ICD 08237

CQ VHF Ham Radio Above 50 MHz

January 1998

- How "Reliable" Is Your Radio?
- Hams and Rocket Science
- Radio Adventures in Europe—Two Reports
- *CQ VHF* Review: Yaesu VX-1R Dual-Band Handheld

Plus . . .

- Build a Code Generator for Your FM Rig
- 6-Meter AM on the World Wide Web
- New Column: Magic Band Chronicles

On the Cover: Rene Shaw, WB4MJE, at his record-setting VHF station in the Florida Keys. Details on page 72.

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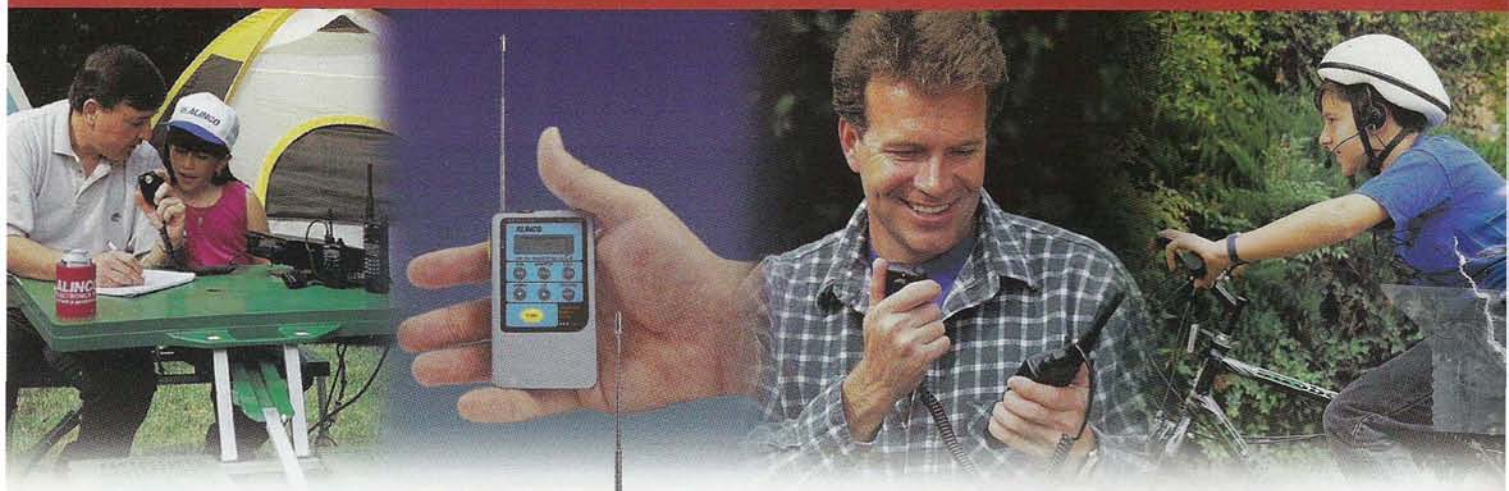

NEW FROM ALINCO
DJ-C1T (2 meter) and DJ-C4T (70 cm) Mini HTs

About the size of a credit card, less than 1/2 inch thick, full 2 meter or 440 band coverage, 300 mw output, 20 memory channels and a lithium-ion battery that can go 100 hours between charges! CTCSS tone encode, "snap-in" 2 hour battery charger, earphone, soft case and auxiliary "pocket" antenna included at no extra cost. DJ-C1T includes extended receive, 118~174 MHz, including Aircraft (AM) band. DJ-C4T covers the full 70cm band, 420~449.995MHz, TX and RX! These are "breakthrough" radios at a low Alinco price!

NEW DJ-S11T 2 Meter Pocket Radio

It's the one you asked for! Full 2 Meter coverage (144 ~ 148 MHz), 21 memories, CTCSS encode, self-storing telescoping antenna, accepts speaker mic and outside power, runs on 3 AA batteries, even has MARS/CAP capability. Get all this and more at a great price!

DJ-S41T 70 cm Pocket Radio

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

Permits required for MARS/CAP use. Performance specifications only apply to amateur bands. Specifications subject to change without notice or obligation.

The DJ-C1T and DJ-C4T have not yet been approved by the Federal Communications Commission. They are not, and may not be, offered for sale or lease until the approval of the FCC has been obtained.

Ask your dealer about Alinco's 2-year extended warranty program

DR-605T(Q) 2 Meter + 70 cm Mobile/Base

The reviews are in and the DR-605T is a winner! Work repeaters, simplex, cross-band, even satellites. 102 memories, CTCSS, built-in antenna duplexer, MARS/CAP capability, clone function, 9600 packet port and more at a price so low, it's hard to believe.

DR-140T(Q) 2 Meter Mobile/Base

A new full-featured radio with 51 memory channels, alphanumeric display (up to 7 characters), extended VHF receive plus (AM) aircraft, CTCSS + European Tone Bursts, MARS/CAP capability, clean design, scanning and cloning functions, all at a very low Alinco price.

HF+6 Meter DX-70 TH and DX-70T

Choose your preference in output power on 6 meters. The DX-70TH transmits up to 100 watts on all Amateur Bands, 160 ~ 6 Meters; the economical DX-70T is 100 watts on HF, 10 watts out on 6. With either radio you get General Coverage Receiver (150 KHz ~ 30 MHz and 50 ~ 54 MHz), face plate that can be remote mounted, built in narrow filter and speech processor, full QSK, semi or automatic break-in, multi-function control and more. Be sure to check out the EDX-2 Automatic Antenna Tuner.

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CIRCLE 159 ON READER SERVICE CARD

MIRAGE...100 Watts...$199

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!

The results? An *ultra-compact* 4¾x1¾x7¾ inch 2½ pound amplifier that delivers a *super powerful* 100 watts.

Free Accessories

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

Plus more . . .

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

Full one year MIRAGE warranty

With Mirage's legendary ruggedness, you may never need our superb warranty.

Dual Band 144/440 MHz Amp

$159.95 BD-35 Suggested Retail

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

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

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

Full Duplex Operation

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

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

- ***Automatic frequency band selection*** --you'll never forget to switch bands
- ***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
- ***Low input SWR*** -- keeps your handheld safe from overheating
- ***"On Air" LEDs*** -- for each band
- ***Free mobile mounting bracket***
- ***Free 3 foot handheld-to-BD-35 coax cable***
- ***Small size:*** just 5x1¾x5 inches
- ***Full one year MIRAGE warranty***
- ***Legendary MIRAGE ruggedness***

Call your dealer today for your best price!

35 Watts for 2 Meter HTs

B-34-G

$89.95

Suggested Retail

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

- ***35 Watts Output on 2 Meters***
- ***All modes: FM, SSB, CW***
- ***18 dB GaAsFET preamp***
- ***Reverse polarity protection***
- ***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!

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

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

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

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

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

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

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

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

More 160 Watt, 2 Meter Amplifiers . . .

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

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

B-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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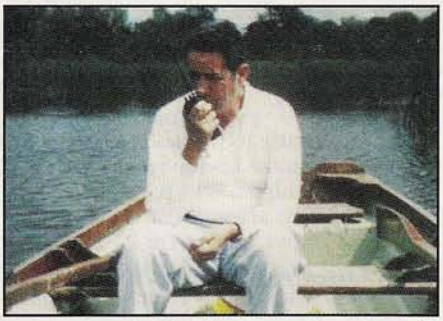
Volume 3, Number 1—January, 1998



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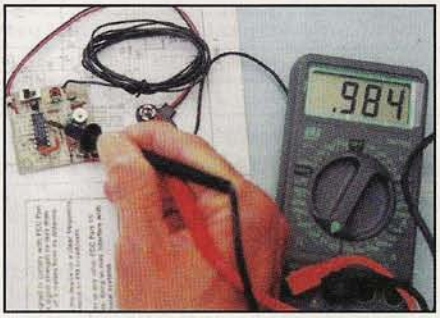

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FEATURES

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Next Month: Hams and Heart Disease—Are You a Sitting Duck? by Richard Benda, M.D., WB2QJA

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2M 440mHz

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- 1.5W standard
- 5W option
- Alpha-numeric display
- Compact & back lit keypad

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Call For Low Price!

VX-1R

2M/440 Sub-Mini HT

- 290 Memory Channels
- .5W output
- Receives 76-999mHz plus AM BCB (Cell Band Blocked)
- Lithium Ion Battery

$5. HRO Coupon

NEW!

Call Now For Your Low Price!

$20. Coupon

FT-50RD

2M/440mHz Compact HT

- DVR, Decode, Paging Built-in
- Alpha numeric display
- Wide Band receive
- Battery Saver
- 112 Memories
- Mil-Spec
- HiSpeed scanning

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Call For Your Low Pricing!

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The Ultimate Oscar Machine

VHF/UHF All Mode Transceiver
25W, Built-In Power Supply

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FT-3000M

- 2M 70W Mobile • Wide Band RX
- AM Aircraft RX • Dual Watch
- 9600 Baud Compatible • Alpha Numeric Display

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FT-920 HF+6M Transceiver

- 100w 160-6M, 12VDC
- Built-in DVR, CW Memory Keyer
- DSP, Auto-Notch • 99 Memories
- Computer controllable, CAT System

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- 110 memories • Wide Band RX
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Let's Make Band Plans a Little Less "Voluntary"

WB6NOA says VHF/UHF band plans protecting non-FM stations should have the FCC behind them...and doing that means getting the ARRL to think it's important.

This month, we pass the microphone to Senior Contributing Editor Gordon West, WB6NOA.

Last week, I was in an SSB QSO on 2 meters with a station about 350 miles away. While this is no record for weak-signal work, it *was* a fun contact because I was only running 25 watts of power with a simple 11-element horizontally polarized beam.

All of a sudden, our QSO was unintentionally interrupted by two nearby FM stations operating on 144.120 MHz—clearly within the weak-signal portion of the band. Since it was no longer possible to finish my SSB QSO, I switched over to FM and waited for a husband and wife to finish up their FM communications.

When they signed off, I signed on with FM, and gently reminded them they were operating FM in an area reserved by "gentlemen's agreement" for weak-signal CW and SSB communications.

"You show me where in the rules that makes it illegal to operate FM down here at the bottom of the band," commented one operator. "The rules only cover CW weak-signal work below 144.1, and there's nothing in the rules that prevents me from legally using FM right where we are."

On the East Coast, reports have it that there's a repeater output on the nationally recognized simplex calling frequency, 146.520 MHz. In the Great Lakes region, there's a nightly FM net on 145.810, right in the satellite window. And down in Texas, APRS activity is constantly being hammered by several crossband "repeater" stations which have indicated that they have no intention of moving.

Voluntary band plans on high frequency bands have similar problems. For example, members of the fast-scan television group at 14.233 are hit with the comment, "Just show me in the rules where I can't run AM on this band."

Voluntary Band Plans Aren't Working

I am not suggesting that we try to petition the Federal Communications Commission for specific chunks of our bands to be allocated to a specific mode or use. Rather, I encourage all of us to re-read Part 97.101(a), "In all respects not specifically covered by FCC rules, each amateur station must be operated in accordance with good engineering and good amateur practice." I don't believe that the language is strong enough to require compliance with fast-eroding band plans; operators both old and new say, "Just show me in the rules where it says I can't do this."

Voluntary compliance with local, regional, and national band plans has been a subject of discussion by the American Radio Relay League Board of Directors. The ARRL Membership Services Committee was instructed by the Board to study the issue of compliance with amateur radio band plans and to make recommendations to the Board. The committee found "that the level of compliance with band plans is eroding, to the detriment of amateur radio operations" (see September, 1997, *QST*).

There was some discussion that Section 97.101(a) of Part 97 might better read as "Amateur operators should be familiar with, and should abide by, the voluntary band plans that are applicable to the frequency bands in which they operate." It makes sense to me.

I would think that it would make sense to all amateur operators throughout the country who enjoy the flexibility of ham radio operation on the bands. And it makes sense where a specific type of operation like APRS, FSTV, satellites, and weak-signal CW/SSB takes place, to have protection from an inconsiderate operator who may think that the extra-quiet portion of the band at the bottom of 2 meters might make a great place for him and his wife to create their own "intercom" away from where FM communications normally take place.

David Peters, KI6FF, of the Western States Weak Signal Society (WSWSS) agrees that acknowledged band plans will "help improve good operating practice." The WSWSS, with its 200-plus members, is fully behind this band plan proposal.

ARRL: It's a "Non-Issue"

An east coast weak-signal group recently asked several ARRL directors *their* opinion about possibly rewording FCC Rule 97.101(a). "It was a non-issue matter to most of them," commented one member. Several other radio groups throughout the country also found little interest among ARRL directors in tightening up the "gentlemen's agreement" band plan procedures.

In just a few weeks, the ARRL Board of Directors will hold its January meeting. I encourage everyone throughout the country to write, call, e-mail, or fax your ARRL director and let him or her know

(Continued on page 82)

By Gordon West, WB6NOA, Senior Contributing Editor

Hamfest Calendar

The following hamfests are scheduled for January and early February, 1998:

Jan. 3, Hamfest and Computer Show, Talley Ward Recreation Center, **Morristown, TN**. Talk-in: 147.03+. For more information, write to: LAKEWAY ARC, P.O Box 895, Talbott, TN 37877-0895, or call Kemp Lawson, KF4AGB, (423) 587-3320.

Jan. 3–4, Hamfest, Ft. Myers, FL. Talk-in: 147.345. For more information, contact Colleen Sammons, KQ4TR, 3667 Kelly St., Ft. Myers, FL 33901, or call (941) 936-9431; e-mail: <csammons@juno.com>.

Jan. 10, Winter Superfest Swapmeet, Larimer County Fairgrounds, **Loveland, CO**. Talk-in: 145.115 - 100 Hz, 146.85-. For more information, call Jeanene Gage, NØYHY, (970) 351-7327; general information: (970) 352-5304. (exams)

Jan. 10, ThunderBird ARC WestFest, Glendale Community College, **Glendale, AZ**. For more information, contact Mark Fellhauer, KC7BXS, (602) 931-1204, or e-mail: <sparkfel @primenet.com>.

Jan. 11, Hamfest/Swapfest, Waukesha Co. Expo Center Forum, **Waukesha, WI**. For more information, send Business SASE to WARAC Swapfest, P.O. Box 1072, Milwaukee, WI 53201; or call Phil Gural, W9NAW, (414) 425-3649. (exams)

Jan. 17, SELARC Hamfest/Radio & Computer Show, Southeastern Louisiana University Center, upper level, **Hammond, LA**. For more information, write to SELARC (Hamfest '98), P.O. Box 1324, Hammond, LA 70404-1324.

Jan. 17, Amateur Radio and Youth Swap-N-Shop #5, UAW Local 599, **Flint, MI**. Talk-in: 147.100+. For more information, contact Ron, KG8IM, (810) 785-6514, or Clay, KF8UI, (810) 233-7889.

Jan. 17, 8th Annual Winter Hamfest, Ramada Inn, **St. Joseph, MO**. Talk-in: 146.85 and 444.925. For more information, contact Northwest Missouri Winter Hamfest, c/o Gaylen Pearson, WBØW, 1210 Midyett Road, St. Joseph, MO 64506. (exams)

Jan. 18, FrostFest '98, The Showplace, **Richmond, VA**. Talk-in: 146.88. For more information, call Todd or Amy McCoy (804) 330-3165, or write P.O. Box 35021, Richmond, VA 23235; general information: (804) 739-2269 ext. FEST; internet: <http://frostfest.rats.net>.

Jan. 18, Giant Electronic Fleamarket, Lincoln High School, **Yonkers, NY**. Talk-in: 449.425 MHz PL 156.7, 223.760 MHz PL 67.0, 146.910 MHz, 443.350 MHz, PL 156.7. For more information, contact Otto Supliski, WB2SLQ, (914) 969-1053. (exams)

Jan. 24, Hamfest, Gallatin Civic Center, **Gallatin, TN**. Talk-in: 147.90/30, T 114.8. For information, contact Bill Ferrell, 1253 Woodvale Dr., Gallatin, TN 37066, or call (615) 451-5992 and leave message. (exams)

Jan. 25, 31st Annual Mid-Winter Hamfest, Odeum Exposition Center, **Villa Park, IL**. Talk-in: 145.390(-). For more information, call (630) 545-9950. (exams)

Jan. 25, MMARC Post Holiday Hamfest, Odenton Vol. Fire Dept., **Odenton, MD**. Talk-in: 146.205/805. For more information, contact Bill Ziegler, KA6TYY, 1307 Ashburton Dr., Millersville, MD 21108, or call (410) 987-2384 (evenings). (exams)

Jan. 25, Hamfest, Ohio National Guard Armory, **Dover, OH**. Talk-in: 146.730-. For more information, contact Howard Blind, KD8KF, 6288 Echo Lake Road NE, New Philadelphia, OH 44663, or call (330) 364-5258.

Jan. 31, 37th Annual Winter Auction, Niagara County Cooperative Extension 4-H Bldg. (at the fairgrounds), **Lockport, NY**. Talk-in: 146.82-W2RUI/R. For more information, contact Floyd King, WA2ZVL, (716) 434-1533; <http://www.loccalnet.com/~ae2t/lara/auction.html>.

Feb. 2, Radio Equipment Auction, St. Clement of Rome Catholic Church Social Hall, **Sun City, AZ**. Talk-in: 147.30+. For more information, contact WVARC, P.O. Box 1573, Sun City, AZ 85327, or call (602) 933-0854; e-mail: <watgl@ juno.com>.

Feb. 7–8, 38th Annual Tropical Hamboree®, Dade County Fair/Expo Center, **Miami, FL**. For more information, contact Evelyn D. Gauzens, W4WYR, General Chairman, 2780 NW 3rd St., Miami, FL 33125-5059; or call (305) 642-4139, Fax: (305) 642-1648; e-mail: <edg@elink.com>; or Hamboree Web page: <www.hamboree.org>.

Feb. 13–15, 1998 Orlando HamCation and Computer Show, Central Florida Fairgrounds, **Orlando, FL**. Talk-in: 146.76. For more information, contact HamCation, P.O. Box 547811, Orlando, FL 32854-7811; e-mail: <ae4nj@aol.com>; or HamCation Info: <http://www.oarc.org>. (exams)

Packet Conference

Jan. 17, The **Southwest Ohio Packet Conference** will be held at the Middletown campus of Miami University (of Ohio) in **Middletown, Ohio**, on January 17, 1998 from 9:00 a.m. to 4:00 p.m. This conference usually attracts nearly 100 packeteers, and the presentations range from very basic to middle-advanced. It's a great way for beginners to learn all about packet and for advanced users and sysops to keep in touch with everyone in the area. For more information, contact Hank Greeb, N8XX, at 6580 Dry Ridge Rd., Cincinnati, OH 45252-1750, or call (513) 385-8363 after 6:00 p.m., or via e-mail: <72277.706@compuserve.com>. ■

Operating Notes

For January, 1998:

4	Good EME Conditions
4	Quadrantids meteor shower peak
17–19	ARRL January VHF Sweepstakes (*Note: The dates that ran in the Dec. 1997, issue for this Sweepstakes were incorrect; these are the correct dates. See rules elsewhere in this issue.*)

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

VHF News

The Floodgates Are Open

By the time you read this, every licensed amateur in the U.S. will be eligible to apply for a personalized "vanity" callsign. The FCC opened "Gate 4," for General, Tech Plus, Technician, and Novice class hams on December 2. Previously, the privilege of choosing your own callsign was reserved for Advanced and Extra class hams, along with hams of any class applying for a call that they previously held. This phased access was the FCC's way of preventing a massive deluge of callsign requests when the vanity call program began in 1996. It was probably a good idea, since there were "bugs" in the system that needed to be worked out before opening the door to all hams.

You may only request a callsign that's appropriate for your license class, and which has been unassigned for two years or longer. This means that Novices may apply only for "Group D" (2 x 3) callsigns, while Generals, Tech Pluses, and Techs may apply for "Group C" (1 x 3) or Group D calls. The vanity callsign fee is $50 for the 10-year license term. For more information, visit the FCC's ham radio Web site at <http://www.fcc.gov/wtb/amateur>, or call the Commission's National Call Center (toll-free) at 1-888-225-5322.

Ariane 502 Launch Partially Successful

Despite an early shutdown of its second-stage engines, the European Space Agency's second launch of an Ariane 5 booster rocket successfully placed one satellite and two dummy payloads into orbit after its October 30 launch. AMSAT's Phase 3D (P3D) amateur satellite was originally scheduled to fly on this launch but was dropped when ESA-mandated structural changes could not be finished in time (see next story). The first Ariane 5 launch, in June, 1996, exploded seconds after liftoff.

While ESA reported the Ariane 502 launch as successful, several reports indicated that excessive rolling during the early part of the flight caused its main engine to shut down early. As a result, the payloads were deposited in lower orbits than were originally planned.

The next Ariane 5 launch is scheduled for this spring. AMSAT officials are optimistic that P3D will be launched sometime this year.

Phase 3D Frame Reinforcement Completed

Modifications to the spaceframe of AMSAT's Phase 3D (P3D) satellite have been completed, according to officials at the 1997 AMSAT-NA Space Symposium and annual meeting, held October 17 to 19 in Toronto, Ontario. The changes were made to satisfy new requirements imposed by the European Space Agency (ESA) after the explosion of the Ariane 501 rocket just seconds after liftoff. AMSAT officials say they are confident of a launch aboard an ESA booster sometime in 1998 for P3D, although nothing is yet scheduled. For more details, see "What We Are Doing Here...IS Rocket Science," elsewhere in this issue.

AMSAT-NA President Bill Tynan, W3XO, discusses the status of the Phase 3D satellite launch and the changes made to strengthen the spaceframe. Tynan spoke in Toronto, at the annual AMSAT-NA Space Symposium.

IARU Satellite Forum in Toronto

The third annual International Amateur Radio Union (IARU) Satellite Symposium was held in Toronto in October in conjunction with the AMSAT-NA Space Symposium and annual meeting.

International Amateur Radio Union (IARU) Satellite Advisor Hans van de Groenendaal, ZS5AKV, leads the first IARU Satellite Symposium ever held in North America, at the AMSAT conference in Toronto last October.

Hosted by IARU Satellite Advisor Hans van de Groenendaal, ZS5AKV, and IARU Region 2 President Tom Atkins, VE3CDM, it was the first such forum ever held in North America.

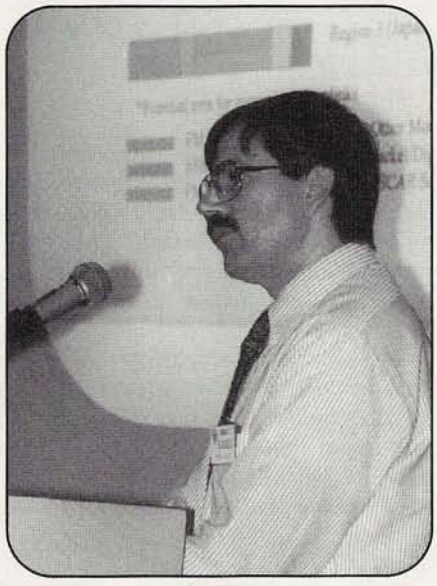
Agenda topics included a proposal to form a worldwide satellite monitoring service aimed at identifying non-amateur stations operating on satellite frequencies, discussion of the role of the IARU Satellite Frequency Coordinator, and a presentation on proposed frequencies for manned space operations (see next story). Future sessions will alternate between Europe and North America.

APRS Move to 144.39?

A cooperative effort is under way to relocate the main Automatic Position Reporting System (APRS) frequency from 145.790 MHz to 144.390 MHz. The goal is to create a clear frequency at 145.800 MHz for the primary downlink by hams aboard manned space vehicles, including the U.S. shuttle, Mir, and the soon-to-be-built International Space Station (the primary uplink frequency would be 144.490 MHz).

The move is jointly supported by AMSAT, TAPR (Tucson Amateur Packet Radio), and the ARRL. The three organizations have also proposed forming an APRS/Manned Space Alliance which would not only encourage APRS

Compiled by the CQ VHF Staff



Frank Bauer, WA3HDO, AMSAT-NA Vice President for Manned Space Flight, explains proposed APRS frequency change at IARU Satellite Symposium in Toronto.

nodes to QSY, but would also administer a fund to help pay the costs incurred by those systems that are crystal-controlled, use special tuned cavity filters, or other frequency-specific hardware. The concept was presented, and met with general approval, at the ARRL/TAPR Digital Communications Conference, the AMSAT Space Symposium, and the IARU (International Amateur Radio Union) Satellite Symposium held after the AMSAT meeting.

WRC-97: Changes Likely on UHF Ham Bands

The 1997 World Radiocommunication Conference (WRC-97) was under way as this was written, so final decisions were yet to be made on several issues potentially affecting hams. The international frequency planning meeting did agree to give the Earth Exploration Satellite Service (EESS) a primary allocation at 1215 to 1300 MHz (the 23-centimeter ham band), but did not go along with a proposal for a secondary allocation at 432 to 438 MHz. Hams are already secondary users of 23 centimeters and, according to the ARRL, giving EESS primary status on the band might protect hams from the possibility of having to share the band in the future with "other, less-compatible" services. The League says there is currently little interference between EESS and amateurs.

It looks like "wind profiler radars," which watch for windshear near airports and which already share the 70-, 33-, and 23-centimeter bands with hams, will stay on those bands. However, draft language specifically protects the weak-signal and satellite portions of all three bands.

Finally, the "Little LEO" (non-voice, non-geostationary) satellite industry appeared to be getting very little of what it wanted at the conference. Among the many frequencies sought for sharing with these satellites were the 2-meter and 70-centimeter ham bands. Meanwhile, the FCC in early October proposed granting two small Little LEO allocations in the U.S., at 455 to 456 and 459 to 460 MHz

HR 2369 Amendments Remove Scanner Threat

Amid protests from scanner enthusiasts, hams, and other radio users, Louisiana Congressman Billy Tauzin completely rewrote his bill which would have outlawed monitoring commercial

(Continued on page 82)

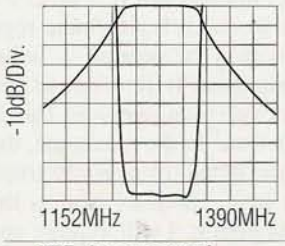
1296MHz Bandpass Filter

Established in 1956, TTE, Incorporated is one of the oldest manufactures of filters in the United States.

Introduced here, is an industrial quality, five pole combline filter. It is manufactured using the same materials and the same processes that are used to manufacture filters for our aerospace customers. Shipments include final test data. This proceedure assures that each filter meets all specifications. Every filter is marked with an individual serial number.

General Specification

Model Number	: 305-1270M-60M
Passband	: 1240 to 1300MHz
Passband Insertion Loss	: -1dB maximum
Passband SWR	: 1.25:1 typically 1.30:1 maximum
Stopband	: 0 to 1152MHz and from 1390 to 5000MHz
Stopband atten.	: -50dB minimum
Connect via	: SMA jacks (female connectors)
Dimensions	: 1.1" x 1.75" x 4.1" plus connectors
Finish	: Black paint over silver placted aluminum
Price	: $200.00, plus shipping & CA tax in CA



Product literature is available. Please request it through the magazine or contact the factory directly with your questions.

When phoning ask for the HAM radio department.

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Letters — Your Spot to Speak Out

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

Dear *CQ VHF*:

I wanted to comment on your insights in October's "Line of Sight." You were right on the money! The "traditional ham," in many cases, is more concerned about making the contact, proving he/she can do it, than about using the contact and the bandwidth to pass a meaningful message. The medium is the message. Today's newer hams, in many cases, use the bandwidth to communicate. The *message* is the message. The medium is merely the conduit through which the message is conveyed.

I guess I fall into the latter category, although I enjoy making "distant contacts" talking with other hams up or down the Coast during an opening. It's fun! But the focus still is on the message, not just the ability to make contact. I guess that is why I am not much of a contester and why I find Field Day operations something of a farce.

Despite the efforts of those who do not want to recognize change in our hobby, ham radio has evolved tremendously as the technology has permitted it to. It is an entity that collectively offers such a broad scope of options that few of us will ever be able to touch it all. Some regulatory changes may be needed to help foster additional growth (like Spread Spectrum and the Code requirements). But that will come in time. In the meantime, there is a lot of uncharted (or rarely charted) territory to stake claim to. And as time and finances permit, I will explore and learn in the process.

Paul J. Toth, KB2WNZ
S. Plainfield, New Jersey

Paul—Thank you for your comments. Your letter gives me the opportunity to acknowledge yet a third traditional group of hams that I inadvertently overlooked when writing about operating styles: the experimenters. These hams, many of whom couldn't care less about making contacts at all, provide the creative force that produces the technology that the rest of us enjoy. All hams owe them a debt of gratitude, and we need to encourage more technically inclined people (especially young people) to join their ranks.

Dear *CQ VHF*:

Sponsors of HR 2369 (see "Line of Sight," Nov. 1997) have promised to "fix" the language in this bill so monitoring public service frequencies will not be a crime.

However, we must maintain gentle but firm pressure on this potential hemorrhage of freedom to monitor our public service providers.

Not only would hams and other radio enthusiasts be criminalized for monitoring virtually all but our own spectrum, broadcast stations, citizen band and world-band frequencies, but the public would no longer be able to monitor its employees - public service agencies.

Philosophy aside, such legislation could put ham radio and scanner manufacturers out of business. And the cellular industry - a huge cash-cow - would have to develop the encryption it promised eleven years ago. The millions of free minutes used to lure new cellular customers represent piles of cash that could be spent developing such encryption technology.

In the interest of hams and millions of others who have the freedom to listen to public service frequencies, write or e-mail your Congressman and Senators. Tell them such legislation would bleed the arteries of another freedom.

Instead, they should drive a stake through the heart of this bill and kill it.

W. David Baird, WA9PDS
Catlin, IL

David—Thank you for adding your support to this effort—but you should be aware that HR2369 never directly threatened the ability to monitor public service communications, only business commu-

nications. The net result, though, might have been the elimination of whole frequency ranges from receivers—ranges that include public service frequencies. See this month's "VHF News" for an update on HR2369.

Dear *CQ VHF*:

I just got finished reading the October issue and enjoyed it immensely. What a surprise, though, to find an April Fools article so late in the year. I assume it must be a joke because I can't believe that any self-respecting editor would allow four pages of valuable print space to be devoted to the "Search for Extra-Terrestrial Intelligence" (October issue, "CQ Universe—Is Anyone Out There?"). C'mon guys, have we run out of good ideas already? Surely you must have had something with a bit more substance in your in basket.

Of course, it could be my fault. I've seen you asking us readers for story ideas in the past and I was hesitant to submit my story, but no more. Enclosed is my four page article describing how I found Elvis on a fox hunt, using nothing but an HT and a doughnut.

Rick Yuhas, KT4DU
Cropwell, Alabama

Rick—I realize that not everyone believes that there might be life elsewhere in the universe, but what we're really talking about here is amateur radio astronomy, a very valid VHF/UHF ham radio activity. In fact, as I recently learned at a VHF conference in Germany, it was a ham who started the field of radio astronomy! One of CQ VHF*'s basic premises is that if it's related to ham radio and it's happening above 50 MHz, we'll cover it. Some people don't like repeater articles, some don't like contesting articles, some don't like SETI articles. But our goal as a magazine is to "cover the spectrum" (pun intended) of VHF/UHF ham activity. Now, a question for you: Did Elvis eat the doughnut? The HT? The fox?*

Dear *CQ VHF*:

I first became interested in ham radio last summer. About six months later, I learned about your magazine, and I decided to subscribe to it. It was very informative and it taught me a lot I didn't know even after I studied for my license. In June, I finally got the initiative to go take my test. I passed and have a Technician license.

Every month, I look forward to receiving a new issue of *CQ VHF* and reading the articles. However, in the October issue of your magazine, I was dismayed to find an advertisement for a homosexual ham club (p. 84, third ad). Unless this lack of morality is changed, I will not renew my subscription next spring. The people of America deserve far better than this, to say nothing of the *children* in this country.

Whether you believe it or not, you have a responsibility—especially to children—to set a good example of decency and moral courage. I am 14 years old, and I am blessed to live in a home that lives the true meaning of love and family as ordained by our Creator. So many children are not so richly blessed these days, and they are quite vulnerable to the attitudes of the people and institutions they look up to. If you shirked your responsibility in this area, you would not deserve anyone's financial support anymore.

Michael Drake, Jr., KD5AYJ
Greenville, Texas

Michael—First of all, congratulations on earning your ham license! And I'm glad you are enjoying CQ VHF*, overall. I agree with you, Michael, about responsibility. We each have many responsibilities—as individuals, as Americans, and as members of our chosen faiths.*

One of our responsibilities as Americans is to observe the law. And the law says that we must treat everyone equitably. There are many ham radio organizations whose membership is based less on their amateur radio activities than on some outside factor, be it religion, profession, additional shared hobbies, etc. In order to refuse one group's ads, we would have to refuse all groups' ads.

Another thing to consider, Michael, is that we also have traditions to uphold along with our responsibilities. Two great American traditions are personal freedom and tolerance for others who are different. And you can't have one without the other. In order to be free—free to speak, write, or worship as we each see fit—we must also have the tolerance to allow others to do the same, even if we don't like what they do, how they do it, or who they do it with. This is at the foundation of our liberty.

Finally, while I'm not going to suggest that you spend your money on things you don't support, I would suggest two things: 1) publication of a paid advertisement does not mean that the publisher necessarily endorses the product, service, or organization advertised; and 2) consider your motivation in buying CQ VHF*. Is it to show your support for the magazine and its advertisers? Or to read and learn more about VHF amateur radio? And are you getting what you paid for? Your answer to these questions should help you decide whether you want to continue receiving the magazine.*

Dear *CQ VHF*:

I would like to address July's and October's Op-Eds by Duane Mantick, WB9OMC and Phil Salas, AD5X.

I used to be a CW hater. I was first licensed in 1979. I stayed a novice for five years. I would try to upgrade, but my code speed never got above 10 WPM.

One day at my local club meeting (there were ten of us in the same boat), we made a bet: whoever was the last to upgrade had to buy the others dinner.

We would work CW on 2-meter simplex and on 10 meters when the band would die. It took me about six months to upgrade to extra. (I didn't lose).

Now I like CW. I have trouble on the phone bands; I have multiple sclerosis. Some days I can talk well, and there are other days I just cannot get my words out. How would we like to lose the CW portion on all bands (VHF, UHF & HF). We have lost so much in the past. I have seen times when you couldn't work phone, but CW was a breeze.

How many of us can and do speak another language? CW is another language. There is no accent to be heard on CW, whereas the phone band has all kinds (even my Alabama accent!).

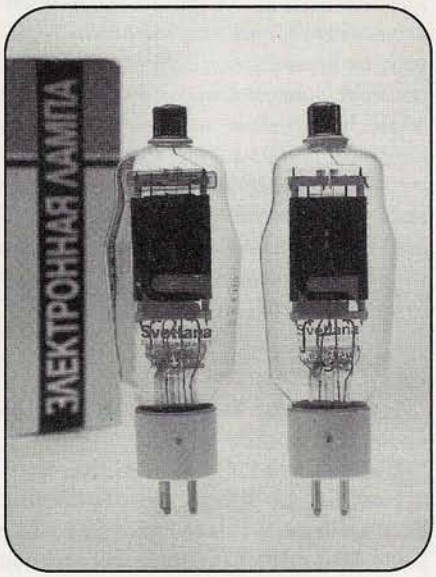
Last comment, there are a lot of hams who cannot talk! What are they going to do? Find another hobby?

All in all, CW works great!!!

Joe Tolbert, AC4NY
Choccolocco, Alabama

Joe—Neither Duane nor Phil nor much of anyone else we've heard from wants to do away with CW altogether. The debate is over whether it ought to remain a requirement for upgrading an amateur license and for HF operating.

Product Update



New Svetlana 812A Power Triode

The original 812A and 811A power amplifier tubes were developed in 1939 by RCA as a companion pair. Now Svetlana has introduced a modern version of the 812A. This new medium-mμ triode is a companion to Svetlana's popular high-mμ 811A. The Svetlana 811A and 812A are identical in appearance.

Like the 811A, the Svetlana 812A is a power triode for use in class AB, class B, and class C RF and audio amplifiers. Both types feature a low-loss ceramic base and a bonded ceramic plate cap thermal insulator for high-power RF transmitting tube capability. The envelopes are fabricated from hard glass intended specifically for the high-temperature operation of transmitting tubes. Svetlana provides a ceramic socket for both types, the Svetlana SK4A, as well as a ceramic plate cap connector, the Svetlana PC1A.

The 811A and 812A are manufactured in Russia at the Electronpribor Manufacturing Corporation in Ryazan, under manufacturing and quality control systems similar to those at the Svetlana complex in St. Petersburg, where the Svetlana ceramic power tubes and the majority of Svetlana glass power tubes are produced.

For more information, contact Svetlana Electron Devices, Inc., at Headquarters, 8200 S. Memorial Parkway, Huntsville, AL 35802; Phone: (205) 882-1344, Fax: (205) 880-8077; e-mail: sales@svetlana.com; or Marketing and Engineering, 3000 Alpine Road, Portola Valley, CA 94028; Phone: (605) 233-0429; Fax: (650) 233-0439, e-mail: engineering@svetlana.com.

Circle 100 on reader service card

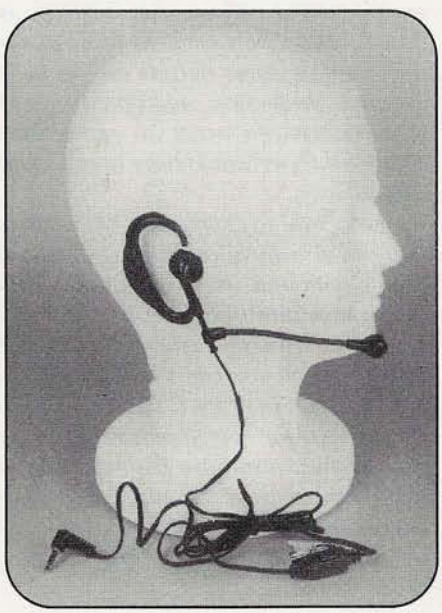
Kenwood TM-V7A Video Now Available to Clubs

Kenwood has announced the availability to clubs of its TM-V7A video. Clubs may borrow the tape for 30 days at no cost. This video shows the main features of Kenwood's TMV7A dual-band mobile radio with a new cool-blue reversible LCD (offering both positive and negative display modes) and many other features. To obtain a copy of the TM-V7A video for a 30-day club loan, send your request, including club name, mailing address, and phone number, to Kenwood Communications, P.O. Box 22745, Long Beach, CA 90801-5745. Attn: TM-V7A video; Fax to (310) 837-8235; or e-mail to: <mharlan@kenwoodusa.com>.

Circle 101 on reader service card

Two New Accessories from ADI/Premier

Nickel Metal Hydride (NiMH) battery technology is available with ADI's newest battery packs. These batteries employ a 13.2-volt design that keeps the battery's operating voltage higher, even under load, providing a full 5 watts out of your radio for as long as 90% of the battery's discharge cycle. In addition to full power, the user enjoys extended talk time because of the battery's enhanced 1amp/hour capacity. Plus, unlike NiCds, NiMHs never develop battery memory.



ADI has two styles of NiMH batteries available: the RBP-612NMH, for the AT-600 HT, and the RBP-120NMH, for the ADI AT-200 and 201 series radios. The RBP-120 is also compatible with many Standard, Relm, Cherokee, and Midland radios. All ADI NiMHs are compatible with either the ADI ARC-12 Smart Charger, or regular ADI wall chargers.

Suggested retail prices: RBP-120NMH (for AT-200/201), $69.95; RBP-612NMH (for AT-600), $79.95.

Premier Communications has also introduced a redesigned mini-boom microphone for use with all popular amateur and commercial handheld radios.

