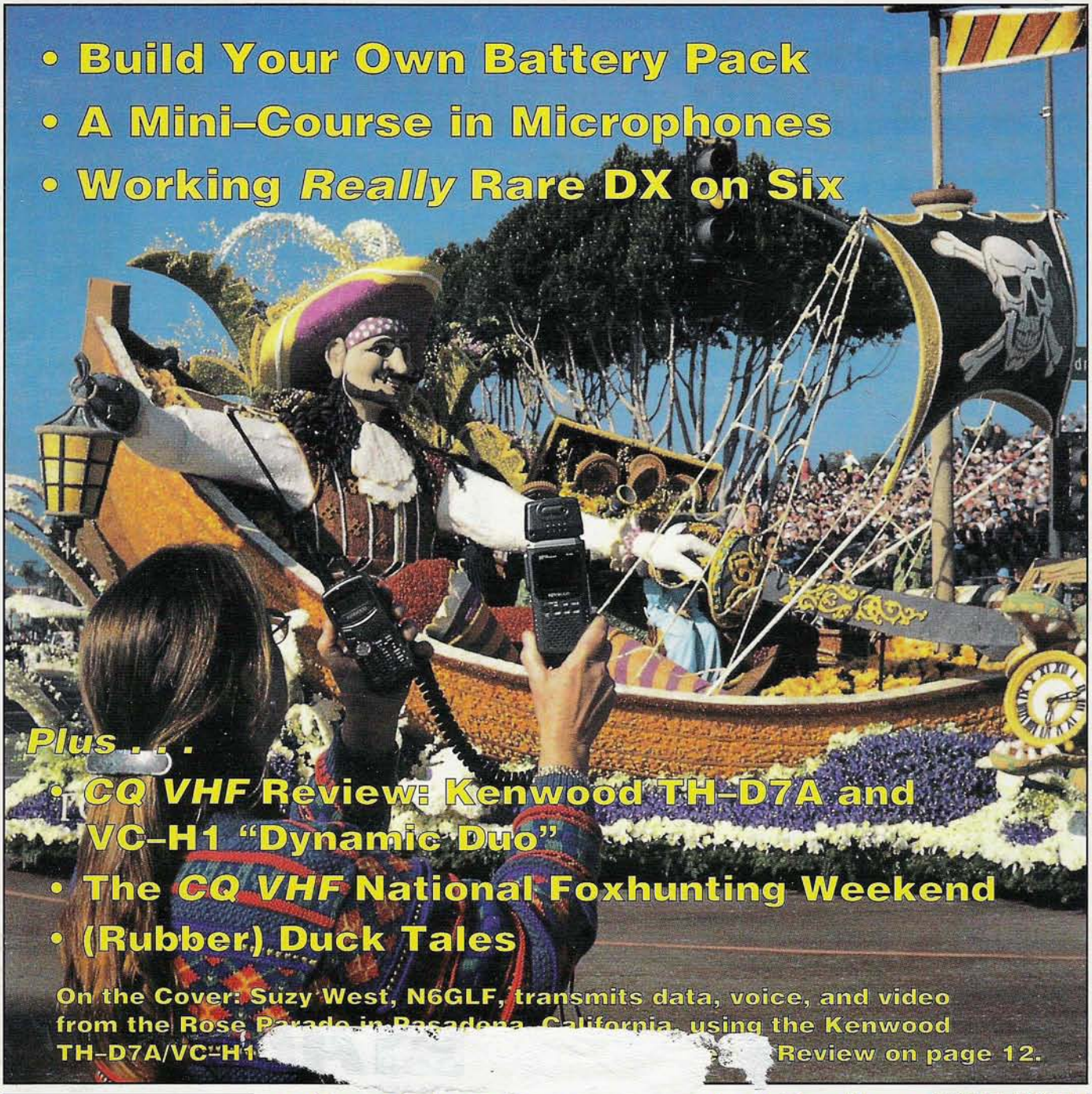
ICD 08237

CQ VHF Ham Radio Above 50 MHz

April 1999



- Build Your Own Battery Pack
- A Mini-Course in Microphones
- Working *Really* Rare DX on Six

Plus . . .

- *CQ VHF* Review: Kenwood TH-D7A and VC-H1 "Dynamic Duo"
- The *CQ VHF* National Foxhunting Weekend
- (Rubber) Duck Tales

On the Cover: Suzy West, N6GLF, transmits data, voice, and video from the Rose Parade in Pasadena, California, using the Kenwood TH-D7A/VC-H1. Review on page 12.

U.S. $3.99/ Canada $5.50

04>

0 74851 08237 9

■ Repeaters & rivi ■ rucket Radio ■ VHF/UHF
ives ■ Amateur
Satellites ■ Plus...Reviews, Upgrade Tips, Product News, VHF Basics, and much more!

"SHOW STOPPERS!"

Check out the new radios from Alinco that have been the "must see" new models at Hamfests and conventions across the country. Maybe you couldn't make it to the show but you CAN enjoy new radios and great engineering at a low Alinco price!

DJ-C5T VHF+UHF "Credit Card" Transceiver

We've taken a great idea and made it even better!

- Internal speaker
- Full 2 meter + 440 band coverage
- 52 memories
- CTCSS encode and decode
- Extended VHF receive includes AM airband
- Internal Lithium-ion battery
- Includes snap-in charger and plastic case
- Accessory port

Alinco DJ-X10T Multimode Handheld Receiver

We've reinvented the multichannel receiver. Look at all the features!

- 100 KHz ~ 2 GHz coverage (cellular blocked)
- 1200 memories plus two VFOs
- WFM, NFM, AM, USB, LSB, CW modes
- Alphanumeric channel designations – up to 3 lines
- Multi-function Channel Scope™ display
- Internal "help" function
- PC programmable
- Beginner and Expert operating modes
- Automatic Memory Write feature
- Auto timer on/off, internal clock
- Backlit display and keys

Alinco DJ-280T 222MHz HT

Every license class can enjoy the 222 MHz band. Alinco makes it fun and affordable!

- CTCSS encode and decode
- 222 ~ 225 MHz coverage
- 10 memory channels, expandable to 50 or 200
- Easy to program
- DTMF tone pad standard
- NiCd battery and charger included
- Wide choice of accessories
- Usable by all USA Amateur license classes

Simple ▪ Clean ▪ Dependable

ALINCO®

AMATEUR RADIO'S VALUE LEADER℠

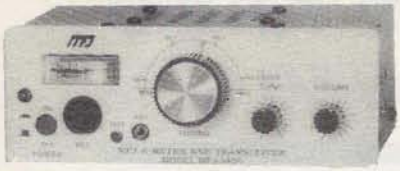
U.S.A. Alinco Branch: 438 Amapola Ave. • Suite 130 • Torrance, CA 90501
Phone: (310) 618-8616 • Fax: (310) 618-8758 • Internet: http: //www.alinco.com

Specifications subject to change without notice or obligation. Transceiver performance specifications only apply to the Amateur bands. Transceivers intended for use only by properly licensed operators.

CIRCLE 120 ON READER SERVICE CARD

MFJ 6 Meter SSB Adventure Radio™

Incredibly low $259.95 . . . for No-code Techs and Veterans alike . . . Explore the world . . . Ragchew with locals . . . 10 Watts Out . . . Super Hot Receiver . . .



MFJ-9406
$259.95
MFJ-9406X
$269.95 with mic

Work exciting 6 Meter DX from all over the world on ham radio's *"magic band"*!

It's an adventure every time you turn on your MFJ-9406 six meter SSB transceiver.

Distant stations come rolling in loud and clear with crystal clear armchair copy. You'll have fun exploring exotic 50 MHz band openings -- Tropo, Sporadic E, F2, TE, Aurora, Meteor Scatter, and more.

Ragchew with locals, hunt down new grid squares from far-away places from home, car or mountain top.

Special Offer! MFJ-9406X, $259.95! Includes MFJ-9406 & MFJ-290 microphone.

Here's what you get . . .

Full SSB/CW coverage: 50.0-50.3 MHz covers SSB, CW, propagation beacons.

Potent signal: 10 Watts PEP output. MFJ's exclusive *Constant-Current*™ syllabic speech processing gives you up to 6 dB more punch to cut thru noise, fading, QRM.

Hot receiver: Crystal-mixed single-conversion superhet with low-noise preamp digs deep into the noise to capture weak signals. If a station is there, you'll hear it!

Easy to operate: No microprocessor mumbo-jumbo . . . just turn on and tune in.

Low power drain: Mountain-top all day on lightweight NiCads or operate from home on 110 VAC with MFJ-4110, $39.95.

Excellent selectivity: Sharp *HF proven* SSB crystal ladder filter reduces QRM and passband noise.

TVI protection: Seven element low-pass filter knocks out TVI -- lets you operate when *you* want to!

Real S-meter: Give meaningful signal reports, accurately steer your beam, monitor speech processing.

Smooth tuning: Vernier reduction drive makes tuning precise and easy.

External amplifier: Jack provides a key-line for activating 6 Meter SSB amps.

Built to last: Premium PC board, quality components, brushed-aluminum panel and tough vinyl-clad case gives years of service.

Compact: At only 2½x6½x6 inches, the MFJ-9406 fits in just about anywhere.

Fully guaranteed: MFJ's exclusive one-year *No Matter What*™ warranty. We will repair or replace (at our option) your MFJ-9406, no matter what happens, for 1 full year.

MFJ-9406 Accessories

Handheld dynamic SSB microphone: Specially matched to compliment the *Constant Current*™ speech processor used in the MFJ-9406. **MFJ-290, $29.95.**

CW Module: Install this and operate CW -- a must for DXers. Provides semi-QSK break-in and sidetone. **MFJ-416, $39.95.**

Power Supply: Heavy duty wall transformer and voltage regulator delivers 13.8 VDC for MFJ-9406. Powerful, yet small. Fits in your coat pocket! **MFJ-4110, $49.95.**

Portable Battery/AC Power Pack: Use Ni-Cad, Alkaline, regular D cells or 110 VAC. Charges Ni-Cads. Fastens to MFJ-9406. Batteries not included. **MFJ-4112, $69.95.**

MFJ 6 Meter *FM Communicator*™ Transceiver

MFJ-9606
$159.95
MFJ-9606X
$169.95 with Mic

The MFJ-9606 *FM Communicator*™ is the most inexpensive way to get on 6 Meter FM Voice or Packet! 10 Watt transmitter, *CrystalClearVoice*™ puts the fun and fidelity back into ham radio with true-to-life speech quality and ultra-clean AFSK data signals. *Super fast* PIN diode switching, no compromise dual-convers- ion FM receiver with quiet LNA, factory installed 52.525 MHz calling frequency crystals. Addl plug-in crystals, $24.95 per freq.

MFJ 6 Meter Antenna Tuners

MFJ-906, $79.95. Lighted 2 Range Cross-Needle SWR/Wattmeter, bypass switch. 100 watts FM, 200 Watts SSB PEP. 8x2½x3 inches.

MFJ-903, $49.95. Like MFJ-906, no meter, bypass switch. 5x2½ x3".

MFJ-945E, $109.95. Compact *mobile* tuner covers 6 Meters thru160 Meters. Lighted Cross-Needle SWR/Wattmeter. Antenna bypass switch. 300 Watts PEP SSB. 8x2x6". Mobile mount, **MFJ-20, $4.95.**

MFJ-969, $189.95. MFJ-969 has MFJ's superb *AirCore*™ Roller inductor, *continuous* 6 Meter - 160 Meters coverage and *QRM-Free PreTune*™! Wide matching range, lighted Cross-Needle SWR/Wattmeter, 8 position antenna switch, dummy load, 4:1 balun., 300 Watts PEP SSB. 3½x10½x9½".

6 Meter Antennas

MFJ 3 element 6 Meter Yagi

MFJ-1762
$69.95

MFJ's three element 6 Meter Yagi quadruples your effective radiated power over a half-wave dipole. 6 foot boom. 2 pounds. Can use TV rotator and mast. Handles 300 Watts PEP SSB. Mounts vertically or horizontally. Current balun decouples feedline. Excellent front-to-back ratio.

MFJ 6 Meter low-angle DX Vertical

MFJ-1756
$69.95

MFJ's omni-directional low-angle vertical radiator lets you work plenty of DX in all directions even with low power. A *GroundIsolated*™ radial system eliminates common mode current paths. Reduces undesirable feedline/supporting structure radiation. 55" *high-strength* aluminum radiator.

MFJ 6 Meter J-pole Travel Antenna

MFJ-1736
$24.95

Hang up this 6 Meter J-pole in the clear and enjoy some exciting DX QSOs. Omni-directional full size halfwave antenna with low angle radiation that outperforms 1/4 waves.

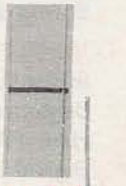
MFJ 6 Meter folded dipole

MFJ-1776
$34.95

MFJ's efficient low SWR folded dipole is light-weight, easy-to-carry, easy-to-put up. Perfect for MFJ-9406 and other 6 Meter rigs.

MFJ full halfwave 6 Meter Antenna

MFJ-1764
$44.95



MFJ's *full halfwave* 6 Meter centerfed antenna has excellent bandwidth and low angle radiation for super DXing! Mounts vertically for FM/Packet or horizontally for SSB. Strong light weight aluminum. Two 47" radiators, 23" boom. 1½ pounds.

MFJ Dual Band 6/2 Meter Mobile

MFJ-1728B
$24.95

On 6 Meters, it's a high performance *full quarter wave* mobile magnet mount antenna. On 2 Meters, it's a *maximum gain* 5/8 wave antenna. Low SWR, handles 300 Watts.

