird, K3PB, 1500 Coulter Shoals Circle, Lenoir City, TN 37772, (423) 986-9562.

**March 14–15, St. Patrick's Day Hamfest**, Midland County Exhibit Building, **Midland, TX**. For information, contact the Midland Amateur Radio Club at P.O. Box 4401, Midland, TX 79704; or contact Larry Nix, N5TQU by e-mail: <oilman@lx.net>; also see Hamfest flyer and download a registration form at: <http://www.lx.net/edge/midswap.html>. (exams)

**March 15, Hamfest/Computer Show**, York County Vo-Tech School, **East Berlin, PA**. Talk-in: 146.97, 447.275. For information, contact Ted Rodes, 17 Sedgwick Dr., East Berlin, PA 17316, or call (717) 259-8063; WWW: <http://members.aol.com.yorkfest>. (exams)

**March 15, 38th Annual Hamfest**, Sterling High School Field House, **Sterling, IL**. Talk-in: 146.25/146.85. For information, contact Lloyd Sherman, KB9APW, AC815 336-2434; or e-mail: <lsherman@essexl.com>.

**March 15, Hamfest '98**, Jefferson Cnty. Fairgrounds, **Jefferson, WI**. Talk-in: 145.49 repeater. For information, send SASE to TCARC, W9MQB, 711 East Street, Fort Atkinson, WI 53538.

**March 15, 43rd Annual Hamfest/Computer Fair**, Lucas County Recreation Center, **Maumee, OH**. For information, send SASE to Paul Hanslik, N8XDB, TMRA, P.O. Box 273 Toledo, OH 43697-0273, or call (419) 243-3836.

**March 15, 26th Annual Hamfest/Computer Show**, Palace Inn, **Monroeville, PA**. Talk-in: 146.13/73 and 147.72/12 repeaters and 146.52 simplex. For information, call or fax: (412) 754-0562.

**March 21, Hamfest**, West Orange High School, **West Orange, NJ**. Talk-in: 146.415+1.0 85.4T/146.520 simplex. For information, contact Jim, N2TDI, or Liz, N2WGH Howe, (973) 402-6066. (exams)

**March 21, FleaMarket**, Hudson Lions Club, **Hudson, NH**. Talk-in: 146.25/85, 222.86/224.46, 444.625/449.625. For information, contact John, KA1FYB, 1 Paget Dr., Hudson, NH 03051, or call (603) 881-5796; Fax: (603) 598-0181, or e-mail: <brunelle@tiac.net>.

**March 22, 20th Annual Hamfest**, Madison High School, **Madison, OH**. For information, contact Len Sechrist, WS8O Hamfest PR Chairman, 8550 Nowlen Street, Mentor, OH 44060, or call (440) 255-0112. (exams)

**March 22, WECAFEST '98**, Yonkers Raceway, **Yonkers, NY**. Talk-in: 147.06/.66 PL 114.8. For information, contact Tom Raffaelli, WB2NHC at (914) 741-6606.

**March 22, LAMARSFEST '98**, Lake County IL Fairgrounds, **Grayslake, IL**. Talk-in: 147.945/.345 NSRC Repeater; 146.52 simplex. For information, contact Dave Gudewicz, KB9KDA, 5 Briantine Lane, Grayslake, IL 60030 or call (847) 937-8227 until 9:00 pm. (exams)

**March 27–28, 15th Annual Hamfest**, Bartholomew Cnty. 4H Fairgrounds, Community Building, **Columbus, IN**. Talk-in: 146.790/146.190. For information, contact Marion Winterberg, WD9HTN, 11941 W. Sawmill Rd., Columbus, IN 47201-8000 or call (812) 342-4670; e-mail: <winterbe@hsonline.net>.

**March 28, Annual Hamfest**, National Guard Armory, **Tullahoma, TN**. Talk-in: 146.70(-). For information, contact Larry Marshall, WB4NCW, (931) 455-0070; e-mail: <lmarsh@edge.net> or Ian Haynes, AB4SW, (931) 649-5187, e-mail: <ithaynes@edge.net>.

**March 28, Annual Hamfest and Computer FleaMarket**, Michigan City High School, **Michigan City, IN**. For informa-

tion, contact Ron Stahoviak, N9TPC, 5802 N. 400 W., Michigan City, IN 46360 or call (219) 325-9089.

**March 28–29, 27th Annual Hamboree and Computerfest**, Timonium Fairgrounds, **Timonium, MD**. For information, call (410)-HAM-FEST for Voice or FAX-Back information. Outside the State of Maryland, dial 1-800-HAM-fest (1-800-426-3378); or visit their Web site: <WWW.GBHC.ORG>. (exams)

**March 29, Annual FleaMarket**, Southington High School, **Southington, CT**. Talk-in: 147.345-224.80-444.25-145.49 PL-77 Hz. For information, send SASE to Southington ARA, P.O. Box 873, Southington, CT 06489. (exams)

## VHF Conferences

**April 3–4, Southeastern VHF Society** Technical Conference, Atlanta Marriott Northwest, between Atlanta and Marietta, GA. Program will include technical presentations, antenna gain measurements, noise figure testing, flea market auctions, Saturday banquet and family activities. Discount on registrations before March 14. Pre-registration for antenna measurement is recommended. Hotel rate is $69 + tax per night; For reservations, call Marriott at (800) 228-9290. For general conference info, visit the SVHFS Web page at <http://www.akorn.net/~ae6e/svhfs/>. For antenna measurement info, contact Dale Baldwin, WBØQGH, at <wbøqgh@mindspring.com>, and for noise figure measurement info, contact Charles Osborne, WD4MBK, at <cosborne@pipline.com> or Fred Runkle, K4KAZ, at <engineer@rightmove.com>.