The new SPM-400 features an adjustable rubber ear hook that makes the microphone more comfortable than previous models. The microphone's PTT key conveniently clips to your lapel with a secure metal clip so hands stay free. Microphone impedance is 1000 Ω; speaker impedance is 8 Ω.

Four models of mini-boom mics are available: the SPM-400 for ADI, ICOM, Standard, and old-style Yaesu radios: (suggested retail price, $25.95); the SPM-401 for Kenwood ($27.95); the SPM-402 for the Yaesu FT-50 and VX-1R ($20.95); and the SPM-403 for Motorola Radius compatible radios ($29.95).

For more information, call (909) 869-5711; or visit ADI/Premier Communications on the World Wide Web at <http://www.adi-radio.com>.

Circle 102 on reader service card.

Grove SP-200B Sound Enhancer

Grove Enterprises' manufacturing division has announced its new SP-200B Sound Enhancer, a multi-functional accessory that increases the intelligibility and sound quality of voice, music, and data. Applications for the SP-200B include scanning, shortwave, ham radio, and "cleaning up" audio on another sound system. According to Grove, the SP-200B

improves sound dramatically, often bringing barely receivable signals out of background mire. For privacy, the speaker may be switched off while audio is monitored via a front-panel headphone jack, or redistributed from a rear-panel jack.

Using all-analog circuitry to avoid the distortion contributed by many digital signal processors (DSP), the SP-200B combines a powerful audio amplifier and four-inch speaker along with separate bass and treble equalizers, a variable passband notch/peak filter to reject interfering tones or boost desirable audio, and an adjustable noise limiter to reduce irritating pulse interference, a variable-hang, 0–45 second, squelch control to remove background noise between sound transmissions, and a tape recorder activator. Powered by 12 VDC, the SP-200B may be operated mobile or from an optional 12-VDC supply. It is housed in a handcrafted oak cabinet and constructed of sturdy, black finished aluminum with white legends.

The SP-200B costs $199.95 plus shipping. For additional information, contact Grove Enterprises, Inc., 7540 Highway 64 West, P.O. Box 98, Brasstown, NC 28902; Phone: (800) 438-8155 U.S. & Canada; (704) 837-9200; Fax: (704) 837-2216; e-mail: <order @grove.net>; WWW: <http://www. grove.net>.

Circle 104 on reader service card

CW with Your PC Sound Card

Since soundcards have become standard on nearly every computer, external hardware for audio signal processing is no longer needed. All that's required is software. The latest entry in ham radio soundcard software is POLAR Electric Software's specialized program for decoding Morse signals: the MRP37 Morse Decoder/Coder for Soundcards.

The software was developed by following the basic design of high-performance receivers. Every radio receiver is a composition of several function blocks: preamplifier filters, demodulators, and so on. An equivalent system was chosen for the design of the MRP37 Software. For each stage of signal treatment, a separate block was developed and intensively optimized. Features of the final product include ease of use, automatic tuning, auto cross-over-level, auto speed, auto noise-limiter, spectrum-analyzer, storage scope, and Morsé sending.

For more information, including prices and exchange rates (POLAR is based in Germany), send e-mail to: <POLAR. Electric@cww.de>, or visit the company's Web site at: <http://www.ProMail.com/~PEE>

Call for Papers— SVHFS Conference

The second annual Southeastern VHF Society Technical Conference will be held Friday and Saturday, April 3 and 4, 1998, in Atlanta, Georgia. Program Chairman Bob Lear, K4SZ, has issued a call for papers and presentations. Anyone interested in making a presentation or having a paper published in the Proceedings (or both), should contact Bob via e-mail to <k4sz@stc.net>, or via regular mail to Bob Lear, K4SZ, P.O. Box 1269, Dahlonega, GA 30533. General information on the conference is available on the SVHFS Web site at <http://www.akorn.net/~ae6e/svhfs>.

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CIRCLE 73 ON READER SERVICE CARD

How "Reliable" Is Your Radio?

WB2AMU shows us how to use "reliability engineering" techniques to promote long, happy lives for our radios and antennas.

By Ken Neubeck, WB2AMU*

The word *reliability* may not automatically come up when hams discuss the performance of their radio equipment. Yet, it is a major factor in determining what equipment we buy as well as how we build our own equipment.

The textbook definition of reliability is *the probability that an item will survive without failure for a stated period of time, under stated conditions of use*. The quality of amateur radio equipment is dictated by how well it's able to perform under certain environmental conditions. If we understand and learn to accommodate these basic environmental factors, certain failures that occur to our gear can be prevented. Once we "Murphy-proof" our radios and antennas in order to cope with these factors, then can we enjoy the fruits of high reliability performance.

Reliability Engineering

Reliability engineering was a major part of the aerospace industry during the boom years of the 1960s and 1970s. I've been involved in this field for over 20 years, doing both analysis and testing. *Reliability analysis* would be performed from the lowest level (the component) to as high as the system (aircraft) level. For many military and commercial programs, the major reliability tasks that were performed were *stress analysis, failure rate prediction, failure modes and effects analysis,* and *reliability testing*.

Although the aerospace field is not the same today as it was during those boom years, and certain requirements have been relaxed, reliability still remains an important part of new equipment design as the benefits of lessons learned from previous experiences are incorporated into the new designs.

What does this have to do with ham gear? Well, the same basic forces that affect the electronics on airplanes also affect the reliability performance of our radios and antennas. There are four major environmental factors that affect *all* electronic equipment, including amateur radio equipment. They are *vibration, temperature, humidity and condensation*, and *electrical stress levels*. Let's take a closer look at each one.

Vibration Factors in Mechanical Design

In my previous position in an aircraft electronics company, I saw that true electrical failures caused by flaws inherent in the component accounted for less than 10% of all failures that occurred during test and ultimately during field service. This is particularly true if the correct electrical component stress levels have been properly addressed during the initial stages of design and proper component values have been used. However, it's not always possible to anticipate potential vibration problems with the *mechanical* aspect of a new design. The great majority of failures that *do* occur during testing seem to be in the area of mechanical design and, to a lesser degree, the manufacturing processes.

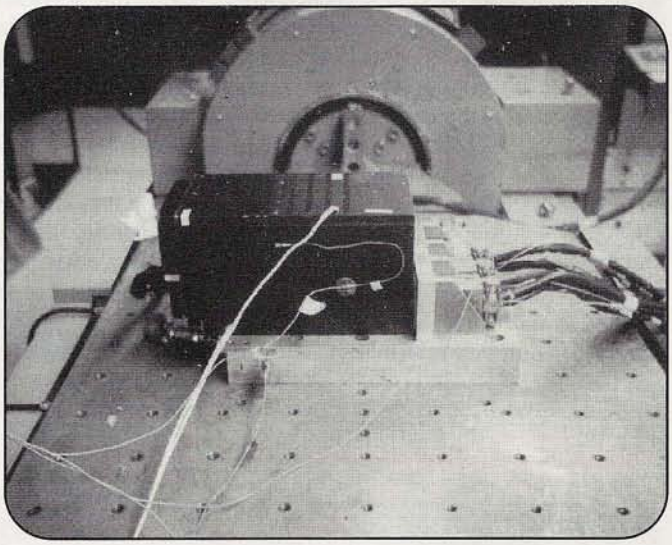

Photo A. This is a vibration setup for an electronic controller unit for a military transport plane. This was the "unit from Hell" described in the text—and a great learning tool! (Photos by the author)

For the average radio amateur who has equipment arranged in a permanent setup such as a base station with a fixed antenna, vibration-related failures do not pose much of a problem (except for antennas). However, for hams who do a lot of mobile work or portable operation, such as DX or grid square expeditions, vibration factors become especially important and must be considered when transporting radio gear to other locations.

When conducting vibration tests on aircraft equipment, test units are installed in a metal fixture that's attached to a slip table which can be vibrated to different levels and in different directions by a large control head motor (see Photo A). Most tests on electronic equipment are conducted using "vibration profiles" that cover frequency ranges from 10 to 2000 Hz. Levels can vary from as little as a couple of Gs to as high as 10 Gs, depending on where the equipment will be located on an aircraft. For example, a wing-mounted unit on a commercial air-

*Ken Neubeck, WB2AMU, is a regular contributor to CQ VHF. He spent over 20 years in reliability engineering, working for Fairchild Republic and Gull Electronic Systems on electronic units for various military and commercial aircraft.

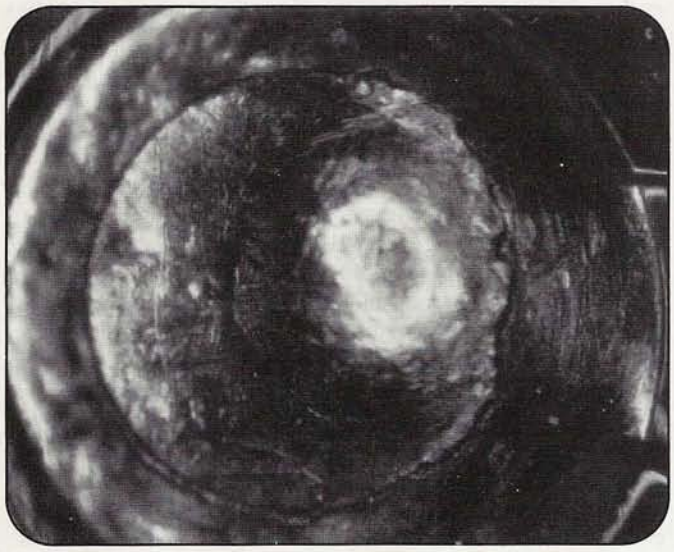

Photo B. Here's what 7.6 Gs of vibration can do to a solder connection. In this case, the base of a terminal post separated from the solder, resulting in an intermittent contact.

craft will require testing that will verify whether it can withstand 7 Gs of vibration without failures. (*One "G" is a unit of force equal to normal gravity on the Earth's surface; 7 Gs is equal to seven times the force of gravity.—ed.*)

What makes this sort of testing interesting is that the equipment may actually have several resonant points at which the effects of vibrations at a certain frequency will be amplified several times on a component or assembly. If such resonant points are present in a design, they can result in components being shaken so severely that they may completely break off of a circuit board assembly.

I have seen many cases of this during reliability testing of aircraft equipment, but I was shocked to see it happen to me with amateur radio equipment! When I made a trip from New York to Hawaii in 1990, I brought along my TS 440S transceiver. When I arrived in Hawaii and opened up the case that carried the radio, I found that all 20 of the radio's chassis screws had vibrated out of the radio and into the bottom of the case! Apparently, there was a resonant frequency in the aircraft that affected the chassis screws to a point where they shook and moved out of the threaded holes!

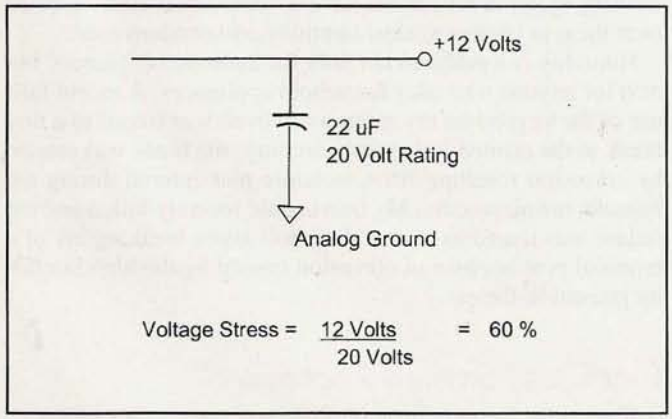

Figure. Electrical stress can be easily calculated by dividing the voltage or current flow through a component by the rated value of that component. Well-designed circuits use components with stress values of 60% or less. See text for explanation.

This is just one illustration of what a ham has to be aware of in the transport of equipment. Many hams have the justified fear that checking their equipment into the baggage area of a plane may result in its being exposed to shock vibration. It makes good sense to find a hard shell plastic or metal case that can be lined with foam into which the radio can fit. Although it may result in additional delays when going through the airport security checkpoint, it's a good idea whenever possible to carry your radio onto the plane as carry-on luggage.

Vibration is a big concern when it comes to antennas. Consider that a beam mounted in your backyard or on a roof is regularly subjected to wind that stresses the antenna. The cumulative effects of these stresses over time may cause mechanical breaks in the feedpoints where the coax is connected or even damage to individual elements. Likewise, antennas used for mobile work face constant stress by wind resistance when the car is driven. Flexible designs are generally the ones that work best.

Wires and Connectors

Wires are the most susceptible to vibration problems. Wires used in antennas and radios must be properly secured to prevent pivoting and eventual breakage. Wires that are soldered into radios and antennas have a natural pivot point where the wicking of the solder ends.

Closely related to wire problems are the connectors to which these wires attach. How the center conductor wire and ground

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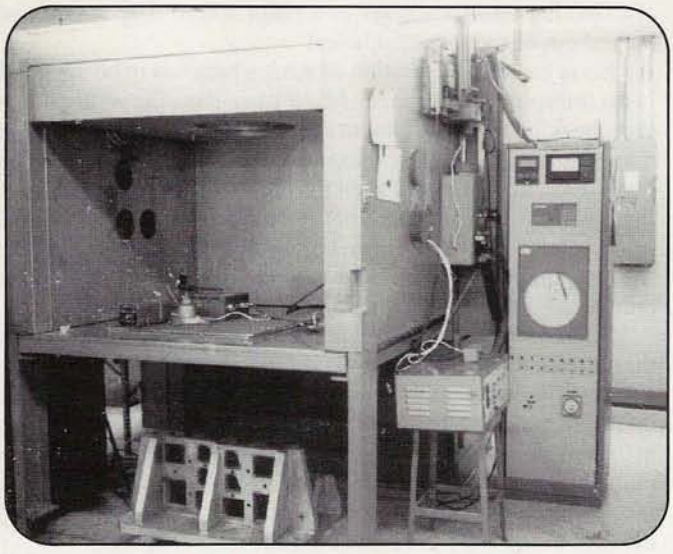


Photo C. A typical thermal chamber used to apply different temperatures to a unit under test.

shielding are soldered onto the coax connector are important (*If you're unfamiliar with soldering connections, see our soldering "Basics" toward the back of the magazine.—ed.*). It's also important to be aware of the mechanical stresses that are placed on these connectors when they're removed regularly. Broken shield or conductor wires are probably among the more common "failure modes" that many hams see.

Vibration testing is the great equalizer. Any weakness in the mechanical design will be exposed. Photo B shows how high vibration levels exposed a design condition in which the solder connections on the terminal posts began to crack. This resulted in a design change in which the terminal posts were eliminated and the wires were soldered directly into the circuit board instead.

Running Hot and Cold

Thermal factors bring out the worst in both components and circuit boards. Many components begin to "act up" when they run at very high temperatures, which is why heat sinks are often attached to power transistors (they help them run cooler and more efficiently).

The most interesting, and infuriating, thing about thermally induced failures is that they tend to be intermittent. Anyone involved in troubleshooting and repairing electronic equipment will tell you that intermittent failures are the hardest ones to troubleshoot. How often have you brought a failed appliance into a service center only to see it work on the repair bench? Imagine trying to troubleshoot this kind of "ghost failure" that only shows up under certain temperature conditions. Thermal testing should spot any such problems.

I had the interesting, and perhaps unfortunate, experience of troubleshooting a whole group of intermittent failures that appeared during the thermal cycling test on an electronic controller unit that was to be installed on a military transport aircraft. In this test, the unit—which I came to call "the unit from Hell"—was installed in a thermal chamber similar to that shown in Photo C and was thermally cycled for 3000 hours through four different temperature plateaus, between -55°C and +71°C. Many "ghost failures" showed up during the "ramp up" from an icy -40°C to a balmy +55°C. Components and assemblies "see" the maximum thermal stresses during these periods of rapid warming or cooling due to different levels of thermal expansion associated with different types of materials. For example, fiberglass has a different thermal expansion rate than metal, which can be a problem for circuit boards made from both materials. If the materials expand or contract at different rates, then the metal traces are likely to break.

Heating and cooling affect electrical components as well as circuit boards. The *potentiometer* is perhaps the component most sensitive to thermal factors, as well as humidity. How often have you heard scratchy noises when you turn dials on audio equipment? A potentiometer is essentially a mechanical device and it typically has a higher failure rate than other components, both in amateur radio and in commercial applications.

Many amateur radios and accessories are only rated for commercial temperature ranges (0° to 70°C) and will start to "act flaky" when exposed to temperatures outside that range. For example, when my friend Mike, N2MS, and I were testing the SWR of some antennas last winter when the temperature outside was only 20°F (-7°C), we noticed that the LCD display on our MFJ Antenna Analyzer was sluggish and virtually unreadable. Was it broken? No, it simply wasn't rated for temperatures below 0°C (32°F). It's good to remember that temperature extremes may affect the operation of any equipment and that temperature ratings should be taken into account if you're planning to use gear outside in very cold or very hot weather.

Humidity and Condensation

Probably the most common failures that hams have to deal with are those related to humidity and condensation factors. And the antenna system, being outside, is most susceptible to their effects. This is why it's so important to try to protect soldered antenna connections from the elements by using electrical tape and silicone sealant.

Any piece of gear that's regularly exposed to outside air must be periodically inspected for corrosion. On occasion, solder components can break down into metal-based salts in the presence of condensation and can short with adjacent solder joints. (See Photo D for an example of this condition.) Analog circuits can be especially susceptible to changes in performance due to the presence of water. Circuit boards used in commercial and military aviation will often have a "conformal coat" applied over them to protect against humidity and condensation.

Humidity is a problem not only for hams and engineers, but also for anyone who uses household appliances. A recent failure of the keypad on my microwave oven was traced to a tiny break in the printed foil switch circuitry; the break was caused by corrosion resulting from moisture that entered during the manufacturing process. My hearing aid recently failed and the failure was traced to one of the small wires breaking off of a terminal post because of corrosion caused by the high humidity present in the ear.

Electrical Stress Factors

Electronic equipment manufacturers have to be aware of *electronic stress levels* of components used in their designs. This also applies to hams who homebrew their own equipment; they must make sure they use proper ratings when selecting different types of components for a design made from scratch.

Troubleshooting Intermittent Failures

Vibration, thermal conditions, and condensation may all cause inconsistent behavior of a component. For example, you may have a problem with a piece of coax that has internal breaks in which the two sides of the break are occasionally touching or breaking contact.

There really is no rule about dealing with an intermittent failure, but the best way to troubleshoot one is to try to recreate the conditions in which the failure occurs, and then take critical measurements—such as voltage or resistance—of the components in the failed circuit. Also, be sure to check for bad or broken solder joints. Even when a connection looks like it's soldered, it may actually be a poor connection. "Cold" solder joints, which tend to look dull and grainy (as opposed to smooth and shiny for a good joint), can be spotted in an inspection, and may actually look as bad as Photo B showing the joint failure in the vibration test. (*Speaking of soldering, be sure to check out "Soldering Tools for the Ham Shack," elsewhere in this issue.—ed.*) If you're unsure about a joint, reheat it and resolder it.

By the way, you don't need fancy test equipment to track down most reliability problems. In fact, a simple multimeter (VOM) with a resistance scale and a voltage scale is perhaps the most important tool you can have for troubleshooting electrical failures in radio equipment, particularly intermittent failures. The resistance scale can often reveal open or short-circuit conditions on circuit board traces and in components. And the voltage scale can show you if power is reaching certain points in a circuit. Yes, an oscilloscope is also useful in analyzing signals, but you'll be surprised at how much a simple multimeter can do for you.

Electronic stress is generally measured as a percentage of the rated capacity of a component or device. For components such as resistors and capacitors, a general goal in circuit design should be that stress levels should not exceed 50 to 60% of their rated capacity. For example, the Figure shows a simple 12-volt circuit in which a bypass capacitor rated for 20 volts is connected between the voltage source and ground. Running 12 volts through this capacitor produces a stress level of 60% (12/20 = .60)—right on target. Likewise, a resistor that's in a circuit in which it "sees" 300 milliwatts of power dissipation should be rated for at least 1/2 watt (500 milliwatts) so that the stress level does not exceed 60%. Stressing components at levels approaching or exceeding 100% increases the likelihood of failure or degradation.

The better companies pay attention to the correct electrical stresses that should be used in their circuits, resulting in fewer component failures of when the product is in use.

Photo D. An advanced case of corrosion caused by water condensation. The solder material has broken down into conductive metal-based salts. Under the right conditions, this can result in shorts to adjacent pins.

Final Thoughts

The better companies also employ reliability testing in all phases of their design. Many companies use the practice of "burn-in" on their production units. For equipment that will be installed on aircraft, this may involve a few days of thermal cycling, 10 minutes of vibration, and running a test procedure to check all the parameters that the unit measures or displays. On a commercial level, burn-in may be as simple as turning units on before they're shipped. For companies that have their quality processes under control, this is generally all that needs to be done.

As ham radio operators, we're fortunate to have a number of radio and antenna manufacturers that make very reliable equipment. The true test for a company is the reliability track record of its different models. Designs that have not been proven through testing, and that have high failure rates when used by customers, will result in high costs both in money and loss of customer satisfaction. The same goes for components, and, generally speaking, today's electronic components—unlike those of a generation ago—are highly reliable.

A basic rule of reliability is the simpler the design, the more reliable it is. Fewer parts means fewer opportunities for failure. Another factor in determining the reliability of simpler versus more complex devices is the *human factor*. This becomes a reliability concern when the complexity of programming or controlling a device gets in the way of its normal operation, or when too many required keystrokes on a mobile rig, for example, may compromise driver safety.

After having gone through a number of difficult test experiences (including the "unit from Hell"), I began to realize how important up-front design work is in making equipment more reliable. Certainly not all failures can be predicted and planned for, which is why testing is done, but the better designers learn from experience to anticipate potential problems and plan for them in their designs.

We hams may not always think much about reliability the way we should, but by understanding how environmental factors affect reliability, we can see that there are many ways to improve it and to get the best possible performance out of our radios and antennas. ■

VHF Adventures in Ireland and England

What's the easiest way to work DX stations on VHF and UHF? Just hop on an airplane...and don't forget your HT (and reciprocal license)!

By Sam Vigil, WA6NGH*
LVengr@aol.com

Last spring, I was fortunate enough to be invited by University College Dublin (UCD) to come to Ireland to assist in teaching an engineering short course on solid waste management and recycling. I decided to take my dual-band HT with me and work some VHF DX the easy way—on local repeaters!

Of course, you can't just travel overseas and use your rig in another country without permission, so first I'll describe how to obtain a reciprocal license (a temporary license in another country). Next, I'll discuss how to use European repeaters. And finally, I'll talk about my hamming and travel experiences in Ireland and England. While my experiences are specific to the countries I visited, the general procedures are similar in most countries.

Joe Ryan, EI7GY, Secretary of the Irish Radio Transmitters Society, manning the IRTS table at the Dublin Radio Rally. IRTS is Ireland' s national ham radio society. (Photos by the author)

Planning Ahead

You should allow about 60 days before your trip to work out the details of obtaining a reciprocal license. To apply for a reciprocal license for Ireland, simply write a letter to the Director of Telecommunications Regulation (see "Resources" for the address) and include the following information:

1. The make and model number of your amateur radio
2. The dates of your visit
3. The address(es) at which you propose to operate
4. A copy of your current license
5. Frequency bands, power and modes of emission required (note: the European 2-meter band is 144 to 146 MHz only)
6. Your previous visitor's callsign, if applicable
7. If mobile operation is desired, the make and registration number of the vehicle concerned.

If any of this information is not available (for example, if the address or the vehicle registration number is not yet known), just explain why.

The Irish reciprocal permit is issued free of charge if it's required for less than a month in any year; if it's required for a period of between one and three months, a fee of 10 Irish Pounds is charged. The maximum period for which a permit may be issued is three months. But the permit may be renewed or extended for additional three-month periods on payment of another 10 pounds at each renewal.

Within a few weeks, you'll receive your permit, called a Radio Experimenter (Amateur) Visitor Permit. Your call will include a V (for visitor). My Irish callsign was EI4VUD.

The United Kingdom

Obtaining a reciprocal permit in the United Kingdom (which includes England, Scotland, Wales, and Northern

Sam Vigil, WA6NGH, is a Professor of Environmental Engineering at California Polytechnic State University. A ham since the early 1960s, Sam's VHF activities include 2-meter and 70-centimeter FM, APRS, and packet radio. He is also active in emergency communications.

The highlight of the trip—the Ashley Park B&B (Bed & Breakfast)—where the author and his wife stayed on the second night of their four-day tour of Ireland. It even had a lake...and a rowboat...and see the next photo.

Table 1. 2-Meter Repeater Band Plan

Chan.	Input Freq.	Output Freq.
R0	145.000 MHz	145.600 MHz
R1	145.025 MHz	145.625 MHz
R2	145.050 MHz	145.650 MHz
R3	145.075 MHz	145.675 MHz
R4	145.100 MHz	145.700 MHz
R5	145.125 MHz	145.725 MHz
R6	145.150 MHz	145.750 MHz
R7	145.175 MHz	145.775 MHz

Ireland) is a bit more involved. Unlike Ireland, the UK doesn't recognize the U.S. Technician or Technician Plus License for reciprocal licenses. Only the Conditional, General, Advanced, and Extra Class licenses are recognized. If you meet this basic requirement, you'll want to write to the Radio Licensing Centre (again, see "Resources") and request an Application for Temporary Amateur Radio License.

The form itself is very straightforward, requiring information similar to the Irish permit. However, it requires submission of an application fee of 15 pounds sterling (£), in the form of an International Money Order or Bank Draft in pounds sterling, written to Subscription Services Limited. I found it very difficult to obtain either of these in my small town, so check into this early on in your planning stage. Although this seems expensive (£15 is about $22.50 U.S.), keep in mind that UK hams pay an *annual* fee of £20 for their amateur licenses!

The UK reciprocal license is valid for six months. You won't be issued a distinctive call, but will be authorized to identify as mobile or portable. On my reciprocal permit, my British callsign was listed as M/WA6NGH.

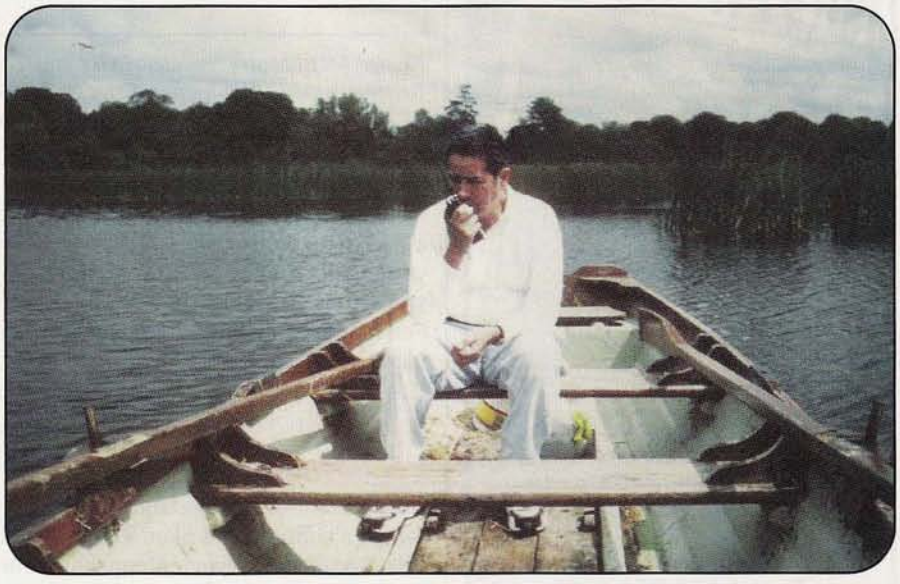
For information on countries other than Ireland or the United Kingdom, check the ARRL Web site at <http://www.arrl.org/field/regulations/io/recip-country.html>. You can also send a business-sized SASE to the Regulatory Information Branch at ARRL HQ and ask for information on reciprocal licensing procedures for specific countries.

CEPT Licenses

The ARRL recently announced that the State Department has applied for U.S. participation in the European Conference of Postal and Telecommunications Administrations (CEPT) Amateur Radio licensing system. If approved, it would be easier for U.S. hams to operate temporarily in European countries that participate in CEPT. Holders of a CEPT license could operate in participating countries without having to apply for a reciprocal license. It's not known at this time how this will affect holders of the Technician, Technician Plus, and Novice licenses, which are not currently accepted for reciprocal permits in certain countries (such as the UK).

Equipment Considerations

The most practical rig for air travel is an HT. I decided to leave my charger at



Lake + rowboat + HT = EI4VUD/Marine Mobile! Unfortunately, though, the author says he was out of range of CTCSS-accessible repeaters and nobody was listening in on the simplex frequencies he tried. Better luck next time.

home and rely on my AA-cell battery pack. AA cells are universally available around the world. They tend to be more expensive abroad, so you may want to pack a few spare sets in your luggage. If you take a charger to Europe, be sure that it's compatible with 220-volt, 50-Hz AC. You'll also need adapter plugs.

I took two antennas with me, my HT's "rubber duck" and a homebrew quarter-wave vertical with a window clip mount. Although a 5/8–wave vertical with a magnetic mount would have been more efficient, packing it in my luggage would have not been practical. In retrospect, a half–wave folding HT antenna and/or a TV twinlead J-Pole would have been more effective.

Airport security is always a consideration when traveling by air, especially on overseas flights. I always carry my HT in my carry-on bag (although I do pack extra batteries and antennas into checked baggage). I usually hand the HT to the security person and explain that it's a two-way radio. I'm typically asked to turn it on, so I usually tune to a pre-programmed NOAA weather channel. On this trip, I kept the HT in the carry-on and just ran

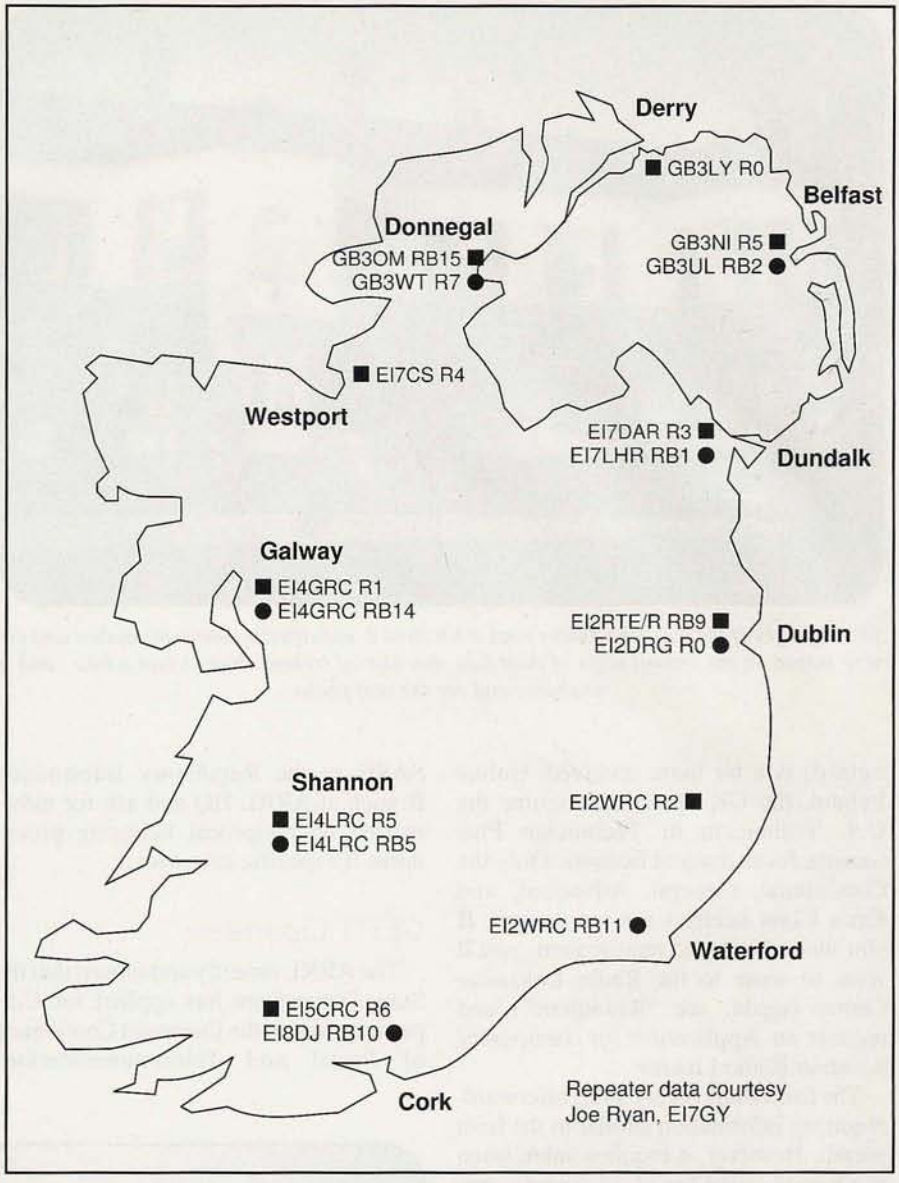


Figure. Map of voice repeaters in Ireland (EI callsigns) and Northern Ireland (GB3 callsigns). Repeaters marked with squares are on 2 meters and those with circles are on 70 centimeters. The "R" numbers refer to each repeater's "channel" (see Tables 1 and 2).

it through the X-ray machine and wasn't asked to demonstrate it. Be sure to have your reciprocal license or permit with you. It may also help to have your instruction manual with you in case you have to identify the rig.

Operating Irish and UK Repeaters

Repeaters in both Ireland and the UK follow a similar band plan. Tables 1 and 2 list the standard repeater frequencies for the 2-meter and 70-centimeter bands. As you'll see, the frequency pairs available for repeaters there are quite limited in comparison with the U.S.—only eight channels on 2 meters and 16 channels on 70 centimeters. This is due largely to the fact that those bands are much smaller there (2 meters extends only from 144 to 146 MHz, and 70 centimeters goes only from 430 to 440 MHz).

Programming your HT to operate in Ireland or the UK is simple. For example, to use Channel R0 on 2 meters, tune your HT to the output frequency of 145.600 MHz and program a minus shift of 600 kHz. This programs your HT to transmit on the repeater input frequency of 145.000 MHz. If you plan to operate on 70 centimeters, though, be sure your

Table 2. 70-Centimeter Repeater Band Plan

Chan.	Input Freq.	Output Freq.
RB0	434.600 MHz	433.000 MHz
RB1	434.625 MHz	433.025 MHz
RB2	434.650 MHz	433.050 MHz
RB3	434.675 MHz	433.075 MHz
RB4	434.700 MHz	433.100 MHz
RB5	434.725 MHz	433.125 MHz
RB6	434.750 MHz	433.150 MHz
RB7	434.775 MHz	433.175 MHz
RB8	434.800 MHz	433.200 MHz
RB9	434.825 MHz	433.225 MHz
RB10	434.850 MHz	433.250 MHz
RB11	434.875 MHz	433.275 MHz
RB12	434.900 MHz	433.300 MHz
RB13	434.925 MHz	433.325 MHz
RB14	434.950 MHz	433.350 MHz
RB15	434.975 MHz	433.375 MHz

rig has an adjustable offset, since the "split" there is +1.6 MHz, rather than the U.S. standard of ± 5 MHz.

There are 13 repeaters on the air in Ireland and five in Northern Ireland (GB3 prefix), as shown in Table 3 and on the repeater map (see Figure). Repeaters in the UK use the same channel numbers as shown in Tables 1 and 2 (*in fact, they're common to most of Europe—ed.*). However, because the UK is one of the most densely populated regions in the world in terms of repeaters per channel per square mile, it's not possible to print the complete UK repeater list. See "Resources" for two Web sites where you can find up-to-date repeater information for the UK.

1750-Hz Tone Burst and CTCSS

All repeaters in Ireland and the UK operate with the European tone burst system. Repeaters are opened by a short (less than 500 ms) 1750-Hz tone burst. All VHF rigs sold in Europe have this capability built in; unfortunately, most rigs sold in the U.S. do not. For example, the European version of my Kenwood TH-79A(D) handheld has both 1750-Hz tone burst and CTCSS built in, but the U.S. version has only CTCSS. Without the tone burst, you can't break the repeater's squelch. I've been told that it's possible to get around this by whistling into the mic! If you're handy with a soldering iron, there is a circuit in the February, 1997, issue of *QST* (page 74) for a small tone burst circuit that can be built into an HT remote mic. It's also possible to buy a commercially built circuit from Communications Specialists, Inc.

Fortunately, some of the Irish repeaters have CTCSS installed in parallel with tone burst. I accessed the EI2DRG repeater near Dublin with an 88.5-Hz CTCSS tone. The non-CTCSS repeaters are located on Ireland's west and southwest coasts. In the UK, most repeaters have already installed CTCSS, so the lack of tone burst capability will not be a problem there.

From Runway to Radio Rally

My wife, Eve, and I set off for Dublin, Ireland, on Friday, May 10, via London. After a seemingly endless flight, we finally arrived around 2:00 p.m. on Saturday. I planned to use Saturday and Sunday to acclimate myself to the eight-hour time change before my engineering course started on Monday. My scheme was only partly successful, as I had trouble sleeping the whole first week.

Fortunately, there was a hamfest (called a Radio Rally in Ireland and the UK) in Dublin that weekend, so I spent most of Sunday walking over to the rally and looking around town. The rally was well-attended by several hundred hams. It was held in the ballroom of Jury's Hotel and was similar to our hamfests, with displays, commercial vendors, and a swap meet (flea market).

Ham gear in Ireland seems to cost about 20 to 30 percent more than equivalent U.S. gear. All of the major brands were represented, along with some interesting local kit vendors with simple kits based on designs from *RADCOM* (the magazine of the RSGB, the Radio Society of Great Britain) and *Practical Wireless* (a UK magazine similar to *CQ*). One interesting kit that I brought back was a half-wavelength 2-meter antenna which included a loading coil etched on a small pc board. A little trimmer capacitor was mounted on the board to resonate the antenna.

Similarities and Differences

I had arranged via e-mail to meet Joe Ryan, EI7GY, Secretary of the Irish Radio Transmitters Society (IRTS) at the rally. Over coffee, Joe discussed the activities of the IRTS and Irish hams with

Table 3. Repeaters in Ireland and Northern Ireland

Callsign	Chan.	CTCSS	Location
Ireland			
EI2DRG	R0	88.5	Three Rock
EI7DAR	R3	88.5	Clermont Carn
EI7CS	R4	-	Truskmore
EI2WRC	R2	-	Mt Leinster
EI4GRC	R1	-	Galway City
EI5CRC	R6	-	Mullaghanish
EI4LRC	R5	-	Killaloe
EI2RTE	RB9	88.5	North Dublin
EI7LHR	RB1	88.5	Clermont Carn
EI2WRC	RB11	-	Waterford City
EI4LRC	RB5	-	Killaloe
EI8DJ	RB10	-	Cork Airport
EI4GRC	RB14	-	Galway City
Northern Ireland			
GB3LY	R0	110.9	Limarady
GB3NI	R5	110.9	Belfast
GB3UL	RB2	110.9	Belfast
GB3OM	RB15	110.9	Omagh
GB3WT	R7	110.9	Omagh

NOTE: All repeaters use 1750 Hz tone for access; those noted also use CTCSS.

Communications room at the Churchill Bunker in London. During World War II, British Prime Minister Winston Churchill directed his country's war efforts from here—and kept in touch with U.S. President Franklin Roosevelt on a secure phone installed in his bathroom!

me. As in the U.S., most Irish hams use VHF and VHF repeaters. However, unlike the U.S., there's significant VHF FM simplex activity, and several contests help generate additional activity on the simplex channels.

The most interesting contest is the Worked All Ireland Contest. It requires working all of the grid squares in Ireland on FM simplex (there's also an 80-meter SSB contest). The Irish National Grid System is on most tourist maps so it's relatively easy to find your grid square. Also, most GPS (Global Positioning System) receivers have the Irish Grid system built in.