Free MFJ Catalog

Nearest Dealer . . . 800-647-1800

• 1 year *unconditional* warranty • 30 day Money Back guarantee (less s/h) on orders from MFJ • Add s/h

MFJ ENTERPRISES, INC.
P.O. Box 494,
Mississippi State, MS 39762
Prices/Specs subject to change. ©1997 MFJ Inc.
• **MAIN** 601-323-5869 • **FAX** 601-323-6551 • **TECH** 601-323-0549
• **Call** 8-4:30 CST, Mon-Fri • **E-Mail:** mfj@mfjenterprises.com
Web Site: http://www.mfjenterprises.com

FCC Type Accepted!

MIRAGE . . . 150 Watt 6 Meter Amp

MIRAGE
A-1015-G
$389
Suggested Retail
Call your favorite dealer for your best price!

Work exotic 6 Meter DX with 150 Watts of brute power! The A-1015-G is the *world's most popular* all mode FM/SSB/CW 6 Meter amplifier. Ideal for 1 to 15 Watt mobile, home or handheld rigs. 150 Watts out with just 10 Watts in. Extra heavy duty heatsink spans length of cabinet. Draws 18-22 amps at 13.8 VDC. 12x3x5½ in.

Power Curve -- typical A-1015-G output power for your HT input								
Watts Out	6	22	42	63	84	98	122	142	150
Watts In	.25	1	2	3	4	5	7	9	10

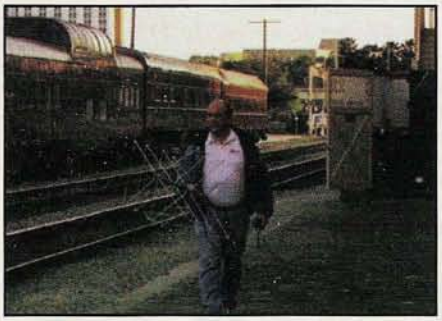
Free Catalog/Nearest Dealer 800-647-1800
Tech: (601) 323-8287 Fax: (601) 323-6551

MIRAGE
COMMUNICATIONS EQUIPMENT
300 Industrial Park Road, Starkville, MS 39759
. . . the world's most rugged VHF/UHF Amplifiers!

CIRCLE 143 ON READER SERVICE CARD

CQ VHF Ham Radio Above 50 MHz

Volume 4, Number 4—April, 1999



page 17

page 54

page 62

Next Month: "Make Your HT Talk Forever!" by Ken Collier, KO6UX

CQ VHF Ham Radio Above 50 MHz

EDITORIAL STAFF

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

CONTRIBUTING STAFF

Gordon West, WB6NOA, Sr. Contributing Editor

Kent Britain, WA5VJB, Microwaves and Antennas
Ken Ernandes, N2WWD, Amateur Satellites
Dave Ingram, K4TWJ, How It Works
Bob Josuweit, WA3PZO, Public Service
Ed Manuel, N5EM, Amateur Television
Tim Marek, K7XC, Weak Signal
Ken Neubeck, WB2AMU, Magic Band
Peter O'Dell, WB2D, Beginner's Corner
Donald Rotolo, N2IRZ, Packet Radio

Doug Bailey, KØFO, Webmaster

BUSINESS STAFF

Richard A. Ross, K2MGA, Publisher
Arnie Sposato, N2IQO, Advertising Manager
Nicole Tramuta, Sales Assistant
Sal Del Grosso, Accounting Manager
Ann Marie DeMeo, Accounting Department
Judith Erickson, Office Manager

CIRCULATION STAFF

Catherine Ross, Circulation Manager
Melissa Gilligan, Operations Manager
Jean Sawchuk, Data Processing
Denise Kells, Customer Service

PRODUCTION STAFF

Elizabeth Ryan, Art Director
Barbara McGowan, Associate Art Director
Edmond Pesonen, Electronic Composition Manager
Dorothy Kehrwieder, Production Manager
Emily Leary, Assistant Production Manager
Pat Le Blanc, Phototypographer
Hal Keith, Illustrator
Larry Mulvehill, WB2ZPI, Staff Photographer
Joe Veras, N4QB, Special Projects Photographer

A publication of

CQ Communications, Inc.
25 Newbridge Road
Hicksville, NY 11801 USA.

Offices: 25 Newbridge Road, Hicksville, New York 11801. Telephone: (516) 681-2922. FAX (516) 681-2926. E-mail: cq-vhf@cq-vhf.com; Web:<http://www.cq-vhf.com>. CQ VHF (ISSN 1085-0708) is published monthly by CQ Communications Inc. Periodical postage paid at Hicksville, NY 11801 and additional offices. Subscription prices (all in U.S. dollars): Domestic—one year $24.95, two years $45.95; Canada/Mexico—one year $34.95, two years $65.95; Foreign Air Post—one year $44.95, two years $85.95.

U.S. Government Agencies: Subscriptions to CQ VHF are available to agencies of the United States government, including military services, only on a cash with order basis. Requests for quotations, bids, contracts, etc. will be refused and will not be returned or processed. Entire contents copyrighted CQ Communications Inc. 1999. CQ does not assume responsibility for unsolicited manuscripts. Allow six weeks for change of address.

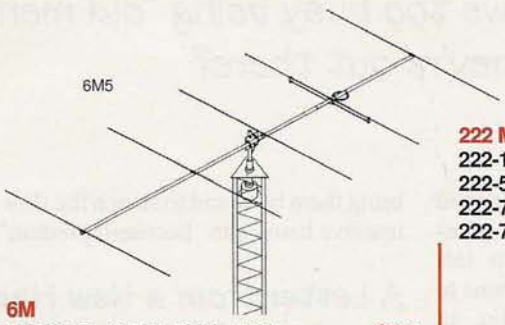
Printed in the United States of America.

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

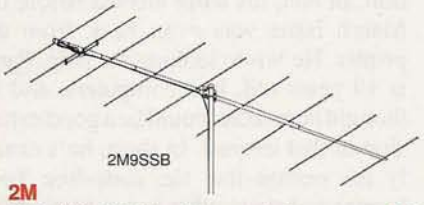
ARE YOU READY FOR THE SUMMER VHF FUN?

You have tried the rest—Now try the BEST!

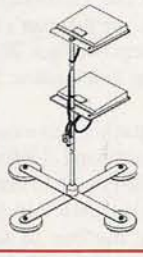
M² state-of-the-art honest gain designs in stock and on sale at Texas Towers!



6M
6M2WLC 49.7-50.5MHz, 39' boom.....$389
6M2.5WLC 49.6-50.3MHz, 50' boom.....$495
6M5 50.-50.5MHz, 15'10"' boom.....$179
6M7 49.5-50.5MHz, 26' boom.....$259
6MSQLOOP 50.-54MHz X 100KHz.....$125



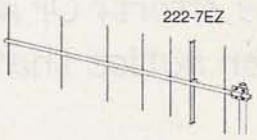
2M
2M4 144-148MHz, 4' boom, 4 el..... $80
2M5WL 144-148MHz, 33' boom, 17 el.....$169
2M7 144-148MHz, 8' 10" boom, 7 el.....$99
2M12 144-148MHz, 19' 6" boom, 12 el..... $135
2M8WL 144-146MHz, 52' boom, 24 el.....$299
2M9FM 144-148MHz, 14' boom, 9 el.....$109
2M9SSB 144-148MHz, 14' boom, 9 el.....$109
2M18XXX144-146MHz, 36' boom, 18 el....$210



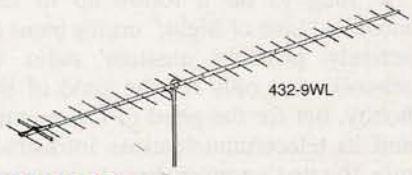
2MSQLOOP

When space, time, budget and desire for good performance on SSB/CW are all factors, the unique SQLOOP is a proven winner. 9" x 9" x 1" package. $55

2 loops on "Big Foot" mount as shown **$239**

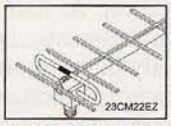


222 MHz
222-10EZ 222-226MHz, 9' boom, 10 el..... $89
222-5WL 222-226MHz, 23' boom, 15 el....$135
222-7EZ 222-226MHz, 5' boom, 7 el.....$79
222-7WL 222-226MHz, 32' boom, 23 el...$169



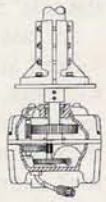
420-440 MHz
420-450-11 420-450MHz, 5' boom,11 el.....$75
420-450-5HD 420-450MHz, 2' boom,5 el....$89
432-13WL 430-434MHz, 30' boom, 38 el..$209
432-9WL 420-440MHz, 21' boom, 28 el....$145
440-18 420-453MHz, 11' boom,18 el.....$105
440-21ATV 420-440MHz, 14' boom,21 el..$119
EB-432 "Eggbeater" omnidirectional.....$105

902 MHz
902-14WL 900-910MHz,15' boom, 41 el..$179
902-16EZ 900-928MHz, 5' boom, 16 el....$115



23 CM
23CM-22EZ 1250-1300 MHz,5' boom, 22 el....$85
23CM-35 1250-1300 MHz, 10' boom, 35 el.....$119

Circular Polarized
2MCP14 143-148 MHz, 10' boom, 7H/7V el.....$155
2MCP22 143-148 MHz, 18' boom, 11H/11V el.....$209
436CP30 430-440MHz, 9' boom, 30 el.....$209
436CP42 UG 430-440MHz, 18' boom, 42 el.....$235



OR-2800P Rotator.....$1095

See our complete on-line catalog at: www.texastowers.com

All specs & prices subject to change

TOLL FREE: **(800) 272-3467**
TECH: (972) 422-7306 FAX: (972) 881-0776

TEXAS TOWERS

A Division of Texas RF Distributors, Inc. • 1108 Summit Avenue, Suite 4 • Plano, TX 75074
MON–FRI: 9 AM–5 PM, SAT: 9 AM–1 PM. M/C, VISA & DISCOVER ACCEPTED

Old Men Making Lunch Plans

Ham radio has a tremendous amount to offer to newcomers and oldtimers alike. But somebody has to offer it to them. Are we making the effort? Or are we too busy being "old men making lunch plans" to even notice that they're out there?

This isn't the editorial I had planned to write this month. I'd been planning to do a follow-up to last month's "Line of Sight," urging hams to actively promote amateur radio in schools—not only for the good of the hobby, but for the good of the country and its telecommunications infrastructure. But that's going to have to wait until next month.

Service After the Sale

Last month, "Beginner's Corner" columnist Peter O'Dell, WB2D, wrote about the need to "sell the sizzle" in ham radio, and to find "salesmen" who "know what the customer wants" and how ham radio can provide it to them. At first, I thought he was being too pessimistic, but now I see that he actually didn't go far enough. "Selling" ham radio is important, yes, but if we want to reverse the slide in license non-renewals, then "service after the sale" is equally important.

In last month's "Line of Sight," I looked at the FCC's licensing statistics for 1998, a year in which the total amateur population in the U.S. *decreased* for the first time in over two decades. A close look showed that the biggest part of the problem was that, even though we had more than 10,000 newcomers join our ranks in 1998, nearly 12,000 hams whose licenses expired in 1998 didn't bother to renew them.

Why are all these hams letting their licenses lapse? I asked. "Why aren't they on the air? How have they lost the spark of interest and excitement? And, most importantly, what can the rest of us do to bring them back and to stanch the flow of inactive hams into 'license-lapsedom'?"

A Letter from a New Ham

A month ago, I didn't have an answer. Now I do, thanks to an e-mail message from a new ham in 9-land named Ryan. Ryan wasn't trying to answer my question. In fact, his letter arrived before the March issue was even back from the printer. He wrote looking for help. Ryan is 19 years old, into computers, and he thought ham radio would be a good extension of that interest. In short, he's exactly the person that the code-free Tech license and every other recruitment effort of the past 15 years has been aimed at. OK, we got him. And now we're in danger of losing him. Why? His letter will tell you better than I can:

Where is everyone? Why won't anyone help? My brother and I got our Tech licenses last November. Ever since, we just can't figure out what to do. Two meters is no fun. Wow, a bunch of old men making lunch plans. Big deal. Same thing on 440.

We're trying to get into packet, but most of the stuff online is pretty confusing. Unfortunately there's nobody to really talk to here. I tried writing the local packet club and they were nice enough to send me one of their newsletters and all, but they still wouldn't tell me how popular packet is here. All they told me is, "Join the club!" Well I would if I knew what I was getting into!

What about HF? We'd learn code, but from listening for years, it's basically the same thing. Old men talking. Hardly exciting stuff.

Public service! Now that's something I could get into. Well, as far as I can tell, there's nothing around here. To the police department, hams are something you eat, not something to use in an emergency.

I guess ham radio is dead already...

Is Ham Radio Dead Already?

Well, I thought, as I read Ryan's letter, he must live out in some rural area where there aren't very many hams. But then I reached the last line: "Oh yeah, I live in Chicago. Maybe that'll put things into perspective."

Yes, it certainly does. According to my 1998 "Callbook" CD-ROM, there are 1,913 licensed amateurs in Chicago, Illinois. And there are 7,148 hams in Cook County, which includes Chicago and its close-in suburbs. And these two new hams can't find anyone to help them discover the excitement of ham radio! We've got ourselves a major league problem here, folks.

I asked Ryan for a little background, hoping to get some ideas for hooking him up with people whose interests matched his and his brothers. Here's his reply:

Well, I'm 19 and my brother is 26. We'd been thinking of getting our licenses for a while. We're your basic geek types. I'm disabled, so I thought it might be something to occupy my time. We thought the 2-meter stuff would be pretty cool, but found out differently. Now we're trying to keep our interest alive. Unfortunately, trying to find out what packet is all about, especially here, is pretty hard since nobody will share much info without joining a club. It would fit in perfectly with our computer obsession and finally convince us this wasn't a waste of time. We even tried looking for some public service stuff, but as far as we can tell, the only thing around is

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

"Where is everyone? Why won't anyone help? My brother and I got our Tech licenses last November. Ever since, we just can't figure out what to do. Two meters is no fun. Wow, a bunch of old men making lunch plans. Big deal."—Ryan, a new ham in Chicago

the Skywarn stuff, and that's in the burbs....Thanks for the help.