**July 23–26, Central States VHF Society** Conference, Adam's Mark Hotel, Kansas City, Missouri. Details to follow in future issues.

## Operating Notes

For March and April, 1998:

**March**

| | |
|---|---|
| 1 | Good EME conditions |
| 7–8 | IARU Region 1 (Europe/Africa) VHF Contest |
| 7–8 | DUBUS EME Contest (Europe) 144/1296 MHz |
| 29 | Good EME Conditions |

**April**

| | |
|---|---|
| 5 | Good EME Conditions |
| 13 | ARRL Spring Sprint, 144 MHz |
| 21 | ARRL Spring Sprint, 222 MHz |
| 22 | Lyrids meteor shower peak |
| 26 | Good EME Conditions |
| 29 | ARRL Spring Sprint, 432 MHz |

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

## Looking Ahead in CQ VHF Ham Radio Above 50 MHz

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

- Our Springtime mobile special, with a twist—three articles on going *bicycle*-mobile!
- " 'Roving' in Scotland," by Simon Lewis, GM4PLM
- "A New Look at EME," by Chip Margelli, K7JA
- "Take the Fear Out of Calling 911," by Neil Dabb, KC7GCL

*Plus...*

- "Antennas, Etc.," introducing another new column by Kent Britain, WA5VJB
- "Hiking...and Hamming...on the Appalachian Trail," by Chris Post, N3SIG (watch for info on how you can contact Chris during his hike this spring)
- "Making a Swan 250 Work Like Almost New," by Dave Booth, KC6WFS

If you'd like to write for *CQ VHF*, you may download our writers' guidelines from the *CQ VHF* World Wide Web site at <http://members.aol.com/cqvhf/> or FTP to <ftp://members.aol.com/cqvhf/General> and look for the file, "writguid.txt." Or, you may send a written request with an SASE (self-addressed stamped envelope) to *CQ VHF* Writers' Guidelines, 76 N. Broadway, Hicksville, NY 11801.

# "I Have a Dream..."

Something's not right in ham radio, says the author, but he has a dream...and a plan to bring back ham radio's "glory days" in modern form.

I've explored most aspects of ham radio in my 32 years as a licensee, and I don't need my polls or surveys to tell me that something is not right. HF late at night is becoming a vast wasteland. When I'm down here in the shack, I listen to 144.200 and 50.125 for SSB activity night after night, but I rarely hear any signals.

Here in the upper Midwest, I should be hearing lots of signals on VHF sideband. I live near the top of a hill, and, with 100 watts of sideband and a small Yagi, I can easily work any similarly equipped ham in Minnesota, Wisconsin, most of Iowa or Illinois. We're talking about an area much larger than California or New England. With slight tropo enhancement, I can work Michigan, Ohio, Indiana, the Dakotas, Missouri, and Kentucky. At this latitude, aurora is fairly common, and I can easily work an even larger area of the U.S. and Canada when auroral propagation is present. But I hear very little random activity on SSB; the signals only come out during the VHF contests around here.

Back in the "glory days," there was a great deal of SSB activity on 40 meters in the daytime—there was always someone around to have a QSO with, even in the middle of the work week. The range of 40-meter SSB in the daytime is actually somewhat less than what I can cover on 2-meter SSB on a typical day. So why is there no activity?

***"The range of 40-meter SSB in the daytime is actually somewhat less than what I can cover on 2-meter SSB on a typical day. So why is there no activity?"***

## Lunch, Anyone?

One very real reason is the cost of new multimode radios. Again, back in the glory days, it seemed like every ham had a radio called a Heathkit "Lunchbox." These were extremely simple and cheap little 1-watt AM rigs (*mine was a 5-watter—ed.*), which came in 10-,6-, and 2-meter versions. They were easy kits to build and their performance was spectacular. What we really need is an updated Lunchbox: a cheap, low-power SSB rig. Perhaps we can entice MFJ or Ten-Tec to make one for us. I think such a device in the $250 or less class would sell very well!

We need radios such as these in order to end the extremely bitter isolation of many new Technician licensees. Those who live in regions with large ham populations nearby may not have this problem, but here in the Midwest it is a crisis situation. I have seen so many enthusiastic new Technicians become disillusioned and resentful when they find out that there is only one repeater in town and only a handful of active hams on it. There are dozens, if not hundreds, of "dead" repeaters in this part of the country with absolutely no activity. (*It's not just rural areas. Even here in Metro New York, I often have trouble finding anyone to talk to on a repeater if it's outside of "drive time."—ed.*)

## Let's Link Up!

Another way that we can aid those isolated hams is through repeater linking. If you have two dead repeaters in your town, why not find a way to link one to another system in an area with more activity? In December 1996 *QST*, James Millner, WB2REM, published a how-to article on linking repeaters via the Internet. This can be done with an older 486 PC, a surplus 2-meter FM rig, $75 worth of software, and a handful of hardware. And it happens to work very well! Why not use that older PC you were going to give away and that old beat up FM rig to let you and your fellow hams have QSOs with mobiles 1,000 miles away?