Since many grid squares are deficient in VHF activity, many Irish radio clubs sponsor mini-DXpeditions to activate the rarer grids. Joe told me about one such expedition that involved renting boats and traveling on one of Ireland's larger lakes. What a great idea for a club outing! I hoped to activate some rare grid squares after my teaching assignment at UCD was completed. By the way, the IRTS does not have a Web page, but Joe has graciously offered to answer any e-mail questions about operating in Ireland (again, see "Resources").

After the rally and a good Irish dinner, I worked my first "DX," Peter, EI4HX, on the channel R0 repeater. I had to cut my hamming short, though, as I needed to prepare for my classes at UCD the next day (after all, that's why I was there).

"As in the U.S., most Irish hams use VHF and VHF repeaters. However, unlike the U.S., there is significant VHF FM simplex activity, and several contests help generate additional activity on the simplex channels."

Down to Business

The three-day course started early Monday morning, with about 20 local engineers attending. I taught about one third of the course, while supporting subjects were taught by UCD faculty, local engineers, and local government and environmental officials. I also taught two hands-on computer lab sessions, which were very popular, and gave a public seminar the day after the course, which was attended by over 40 people, mostly government officials. Alas, course preparation and evening social events kept me off the local repeaters.

After the course was finished, Eve and I did get a chance to explore Dublin a bit. It is a beautiful city with a lot of history, great restaurants, and friendly people. I also really came to appreciate the Irish national brew, Guinness Stout. It's an Irish tradition not to be missed! (Motto: "Guinness is Good for You") Again, events conspired to keep me off the air!

On the Road in Ireland

On Saturday, we rented a car and set off to explore the rest of Ireland. We only had four days, so there's still a lot left to explore on our next trip! Traffic is very heavy in the Dublin area, so we got out of town as quickly as possible on a four-lane freeway type road. This good road

How can you work DX if you don't have a tower? This is the closest Sam got—the Tower Bridge in London. And no, he couldn't put up an antenna there!

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only lasted about 20 miles, though; for the rest of the trip, we were on narrow, two-lane roads, most without shoulders. Driving in Ireland is not something for the faint of heart!

Our first day, we only went about 75 miles out of town, staying at Lynnbury, a beautiful 19th century B&B (Bed & Breakfast) with a "secret garden," an overgrown half-acre or so with a Victorian greenhouse. Prices in B&Bs are very reasonable, about $45 to $60 for a double room. On our second day out, we found Ashley Park, an incredible B&B that had its own lake! The owners even let us use their rowboat. This was definitely the highlight of the trip!

I tried my hand at operating marine mobile from the rowboat, but had no luck. I quickly discovered that I was out of range of the east coast repeaters, and the west coast repeaters, which I might have been able to reach, didn't have CTCSS access. So I tried operating simplex, on the "Worked All Ireland" simplex frequency, but made no contacts. I decided not to operate mobile, because I was still not comfortable with driving on the left-hand side of the road. Thus, all of my operating in Ireland was with a rubber duck antenna. A better antenna would have really helped.

On to London

On Wednesday, we flew off to London. It was everything we'd been told and more—hectic, exciting, crowded—and we were there in the off season! Most of our time was spent doing "tourist things" (we were on the streets of London literally from 8:00 a.m. to midnight), which again left little time for on-the-air hamming. But I did manage to fit in two ham-related stops, the Churchill WWII Bunker and a ham radio store. I had also planned to visit the Greenwich Observatory and the headquarters of the RSGB, but we ran out of time.

The Churchill Bunker is of interest to hams because it includes a restoration of the wartime prime minister's communications room, and the famous telephone room (hidden in what appeared to be Winston Churchill's private restroom!) that Churchill used to secretly talk to President Franklin D. Roosevelt. The telephone line was encrypted by an elaborate system located in the basement of a nearby department store.

While Eve visited the famous Chelsea Flower Show, the largest in the world, I visited Martin Lynch & Son, a major ham radio dealer. As in Ireland, radio prices were much higher than here in the U.S. An unusual feature of the store was a radio museum which included several tube type rigs of the '40s and '50s, including Racal, Hallicrafters, and several well-made homebrew rigs, all in operating condition. Alas, the new equipment is virtually identical to what you would find in any U.S. ham radio store (*the perils of a global economy—ed.*).

Closing Thoughts

This was primarily a business trip with some vacation travel tacked onto the end, and that, unfortunately, limited the time available for hamming. Most of my travel these days is similar, but I always take my HT and repeater guide with me and have enjoyed many good QSOs and met many new friends on the air.

Taking along ham radio on a foreign trip is a bit complex, but I think it's well worth the trouble. In retrospect, my trip was too brief to fit in all of the tourist activities that we'd planned and ham radio as well. I plan to return to both Ireland and England again for a more relaxed trip. I'd allocate at least a week to each country, which would allow ample time for "seeing the sights" and doing some serious hamming. I also recommend trying to visit a local radio club activity or radio rally. The ARRL Web site has information on the International Travel Host Program, which will introduce you to hams in other countries.

Acknowledgements

I wish to thank University College Dublin, Department of Chemical Engineering, for making this trip possible. I especially want to thank IRTS Secretary Joe Ryan, EI7GY, who explained the Irish repeater system to me and gave me a lot of help in planning the ham radio portion of my trip. ■

Resources

To request a reciprocal license in Ireland, write to:

Office of the Director of Telecommunications Regulation, Radio Section, Abbey Court Irish Life Centre, Lower Abbey Street, Dublin 1, Ireland; Phone: (011) 353-1-804-9600; Fax: (011) 353-1-804-9680; Direct telephone line to the Radio Section: (011) 353-1-804-9621. (The 011 access code is for calls originating in the U.S.)

To request a reciprocal license in the United Kingdom, write to:

The Radio Licensing Center, Subscription Services Limited, P.O. Box 885, Bristol BS99 5lG, United Kingdom; Phone: (011) 44-1179-258333

Additional helpful resources:

ARRL Reciprocal Licensing Information: <http://www.arrl.org/field/regulations/io/recip-country.html>; or send a business-sized SASE to: Regulatory Information Branch, ARRL, 225 Main St., Newington, CT 06111.

ARRL Reciprocal Licensing Frequently Asked Questions (includes the International Travel Host Exchange Program): <http://www.arrl.org/field/regulations/io/faq.html#ithe>

Communications Specialists, Inc. (source of assembled 1750-Hz tone-burst circuits): 426 W. Taft Ave., Orange, CA 92865-4296; Phone: (800) 854-0547; Fax: (800) 850-0547

International Amateur Radio Union (IARU) (links to national radio societies all over the world): <http://www.iaru.org/iaru-soc.html>

Irish Radio Transmitters Society (IRTS) (Ireland's national ham radio society): e-mail to Joe Ryan, EI7GY, at <jryan@iol.ie>.

Radio Society of Great Britain (RSGB) (great source of ham related information and activities in the United Kingdom): <http://www.rsgb.org/contents.htm>

United Kingdom Repeater Lists: (1): <http://members.aol.com/rmcweb/brief.htm> (Web site of the RSGB's Repeater Management Committee, or RMC); (2) <http://www.haigh1.demon.co.uk/ham.html> (downloadable version of the RMC's Web site. It's a zipped file that produces a Microsoft Word help file version of the UK repeater list. It's easier to use than the RMC Web site itself.)

Q & A

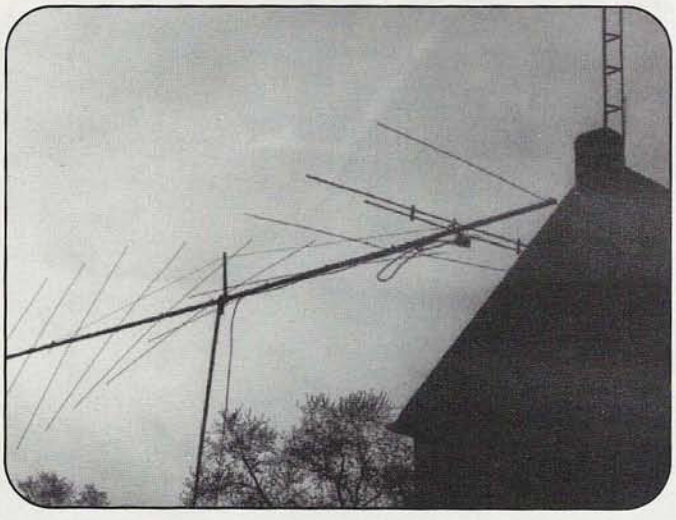
Questions and Answers About Ham Radio Above 50 MHz

Q: I am a nut about 6-meters and recently acquired an antenna called a *Spiral Ray*. I am seeking information about it. Maybe some readers who are active on 6-meters have one and could send me some information, such as instructions on cable. Any information would be helpful. Some pictures of it are enclosed. Thank you.

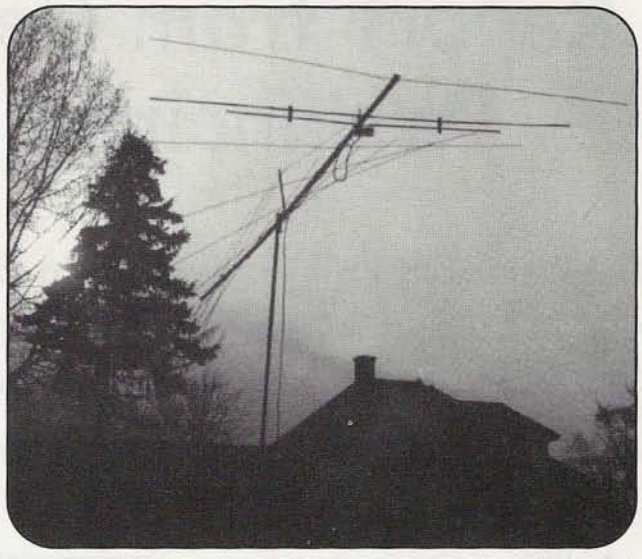
Ron Harris, KB8TIC
Akron, Ohio

*A: Interesting antenna you've got there, Ron. Looks to me like it's an antenna with multiple polarization: horizontal, vertical, and a few steps in between. My guess is that it's designed for sporadic-*E *and/or meteor scatter, in which the polarization of a signal gets all jumbled up. An antenna like this might be able to catch a signal of any polarization. But our readers will know more than I do, so here are the photos.*

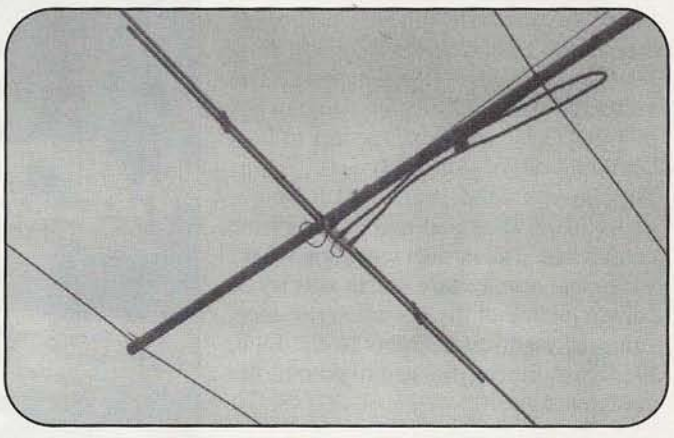
Readers: Are any of you familiar with this antenna, and can you help Ron with info? If so, contact Ron at his Callbook *address or c/o* CQ VHF.



Side view of the Spiral Ray antenna. Is anyone out there familiar with this particular antenna?



Rear view of the Spiral Ray. It appears to rotate from horizontal to vertical polarization.



Detail of the Spiral Ray feedpoint. Judging from the photo, the feed seems relatively straightforward. Anyone with details on this interesting antenna is urged to share them with us.

Q: I am writing to request an article on how to decipher user's manuals. Usually, these manuals are fairly clear and to the point. But I need someone to take me by the hand and explain what each function is, how it's used, why it's used, and how it is programmed into the radio. I can set up my radio for plain vanilla operation, but that's all I really understand. If you should decide this is worthy of a few pages in your publication, please use terminology that we non-engineers can understand.

R. L. Frederick

A: The problem with writing a generic article on deciphering poorly-written manuals is that no two radios are alike and no two manuals are alike. Even the well-written ones are often complicated. Nonetheless, we've set Senior Contributing Editor Gordon West, WB6NOA, to work on trying to write a "User's Manual User's Manual." Watch for it in a few months. By the way, we always *try to use terminology that non-engineers can understand, or to provide explanations when there's no choice.*

Reader Response (Attention N3TZD):

In regard to the coax question in "Q&A" from Bill Michael, N3TZD (August, 1997, *CQ VHF*, looking for specs on feedline labeled "International Electronics W&C 9096-2A"): If you will go to The RF Connection's Web site at <http://www.therfc.com>, all of your questions will be answered. Thanks for a great magazine. 73,

Walt Hilton, KA6VNU

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

Report from Germany: The 42nd "Weinheimer UKW-Tagung"

The Weinheim VHF Conference in Germany is the biggest event of its kind in Europe, attracting as many as 10,000 hams. CQ VHF visited the 1997 conference to find out how they do it!

By Rich Moseson, W2VU*

A VHF conference that draws 10,000 hams...it's mind-boggling when you consider that the premier VHF and VHF-related conferences here in the United States routinely draw between 200 and 300 amateurs. The secret (as discussed in more detail in last month's "Line of Sight") seems to be a combination of longevity—1997 was Weinheim's 42nd year—and having a major hamfest as part and parcel of the conference. Rather than repeating what I wrote last month, this article will try to paint a picture of the overall experience, from the eight-hour flights to the food, the sights, the people, and of course, the conference itself.

Photo A. The "marktplatz" in downtown Weinheim. At the heart of the "aldstadt," or old town, this semi-pedestrian mall today features restaurants and other shops. (All photos by the author)

Feeling Foreign

If I had any doubts that I was going to a foreign country, they were erased the minute I boarded the Lufthansa flight to Frankfurt at New Jersey's Newark Airport on the Wednesday before the conference. The crew spoke English (thankfully) as well as German, but mainly as a courtesy to their many American passengers. It was clearly not their first language (even though they all understood and spoke it beautifully).

On arrival in Frankfurt about eight hours (and one day) later, I was met at the airport by *CQ VHF* "Digital Data Link" editor Don Rotolo, N2IRZ. Don works for a German company and was not only able to arrange a business trip to the "home office" at the same time as the conference, but also was able to get time off to attend. He was a lifesaver as translator and tourguide. Don's car had a built-in navigation system, which was really cool (as long as you were on roads that were programmed into the map software; if you weren't, it thought you were in a field and kept telling you, in German, to get back on the road). Between the computer, the map Don carried as backup, and the fact that he'd been to Weinheim the night before, we managed to make it there with a minimum of confusion.

After checking into our hotel, taking a quick walking tour of "aldstadt" (old town) Weinheim, and having a delicious but unidentifiable lunch at an outdoor café in the "Marktplatz" ("marketplace," see Photo A), we got a little bit of rest, then headed to a barbecue at the home of Wolfgang Mahlke, DF1GW, our host at the conference. There, we met his fami-

"On arrival in Frankfurt...I was met by* CQ VHF *'Digital Data Link' editor Don Rotolo, N2IRZ....He was a lifesaver as translator and tourguide."

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

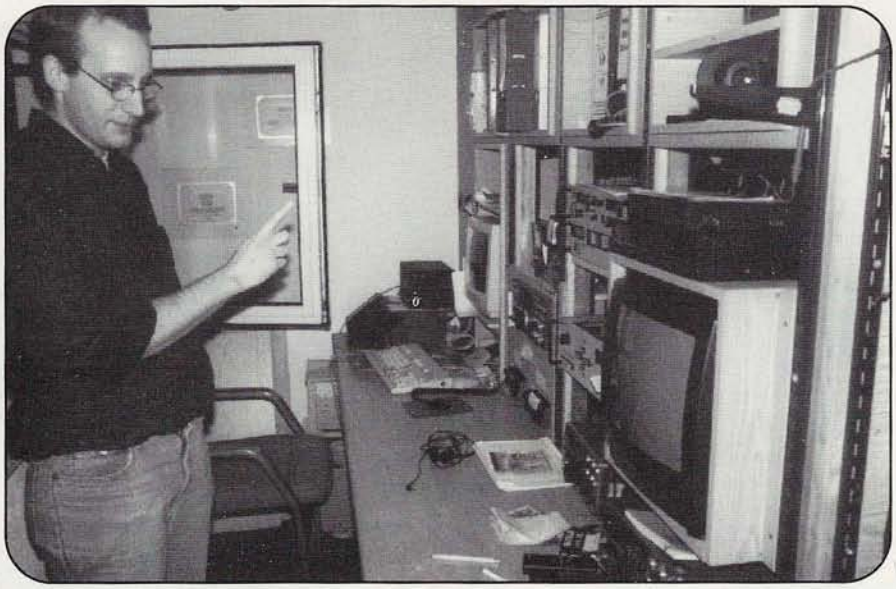


Photo B. Joachim Danz, DL5UL, leads us on a tour of the Weinheim club station. He's standing on the VHF/UHF side of the radio room, which is equipped for satellites, packet, VHF DXing, and ATV.

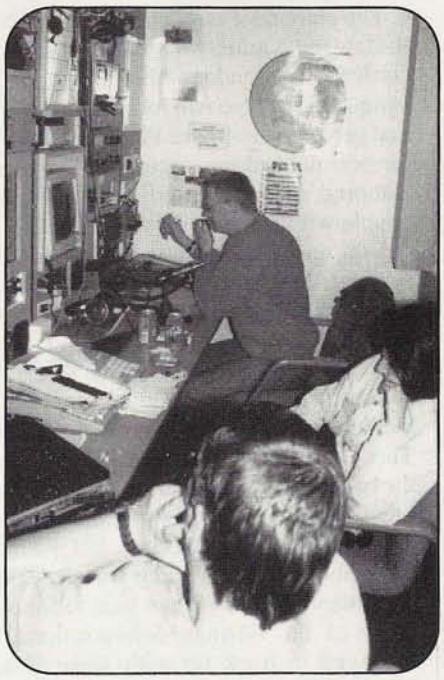


Photo D. Horst, DF7ZH, operates the Weinheim special event station, DL2OOO, on HF, while other visitors listen.

Photo C. Repair bench at the Weinheim club station. It's at the bottom of a "U"-shaped console, with VHF/UHF gear on one side and HF equipment on the other.

ly and several other members of the sponsoring club, and, after dinner, headed out to the club station on the outskirts of town. This is truly one of the marvelous things about ham radio—we were meeting these people for the first time, and within minutes, it was like we were old friends. This, to me, is the heart of amateur radio.

A Visit to the Club Station

The Weinheim club station is impressive by any standard. A building that originally served as a pump house for irrigating surrounding fields, it now houses a complete ham station on the second floor, along with a large kitchen and meeting room on the first. The building was given to the club by the city, partially in appreciation for its continuing sponsorship of the VHF conference, Weinheim's biggest annual event. There are several towers outside, holding a wide variety of HF, VHF, and UHF antennas. The towers were surplus from the electrification some years back of Germany's highly efficient light-rail system, which lets you get to and from virtually anywhere via public transit.

Inside, the radio room is set up in a "U" shape, with seating along the outside and all the radios built into a central console in the middle. On the left is the VHF/UHF side, set up for satellites, packet, ATV, and more. On the right is the HF station (with two separate operating positions), which was quite busy the night we were there, with operators making contacts using the special-event callsign of DL2OOO. At the bottom of the "U" is a well-equipped workbench, with tools and spare parts for fixing just about anything electronic (see Photos B through E).

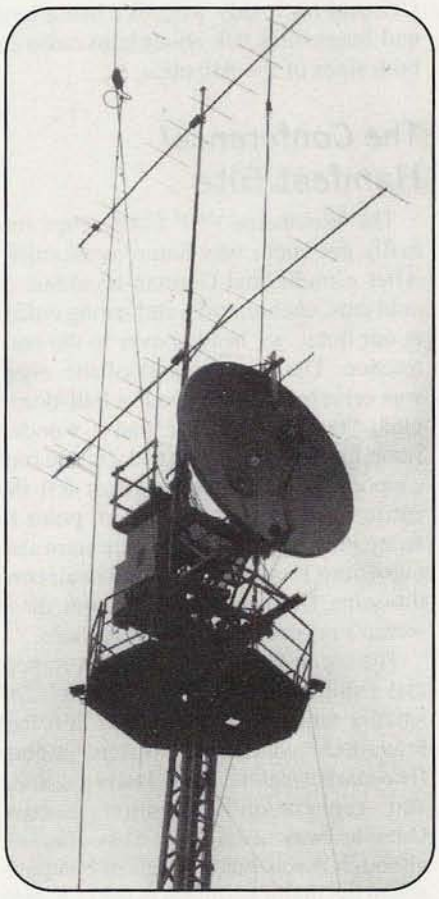


Photo E. One of the VHF/UHF towers at the Weinheim club station. The towers were surplus from electrification of Germany's light rail system.

The clubhouse was also the site of big Friday and Saturday night barbecues for conference attendees (there's no fancy banquet, just these two relaxed and informal get-togethers—see Photo F), and the farmer next door regularly provides camping space in an adjacent field for people with tents, trailers, and RVs.

Don and I had nothing in particular scheduled for Friday—it was intended as a de-jetlagging day for me—so, on Wolfgang's advice, we went to visit Heidelberg, about a half hour south of Weinheim (some of our photos from Heidelberg are in last month's "Picture This" column.) We returned in time for the barbecue and had our fill of wurst and other German specialties. It rained heavily for most of the barbecue, but we had big tents to sit under and it wasn't really a problem. After trying in vain to follow some of the German conversations, I managed to hook up with some folks who'd driven down from England (through the "Chunnel" under the English Channel), most notably Peter Rodmell, G3ZRS, owner of Linear Amp UK, and his lovely wife. We had a long and interesting talk about ham radio on both sides of the Atlantic.

Photo F. The Friday night barbecue outside the club station. No fancy banquets here, just stick-to-your-ribs wurst and plentiful beer! Lots of good conversation, too (mostly in German).

The Conference/ Hamfest Site

The Weinheim VHF Conference formally got under way Saturday morning. After a traditional German breakfast of cold cuts, cheese, rolls, and strong coffee at our hotel, we headed over to the conference. The hamfest part of the event was centered around about a half-dozen giant "tents." Each one had a wooden floor, hard plastic walls, and a fabric roof supported by metal arches that left the entire interior open and free of poles to bump into (see Photo G). There were also provisions for pumping in heat or air conditioning from outside units, but these weren't needed while we were there.

The biggest tent, housing the commercial exhibitors, was 400 feet long! The smaller tents, each only about 250 feet long, held additional exhibits, indoor flea-market spots, a food-service area, and registration/information booths. Outside was a sizable flea market, although it was pretty small in comparison to the major hamfests in the U.S. (see Photo H).

Inside, though, all of the major manufacturers were represented, as were virtually all of the European companies that made any VHF/UHF-related equipment. All of the major magazines serving the German ham market had booths as well. In the organizational "tent," DARC (Germany's equivalent of the ARRL) had several booths, including separate ones for its VHF/UHF specialty division and its educational division. The European Space Agency (ESA) had a large but unattended exhibit, and there were also booths from AMSAT-DL, AATiS (a ballooning-in-education group which N2IRZ reports on in this month's "Digital Data Link"), an amateur television group and ADACOM, a German digital group similar to TAPR. The ADACOM folks were so impressed with N2IRZ's column earlier this year on their "FlexNet" packet network that they posted a blown-up copy of it on a wall for everyone to look at (see Photo I).

The Conference Sessions

Conference sessions were spread out in nearby buildings, about a five-minute walk from the hamfest area. One innovative feature was the use of self-con-

Photo G. Inside the 400-foot-long commercial exhibitors' "tent" at the hamfest. It housed booths from all major manufacturers and German ham radio publishers.

Photo H. The flea market wasn't as big as those at some major U.S. hamfests, but it was always crowded—even when it rained, which it did on Friday night and Saturday morning.

tained, transportable ATV units to transmit the talks back to the main hamfest area. There were three talks scheduled for any given time slot (39 total), with an average attendance of 50 to 100 people at each session. My guess is that at least 600 people attended at least one session, which may not seem like a large number out of a total hamfest attendance of 8,000 to 10,000 hams, but that's two to three times the number of people who normally attend a VHF conference in the U.S. And just ask the organizer of any hamfest with forums how much he/she would give to have 600 or more people attending those forums.

The technical presentations covered a wide variety of topics, from introductory sessions on satellites, contesting, and general VHF operating to highly technical talks on transceivers designed by the speakers, high-speed digital links, and an experiment with digital voice transmissions on a 25-kHz-wide FM simplex channel. There were also sessions on propagation and even amateur radio astronomy. One of the highlights was a ham radio balloon launch on Saturday morning (again, see this month's "Digital Data Link"). Don and I were both impressed by the group's success in using ham radio and weather balloons to interest schoolchildren in technology and engineering. And as I wrote in last month's "Line of Sight," I was most impressed by the simple fact that so many people were designing and building innovative radios—a traditional part of ham radio that seems to have been lost on this side of the Atlantic.

Photo I. Translator, tourguide, and CQ VHF *"Digital Data Link" columnist Don Rotolo, N2IRZ, in front of an enlarged copy of his June, 1997, column on the German "FlexNet" packet network. The network operators posted the enlargement on the wall for all to see.*

Chinese Food, Castles, and Flamkuchen

Don and I accepted an invitation from the ADACOM folks to join them for dinner Saturday night, and when they asked if we were willing to go to a Chinese restaurant, we said, "Why not?" Well, now I know why not. I won't go into detail except to say don't eat Chinese food in Germany! (No bad jokes, please.)

After the conference ended Sunday afternoon, Don and I did some more castle sight-seeing (after visiting the well-known Heidelberg Castle, or "Schloss Heidelberg," on Friday) and couldn't escape ham radio even then. There are two castles overlooking Weinheim, one dating back to the 12th century and another one that was built early in this century, apparently as a retirement home for nuns. There's not much left standing of the older castle, but enough remains for a pricey "Biergarten," or beer garden, and an even pricier restaurant.

The newer castle is in excellent shape, and it also has a pricey restaurant as well as a climbable tower with excellent views in all directions (see Photo J). Before going up, we noticed a few antennas mounted at the top, and, as we made our way up the winding stairs, followed runs of hardline till we found several repeaters on various landings, including two ham repeaters. Line of sight from this tower is excellent (see the photo in "Digital Data Link"), so the repeaters must have excellent coverage.

We ended up back in the Marktplatz in downtown Weinheim for dinner Sunday evening, at the same restaurant where we had lunch on Thursday. We both had something called *flamkuchen*, which literally means "flame cake." Imagine a large crepe, cooked until it's crispy, then covered with your choice of toppings and baked. Don compared it to "a cross between a pancake and a pizza." However you want to visualize it, the flamkuchen was delicious!

After finally getting a good night's sleep, we checked out of the hotel on

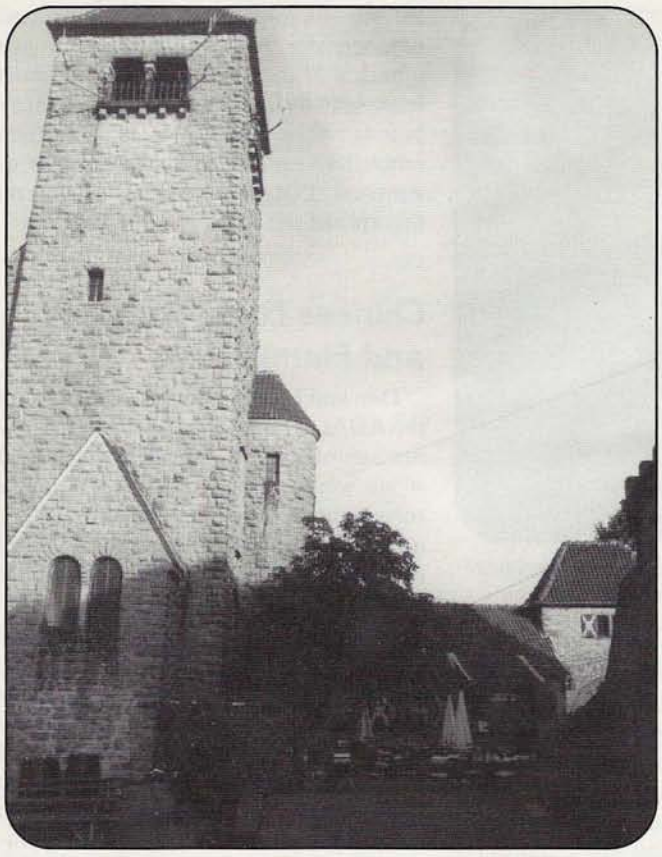


Photo J. Stone tower at one of the two castles overlooking Weinheim. If you look closely, you'll see several antennas mounted near the roof. Two of them are for ham repeaters.

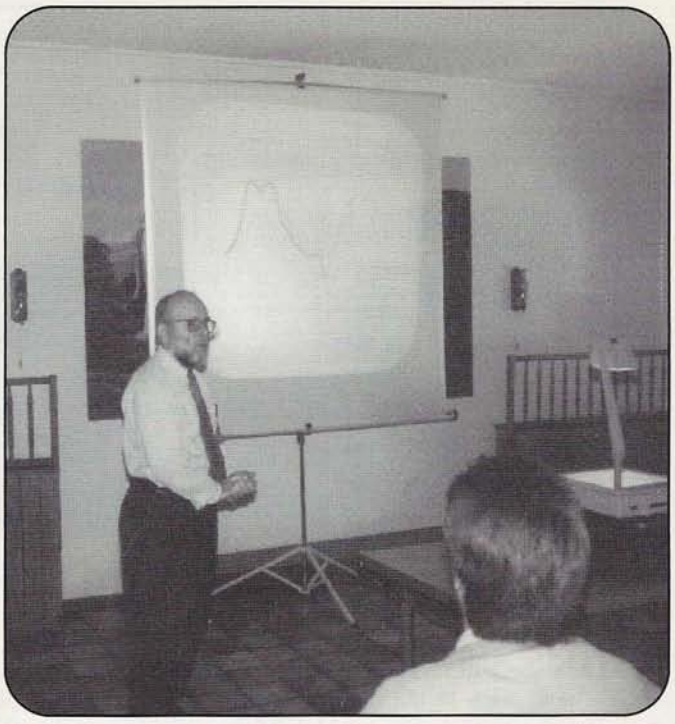


Photo K. Frantisek Janda, OK1HH, talks about propagation and the solar cycle. But he also told the audience how restricted ham radio, and life in general, had been in the old Czechoslovakia before "the changes in government" that ended the Communist regime there. Janda lives in what is now the Czech Republic.

Monday morning, and Don dropped me off at the Frankfurt airport before heading up to a business meeting in Bonn. The flight home was uneventful, except for boarding the plane at 1:00 p.m., and arriving in Newark at 4:00 p.m.—a "three-hour" flight that actually took nine hours!

Final Images

Any trip of this sort provides a bit of sensory overload, but there are a few things that will stand out in my mind. First and foremost are the friendships that ham radio produces, even among people who are otherwise complete strangers. People like Wolfgang Mahlke, DF1GW, who welcomed N2IRZ and me with open arms, held a barbecue at his home in our honor, drove us out to see the Weinheim club station, and was generally available to help us with whatever we needed while we were there. Or Henning Rech, DF9IC, already a good friend of Don's, who noticed me wandering aimlessly in the exhibits area and spent the next 45 minutes being my substitute tourguide/translator. Or Gunter Jost, DK7WJ, or any number of others.

But the images that will stick with me longest really have very little to do with amateur radio. One is the image of Frantisek Janda, OK1HH, a small man from the Czech Republic, and the matter-of-fact way in which he described the way things used to be in the former Czechoslovakia...before "the changes in government" (see Photo K).

Janda's specialty is propagation forecasting, and he's been writing weekly and monthly predictions for the past 20 years (he thinks the new solar cycle will be pretty similar to the past four, with best conditions likely between 1999 and 2003). And since 1996, he's been the Czech Republic's Beacon Coordinator, appropriate since beacons can be among the most reliable alerts to enhanced propagation, both on HF and VHF.

He's also recently become involved with packet radio—only recently because until "the changes," packet radio was illegal. In the old Czechoslovakia, Janda explained, all data networks, including packet, were prohibited, even for business and government uses. In fact, he told us, he worked for the country's civil aviation authority and *they* couldn't have a computer network. In a totalitarian state, I was reminded, easy access to information is downright dangerous!

And then there was Matjaz Vidmar, S53MV, from Slovenia. He gave a talk on building an SSB transceiver he's designed for your choice of 1296, 2304, or 5760 MHz, all with parts readily available in his country. This meant parts at least five to 10 years "out-of-date" here in the U.S., and technology several generations removed from the current "state of the art." And everything is much more expensive there than here. But what impressed me most about Matjaz was that, despite the limitations, he was out there designing and building.

How many 2304-MHz SSB transceivers are available in the U.S.? And 5760? How many American hams are taking advantage of the superior technology and lower prices available in this country by designing stuff like this?

This spirit of innovation, of making the most of what you have available, and the realization that the ability to communicate freely is a fragile thing—these are the images from Weinheim that will stay with me the longest. ■

A Handheld Satellite Station

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!

Imagine being able to make satellite contacts with an HT! *Well, you can*, on AO-27, the only current amateur satellite with an FM repeater on board. You do need to know when the satellite is going to be in range of wherever you are (Keplerian elements and free software to make sense of them are readily available on the Internet and on packet. There's also commercial software—with more features—available through AMSAT), but special equipment is minimal, as was demonstrated not once, but twice, at the annual AMSAT space symposium last October in Toronto (for a full report, see "What We Are Doing Here...IS Rocket Science" elsewhere in this issue).

Parking lot portable. KIØAG uses his handheld OSCAR Yagi to make a contact on the AO-27 satellite from the parking lot of the AMSAT conference hotel.

Chuck Duey, KIØAG, talks about his handheld Yagi for making AO-27 contacts with a dual-band HT. The three longer elements are a 2-meter beam for the uplink to the satellite, and the seven shorter elements are for the 70-centimeter downlink.

You can even do it with a duck! Here, veteran satellite operator Ray Soifer, W2RS, makes AO-27 contacts from another part of the parking lot, using a dual-band HT and an MFJ-1717 two-band rubber duck antenna. The antenna is 1/2-wave on 70 centimeters and 1/4-wave on 2 meters. Ray says a regular duck won't make it, and that Chuck's Yagi will provide an extra 15 dB of gain over his extended duck on the uplink and 10 dB of additional gain on the downlink. Even though that's significant, Ray was still able to make several contacts on this AO-27 pass, from New England to Alberta.

Yaesu VX-1R Dual-Band Micro HT

"They" say good things come in small packages. WB6NOA—back from field-testing on an Alaskan glacier—says "Here's proof!"

By Gordon West, WB6NOA*

"Too small!" he argues. "It's just right!" she insists. While the argument between OM and XYL continues on whether or not the new Yaesu VX-1R dual-band handheld is actually *too* small, nearly everyone who has one agrees that there's a lot more inside this radio than its diminutive size might suggest.

With no keypad, for example, you might assume Yaesu's new micro-HT can't do autopatch. Oh, yes it can! DTMF tone is selectable by the top knob, and up to 10 phone numbers can be pre-stored for quick autopatch operation.

But before we get into some of the "tricks" discovered after extensive field (*glacier?—ed.*) testing of the VX-1R, let's take a look at *all* of this radio's basics, and they're far from being just basic!

Full-Featured Dual-Bander

The Yaesu VX-1R is a full-featured, dual-band (2-meter/70-centimeter), amateur transceiver that monitors one band at a time and has 1/2-watt output on both bands. In addition to full 2-meter coverage, this micro-communicator transmits over a big 20-MHz chunk of the 70-centimeter band—from 430 to 450 MHz. This means that the VX-1R is all set to take advantage of the 430- to 440-MHz segment for remote base and FM satellite communications below 440 MHz (but please avoid the SSB/CW area around 432 MHz and the non-FM satellite frequencies between 435 and 438 MHz).

The radio also has super receive coverage, starting with the AM broadcast band and extending (with holes) to 999 MHz. Plus, it can be factory-modified to transmit on certain frequencies adjacent to the ham bands.

"Amateur operators who also hold valid licenses for MARS, CAP, and United States Coast Guard government frequencies may qualify for a free factory modification of this unit for their out-of-band transmit requirements," comments a Yaesu technical support representative, who also warns, "Under no circumstances should anyone try and perform transmit modifications on their own—there's a lot more to it than just clipping a diode." The factory insists that hams returning a unit to Yaesu for the free mod include copies of their official MARS, CAP, or U.S. Coast Guard frequency authorizations.

What Can You Do with Half a Watt?

I was surprised at how well 1/2 watt could access most repeaters. If the repeater is generally full quieting where you are, 1/2 watt out in the open will do the job nicely. If you're mobile, the optional EDC-15 cigarette lighter DC power cable will simultaneously charge your battery and supply more voltage to the HT, giving you slightly more than 1 watt of power output. During my recent review of this unit at the Anchorage Amateur Radio Club Hamfest in Alaska, I ran the 1-watt output to a 2-to-35-watt power amplifier. With 1 watt in, the amp produced a consistent 29 watts out for plenty of repeater talk-power on a small magnetic antenna.

At the 1/2-watt level on the internal lithium-ion battery (more on the battery in a minute), I measured 389 milliamps of current consumption on prolonged transmit. On receive, I measured 152 milliamps at medium volume, 42 milliamps squelched, and an average of 16 milliamps with the unit in the power-save mode, in which the receiver only comes alive momentarily to sample the frequency for activity. Turning the handheld off, I could only measure a couple of microamps, which is probably attributable to keeping the internal memory bat-

The Yaesu VX-1R dual-band handheld is smaller than palm-sized, but it's packed with features including full 430- to 450-MHz transmit coverage on 70 centimeters, and reception capabilities from the AM broadcast band to 999 MHz, including the 856-MHz public service band shown here. See Table for details of frequency coverage.

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

Table. Yaesu VX-1R Frequency Coverage

The Yaesu VX-1R has tremendous receive coverage in addition to its transceive capabilities on 2 meters and 70 centimeters. This is the complete list of frequencies covered by the radio.

Frequencies are receive only, except as noted:

500 kHz–1700 kHz	AM broadcast band
76 MHz–108 MHz	TV audio channels 5 & 6, plus FM broadcast
108 MHz–137 MHz	Airband AM
137 MHz–144 MHz	Narrow-band FM, government and FBI
144 MHz–148 MHz	2-meter ham band, receive & transmit, narrow-band FM
148 MHz–170 MHz	Narrow-band FM, rural fire & police, VHF marine band, & 24-hour weather broadcasts
170 MHz–222 MHz	Wide-band television audio, TV Channels 7 through 13
222 MHz–225 MHz	Ham "220" band, receive only
225 MHz–420 MHz	Government band, lots of juicy narrow-band FM signals
420 MHz–450 MHz	70-centimeter ham band, receive & transmit (transmit 430–450), narrow-band FM
450 MHz–512 MHz	Big city public safety band; police, fire, paramedics, GMRS, FRS, you name it. Includes 500 MHz "T" band public safety
512 MHz–806 MHz	UHF TV Channels 14 through 83, wide-band audio
806 MHz–999 MHz	Trunking radio systems, public safety around 856 MHz, ham reception around 902 MHz, cellular lock-out in place

tery alive. On auto-power-off during automatic shutdown, the unit pulls only a fraction of a milliamp.

Lithium-Ion Battery

The rechargeable lithium-ion battery pack is rather unique to the amateur radio industry, but not at all new to the professional telecommunications industry. Yaesu's 3.6-volt lithium-ion battery provides 700-mAh capacity, yet weighs only 33 grams (just over an ounce). Recharging the battery with the massive factory-supplied "wall wart" charger was quick, with a two-hour complete recharge after the battery was just about exhausted. And the battery really didn't get all that warm, either, during this quick-charge mode.