Where Is Everyone?

I immediately contacted two ham friends of mine in the Chicago area and asked if they could help find someone to "Elmer" Ryan and his brother and made a few interim suggestions: First, since Ryan's "@amsat.org" e-mail address indicated an interest in satellites, I suggested that he talk to the AMSAT area coordinator for Chicago ("I didn't even know there was such a person here," he replied). Next, since he said he's disabled, I suggested he contact the Courage Handi-Ham System, and passed along their Web address (<http://www.mtn.org/handiham/>). Finally, I suggested that he check out the CQ videos, "Getting Started in VHF" and "Getting Started in Packet Radio," since they're written specifically for new hams who say, "OK, I've got my license, now what do I do?"

Not a New Problem

Thinking back to those videos, which were my first project when I joined the CQ staff seven years ago, we decided to make them because of what we perceived then as a growing problem in ham radio—the ARRL and local radio clubs were actually doing a pretty good job at *recruiting* new hams, but all of us were falling down flat on our faces when it came to follow-through in helping those new licensees become active, involved, hams. There were no teams of "Elmers" to finish the job started by the instructors at the licensing courses and the Volunteer Examiners at the test sessions. And there still aren't.

Back when I was an ARRL Section Manager, one of the first new programs I tried to start was a section-wide "Elmer" registry. I publicized it in my *QST* column and on packet. Maybe a half dozen people from the whole section signed up. Needless to say, the program never got off the ground. CQ's "Getting Started" videos were designed as "video Elmers" to help fill the gap and provide new hams with basic information on what they could do with their ham licenses and how to do it. They do a good job, but they're still no substitute for a real, live ham, showing you how things work and giving you the chance to try things out under their supervision.

What Ryan Needs

What Ryan and his brother need—what every new ham needs—is to be paired up with a more experienced ham (or several of them) who can show them what's out there to do. Ryan and his brother seem to be trying. They checked out the local repeaters and found they're not especially interesting to them. They want to learn more about packet, but were told "we won't share our knowledge with you until you join our club." They've apparently joined AMSAT to learn about amateur satellites, but there's no indication from the e-mail that either of them has ever made a satellite contact.

We need a volunteer—10,000 volunteers actually—to get to know every new ham who joined our ranks last year; to help them find repeaters where the conversations go beyond "old men making lunch plans"; to show them how to navigate the packet networks; to let them watch a pass of Mir via APRS; to help them make a contact on the AO-27 satellite; to bring them along to a big-gun VHF contest operation; to let them listen in on a moonbounce contact. I could go on and on, because there's so much to do in ham radio, so much variety, that it's nearly impossible to list everything here. But we can't expect new hams to discover all this by themselves. They need to be "shown around the neighborhood." Videos are good. Magazines are good. But what we really need is a ham radio "Welcome Wagon."

For those of you who aren't familiar with it, the "Welcome Wagon" is an organization of volunteers in many communities who make it their business to find out who moves in, and to go knock on their door with information and introductions for the newcomer to the neigh-

(Continued on page 78)

JUN'S ELECTRONICS
IN BUSINESS SINCE 1976
Out of State
1-800-882-1343
California
1-800-564-6516
310-390-8003 FAX 310-390-4393
http://www.juns.com

ICOM
NEW! Call for price
IC-746
HF+6M+2M All Mode
List $2220.00 $1589.95
IC-706MKII
Mobile Sized
HF+6M+2M
IC-2GXA 2M HT w/Alkaline Pack, BC-105 (Export only) ..... $149.95 Now $129.95
(Limited Quantities 30 Day Jun's Warranty)

KENWOOD
CALL!!
TS-570D(G) $1198.95 $1199.95
TS-570S(G) $1349.95
TH-G71A
2M/440 MHz
Handheld
List $429.95
SALE $269.95
TM-V7A 2M/440 MHz Mobile CALL!!
$199.95 TM-261A 50W, 2M, FM
TH-D7A 2M/440 MHz w/TNC New CALL!!

YAESU
FT-847 Call
Call for price
HF+50+144+430MHZ All Mode
FT-51R
5W 2M/ 440MHz HT
FT-50RDH 2M/440 MHz, 5 watt handheld Call for price
New CALL!! VX-5R 2M/440MHz, 5W, HT

BARGAIN BOX (Limited Quantities)
IC-3 SAT 220 MHz HT (Free MH-BP83) $279.95
IC-V21AT 2M/220 MHz HT $399.95
IC-2SRA 2M Rx 50-95.0 MHz Scanner $299.95
BP-173 9.6V 600 mA $69.95
DJ-C1 or C4 ..... $89.95
AR-146 2M/ Mobile $179.95
AT-201H HiPw, 2M /HT $139.95
C168A Sub-Mini 2M handheld with FREE CNB 160 ..... $169.95

JUN'S ELECTRONICS
HRS M-F 10:00 - 6:00 SAT 10:00 - 5:00
5563 SEPULVEDA BLVD.
CULVER CITY, CA 90230
2 1/2 miles from LAX-North on I-405
ESPANOL • KOREAN

VHF News

King Hussein of Jordan, JY1, Silent Key

Jordan's King Hussein, known to hams worldwide as JY1 and perhaps the world's best-known radio amateur, died February 7 at age 63 after a long battle with cancer. As world leaders, including four U.S. Presidents, Russian President Boris Yeltsin, and three Israeli Prime Ministers, gathered in Amman to pay their last respects to a man credited with spearheading Middle East peace efforts, hams remembered JY1 as a ham who insisted that he be called only "Hussein" on the air and who went out of his way to chat with his radio friends (who came out in great numbers to call him whenever he appeared on the air).

Pat Kilroy, WD8LAQ, posted a remembrance on the Internet that captured the experience of many hams who had the opportunity to contact JY1 on the radio:

> My life was directly touched by King Hussein on October 20,1995. I answered his CQ on 14.295 MHz and enjoyed a three-minute "ragchew" with him. JY1 was traveling aeronautical mobile, en route to the United Nations in New York City. He insisted on me addressing him simply as Hussein. In one of the oldest traditions in amateur radio, Hussein upheld that this kinship transverses not only age and nationality, but also between citizen and head of state!
>
> My QSO with him occurred less than five hours after the launch of [the space shuttle] Columbia on STS-73 (how appropriate!), the USML-2 mission. Hussein was monitoring the WA3NAN space shuttle retransmission frequency as the 16-day mission unfolded....Recalling his historic two-way contact with Owen Garriott, W5LFL, on STS-9 in 1983, I struck up a conversation on the latest educational benefits of SAREX (the Space Amateur Radio Experiment). Hussein was indeed interested in the program and was pleased to see it develop. I yielded the frequency for others to get a chance and was rewarded with how orderly and gentlemanly he conducted the emerging pileup. Even through the hobby (service) of amateur radio, one could detect King Hussein's heart-felt commitment to human dignity and peace.

According to an ARRL bulletin, JY1 felt that the high point of his ham radio career was a single contact on 2 meters: the contact Pat referred to with Astronaut Owen Garriott, W5LFL, the first ham to operate in space. Both sides of that QSO were videotaped for the ARRL video, "The New World of Amateur Radio," and if you've seen it, you know that the joy on the king's face at making the contact was unmistakable, especially when Owen reported that he was flying over Jordan as they spoke. On the other hand, the smile was just as broad on W5LFL's face when he asked, "Is this His Royal Highness?" and the voice from the ground responded "This is Juliet Yankee One, Hussein on the mic...."

Juliet Yankee One will be missed by hams—and millions of other people—all over the world.

FCC Acts on Repeater Interference; Questions Internet Link

The FCC has expanded the scope of its recent enforcement crackdown to a case of repeater-to-repeater interference in New Jersey and, in the process, is taking a close look at the legality of linking amateur repeaters via the Internet.

In a warning notice sent to the trustee of the West Morris Wireless Society repeater in New Jersey, the FCC's Riley Hollingsworth cites complaints about lack of cooperation in resolving interference with the nearby WR2M repeater and says continued interference "will place your Amateur radio licenses in jeopardy."

In addition, Hollingsworth writes that "[w]e also have serious concerns...about the technical characteristics of the Eyephone/Repeater Link interfaced to the repeater transmitter." Repeater Link software connects geographically distant repeaters via the Internet and also allows direct access to those repeaters from the Internet by users whose computers are equipped with sound cards and microphones. Hollingsworth asks the repeater trustee to "[d]escribe in detail how the Internet Repeater link/Eyephone configuration is routed to transmit on [the repeater's frequencies, and] what steps are taken to insure that there is a control operator available at all times during repeater link."

Repeater Coordinators Left Hanging

The National Frequency Coordinators' Council (NFCC), which represents the nation's repeater coordination groups, *thought* it had ARRL backing in its petition to the FCC requesting mandatory repeater coordination. After all, ARRL General Counsel Chris Imlay, N3KD, drafted the proposal for them, with input from two ARRL vice presidents. But when the League Board of Directors met in January and discussed the matter, a majority voted *not* to join the NFCC petition. "Board members are keeping an open mind," explained ARRL Executive Vice President Dave Sumner, K1ZZ, in the *ARRL Letter*, "but by and large, they are not yet persuaded of the necessity" of mandatory coordination.

Meanwhile, there appears to be infighting at the NFCC as T-MARC, the repeater coordinator for Maryland and Delaware, apparently withdrew its original "yes" vote in support of the FCC petition and replaced its NFCC representative, Owen Wormser, K6LEW, forcing Wormser—a leading force in the founding of the national organization—to resign from the NFCC board. Several days later, in an effort to keep Wormser on the board, the Upper New York Repeater Council (UNYREPCO) named him as *its* NFCC representative, even though Wormser lives in Virginia. At press time, we learned that Wormser had indeed been returned to the NFCC board.

And out west in Oklahoma, it appears that the Oklahoma Repeater Society (ORSI), that state's coordination organization, has stopped functioning. In a letter to ham media, former Oklahoma Frequency Coordinator Hal Dietz, WB9VMY, says ORSI never appointed a

(Continued on page 79)

Note: "Product Update" appears this month on page 49; "Letters" begin on page 70.

Compiled by the CQ VHF Staff

Earth Station

Mohan, VE7FM, on Vancouver Island, British Columbia (CN79), sent us a few photos of the station that he shares with his wife, Susan, VE7SBM, along with some Earth views downloaded from Mir via slow-scan TV. Mohan says that "a couple of years ago, *CQ VHF* sparked my interest in OSCAR satellites, VHF, UHF, and microwaves, after nearly 40 years of HF hamming."

Views of the Earth transmitted via slow-scan TV (SSTV) on 2 meters by the Russian Mir space station in December, 1998. Vancouver Island and the mainland of British Columbia are visible in the lower right-hand photo.

In slightly warmer weather, the couple operates portable for Field Day.

Homebrew VE7FM QSL card, designed specifically for confirming contacts via the OSCAR-10 satellite.

VE7FM and VE7SBM's "Earth station." Main rig is a Yaesu FT-847. The station is active on HF, 2 meters, 70 centimeters, and 2.4 GHz, operating mostly QRP on SSB, SSTV, CW, RTTY, and packet.

Mohan, VE7FM, working AO-27 with a handheld outside his home on Vancouver Island.

If you've got a cool snapshot to share with us, but don't have a whole article to build around it, send it in to "Picture This," along with a brief description of who and what we're seeing. If we like it, too, and have the space, we'll print it (no pay, just glory). Send your color prints to *CQ VHF*, 25 Newbridge Road, Hicksville, 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, please tell us so and include an SASE (self-addressed, stamped envelope) with sufficient postage. Thanks!

Lasers to the Limit—Part 2 Using an Argon Laser for Free-Space Communication

We all know lasers look cool and can do great things, as long as you're very careful. But are they RADIO? Of course they are—on very, very high frequencies. Here's how one group is using lasers for ham communication, and how you can (safely) do it, too.

By Eric Stroud, KB2TCQ*
<joe@mousehole.com>

Well, did you go out and buy your laser yet? Part 1 of this article introduced laser communication and described what's available in the way of equipment and accessories. Most of what we discussed is on the surplus market since new laser equipment is beyond the budget of most hams. In this concluding segment, we'll move from what you can use to actual on-the-air laser communication (see Photo A for an example of a laser in action).

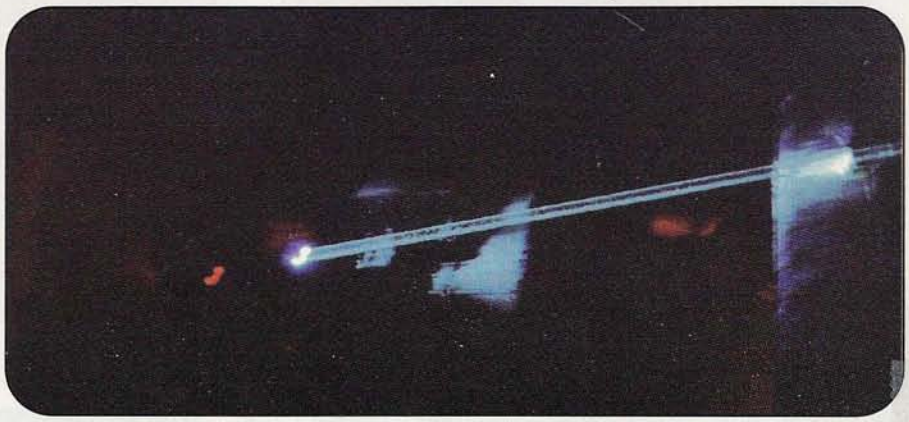


Photo A. An argon laser in action. This beam is from an HGM Model 20 laser, which puts out a 16-watt laser signal. (Photos courtesy of the author)

Safety First!