The ultimate answer to this problem will come when we establish our own truly high-speed digital radio network. No, I don't think we need our own Internet. If you want to publish Web pages, this is not the place to do it. But with a high-speed amateur backbone, we could provide unlimited repeater linking. We could even build a system to permit random linking of remote repeaters to simulate the effects of propagation at HF! The repeater linking software I mentioned earlier works fine at 14.4 kbps (kilobits per second). Imagine what we could do with a bandwidth of 2 Mbps (megabits per second)! There are inexpensive commercial systems available that do just that, today, over distances of several miles.

## A New Kind of "Radio Relay" League

Back in the early days of ham radio, those "kids with their spark coils" usually didn't enjoy a maximum range much greater than that of a 2-meter HT on simplex today. Those early pioneers found a way to build transcontinental networks,

By William F. Osler, WFØH*

*William Osler, WFØH, has been a ham since 1965. He currently lives in Rochester, Minnesota, and holds an Extra class license.

linking all of those "kids" together. They formed an organization and called it the American Radio Relay League (ever wonder where the word *relay* came from in the ARRL's name?). Our isolated newcomers are exactly where those pioneers were 80 years ago—except that today we have much greater resources. Let's build a new "relay league" of linked repeaters! (Techs, if you really want to give old-timers a fit, threaten to join the ARRL and use your votes to change its name to Amateur Radio Repeater Linking, Inc.!)

The second big issue we have to address is ham radio's relevance in the area of the "Information Superhighway." Here, I think, we need some marketing assistance.

Why is ham radio such an individual pursuit? As the father in a two-career, two-child family, I can tell you that "family time" is a precious commodity. With all the criticism of our public schools, our youngsters are piled high with homework every night. Then, there are the Scouts, 4H, sports, and other activities that put many miles on the family minivan every week. TV is not a prime-time activity around here due to lack of time.

So what happens when Dad wants to yack on 2 meters? He either does it while driving the kids around town, or he sneaks off to the shack after the kids go to bed. This really cuts into one's operating time! If the kids scream that they want to listen to the car stereo, it's even worse! With millions of harried parents looking for constructive things to do with their kids, why not make ham radio a true "family activity"?

Recently, I've been inviting my 10-year old into the shack, letting him actually talk to other hams on the air with me. You should see the delight in his face when we make a new contact. I also keep wondering how much more fun it would be if the ham on the other end would put his kids on the mic and let them talk?

How much effort would it take to establish regular "Family Radio Night" events? Some major religious groups designate Sundays as family time, so perhaps we should try to make Sunday evening the regular time. Crank up a radio on one of the designated frequencies and make contact, then let your 10-year-old talk to mine, let your XYL talk to mine, even let your beagle bark at mine if it pleases him.

Hopefully, we would soon attract a few hundred thousand new converts to ham radio, and, if this becomes as big a hit as I think it should, it would provide a permanent sustaining growth for the hobby.

***"Anything that is regarded as a regular family activity for lots of people soon takes on a certain 'holy' status. The FCC wouldn't dare sell our frequencies for fear of a million minivans descending on Washington, DC!"***

Anything that is regarded as a regular family activity for lots of people soon takes on a certain "holy" status. The FCC wouldn't dare sell our frequencies for fear of a million minivans descending on Washington, DC!

## License Reform

My third dream involves revamping the amateur licensing structure to ensure the continued growth and prosperity of the ham radio hobby.

First, I would love to see some kind of "apprenticeship" program that would allow any licensed amateur to sponsor the members of his immediate household and up to three outsiders as "limited operators." This goes beyond the Family Radio Night idea. Here, a licensed ham could issue "limited operator" certificates to his

## Weekend Ham Course Offered in New York

The Long Island Mobile Amateur Radio Club (LIMARC) will be running its next Weekend Ham Radio Course, Saturday, March 21 through Sunday, March 22, 1998, at Briarcliffe College, 1055 Stewart Avenue, Bethpage, New York. This course is for anyone interested in obtaining their entry level Technician class amateur radio license in a one-weekend course. There is no prerequisite for registering, just a desire to become a ham. The cost is $35 per person and includes the workbook, lunch each day, and refreshments at breaks. It does not include the exam cost of $6.35.

Preregistration is required. Interested participants should register as soon as possible as pre-study is necessary to assure success. To register, please send your name, address, city, state, Zip code, phone number and e-mail address (if any) to LIMARC Weekend Class, P.O. Box 392, Levittown, NY 11756. Please make checks payable to LIMARC for $35 per person. If you have any questions please e-mail George Tranos, N2GA, at N2GA@aol.com.