Plugging in the AC supply will allow you to listen to the radio without pulling down the internal battery. However, it won't charge while it's on, and transmitting with the radio plugged into the AC charger circuit will result in a 60-cycle hum that could very well cover up your CTCSS. While you might get through on simplex, chances are you wouldn't be heard on a local repeater.

I also noticed that there was a faint ticking noise when the radio was being charged and it was turned absolutely off, but I'm told that this is normal for the pulse type of battery charging used with these lithium-ion cells.

Emergency Power

When I was out on some of the Alaskan glaciers, I exhausted my lithium battery, but Chip and Janet Margelli (K7JA and WØMF) came up with a single "AA" alkaline battery and the optional FBA-20 battery case that allowed me to get back on the air and continue listening to a neat repeater in Seward, Alaska, and also provided some quick emergency transmit capabilities at 100 milliwatts output.

Now, you're probably wondering how this radio can still work with a simple 1.5-volt alkaline battery when it really "wants" 3.6 volts. This is because the optional FBA-20 battery case includes a DC-DC converter that takes the 1.5 volts out of the alkaline battery and doubles it. You can't do too much transmitting or listening on a single "AA" battery, but nonetheless, if you have the optional battery case, it could still give you a couple more hours of ballgame listening time when you have this little handheld tuned down to the AM broadcast band.

It's a Super Scanner, Too!

That's right, AM broadcast, plus a lot more VHF and UHF scanner receiving from the dual-conversion, superhet, "go anywhere" receiver! Take a look at the Table for a complete rundown of this radio's incredible receive coverage. As you will see, besides being the world's smallest dual-band ham transceiver with a built-in speaker to handle the 50 milliwatts of audio output, this micro-Yaesu is also a powerful programmable scanner. In fact, the VX-1R scans some juicy parts of the 300-MHz government bands that even dedicated programmable scanners may miss!

"This radio is designed around software and cloning, and that's why typical modification attempts by removing a diode won't work with this set—all of its 'brains' come from a computer download."

Flexible Memory Configurations

You can program your favorite transmit and receive ham frequencies and receive-only scanner channels into a choice of two memory configurations. Configuration Group I is good for ham channels, holding 52 memories which store repeaters and their associated transmit offset, plus power level and CTCSS encode/decode tones. Configuration Group II can hold 142 scanner frequencies including memory skip and alphanumeric memory labels. (Each memory channel can be labeled with an alphanumeric tag of up to six letters or numbers. The frequency display switches over to the label, and you select the characters you want to ID that specific channel.) My unit was shipped from the factory configured for Group I, giving me 52 duplex memories. If I was going to use it primarily as a scanning receiver, I could switch it over to Group II.

Both configurations will also hold your favorite 10 AM broadcast radio frequencies. But I noticed on the AM broadcast band that you don't get an actual kilohertz frequency readout. In all the other scanner and ham modes, however, the frequency reads out in megahertz along with any alphanumeric ID that you may have programmed in to remind yourself of what you've dialed up from the massive memory.

I found that loading VFO frequencies into memory was relatively easy. Press the function icon until the left corner of the LCD display blinks and a memory number appears above the frequency display. This is the lowest vacant memory channel available for storage. If the number doesn't blink, that channel is occupied. I then press the function right button one more time, and that's it. Recalling memory is as easy as toggling between the memory and VFO by pressing the M/V button.

It took a little time to learn that you don't switch between memories by reaching down and turning the top-mounted dial: doing so pops you back into the VFO mode. Rather, to cycle up or down in memory mode, you have to use the UP or DOWN buttons. If you forget and turn the dial, simply toggle back to memory mode. Whoever wrote the instruction book anticipated that this might be a problem and has a complete paragraph about what might happen if you accidentally turn the big knob, rather than push the UP or DOWN button.

Scanning Options

Like any good handheld scanner, the VX-1R can be set to hold for a few seconds after a transmission stops, instantly resume scanning after the carrier drops, or simply scan the entire band without your having to push a button or twirl a knob. Plus, any memory channel can be skipped at the press of a button.

There's also a feature called "smart search," which came in quite handy when I was searching for activity on the 300-MHz band. Once a frequency is detected with activity, it's stored in a special "smart search" memory bank, consisting of 31 memories: 15 above the current frequency, 15 below the current frequency, and the current active frequency itself. This increases the likelihood that you'll be able to pick up a response, even if it's on a different frequency.

Many of these "advanced functions" are detailed within a couple of pages in the well-written instruction manual. The "set mode" has 32 options, so you'll need to keep the manual handy to optimize your scanning and searching options.

One other thing...the VX-1R clones, too. I tried it and it works. But it requires Yaesu's *new* cloning software, and it won't clone with older versions. But the new software, "ADMS-1D," will work with older Yaesu radios as well as the new VX-1R. This radio is designed around software and cloning, and that's why typical modification attempts by removing a diode won't work—all of its "brains" come from a computer download.

On the Air

Down on the ham bands, transmitting and receiving were straightforward. I discovered one unique mode called "automatic range transpond" when walking through a swap meet and staying in touch with a buddy who had a similar unit. It uses the digital coded squelch system (different from the built-in CTCSS), and, every 15 seconds, my unit would transmit a one-second DCS "squawk." If the other radio was in range, the two units quietly "did their thing," indicating "**INRNG**" on the LCD display. But if my rig lost contact with the other Yaesu for more than about 60 seconds, my unit would beep and the display would indicate "**OUTRNG**."

Something else I liked—the radio can be set to automatically transmit your callsign every 10 minutes in MCW (modulated CW) to comply with FCC identification requirements. I'm just getting used to this feature, but I like not needing to worry about watching the clock.

For ham use, I recommend that you buy the optional Yaesu MH-34 speaker/microphone. It makes operating a little easier if you don't need to change channels very often. The microphone also allows for an earphone to be inserted at the bottom of the mic for quiet operation. And no, there's not a keypad on the mic for autopatch calls. But you can still manually or automatically generate telephone-style DTMF tones to control a repeater or to use a repeater or remote base for autopatch.

It's a little slow if you do it manually without storing the frequencies in the auto-dialer, so I suggest using the auto-dialer memory, which can hold up to 15 DTMF codes in eight DTMF memory slots. It took me about 20 minutes to get into the swing of memorizing the repeater autopatch upcodes, plus the telephone number. But once I got the hang of it, again after careful review of the manual, everything went well.

Antenna Options

The antenna goes into a microwave-type SMA jack. The short little antenna supplied with the radio is OK for local use, but a longer antenna gave me much better AM broadcast band reception, plus much-improved scanner reception on VHF and UHF. To attach an antenna with a BNC connector at its base or at the end of a feedline, you'll need an SMA-to-BNC adapter. You can get one at the same place you get the radio (Yaesu Part #CN-3) or at your favorite electronics store. I'd suggest buying two or three of these because they're so small and you'll probably lose one or two, like I did.

It's also important to not over-stress the radio's SMA connector. I'm just hoping that the actual connection inside the radio from the SMA to the circuit board is not a stiff wire because, if it is, and if you over-extend the SMA connector with too long of an antenna, you'll pop the connection right off the board. Yaesu's Chip Margelli says this radio has been well-engineered from the very beginning and that the designers anticipated that bigger antennas would probably be stuck on the top of the SMA.

Closing Thoughts

After using the Yaesu VX-1R for a month, I liked the set a lot if I needed a radio small enough to literally fit in my shirt pocket. Its audio isn't all that loud, but if you hold the radio up to your face it's plenty loud enough. The side-mounted power button is bright orange, and you really must mash it down to get it to turn on or off. Great feature! This means the radio can be carried in a pocket without accidentally turning on.

Words like "cute" or "a toy" don't really describe the power of this micro-transceiver. It is by far the smallest and least expensive ham radio dual-band handheld (it lists for $349 and has been seen selling for around $300), is packed with features, and runs just enough audio and power output to get the job done. And if you need more audio, or you want more power, or both, Yaesu offers a full line of accessories to tailor this micro-handheld to exactly how you plan to use it. And chances are, you'll be using it a lot! ■

Resources

To learn more about the Yaesu VX-1R, contact your favorite amateur radio dealer or the manufacturer directly at Yaesu USA, 17210 Edwards Road, Cerritos, CA 90703; Phone: (562) 404-2700; Fax: (562) 404-1210.

Soldering Tools for the Ham Shack

Having the right tool at hand makes any job go more smoothly. Nowhere is that truer than in soldering! Here's a guide to the soldering gear that every ham needs.

By Jim Aguirre, WB7DHC*

What should the well-equipped ham shack have in the way of soldering tools? First of all, there's no "one-size-fits-all." A lot depends on the kinds of projects you'll be working on. Let's take a look at some commonly available soldering tools and find out which ones may fit your particular needs. Then, we'll put together a "basic" and an "ideal" soldering tool kit.

Soldering Tool Basics

There are three basic types of soldering tools suitable for use around the ham shack: "pencils," "guns," and "soldering stations." Each one does a particular type of job well and is best used within those limits (see "What's Watt" for more on this subject).

"Pencils" are low-wattage soldering units with a straight-line design, meaning a hot tip on one end and handle/cord on the other. They're usually found in the 15- to 45-watt heat range. Among the units commonly available are Weller's WP-25 and SP-23 (both 25 watts), and the SP-40 (40 watts). Sears sells two models in its Craftsman line, the #9-54041 (30 watts) and the #9-54042 (45 watts). RadioShack offers several pencils in the 15- to 40-watt range, along with its #640-2055 dual-heat (15/30 watts) unit.

One of the advantages of the soldering pencil is that it can accommodate a variety of different tips, including regular pointed, slender pointed, and chisel. Just having the right tip can sometimes make the difference between a nice, clean solder connection and a botched job. I've also found that making a 30-degree bend near the end of a pointed tip allows me to get into tight spots that are otherwise a real challenge.

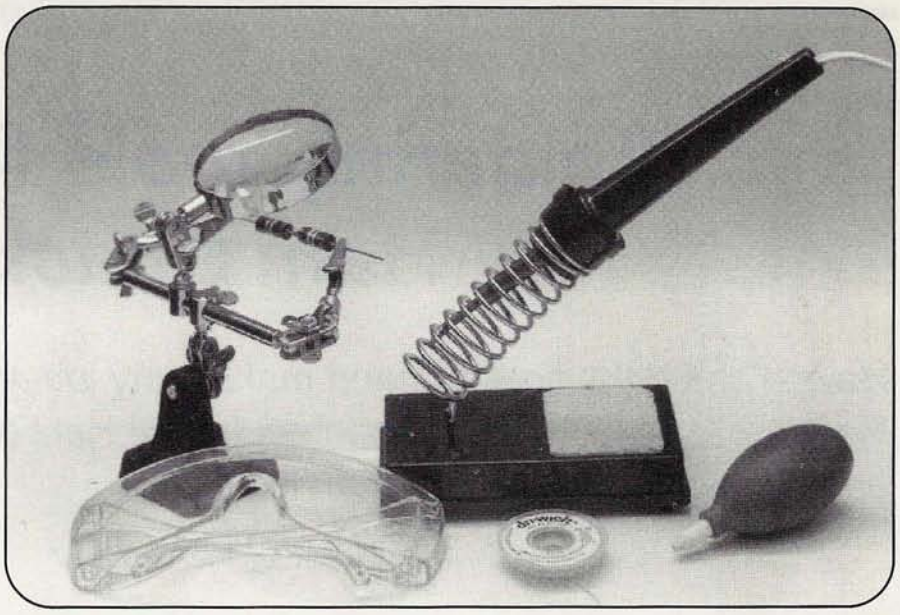
A good basic soldering kit consists of a 100/140-watt gun (upper left), 25-watt pencil (bottom), solder, safety glasses, and spare tips for the gun and pencil. (All photos by the author)

Solder "guns" are higher wattage soldering tools with a pistol-grip design. They are usually available in the 75- to 400-watt range. Especially useful are the dual-heat guns which provide two levels of heat simply by pulling the trigger back to the second position. Examples are the Weller 8200 (100/140 watts) and D550 (200/260 watts); Sears Craftsman #9-54045 (100/140 watts), #9-54046 (150/250 watts) and #9-27230 (150/400 watts); and the RadioShack #640-2187 (150/230 watts). My personal favorite is the older Weller D550 (240/325 watts) which is no longer available new, but can sometimes be found at hamfests for a reasonable price. My advice is to grab one if you find it. It uses the same tips as the newer D550, so there's no problem there.

Speaking of tips, the ones you'll find on soldering guns are pretty much confined to one style: a chisel point. They're

*Jim Aguirre, WB7DHC, lives in Preston, Washington. He describes himself as "an antenna builder, occasional kit assembler and general all-around electronic tinkerer."

"There are three basic types of soldering tools suitable for use around the ham shack: 'pencils,' 'guns,' and 'soldering stations.' Each does a particular type of job well and is best used within those limits."



Accessories like these make soldering easier and safer. They include (from left to right) a magnifier stand with clip arms, safety glasses (a "must-have"), a pencil-iron holder, a solder wick, and a desoldering bulb.

definitely not designed for fine work! In addition, for some soldering guns you can get specialty "knife" tips designed for hot-cutting various synthetic ropes and lines (poly, nylon, etc.). They're a handy addition if you use those materials often.

"Solder stations" are the ultimate in convenience for bench work, and they provide true temperature control capability, either by changeable tips or thermostatic controls. They're available in the 30- to 60-watt range and consist of a pencil-type tool attached to a box-like power unit. Solder stations range in price from about $100 to more than $600, so they're definitely not for the faint of pocketbook! Because they are lower-wattage units, they're not well-suited to soldering coax connectors and other heavy work. If you're into building kits or you do a lot of work with circuit boards, you'll probably want to look at soldering stations.

As with all tools, you can find good ones and you can find cheap ones, but it's rare to find a good tool at a cheap price! Buy professional quality tools, or at least a good quality consumer-grade that will last. You'll save money and frustration in the long run.

Specialty Soldering Tools

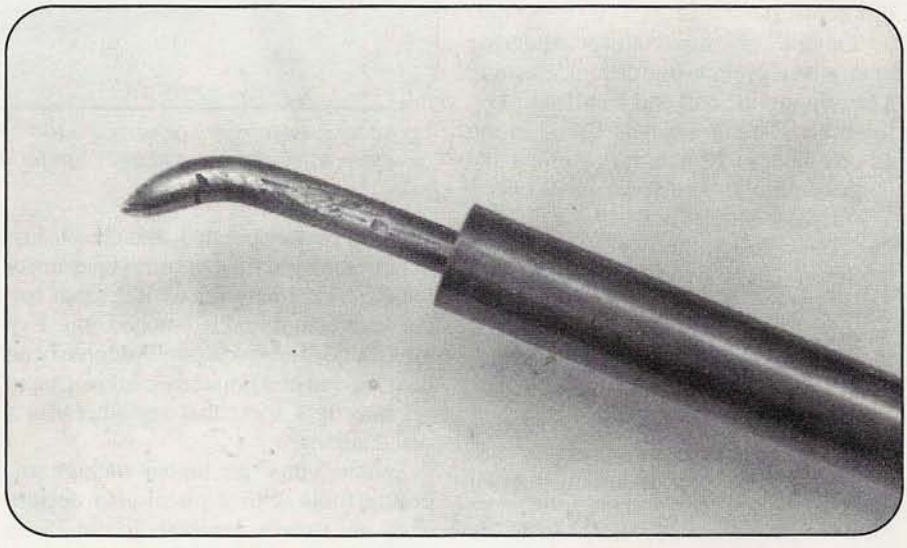
In addition to the basic units described above, there are several specialized soldering tools that are quite handy in certain situations. One especially useful item is the gas-heated soldering pencil. It has an adjustable heat range equivalent to a 10- to 60-watt electric pencil and can be used where no electric power is available. It uses readily available butane lighter fuel for heating and can operate for 30 minutes or more on a single charge. Refilling is easy, even out in the field. The Weller Portasol P-1-B and RadioShack Techline (#64-2182) are among the commonly available units of this type. Both also offer several accessory tips as well.

Another handy portable unit is the rechargeable or "cordless" soldering gun. Available in lower wattage units like the Weller Isotip 60 (60 watts), they provide medium-duty soldering capability away from an electric outlet. They're great around the shack, but they must be recharged periodically from 120-VAC power so their use in the field is somewhat limited.

RadioShack's "30-watt mobile" (#64-2105) soldering pencil is yet another portable option to consider. It operates on 12 VDC and plugs into your vehicle's cigarette lighter socket. This little unit might be just the ticket for Field Day or other portable activities.

Accessories

There are a number of useful accessories available that make soldering easier, better, and safer. One is a holder or stand to keep your soldering pencil from rolling around and burning everything in sight—including you! It's especially handy when you're doing "dining room table" projects. RadioShack offers one (#64-2078) for less than $7 that also



Putting a 30-degree bend in the tip on a soldering pencil makes getting into tight spots a bit easier. Be sure to remove the tip from the pencil prior to making the bend to avoid damage to the pencil body.

What's Watt?

Higher wattage in a soldering tool means more heating ability, but not necessarily higher temperature! Most soldering equipment, whether a 25-watt pencil or a 250-watt gun, generates temperatures in the 500- to 900-degree Fahrenheit range at the tip (60-40 alloy solder melts at about 365 degrees). However, component leads, wires, circuit board traces, coax connector bodies, etc. all draw heat away from the working point, reducing tip temperature in the process. Higher wattage units will maintain their tip temperatures longer.

For delicate jobs, soldering on circuit boards or around heat-sensitive components (for instance, tip cooling) is not a problem because the materials being joined are small and contact times are short. Here, a low-wattage tool works fine. As a general rule, use no more than 25 to 30 watts for soldering circuit boards and similar items.

General work, such as soldering antenna wires, is best done with a 100-watt gun. With the larger work surfaces involved, tip cooling begins to come into play. This is especially true if you're working outdoors when ambient temperatures are low. Overcoming this without resorting to overly long heating times requires more wattage. In the dead of winter, you may find that an outdoor job will require 250 watts or more, even though the same job could easily be done in July with a 100-watt gun.

As the soldering jobs get even bigger, you'll need still more wattage to maintain the proper tip temperature. For example, you should use a gun rated for at least 140 watts when installing a standard PL-259 connector on coax, a 250-watt unit is even better. Sure, you can use a 75-watt gun and eventually get things hot enough for solder to flow, but you'll melt the coax in the process! Using a higher-wattage gun instead, you can quickly heat the work area, flow the solder, and remove the heat without damaging the coax.

Remember...match the wattage to the job!

includes a sponge for cleaning the tip (be sure to keep the sponge wet!).

Another accessory I find especially useful is a magnifier stand with alligator-clip arms to hold small components (sometimes called a "third hand"). It's really handy to be able to position components and then concentrate on soldering instead of trying to hold everything together with one hand and hit a moving target with a soldering pencil or gun held in the other. I found my magnifier stand at a hamfest, but I've also seen them in hardware and electronics stores.

A somewhat larger accessory that performs a similar function is the Panavise unit with interchangeable heads. The circuit board holder and wide-jaw unit with rubber pads are two of my favorites. I frequently use the rubber-padded unit to hold coax when I'm soldering PL-259 connectors. By clamping the coax loosely in the rubber jaws, it's held steady and can be rotated easily, allowing access to all sides of the PL-259 for soldering.

The circuit board holder is a "must" if you do much work with pc boards. It consists of two vertical supports that slide in and out on a square bar to accommodate various board sizes. The supports are grooved to hold the circuit board securely in any position from vertical to horizontal, and one is spring-loaded to allow easy removal of the board for inspection or repositioning.

"As with all tools, you can find good ones and you can find cheap ones, but it's rare to find a good tool at a cheap price! Buy professional quality tools, or at least a good quality consumer-grade that will last. You'll save money and frustration in the long run."

Reverse Soldering

A couple of other accessories are useful for reversing the soldering process. When you need to "desolder" something, "solder wick" (available in most electronics stores) gathers up molten solder in much the same way as a paper towel picks up spills in the kitchen. Apply it to the molten solder and remove as much as you can, then clip off the saturated portion and repeat as necessary.

There are also "desoldering tools" available. They range from a simple rubber bulb with a high-temperature snout to semi-automatic spring-loaded units and a soldering pencil with a vacuum bulb permanently attached. I use the simple rubber bulb unit; it's cheap and works just fine. Simply heat the solder joint with a pencil or gun, squeeze the bulb, place the snout against the molten solder and allow the bulb to "inhale." It slurps up the solder and deposits it inside the bulb for later removal. RadioShack sells one (#64-2086) for about $3.

A note of caution here: **Never** blow solder out of a joint with air pressure! This is extremely dangerous and can result in a serious eye injury! In addition, it splatters molten solder into places where it shouldn't be, creating potential short circuits and generally wreaking havoc on whatever you're trying to solder.

And of Course...Solder

The other basic component in the soldering equation is solder itself. For all electronics projects, a good quality rosin core solder in the 60-40 alloy is recommended. Never use acid core, or "plumber's," solder of any kind as it leaves corrosive residues behind.

Several sizes of solder are available, with .062", .050", and .032" being among the most common. The .062"-size is probably best for all-around use while the smaller .032"-size is very handy for fine work. A well-equipped ham shack should probably have both. Buy the half-pound spool; it's a handy size to work with and is less expensive in the long run than smaller quantities.

The "Basic" Tool Kit

OK, so with all the choices out there, what should you buy first? As noted previously, no single soldering tool does everything well; however, the 100/140 dual-heat gun probably comes the closest. It will do most of the general soldering you'll encounter and, at the 140-watt level, will do a respectable job of soldering things like coax connectors and larger antenna wires in most cases. This should be your first purchase. Next, fill out your basic kit by adding a 25-watt pencil for those smaller jobs and a holder to keep it from rolling around. Be sure to buy spare tips for both.

"...no single soldering tool does everything well; however, the 100/140 dual-heat gun probably comes the closest....This should be your first purchase."

Even the "basic" soldering kit is incomplete without safety glasses! Buy a pair and use them! It only takes one splatter of molten solder in the eye to change your life! Don't take the chance.

Finally, don't forget a half-pound spool of .062" rosin core solder in the 60-40 alloy, and a second half-pound spool in the .032" size is highly recommended. You should be able to put this basic kit together for less than $80.

The "Ideal" Tool Kit?

When putting together the "ideal" soldering tool kit, a lot depends on both your wallet and the kind of work you'll be doing. I'm an antenna builder, occasional kit assembler, and general all-around electronic tinkerer. So, for my money, the ideal complement of soldering tools starts with the basic setup described above and adds a second dual-heat gun in the 150- to 350-watt range for heavy work. Then, I'd slip a butane-heated pencil into my tool kit for Field Day and portable operations.

If you do a lot of kit building or production-type work, you may want to top off the whole thing with a solder station. Don't forget spare tips for all the soldering equipment and a large can of butane lighter fuel for the portable unit.

Accessories are what really "make" the ideal soldering tool kit, however. Add at least some solder wick, a rubber desoldering bulb, and a magnifier stand. I'd also add a Panavise unit with circuit board and wide-jaw heads! Put it all together and there aren't many soldering jobs you can't handle!

Cost for the "ideal" package—not including the solder station or Panavise unit—should be around $200. Add about $120 for the Panavise, including optional circuit board head. A solder station will add an additional $100 to $600.

Hamfest Bargains

Don't forget to check out the next hamfest for soldering equipment; you may be able to shave a considerable amount off the cost of assembling your tool kit. I frequently find good 100/140 or 240/325 dual-heat soldering guns selling in the $2 to $5 price range at hamfests. Be sure to plug in the unit and check to see that it works. The good thing about a soldering gun is that it either works or it doesn't.

A good, high-wattage solder gun is best for soldering coax connectors and heavy antenna wires. This early version of the Weller D-550 provides an ideal 240/325 watts of heating power for big jobs. Current models provide 200/260 watts and are still adequate for this work.

I recently bought one of the older Weller D550 240/325-watt dual heat units at a hamfest for a buck! It worked, but had a cracked case. For about $10, I bought a new case from the local Weller dealer, added a new tip, and came out with one that looked and worked as if it were new—for less than $15. That's about one-third the cost of a new one!

You'll also find used soldering stations being sold at hamfests as well. These, however, are a bit more iffy. Most have been heavily used in a production environment and show it. Unless you find a really clean one from a seller you know (or at least can find again if the unit is defective), be very careful about buying one at a hamfest. Interestingly enough, most of the ones I've seen were priced at not much less than the cost of a new one.

Magnifier stands and Panavise units also show up at hamfests occasionally. I recently found a complete Panavise set, including base, circuit board holder, regular head, and wide-jaw head plus accessory C-clamp mount for $35, all brand new in the box. It always pays to keep your eyes open!

Wrapping Up

Well, there you have it—a blueprint for the basic soldering tools that every ham needs, with steps for customizing your toolkit according to your interests and your budget. Once you have the tools together, learn the basics of good soldering techniques (if you don't already know them) from an experienced ham or the tips in this magazine, then go out (or is it *in*?) and build something! ■

A Panavise unit holds larger jobs to make soldering easier. Several different heads are available for the unit, including a circuit board holder.

CQ VHF Ham Radio Above 50 MHz

Reader Survey—January, 1998

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

Each month, we'll ask a few different questions and ask you to indicate your answers by circling certain numbers on the Reader Service Card and returning it to us (we've already paid the postage). And, as a bit of an incentive, we'll pick one respondent every month and give that person a complimentary one-year subscription (or subscription extension) to CQ VHF.

In this month's "Line of Sight," Senior Contributing Editor Gordon West, WB6NOA, calls for the FCC to recognize currently voluntary band plans in its amateur rules and to require compliance with them. We'd like to gauge your views on the issue.

1. Please indicate your level of familiarity with the band plan(s) for the band(s) on which you operate:	**Circle Reader Service #**
Very familiar	**1**
Somewhat familiar	**2**
Unfamiliar	**3**
What's a band plan?	**4**
2. Please indicate how much of a problem you perceive in your area in interference between incompatible modes (e.g., FM & SSB) due to poor band plan compliance by other amateurs:	
Severe problem	**5**
Moderate problem	**6**
Slight problem	**7**
No problem	**8**
Don't know	**9**
Don't care	**10**
2. Please indicate your personal level of compliance with the band plans (avoiding operation in band segments designated for other modes):	
I'm very careful to comply	**11**
I try to follow the band plan	**12**
I don't think much about it	**13**
I only follow FCC rules, not rules made by other hams	**14**
4. Please indicate how often (if at all) you personally have encountered interference problems due to poor compliance with band plans:	
Regularly	**15**
Occasionally	**16**
Rarely	**17**
Never	**18**
5. Please indicate how you think interference between incompatible modes should best be handled:	
Ignore it or change frequency	**19**
Improve education	**20**
"Peer pressure"	**21**
FCC rulemaking	**22**
Survival of the fittest	**23**
6. Please indicate what action, if any, the FCC ought to take regarding band plans and protection of interference-susceptible modes:	
Set band segments for each mode	**24**
Require compliance with ham-established band plans	**25**
Recognize and urge compliance with ham-established band plans	**26**
Leave rules as they are	**27**

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

What You've Told Us...

Our October survey asked about your involvement in public service and emergency communications. From the looks of the responses, it appears that most people who aren't at all involved in this aspect of amateur radio did not reply at all (e.g., 38% of this month's respondents belong to ARES versus 28% only a few months ago). So let's look at these numbers as being representative of *CQ VHF* readers who are at least somewhat active in public service.

Nearly two-thirds of you (64%) say you've participated *at least once* in a real emergency, and one-third of you (33%) say you do it regularly. Next on the list is public service events/activities (62% at least once/39% regularly); severe weather nets (57%/42%, #1 in regular activity); emergency training nets (50%/35%); emergency/disaster drills (48%/30%); other public service activities (46%/32%); message-handling (traffic) nets (41%/22%); and disaster communications (38%/21%).

As for membership in public service organizations, SKYWARN led the pack (41%); followed by ARES (38%); public-service oriented ham clubs (35%); RACES (24%); and other emergency/public service groups (also 24%). Then there was a sharp drop-off to MARS (7%); search and rescue groups (6%); REACT (also 6%), and the Civil Air Patrol (2%).

Finally, we asked if you personally feel prepared to respond effectively in a disaster or major emergency, and 80% said "yes"; 10% "not sure"; followed by 7% "no"; and 3% "not interested."

Thanks for *your* interest in our surveys. This month's winner of a free one-year subscription is Thomas O'Brien of Seabrook, Texas.

A 6-Meter AM Experiment on the World Wide Web

Out with the old and in with the new? Not for KC6WFS. He's combining both—so-called "Ancient Modulation" (AM) and the World Wide Web. Read on...

By Dave Booth, KC6WFS*
kc6wfs@juno.com

Last March, I was working a "swing" shift and would hold nightly mobile-to-mobile QSOs with Bill Pasternak, WA6ITF, of "Newsline." Bill and I also happen to be neighbors in the Santa Clarita Valley, living less than a half mile from one another. And when the weather is nice, it's not unusual for Bill to drop by my house on his trek home to spend a few minutes in my Jacuzzi. Yes, I am one of those "dreaded Californians" with a hot-tub out back. Then again, that's part of living here in the "Southland." When it's not raining, shaking, or smogging, it's a pretty good place to live.

Anyhow, Bill and I were sitting in the Jacuzzi on that March day (*we spared you that photo—ed.*), watching a 737 start its descent toward Burbank Airport, when Bill casually mentioned that he'd be suggesting in an upcoming "Newsline" report that "any people with 6-meter AM gear should try a 'fun' experiment." Bill proposed that, starting in May, anyone with old 6-meter AM equipment should get on 50.400 MHz (the unofficial 6-meter AM calling frequency) and call "CQ" at least once a day.

The author at his station in Santa Clarita, California. The radio with the white faceplate and black dials is a Gonset G-50 AM transceiver. To its right (behind the Astatic D-104 "lollipop" mic) is a Swan 250 SSB rig, both for 6-meters. (WA6ITF photo)

Back to the "Good Ole Days"

"AM? Why AM?" I asked. Bill responded that there was no reason to think that DX on 6 meters is "mode dependent." He told me of the early '60s, when AM was the only voice mode used on 6 meters, and that when he first got on the band in 1959, he regularly heard stations talking coast-to-coast on AM, using 4-watt transmitters, simple super-regenerative receivers, and dipole antennas.

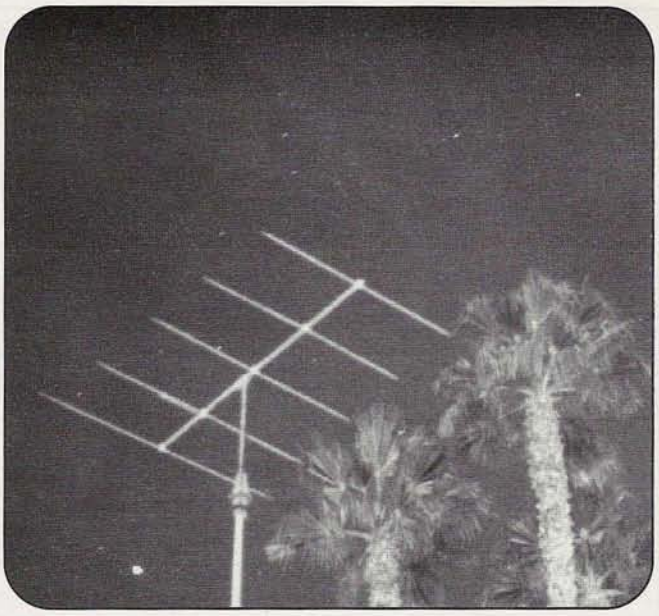
He recounted the day that he listened as Marie Simon, K2YEA, on Long Island, New York, talked to a station in Japan. Marie's station consisted off a 40-watt Lettine transmitter, a receiving converter, an old Hallicrafters receiver, and Telrex four-element beam. Nothing fancy and the mode was AM.

Bill also told me about *his* first QSO. It was from Brooklyn, New York, to Orlando, Florida, with Bill transmitting and receiving on an indoor random-length longwire antenna...on AM.

Returning to 1997, Bill said he feels 6 meters needs more activity, and that even during some band openings, you can sit there for hours copying beacons, but not hear a soul calling CQ. He added that there is a lot of old 6-meter AM gear out there, with much of it crystalled to that

*Dave Booth, KC6WFS, is a Graphics Specialist for Pacific Title Digital in Hollywood. In his spare time, he enjoys VHF DXing. especially on 6-meter AM, and maintains the 6 AM World Wide Web site that he developed.

Bill Pasternak, WA6ITF, checks out the 6-meter Halo antenna on the author's car. Remember not to touch it while he's transmitting, Bill! (KC6WFS photo)



The author's 6-meter beam, highlighted against a night sky. For those of you into photography as well as ham radio, Bill says it was a 30-second exposure at f/1.4 with fill flash, using Agfa XRE-400 film. (WA6ITF photo)

"unofficial AM calling frequency" of 50.4 MHz. Actually it was 50.4 *Mc*, or *Megacycles*, when most of those rigs were built (*MHz, or Megahertz, means Megacycles per second—ed.*).What is "crystalled," you may ask? Many radios from the '50s and '60s, including most VHF rigs, were "crystal controlled." Their operating frequency was determined by a specially cut quartz crystal which was plugged into the crystal oscillator circuit. Changing frequencies required changing crystals.

Finally, Bill said the AM mode *sounds* terrific, because of its very wide bandwidth. The average AM signal can be up to 15 or more kHz wide, depending on the "fidelity" the station is producing. Compare this to ±5 kHz (10 kHz total bandwidth) for narrowband FM and 3 kHz overall for SSB. Realistically, 6 meters is probably the only one of our lower VHF bands that isn't too crowded to host AM operation.

The Plan

Bill's plan to stir up activity was simple. He would use "Newsline" and his column in *Worldradio* magazine to let hams worldwide know that the experiment would run all summer. He would also suggest that those taking part post the time (UTC or local) that they planned to operate onto the "W6YX VHF reflector" so that other VHF operators would know when to listen (see "What's a Reflector, Anyway?" for more on Internet reflectors). In that way, all of us taking part would become "beacons" for one another. Who knew how many QSOs would result? In a few months, we would be able to compare notes an see if SSB (single sideband) was really that much better than AM when six is wide open!

Well, he got me hooked! I had only run SSB on six and was interested in this experiment from the start. I was able to run AM on my Yaesu FT-680R, so I listened every day on 50.400, and called "CQ" about every half hour. Within a week or so, I actually had two or three DX QSOs!

Putting AM on the Web

After a few days, I called Bill and asked him what he'd think if I took the experiment one step further by creating a World Wide Web page dedicated to 50.400 AM. This would permit any ham with Internet access to watch and participate in the experiment's progress. Bill thought it was a good idea, so away I went.

The 50.400 AM Web site is at <http://www.geocities.com/Hollywood/5860/50am.html>. The pages are simple, with the "home page" giving a brief description of the "fun test" and how to subscribe to the "W6YX VHF reflector."

AM Nets

The Web site also features a page on AM nets that gather on the longtime meeting channel of 50.400 MHz. A few cities have nets once a week. (See "Some Active 6-Meter AM Nets" for a short list.)

Also on the AM home page is a very well-written article on "Receiving Weak Signals," by well-known VHF/UHF DXer Ken Ramirez, N4UK. There's also a log section in which I keep a log of all the QSOs that are reported to me. If you have a DX QSO with someone, send me the callsigns, date, time (UTC or local), and grids, and I'll post it in the log section along with all the others.

Radios Old and Older

The Web site also includes a page dedicated to "Old 6-Meter Rigs." And we are talking "old," as in pre-1970! Many of these transceivers cost hundreds of dollars when they were new. Nowadays,

Some Active 6-Meter AM Nets

Net Name	Day	Time	Frequency
So. Cal 6-m Club	Sunday	10:00 a.m. PT	50.400 MHz
Wadsworth, Ohio	Sunday	10:00 a.m. ET	50.550 MHz
Northwest AM Net	Sun./Weds.	8:00 p.m. PT	50.400 MHz
Arizona AM Net	Saturday	8:00 p.m. MT	50.400 MHz
Washington, DC	Sunday	9:00 a.m. ET	50.400 MHz
Cape Cod (MA) Area	Saturday	8:00 a.m. ET	50.400 MHz

Here are the meeting dates, times, and frequencies of a few of the active 6-meter AM nets. I've been told that the Washington, DC net (The Sunday Morning Coffee Net) is one of the oldest continuous VHF nets in the U.S., dating back to the beginning of the old 5-meter band! Five meters, which became available to radio amateurs after World War II, was the predecessor of the modern 6-meter allocation.

most are of interest only to "collectors" and can be bought for $20 or so at hamfests and swapmeets.

I'm the first to admit that $20 might not buy you a "mint" radio, but, with some work, these rigs can be made to work as well as they did when they were new. That includes the noticeable receive and/or transmit VFO frequency drift! In the 1950s and 1960s, some amount of frequency drift was acceptable as well as expected. How things have changed!

Here are a few of the radios that are listed on this Web page:

Hallicrafters SR-34 (1958)—6 & 2-meter transceiver that was a decade ahead of its time!

Clegg 99er (1960)—Double-conversion superhet receiver, 7-watt crystal (Xtal) transmitter.

Polycom 6n2 (1961)—Great looking, but built in transmit VFO drifts badly. Uses Xtal control.

Polycom 6 (1962)—Blue faceplated, 6-meter only version of above. Less VFO drift and better transmit audio.

(I'm still looking for JPG images for a lot of the radios. Soon I hope to have images for all of them.)

WARNING, Will Robinson! WARNING!

At this point, let me stop and issue a stern warning: Most, if not all, of these older radios are of the tube type and the voltages running through these radios are *very high*! If you need to do some work on the inside of the radios, be sure to follow this advice:

"If you do not know how to work safely around tube-type radios and the potentially lethal voltages at which they operate, then keep both hands in your pockets!"

If you *do* know how to work safely around tube-type equipment, be certain to stand on a rubber mat to isolate yourself from ground. and keep one hand in your pocket. If you do *not* know how to work safely around tube-type radios and the potentially lethal voltages at which they operate, then keep *both* hands in your pockets! The high voltages in these radios can *KILL* you. If you need to, get help from another ham who has experience with them.

Please Sign the Guest Book

The Web site also features a "Guest Book" that is being used for people who don't want to subscribe to the VHF reflector (which has a very large volume of messages, most of which are *not* related to 6-meter AM). In the guest book, we ask everyone to note, in UTC or their local time, when they plan to be monitoring or calling CQ. I have found this to be a very good tool to keep us informed on who is out there. I also keep notes on the page of QSOs that I have, so we all can look at them and compare notes in the future. Here is a sample from last May:

"On 5/23/97 when I was out there, no activity on 50.4! I called "CQ" on 50.125 SSB and got some folks from up north to QSY (*change frequency—ed.*) to 50.4 AM. It was very nice to hear Pat, K7YIR. on 50.4 AM, since we had been trying to work each other for about 2 weeks! One odd note was that Pat was having a QSO with a friend, K7NQ, who only lives 40 miles away from Pat and I could not work him."

If there's not a lot of AM activity in your area (and there probably isn't), you may also want to try this joint SSB/AM approach. I monitor both 50.125 (the SSB calling frequency) and 50.400, listening for openings. When I hear faraway stations starting to come in on .125, I know where to aim my antenna and I start calling CQ on 50.400.

The Way I Operate

As I've become more interested in 6-meter AM, my station has grown beyond that original FT-680R. My 6-meter rigs now also include an ICOM IC-726, a Swan 250 on SSB, and a vintage Gonset G-50 Communicator on AM. Like the FT-680, the IC-726 is a good 6-meter radio. It puts out 10 watts on AM and gets good audio reports. The receive sensitivity is good (perhaps a tad better than the 680), letting me hear the weak stuff well.