Lasers can be very dangerous. Carefully read "Laser Safety," and the following paragraphs before putting any laser equipment on the air.

First and foremost, *get the proper eye protection!* The human eye cannot blink fast enough to prevent serious injury. Don't rely on sunglasses to save your eyes when dealing with these lasers. Spend the money and get the proper argon laser goggles (see mine in Photo B). You need them for diffuse viewing and for aligning your optics. *Never stare directly into the output beam, even if you have laser goggles.*

Second, if you're using a Class IIIB or Class IV laser outdoors (Photo C), you need to let the CDRH (Center for Devices and Radiological Health; see "Resources") know what you're doing. Be responsible. Fill out the required paperwork before you go into the field. Chose an optical path that's not likely to involve people who have no eye protection (see "Laser Safety" for a description of each class of lasers).

Third, never point a Class IV beam into the sky, as this may interfere with air traffic. If you're planning to do EME (Earth-Moon-Earth) or atmospheric work, contact the Federal Aviation Administration (FAA) for a variance. It's the law, and the penalties are severe if you're caught operating without authorization. You can also find additional information on the CDRH Web site.

Equipment Models

My fellow North Jersey laserists and I chose to use both the Lexel 88 argon ion laser system and an American 60X argon ion laser head with an Omnichrome Model 150 power supply to do our DX work (see Part 1 for descriptions of these units). Both lasers produce multiline emissions, making them ideal for pro-

**Eric Stroud, KB2TCQ, is a ham and a chemical engineer. He heads up a small laser interest group which is seeking to study and promote free-space laser communications. Eric lives in Oak Ridge, New Jersey, with his wife, Jean.*

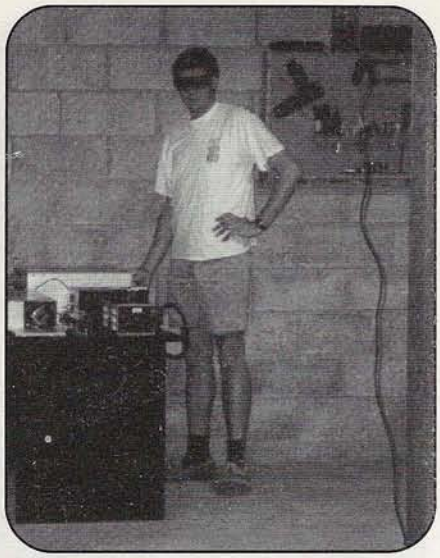


Photo B. Proper eye protection is an absolute must when working with argon ion lasers. Sunglasses won't protect you, and the human eye cannot blink fast enough to prevent permanent damage. Always use special argon laser goggles.

ducing multiple THz signals from only one laser unit.

Hint: A nice way to check which emission lines are present is through the use of a *diffraction grating*. The blank side of a CD is actually a poor diffraction grating, as it can separate white light into its component wavelengths. Look for a good quality grating in the surplus market. Some surplus bar code scanners contain an optical grating wheel, which works very well for separating the argon laser output into its component wavelengths. You should observe at least five distinct "dots" when you diffract the output from an American 60X. You'll also notice how intense the deep blue 488-nanometer (nm) and the blue-green 514-nm lines appear. Remember your goggles!

Modulation

For the sake of simplicity, we used a 110-VAC computer fan to "chop" our laser beam at approximately 1 kHz. You can send MCW (modulated CW, or Morse code in audio tones) by using a hand-held block, such as a thick piece of black plastic, directly after the "chopper" (computer fan). I don't recommend the usual surplus LCD shutters, because they're neither 100% transparent nor 100% opaque, regardless of state. They *are* good for slowly intensity-modulating the beam, but are usually not quick enough to do FM voice. Most acousto-optic modulator (AOM) crystals, such as $LiNbO_3$, $PbMoO_4$, TeO_2, and $LiTaO_3$ (*look 'em up on a periodic table in your kid's chemistry book!—ed.*), are very expensive for just tinkering when they're new, but surplus AOMs can be found for around $100. Even so, compare that to a $3 fan.

The Receiver

There's no complexity to our receiver. We used a Motorola mobile speaker (HSN4018A), a homebrew 12-watt audio amplifier using a TDA1910/W88AA509 amp, and a silicon photovoltaic cell. The cell was simply fixed to a filter and then fixed to a telescope at the receiver end to receive the MCW signal (Photo D). We used a Scope model No. 2551 astronomical telescope with a star diagonal prism objective (F = 700 mm, d = 60 mm).

Receiver selectivity is provided by a narrowband interference filter for the specific wavelength that we were testing. Interference filters use thin-film technology to reject almost all light except for a very narrow region, typically 2 to 5 nm. These filters are a bit pricey new, but are much cheaper on the surplus market. The filter is used to remove mercury and sodium spectral lines (from street lamps), and other "noisy" light sources that may interfere with the quality of the transmission. Using interference filters greatly improves your receiver's selectivity. They also tend to attenuate the desired signal by as much as 10%, but we have to live with this.

The use of interference filters is most critical when you're using Class I, II, or IIIA lasers. When you're dealing with watts instead of milliwatts, you'll find that the beam reaches the receiver with just about no interference at all! Class IIIB lasers need to be studied case by case, but chances are you can get away without using filters.

Some of Our Work with Argon Ion Lasers

We operated the American 60X from the top of a 150-foot cement tower in Bayonne, New Jersey (FN20wp), which had 100 VAC at 20 amps for our use. From here, we had unobstructed optical paths to Todt Hill in Staten Island, New York, and various parts of Northern New Jersey, including the West Orange mountains (*these are not real mountains by most standards, but they are the first major ridge line west of New York City.—ed.*). Here, the sky was illuminated by millions of high-pressure sodium, mercury vapor, and metal halide lamps!

We operated the Lexel 88 from my home QTH in Oak Ridge, New Jersey, since finding 220-VAC dryer outlets with running water is difficult on top of a

Table. 550+ THz Laser Team Claimed Records

100-mW Level (American 60X laser and five interference filters)

Frequency (THz)	Distance (Miles)	Miles/Watt
583.7	12.2	122
597.6	12.2	122
604.8	12.2	122
614.8	12.2	122
630.3	4.3	43

2-W Level (Lexel 88 laser, no interference filters)

Frequency (THz)	Distance (Miles)	Miles/Watt
583.7–630.3	21	10.5

(possibly some UV in there, too!)

Table. Claimed distance records for specific laser frequencies by the 550+ THz Laser Team, all set in the New York City metro area, where there's lots of light interference and not much height available. If you live somewhere with less light and more open space, maybe you can set a laser record of your own. If you do, be sure to post your accomplishments on one of the Internet sites listed in the text.

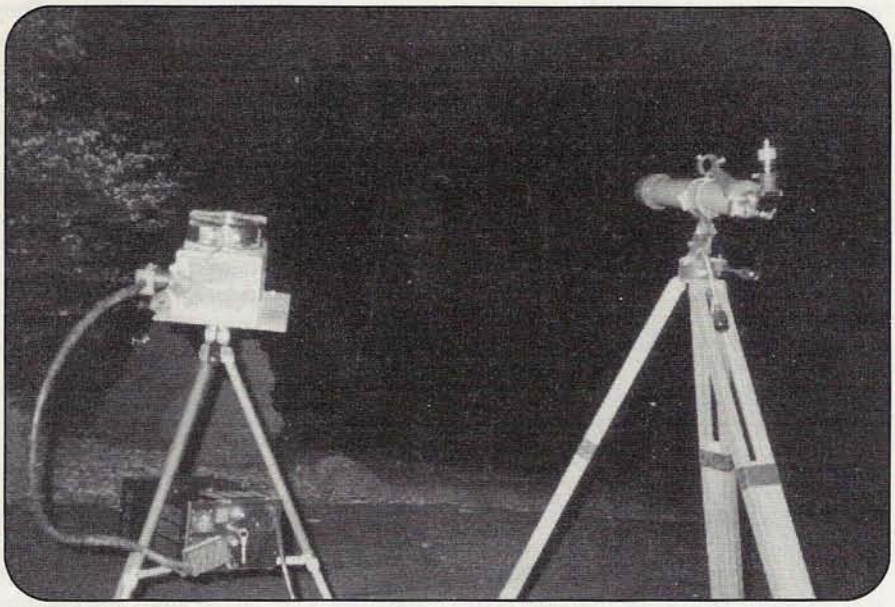


Photo C. A complete 550-THz station. On the left is the American 60X laser transmitter, with its power supply below. On the right is the "receiving antenna"—commonly known as a telescope.

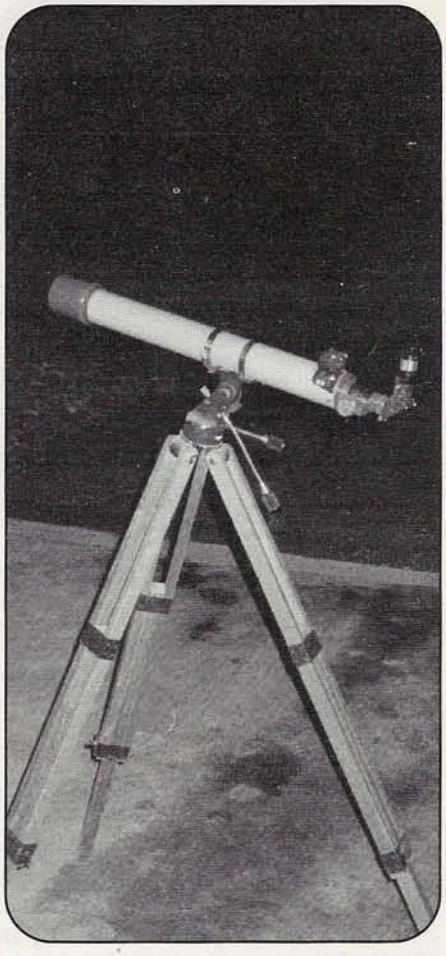


Photo D. A high-gain receive antenna is a major component of any weak-signal station. When "listening" for a signal at visible frequencies, you want a high-gain antenna for light. Fortunately, high-gain light antennas are available anywhere you can buy an astronomy telescope (but tell them you want a telescope, not a "light antenna." They'll think you're weird).

tower. Oak Ridge is much farther from the New York metro area than is Bayonne, so the night sky here is much darker. Although mountain ranges and cliff faces are plentiful out here, our main problem was trees in our optical paths.

Transmitting a Signal

Since each of our lasers produces a multiline output, and since the team wanted to study individual frequencies, we used interference filters directly after the laser output section to filter out the undesired frequencies. I had filters for six of the lines in the argon output spectra, so we simply placed these right in front of the laser output prism assembly. Thus, only one wavelength of light was passed into the next stage. This way, we could confirm individual frequencies.

After the interference filter, we placed our chopper to modulate the beam at an audio frequency rate. After the chopper, the modulated filtered signal passes into free space, looking for a receiver!

Receiving the Signal

One of the team members would then drive to a good receiver spot. We used trestles, rooftops, and industrial parks as some of our receiver locations (*with permission, of course!—ed.*). When I was the "rover," I'd pinpoint the transmitter site (not the beam) using binoculars, then fix the telescope on the site, and then radio the team to fire the laser. When the telescope is perfectly aligned with the laser beam, it is extremely bright! *Always keep your goggles on when positioning the telescope receiver with a live laser!* The filter and detector were then applied, and a nice audio tone could be heard from the receiver circuit. Mission accomplished!

Keep this in mind: rain, hail, sleet, snow, fog, low clouds, and high humidity will scatter laser light, sometimes enough to effectively attenuate almost all of the signal. Stray light, especially mercury vapor, high pressure sodium, and metal halide lamps, will interfere with your receiver. This may result in AC noise (a "buzzing" sound caused by street lamps) in your receiver audio.

Setting a Laser DX Record

Living in New Jersey, we really don't have the altitudes and mountains required to set terrestrial records in the 100-mile range, due to the curvature of the Earth. And, since we're in the nation's most densely populated state, finding unobstructed optical paths is also difficult. We try to make the best of what we have!

I'm sure a 2-watt argon laser would have no trouble setting a 100-plus-mile record. EME is definitely possible, but we can't attempt it around here unless we can get an FAA variance—and with three major airports in the area, that may take a while.

Unless you consider a tunable dye laser, there really aren't an infinite number of frequencies on which you can operate a laser. Every type of laser has its characteristic emission line(s), so there is, in a simple sense, a finite number of lasers available to the experimenter.

"I'm sure a 2-watt argon laser would have no trouble setting a 100-plus-mile record. EME is definitely possible...."

Laser Safety

By Lilburn Smith, W5KQJ*

Interest in lasers among radio amateurs has increased greatly in recent years. Previously, most of the amateurs were actually professional laser engineers on "busman's holiday" who understood the danger involved. Now, however, many new amateurs are finding lasers in the surplus market or buying new lasers from the many sources now available.

Hams interested in laser communications are certainly encouraged to experiment, but should do so with the knowledge that lasers can be very dangerous. There are safety and legal issues with which every laser experimenter must be familiar. So, for the benefit of newcomers to lasers, here's a review of the safety and legal aspects of laser usage.

Lasers are hazardous in several ways. The most important aspect is eye damage, which can cause permanent blindness. Even if blindness does not result, cataracts and degradation of color vision or night vision are possible. Other hazards are skin burns, electrical shock, fire, collateral radiation, explosion, airborne contaminants, chemical hazards, noise and cryogen hazards. The lasers most likely to be used by hams are dangerous because of eye safety.