—Diane Ortiz, K2DO, Secretary, LIMARC

*Promote* your *licensing course for* free *in* CQ VHF*! See the notice on the Ham Ads page in the back of this issue.*

apprentices who successfully complete a written or oral examination on basic rules and regulations. This is similar to the old commercial 3rd Class Radiotelephone Permit, whose holders could operate a radio, but could not make any technical adjustments to the transmitters (*and very similar to a proposal made here in* CQ VHF *last May—ed.).*

Then, after some required period of supervised operation, the apprentice would be allowed to operate with very limited privileges, say, 20 watts output. The operator certificate would have to be endorsed for each band and mode involved, after another period of supervised operation. Apprentices would operate at the discretion of the licensee, who would retain absolute responsibility for both the technical and operational aspects of his or her apprentices' hamming. We could require, particularly for HF operation, that the licensee be present (in the building) during operations. This could be used to maintain compliance with those pesky international requirements.

Next, I would hate to see the Novice license go because some people have more trouble with the written exams than with the code. I would like to see the Novice privileges expanded to include all amateur non-voice privileges except those reserved for Advanced and Extra. This means CW, AMTOR, Packet, ATV, and even cross-mode QSOs in the phone bands.

I would continue the current No-Code Tech, lower the General class code requirement to 5 wpm (words per minute) and grandfather all Tech-Plus licensees to General. It would then be reasonable to lower the Advanced class code requirement to 10 wpm, but I would like to see the Extra stay at 20 wpm (if there is no incentive whatsoever for people to become truly proficient at code, then CW as we know it will go away, and, yes, I'm sorry, but CW is just too great a mode to let that happen! Try 2 meter CW sometime—you'll be amazed at how much better it works than SSB!)

## Help Bring Back the Glory Days

Finally, I hope that I have planted some seeds that will grow to bear fruit. We *can* bring back the glory days of ham radio without trying to change international treaties! All we have to do is give up our cursed stubbornness, vanities, and prejudice and work together. A house divided against itself will not stand!

*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.*

# 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, 76 N. Broadway, 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.

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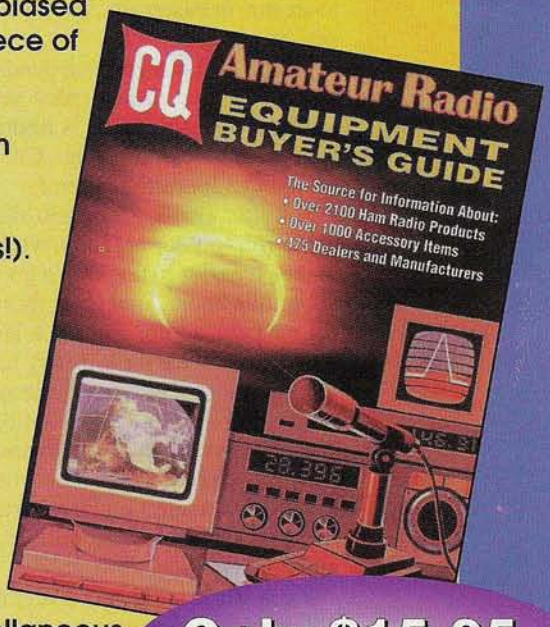


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Basics

# Setting Up Your Ham Shack

No matter where you put your station, here's some advice on keeping it comfortable, convenient, and safe.

There are two main ingredients in any ham radio station: radio equipment and a place to put it. We hams call that place, wherever it may be, our "shack." A ham shack can be found anywhere there's available space, from the corner of a bedroom to an attic or basement...even your garage or the front seat of a van.

Where you put yours depends, of course, on how much—or how little—space you have. Your most important consideration is finding a spot that's convenient and comfortable. Chances are you'll be spending a lot of time there.

An attic shack gives you the benefit of a short cable run to your antenna, while a basement shack makes it easier to hook up a good RF ground (more about this later). Whatever room you choose, try to set up your equipment on a large, sturdy surface, such as an office desk. Many hams today use computer hutches and other desktop shelf units to hold their gear. Arrange your station so the equipment you use most often is within easy reach and close to any other gear to which it may be connected. Be sure to leave yourself a place to write and some storage for logbooks and other items. Again, think comfort and convenience.

Keep this in mind, too: Every now and then, you're going to want to rearrange or rewire something. That means getting behind your gear. So if you have the room, leave enough space in back so you can walk behind and work on all those wires and cables that hook everything together. If you can't do that, make sure there's enough slack on your cables to let you pull out each piece of gear and work behind it. And remember to provide some access from your shack to the outside so you can run antenna cables, called feedlines, from your radio to your antenna.

## Getting Down to Earth

Earlier in this article, we said that a basement shack makes it easy to hook up a good RF ground. So just what is that? And why is it important? The purpose of an RF ground is to provide a low-impedance path to earth for any stray RF energy that may be floating around your shack. A poor RF ground is often the cause of many interference problems, not to mention strange behavior by your equipment and little RF "bites," or shocks, whenever you touch a piece of gear or get a little too close to the microphone while you're transmitting.

What makes a good RF ground? Your best bet—if you have the room and if your house has metal water pipes—is to locate your shack as close as you can to the point where your main water pipe enters the house. Connect all of your gear to a common point and run a short, heavy-gauge ground wire to the water pipe on the street side of the meter. Next best is to connect that single ground wire to a cold water pipe.