The Swan 250 puts out 70 to 80 watts and also has a very good receiver. I get the best audio reports from this radio. The main drawback is that, as a tube radio, it takes about two hours to stabilize before it stops drifting! (This is why so many rigs from that time were crystal controlled.

Best of all on AM, though, is the Gonset G-50. Yes, I know that it's a bit older than I am, but it was another radio that was well ahead of its time yet, somehow, right for its time, too. In a box the size of one of those old very large table radios of days gone by, Faust Gonset, W6VR, was able to package a nifty and sensitive tunable receiver, a 48-watt input plate-modulated transmitter and the most stable transmit VFO of its time.

This hand-crafted piece of ham radio history has survived through the ages and still performs admirably. I've been told that, 40 years ago, it was easy to tell who

What's a Reflector, Anyway?

An Internet *reflector* or *remailer* is nothing more than an electronic mailing list. When someone sends information or an announcement to the reflector, it gets automatically "re-mailed" to everyone who has "subscribed" (at no cost) to that list. For VHF DXers, it's a good tool to keep up to date with band openings. The advantage to the sender is that a single message can reach many people with similar interests all over the world.

Here is a sample of an e-mail message you might get from the VHF reflector:

Subj: Re Saturday Looking west
Date: 97-09-27 14:29:14 EDT
From: jordana@nucleus.com (Jordan Arndt)
Sender: owner-vhf@w6yx.stanford.edu
Reply-to: jordana@nucleus.com
To: vhf@w6yx.stanford.edu

Here it is Saturday Sept. 27th and I'm looking East from DO-21 on 6-432 and hearing nothing...No Au this A.M. perhaps tonite I'll go look at a solar info site and check-out the forecast...For those interested I'm QRV now on 222 with 18 ele Stacked Quagi's 9 ele each...and 150 watts...See Ya...

73 de Jordan VE2SWL/VE6...

Submissions: vhf@w6yx.stanford.edu
Subscription/removal requests: vhf-request@w6yx.stanford.edu
Human list administrator: vhf-approval@w6yx.stanford.edu

With this information, you'll be able to see who is ready from where to try for a QSO on bands above 50 MHz. I'll often view the postings while at work and when lunch comes around, I know whether I might be able to get in on some good DXing from my mobile.

About the VHF Reflector

The W6YX VHF reflector focuses primarily on VHF/UHF "DXing" (weak-signal operating on SSB and CW, and a little bit of AM) and related topics. If you post messages about FM, packet, or satellites, you'll most likely be "flamed," or find yourself on the receiving end of a barrage of nasty messages. But if non-FM operating is what you like to do on VHF, then you'll find a lot of useful information on this list. To join, or "subscribe," send an e-mail message to <vhf-request@w6yx.stanford.edu>. It doesn't matter what, if anything, you put in the subject line (it's ignored), and just type the word "subscribe" (without the quotes) on the first line of your text. That's it. Don't write anything else. Just send the message. Soon, you'll get a robotically originated reply telling you that you're on the list. After that, you'll never go hungry for e-mail again!

Newsgroups

Newsgroups operate on something called USENET, which is a computer network that predates the Internet as we know it today. Newsgroups are very similar to the forums on AOL or CompuServe, or to telephone bulletin boards (or to old-time packet bulletin boards) except that they're linked to Internet providers worldwide. Messages posted to a newsgroup are listed on a master menu, and you select which ones you want to download and read. If you don't know how to join and use newsgroups, check with your Internet Service Provider for details.

was running a Gonset-built radio because its transmitter audio stood out from all the others. Today, the stations I work using this relic of the late 1950s tell me it's the best AM audio that they've ever heard. Some things never change.

The mic I use with the G-50 is itself a classic: the Astatic D-104. As any dyed-in-the-wool, 6-meter AM DXer (*and a whole lot of other folks—ed.*) will tell you, "Nothing cuts through the band noise like a D-104." The D-104, also known as the

Mr. NiCd **THE BEST BATTERIES IN AMERICA!**

NEW YEAR '98 SPECIALS!

NEW for ***YAESU*** *FT-50R / 40R / 10R:*			
FNB-40xh Slim-NiMH	7.2v	650mAh	$41.95
FNB-V47 (NiCd)	7.2v	1200mAh	$39.95
FNB-47xh (NiMH)	7.2v	1800mAh	$49.95
FNB-41 (5w NiCd)	9.6v	700mAh	$39.95
FNB-41xh (5w NiMH)	9.6v	1000mAh	$49.95
BC-601c	Rapid/Trickle Charger		$64.95
For ***YAESU*** *FT-51R / 41R / 11R:*			
FNB-31 pk.	4.8v	700mAh	$33.95
FNB-38 pk. (5w)	9.6v	700mAh	$44.95
BC-601b	Rapid / Trickle Charger		$64.95
For ***YAESU*** *FT-530 / 416 / 816 / 76 / 26:*			
FNB-26 pk.	7.2v	1200mAh	$29.95
FNB-27s pk. (5w)	12.0v	800mAh	$35.95
BC-601a	Rapid / Trickle Charger		$64.95
For ***YAESU*** *FT-411 / 470 / 73 / 33 / 23:*			
FNB-10 pk.	7.2v	600mAh	$20.95
FNB-11 pk. (5w)	12.0v	600mAh	$24.95
FBA-10	6-Cell AA case		$14.95
BC-601a	Rapid / Trickle Charger		$64.95
Packs for ***ALINCO*** *DJ-580 / 582 / 180 radios:*			
EBP-20ns pk.	7.2v	1500mAh	$29.95
EBP-22nh (5w)	12.0v	1000mAh	$36.95
EDH-11	6-Cell AA case		$14.95
For ***ICOM*** *IC-Z1A / T22-42A / W32A / T7A:*			
BP-180xh (NiMH)	7.2v	1000mAh	$44.95
BP-173 pk. (5w)	9.6v	700mAh	$49.95
BC-601d	Rapid / Trickle Charger		$64.95
For ***ICOM*** *IC-W21A / 2GXAT / V21AT:(Bk. or Gr.)*			
BP-131xh (NiMH)	7.2v	1350mAh	$39.95
BP-132s (5w)	12.0v	850mAh	$39.95
BC-601e	Rapid / Trickle Charger		$64.95
For ***ICOM*** *IC-2SAT / W2A / 3SAT / 4SAT etc:*			
BP-83 pk.	7.2v	600mAh	$23.95
BP-84 pk.	7.2v	1200mAh	$34.95
BP-83xh (NiMH)	7.2v	1350mAh	$39.95
BP-90	6-Cell AA case		$15.95
For ***ICOM*** *IC-02AT etc &* ***REALISTIC*** *HTX-202:*			
BP-8h pk.	8.4v	1400mAh	$32.95
BP-202s pk.	7.2v	1400mAh	$29.95
IC-8	8-Cell AA NiCd / Alkaline Case		$15.95
BC-350	Rapid Charger		$59.95
For ***KENWOOD*** *TH-79A / 42A / 22A:*			
PB-32xh (NiMH)	6.0v	1000mAh	$29.95
PB-34xh (5w)	9.6v	1000mAh	$39.95
KSC-14	Dual Rapid / Trickle Charger		$64.95
For **KENWOOD** *TH-78 / 48 / 28 / 27:*			
PB-13T (w/chg.plug)	7.2v	600mAh	$23.95
PB-13xh (NiMH)	7.2v	1350mAh	$39.95
BC-15A	Rapid / Trickle Charger		$64.95
For ***KENWOOD*** *TH-77, 75, 55, 46, 45, 26, 25:*			
PB-6 (w/charge plug!)	7.2v	600mAh	$27.95
PB-8 pk. (5w)	12.0v	600mAh	$32.95
KSC-14	Dual Rapid / Trickle Charger		$64.95
For ***STANDARD*** *C-628A / C558A / 528A / 228A:*			
CNB-153 pk.	7.2v	1200mAh	$29.95
CNB -152 pk. (5w)	12.0v	800mAh	$32.95
For ***STANDARD*** *C-168A / C468A:*			
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CIRCLE 74 ON READER SERVICE CARD

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In Conclusion

Over the next few years, as the sun cycle moves toward its next peak, we'll begin to see many more and "longer" openings on six. Needless to say, I'm really looking forward to this, along with most other 6-meter enthusiasts. And when six *does* open up, don't overlook AM on 50.4! It's a mode that few people use any more, which makes it especially enjoyable when the band opens up since the frequency won't be crowded and you can have a nice, long DX chat with the other person instead of that fast "QSL, 73, QRZ" exchange. And, as for our "summer fun experiment," well, it's still going strong! ■

Resources

Here are some good places to start looking for some of the older tube-type radios. All are "reflectors" found on the Internet:

VHF reflector <vhf@w6yx.stanford.edu> (general non-FM/non-packet VHF topics)

GLOWBUGS reflector <glowbugs@www.atl.org> (topics related to tube-type radios)

BOATANCHOR reflector <boatanchors@theporch.com>: (topics related to big, heavy, old "boatanchor" radios)

There are also these "newsgroups" found on USENET (see "What's a Reflector, Anyway?" if you're not familiar with newsgroups):

rec.radio.amateur.boatanchors (see BOATANCHOR reflector description)

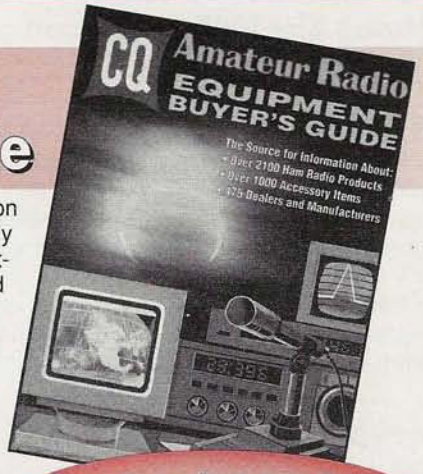
rec.radio.amateur.homebrew (topics related to home-built radios)

rec.radio.swap (buy/sell/trade notices)

Finally, if you want to send me questions or comments, my e-mail addresses are <booth@pactitle.com> and <kc6wfs@juno.com>.

The book you've been waiting for...

CQ Amateur Radio Equipment Buyer's Guide



This information-packed book is your most reliable, unbiased source for detailed information on practically every piece of Amateur Radio equipment and every accessory item currently offered for sale in the United States. From the biggest HF transceiver to Ham computer software, it's in the CQ Amateur Radio Equipment Buyer's Guide, complete with specs and prices. There are over 2100 product listings (3100 including transceiver accessories!).

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Reader Snapshot!

Meet CQ VHF Reader...David Christmas, VK4DJC

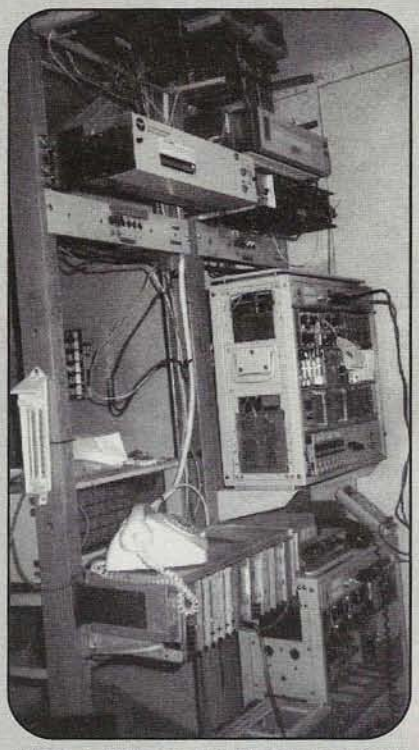


Photo A. Being nearly 50 miles out in the Coral Sea, Heron Island's telephone system uses UHF radio to connect to the Australian mainland. This is the island's 12-channel radio telephone system.

Hi. I live and work at Heron Island Resort, on an island in the Coral Sea 75 kilometers (about 47 miles) offshore from the city of Gladstone in the state of Queensland, Australia.

With Heron Island being so far off the Australian coast, our telephone system here is on analog UHF radio (see Photo A), operating on 403 to 416 and 413 to 416 MHz, and running about 25 watts to eight 16-element beams mounted atop a tower (see Photo B).

I have also enclosed a photo taken outside my room with my 11-element 2-meter beam (Photo C). My VHF radio is a Kenwood TM-231A with 50 watts output. I also have a 2-meter repeater almost ready to set up here on the island. The radio is a 25-watt, single-channel Philips FM-828, set up to transmit on 147.825 MHz and receive on 147.225.

Photo B. David hasn't managed to get any of his own antennas onto this tower just yet. The 400-MHz Yagis at the top are for the Heron Island telephone system. →

The repeater is under test at the moment, but, when it is licensed, I hope the call-sign will be VK4RDC.

73, David, VK4DJC

Editor's Note: David apparently thought we'd be more interested in pictures of equipment than of people, so he didn't bother to include a snapshot of himself. So we'll have to leave that part to your imagination....

*In case you're trying to find Heron Island on the map, it's off of Australia's east coast, in the Coral Sea. It's part of the Great Barrier Reef and lies directly on the Tropic of Capricorn. Anybody for a DXpedition? (*David—any special rates for hams? Just kidding.—ed.*)*

Photo C. Here's what David uses to stay in touch with the mainland—an 11-element 2-meter beam mounted outside his room in the Heron Island staff quarters.

• • •

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.

New York Hams Put on Olympic Effort

The athletes came from all over New York State, and hams from all over the state's Capital District turned out to provide communications support for the 1997 Empire State Games.

The Empire State Games (ESG) is America's largest state sports festival, with over 6,000 athletes participating in more than two dozen different Olympic-style events. Last summer's event, held in the Albany metropolitan area, marked the Games' 20th anniversary, and nearly 100 New York amateurs provided valuable communication services to both event organizers and medical staff over a four-day period.

Hams have been involved with the Games since the beginning. For example, Ruth (N2MXN) and Roger (WB2BWQ) Harnaart have been helping out for the entire 20 years. Bob Carlson, KA2BNL, is a 17-year veteran. There was a traveling group that volunteered up to five days of their time to come and work. Some took vacations from their jobs, and Chuck Biss, WB2KIO, even flew in from a work assignment in London, England, to make his annual trip to the Games.

Putting It Together

April Stack, KA2QIG, wore the hat of Local Event Coordinator, and was responsible for organizing the ham radio aspect of the Games. Stack received the official schedule from the Games people on about July 8—less than a month before the event began. There were a *lot* of slots to be filled. April sat down and started breaking out events into "ideal shifts." Breaking out the ideal slots for just one day, she counted them up, and realized *she needed 66 hams to fill them*! "Are our people really up to the challenge?" she wondered. "And can I really pull this off after sticking my neck out?"

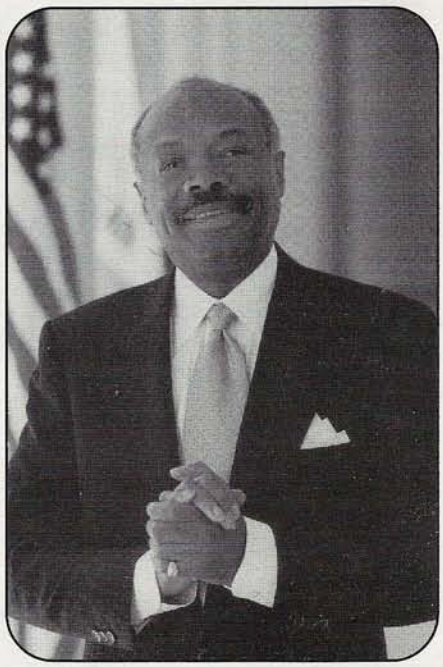
"Organizers made mental notes regarding best times to reach people, who lived where, which hams had to be teamed because of transportation needs, etc."

Working Around the Giants

One of the reasons so many hams were needed was that the events were spread out across the Albany area. Most of the ESG athletes stayed at the State University of New York (SUNY) campus in Albany. But the New York Giants were in the process of setting up their training camp there, so most of the competition took place across the Hudson River in Troy, at Rensselaer Polytechnic Institute (RPI, home of W2SZ). Even if the ESG athletes hadn't had to share space with the football players, the special needs of some events required special sites. For example, Games organizers had to find four volleyball courts together, two soccer fields together, natural water resources for rowing, canoe, and kayaking competition, and an ice hockey rink that was usable in August.

The Recruiting Challenge

The first job, obviously, was recruiting volunteers. The first place the organizers looked was the many radio clubs in and around the four-city Capital District, and the "meeting circuit" turned up a good number of interested operators. This was followed up by on-air recruiting, principally via a weekly net that met every Tuesday night for about six weeks before the Games. The net gave both prospective volunteers and those already signed up a chance to ask questions and test their gear, both locally and from fringe areas. Some who felt that they might have a problem transmitting from the actual venues (event locations) where they would be stationed even went to those locations to test their gear.



San Francisco Mayor Willie Brown recently praised California hams for providing emergency communications. (See "Hams Applauded for Work on Both Coasts" for details.)

The net was very successful; matching volunteers with events came next. Organizers made mental notes regarding the

By Bob Josuweit, WA3PZO

Hams get a place of honor near the head of the opening parade in the Empire State Games. These photos are from the 1995 Games.

Distinctive green shirts made it easy for Games officials or participants to find a ham when they needed one—or four!

best times to reach people, who lived where, which hams had to be teamed because of transportation needs, etc. Two hams who were particularly helpful before the events began were Jack Donnelly, WA2YBM, who was heavily involved the last time the Games were in Albany, in 1992; and Stu Balter, KB2ZTV, the Games Head Trainer, who advised the hams on all aspects of what was to be expected.

Thanks to good internal and external organization, the volunteer schedule started to shape up quickly, and by July 28 there were only a few slots left to fill. The Capital District's hams had come out in full force.

ID Tags and T-Shirts

As the Games approached, every volunteer was issued an official ID and a color-coded shirt. Red shirts, for example, were for trainers and medical staff. Green was for the amateurs. Even the shirt pickup turned into a recruiting area. Susan Polewczak, N2EKQ, brought her 15-year-old daughter, Rebecca, N2LPW, to the pickup area at a shopping mall parking lot. Rebecca got so excited about working at the Games that her enthusiasm rubbed off on Mom, who also signed up on the spot.

Radio Central

The amateur radio command post was located directly next to the ESG Headquarters. It had two operating positions, staffed almost the entire time by the husband-wife net control team of Bob (KD2IM) and Paula (N2FDA) Brackett.

Top Games officials have come to rely on radio coverage so much that they were sometimes reluctant to leave the radio room-office area when something important was happening. Stack quickly came up with a way around that problem.

"I gave Vice Director Lisa Del Signore my little AA battery-operated Standard HT [to listen to], and she put it into the pocket of her shorts," Stack said. That way, she could go wherever she needed to, and could still monitor important communications.

"I have been doing this with events organizers lately," Stack added. "If I can't

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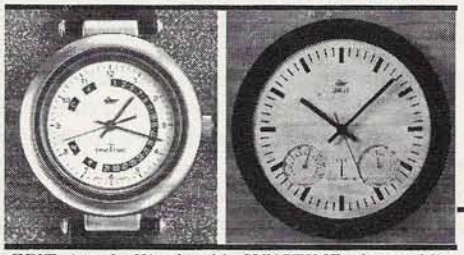

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CIRCLE 57 ON READER SERVICE CARD

Hams Applauded for Work on Both Coasts

Amateur radio operators in San Francisco were honored last year by Mayor Willie Brown in comments about members of the Auxiliary Communications Service (ACS). The ACS is a program created by California's state emergency management office to supplement its emergency communications. Mayor Brown remarked:

I must also tell you that I have been frankly fascinated with that unpaid group of people with those ham radios, the Auxiliary Communications Service. Now they are maybe the most active of all the volunteers. They are virtually over at the office every time I go over there. And I suspect that they hang out there. Now they're an interested group of people....

It is a communication system, though, that I think now covers practically every community in San Francisco, and in some cases damn near every block in San Francisco, for emergency communication purposes, which means that a wireless system that seldom if ever can be totally disrupted by a disaster is within our grasp, and we are able to use....

Obviously the cell phones play a role in that now, but the ham radio operators are the heart and the soul and the life blood of that system. And so we do have a system that is virtually communications disruptive proof in terms of being able to do the communications that we may need to do....

There is also, I think, a level of training enjoyed by these people to carry out their task, and some method to identify them visibly in case of a disaster when they go into their operations mode.

New York City Mayor Rudolph Giuliani declares Amateur Radio Awareness Day in the Big Apple. The ceremony was attended by Howard Price, KA2QPJ, NYC EC for Media and Public Relations/NYC RACES Deputy Radio Officer; Charles Hargrove, N2NOV, Staten Island EC/Radio Officer; Matt Evans, WA2UKM, Brooklyn AEC; Scott Swanson, N9SAT; John Kiernan, KE2UN; and Jerry Cudmore, K2JRC.

All the way across the continent in New York City, in a proclamation declaring Amateur Radio Awareness Day, Mayor Rudolph W. Giuliani recognized the city's RACES and ARES organizations for their participation with the New York Police and Fire Departments, and the Emergency Medical System. His proclamation read as follows:

WHEREAS Amateur Radio Awareness Day is being celebrated on the twentieth of September, and

WHEREAS; More than 100 federally licensed amateur radio operators dedicate their time to support public and private agencies in times of crisis. Two organizations—The Radio Amateur Civil Emergency Service, under the Mayor's Office of Emergency Management and the Amateur Radio Emergency Service, a volunteer arm of the American Radio Relay League—provide backup communications to government agencies and disaster relief in the event normal radio channels are disrupted or overload, and

WHEREAS; Volunteers work around the clock, donating their skill, time, and equipment to serve the public. Many of the volunteers are trained by the Red Cross in first aid, and all are specially trained to handle emergency messages and routine radio traffic under intense deadlines and conditions. These volunteers have recently worked during the TWA Flight 800 Disaster and for Red Cross shelters opened for safe havens during weather emergencies; and

WHEREAS; Our City's vast and complex communications system is indebted to the many trained amateur radio volunteers who are efficient and dependable and lend a much-needed hand in times of crisis or disaster. They are an invaluable part of our city's communications network.

NOW THEREFORE, I, Rudolph W. Giuliani, Mayor of the City of New York, in recognition of this important Event, do hereby Proclaim Saturday, September 20, 1997 in the City of New York as "Amateur Radio Awareness Day"

leave a ham with them, I at least leave a handheld scanner, and they love it."

Check in with the Red Shirts

Every sport from bowling to water polo had a State Chairperson designated by the Empire State Games. The State Chairperson was responsible for making that sport function within the Games structure. The main job of the amateurs at each location was to check in with that chairman and provide any communications assistance he or she needed. Next, the hams had to check in with the medical staff (red shirts) at each event and make their presence known to them. Only then could they check in on the radio with net control. Operators used tactical calls, such as *Soccer 1* and *Soccer 2* (there were two fields). At the end of a contact, they signed with their own calls.

The hams' main function at the Games was to provide emergency medical communications if needed. Communications were constantly monitored by *Med 1*, the tactical call assigned to the ham with the Games Medical Director, and by *Med 2*, the ham assigned to the Games Head Trainer. Medical staff were told at Games briefings that, if they were in need of communications assistance, they should just look for the Green Shirts (hams).

Of course, there were other communication needs as well, ranging from look-

"Medical staff were told at Games briefings that, if they were in need of communications assistance, they should just look for the Green Shirts (hams)."

ing for a tent that never arrived to getting supplies, such as ice, for trainers or arranging transportation for athletes who missed the last shuttle bus. When an event ended, the hams first had to check out with the State Chairman and the medical people before checking out of the net.

Side Notes

Most of the events went pretty much according to schedule, although softball did go to almost midnight one night. Steve Kopecky, KF2WA, was the unlucky operator on duty, but he laughed about it all the way. Tim Maxwell, KA2PKH, showed up to work the weightlifting venue in a moving van. The scheduled operator couldn't make it and Tim was called at the very last minute. He was kind of busy, but took the duty anyway. Ridge MacDonald, KB2HWL, got to see a coach ejected, at, of all things, women's basketball! And Marc Shoobe, N2XLC, and Don Slocum, KF2AB, had to call the police for a public disturbance at a tennis match!

Overall, everyone did their best to help each other out. The Games staff did their best to accommodate the hams, and the hams responded in kind. If an extended tour was needed, the hams pitched right in. Fortunately, there were no life-threatening injuries, but the clinic was pretty busy most of the time.

Leading the Parade

Over the years, the Empire State Games have come to rely heavily on hams. At weightlifting, they were reluctant to start one practice session until the ham arrived. As for the hams, the volunteers said they did it for the kids and in the spirit that the Games tries to foster.

"Our City's vast and complex communications system is indebted to the many trained amateur radio volunteers who are efficient and dependable and lend a much-needed hand in times of crisis or disaster. They are an invaluable part of our city's communications network."—New York City Mayor Rudolph Giuliani

The opening ceremonies gave Games organizers a very public opportunity to show the high regard they have for hams and ham radio. The ceremonial opening parade was led by the medical staff, followed by the hams, and only then, by all of the athletes.

The 1998 Empire State Games will be held in Rochester, New York, giving amateur radio another opportunity to shine "in the public interest." ■

Acknowledgments

The Empire States Games photos are by Joe Traver and are courtesy of ESG Director Frederick Smith.

The photo of San Francisco Mayor Willie Brown is by Dennis DeSilva and is courtesy of the Mayor's office; Mayor Brown's comments were provided by the California Auxiliary Communications Service Newsletter. The photo of New York Mayor Rudolph Giuliani was taken by one of the mayor's aides and was supplied by Jerry Cudmore, K2JRC.

"Wavelengths"—Spreading the Word

One major concern of many hams is getting out word of amateur activities to government and other agencies in hopes that they'll recognize our capabilities *before* an emergency happens.

Amateurs in the Albany, New York, area have taken on the task of keeping state, local. and agency officials informed. Under the guidance of April Stack, KA2QIG, local clubs and ARES groups publish a quarterly newsletter called *Wavelengths*. It covers amateur radio public service activities in New York and around the country. Its purpose is to inform the public and emergency agencies supported by amateur radio that amateurs really do serve in the public interest.

Stack says *Wavelengths* is unique in that no single group or club is responsible for its content. It is totally a joint effort. The postage for each issue is covered by a different amateur radio club. Copies of *Wavelengths* are sent to the New York State Police, county sheriffs' offices in the Albany area, police and fire departments, major ambulance companies, the New York State Department of Hospitality & Tourism, the Red Cross, Salvation Army, and the March of Dimes.

For more information, contact Stack via e-mail at <KA2QIG@aol.com>.

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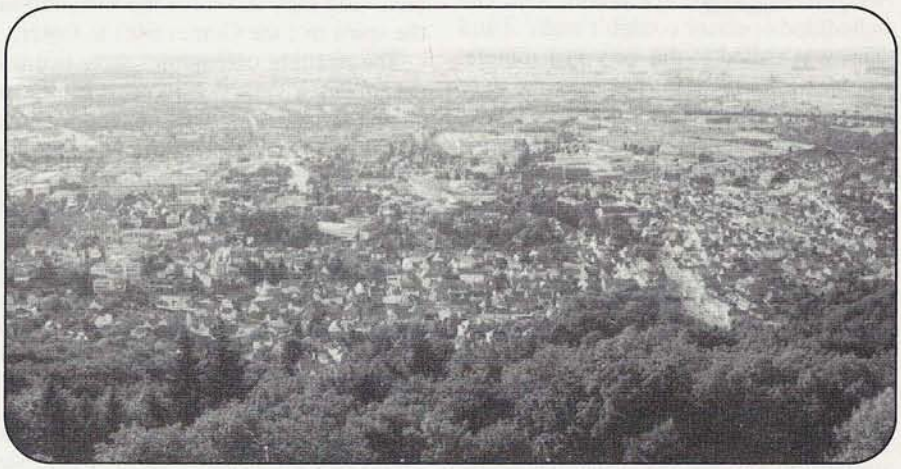
CIRCLE 71 ON READER SERVICE CARD

Trips on the "Digital Bus"

Keeping up with the latest and greatest in digital communications means "doing the conference circuit." Here are some highlights from three conferences on two continents!

Welcome to another year of the Digital Data Link. This month, we'll do some traveling to see what everyone is up to these days.

Our first stop is the 42nd annual VHF convention in Weinheim, Germany, which I had the pleasure of attending last September. Then we'll take a look at some of the doings right here at home.



Weinheim is a picturesque town in Germany's Rhine Valley, about a half-hour south of Frankfurt. The VHF conference there is the town's biggest event each year. (Weinheim photos by W2VU)

A German Approach

Weinheim is a small town in central southern Germany, about a half hour south of Frankfurt. The VHF convention there is a major annual attraction for some 10,000 European hams, as well as a major source of revenue for this nice little town. *CQ VHF* Editor Rich Moseson, W2VU, and I went there—Rich to see what it is that attracts all those hams to a VHF conference, and me as Rich's translator and tour guide. Our gracious and generous host was Wolfgang Mahlke, DF1GW, who made sure we felt at home, and pointed us towards all the important events.

You should look for Rich's detailed report elsewhere in this issue; however, there were a few people doing some interesting things with packet that I'll discuss here. Aside from the FlexNet network in Germany, which I've already written about (and plan to write still more about), there were people doing balloon launches, high-speed user ports, digital voice, and all kinds of radio equipment.

Hams, Kids, and Balloons

The non-profit *AATiS* group, led by Wolfgang Lipps, DL4OAD, is devoted to introducing technology to school kids throughout Germany. (AATiS stands for Arbeitskreis Amateurfunk und Telekommunikation in der Schule, which means "Working Group for Amateur Radio and Telecommunications in Schools"). Aside from producing educational kits, information packets, and a monthly magazine, the group conducts a balloon launch every two weeks, incorporating GPS (the Global Positioning System) and packet. I've seen a few balloon launches before, here in the U.S., and they always generate enthusiasm, but it gets kind of boring, watching the crew set up the balloon and payload, taking utmost care...as well as a few hours.

AATiS has a different approach. I knew the launch was scheduled for 10:00 a.m., and was to occur from a soccer stadium adjacent to the conference site, so I showed up at 9:30, hoping to get a few photos of the setup. I was disappointed to find the stadium completely empty and assumed that the launch had been canceled as there was a stiff breeze. I went back just before 10:00, though, and was surprised to see a bunch of kids—yes, 12-year-olds—pull a bottle of helium out of a car, along with the payload and the (empty) balloon.

In about five minutes, teams of these kids had inflated the balloon, attached and tested the payload, made some final adjustments, and got ready to launch! It was a little surprising, both the speed of the setup, and the fact that all the adults who were running the program took special pains to not touch any of the equipment (except the big guy holding the inflated balloon). The adults were available for consultation, but it was the kids' show all the way.

It was obvious that these kids had studied and practiced for this, but I was surprised again when I later learned that this was their first launch ever. We listened to the balloon's voice talker for about 10 minutes while the balloon turned into a

By Don Rotolo, N2IRZ

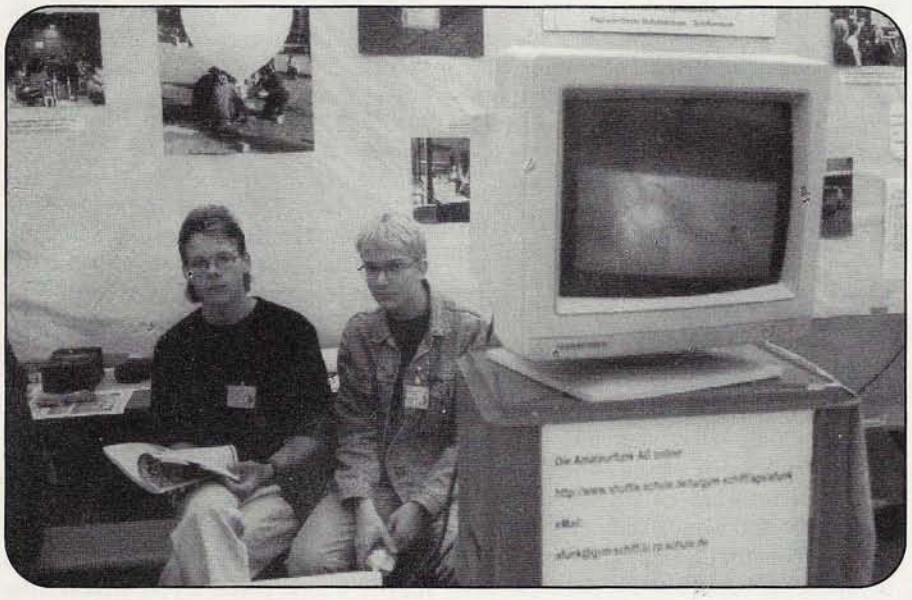
Young people involved in the AATiS technology program (see text for details) prepare to launch a weather balloon from Weinheim. The payload included a GPS (Global Positioning System) receiver, plus packet and digital voice transmitters.

tiny speck in the sky. Teams from other schools along the expected path were tracking the payload, and it was recovered some 200 miles away—only 15 minutes after it landed.

AATiS has the right idea: the kids had devoted months to the design of this flight, and their excitement and interest in the technology was obvious. Teachers from around the country are involved, with some 300 schools already participating in the balloon projects. Now, here's a great way to get kids involved with technology, earn their ham licenses, and to go on to become engineers, scientists, and help the country maintain its position as a technology leader. If only we could do that here....You can visit the AATiS Web site (it's in German) at <http://home.t-online.de/home/aatis>.

Technological Potpourri

What a diversity of technology we saw in Weinheim! The papers in the Proceedings (3/4-inch thick) were in both German and English, many used hand-drawn illustrations, and one was even



Two of the high school students involved in AATiS's balloon technology program help out at the group's booth at the Weinheim VHF conference.

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APRS author Bob Bruniga, WB4APR, works with one of the many "goodies" he brought to the annual ARRL/TAPR Digital Communications Conference (DCC), held last October in Baltimore, Maryland. (DCC photos by WD5IVD, courtesy TAPR)

handwritten in a neat longhand! (not everyone has a typewriter or computer).

Most of the papers described a circuit that the author had built, such as 2-meter SSB transceivers for under $200, high-speed 10-GHz data links, a dozen radios of different types, and a 13-GHz tracking generator, while others presented the results of high-level research, including the biological effects of RF and a study of the effects of TNC parameter settings on data throughput. Clearly, the greatest use of VHF in Europe is for DXing ("weak-signal," we call it), but packet is number two. And, surprise again, they've never even heard of APRS (*In case you've never heard of it, APRS is the Automatic Position Reporting System, a method of using packet to track moving objects.—ed.*)

On to Baltimore

Our next stop is the ARRL/TAPR Digital Communications Conference, held last year in Baltimore, Maryland. If you didn't know about this event, you haven't been reading this column. This is the premier event for digital communications (mostly packet) in the U.S. Everyone who was able to make it had a great time.

"[The balloon project is] a great way to get kids involved with technology, earn their ham licenses, and go on to become engineers, scientists, and to help the country maintain its position as a technology leader."

As you might have guessed, the biggest topic of conversation was APRS and all the things relating to it. All of the APRS software authors were there, not only presenting their papers on Saturday, but conducting a whole-day APRS symposium on Friday. The Saturday evening banquet was a big success (except that yours truly did not win a door prize. Sigh...), and the talk given by Japanese Packet Radio Users' Group Vice President Yutaka Sakurai, JF1LZQ, was great. More on that later.

There were many interesting presentations on Saturday, covering a broad range of topics, from a next-generation TNC design concept to the North American Digital Systems Directory update. One of the most interesting talks was by Frank Bauer, AMSAT's Vice President for manned space operations. It seems that the established APRS frequency of 145.79 is located right next to the satellite subband (145.80 to 146.00), and if we all expect to make the best use of our assets in space (including the ham setup that will fly on the International Space Station), we have to think about moving APRS somewhere else. The leading contender seems to be 144.39, and I'll be discussing this topic in detail in next month's column. Personally, I think the idea is a well-thought-out and sound plan, which has many benefits and no downside.

No One Bored at the Banquet

The after-dinner talk by JF1LZQ was really something. Most everyone expected something fairly standard—a relatively dry speech about something or another—but what we got was a warm, humorous, and wonderfully entertaining speech about the decline of amateur radio in Japan, and what they (the Packet Radio Users' Group) are doing about it. I later learned that, although he often makes presentations at work in Japan, this was Sakurai's first time giving one in English. I guess that once you're good at it, language doesn't matter.

To find out a little about what the Japanese Packet Radio User's Group is doing, visit their Web site at <http://www.prug.or.jp>. It's mostly in English.

Overall, everyone I spoke with had a great time. Attendance was over 200, and we all left with plenty of new and interesting ideas. If you're interested in hearing JF1LZQ actually giving his speech, or any of the talks given, just visit the TAPR Web site, <http://www.tapr.org>, where you'll find links to the entire conference, recorded as Real Audio files, as well as a gaggle of nice photos (including one of yours truly).

Ohio Digital Conference

This would be a good point to mention the upcoming Southwest Ohio Digital Symposium, being held on Saturday, January 17, 1998, from 9:00 a.m. to 4:00 p.m. at the Middletown campus of Miami University (of Ohio) in Middletown, Ohio. If you live within a few hundred miles of Middletown (near Dayton), consider making the trip. This conference usually attracts nearly 100 packeteers, and the presentations range from very basic to middle-advanced. It's a great day for beginners to learn all about packet, and for advanced users and sysops to keep in touch with everyone in the area. For more details, contact Hank Greeb, N8XX, at 6580 Dry Ridge Road, Cincinnati OH 45252-1750; Phone: (513) 385-8363 after 6:00 p.m.; e-mail: <72277.706@compuserve.com>.

NEDA in New Hampshire

Last but not least was the North East Digital Association (NEDA) meeting, held in late October at Hanover, New Hampshire. I wasn't able to attend, having used up all my ham radio travel points by going to Germany and Baltimore, but one item of interest is worth mentioning.

As I wrote in my September, 1997 column, less and less new is being done in packet, and it's on its way toward becoming just another mode, like CW, RTTY, and AM. Having seen my column, as well as Greg Jones' article in the same issue, a few of the do-ers from long ago decided to do something about it. I suppose they're a little bored again, after resting for so many years, and have put together a plan to once more begin promoting packet network construction.

TAPR's Dewayne Hendricks, WA8DZP (left), with DCC banquet speaker Yutaka Sakurai, JF1LZQ (right). Sakurai is vice president of the Japanese Packet Radio Users' Group.

The plan is to revitalize the construction of the networks that are so essential to cooperative packet operations. Unlike RTTY or CW, you need more than two stations to use packet effectively. The concept is that, since all the people who weren't really packet worshippers have left for the Internet, all that's left are the real hard-core packeteers, and it should be a cinch to organize these people to move forward to bigger and better things.

The "how" is still another question. Certainly, offering loads of information on what exactly to do and how to do it, as well as lots of related technical information, is a good (and do-able) start. Other plans include personal visits to radio clubs to promote packet networking, a better newsletter (sponsored by NEDA), network maps (possibly in cooperation with the North American Digital Services Directory administered by TAPR), and more research into newer technologies, such as Spread Spectrum.

One fellow put forth the proposal that the "T1" rate (1.44 MB/s) should be the standard for user access, with backbones running three to 15 times that rate. It is do-able with current technology and the costs are not unreasonable. Imagine what you could do with that kind of data pipe!

"[The ARRL/TAPR Digital Communications Conference] is the premier event for digital communications (mostly packet) in the U.S."

Where all this leads remains to be seen. However, I have renewed my commitment to NEDA (as well as my membership), and I hope you'll consider renewing your commitment to packet in 1998 as well. Become a do-er. Contact NEDA at PO Box 563, Manchester NH 03105, or at <http:// www.cam.org/~burt/neda/neda.html>.

Coming Up Next Month

Next month, we'll take yet another look at APRS, including the AMSAT proposal to move the national 2-meter APRS frequency. I don't know if that subject will fill out an whole column, so I'm thinking of including another easy construction project, this time for DC power distribution. If I don't have the room, it'll appear in March.