Laser Classifications

Lasers are covered by both state and federal regulations. The federal standard is ANSI Standard Z136.1-1993, which places lasers in four broad categories for regulation:

Class I. Any laser not capable of exceeding the maximum exposure level for the human eye or skin for the maximum length of time for which the device is designed. The maximum levels vary with wavelength and are determined by consulting charts in the ANSI standard. Class I lasers are generally too small to be of interest for ham communications.

Class II. Any laser more powerful than Class I, but less than 1 milliwatt. Class II lasers form the vast majority of ham usage. They are safe except for staring into the beam, which can produce permanent eye damage. Remember that a *specularly reflected* beam is just as dangerous as a direct beam (a *specular* reflection is a direct reflection of a light beam off of a solid object).

Class IIA. A Class IIA laser is a more powerful laser made safe by enclosures.

Classes IIIA and IIIB contain lasers with power of more than 1 milliwatt but less than 0.5 watt. A few of the more powerful pointers are Class IIIA. They are justified by the short exposure time. The eye would, in theory, blink and prevent damage. However, one could inadvertently focus on the beam or reflection and sustain injury. Trying to focus your transmitter or receiver might distract you and make you forget the beam is dangerous.

Class IV. Lasers more powerful than 0.5 watt. All Class IV lasers are dangerous and must be used only under carefully controlled conditions with protective equipment.

The power levels are for CW (continuous wave) lasers. Pulsed lasers are characterized by the energy level in the pulse.

Rules and Regs

Federal law requires that the manufacturer label each laser with its appropriate class. Federal laser laws are administered by the Food and Drug Administration's Center for Devices and Radiological Health (CDRH). See "Resources" for contact information. The Federal Aviation Administration (FAA) has additional safety regulations for lasers shining through navigable airspace. Contact your local FAA center for specifics.

In addition, each state has laws governing the ownership, registration, and use of lasers. In Texas, for instance, the Texas Department of Health, Bureau of Radiation Control, requires registration of Classes IIIB and IV lasers and payment of a fee. Consult your state Department of Health for information.

**Lilburn Smith, W5KQJ, is a professional laser engineer who is well versed in laser dangers and safety precautions.*

The ARRL does not want to make a distinction of laser DX records for each color, or quantum line *(as per K. Britain/ A. Ward 7/98)*; rather, it wants to classify all laser DX reports under the single category of "Laser." Unless and until this policy is changed, you can publicize individual quantum-line laser DX records at the Web sites listed in "Resources," and on any laser newsgroup on the Internet. You can also find additional general information in these places.

So, here's some incentive: Try to beat our group's records at each of the frequencies on which we believe we've set one (see Table). Good luck and I hope to plan a sked with you above 550 THz! ■

Resources

For more information...

One of the most comprehensive online sources for laser info is Sam's laser FAQ Page: <http://www.intermarket.net/~don/lasersam.html>.

Additional information, including individual quantum-line laser DX records, is available on the following Web sites:

KB2TCQ laser DX record page: <http://www.mousehole.com>
Amateur Laser Communications page: <http://www.qsl.net/wb9ajz/laser/laser.htm>.

The Center for Devices and Radiological Health (CDRH) is a branch of the U.S. Food and Drug Administration. CDRH permits are required for certain outdoor laser activity. More information can be found at their Web site, <http://www.fda.gov/cdrh>. Or you may write to Center for Devices and Radiological Health, Rockville, MD 20850.

Kenwood's Dynamic Duo: The TH-D7A and VC-H1 Combo

Be a one-person, portable special-event station—send and receive slow-scan TV, squawk automatic APRS, work dual-band voice, and don't worry about missed DX opportunities with your built-in Packet Cluster alert system. Just add a handheld GPS and you'll be the star of the parade.

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

If you're one of those hams who seeks the excitement of conquering new heights of portable transceiver technology, you'll certainly be impressed—and probably overwhelmed—at everything Kenwood has put into its TH-D7A handheld, dual-band data communicator as well as its VC-H1 portable transmit-and-receive, not-so-slow-scan TV communicator...especially when you use them together.

"Working the new TH-D7A packet dual-band transceiver was both fun and challenging. I am three weeks into it, and I'm still finding more digital tricks it can do on the air," comments Julian Frost, N3JF, a West Coast packeteer who regularly heads up public service events with his portable APRS (Automatic Position Reporting System) station. "I can now... go with the Kenwood HT in one pocket and my GPS [Global Positioning System] receiver in the other and have the event fully covered," adds Frost.

When I showed him how easily the portable Kenwood video grabber would tie into the data communicator, I knew he had finally found his ultimate hip-pocket station for voice, data, video, and position. And the 1999 Pasadena Rose Parade proved the success of this one-man walking super-station! (See Photo A; *but since Julian was* taking *the picture, he couldn't be in it. Gordon's wife Suzy, N6GLF, demonstrated the "dynamic duo" in action.—ed.*)

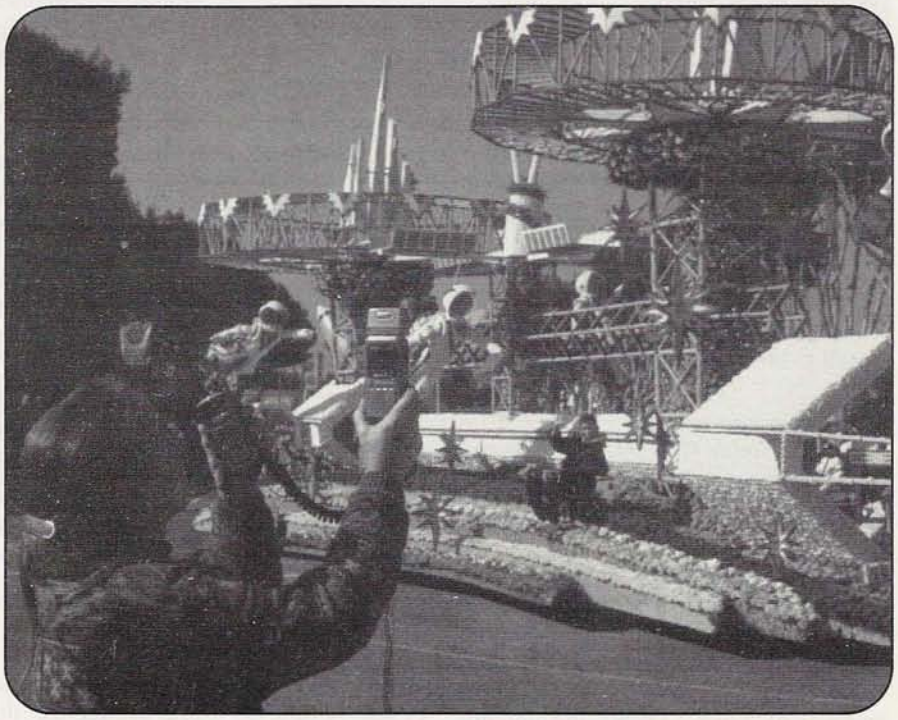


Photo A. Suzy West, N6GLF, uses the Kenwood TH-D7A / VC-H1 combo during the 1999 Rose Parade in Pasadena, California, to send slow-scan TV pictures to net control. (Photo by Julian Frost, N3JF)

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

The Dual-Band TH-D7A

The Kenwood TH-D7A has the look and feel of a solid dual-band VHF/UHF handheld (Photo B). The nickel cadmium battery pack snaps into place on the back of the HT, from top to bottom. The belt clip goes on the back of the battery, and may be easily moved from one battery to another in the field. Kenwood supplies a 9.6-volt, 600-mAh (milliamp-hour) battery that put out a healthy 5 watts on both VHF and UHF.

Photo B. At its most basic, the Kenwood TH-D7A is a full-featured dual-band handheld. But as the funny button on the left and the cable on the right suggest, this radio is more than just another dual-bander. (N3JF photo)

The 2-meter side also includes aircraft AM and public safety FM receive from 118 MHz to 170 MHz. On UHF, the normal 70-centimeter ham band coverage from 438 MHz to 450 MHz is supplemented by extended receive for public safety stations between 450 and 470 MHz. On VHF, the D7A offers dual-receive, enabling both voice and data to come through the speaker or out the speaker jacks at the same time.

There are 200 memory channels that display on the large 12-digit x 3-line dot matrix LCD screen, which also supports all sorts of icons during the many modes of operation. The information scrolls up the screen when you push the unique soft-touch silver left/ right/up/down pad to the left of the speaker. When you first look at the radio, the silver pad seems somewhat out of place on the dark body of the radio. It almost seems as though something is missing, or fell off the front of the unit. But after awhile, you get used to the look.

"On VHF, the D7A offers dual-receive, enabling both voice and data to come through the speaker or out the speaker jacks at the same time."

Squelch is either automatic or keyboard selected, and the single top knob controls volume on the bottom and tuning on the top. The antenna uses an SMA connector, not a BNC, so you'll need an adapter to run this rig mobile (you can also get the optional PG-3J cigarette lighter cord).

There are three levels of power output, including extra-low power when communicating simplex to another station close by. There is automatic repeater offset as well as a unique function called "automatic simplex check." This gives you an indication that your D7A can hear the other station "direct," but it chops the repeater frequency every three seconds, and that gets on your nerves after a while. Fortunately, a few keystrokes easily disable this function.

Neat Tricks...But Tricky

"There are plenty of neat tricks the dual-band transceiver can offer for just voice communications," comments N3JF. "You use the F key to access the menus and alternate functions. Sometimes you press and hold other keys for other functions. You can also use the menu key for yet more functions—it may take several weeks for you to explore all of these sub-functions."

There is alphanumeric memory naming, with each channel storing up to eight characters. You can also mask frequencies with just a simple channel number. "I liked the tone frequency ID scan—it lets me scan signals to identify their encoded CTCSS tone," commented my wife, Suzy, N6GLF. She also discovered that overwriting a memory channel may only change the frequency, keeping the name retained.

"There is scanning, call channel, priority, memory channel lockout, program scanning, auto-dialing with 10 different numbers, and just about anything else a full-featured, nothing-left-out, dual-band handheld can do," notes Frost. But he cautions, "Try these functions ahead of time before you go for transmitting DTMF on the road. For DTMF memory, you press PTT plus menu, then release menu, press up/down to select the memory channel, and then press menu again while holding PTT. I suggest leaving it in the right channel ahead of time!"

"In sending straight packet, we could select either 1200 or 9600 baud with the HBAUD command, and could simultaneously send voice on one band and packet on the other in the full-duplex mode."

Oh yes—if the radio wears you out with all these features, it can also automatically power off and also self-select a battery-saver mode.

Built-in Packet

But the standard voice-related features of the dual-band Kenwood D7A are only half the story. The radio also has a built-in 9600-baud terminal node controller, or TNC (Photo C). This allows you to access your local packet bulletin board, send e-mail, download a file, and get an instant alert when the local DX Cluster announces a rare one over the air.

"The built-in terminal node controller does a lot, but this equipment is not a digipeater, nor does it support all functions found in a stand-alone terminal node controller. But what it *does* have inside is amazing!" adds Frost.

Photo C. There's a 1200/9600-baud packet TNC built into the TH-D7A, along withsoftware for sending and receiving APRS (Automatic Position Reporting System) data and messages. (N3JF photo)

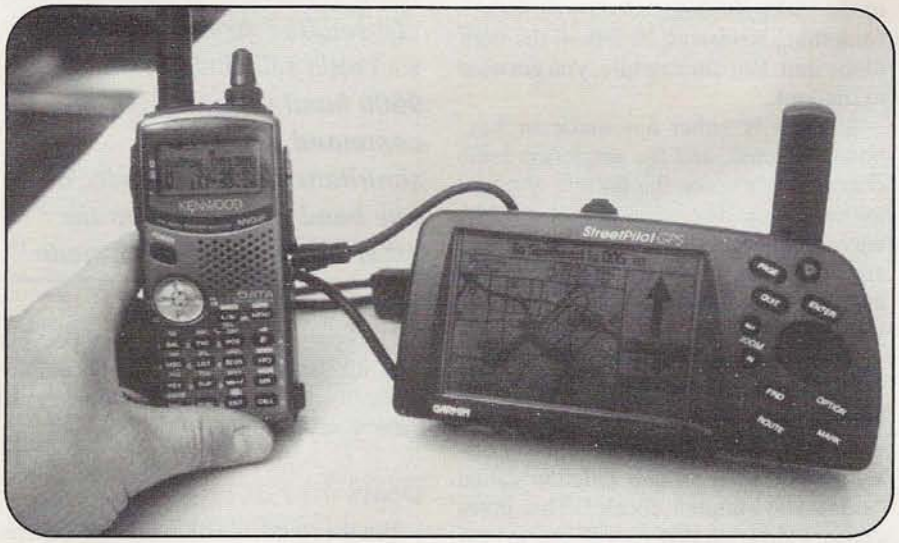


Photo D. If you plug in the optional cable to connect the TH-D7A to a GPS (Global Positioning System) receiver, such as this Garmin Street Pilot, the HT will display your location by latitude, longitude, and six-character grid square. And it can transmit that information via APRS. (N3JF photo)

Example: We successfully sent an e-mail message across the U.S. and got an automatic response without any external connection to a computer. We pressed the **MSG** key, selected **input**, and then entered "**email**" on the "**to**" line. We entered the address, a space, and a short message via the keypad. The message was then sent on an APRS I-gate (Internet gateway), which acknowledged our handheld transmission. After 1 minute and 52 seconds, my message went from California to Miami, Florida, and back to my e-mail account in California, thanks to the K4HG-2 I-gate in Miami. Absolutely amazing!

In the DX Packet Cluster® mode, each time a new DX "spot" is received, the frequency display is interrupted to show the DX station, its operating frequency, and the time. Now you can mow the lawn or wash the car (the D7A is water-resistant) and never miss a rare DX spot on the packet cluster!