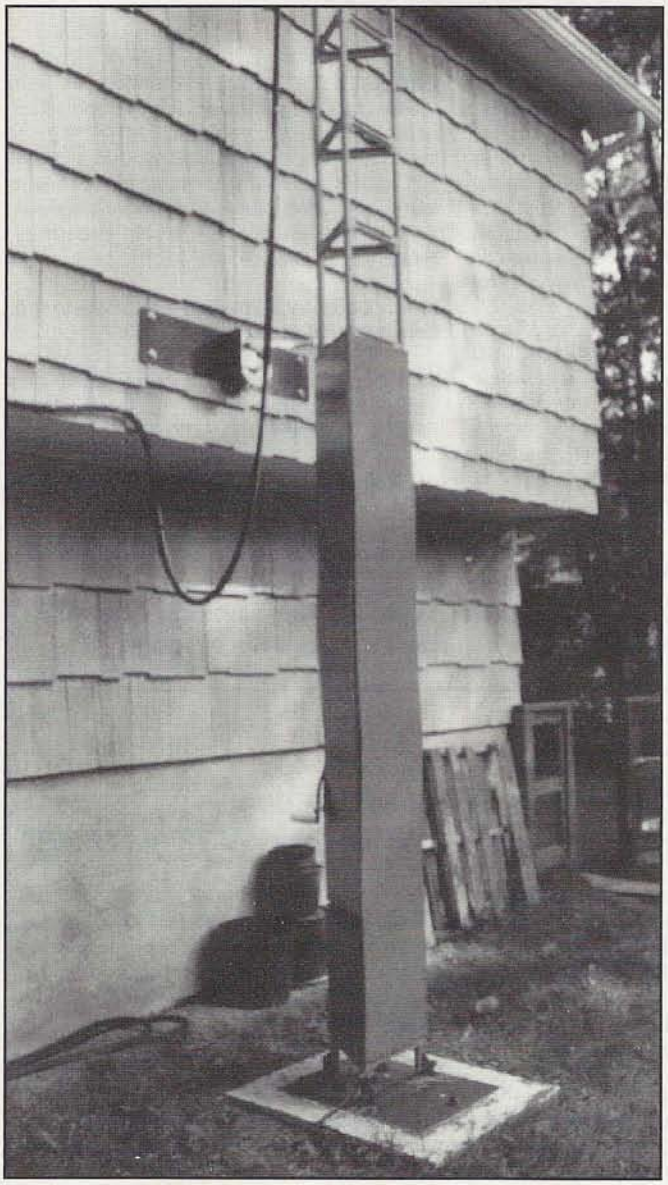
*On Top of It All—Jim Stanley, KB8FCQ, has his ham shack in the attic of his Cuyahoga Falls, Ohio, home.*

Many people say it's best to connect your ground wire to a copper "ground rod," at least eight feet long, that you hammer directly into the ground. But the effectiveness of a ground rod depends on the "ground conductivity" of your soil. In other words, if you have moist, well-packed soil that conducts electricity well, a ground rod will work fine. But if you have dry, sandy soil, or lots of rocks that break up the soil, it will be less efficient. On the other hand, water pipes tend to be *at least* eight feet deep, and they also present a much greater surface against the ground than does a ground rod. Just make sure you have copper pipes coming into your house (for health reasons, they shouldn't be lead; and PVC plastic is an insulator, not a conductor). Your water company should be able to tell you.

If you can't get a good RF ground directly, you should consider a counterpoise or artificial ground. You can buy one commercially or make it yourself. This isn't as effective as a true RF ground, but it does provide significant dissipation of the energy that needs to go to ground.

## What Shouldn't You Use for an RF Ground?

1. NEVER USE A NATURAL GAS PIPE! Little sparks of RF energy can cause BIG booms if they come in contact with natural gas.



*Mike Mardit, WA2VQW, of Yorktown Heights, New York, built this plywood anti-climbing shield to keep his kids off of his tower. It's padlocked on and can be removed when Mike needs to climb the tower.*

2. Don't use a hot water pipe—the water heater may insulate it from ground.

3. Don't rely on your electrical ground, the center screw on an outlet cover or the third wire in your electric cords. A ground wire that's more than a quarter-wavelength long at any frequency on which you're transmitting acts just like an antenna. Your electrical wires run all over your house and straight into your TV and your stereo—maybe your neighbor's, too.

## ZAP!

There's one more type of ground to worry about: lightning ground. The last thing you want is for a bolt of lightning—or the induced current from a nearby strike—to zip into your antenna, down your feedline and into your radio. If that happens, you'll end up with a fried radio. And if you're operating at the time, add a course of baked ham. That's no joke—you can be

*Down Under—Rich Burgan, WC8J, operates a satellite station from the basement of his home in Akron, Ohio. A basement shack requires longer runs of feedline than an attic station, but, on the other hand, it's more convenient for installing a good RF ground (see text).*

seriously injured, or even killed! So NEVER operate during an electrical storm.

When the storm is *approaching*, unplug your antennas from your rigs and ground them if you can. A lightning arrestor, or static discharge eliminator, in each feedline is also useful. Use the "gas discharge" type. Despite the name, a "lightning arrestor" will not stop a direct lightning strike from damaging or destroying your radios. What these devices really do is keep static charges from building up on your antenna, making the antenna less inviting to lightning. But there's no substitute for disconnecting and grounding the feedline.