If this month's column seemed a little short, you're right, it is, but with all this traveling, who's got time to write? Anyway, there are some interesting subjects to be covered in 1998, and I hope you stick around for them. I would also like to wish you and your loved ones a happy, healthy, and prosperous New Year. Until next month,

73 de N2IRZ

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"What We Are Doing Here... IS Rocket Science"

An in-depth look at the status of the Phase 3D satellite and other highlights of the 1997 AMSAT-NA Annual Meeting.

By Rich Moseson, W2VU*

Amid growing impatience by satellite enthusiasts over the delays and uncertainties surrounding the launch of the international Phase 3D (P3D) amateur satellite, AMSAT officials tried to provide as much information as possible to the 200-plus hams who attended the 1997 AMSAT-NA Space Symposium and Annual Meeting, October 17 to 19, in Toronto. It was the group's first meeting in Canada.

AMSAT President Bill Tynan, W3XO, expressed confidence that the satellite will be launched sometime in 1998, despite current uncertainty. As of now, said Tynan, "we don't know what launcher we'll get on and when. ESA [the European Space Agency] won't even talk to [AMSAT-DL President and Phase 3D Project Leader Karl Meinzer, DJ4ZC] until after the 502 launch."

P3D was bumped last summer from the launch of Ariane 502, the second Ariane 5 booster qualifying launch, after ESA-mandated structural changes made it impossible to be ready in time for the scheduled September 30 liftoff. At the time of the AMSAT conference, the rocket was still on the ground, awaiting a possible launch in early November (Check "VHF News" for any last-minute updates). ESA imposed much tighter structural standards on Ariane 5 payloads after the first test flight exploded just 37 seconds after liftoff. The decision to drop P3D from the 502 launch was "just a matter of simple economics" for ESA, said Tynan, noting that "they couldn't afford to wait for us."

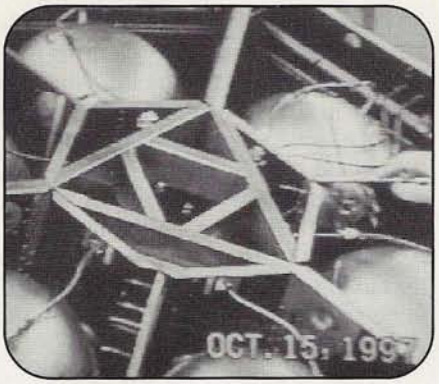
Top AMSAT officials provided a detailed update on the Phase 3D satellite at the annual AMSAT-NA symposium, held in Toronto. From left are AMSAT-NA Executive Vice President Keith Baker, KB1SF; President Bill Tynan, W3XO; P3D Integration Lab Manager Lou McFadin, W5DID, and incoming Engineering Vice President Stan Wood, WA4NFY.

Still, he and AMSAT-NA Executive Vice President Keith Baker, KB1SF, were extremely optimistic about getting P3D launched sometime in 1998. "ESA is very much in our court on this," said Baker, as is Arianespace, the French space agency, which he said is "calling the shots on who will fly when."

"The indications we're getting," Baker told the conference, "are that Arianespace acknowledges that they have an obligation to us" to find a launch vehicle for P3D. Tynan noted that the "specific bearing structure," or "SBS," which physically attaches the satellite to the booster, will fit on an Ariane 4 rocket as well as on an Ariane 5. However, he said that even though an Ariane 4 launch would most certainly be accepted, AMSAT's preference is to go on an Ariane 5 booster, since it would lift the satellite much higher before separation and would not require as much fuel to establish the proper orbit.

Meanwhile, impatient hams on the AMSAT-BB Internet reflector had been offering to build a simple transponder that they believed might be able to be

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



Detail of the reinforced center hub of the Phase 3D satellite spaceframe. Note the two concentric triangles added to the original hexagonal hub. The goal is to better distribute sideward forces during launch. (From AMSAT video)

launched on any number of different vehicles. In response, AMSAT Board member and President Emeritus Tom Clark, W3IWI, noted that there's much more than building a radio involved in designing a satellite, including such aspects as spaceframe design and construction, plus thermal, power, and fuel considerations. Or, as Baker summarized it, "What we are doing here, ladies and gentlemen, *is* rocket science."

128 New Parts

Tynan also noted that the need for strengthening the P3D spaceframe came as no surprise. He said AMSAT first became aware of the greater-than-anticipated structural stress last February, soon after the explosion of Ariane 501. But it wasn't until an analysis of those stresses on the P3D spaceframe was completed in early June by a professor from Embry-Riddle Aeronautical University that the full extent of the necessary changes became clear.

As explained in detail by P3D Integration Laboratory Manager Lou McFadin, W5DID, 128 parts were either added or modified to strengthen the spaceframe, mostly against sideward forces of up to 400 pounds—forces that apparently are significantly greater than virtually any commercial satellite in current production is designed to withstand. Principal changes included reinforcing the spaceframe's hexagonal inner core with two concentric triangles to better distribute any sideward forces (see photo), and the addition of several reinforcing rods to strengthen the bottom part of the satellite. It's estimated that the modifications added some $20,000 to $25,000 to the overall cost of building P3D, now estimated at nearly $2 million. It was also noted that a successful launch of Ariane 502 might result in some relaxation of the new, very strict strength requirements, since the revisions were based on only 37 seconds of hard data from Ariane 501.

"The question of what AMSAT should do after P3D is finally launched was on many people's minds at the symposium, with several presentations devoted to possible follow-on projects and potential orbits...."

Next Steps for P3D

With the structural upgrade complete, McFadin said the next step in returning P3D to full launch readiness would be to reinstall all the electronic modules and

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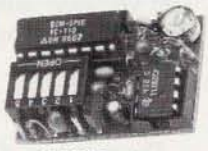

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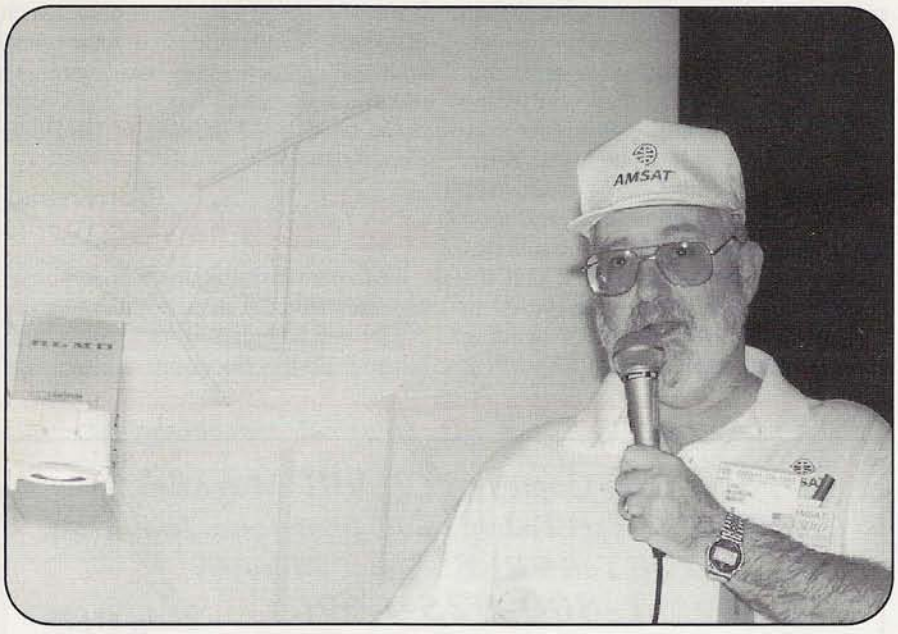


Phase 3D Integration Lab Manager Lou McFadin, W5DID, explains the changes made to the P3D spaceframe to bring it up to new European Space Agency structural standards.

torque rods removed in order to do the structural work. That would be followed by power-up and the beginning of RUDAK software tests (see below). Then, sometime in December, there would be a full integration test in which all systems are tested together, and "environmental testing" sometime in January. This will include a vacuum test at Orbital Sciences, Inc., in Maryland, followed by vibration testing at NASA's Goddard Space Flight Center, also in Maryland. Once all of these tests are complete, the satellite will be ready for shipment to the ESA's South American launch site in Kourou, French Guiana, whenever a suitable launch vehicle is found.

RUDAK Update

RUDAK is an acronym for a German phrase which, loosely translated, means *Regenerating Digital Data for Amateur Radio*. It's the digital portion of the P3D communications package. Its initial functions will include a 9600-baud packet BBS, along with telemetry for the satellite's "housekeeping" computer and a variety of other "modules," such as the Japanese SCOPE camera, radiation sensors, and an HF spectrum analyzer. The RUDAK unit uses digital signal processing (DSP) and, since all functions are in uploadable software, new capabilities may be uploaded and run after the satellite is in orbit. RUDAK, notes W3IWI, is "an investment in future technology."

RUDAK programming coordinator Bdale Garbee, N3EUA, says his team is counting on that upload-after-launch capability, since much of the application software was still being written. However, Garbee says the RUDAK hardware is complete and ready for reinstallation on the satellite. "We could launch today," said Garbee, "with confidence that the RUDAK components will work."

After P3D

The question of what AMSAT should do after P3D is finally launched was on many people's minds at the symposium, with several presentations devoted to possible follow-on projects and potential orbits, and a fair amount of the annual AMSAT business meeting Saturday afternoon being spent discussing the wisdom of trying to keep the P3D integration lab in Orlando, Florida, in operation after the launch. Possibilities for keeping the Orlando facility open include a commercial rental and spinning off a separate, profit-making organization to run the lab. Any use would have to be short-term, as the building housing the lab is scheduled to be torn down in 1999. No decisions were made.

"P3D Integration Laboratory Manager Lou McFadin, W5DID, [explained that] 128 parts were either added or modified to strengthen the spaceframe, mostly against sideward forces... greater than virtually any commercial satellite in current production is designed to withstand."

And Finally...

After all of the conference sessions and the International Amateur Radio Union (IARU) Satellite Symposium (see "VHF News") were over, the AMSAT Board of Directors met and elected officers for 1998. President Bill Tynan, W3XO; Executive Vice President Keith Baker, KB1SF; Vice President for Operations Keith Pugh, W5IU, and Secretary Martha Saragovitz were all re-elected. Stan Wood, WA4NFY, was elected Vice President for Engineering, succeeding Dick Jansson, WD4FAB, who did not seek re-election. Jansson will, however, complete all engineering tasks related to the P3D satellite.

In addition, a former ARRL New England Division Director, Bill Burden, WB1BRE, was named to the newly created post of Vice President for Strategic Planning. He will help plan future AMSAT-NA satellite projects after P3D is launched.

Finally, AMSAT's first president, Perry Klein, W3PK, was named "Founding President Emeritus," joining W3IWI as an AMSAT President Emeritus. (Tnx to the AMSAT News Service for the Board meeting information.)

From North to South

After having its 1997 meeting in chilly Toronto, where morning temperatures dipped below zero (Celsius, that is), AMSAT will heat things up a bit for its 1998 conference, which will be held in Vicksburg, Mississippi, home of *AMSAT Journal* Editor Russ Tillman, KC5JVB (who will also be conference chairman). The date is not yet certain.

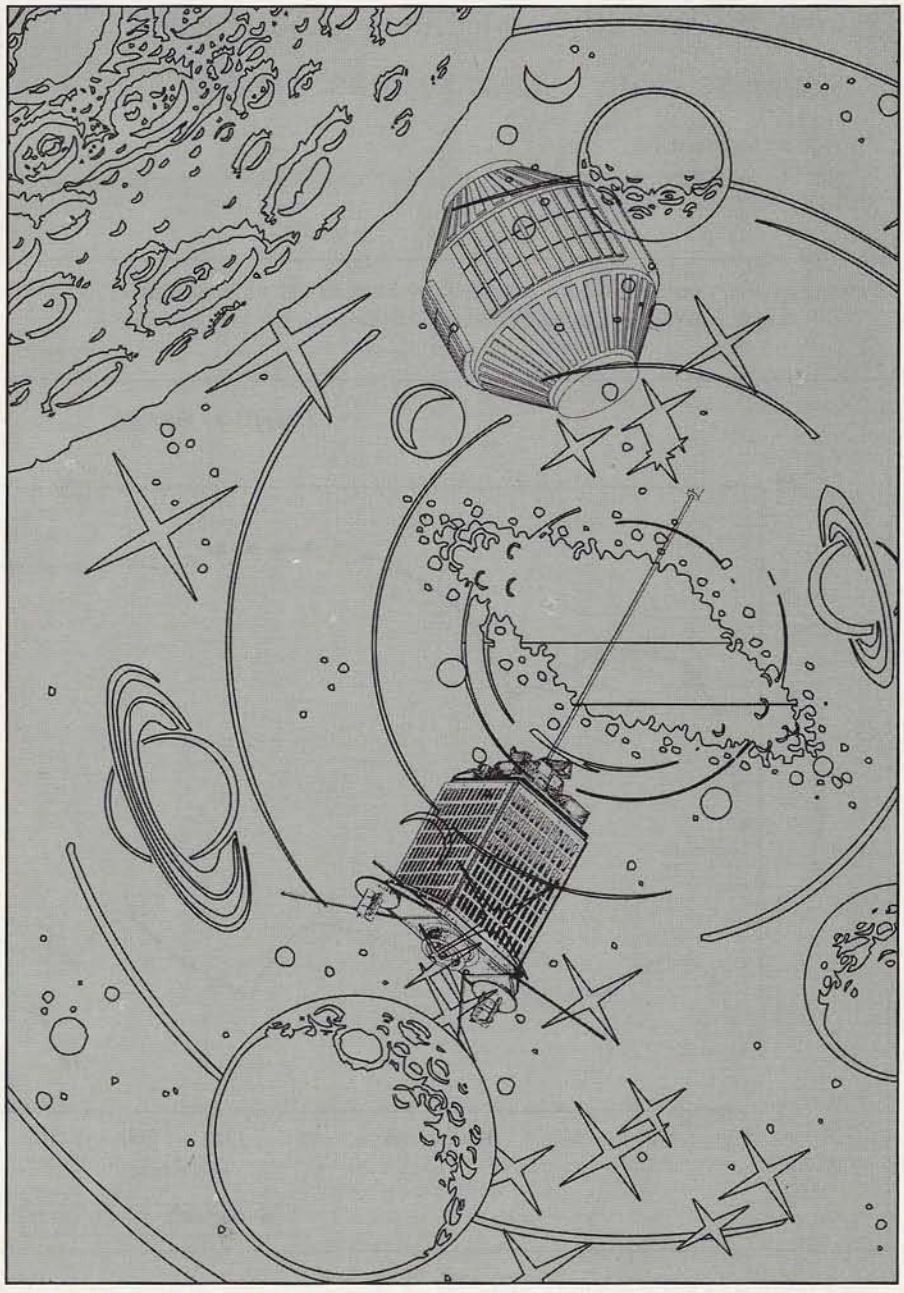
If you have any interest in the design, construction, or operation of amateur satellites—or just want to learn more about them in general—you may want to consider a trip down "Ol' Man River" to Vicksburg next fall. ■

Measuring from Afar

Satellite controllers on the ground use telemetry to monitor the health of a satellite in orbit. And, if you can receive and decode the data, so can you!

An integral part of any satellite system is the sub-section that monitors itself. The data generated by this self-measurement is called *telemetry*, a word derived from the Greek words "tele" and "meter," meaning "to measure from afar." This data is used by the onboard control system to make automatic adjustments and is transmitted to Earth, where control stations collect and analyze the information to understand what the onboard systems are doing.

Telemetry has been a part of all AMSAT satellites. Even OSCAR I, launched in 1961, repetitively sent the CW message "HI" at a speed related to the internal temperature of the spacecraft. The information received from this simple telemetry resulted in changes to the thermal coating and a lowering of the transmitter power for OSCAR II. Figure 1 shows how the lessons learned from OSCAR I enabled OSCAR II to operate at a much lower internal temperature. The telemetry information gleaned from each satellite has contributed to the design of more reliable, longer-lasting, and more fully featured successive satellites.



Why Telemetry?

A satellite is a self-contained system that must be able to sustain its own existence. Unlike terrestrial systems, problems can't be diagnosed and corrected on the workbench. A satellite is an "ecosystem." It must generate enough power to stay functional and, when necessary, apportion this power to the most critical systems. It also must be able to regulate its temperature so as not to stress the mechanical structure and to maintain the electronics and batteries within their operational ranges.

By G. Gould Smith, WA4SXM

Table. Types of Telemetry

1) Digitized speech	UO-9**, UO-11*, DO-17*
2) CW	AO-10*, RS-10/11, AO-13**, FO-20*, LO-19, AO-21**, RS-12/13, RS-15, RS-16, FO-29
3) RTTY	AO-10*, AO-13**, AO-21 **
4) 1200 bps AFSK packet	DO-17, AO-27
5) 1200 bps AFSK ASCII	UO-11
6) 1200 bps PSK packet	AO-16, WO-18, LO-19, FO-20*, AO-21**, IO-26, FO-29
7) 400 bps PSK ASCII	AO-10*, AO-13**, AO-21**, P3D***
8) 9600 bps FSK ASCII	UO-22, KO-23, KO-25, FO-29

* mode no longer used
** satellite no longer active
*** satellite not active yet

Types of telemetry used by amateur satellites active since 1990, listed in order of increasing complexity. See "Telemetry Complexity" in the main text for explanations.

The system must be kept in equilibrium or it will quickly fail. Ideally, all combinations of possible problems will have been anticipated and solutions formulated before the satellite is deployed. In reality, of course, this is an unattainable objective. The most reasonable alternative is to monitor the critical systems and provide a means to alter the operation of the satellite from the ground to correct anticipated or unanticipated problems.

Determining the proper points to monitor, analyzing the telemetry, and using this analysis to keep the system in harmony will allow the satellite its full controllable lifetime. But monitoring a satellite's major systems is only the beginning. This data must also be sent to the command stations on the ground in a reliable and timely manner. When any one component of the system is not functioning properly, the problem must be quickly corrected, as all the systems depend upon one another.

Four Major Measurements

Telemetry generally measures four quantities: *temperature, current, voltage,*

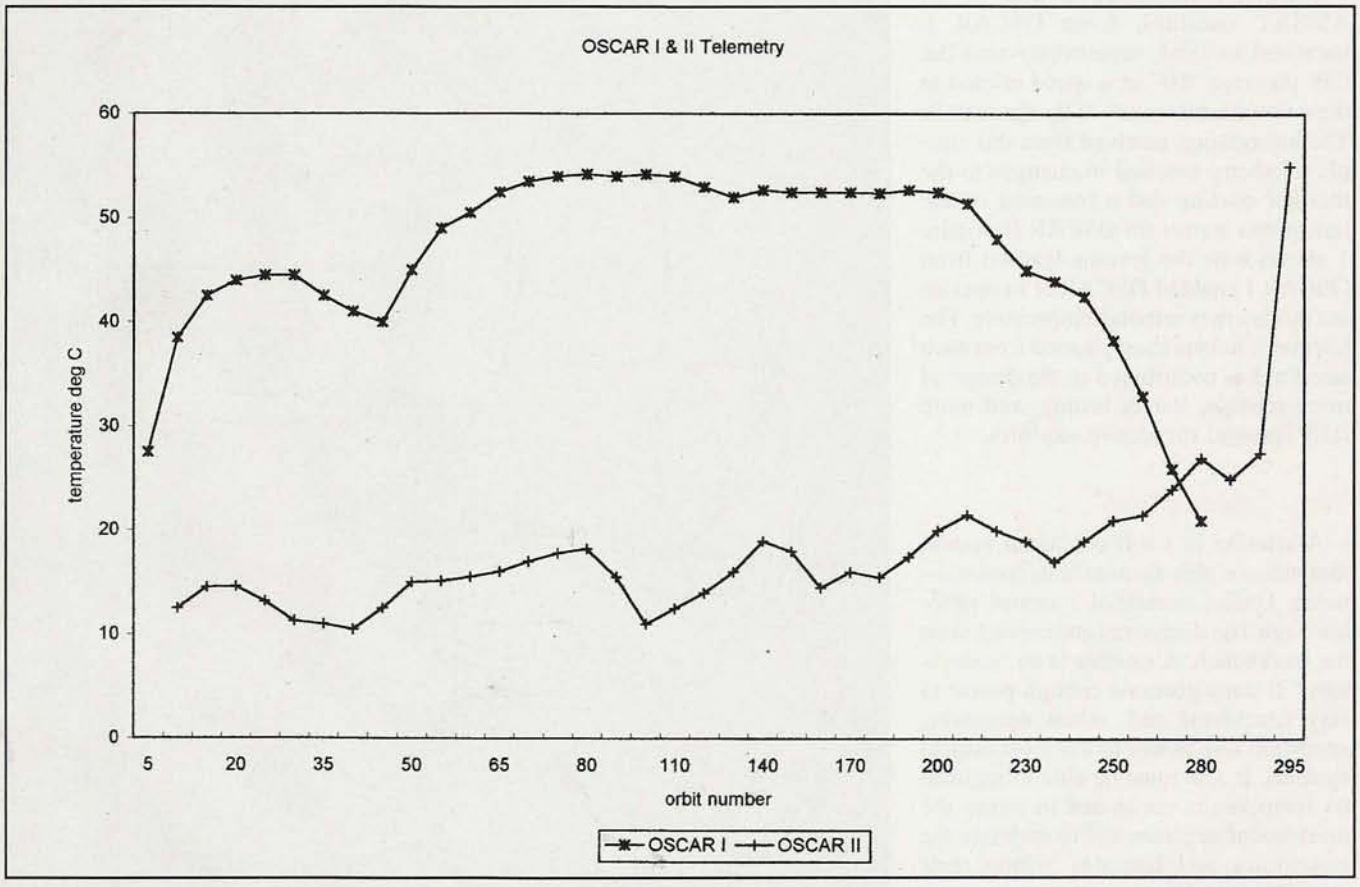


Figure 1. OSCAR I and II telemetry data. Note the much cooler internal temperature of OSCAR II. This is a result of design changes made based on telemetry data from OSCAR I.

and *status*. The first three describe the analog portion of the system. The fourth is digital data necessary to communicate the state of a device: is it *ON* or *OFF*, *selected*, or *not selected*? The major components of each satellite offer many sources of analog and digital values to be sampled. Some of the difficult decisions of the system designers in defining the telemetry system are:

- What devices will be monitored?
- What mode of transmission will be used?
- How will the data be encoded?
- What will be the format of the data?
- How much error detection will be used?
- How often will the telemetry be sent?
- How much power will be allocated to the transmission?
- What will be the data rate?
- How much memory can be allocated?
- How versatile is the system to adjustments via ground commands?
- How complex a ground station will be needed?
- Will new ground station hardware be necessary?
- Will new ground station software be necessary?

A General Telemetry Model

A telemetry *frame* is the unit used to describe the collection of all the sampled points. The general frame is comprised of a group of attention characters, the header, all the data channels, and the checksum. Most of the telemetry from the amateur satellites contains all these features. The telemetry samples found in Figure 2 are to be used as examples for the following descriptions of the major sections of a telemetry frame.

Attention/Synchronization Characters

Attention characters are a sequence of characters used to signal the beginning of a new frame. When a receiving station begins to acquire satellite telemetry as the "bird" moves into range, the station has no way of knowing where in the data stream it is. Odds are it is somewhere in the middle of a frame. The attention characters tell the receiving system to start anew, to clear its buffer, and to begin a new frame sequence. Before its re-entry last year, AO-13 in PSK mode used the ASCII sequence 39h, 15h, EDh, 30h; and in RTTY mode, the traditional RYRYRYRYRYs. Many satellites still use the OSCAR-I "HI HI" sequence in CW and ASCII modes.

Header Line

The header line follows the attention characters. It normally identifies the satellite and contains some type of date/time group. UTC (Coordinated Universal Time) is used for both the time and the date for all the amateur satellites. The time that the data was sampled by the microprocessor is as important as the data itself. When analyzing the data, it is necessary to know or be able to find out things like whether the sun was shining on the satellite, what mode the satellite was in, and/or where the satellite was in its orbit.

The header line for DOVE and the other so-called *microsats* (OSCARs 16 through 19) identifies the spacecraft, tells how long the current software has been running, and gives the current UTC date and time. The AO-13 header line gave generally the same information, but added a block or frame type. Often the date and time information is coded to save memory space. It requires less power to transmit shorter data sequences (decoding the encrypted date/time groups for each satellite is covered in the format descriptions of the individual satellites).

Channel Data

This is the actual telemetry data. As noted earlier, these data points sample either analog or digital data. An individual analog data value is referred to as a channel. A channel of digital or state data often contains many states since only one bit is used to signify and ON/OFF condition. An analog to digital converter (ADC) is used to convert the pressure, temperature, current, or voltage to a digital value that the On Board Computer (OBC) can store. Each ADC reads the analog value of a sensor a little differently, so it's necessary to calibrate each sensor/ADC connection. (See Figure 3 for sample calibration equations for RS-16.) About half of the amateur satellites (the Microsats) use a format that attaches the channel number to each channel's data. The channel numbers are helpful in locating specific data and as a check, but sending them almost doubles the amount of the telemetry data transmitted, thus using quite a bit more energy. Other amateur satellites, such as UO-11, use just a

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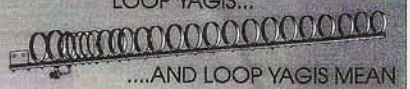

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(DO-17)
DOVE-1>TIME-1:PHT: uptime is 001/01:10:22. Time is Mon Jul 23 03:52:18 1990

DOVE-1>TLM:00:59 01:58 02:88 03:30 04:56 05:56 06:6F 07:49 08:6C 09:6A 0A:A2
0B:DC 0C:E8 0D:D6 0E:00 0F:24 10:C8 11:88 12:00 13:01 14:B5 15:A3
16:9B 17:9A 18:9C 19:9B 1A:98 1B:94 1C:A0 1D:9C 1E:21 1F:5D 20:BC

DOVE-1>TLM:21:8E 22:78 23:1C 24:1C 25:35 26:00 27:00 28:00 29:00 2A:00 2B:00
2C:00 2D:30 2E:00 2F:A4 30:D2 31:A4 32:06 33:28 34:CA 35:AA 36:B1
37:B0 38:BF 39:85 3A:87

DOVE-1>STATUS: 80 00 00 85 B0 18 55 02 00 30 00 00 09 0B 3C 05 29 5A 03 04
DOVE-1>LSTAT:I P:0x3000 o:0 l:13081 f:13081, d:0

DOVE-1>WASH:wash addr:3640:0000, edac=0x3f

==========

(UO-11)
UOSAT-2 9008046141320

00516201395E022321035723040532050371060204070520080459090400D
1049841133551200031306621407021550671618681749OB18483619524B
2051422122472266002300012400062500072609582746 9E28474D29499F
30274231036732285E335731340070352730363215 37428A38470839505A
4076504112064264264306234416704500014600024749 0E48505C49475B
50547351107252682B536891546623550000560003574978584922594954
6083E3615FC1625F4A633305644402651E0C661B4E67700668000E69000F

==========

(AO-13)
Q HI, THIS IS AMSAT OSCAR 13 02:39:31 4581
#0026 #0020 #017A
64 9 0 1 17 230 0

193	7	152	7	193	7	165	115	200	7	136	7	100	7	153	29
7	7	138	54	9	7	136	136	16	7	139	151	116	7	137	7
147	134	136	7	220	149	134	7	75	149	134	165	227	132	127	55
179	133	139	94	146	144	138	7	13	141	125	7	208	140	132	7
64	9	0	1	17	230	0	0	10	3	105	84	5	40	65	32
65	0	152	0	148	0	38	55	0	205	3	5	0	0	32	0
0	250	0	100	14	210	65	6	14	33	39	2	229	17	1	0
0	0	1	0	0	0	1	0	0	0	1	0	38	0	17	0

==========

(FO-20)
8J1JBS>BEACON:JAS1b RA 90/05/07 03:49:58
427 453 669 678 729 836 847 829 001 660
617 000 498 497 521 516 519 522 654 000
644 644 644 619 999 646 879 485 026 010
010 111 100 000 111 100 101 110 010 000

==========

(RS-10)
RS10 IS80 IR00 ND28 IG00 NU00 IW46 NK00 NO00
AS34 AR34 AD37 AG33 MU00 MW00 MK46 AO89 RS10

==========

(RS-16)
RS16 RS16 P167 O128 N45 M0 L0 K7 J5 I7 H49 G0 F164 E8 D8 C9 B9 A8
ZEAA ZEHA ZEAA

Figure 2. Here are some sample telemetry frames from various amateur satellites. As you can see, each one is different and requires a separate decoding table—called calibration equations—in order for the user to understand what the numbers mean. Figure 3 will help you translate the information that's presented here from RS-16.

Channel	Parameter	Equation	Value	Sample Decoded
P	power supply voltage	n x 0.1	V	16.7 V
O	solar panel voltage	n x 0.1	V	12.8 V
N	solar panel current	n x 1	mA	45 mA
M	29 MHz transmitter power	n x 10	mW	0 W
L	29 MHz transmitter current	n x 1	mA	0 mA
K	29 MHz transmitter voltage	n x 1	V	7 V
J	435 MHz transmitter power	n x 10	mW	50 mW
I	435 MHz transmitter current	n x 1	mA	7 mA
H	435 MHz transmitter voltage	n x 0.1	V	4.9 V
G	Transponder voltage	n x 0.1	V	0 V
F	U of stabilizer voltage	n x 0.1	V	16.4 V
E	temp of charger	n x 1	°C	8 °C
D	temp of 29 MHz TX	n x 1	°C	8 °C
C	temp of 435 MHz TX	n x 1	°C	9 °C
B	temp of 145 MHz RX	n x 1	°C	9 °C
A	temp of stabilizer	n x 1	°C	8 °C

Figure 3. Sample RS-16 calibration equations. From left to right, you have the code letter transmitted for each "channel"; what it means; how much to multiply the figure by, and the value that the figure represents. The final column applies these equations to the sample data for RS-16, shown in Figure 2.

straight numeric position count to identify the channels.

The actual telemetry data is transmitted as a decimal, hexadecimal, octal, or binary value. Different number bases are used by all of the amateur satellites. Often one satellite will send data in a variety of different number bases in a single frame. But these are consistent and documented for each satellite, so as long you have the correct documentation, decoding the telemetry should be easy.

Each channel has a specific *calibration equation*, or set of formulas by which a person or a computer can decode the numbers send down by the spacecraft. Look at the RS-16 telemetry sample in Figure 2 and the RS-16 calibration equations in Figure 3 for examples. These calibration equations are initially calculated on the ground for each channel prior to launch. After the satellite is in space, the data for each channel must be *normalized* by its own calibration equation to give the true value of the channel measured.

Checksum

A checksum is used to validate the data. The name comes from a summing of the data as they are received, then by comparing, or checking, this sum against the sum calculated before transmission. The received data are useless unless they are valid. An even worse situation exists if erroneous measurements are considered valid and incorrect decisions are made because of this error. Therefore, some level of error checking is necessary; the difficult decision is how much to use.

There are a number of different methods that give varying degrees of validity to the data. Some are simple to implement, but have only a 60% chance of catching the error. On the other extreme, some error checking schemes require complex mathematical formulas and use more bits than the data they are validating. Obviously, there has to be some middle ground that gives a reasonable level of integrity without using a large number of characters, and this is what the satellites use (normally, the checksum is either some type of straight sum or XOR/EOR [EXclusive OR] of the data). The checksum either passes and the data are valid, or fails and the data are invalid. The checksum can be attached to each channel, to a line of data, or it may encompass the entire frame. Telemetry sent in AX.25 packets includes the checksum as part of the packet.

Telemetry Complexity

I've divided the telemetry from the satellites active during the last eight years into categories based upon the complexity of the reception/decoding requirements. They're listed in the Table in order of simplest to most complex, and are explained in more detail here.

Digitized Speech

Digitized speech telemetry offers a fun, simple way to interest people in satellite operation. It has the simplest requirements of all amateur satellite telemetry, both in terms of equipment and operator skill. It also is the least efficient (data rate/time), has the least resolution, and is the most prone to error (the user must recognize and record the data). Data values from each channel are already calibrated when spoken, so all the listserv has to do is write down the data for each channel is all that's required. Currently, no satellites use this mode.

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CW Telemetry

CW (Morse code) telemetry has minimal equipment needs, but more operator skill is required to receive and decode the 15 to 20 word per minute (wpm) CW transmissions than is needed to understand digitized speech telemetry. The data resolution is not as high as most of the other telemetry formats and no error checking is used. Most of the CW telemetry transmissions don't transmit the date/time group or label each channel. It is up to the operator to add the date/time group to any CW telemetry received. Data values for each channel must be calibrated using a specific calibration equation. Each satellite has its own set of calibrations equations for each channel (see Figure 3). CW telemetry on the later (post-1987) satellites is transmitted more in deference to tradition than as an efficient method of satellite monitoring.

RTTY Telemetry

AO-13 was the last amateur satellite to routinely transmit telemetry in RTTY (radioteletype). At the time of AO-13's launch, many amateur stations had RTTY units and VHF/UHF SSB receivers or converters, so reception was fairly easy. This mode is more efficient than speech or CW in terms of number of characters per unit of time, but it still has many of the limitations of CW or voice (such as no error-checking). On AO-13, RTTY was used more to make telemetry data available to general amateurs than as a primary telemetry mode. It was transmitted only twice per hour.

1200-BPS AFSK Packet

A very common digital telemetry mode today is AX.25 AFSK packet. The data can be collected with any standard 2-meter FM receiver and a 1200-bps packet TNC. Efficient transfer, error checking, and the large number of stations equipped to receive the data make this a very good telemetry format.

1200-BPS AFSK ASCII/Binary

This format utilizes the simple modulation scheme of sending ASCII data by shifting between 1200 and 2400 Hz to convey the ones and zeros. This ASCII data comes down at 1200 baud and can be copied by a standard Bell 202 modem that has a slight modification (the bit sense needs to be reversed). This format was chosen because there was a fairly large installed modem base. High signal/low noise levels are important for this digital data, so a good receiving station is needed. The specialized equipment and station requirements put this format at number 5. UO-11 still uses this mode. Data transmissions are split between the 7-bit ASCII and 8-bit binary modes.

"The received data are useless unless they are valid. An even worse situation exists if erroneous measurements are considered valid and incorrect decisions are made because of this error. Therefore, some level of error checking is necessary; the difficult decision is how much to use."

1200-BPS PSK Packet

This is the telemetry format of choice for the microsats, their derivatives, and the Fuji satellites. PSK stands for *phase shift keying*, and it cannot be received on a standard TNC. The range of equipment needed and the skill of the operator make this somewhat advanced, but certainly within anyone's ability. This form of telemetry has evolved to be among the most efficient to decode. The data are sent as 8-bit hex and ASCII frames interspersed between packet BBS messages or other binary data being downloaded. This is one of the most prevalent telemetry modes in use today.

400-BPS PSK ASCII

This was the predominant form of telemetry on AO-10 and AO-13, and it will be used by P3D whenever it is launched. The station complexity increases somewhat here because a specialized piece of equipment is needed for only the telemetry reception, but operator skills are minimal. The telemetry from AO-13 was extensive and efficient. AO-21 (also known as RS-14) had the capability to utilize this data format as well.

9600-BPS FSK ASCII

Currently, UO-22, KO-23, and KO-25 use 9600 BPS FSK (frequency shift keying) telemetry. This is the fastest and the most exacting form of amateur satellite telemetry. Data sent at 9600 bps takes $^1/_8$ the time to send as the same amount of data at 1200 baud. This means that 1000 characters could be sent at 9600 baud in the same amount of time as 125 characters sent at 1200 baud.

This mode requires some more effort by the ground station and possibly a little modification to the receiver. The high data rate causes the voice bandwidth of most transceivers to be exceeded. So. in addition to a special modem, the modem needs to be connected directly into the discriminator of the receiver. Nonetheless, this mode is probably the most popular among ground stations because of its high data rate.

Capturing and Decoding the Telemetry

Most of the telemetry can be captured and stored to disk using a standard terminal program or a dedicated telemetry program. Dedicated hardware modems or DSP units demodulate the data which the software decodes, stores, and, in most cases, provides a realtime screen display.

A complete set of decoding software including the calibration/decoding equations for each of the active satellites is available on the AMSAT *ftp site* (an ftp site is a location on the Internet from which you may download files. AMSAT's ftp site and is accessible from the AMSAT WWW site at <http://www.amsat.org>.

Hand decoding the telemetry is a good skill to learn, but, once mastered, it's much faster and easier to let the computer do it. Once you've put together the necessary equipment and skills, you can get regular "health" updates on the satellites of your choice—directly from those satellites! Happy listening! ■

Editor's Note: This is WA4SXM's final "Orbital Elements" column. Increased work responsibilities have made it impossible for Gould to keep up with the demands of his monthly column. Starting next month, Ken Ernandes, N2WWD, will be taking over the column. We'll give him a full introduction then. We thank Gould for his two-year stewardship of "Orbital Elements" and welcome Ken as his successor.

Op-Ed — One Reader's Opinion

Reality Check

Requiring a variety of ham activities in order to upgrade may sound good, but doing it isn't always realistic.

In the August, 1997, issue of *CQ VHF*, the "Op-Ed" column discussed the pros of requiring operators to show a greater devotion to the hobby in addition to the code and knowledge tests required for upgrades. While I agree that there is a need to enhance the hobby with many of the activities discussed, let's take a reality check.

We need to ask ourselves two questions: First, why do people become hams? And second, how many of us can devote the time and/or money to these activities once we do get the license?

Time and Money

There are three common answers to the first question: "because Mom or Dad told me to," "so I can talk to my spouse (or parents ...)," and "it sounded like a fun hobby." The second question yields a list of conflicts that begins with work and family schedules and then moves to other hobbies and commitments. Unfortunately the same list of conflicts covers money as well.

That's not to say that the cause is hopeless, however. Many of the suggestions made in the August "Op-Ed" are available to operators now and have been all along. The ARRL has contests and certificates that are open to all hams. There are dozens of local clubs that meet monthly and have a variety of activities. Local and wide area nets are held on almost any band, and the literature that is available is endless. (Notice how much junk mail has your callsign attached, then send off for a few free copies. It's not all junk.)

In a Perfect World

In a perfect world, all hams would spend hours on end advancing the hobby. In the real world, it must fall to those operators who have time and/or money to take the lead and continue to make the tools of advancing the hobby available to those of us who struggle with time and money conflicts. To those who want to see the hobby advanced, take the lead. If there isn't a local club, start one. Sponsor local contests, write for the various magazines and newsletters, provide the means for others to immerse themselves in the hobby when they do have the time.

Most of us are lucky just to find the time to learn the code and the answers to the questions with respect to upgrading. We need to let the new kids on the block get used to the water before we start turning up the heat. ■

Neil Dabb, KC7GCL, is a freelance writer living in Logan, Utah. He has been a ham since early 1995.

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.*

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By Neil Dabb, KC7GCL*

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Shake the ice off those antennas and get ready for the 51st running of the ARRL's January VHF contest!

Following are the complete rules for the contest, plus two quick notes from *CQ VHF*: A) We had the date wrong in last month's "Operating Notes." We apologize for any confusion; and B) the ARRL Contest Branch informs us that it is in the process of revising the *format* of all contest rules, so the rules that appear in *QST* will *look* different from these (they weren't available by our production deadline). However, we are assured that there is no change in the *content* of the rules. So get set to brave the elements, get on the air, and *have fun!* Now, here are the rules:

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

2) Contest Period: Begins 1900 UTC Saturday, January 17 and ends at 0400 UTC Monday, January 19, 1998.

3) Categories:

(A) Single Operator: One person performs all operating and logging functions.

(1) Multiband.

(2) Single Band: Single-band entries on 50, 144, 222, 432, 902, 1296 and 2304-and-up categories will be recognized both in *QST* score listings and in awards offered. Contacts may be made on any and all bands without jeopardizing single-band entry status. Such additional contacts are encouraged and should be reported. Also see Rule 9, Awards.