The GPS/APRS Connection

Next, we connected the D7 to a Garmin GPS receiver and received packets from APRS which displayed on the GPS screen, *complete with callsigns* (Photo D)! We didn't see this feature in the manual, but were pleasantly surprised to see it on the screen. Kenwood supplies the three-conductor plug and cable for the HT, and we needed to make up our own connection between the radio and the GPS receiver's NMEA data line. We also linked up the D7 to a laptop computer and ran the WINAPRS program to display the station's callsign and icon on our mapping program.

"We set the beacon mode to PTT and had it transmit our position each time after we talked, or we could set it to the auto mode and have it send our position at specific intervals," comments Frost. "We could even enter our digi-path, such as 'relay, wide,' or 'N6TVZ-10, relay, wide.' And we even got to select our own APRS icon!"

When using the equipment with your laptop computer, you'll need to order the optional PG-4W connection cable that comes with software for programming memory channels via your computer, plus a manual that gives further details on using the equipment on APRS through your computer. If you're planning to link the radio to a laptop, you should buy the cable at the same time you purchase the handheld.

We found that our APRS transmitted data always included a position comment, such as: "Off duty," "In route," "In service," "Returning," "Committed," "Special," "Priority," or "Emergency." "We could also send optional status text up to 20 characters with this handheld," adds Frost. In addition, we found that we could restrict the display of APRS data to that sent by stations within a specific distance from our station. Distances from 10 miles to 2,500 miles, in steps of 10 miles, can be specified. We could also send packet text messages and bulletins via APRS to other APRS stations. Messages can be reviewed by pressing MSG, then selecting LIST. Special messages are flagged by the D7; for example, messages from the National Weather Service have a "!" before them.

In sending straight packet, we could select either 1200 or 9600 baud with the HBAUD command, and could simultaneously send voice on one band and packet on the other in the full-duplex mode. Another great feature of the very flexible D7.

Photo E. The Kenwood VC-H1 Visual Communicator makes up the second part of this all-in-one portable station, plugging into the TH-D7A to send and receive slow-scan TV pictures. It takes about 15 seconds to send one still frame at 9600 baud. (WB6NOA photo)

"Don't be surprised if you get a lot of questions about what those funny sounds are when you're working a public service event and are using an alternate simplex frequency to transmit the 15-second, 9600-baud video color signals!"

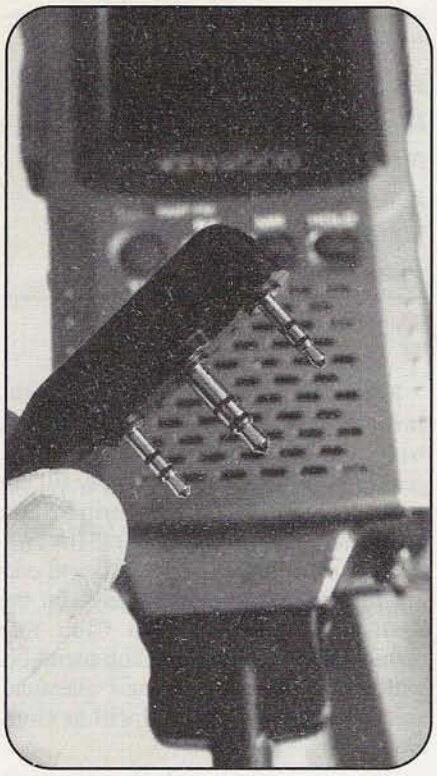


Photo F. A special three-plug cable connects the VC-H1 to the TH-D7A. The other end of the cable plugs into the bottom of the video unit. The TH-D7 can be used to type titles and superimpose them on video shots taken by the VC-H1. (WB6NOA photo)

There are also icons which indicate packets to be transmitted still remaining in the buffer. On receive, we were fascinated to see the amount of packet activity where everyone's callsign was displayed right on the D7 screen. And finally, in the packet mode, we could choose to have only specific APRS packet stations show up on the display, such as KK7IO, Skywarn.

Adding Video

We're not done. The Kenwood VC-H1 Visual Communicator (Photo E) comes with a curly cord to plug directly into the triple-port side of the D7. The top plug is for the speaker, the middle plug is the mic jack with push-to-talk, and the bottom plug marked "PC" works the video (Photo F).

You can use the D7 as a character generator for the VC-H1. "You can also use the D7 to superimpose messages on transmitted pictures, including messages in different colors," adds Frost. The D7 can control the VC-H1, and also send readability, strength, and a video quality report.

The VC-H1 runs on its own four AA batteries (Photo G), so it doesn't steal power from the HT. An LCD screen lets you see what you're about to capture, store, and transmit. Ten color images can be stored in the VC-H1, and all you do is press the **S** button once to see live images on the screen, and then press it again to capture the image. You push the **MR** button to store the captured image into memory. We found the VC-H1 to be a lot simpler to operate than the D7, and the only drawback was that the screen was a bit hard to see out in direct sunlight. Cupping a hand over the screen did the trick nicely for great daylight viewing.

During our Rose Parade public service assignments, we would capture specific images and retransmit them back to net control on 2 meters or 440-MHz simplex, along with our callsign and color message. The everything-in-one also supports detaching the CCD camera so you could remotely mount it on your helmet, belt, or handlebars of a bicycle if you are pedal-powered. The built-in microphone and speaker allows you to remotely control the D7 that you might be wearing on your belt.

N3JF notes that you don't even have to be near the D7/VC-H1 combo to use it. "Select a frequency on the D7 and select a sub-audible tone. Make sure the other station has tone encoded and is using the same tone and frequency as our D7. Now we are in the remote-control mode; and when the control operator transmits for 1 second, he can cause our D7 and VC-H1 to capture an image, allowing net control to remotely grab color still pictures when they want." During the parade, we were able to send and receive full-color pictures in 15 seconds at 9600 baud. Kenwood calls this the "fast FM" mode.

"The Visual Communicator is designed to work with personal computers for image-storing and editing, too," comments Kenwood Communications President Tom Wineland. "The Visual Communicator connects to a PC's RS232C port with a cord that is sold with an optional connection kit that includes Microsoft Windows 95 software." Once

Photo G. The VC-H1 has its own power source—four AA batteries—so it's not a drain on your HT batteries. A single set of AA batteries kept the VC-H1 running all through the 1999 Pasadena Rose Parade. (WB6NOA photo)

the connection is made, images can be saved in JPEG format and manipulated using standard graphics software.

Also, the Visual Communicator can be controlled through the computer to simplify cut-and-paste procedures and the superimposing of text to really get a great shot along the parade route. Along the parade route, it was a snap capturing color images and then sending them back to net control. Just keep the Visual Communicator away from your transmitting antenna to prevent unwanted streaks or snow.

What's That Sound?

We had a lot of questions about the funny 15-second swishing sound coming over 2 meters and 440-MHz simplex. It was the sound of slow-scan video, and

"...the portable Visual Communicator also works for sending and receiving slow-scan TV on worldwide (HF) frequencies...."

Photo H. The VC-H1 is not limited to use with the TH-D7A or even to VHF/UHF. Its built-in SSTV software automatically selects the transmission mode in use, allowing it to be used as a video source and monitor for SSTV on HF as well. Look in on 14.230 MHz sometime. (WB6NOA photo)

some hams didn't pick up the fact that we were sending video on what would normally be simplex voice frequencies. Don't be surprised if you get a lot of questions about what those funny sounds are when you're working a public service event and are using an alternate simplex frequency to transmit the 15-second, 9600-baud video color signals! I would caution you not to do it over a repeater until after everyone knows what's going on! By the way, if you're used to hearing SSTV signals on HF (where they're sent in single sideband), you should know that they sound different on FM.

And speaking of HF, the portable Visual Communicator also works for sending and receiving slow-scan TV on worldwide (HF) frequencies (see Photo H). The VD-H1's default SSTV mode is *Robot 36*, with *Scottie 1* automatically chosen for most 20-meter contacts. You don't really need to know what those names mean, or do anything to get the VC-H1 to capture the right mode—although Robbie, WB9VCL, indicates that it needs to listen to the sound of one complete picture on HF to get in the right mode. The inability to switch manually between modes is a time-waster. The unit kept defaulting to fast-FM on HF, and we would then need to wait for another station to come on the air with a Scottie 1 signal before it would switch over and let us transmit in the correct mode.

Wade Donnelly, KB1HJ, and Chuck Lanza, K5PR, sent some terrific pictures on 14.230 MHz (the primary 20-meter SSTV frequency). When I asked these three hams whether "video newbies" were welcome to come up and practice, all three indicated they would love to see more SSTV video activity from newcomers on 14.230, and everyone with the new Kenwood VC-H1s is welcome—ham radio at its best in exploring new modes with new generation equipment.

The hook-up of the VC-H1 to an HF transceiver is straightforward, and Kenwood supplies pre-made cables for direct connection to the TS-570 or TS-870. It's easy to make up your own input and output cables for other brand transceivers, too.

Factory Support

During our month-long testing of the TH-D7A data communicator and VC-H1 Visual Communicator, Kenwood tech support was excellent. They also had plenty of information on their Web site, including the complete instruction manuals for both equipment.

"Kenwood offers amateur radio clubs two separate videos on this equipment with some terrific live-action shots of the gear in use. Clubs need to simply fill out a simple video loan request form...."

Kenwood offers amateur radio clubs two separate videos on this equipment with some terrific live-action shots of the gear in use. Clubs need to simply fill out a simple video loan request form by faxing the request to Kenwood at (310) 537-8235, or calling (310) 639-4200, and asking for the information package on the Kenwood Amateur Radio Club free membership application. Club members will need to complete a short questionnaire after the viewing and will be eligible to win a new TH-D7A.

The Sky's the Limit (Not)

"If you're looking for the ultimate, this very well may be the system," comments Julian Frost, summing up his positive experience in working the two pieces of equipment during the Pasadena Rose Parade. And the sky is no longer the limit for the TH-D7A / VC-H1 combo—we understand that the cosmonauts on Mir have been using a pair to send and receive SSTV pictures.

So, if you're looking for a handheld station that can do it all—voice, packet, APRS and SSTV—take a good hard look at Kenwood's dynamic duo: the TH-D7A and the VC-H1. ■

Resources

For more information, contact Kenwood Amateur Products Group, P.O. Box 22745, 2201 E. Dominguez St., Long Beach, CA 90801-5745; Phone: (310) 639-5300; Internet: <http://www.kenwood.net>. List price for the TH-D7A is $519.95, and the VC-H1 lists for $584.95. "Street prices" are generally a bit lower and vary by dealer.

The Second Annual CQ VHF National Foxhunting Weekend April 17–18, 1999

Whether you call it foxhunting, T-hunting, or something else, this is the time to give your detective skills a try...by hunting down wily hidden transmitters.

By Joe Moell KØOV*
(homingin@aol.com)

What comes to mind for your when someone says "foxhunting"? Non-hams envision dozens of mounted horsemen following hounds through an English forest in search of a wily bushy-tailed canine. Many hams in the U.S. imagine cars, trucks, and vans full of radio direction-finding (RDF) gear in search of a well-concealed transmitter/antenna setup. The hunt can last from an hour to a weekend, depending on local preference. "T-hunting" and "bunny hunting" are other common terms for this activity.

In other countries, especially in eastern Europe and the Far East, "foxhunting" makes hams think of a two-hour run (or walk) through the woods in search of five "fox" transmitters. Each one beacons for 60 seconds at a time, one after another in numbered sequence, all on one frequency. This sport is also called *fox-tailing*, *fox-teering*, *radio-orienteering* and *ARDF*.

Whichever type of radio foxhunt appeals to you, the *CQ VHF* National Foxhunting Weekend (NFW) is the time to do it and to promote it among your fellow hams. Last year's NFW was a great success and this year's should be even better. Mark your calendar for April 17–18 and make plans now.

Photo A. Beware of wily foxes! Here, a "fox" tries to confuse hunters by bouncing signals off of a tall building, making it seem as though the signal is coming from the building. These photos were taken at an "urban foxhunt" in Orlando, Florida.

A Different Sort of Contest

The NFW isn't like other on-the-air contests. There are no mandatory time periods, no universal rules, and no log sheets. It's just a weekend to set aside for your club, school, or Scout group to try this exciting aspect of ham radio. Foxhunters don't even have to have ham licenses, since they will be receiving, not transmitting. If there's a conflict on that weekend, any time in the month will do. We're not picky!

To get an idea what it's like to participate in the NFW, take a look at the results from last year, as detailed in *CQ VHF* for October, 1998. For clubs that regularly hold RDF contests, it was a chance to do something special. For others, it was the first time for nearly every participant.

Joe Moell, KØOV, is a professional engineer who has hunted hidden transmitters for over 20 years and serves as ARRL's USA ARDF Coordinator. He is also coordinator of the CQ VHF *National Foxhunting Weekend.*

"Whichever type of radio foxhunt appeals to you, the National Foxhunting Weekend (NFW) is the time to do it and to promote it among your fellow hams."

There were hunts for RDF-equipped vehicles with total distances of a few miles to several hundred. Sometimes the fox was at the end of a paved road, but in other cases, hunters had to "sniff" it out in the woods, a couple of football field lengths away from where they could park.

Sometimes the transmitters and their antennas were in plain sight, but other foxes were buried or up in the trees. Many hiders took advantage of the fact that VHF signals reflect from buildings, hillsides, mountains, and so forth (see Photo A). Those who hunted them (see Photos B and C) discovered that the bearings they got weren't always in the actual direction of the transmitter! And sometimes is wasn't clear who was the fox and who was the hound (see Photo C)

Every reported NFW-98 hunt was on 2 meters. A majority of participants used 146.565 MHz, which is the coordinated transmitter hunting frequency in southern California and a growing number of other places. But there are no restrictions on bands or frequencies for NFW activities, so long as you follow local band plans and guidelines.