Plus, if you have a tower or vertical antenna, it should always be grounded at its base, and the tower ground should NEVER come into your shack. Connect it straight to one or more ground rods, buried six to eight feet in the ground.

Speaking of tower safety, consider an anti-climbing shield, especially if you have children. Mike Mardit, WA2VQW, protects his kids and tower from each other with a simple plywood shield that locks into place (see photo).

## ZOT!

Lightning isn't the only type of electricity that deserves respect. The 110 volts in your wall sockets probably kill more people each year than lightning does. And many ham rigs operate with much higher voltages inside. For safety, always turn off and unplug a piece of gear before you work on it. If you must work with the power on, wear rubber-soled shoes and keep one hand in your pocket. This helps keep you from becoming the shortest path to ground for a hundred or a thousand volts.

RF energy deserves respect, too, especially if you're operating at UHF or above. The shielding inside most ham rigs is there for a reason. Operating with an open cover on HF can cause interference problems; at UHF and above, it can be downright dangerous. (UHF frequencies include microwaves. Think about what they do to food in a microwave oven.) If you're not sure what you're doing, ask a more experienced ham for help. And remember the motto that hams have lived by for nearly a century: SAFETY FIRST. ■

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**Orlando HamCation(sm)**... February 13, 14 & 15, 1998. The Orlando Amateur Radio Club, will hold the annual Orlando HamCation(sm) at the Central Florida Fairgrounds, 4603 Colonial Drive, Orlando, FL. Satellite workshop Friday and High Speed Code Copying Contest plus Fox Hunt on Saturday. Contact Tim Starr, AE4NJ, PO Box 547811, Orlando, FL, or call (407) 850-9258 for info. **http://www.oarc.org/hamcat.html**

Join the **LAMBDA AMATEUR RADIO CLUB** (Larc) since 1975, the only open and visible public service-oriented ham club for gay and lesbian hams. Monthly newsletter, HF skeds, internet listserv and IRC, hamfest meetings, chapters, DXpeditions. Write LARC, PO Box 56069, Phila., PA 19130-6069 or e-mail: <LARC@net-quest.com>.

**WANTED**: Older model bugs, unusual bugs, and miniature hand keys. State price, condition. Dave Ingram, K4TWJ, 4941 Scenic View Drive, Birmingham, AL 35210

**FOR SALE OR TRADE:** 126' spool of RG-225 teflon coax (high-power, high-temperature, good for ***indoor*** use up to 450 MHz). Will sell for $200 + shipping (or you pick up in Metro NYC/NJ area). Prefer to trade for 6/2-meter transverter of similar value. Rich Moseson, W2VU, c/o *CQ VHF*, 76 N. Broadway, Hicksville, NY 11801.

**Learn Code by Hypnosis—http://www.qth.com/cweasy/ or 1-800-425-2552.**

ALUMINUM chassis–cabinet kits, UHF and VHF antenna parts. K3IWK, 5120 HARMONY GROVE RD., DOVER, PA 17315-3016.

ARRL Handbook CD-ROM v1.0 $25 postpaid, TravelPlus for Repeaters CD-ROM $25. Paul Husby, 1462 Midway Parkway, St. Paul, MN 55108. (612) 642-1559.

**Looking for "Looking Ahead?" Look back—it's on page 75.**

# Something New...

## Advertise Your Club or Class Here FOR FREE!...
## ...or Your Personal or Commercial Web Site for PRACTICALLY FREE!

Well, you've probably noticed that we haven't had too many classified ads here lately...frankly, we've never had too many classifieds (that no-good Internet!). So, starting with our **May** issue (by the time you get this one, April will be on its way to the printer), we're going to be trying something new: *free listings* of clubs, licensing classes, and exam sessions! *Plus*, for the staggering sum of $1/month, we'll also offer listings of **ham-related** *personal* Web sites (*commercial* **ham-related** Web listings will be $5/month).

Here are some guidelines to follow:

- **Club listings**—First of all, be sure that your club has some VHF interest. Then, send us your club name, meeting date/time/location, mailing address, and other contact information (e.g., phone, fax, e-mail, Web site, repeater frequency). If your club has a specialty, include it so we know which category to put it in.
- **Class listings**—If you'll be running a licensing or upgrading class, let us help you spread the word. Give us at least three months' notice (no later than March 1 for the May issue; April 1 for the June issue, etc.), and send us the class location, starting date/time, duration (# of sessions), any costs for students, and contact information (name, address, phone, fax, e-mail, Web site, etc.). Also include the name of the sponsoring group (if any) and the license class(es) for which the course will prepare students.
- **Exam sessions**—Same basic drill as for classes: date, time, location, sponsoring group, and contact information (same as above); plus fees, which VEC your group is affiliated with, and whether pre-registration is required/recommended. If your sessions recur on a set schedule (e.g., 2nd Saturday of every month), put that in and we'll keep repeating the listing.
- **Personal Web site listings**—Send us your name, callsign, mailing address (for our files), URL (Web address), and any ham radio specialties to which your site caters (e.g., weak-signal, microwaves, etc.). Plus, of course, a check or money order for $1 U.S. for each month in which you'd like it to appear ($10 for a full year, if you buy the whole year at one time).
- **Commercial Web site listings**—If your company makes, sells, or fixes anything related to VHF/UHF ham radio, list your Web site with us. Our surveys show that the majority of our readers use manufacturer/dealer Web sites to learn more about your products and communicate with customer service. Send us your company name, mailing address (for our files), URL (Web address), and a very brief description of your products or services. Cost is $5/month or $50 for a full year (if you buy the whole year at one time).