(B) Single Operator, QRP Portable: Run 10 watts output or less using a portable power source from a portable location. The intent of this rule is to encourage operation from "remote" locations, not to have home or fixed stations run low power.

(C) Rover: One or two operators of a single station that moves among two or more grid squares during the course of the contest. A rover vehicle may transport only one station using a single call sign; thus a rover may not operate with multiple call signs under the family rule 7 (C). Rover vehicles must transport all the equipment, power supplies, and antennas used at each operating site. This rule is not intended to prevent an operator from using the same call sign to submit separate logs for single operator (fixed station) and rover entries. Rovers sign "rover" on phone and /R on CW after their call sign. All Rovers are encouraged to adopt operating practices that allow as many stations as possible to contact them. Rovers entering club competition must indicate the grid squares where operating sites were within their club's area, as spelled out in the Club Competition Rules (January 1994 *QST*). Only scores from those operating sites count toward the club's aggregate score for club competition.

(D) Multioperator: Multioperator stations must locate all equipment (including antennas) within a circle whose diameter does not exceed 300 meters (1,000 feet).

(E) Limited Multioperator: Multi-

Scoring Example

Band (MHz)	QSOs Points	QSO	Grid Squares
50	25 (x1)	25	10
144	40 (x1)	40	20
222	10 (x2)	20	5
432	15 (x2)	30	10
902	36 (x4)	144	9
1296	5 (x4)	20	3
2304	1 (x8)	8	1
5760	1 (x8)	8	1
Totals	133	295	59

Final Score = (QSO Points) X (Total no. of Grid Squares):
17,405 = 295 x 59

operator stations that submit a maximum of four bands for score are eligible. Logs from additional bands used should be included as checklogs.

4) Exchange: Grid-square locator (see April 1994 *QST*, p 86). Example: W1AW in Newington, CT would send FN31. Exchange of signal report is optional.

5) Scoring:

(A) QSO points: Count one point for each complete 50- or 144-MHz QSO. Count two points for each 222- or 432-MHz QSO. Count four points for each 902- or 1296-MHz QSO. Count eight points for each 2.3-GHz-or-higher QSO.

(B) Multiplier: The total number of different grid squares worked per band. Each 2 degree by 1 degree grid square counts as one multiplier on each band it is worked.

(C) Final score: Multiply the total number of QSO points from all bands operated by the total number of multipliers for final score (see scoring example).

(D) Rovers only: The final score consists of the sum of the scores made from each grid square. Submit separate logs for each grid square where operating sites were established and score them individually, as explained in paragraphs (A) through (C) above. Then add the scores from each grid square on the summary sheet for your total rover score. Rovers are listed in the contest score listings under the Division from which the highest aggregate score was made.

6) Use of FM:

(A) Retransmitting either or both stations, or use of repeater frequencies, is not permitted. This prohibits use of all repeater frequencies. Contest entrants may not transmit on repeaters or repeater frequencies on 2 meters for the purpose of soliciting contacts.

(B) Use of the national simplex frequency, 146.52 MHz, or immediate adjacent guard frequencies is prohibited. Contest entrants may not transmit on 146.52 for the purpose of making or soliciting QSOs. The intent of this rule is to protect the national simplex frequency from contest monopolization. There are no restrictions on the use of 223.50 MHz.

(C) Only recognized simplex frequencies may be used, such as 144.90 to 145.00; 146.49, .55 and .58, and 147.42, .45, .48, .51, .54 and .57 MHz on the 2-meter band. Local-option simplex channels and frequencies adjacent to the above that do not violate the intent of (A) or (B) above or the spirit and intent of the band plans as recommended in the *ARRL Repeater Directory* may be used for contest purposes.

7) Miscellaneous:

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

(B) Partial QSOs do not count. Both calls, the full exchange and acknowledgment must be sent and received.

(C) A transmitter or antenna used to contact one or more stations may not be used subsequently under any other call during the contest period (with the exception of family stations); one operator may not give out contest QSOs using more than one call sign from any one location. The intent of this rule is to accommodate family members who must share a rig, not to manufacture artificial contacts.

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

(E) While no minimum distance is specified for contacts,

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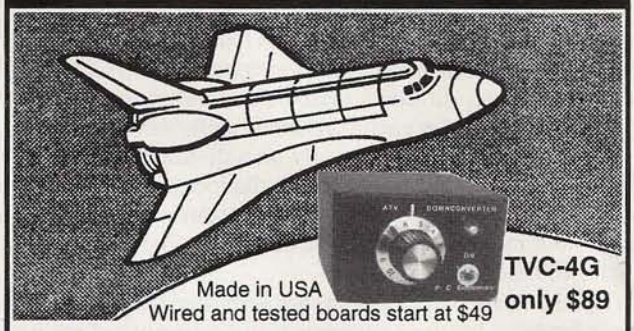

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equipment should be capable of real communications (i.e., able to communicate over at least 1 km).

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

(G) A station located precisely on a dividing line between grid squares must select only one as the location for exchange purposes. A different grid-square multiplier cannot be given out without moving the complete station (including antennas) at least 100 meters.

(H) Above 300 GHz, contacts are permitted for contest credit only between licensed amateurs using coherent radiation on transmission (e.g., laser) and employing at least one stage of electronic detection on receive.

(I) Marine Mobile (and Maritime) entries will be listed separately as "Marine Mobile" in the listings and compete separately for awards.

(J) Participants are reminded that the segment 50.100–50.125 MHz should be used for intercontinental QSOs only, using 50.125 MHz as a calling frequency then QSY after contact is established.

8) Reporting:

(A) Entries must be postmarked no later than 30 days after the end of the contest (February 19, 1998). No late entries can be accepted. Use ARRL January VHF Sweepstakes forms, a reasonable facsimile, submit your entry on diskette, upload your entry to the ARRL BBS, or send your entry to ARRL HQ via Internet.

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(1) Official entry forms are available from HQ for an SASE with 2-units of First-Class postage or 4 IRCs.

(2) You may submit your contest entry on diskette in lieu of paper logs. The floppy diskette must be IBM compatible, MS-DOS formatted, 3.5 or 5.25 inch (40 or 80 track). The log information must be in an ASCII file, following the ARRL Suggested Standard File Format, and contain all log exchange information (band, mode, date, time in UTC, call of station worked, exchange sent, exchange received, multipliers [marked the first time worked] and QSO points). One entry per diskette. An official summary sheet or reasonable facsimile with signed contest participation disclaimer is required with all entries.

(3) You may submit your contest entry via the ARRL BBS (860-594-0306), anonymous FTP (ftp.arrl.org) or via Internet to contest@arrl.org. Send your summary sheet file (Make sure it includes all the pertinent information outlined in the official ARRL summary sheet.) and your log file following the ARRL Suggested Standard File Format.

(B) Logs must indicate band, mode, date, time in UTC, calls and complete exchanges (sent and received), multipliers and QSO points. Multipliers should be marked clearly in the log the first time they are worked. Entries with more than 200 QSOs total must include cross-check sheets (dupe sheets). Send entries to: ARRL Contest Branch, 225 Main St, Newington, CT 06111.

9) Awards: Certificates will be awarded in the following categories.

(A) Single operator.

(1) Top single operator in each ARRL/RAC Section.

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

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

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

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

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

10) Club Competition: ARRL-affiliated clubs compete for gavels on three levels: unlimited, medium and local. Details are in January *QST*.

11) Condition of Entry: Each entrant agrees to be bound by the provisions, as well as the intent, of this announcement, the regulations of his or her licensing authority and the decisions of the ARRL Awards Committee.

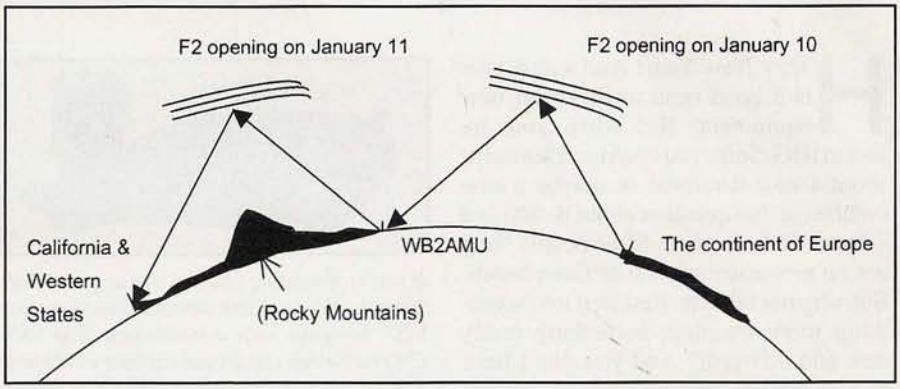
12) Disqualifications: For excess duplicate contacts and call sign or exchange errors. See January *QST* for complete details.

Courtesy ARRL Contest Branch

Remembering the Last Great F_2 Opening on the Magic Band

When the sunspots are hot, DX on six is really cool. Here's what to look forward to a year or two from now.

We're happy to introduce a new mini-column, "Magic Band Chronicles," all about the fun and excitement of operating on 6 meters. Columnist Ken Neubeck, WB2AMU, is a veteran 6-meter operator, a regular CQ VHF *contributor and author of* Six Meters: A Guide to the Magic Band *(Worldradio Books). We welcome him to our staff of contributing editors.*



Signal paths during the last great F_2 *opening on 6 meters back in January of 1992.*

It's been almost exactly six years since we heard the wonders of an F_2 opening on 6 meters during the waning days of the last sunspot cycle. While other types of propagation, such as sporadic-*E* and aurora, have filled in the gap somewhat during this period of low sunspot activity, many of the veteran Magic Band ops are waiting anxiously for the next sunspot peak.

I remember that wild week in early January of 1992. For me, it started on Sunday morning, January 5, when I was able to work 9Y4VU in Trinidad & Tobago on CW from my home grid of FN30 (Long Island, New York). The next night brought a tremendous sporadic-*E* opening toward the north that began after 10:00 p.m. local time. I worked stations in Minnesota, North Dakota, and Canada. The highlight was working VO2GD in Labrador (FO52) at 11:00 p.m. with super loud signals. The band stayed open until midnight. Then the Magic Band stayed quiet through Friday. But the fireworks *really* began on Saturday!

Long and Far

At 10:30 a.m., I started hearing weak signals through my Swan 250 transceiver, which was hooked up to an old car vertical antenna that was cut for 6 meters. Suddenly, the signals started taking off in signal strength and I realized that *all* of the stations were from Europe! Over the next 20 minutes, I worked in succession: F6CER (JN18), PAØRDY (JN22), ON4ANT (JN22), G4ANT (JO02), GØJHC (IO83), G1EMJ (I082), G6HCV (I082) and G1SWH (IO83). I found out later that many of these stations were running either moderate or low power levels, yet they were all better than 5 by 7 signal strength. Then, at 11:00 a.m., the band died! Just like that. Just after noon, I heard FO5DR breaking through, but I couldn't get him.

But the Magic Band was not through for the weekend! Sunday the 12th started with me working TI2KD/5 in Costa Rica (EJ79) at 9:30 a.m. I went out to church and when I came back, I heard the loudest signals that I've ever heard on the band coming in from the U.S. West Coast. I worked N6RMJ (DM14), AD6C (DM04), KF7JN (DM43) and K6UIY in DM14 (on both CW and SSB). The opening lasted from 11:30 through 3:00—a real long one!

The next night, I heard a lot of activity, but it was all local stations who had heard the news about the openings during the previous days. There was no sign of any F_2 or sporadic-*E* activity. For sunspot cycle 22, now ended (23 has begun), that was to be it as far as sustained F_2 openings for the 6-meter band, except for a couple of short ones that February. The next time I was able to work Europe was the summer of 1993, during a short double-hop sporadic-*E* opening.

Waiting for Next Time

Once an operator gets a taste of a fantastic F_2 opening on six, it becomes a longing. The next F_2 openings are expected in the fall of 1999, and many more of our friends in Europe have joined the ranks of Magic Band operators since 1992 (*largely because many European countries have only recently made 6 meters available to hams—ed.*). Stations with modest or low power will be able to make contacts, and it's conceivable that over 300 kHz of spectrum could be occupied during a good F_2 opening.

See you then! ■

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

Time to Dream...and Plan

If winter's cold has you spending more time THINKING about your ham station than OPERATING it, Peter has some thoughts on making daydreams come true.

Happy New Year! And a new year is a good time to dream of new equipment. But when you do, dream BIG. Sure, you could just fantasize about a new handheld or maybe a new mobile rig. No question about it, 440 and 2-meter FM are great. Most people hang out on a repeater on one of these bands. But why not take the first step into something more exciting, something really new and different? And you don't have to give up FM and repeaters to explore other areas.

If you're ready to venture out from the herd, here are some areas you might consider exploring. Daydream a bit. Imagine. Dare to. It's fun. It's exciting, and it's the first step into a much bigger world.

Assuming you want to stay in the VHF/UHF bands, you're going to need a rig that does more than transmit and receive FM; in short, you need either a multimode VHF/UHF rig or an HF rig with a bunch of transverters, preamps, and amplifiers. You might be able to do it less expensively by going the HF-rig route, but my feeling is that, in the long run, you'll probably get a lot more satisfaction out of a multimode VHF/UHF unit. This is especially true if you're not a technical whiz; there are just too many things to hook together and too many ways to mess up. Blow out a transverter or two, and any savings that you made with the old HF rig go up in smoke.

Figuring out Features

What do you look for in a multimode rig? For one thing, it's probably better to think of these radios as HF rigs that happen to operate above 50 MHz, than as VHF FM rigs with added capabilities.

If you're dreaming of a new rig to grace your station, why not think about expanding your VHF horizons with a multimode (FM/SSB/CW) radio that can let you explore whole new worlds beyond repeaters? This is a single-band Yaesu FT-290.

Why? Because the features (and the price tags) you'll find on these rigs are closer to what you'd expect on an HF rig than on even a fancy FM rig. For example, like many HF rigs, VHF multimodes typically have at least two "VFOs" (two per band for the multiband units). This can come in handy if you want to be able to switch quickly from the SSB area at the bottom of the band to your favorite repeater or packet frequency further up the band. These dual VFOs generally are in addition to the RIT (receiver incremental tuning) circuit which lets you shift the receive frequency by a few Hz to maybe a few hundred Hz. This lets you precisely tune in an SSB station that may be slightly off of your frequency without having to change your transmit frequency.

Some rigs also offer memories with programmable band limits. This is extremely useful in many "weak signal" modes where most activity takes place in a narrow band of frequencies. If you're willing to pay top dollar, there are even rigs that offer what amounts to a second receiver built into the unit, which allows the operator to monitor two frequencies simultaneously. One possible way to use this is to monitor the DX Cluster® on packet while working a band opening on SSB or CW.

Unique VHF Features

So far, these units sound pretty similar to their HF cousins, don't they? But they also have unique features that you won't find on any HF rigs, such as *automatic Doppler compensation*. When you're working satellites, you have to contend with *Doppler shift*, a change of frequency caused by the satellite's motion relative to your station. Luckily, in many VHF/UHF multimode rigs, you'll find circuitry that automatically compensates for Doppler shift. You won't find this on an HF rig, since Doppler shift decreases with frequency, so it's not a major concern even for the few satellites that do operate on HF (some of the Russian "birds"). Also, a little bit of frequency drift inside your radio is hardly noticeable on HF, but at higher frequencies, any drift may be magnified, so special high-stability oscillator circuits are of interest to many VHF enthusiasts—and once more, many multimode rigs include this feature.

Of course, virtually all VHF/UHF multimode rigs also offer FM capability, so you don't lose out on repeater/packet communications. This FM aspect will interest operators involved in public service work as well as "weak signal" communications, and you'll want to look for certain FM-related features. For instance, CTCSS (Continuous Tone Coded Squelch System), paging, and DTMF (Dual-Tone Multi-Frequency, or telephone-type tones) squelch circuits are often used to alert operators to emergencies. If you intend to use a multimode rig

By Peter O'Dell, WB2D

for emergency communications as well as for DXing, you may be interested in looking for one that includes some or all of these features.

The size of the radio is another consideration. There's one rule of thumb to follow in looking at rig size: in general, the smaller units are intended for portable/mobile operation. Typically, (but not always) they lack some of the conveniences and many of the bells and whistles of their larger counterparts. Unless you plan extensive portable /mobile operation, I would suggest you avoid the smaller "mobile" units. However, if you're on a budget, they usually cost considerably less than the big "base" stations, so you'll have to balance size and features against available funds.

Receiver "Specs"

Another feature you'll want to look at is the rig's ability to separate desired signals from undesired, adjacent signals: its *selectivity*. One method used by manufacturers to accomplish this is to include a *crystal lattice filter network* in the IF chain. These filters use the orderly nature of atoms in a crystal to shape their frequency response, and are capable of being quite *sharp* (narrow bandwidth).

If you're really getting serious about VHF/UHF multimode operating, you won't want to limit yourself to a single band. This ICOM 821H lets you operate FM, SSB, and CW on 2 meters and 70 centimeters.

Many radios currently on the market offer the option of several different filters. The ability to install more than one filter and switch between them is important, too, particularly if you're interested meteor scatter, aurora, or any of the other "exotic" modes. Different types of signals place different demands on a receiver, and the more flexibility you have in meeting those demands, the better your chances are of hearing what the other station is saying.

The effectiveness of these filters can be determined by what's known as their *shape factor*. Bandwidth is measured at 6 dB and 60 dB down from the strength of the received signal, and is stated in terms a ratio, such as 2.8/3.6 kHz. The closer together the numbers are, the steeper the slope of *skirt* (graphically, it looks like a woman's skirt).

In additional to selectivity, you'll want to know what the *sensitivity* of a VHF/UHF receiver is. This is the "signal to noise" ratio (s/n) measurement and is usually expressed as **X** μ**V** of signal for **Y dB SINAD** (SINAD is an acronym for SIgnal, Noise And Distortion; in other words, the composite of what comes out of your speaker). In practical terms, if the **Y dB SINAD** figure is the same for two rigs, then the one that has the *smaller* **X** value would be more sensitive. For example, if two radios have s/n ratios, respectively, of 0.20 μV for 12 dB SINAD and 0.18 μV for 12 dB SINAD, *the second radio* has the better receiver. The lower s/n number tells you it can "hear" weak signals better than the first.

Single- or Multi-Band?

For the general "weak-signal" enthusiast, a multiband rig might be the ideal

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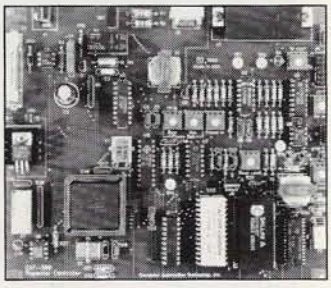

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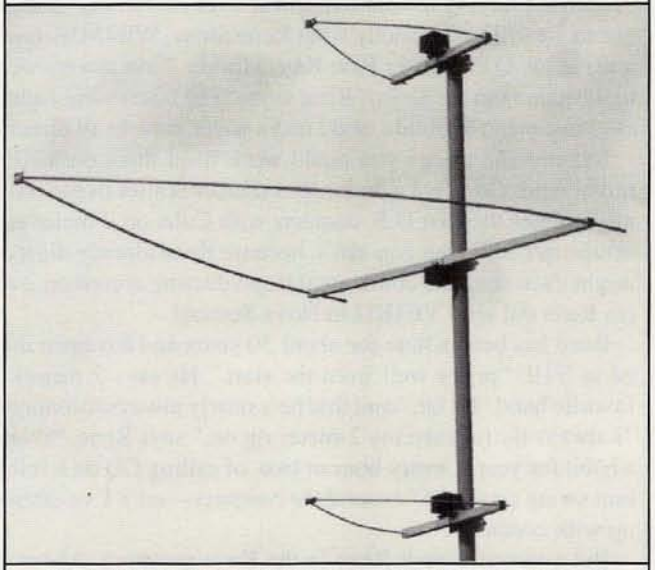

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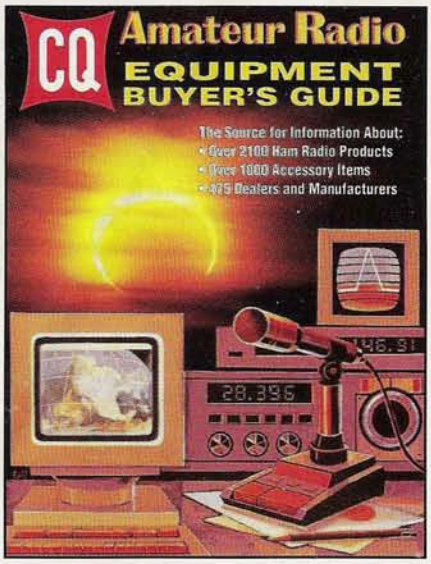


Where can you find out what's available to upgrade your station? One source that's hot off the presses is CQ's new Amateur Radio Equipment Buyer's Guide. *See "Resources" for additional information.*

choice. Like an HF rig, it gives you the ability to operate on two or more VHF/UHF bands with a single radio. But if you're serious about trying some of the specialized modes, such as EME (moonbounce), you might prefer the single-band approach. This is because, in a station set up for exotic modes, the rig is probably one of the smaller elements of that station. It's the large antenna arrays, preamps, big amplifiers, etc., that are the stars of that stage. But for the generalist, who probably won't need such fancy peripherals, the rig is a much larger part (financially) of the overall station. In that case, the economy of a multiband unit might very well outweigh the inconvenience of switching peripherals in and out when changing bands.

Want even more versatility? You've got it! Some multiband units come with one or two bands built in and provisions for installing "modules" for other bands. That means you can buy the basic unit now, and get on one or more other bands later on. That's great news for serious hams on a budget. You'll also run into all sorts of provisions for adding external peripherals. For instance, an external GaASFET preamp is a terrific addition for weak-signal stations. These gallium arsenide receive amplifiers are extremely sensitive and can really pull those weak signals "out of the mud." *(The ability to receive and understand weak signals is*

If you want to put your computer on the radio, you'll need one of these—a Terminal Node Controller, or TNC. They range from plain-vanilla 1200-bps packet-only units to multi-mode, multi-speed data controllers.

where the name "weak-signal" comes from, even for stations running a kilowatt and mega-gain antennas.—ed.) Want to mount the preamp up at your antenna? How about controlling the speed with which the preamp is switched in and out of the circuit? There are modules available for all that, too.

More Power to the Tower

Another important consideration in choosing a multimode rig (but not as important as receiver or antenna quality) is how much power the transmitter puts out. In a typical specifications listing or advertisement, power ratings given are

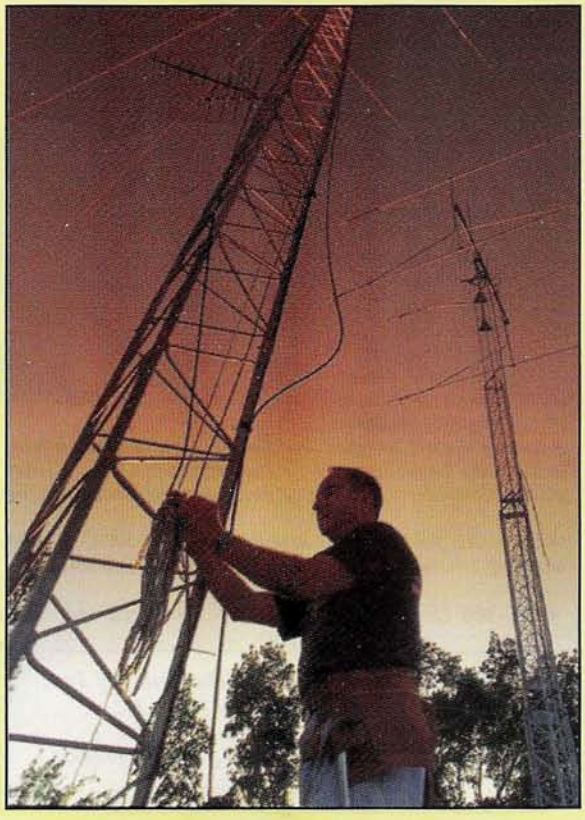
On the Cover

Imagine having towers that tower over *everything,* and a 360° ocean view. That's exactly what Rene Shaw, WB4MJE, had (yes, *had*) at his QTH in Big Pine Key, Florida. "My towers were the highest thing in the Keys," Rene says. "The bases were eight inches above mean high tide, and I had a water view in all directions."

Imagine the places you could work from there on VHF. You might work Costa Rica on 2-meter meteor scatter (Rene has); you might make the first U.S. contacts with Cuba on 2-meter and 70-centimeter SSB (but you can't, because Rene already did); or you might even snag the continental tropo ducting record on 2 meters (as Rene did with VE1KG in Nova Scotia)!

Rene has been a ham for about 30 years and has been interested in VHF "pretty well from the start." He says 2 meters is his favorite band "by far," and that he's nearly always listening there. "I always try to leave my 2-meter rig on," says Rene. "I've made a habit for years...every hour or two, of calling CQ on a full quadrant swing (*every 45° around the compass—ed.*). I've often come up with contacts."

But you can't work Rene in the Keys anymore. About a year ago, he moved back to the mainland, to the top of a 310-foot "mountain" in central Florida with a 300° view to the horizon. Rene's in the process of putting his station back together, and says he's looking forward to expanding his own horizons. "I plan to do some more work on 1296," he says, "and on 5 and 10 GHz...if I get around to it. You're familiar with round tuits...." (Cover photo by Larry Mulvehill, WB2ZPI)



for SSB/CW (FM and AM ratings are usually somewhat lower), and there may be some small variation from band to band in output power ratings. It's also common for manufacturers to offer low-power (say 25 watts) versions of their upscale rigs. Such a power level can be a good compromise for the casual general-interest operator.

Few VHF/UHF modes require the transceiver to transmit continuously at full power for extended periods of time. But if your plans include one of these constant-duty modes, such as ATV (amateur television) or RTTY (radio teletype), make sure the transceiver *and* its associated power supply are able to meet these requirements. You'll need to pay particular attention to each unit's *duty cycle* rating. This refers to the percentage of time the rig is expected to be transmitting at full power during any period in which it is turned on, and, unless otherwise stated by the manufacturer, is probably 50%. If you buy a 100-watt unit with a 50% duty cycle and attempt to run RTTY (a 100% duty-cycle mode), you're going to have to cut the output power back to 50 watts or less to ensure the safety of the rig.

Doin' It Digitally

So much is changing in the world of packet/digital communications that this is a great time to explore it as a potential new mode of fun.

There are a number of different standards that have emerged in this field. At VHF/UHF, 1200-bps packet is the accepted standard, although many stations have moved to 2400-bps for faster data throughput, and even to 9600 bps to work certain satellites. If you're making your first journey into packet, then make sure that your selection is capable of 1200 bps, regardless of any other capabilities it might have, or you won't be able to check for mail on your local BBS (bulletin board system).

The heart of a packet station is the *TNC* (terminal node controller), though it might be more accurately called a *data controller*, since a true TNC is dedicated to nothing but 1200-bps packet. The more expensive models are multimode units that provide numerous modes including VHF packet, HF packet, RTTY, AMTOR, CW (the original digital mode), and perhaps even 2400-bps packet and SSTV (slow-scan TV). These boxes do everything but make breakfast. But if you're on a budget and don't plan digital HF or satellite operation, start with the bare-bones TNC. You can always upgrade later.

One popular, but basic, feature of TNCs is the personal mailbox. This is really just some RAM (memory) and a bit of firmware built into the data controller that allows it to function sort of like a telephone answering machine. Just set your mailbox to receive incoming messages and leave your rig and data controller turned on (you can turn the computer off). Later, when it's convenient, you just log back on to your computer and check for electronic messages. Simple.

A fairly recent addition to the design of digital systems is the ability to interface packet stations with GPS (Global Positioning System) satellites. Some units have a GPS receiver built right into the data controller; others provide special ports and hookups for adding on a GPS receiver. Likewise, some controllers either include or offer options for receiving and decoding weather fax (WEFAX) pictures. If one of these special interests piques your curiosity, you should be able to find a product that includes it.

Do you need all the bells and whistles? Well, probably 99% of the end user packet operation still occurs at 1200 bps on the 2-meter band. Think it through: if you really have no intention of ever operating HF, satellites, or WEFAX, then spending extra money for fancy modes doesn't make much sense.

Neither does investing in a separate radio just for packet, if you're going to split your time between voice and digital communications. Most casual packet users have a single rig for both FM voice and packet use. This, of course, requires some sort of switching device that allows you to quickly switch back and forth between packet and regular voice communications. While you can just do a lot of plugging and unplugging, these switchboxes are reasonably priced (in the $40 range, a far sight cheaper than a second rig), and the time they'll save you can be well worth the price, not to mention the reduced wear and tear on your cables and connectors.

Another device for added convenience is the pre-made cable, designed to go between a specific rig and a specific TNC. Just plug it in and use it. If you have a less-common radio or TNC, though, these may be hard to find and you'll have to "roll your own." (*For a more complete guide to the digital marketplace, see "Digital Data Link" in last month's* CQ VHF; *or the new* CQ Equipment Buyer's Guidebook.—*ed.*)

Daydream Believers

These have been just a few suggestions. You may have other ideas of your own to daydream about on these cold winter days. The fun thing about this sort of daydreaming, though, is that you can justify it to yourself by calling it *planning*. Knowing what you'd like to do with your station, and identifying the gear you'd like to do it with, are crucial first steps in that process. Then, with careful planning and budgeting, you can start making those dreams come true. ■

Resources

My favorite source of information about currently available ham rigs and accessories is the brand new *CQ Equipment Buyer's Guidebook*, a 144-page reference listing thousands of ham products. (Of course, I'm slightly biased since I had the opportunity to work on it as "Technical Contributor.") Unlike our previous annuals, this version is a book instead of a magazine, and there's no advertising, so every page is packed full of the latest information. The *CQ Equipment Buyer's Guidebook* sells for $15.95 and is available from your favorite radio store or directly from CQ at 76 N. Broadway, Hicksville, NY 11801; Phone: (516) 681-2922; Fax: (516) 681-2926; Mail orders in the U.S., add $4 S&H (shipping outside U.S. based on weight and destination.)

Two other sources of information are the *CQ Amateur Radio Almanac*, also from CQ Communications, which includes a list of product reviews that have appeared in *CQ*, *CQ VHF*, and *QST* ($19.95 plus $4 S&H), and the *ARRL VHF/UHF Radio Buyer's Sourcebook*, a collection of *QST* product reviews on VHF/UHF equipment and accessories ($12 plus $4 shipping from ARRL, 225 Main St., Newington, CT 06111, or you may order it through CQ at the numbers above.)

"Morsing" on Your FM Rig

"Morsing"...no, it's not like "morphing." Except that, this month, we're going to "morph" a Foxhunt Transmitter kit into a Morse code tone generator you can plug into your FM handheld or mobile rig.

Greetings again, friends! Are you ready for another unique quick-assemble project, plus more tips for no-miss homebrewing? Well, warm up the soldering iron and read on: another treat is coming your way!

Two months ago, we featured a wireless audio link for surround sound mobiling and hands-free around home monitoring. The project was built around half of a Ten-Tec T-Kit "Foxhunt Transmitter" module that we modified to fit our own needs. Since then, a number of readers have asked me to spotlight an "easy brew" circuit for code practice on 2-meter FM, and a quick check revealed the ideal candidate was built right into that same T-Kit "Foxhunt Transmitter" module (Photo A and Figure 1). So now I'll show you how to convert the "unused" half of the T-Kit module to make a keyed tone generator for transmitting Morse code "Modulated CW style" with a VHF FM handheld or mobile transceiver.

Getting two projects on one pc board for only $12 plus $6 shipping and handling is a bargain that's hard to pass up! There's another good option here, too. If you prefer, you can order two "Foxhunt Transmitter" kits ($24 altogether plus $6 for "both in one box shipping"), and mount each in a separate box for stand-alone use. Ah, such pleasant decisions!

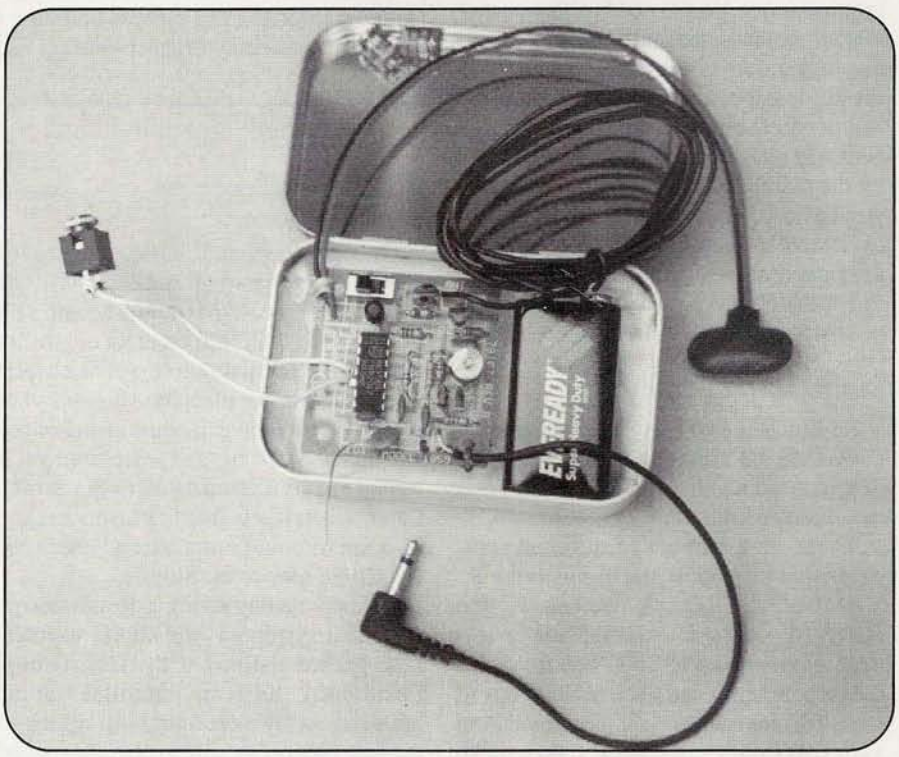


Photo A. Top view of Foxhunt Transmitter's pc board with tone generator circuit on left and wireless rig interface (see November '96 "Project Corner") on right. The whole circuit plus the battery are mounted in an Altoids peppermint tin. (Photos by the author)

CW on FM? Yes, Indeed!

License upgrading is the best investment any amateur can make for greater enjoyment of our super hobby. It makes new bands available to you, opens new worlds of excitement, and requires little more than time for study. Realizing that, amateurs in many areas are setting up code practice sessions on 2-meter FM.

But a variety of questions and opinions surface when we talk about operating CW with an FM-only mobile or handheld transceiver, so let's begin with some facts to clear the air. First, simply tapping out Morse code using your rig's Push-To-Talk (PTT) switch is a NO-NO. It's legal, but it simply *doesn't work* on FM. Receiving stations will only hear a string of squelch breaks or carrier drops (kerchunks) with some of your hand/rig movement sounds or talking during "keydowns" (yuck!). If you connect a key to your rig's external PTT input and disable (disconnect) its microphone input to prevent any "FMing," then you can send true, clean, and clear CW; receiving stations, however, must use an SSB or CW rig to copy it.

Now consider a technique called *Modulated CW* (MCW). You build a small tone generator that's switched on/off with a telegraph key and connect the generator's audio output to the microphone input of your FM transceiver. Receiving stations (with only FM transceivers) will then hear the cheerful tones of your transmitted Morse in high style

By Dave Ingram, K4TWJ

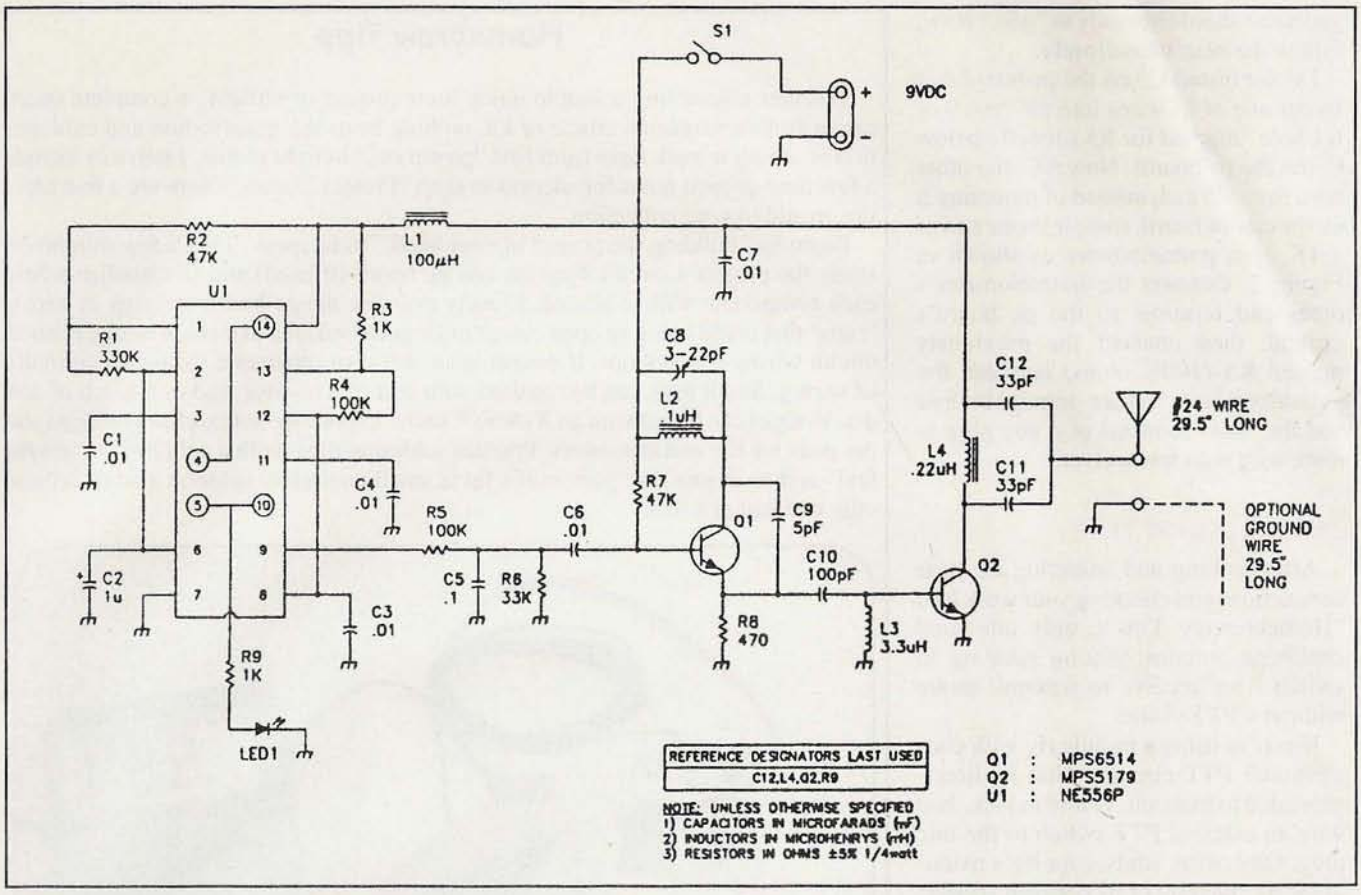


Figure 1. Original/unaltered circuit diagram of the Ten-Tec Foxhunt Transmitter kit. We used the "Q1 and Q2" section to make the wireless rig interface featured last November, and the "right side of U1" section to make this month's project. The timer/"left side of U1" section is not used. (Diagram courtesy Ten-Tec, Inc.)