Getting Started

Many clubs start out with simple foxhunts on a local repeater. Someone goes to an easy-to-find location, such as the parking lot of a local eatery, and makes occasional "come and find me" transmissions on the repeater input. If they're licensed, the hunters can talk back and have a QSO while they hunt. To make sure everyone has success, the hider should give hints and clues later on. Encourage ride-alongs, so more people can participate. When all arrive, it's time to go inside for dessert and discussion of what equipment worked, what didn't, and when to have the next hunt. A good time for such practice foxhunts is just after your club's net on the repeater, when listenership is high. Why not start having mini-hunts like this right away, so the group will be ready for something more ambitious during the NFW?

Harder hunts last longer, so have them on simplex to avoid tying up the repeater. Consider having everyone start at the same point, such as a local hilltop. That avoids giving some hunters the lucky break of being closer to the fox when the hunt starts. It also allows you to include odometer readings as a scoring criterion. Instead of the first team getting the prize, give it to the one with lowest start-to-finish mileage. Mileage-factor hunts discourage reckless driving, encourage careful plotting of bearings, and even out the competition. Sometimes the last team to find the fox wins, which keeps the level of excitement high.

All-on-foot hunts can be great entertainment, too. What better way to get Scouts and other young people interested in ham radio fun? Scatter a few low-powered transmitters in a woodsy park. Encourage everyone to track them down with their little beams, or just with their handi-talkies and scanners (see "Bearings from Your Belly"). Have everyone bring some food and beverages and turn it into a mini-hamfest.

After a couple of romps like this, try on-foot hunting with universal rules, as set by the International Amateur Radio Union. In IARU Championship foxhunts, competitors carry an orienteering card to mark with the special punches at each of the five fox transmitters. They must find them all and get to the finish line in a set time period, usually about two hours. That's not easy on a championship course, which can encompass more than 1,000 acres! To even out the competitors, there are separate age and gender divisions. See "USA Takes on the World Foxhunting Championships" in last month's issue of *CQ VHF* for more about international-rules foxhunts.

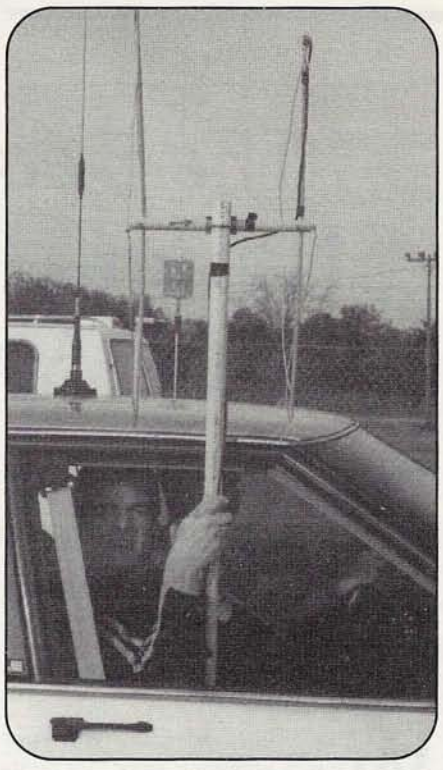


Photo B. A simple, homemade two-element quad like this one will get you started in mobile T-hunting. It can also be carried on foot, although it's a bit bulky.

Table.

Required information for reporting results of activity in the 1999 *CQ VHF* National Foxhunting Weekend:

Name of club, if any
Date of hunt
Starting city and state or province
Number of hidden transmitters
Frequency(ies) of transmitter(s)
Type of hunt (e.g. mobile, mobile/sniff, IARU)
Scoring method (time, mileage, combination, other)
Names and callsigns of hider(s) and winner(s)
Comments, quotes, etc.
Name and callsign of person submitting the report

Table. While there is no official log form for the CQ VHF *National Foxhunting Weekend, your reports must include this information at a minimum. Additional information and photos are welcome, but photos cannot be returned.*

No-Form Reporting

No two foxhunts are alike, and the 1998 NFW reports were all different, too. I

Bearings from Your Belly

Even with just a simple "duckie" antenna, you can get bearings with your handi-talkie or scanner using the "body shield" technique. Hold the receiver tightly against your chest and turn around slowly, listening for the direction at which your body blocks the signal most effectively (the signal *null*). At this point, the signal is coming from *behind* you. Some "body shielders" walk backwards toward the signal while continuing to listen for the null, while others walk normally in the signal direction for a while and then stop to take another bearing.

When the signal becomes so strong that you can't detect the null, remove the "duckie" and try again. If that isn't enough to knock down the signal, try tuning 5 or 10 kHz off frequency. If your handheld is dual-band or if you're using a scanner, tune to the third harmonic while performing the body shield; for example, the third harmonic of 146.565 MHz is 439.695 MHz, tunable on just about any dual-band HT. The harmonic will usually be much weaker and easier to shield with your body. A small UHF Yagi or quad is easy to carry along for more precise third harmonic bearings. A simple two-element Yagi or quad (driven element and reflector) works well for on-foot RDF with a handheld.

Accurate bearings are easiest if the set has an S-meter. When you get so close that the meter goes off scale, you must reduce (attenuate) the signal into the receiver without affecting directivity. Simple resistive RF attenuators, the usual choice for mobile T-hunting, are not as effective for on-foot use with handhelds because strong signals bypass the attenuator and penetrate the radio's case. "Offset" or "heterodyne" type attenuators that shift the signal to another frequency at variable level work better in this application.

Photo C. Compact, rugged beams and quads are preferred by most foxhunters for on-foot use.

enjoyed reading details of all the clever hiding locations and signal tricks of the sneaky foxes. But important information was sometimes omitted. So this year, we'll try to standardize a bit. Since the majority of last year's reports came in by e-mail, there won't be a printed report form, just a list of important information that should be included in your report. See the Table for required information. The list is also posted at my Web site and on the *CQ VHF* Web site (see "Resources"), so you can download it to your word processor and insert the information if that's convenient. Or if the report that's printed in your club's newsletter includes all the information, just mail me a copy. (You *will* have a big write-up in your club newsletter, won't you?)

If your group has more than one NFW event, please send in a separate report for each one. Include other facts that may be important, such as the distance of each fox from the start, whether the transmitters were continuous or intermittent, attended or unattended, and other interesting technical features. By local standards, was the anticipated skill level basic, intermediate, or advanced?

What types of RDF equipment are preferred by local hunters? What important lessons were learned? What is your group doing that's new and different? Are you having regular foxhunts now? What are you doing to encourage newcomers to try foxhunting?

If your club has regular foxhunts, who deserves an award for Most Innovative RDF Setup? Sneakiest Hiding Spot? Best Camouflage of a Fox Transmitter? Have you tried T-hunting on other bands besides 2 meters? What about 440 MHz (love those reflections!) or 6 meters (where a simple loop can win the hunt)?

Great Year Ahead

Transmitter hunts are held year-round where I live in sunny southern California. However, NFW-99 will kick off the annual foxhunting season in many parts of North America. If my mail is any indication, it's going to be a great year, with more activity than ever. There will even be opportunities for you to meet and compete against foxhunters from other parts of this country and the world.

If you're coming to Dayton this year, there will be a two-hour Foxhunting Forum at 10 a.m. on Saturday, May 15, plus an on-foot foxhunt at 3 p.m. There will also be RDF talks and foxhunts at conventions in southern California

TIRED OF WORKING THE LOCAL REPEATER?

Try something NEW with your HT!

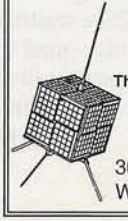
There's **LOTS OF FUN** waiting for you RIGHT NOW on the ***AMATEUR RADIO SATELLITES!***

"TOO COMPLICATED" you say??? ***NOT SO!*** Some satellites now in orbit require little more than your HT to work or a shortwave receiver to hear.

FIND OUT HOW... JOIN AMSAT® TODAY!

Members receive the bi-monthly, 32 page ***AMSAT Journal*** and substantial discounts on computer tracking software. For a limited time, new members will receive the 115 page book "Mode S – The Book" by K9EK.

For more information call or write:



AMSAT®
The Radio Amateur Satellite Corporation
850 Sligo Avenue, Suite 600
Silver Spring, Maryland 20910
301-589-6062, M-F, 10-6 Eastern
Web Site: **"WWW.AMSAT.ORG"**

CIRCLE 62 ON READER SERVICE CARD

"The NFW isn't like other on-the-air contests. There are no mandatory time periods, no universal rules, and no log sheets. It's just a weekend to set aside for your club, school, or Scout group to try this exciting aspect of ham radio. Foxhunters don't even have to have ham licenses...."

(Hamcon-99 on October 2), in Oregon (SeaPac on June 5), and probably at other hamfests, too. Find out if the ones close to you are having them. If not, volunteer to put one on!

The high point of 1999 for fans of international-style foxtailing will be the first IARU Region 2 ARDF Championships, to be held this August as part of the sixth biennial Friendship Radiosports Games (FRG-99) in Portland, Oregon. As part of a week of festivities, the 2-meter foxhunt will be on August 11 and the 80-meter event on the next day. Radio-orienteers from the U.S., Canada, Russia, and Japan will be on the course, and there have been expressions of interest from Norway, Sweden, Ukraine, and Moldova. Here's your chance to compete in a truly world-class foxhunt. See the Web addresses in "Resources" or write to me for more information on how to get involved.

Practical Value... and Lots of Fun

Foxhunting teaches an important skill: the ability to find the source of signals from afar. RDF is useful for public service and volunteer enforcement. It can even save lives. Most of all, it's fun. Give it a try. But make sure you have *safe* fun. See to it that no one can be injured by your hidden transmitter or by trying to get to it. Don't let the excitement of the hunt make you an unsafe runner or driver.

The goal of *CQ VHF*'s NFW-99 is to double the number of hunts and hunters, so spread the word and encourage other clubs in your area to try it. I'll be waiting for your reports. Send them via e-mail to <foxhunt@cq-vhf.com> or postal mail to Joe Moell, KØOV, P.O. Box 2508, Fullerton, CA 92837. ■

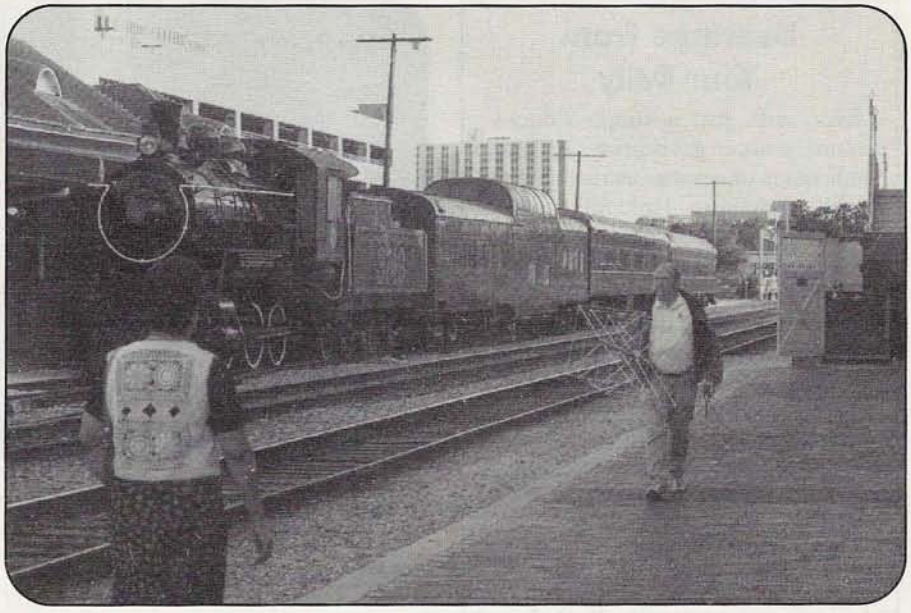


Photo D. Be ready for surprises. Sometimes the fox looks like one of the hunters. "Fox" Hal Prosser, KK1B, fooled several of them in this downtown Orlando event.

Resources

Read about the clever capers of last year's NFW hiders and hunters in *CQ VHF* magazine for October, 1998, beginning on page 14.

Mobile T-hunting was detailed in "Foxes, Hounds, and Hams—An Introduction to Fox Hunting," by KB8TEP on page 12 of the September, 1996, issue of *CQ VHF*.

International-style foxtailing was featured in the March, 1999, issue of *CQ VHF*, where you can read about the USA's participation in the ARDF World Championships. Also see "World-Class Fox Hunting Comes to America," by KØOV, on page 16 of the October, 1996, issue. This article includes many ideas for putting on such events in your town.

Elementary radio direction finding techniques are discussed in the "Basics" section of this issue of *CQ VHF*.

Back issues of *CQ VHF* may be ordered for $4 each, postage included (to U.S. addresses) from *CQ VHF* magazine, 25 Newbridge Rd., Hicksville, NY 11801; Phone: (516) 681-2922; Fax: (516) 681-2926; E-mail: <backissues@cq-vhf.com>.

Technical information about VHF RDF methods is in the "Repeaters, Satellites, EME and Direction Finding" chapter of *The ARRL Handbook*, available from your favorite ham dealer or from the ARRL, 225 Main St., Newington, CT 06111; Phone (orders only): (888) 277-5289 or (860) 594-0355; Fax: (860) 594-0303; Internet: <http://www.arrl.org>.

The most comprehensive book for hams on this subject is *Transmitter Hunting—Radio Direction Finding Simplified*, by KØOV and WB6UZZ (TAB/McGraw-Hill #2701). It has 323 pages and 235 illustrations of RDF techniques, projects, and equipment reviews. Ask for it at your local bookstore or contact Tab Books, Division of McGraw-Hill, Inc., Blue Ridge Summit, PA 17294-0850; Phone: (717) 794-2191; Fax: (717) 794-2103.