All Web site listings must be accompanied by payment in full in check or money order in U.S. dollars and mailed to *CQ VHF Weblink*, Attn: Bernadette Schimmel, 76 N. Broadway, Hicksville, NY 11801. Credit card orders also accepted by mail, phone (516) 681-2922, or fax (516) 681-2926. Club, class, and exam listings may be submitted as above, to *CQ VHF Clublink*, or by e-mail to CQVHF@aol.com. Be sure to say what it is in the subject line (e.g., club listing).

*"The quick-release remote front panel gives you so many installation options."*

*"And with dual receive you can talk on one band, and listen on another!"*

*"Plus, the high-tech Enhanced Smart Search™ is great for finding repeaters --and you can watch it all on the dual display."*

*"Looks like Yaesu did it again!"*

# FT-8100R

## Compact Dual Band Mobile

# Now a dual-bander that remotes and is easy-to-use, without sacrificing the features you want!

With its quick-release, remote front panel system, the FT-8100R combines high-performance dual-band features in a simple-to-operate rugged mobile built to the endurance standards of commercial radios. The result is installation flexibility and industry-first, "must-have" advantages!

Use dual receive (V+V, U+U or V+U), or talk on one band while listening on another. Watch Yaesu's exclusive Enhanced Smart Search™ automatically seek out and load active frequencies--great for finding new repeaters while traveling.

Get wide receive coverage--from 110 to 550 MHz and 750 to 1300 MHz* for public safety, marine, aircraft, and weather channels. Enjoy up to 50 Watts of VHF power output (35 Watts on UHF) with High/Medium/Low choice on each band, and "plug and play" 1200 or 9600 bps packet. Utilize 208 memory channels--the greatest available on any remote mobile--to store repeater offset, CTCSS tone, packet baud rate, and power level.

Yaesu's popular Omni-Glow™ display provides a wide field of view, and includes a DC voltage meter. Quickly program, or clone frequency memories with optional Windows™ PC programmable ADMS-2D.

"User-friendly" describes the streamlined front panel layout. Eight clearly-marked keys, and separate Volume/Squelch controls for each band, make operation easy. And the backlit DTMF microphone includes 3 user-programmable keys...but no awkward keypad cover!

Don't sacrifice high-performance features in your dual-band mobile installation Get the easy-to-use FT-8100R at your Yaesu dealer now!

YAESU

*...leading the way.℠*

For the latest Yaesu news, hottest products: visit us on the internet! http://www.yaesu.com