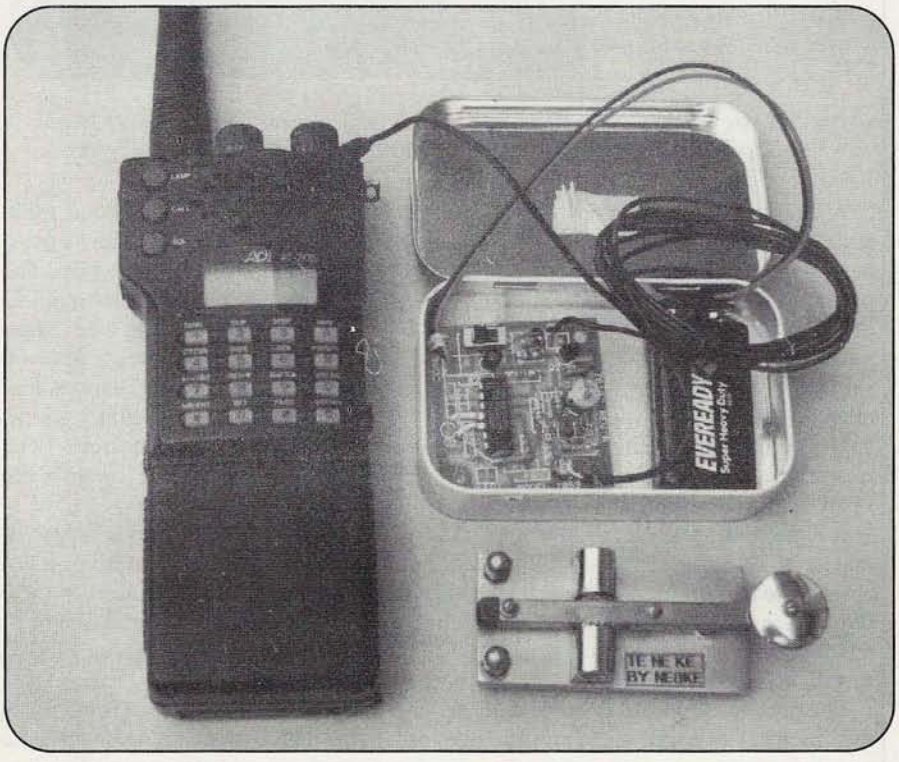


Photo B. Basic items required for transmitting CW with an FM handheld or mobile transceiver are a rig (naturally!), a tone generator, and a telegraph key.

(Photo B shows all the equipment you'll need to do this).

Go for It!

So how do you turn Ten-Tec's "Foxhunt Transmitter" into a code oscillator? It's simple because there's a Jim Dandy little tone generator already built into the kit's main microprocessor (pins 7 through 14 of U1)!. You simply disable the generator's "beep beep" timer, add in a key, route its output through a volume/deviation control to your 2-meter rig, and Bingo—you have CW on FM! Let's get started.

First, wire up only the tone generator-related components (see Figure 2). Specifically, that means install S1 and L1 (if not previously installed), R3, R4, C3, C4 and U1. *Important note: Bend up pins 4 and 5 of U1 so they do not connect to the pc board's holes.* Do *not* install R1, R2, C1, C2, C5, or R5. Installing R9 and the LED is optional; if wired in, the LED will flash in synch with your keyed Morse. Next, solder wires for a key in series with the battery's positive lead and the tone

generator should be ready to "gen." Now, follow the next steps closely.

Do *not* install C5 on the pc board, but solder one of its wires into the "pin 9 of U1 hole" marked for R5 (directly below C3 on the pc board). Now take the other wire from C5 and, instead of mounting it on the circuit board, route it to one end of a 1K ohm potentiometer as shown in Figure 2. Connect the potentiometer's other end terminal to the pc board's ground, then connect the previously unused R5 (100K ohms) between the potentiometer's center terminal/wiper and the "hot" terminal of a mic plug to mate with your transceiver.

Hookup and Use

After making and soldering all your connections and checking your work (see "Homebrewing Tips"), only one final challenge remains: getting your rig to switch from receive to transmit mode without a PTT switch.

If you're using a mobile rig with conventional PTT circuitry that is direct-grounded to transmit, you're in luck. Just wire an external PTT switch to the mic plug. Otherwise, study your rig's manual (or the diagram of its optional speaker mic) for guidance.

Some handheld transceivers use a three-terminal socket for external speaker-mic connections, some use a two-terminal socket. If your handheld uses three terminals (in other words, a separate wire for PTT), I suggest first inserting a 2K ohm potentiometer in series with the (external) switch and then reducing its value only to the point that reliable T/R switching is achieved. Then measure the pot's resistance and replace it with a fixed resistor of that same value. (This resistor is necessary to prevent excess current flow in the handheld's PTT circuitry.)

If your handheld uses a two-terminal mic socket, try inserting a 2K ohm potentiometer and PTT switch between the mating plug's tip (which is often the audio input terminal) and ground. Once again, reduce the pot's value only to the point where reliable T/R switching is achieved, then measure the pot's value and replace it with a fixed resistor. Bear in mind, exceptionally low resistance here will shunt the tone generator's output and necessitate readjusting the 1K ohm deviation control.

Because there are so many varieties of FM rigs in use today, "talking more specifically" in this column is practical-

Homebrew Tips

Whether assembling a simple quick-brew project or building a complete transceiver from a magazine article or kit, nothing beats the gratification and exhilaration of seeing it work right from first "power on." In light of that, I strive to include a few time-proven notes for success in each "Project Corner." Here are a few more tips to add to your collection.

Begin by "building the project in your head," so to speak. Take a few minutes to study the project's circuit diagram and pc board (if used) and to visualize where each component will be placed. Closely examine the pc board for gaps in wiring "runs" that could cause an open circuit or an unetched area that could bridge or short circuit wiring connections. If doubts arise, use your ohmmeter to check continuity of wiring. Small gaps can be repaired with part of a resistor lead or a touch of solder. Bridges can be cut with an X-Acto® knife. Especially notice closely placed solder pads for ICs and transistors. Practice soldering them with a cold iron to "get the feel" and to ensure that your iron's tip is small enough to solder a lead or wire to only one pad at a time.

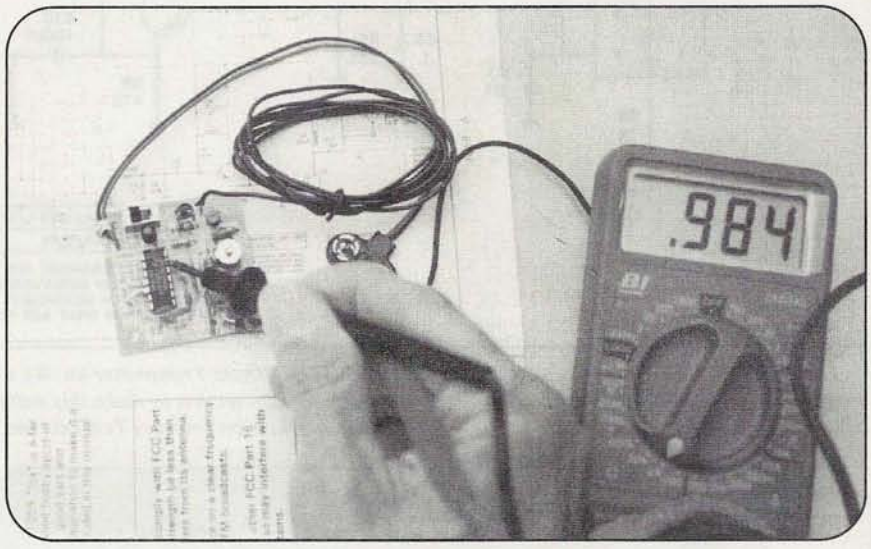


Photo C. Are your soldering connections good and parts placements correct? Double checking your work with an ohmmeter as you go ensures "first power on" success.

After measuring component values and soldering them in place "round robin style" as we discussed last time, check your work for both accuracy and errors. Notice, for example, in Photo C, how I'm checking both solder connections and proper wiring associated with R3 and U1. One ohmmeter lead's tip end is on pin 13 of U1 (see diagram in Figure 1 or 2) *right where it enters the IC*. The other ohmmeter lead's tip is on the positive terminal of the battery connector *right where it snaps onto the battery's post*. I'm therefore reading from the pin (13) and solder connection of U1, through the solder pad connections of R3, on through L1 and its solder pads, plus S1, the positive battery lead and to the battery connector's positive terminal—all at one time. The meter is reading 984 ohms, which is well within the resistor's tolerance range.

If I move the left meter lead down to Pin 12, the meter will then read approximately 101K ohms. That's because I'm then measuring through R4 and R3 plus L1, S1 and the battery leads. I attempted to shoot another photo for illustration, but trying to balance two meter leads in one hand and a camera in the other hand amidst a Fall breeze was a bit too challenging. I'm sure, however, you get the idea: Check, install, solder, and recheck your work on a cumulative basis.

The process is simple "troubleshooting on the fly," but it's most rewarding when the "moment of truth" (first turn on) arrives! (Note: The previous discussion in no way indicates poor quality of the Ten-Tec kit. Indeed, I have built several Ten-Tec kits and they have all been top quality in every respect.

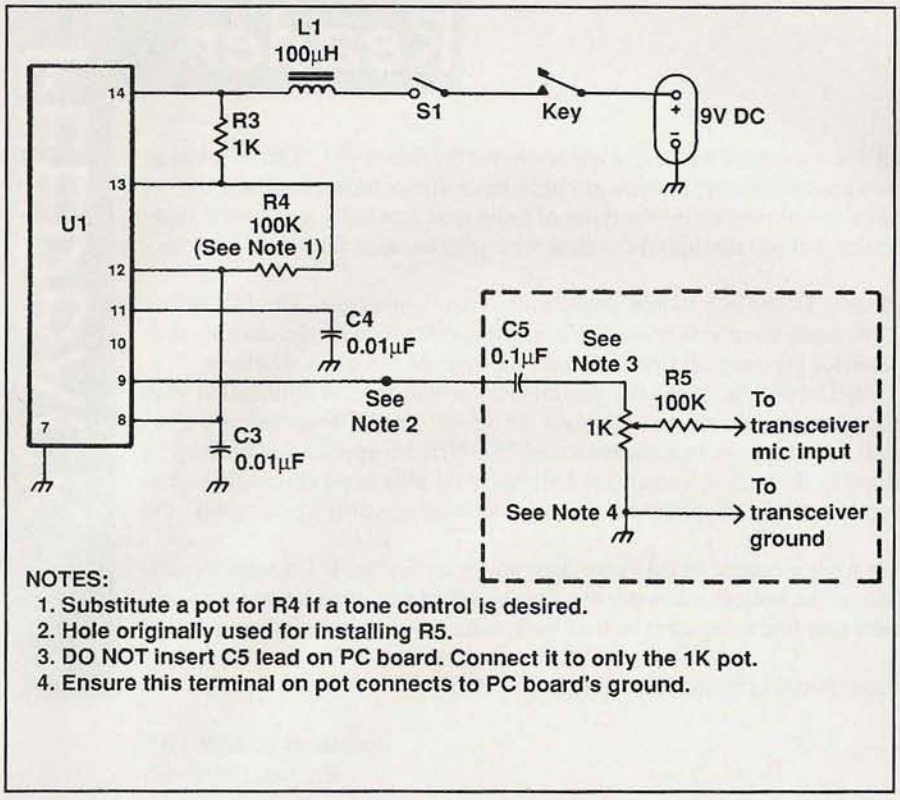


Figure 2. Detail of the Foxhunt transmitter circuitry used to make the CW tone generator. Output from the .1-µfd capacitor installed in "U1 side of R5 hole" routes to off-board components and on to output cable. See discussion in text.

"A second rig or scanner can be used to monitor initial deviation adjustments, then more remotely located amateurs can 'talk you through' fine adjustment."

ly impossible. If you have questions, your best bet is checking with the service department of your particular rig's manufacturer regarding PTT/speaker-mic hookups. Alternately—and easiest of all—just hold your talkie's PTT depressed with one hand and send CW with your other hand. Now let's add some quick final notes.

Closing Thoughts

The deviation control on this MCW unit must be set very accurately to ensure adequate, but not excessive, modulation. A second rig or scanner can be used to monitor initial deviation adjustments, then more remotely located amateurs can "talk you through" fine adjustment.

Although sending "toned CW" is perfectly legal on our VHF and UHF bands (CW repeater IDs are MCW), some repeater groups may not endorse the idea, and "direct" or "simplex" frequencies in congested areas may be too busy for additional activities. Always ensure that your MCW transmissions are "socially acceptable" before airing them—then enjoy using amateur radio's most famous mode of communications for demos and to help your fellow ham (or yourself) toward a license upgrade.

That's all the space for now, friends, but rest assured more unique and exciting projects are coming in the near future. Next up, I plan to feature a solar charger for your handheld and squeeze in more homebrewing tips. Stay tuned! ■

Resources

You can order T-Kits directly from the T-Kit division of Ten-Tec, Inc., at 1185 Dolly Parton Parkway, Sevierville, TN 37862; Phone: (800) 833-7373; e-mail: <sales@tentec.com>.

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CIRCLE 76 ON READER SERVICE CARD

Reader FEEDBACK!

Dear *CQ VHF*:

After just having read Mr. Rick Berman's letter regarding his mic question (November, 1997, "Q&A"), I must tell you that I think you may be in error with your answer! Do you possibly have things turned around?

Yes, impedance is the question here; however, almost all newer types of radio gear generally have a low input impedance (i.e., 600 ohms) to minimize noise pick-up through the coiled cord, plus because they are using electret types of mic elements.

In your answer, you told him that an Astatic D-104 mic is low impedance. That is incorrect! The D-104 had a crystal element from the days of tube-type equipment and presented a *high* impedance, with the exception of one of the models that included a two transistor pre-amp section built into the base of the stand, I believe.

The second issue is audio bandwidth! The D-104 was originally designed for use in an AM application with much wider bandwidth allowed, and its frequency response was "peaked" or "E-Qd" in the upper portion of its passband. Consequently, it's really not well suited for use in a narrow-band FM (NBFM) application unless you can really check the radio's deviation properly. Using such a mic on NBFM could also wind up causing adjacent channel problems on simplex or even exceeding the passband of a repeater and possibly "talking off" the PL tone.

As far as the Shure 444 mic goes, there were a couple of different derivations available, if I remember correctly. One was a model that had a switch at the bottom allowing the user to select the impedance from low, medium, and high. There was also a model that had a pre-amp in it as well, with a screwdriver adjustment on the bottom to adjust its gain.

I hope my input has clarified his question unless I missed the ball here too, hi,hi.

Keep up the good work! 73,

Bob Oserkis, KD6YBT
Encino, California

Bob—Your knowledge of these microphones is clearly greater than mine. I happen to have both a D-104 (the one with the preamp in the base) and a Shure 444. The data sheet for the D-104 lists the impedance as "5,000 ohms or less," which is low in comparison to the typical 50 K-ohm high-impedance mics of the same period. So I guess neither of us is wrong, but you're more right! Same goes for the Shure. I didn't look any further than the data sheet in my shack. It describes the mic as high-impedance, and the only switch on my model is for PTT/VOX.

I hadn't considered the bandwidth issue, and I'm still not sure it is one, since the typical "wide" AM signal has a bandwidth of 6 kHz, while a "narrowband" FM signal has a typical deviation of ±5 kHz, for a total of 10 kHz, and an overall bandwidth of 10 to 15 kHz.

Thanks for your feedback. Obviously, anyone planning to use these mics for anything other than their intended application (AM) should carefully check their specific model for compatibility with their rig.

The following is a condensed version of an e-mail exchange between Hanspeter Nafzger, HB9AQZ, and W2VU.

HB9AQZ—There's a misleading piece of information in the November, '97 issue that packet satellites don't use FM. This was partially true for the early PACSATs (1200 baud), but not so for the 9600-baud satellites such as UO-22, KO-23 & KO-25. All these "birds" use FM-mode for the up-and downlink.

W2VU—I presume you are referring to the line in the satellite "Basics" article which says that "Only one currently-operating satellite accepts FM voice signals. All the others operate on SSB, CW or modified packet...."

We really didn't say anything about the type of modulation used by the digital satellites. And the key point here was that you can't use your standard dual-band FM rig &/or a "plain vanilla" packet TNC to make use of these satellites (except AO-27, Mir, and the shuttle), without specialized add-ons or rig modifications.

HB9AQZ—UO-22, KO-23 & KO-25 use "true" FSK (G3RUH standard), in other words, the data-output directly modulates the FM-modulator (varactor). Standard dual-band FM rigs can be used to some extent, but need some modification, (IF-filter) to cope with the Doppler shift and direct connection to the discriminator & varactor. (Some of the latest FM rigs available already have connections for 9600 baud.)

W2VU—As you point out, most rigs that are not "9600-ready" cannot deal with "true" FSK (Frequency Shift Keying) without significant modification. While a growing number of radios are (or claim to be) "9600-ready," most rigs on the market today still are equipped only to handle 1200-baud AFSK (Audio Frequency Shift Keying), usually via the mic and speaker jacks. Our "Basics" column is aimed at newcomers to VHF, who may not be ready yet to take on the modifications you describe.

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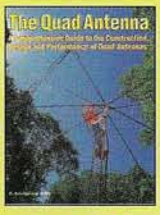
by Bob Haviland, W4MB
Second Printing



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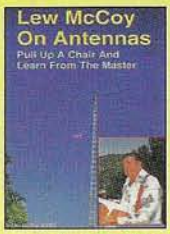

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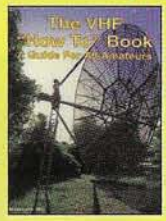

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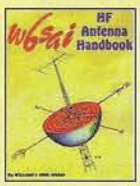

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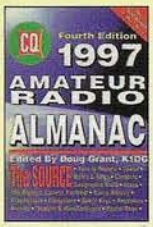

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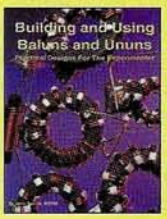

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Basics

Soldering

Sooner or later, just about every ham needs to solder something. And while you don't have to know how to solder to get your license, it sure does come in handy for getting on the air. Connectors need to be soldered to wires and cables; wires break and need to be fixed, etc. Knowing the right way to solder is important, because poor soldering can cause all kinds of problems, including interference on your neighbor's TV set.

Let's start at the beginning: What type of iron do you need? Most irons are rated for both power and temperature. For amateur work, a 700° F tip is probably best. The wattage of the iron measures how quickly it will heat the surface you're going to solder—what we call the "work." A 45-watt iron is fine for most amateur projects. But it's handy to have a 100-watt soldering gun available when working on large materials and antenna connectors. *(Remember: Pick up a soldering iron* only *by its handle—700 degrees is HOT!)*

You'll also need a stand to hold your iron when you're not soldering, some rosin-core solder (never use acid-core "plumber's" solder), plus a small sponge and some type of solder remover. A vise or something else to hold the work still is also important.

Be Prepared

Before you start to solder, you need to prepare the tip of your iron for the best heat transfer. This is called "tinning." To prepare a new tip, plug in the iron and let it heat until the tip will melt solder. Then apply a liberal amount of solder all over the tip and a quarter to a half inch down as well. Clean off the excess with a damp sponge. The tip should now be shiny all over, and you are ready to solder.

Just keep a couple of rules in mind as you begin your work:

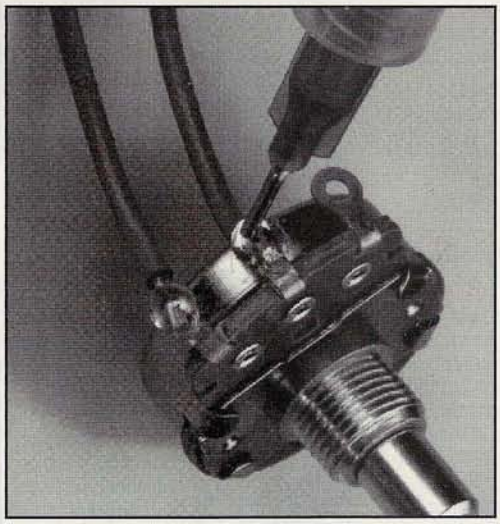
Rule 1. Solder is only for making electrical connections, not for physically holding things together. Make sure you have a good mechanical joint before you solder. Also, make sure the surfaces you're going to solder are clean.

Rule 2. Heat the work, not the solder. If the surface to be soldered isn't hot enough, the solder won't stick or will produce a "cold joint" (more on that later).

It's Hot!

Hold the soldering iron on an angle; about 45 degrees is best. This puts more of the tip in direct contact with the work—and transfers more heat—than holding it straight down. First, "tin" any wires you're going to solder by applying a small amount of solder to the wire itself. Now, heat the larger mass to make the connection—if you don't, the solder may not adhere to both surfaces.

Here's a hint: If you put a little bit of solder between the tip and the work while it's heating, it'll help maximize heat transfer and will also tell you when the



work is ready to solder. The solder starts out balled up on the tip of the iron. When it's hot enough, the solder "wets," or flows into the joint. Now, add more solder. Apply it to the work, not the tip.

Now Cool It!

When the joint is covered with solder, remove the solder first, then the iron. Clean off the tip with your damp sponge and put the iron in its holder. Now let the joint cool. Don't try to rush things. It usually takes a solder joint no more than 10 seconds to cool. If you move it or blow on it before it's cool, you'll cause a cold joint and you'll have to start again. Your finished joint should be shiny and smooth. You should be able to see the outline of the materials you've joined, and the solder itself should have a feathered, tapered shape.

Cool, Not Cold

If the joint looks dull and grainy, you've got a "cold solder joint." The solder here is brittle, may be a poor conductor, and will eventually fall apart. To "warm up" a cold solder joint, reheat the connection until the solder melts, then add a small amount of fresh solder and let it cool slowly.

Finally, check your connections with a V-O-M (volt-ohm meter) to make sure there are no shorts and that you have a solid connection to whatever's on the other end of what you've soldered. Use the "ohms" setting. On the meter, look for zero resistance in your continuity check and for infinite resistance when checking for shorts.

All Done!

It's really not that hard to solder well. In fact, if you're using the right iron and tip, have prepared the tip and work properly, and have the patience to wait while your work heats and then cools, soldering can be easy and fun.

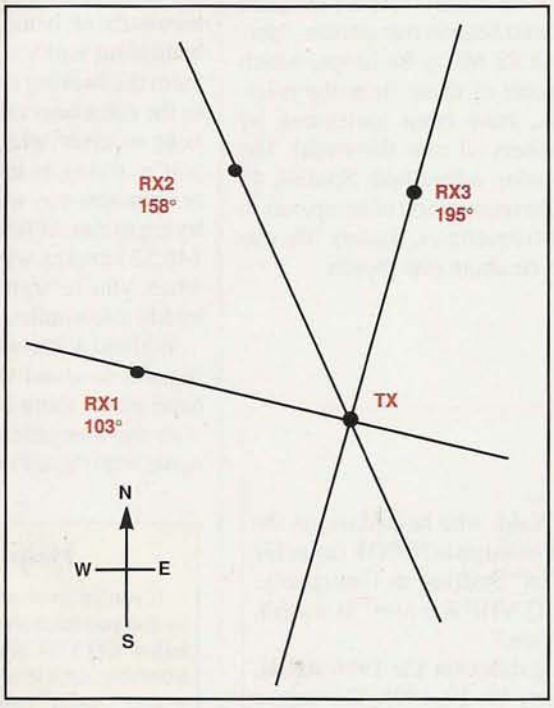
Basics

Radio Direction Finding

Radio direction finding—also known as RDF, DF, DFing, T (for transmitter)-hunting, and fox hunting—is the use of radio signals from a transmitter in an unknown location to track down and locate that transmitter. It's very useful in identifying repeater jammers and other unidentified signal sources. (If you want to find out what direction *you're* going, though, a map and compass might be your best bet! You can't DF *yourself*! Keep the map and compass handy, though. You'll need them if you go fox hunting.)

Triangulation

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



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

Each triangulation team needs, at minimum: a receiver tuned to the transmitting station's frequency; a directional antenna, a detailed street map (preferably a topographical map), and a reliable compass. The teams will also need a way to keep in touch with each other (if you're tracking a jammer, use cell phones, not the radio).

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

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

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

The Doppler Detective

Triangulation requires that you stop and take bearings from specific locations. But if you're equipped with a Doppler detection system, you can track the hidden transmitter while on the move. This is the same system used by police departments to track stolen cars equipped with RF alarms, such as LoJack®.

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

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

News *(from page 7)*

two-way radio transmissions (see "Line of Sight," November, 1997 *CQ VHF*). The amended version of HR 2369 requires only that scanner manufacturers block PCS (Personal Commun-ications Service) frequencies as well as standard cellular telephone bands.

Our sister magazine, *Popular Communications*, is keeping its Web site updated regularly with developments on this bill and a companion, HR 1964. To get the latest information, point your Web browser to <http://www.popcomm.com>.

1998 Exam Fee Set

The FCC has set a maximum fee of $6.39 for administering amateur radio license exams in 1998. The annual fee increase is based on the Consumer Price Index. The ARRL/VEC, which administers the majority of the license exams in the U.S., has set its 1998 fee at $6.35.

Four New FCC Commissioners

The face of the FCC has changed radically, with the Senate confirmation of a new chairman and three new commissioners for the five-member panel. William Kennard, former FCC General Counsel, is now Chairman—the first African-American to hold the post. He is joined by new Commissioners Michael Powell (son of retired Gen. Colin Powell), Harold Furchtgott-Roth, and Gloria Tristani. These appointments were followed by significant upper-level staff shakeups. It's unclear yet whether there will be any impact on the Wireless Telecommunications Bureau, which administers the amateur service.

1st China-North America EME QSO

KB8RQ became the first North American ham to contact China via moonbounce, making contact on 2 meters with BY1QH on October 25, according to a report on "Newsline." The report says W5UN was also able to work the Chinese station off the moon.

RS-17/Sputnik 40 "Launched"

A functional scale-model of the original Sputnik satellite was hand-launched from the Mir space station during a November 3 spacewalk by Cosmonaut Anatoly Solovyev. The model was built to commemorate the 40th anniversary of Sputnik 1, whose 1957 launch also launched the space age. According to the ARRL and AMSAT, the satellite contains a 100-milliwatt beacon transmitter, operating on 145.82 MHz. Its beeps, which are reminiscent of those from the original Sputnik, have been monitored by hams and others all over the world. The satellite is being called both Sputnik 40 and RS-17, in recognition of its operation on amateur frequencies. Battery life was expected to be about one month.

Ooops...

Well, our eagle eyes missed a few things yet again ...

In our November issue, we misidentified Norman Wald, who helped us get the photo of CO2KK to go with Arnie's article. Norman's callsign is **N9NW** (as in his initials), not N9MW; and Richard Ferguson's article on "Staffing an Emergency: A Manager's Guide," was incorrectly slugged as a "CQ VHF Review." It wasn't, obviously, and should have been labeled "Public Service."

And in the December issue, we gave you the wrong dates for the 1998 ARRL January VHF Sweepstakes. The correct dates are January 17–19, 1998. The source of the confusion is the fact that the *1999* contest will be a week later than usual (January 23–25). But in 1998, it's in its usual spot on the calendar.

Also in December, we got TAPR President Greg Jones's callsign wrong a couple of times in the Annual Index. It's W**D**5IVD, not W**O**5IVD. Sorry, Greg. Plus, we had another typo in one of the captions in "Picture This." The German word for "castle" is "schloss" (actually "schloß" which is pronounced "schloss"), but in any event, not "scholss." Sorry, schloß.

Stay tuned to see what we get wrong this month!

Line of Sight *(from page 4)*

there *is* support to develop a band plan structure through which we can continue to explore the flexibility of the rules for experimentation, yet provide "windows of opportunity" where a particular type of emission is common to certain frequencies within the band on a local, regional, state, or national level. Or maybe you don't agree and want to leave the rules as they are. But we must communicate with the League's directors to let them know what their constituents—you and I—think about what's happening when it comes to band planning and what we think should be done.

Page 10 of every *QST* magazine lists the ARRL Board of Directors by area. Or you can e-mail your director at (their callsign)@arrl.org or hq@arrl.org. A final option is to e-mail your comments to us right here at *CQ VHF* (our address is CQVHF@aol.com), and we'll forward them for you.

Do It Now

But you gotta do this right now while it's still fresh in your mind. Support those hundreds of hams who help formulate band plans with *you and me* in mind. Give them the backing that will put some teeth in the rules next time someone hammers your receiver with an FM signal when you're trying to hear that satellite pass; or hammers you with code when you are trying to run APRS; or blocks you out on 146.52 simplex with a crossband remote when you're trying to talk with your buddy a few miles away from car to car.

Without acknowledgment of, and willingness to stand behind, our voluntary band plans, there is little that we can do with the renegade operator who doesn't agree with "good amateur practice." ■

Help Wanted

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

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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**

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CQ VHF Ham Radio Above 50 MHz

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- "Hams and Heart Disease—Are You a Sitting Duck?" by Richard Benda, M.D., WB2QJA
- "Riding the Airwaves" (on a bicycle), by Scott Farrell, KE4WMF
- Two *CQ VHF* Reviews:
  - –"Comet CYA 240 Dual-Band Antenna," by Gordon West, WB6NOA
  - –"Yaesu FT-(x)90 Multimode Rigs: A 10-Year Review," by Ken Neubeck, WB2AMU

Plus...

- "No Code to Know Code," by Jeffrey Lih, N2VHV
- "'Roving' in Scotland," by Simon Lewis, GM4PLM
- "Microwave Hamming in Europe," by Simon Lewis, GM4PLM

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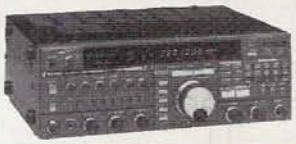

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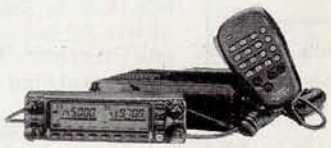

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KANTRONICS DAIWA Larsen W & W MIRAGE SGC KLM BENCHER, INC. GAP

CIRCLE 180 ON READER SERVICE CARD

2m/70cm Mobiles **FT-2500M/FT-7400H**

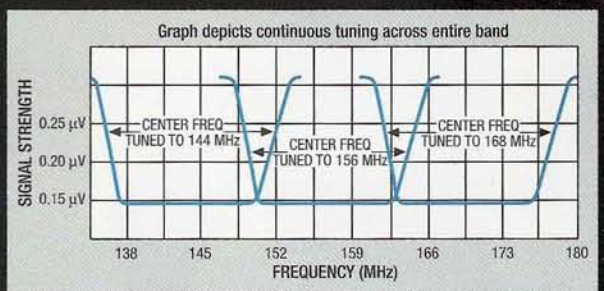
Advanced Track Tuning, Mil Spec, true FM. All in one radio!

Outside, you can easily see why the FT-2500M stands up to the shock and vibration like no other. We engineered the first mobile radio to meet the rigid standards set by the U.S. Military back in the '80s, and that same critical design is in the FT-2500M. From the simplified front panel, rubber coated knobs, durable pebbled finish coating, and huge Omni-Glow™ display to the one-piece die-cast chassis, the FT-2500M can take whatever you throw at it!

Inside, the electrical circuitry meets standards so uncompromising the FT-2500M can respond like no other radio. Built-in 3-Stage Advance Track Tuning (ATT), automatically retunes from 140 to 174 MHz permitting consistent receiver sensitivity across the entire band.

But there's more. Like alpha-numeric display capability! Lets you program a frequency or a 4-character name on any of the 31 memories. With three selectable power output levels and up to 50 watt power output, the FT-2500M extra large heat sink means forced air cooling is not necessary. And, as a bonus, Yaesu's exclusive backlit DTMF mic comes with every FT-2500M.

Experts say the FT-2500M is the only commercial-grade amateur radio available. So, for tough manufacturing standards, inside and out, with true FM clarity, and outstanding performance, the FT-2500M is your mobile.



3-Stage Advance Track Tuning (ATT) – The exclusive 3-Stage Advance Track tuning front end automatically adjusts band width sensitivity across the entire receiver range, while maintaining selectivity specifications. ATT significantly reduces interference from inter-modulation and front end overload.

Specifications

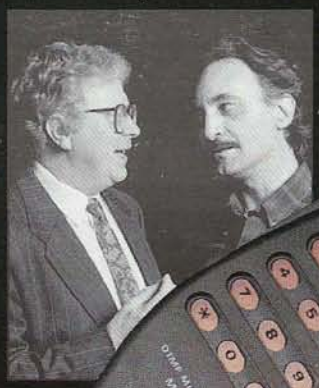
- **Frequency Coverage:**
  FT-2500M
  RX: 140-174 MHz
  TX: 144-148 MHz
  FT-7400H
  RX/TX: 430-450 MHz
- Rugged Military Spec Design
- Advanced Track Tuning (ATT)
- Selectable Alpha-Numeric Display
- Omni-Glow™ Display, largest available
- Power Output:
  FT-2500M 50/20/5 Watts
  FT-7400H 35/15/5 Watts
- Flip Up Front Control Panel hides seldom used buttons
- Backlit DTMF Mic
- 31 Memory Channels
- CTCSS Encode Built-in
- Automatic Power Off (APO)*
- Time-Out Timer (TOT)*
- Manual* or Automatic Backlighting Adjustment
- **Accessories:**

FP-800	20 Amp HD Power Supply w/ Front Mounted Speaker
FRC-6	DTMF Paging Unit
FTS-17A	CTCSS Decode Unit
SP-4	External Mobile Speaker w/ Audio Filters

*FT-2500M

"Just look inside. Military spec really means something to Yaesu!"

"A QST review says 'the FT-2500M exhibited superior 10 MHz offset IMD dynamic range of 103 db!'"



"This Advanced Track Tuning practically eliminates intermod!"

"Yaesu did it again."

YAESU

Performance without compromise.℠

FT-3000M

High-Powered 2-m FM Transceiver
Feature-rich, 70 full watts of TX power, and built to the tough performance standards you've come to expect from Yaesu.
FEATURES • Frequency Coverage Wide Band Receive-- RX:110-180 MHz, 300-520 MHz, 800-999 MHz* TX:144-148 MHz • AM Aircraft Receive • MIL-STD 810 Rating • Interactive Programming • High Power Output: 70 Watts, plus 50, 25 and 10 Watts • Quick-Touch™ Dual Concentric Control Knob • Twin Cooling Fans • ADMS-2 Windows™ Programmable • Digital Coded Squelch (DCS) • 81 Memory Channels • Auto Range Transpond System™ (ARTS™) • 1200/9600 Baud Packet Compatible • Smart-Search™ • Alphanumeric Display • Dual Watch • Full line of accessories *800 MHz Cellular blocked

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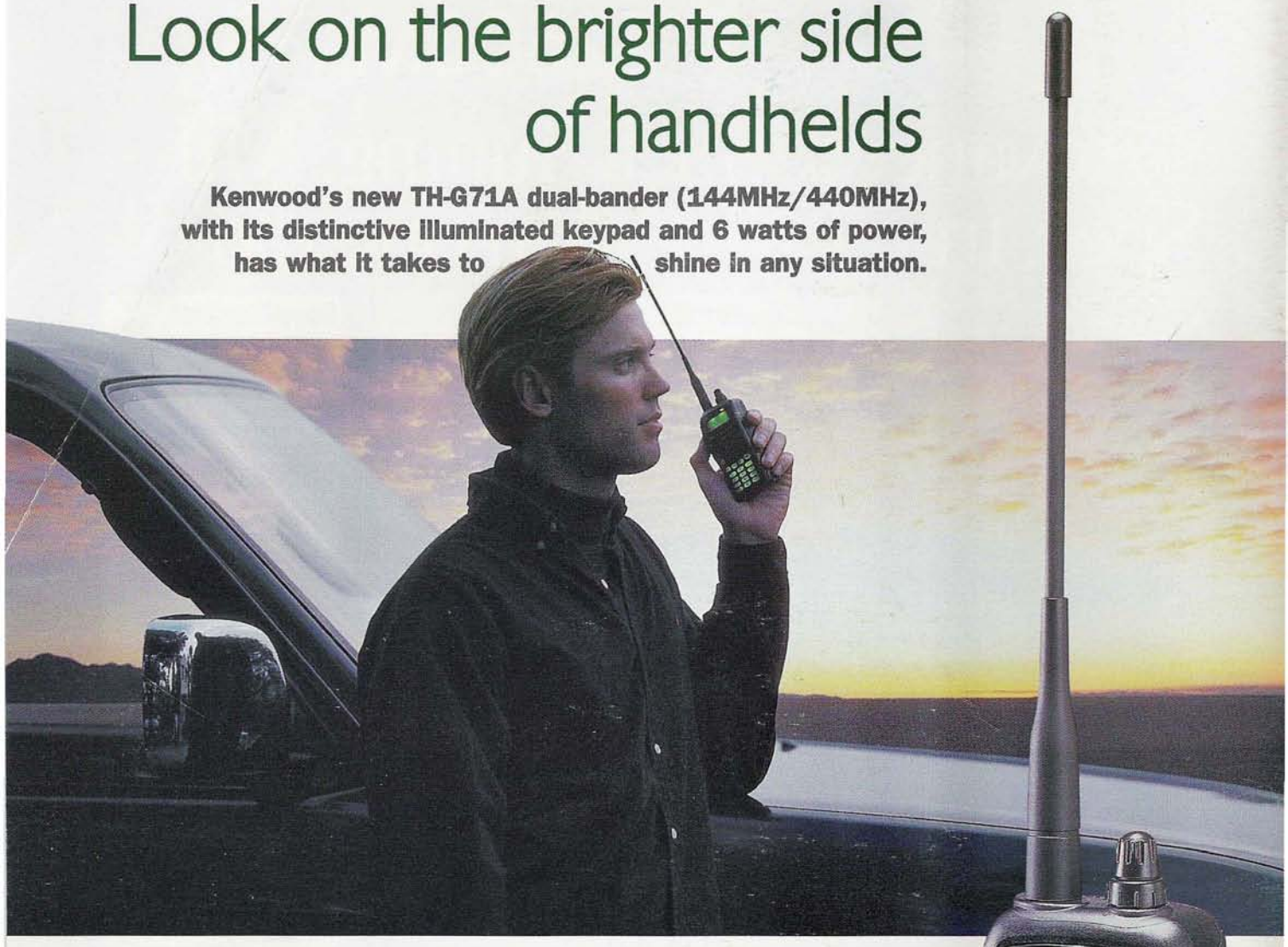
Specifications subject to change without notice. Specifications guaranteed only within amateur bands. Some accessories and/or options are standard in certain areas. Check with your local Yaesu dealer for specific details.

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.

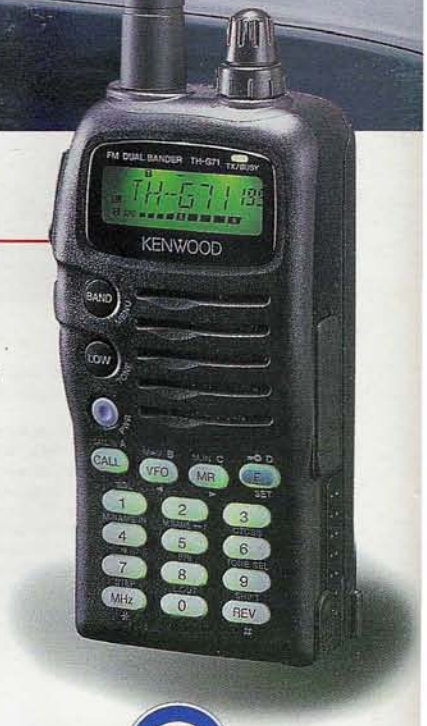
Just hold it in your hand and it's immediately clear how well our new handheld transceiver is engineered. The ergonomic design, **illuminated keys** and **backlit display** all combine to make operation a breeze. As does the menu mode, which allows you to customize the TH-G71A by adjusting all major 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
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KENWOOD
Amateur Radio Products Group
97ARD-1670

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