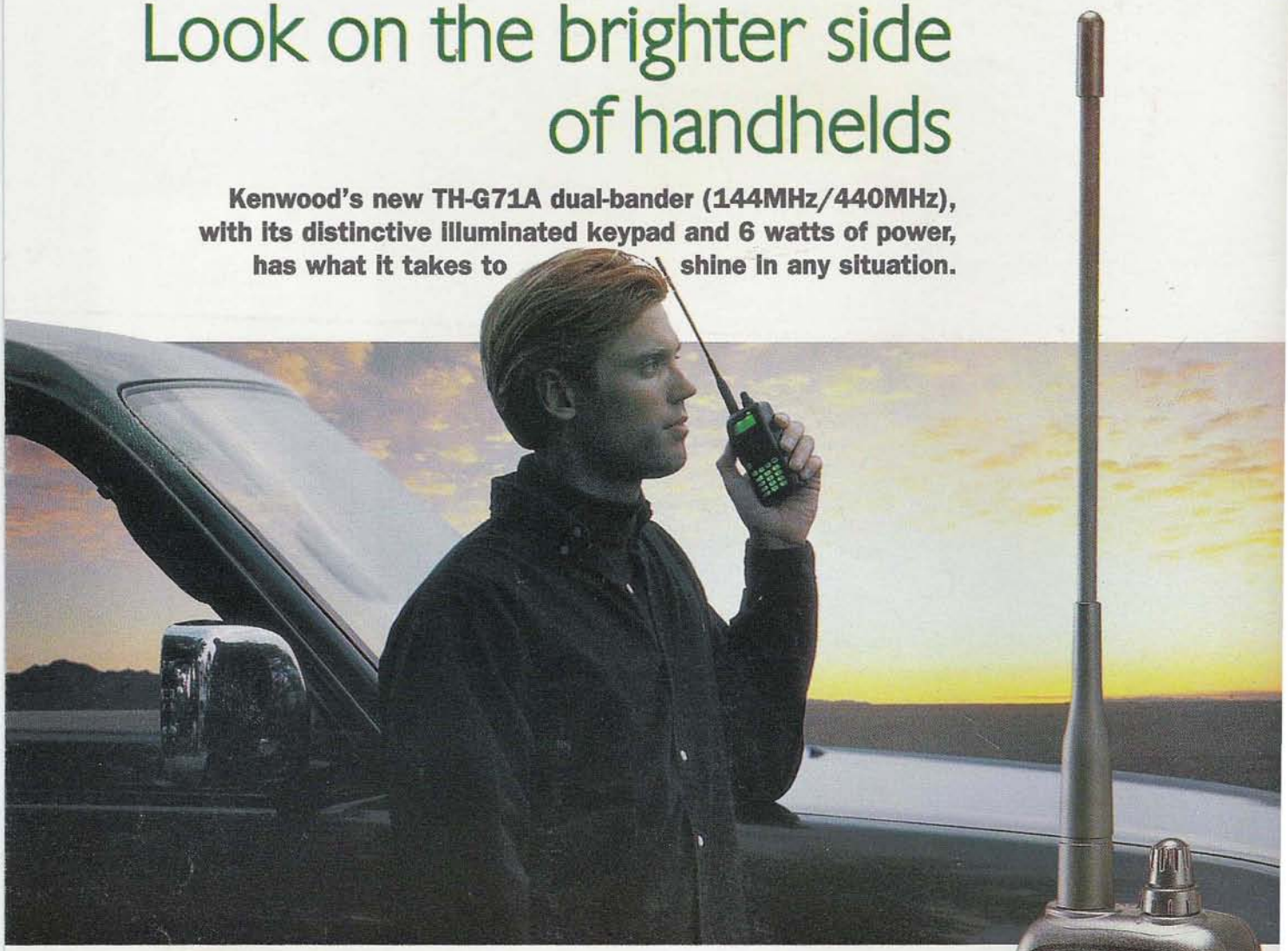
## Features

- Frequency Coverage
  - RX: 110~550 MHz
  - 750~1300 MHz*
  - TX: 144~148 MHz
  - 430~450 MHz
- Detachable Front Panel (remotable w/optional YSK-8100)
- 3 Power Output Levels
  - 2m 50/20/5 Watt
  - 70cm 35/20/5 Watt
- 208 Memory Channels
- Enhanced Smart Search™
- CTCSS Encode
- Built-in Duplexer
- S-Meter Squelch
- Dual Receive (V+V,U+U,V+U)
- Crossband Repeat (bidirectional or one-way)
- PC Programmable w/optional ADMS-2D
- Digital Battery Voltage Display
- Auto Power Off (APO)
- Omni-Glow™ Display
- 1200/9600 bps Packet Compatible
- Alternating-Band Memory Selection (ABMS)
- DTMF Autodialer (6 Memories)
- Time Out Timer (TOT)
- Accessories: Consult your local Yaesu dealer.

*Cellular & 900 MHz Cordless Phone frequencies blocked.

# Look on the brighter side of handhelds

**Kenwood's new TH-G71A dual-bander (144MHz/440MHz), with its distinctive illuminated keypad and 6 watts of power, has what it takes to shine in any situation.**



## TH-G71A 144/440/MHz FM DUAL BANDER

If you're looking for a compact dual-bander with all the right features, yet without the price tag that usually goes with high performance, there's no better choice than the TH-G71A.

Just hold it in your hand and it's immediately clear how well our new handheld transceiver is engineered. The ergonomic design, **illuminated keys** and **backlit display** all combine to make operation a breeze. As does the menu mode, which allows you to customize the TH-G71A by adjusting all major settings to your choice. Besides being easy to use, it also boasts extraordinary power – up to 6 watts (VHF) or 5.5 watts (UHF) of RF output (selectable) with its **high-performance antenna.** The speaker provides **powerful, refreshingly clear audio.**

Of course, power is only part of the picture. Features count. And you can count on the TH-G71A to offer what you'd only expect to find in far more expensive HTs. There are **200 memory channels** – allowing you to store transmit and receive frequencies independently. Memory data can even be edited and stored on your PC. Multiple scan functions are available, including programmable band scan, memory scan with memory channel lock-out, MHz scan and call scan. For each band there are TO (time-operated), CO (carrier-operated) and seek scan resume modes. With the Memory Name function you can choose to identify each channel with up to **6 alphanumeric characters.** DTMF memory and CTCSS tone encode/decode are provided.

The TH-G71A also scores well for stamina and reliability, boasting long battery life – thanks to a variety of power-saving features – and **MIL-STD 810E** compliance for rain & shock resistance. So there's no need to go easy on this dual-bander. It's built better and brighter in every way.

- **6W (VHF), 5.5W (UHF) at 13.8V DC**
- **PC programmable**
- **200 memory ch. with alphanumeric display**
- **MIL-STD 810E (rain & shock)**
- **CTCSS tone scan**
- **Wide-range coverage (incl. aircraft receive)***
- **DTMF memory (10 ch. up to 16 digits)**
- **Multiple scan modes**
- **Key illumination**
- **High-performance antenna**
- **HI/LOW/EL power output selectable**
- **TM-V7A remote control (DTMF remote)**

** Specifications are guaranteed for Amateur Bands only*




ISO 9001
JQA-1205

KENWOOD
Amateur Radio Products Group
97ARD-1670

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