The first foxhunting stop for Internet surfers should be the author's Web site, <http://members.aol.com/homingin/>. (Don't omit the forward slash at the end.) At this URL, you will find 20 articles on hidden transmitter hunting, a bibliography of 125 more articles, information on 20 RDF equipment suppliers, and 130 RDF-related Web links and local foxhunting e-mail contacts. Information on the *CQ VHF* National Foxhunting Weekend may also be found on the *CQ VHF* Web site at <http://www.cq-vhf.com>, under "Contests and Awards."

A Case of Sunspots

With the new sunspot cycle bringing really long-distance contacts back to 6 meters, travel back in time with us to a previous cycle as WA6ITF relates this "far-out" tale of the Magic Band.

By Bill Pasternak, WA6ITF*
(BillWA6ITF@aol.com)

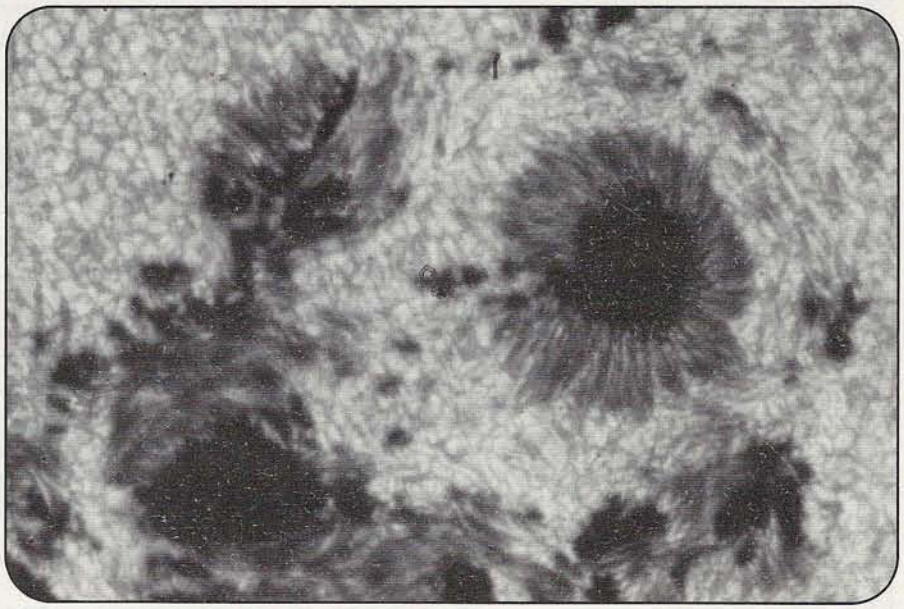
"Now that was the oddest guy I have ever worked!" This was the remark that Kendie Lomm directed toward his wife, Corliea, as he shut down his amateur radio station for the evening.

"That guy has to be the biggest bootlegger on 6 meters. The biggest on this planet!" That remark finally caught Corliea's attention. Corliea was well versed in hamspeak even though she never professed any interest in getting a license of her own.

"What's that you said, love? What about a bootlegger?"

"Oh, nothing, hon. I guess I was thinking out loud about this last QSO I had. It was with this guy who calls himself Bill. His callsign is WA6ITF. Most of what he said made no sense at all. I have a suspicion that it was a put-on by some guys in the club. Probably some friend of Prond's. You know his sense of humor. Either that or this Bill has his ham station in a loony barn!"

They departed that taboo, off-limits-to-the-world room known as Kendie's hamshack and moved to comfort in the far more hospitable living room. Taking note of the bewildered expression on Kendie's face and his upturned brow, Corliea said, "I wish I could help you but I have a much bigger problem. If we don't get a move on, the market will be closed before we get there. Let's face it K.L., even a diehard 6-meter DXer like you needs a good meal now and again. We can talk about it as we go."



Sunspots are known to be responsible for long-distance radio wave propagation on Earth, so it's only reasonable to assume that their influence extends to other bodies in our solar system as well. (National Science Foundation photo)

Celestial Extravaganza

It was cold outside. One of those early winter reddish-gray sunsets. As the big warming star started to sink below the horizon, Kendie and Corliea scooted along the canyon road toward the shopping center. It was warm and cozy inside their vehicle, but Kendie's mind was neither on the scenery nor the ongoing celestial extravaganza taking place above.

"This fellow I worked, Bill, he says that he lives in a year-round paradise called Van Nuys, California. He says that it is a suburb of a city known as Los Angeles and that the average temperature there is 70 degrees all year long. He says that he was mobile on a road he called the San Diego Freeway, on his way home from a place he called the saltmine. Can you believe anything as outlandish as this?"

"Kendie Lomm. We have been together for the last 24 years. You had your ham license many years before that. In all of this time, I have never seen a simple QSO get you so upset. Maybe you are overdoing it a bit?"

"It's not that, Cor. I'm just bugged by some of those things he told me. I think

**Bill Pasternak, WA6ITF, is Executive Producer of "Newsline" and is a regular contributor to* CQ VHF. *He made the contact described here in April, 1972, just after the peak of solar Cycle 20.*

I'm a bit jealous, too. You know that the average temperature up here is only around 43 degrees."

"And who ever heard of going to a store to buy a ham rig? Bill claimed his station at home is a brand new Swan 250 transceiver with so many tubes that he can't count them all. And he claims to also have a full kilowatt 6-meter amplifier, a 70-foot-high tower, and a six-element beam antenna. And he has the nerve to tell me that he bought the whole thing as a package deal at a local ham radio supply store. Ever hear of a store that supplies ham radios? Everybody here knows that if you

Analysis of the Propagation Modes Between WA6ITF in Van Nuys, California, Earth (Grid DM04), and MMM6YTL In Norchelli, Great Open Red Plain, Mars (Grid XM04)

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

Editor's Note: We asked our resident expert on 6-meter propagation, Ken Neubeck, WB2AMU, if he could figure out how the contact Bill described might have taken place, in terms of getting the signals from one point to another. Here's his analysis.

After examining the details of the referenced contact, it's a small wonder that hams (both on Mars and Earth) call 6 meters, the Magic Band!

It's going to be a bit tricky to analyze all of the different modes for this unique propagation path between ham radio station WA6ITF in Van Nuys, California, in Grid DM04, and ham radio station MMM6YTL in Norchelli in the Great Open Red Plain of Mars in Grid XM04.

Ken Neubeck, WB2AMU, is Editor of the "Magic Band" column in CQ VHF.

It's noted that the contact was made on April 1, 1972, during the waning years of sunspot Cycle 20. However, the early months of 1972 were unusual in terms of sunspot activity, as the decline in sunspot numbers, which had begun in July, 1970, did a brief about-face in the fall of 1971, with numbers rising between September, 1971, and May, 1972, before beginning to drop again. So this contact took place at the peak of this mini-bump in the sunspot cycle (see Jacobs, Cohen, Rose, *The NEW Shortwave Propagation Handbook,* CQ Communications, Inc., 1995; pg. 2–9).

In addition, as most 6-meter DXers know, the months of April and October are the best months for long range terrestrial contacts such as U.S. East Coast to Australia. Well, the same holds true for long range Earth-to-Mars contacts on 50 MHz, more specifically, Van Nuys to Norchelli. As in long-range terrestrial contacts, multiple propagation modes are required to make it happen.

It must be pointed out that Bill's QTH is near Magic Mountain, which for years seems to have captured the interests of various geophysicists on the planet. It has been rumored in scientific circles that there's a particularly unique field from this mountain to the ionosphere. Some unusual, seemingly random reflections over this area have been observed on 6 meters over the years, but never nailed down completely. Magic Mountain and the Magic Band...could there be a connection?

Most hams know that signals that are not absorbed or reflected by the ionosphere will travel into space. However, under the right conditions (and scientists are still studying the specific causes), a strange and unusual type of ducting

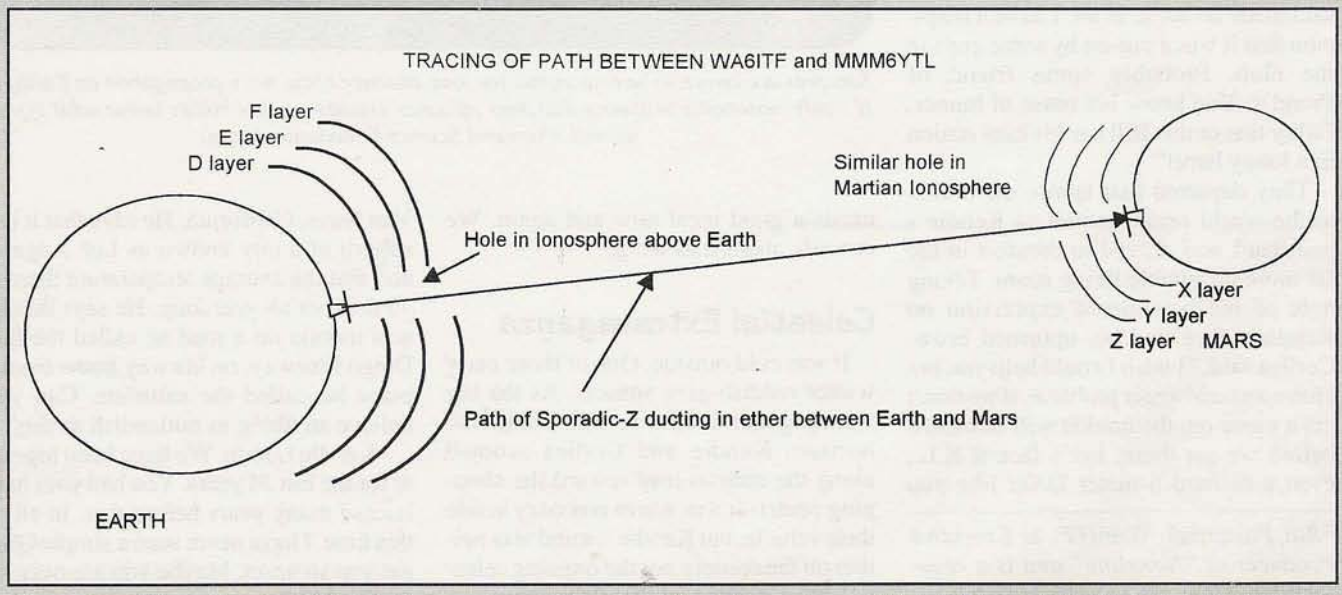


Figure. Possible explanation of Earth-Mars contact on 6 meters. Given the proper conditions of ionospheric "holes" on both planets, scientists believe a "Super Sporadic-Z" duct could channel radio waves between them.

want to get on the air, you build your whole station from the antenna down."

"I told you that the whole thing makes no sense at all," said Corliea. "Besides, nobody's used tubes in at least 150 years! If this Bill is for real, he's sure proud of an antique. It has to be a put-on!"

takes place in the ether of space beyond the ionosphere. This ducting has the capability of transporting signals (particularly those in the Magic Band range) millions and millions of miles. Given that this condition is very rare, scientists have been prone to call it *Super Sporadic-Z*, where *Z* is a generic description for the fact that no layers of the ionosphere are involved.

Analyzing Sporadic-Z

If no layers of the ionosphere are involved, then a "hole" in the ionosphere must be present to allow the escape of radio signals in the Magic Band range. This ionospheric hole is a very rare condition that seems to occur when geomagnetic activity is high, particularly during the years following the sunspot peak. When geomagnetic activity is high, a strange type of bending of field lines occurs in the *E* and *F* layers of the ionosphere such that an electronic "hole" occurs. This hole appears to be of infinitely low resistance, so that any electrical or magnetic field (as in a radio wave on 50 MHz) is sucked through it into space. This electronic hole works somewhat in the fashion of a black hole, only in the electromagnetic sense!

The last part of the equation to make this path work is that a similar hole must exist in the Martian ionosphere. We don't know what they might call the different layers of their ionosphere; probably it's not *D*, *E*, and *F* like on Earth, but rather it is probably *X*, *Y*, and *Z*. Also, notice that the city of Norchelli is located in Grid Square XM04 which is the same corresponding longitude and latitude location on Mars as DM04 is on Earth (we don't know if there is an equivalent of Magic Mountain on Mars as there is in Van Nuys). Again, some precise positioning is involved to complete this last leg of this journey through the Martian ionosphere!

We attempted to draw this path in the accompanying Figure. Again, we put the disclaimer that this is only a reasonable guess and not necessarily the right answer! Additional research is required. Any other reports of E-M-E (Earth-Mars-Earth) contacts should be sent to Prof. Uranap Rilfool c/o *CQ VHF*.

Not in the DX Atlas

She thought for another minute. "Van Nuys? Hmmm. I don't think I ever heard of it. Where did he say it was, Kendie?"

"That's the other thing I can't figure. When I questioned him, he acted as if I was some sort of moron, not knowing where this Van Nuys place was. He snickered as he told me it was in a place called California on the west coast of the North American continent. Ever hear of either of those places? They're not listed in the DX Atlas. Neither is this strange WA6 prefix that Bill used."

"If they're not in that green book of yours, how can you expect your non-ham companion to know where they are? I think you're right. It sounds like one of Prond's practical jokes. Better hurry up. We only have a short while left before the stores close."

Their jet turbine powered vehicle had covered the 155 miles to the shopping center in less than 45 minutes. In that short time, the beautiful red sunset had become a cold and black Martian evening. As they rode the moving stairway from the parking lot to the shopping area Corliea slipped one of her eight upper tentacles around her beloved husband and remarked, "This ham radio hobby of yours sure breeds some strange bedfellows. Either you and Bill have just set some sort of amazing new DX record or you had better get ready for a lot of ribbing at the next club meeting."

Meanwhile, Back in Van Nuys...

Meanwhile, a couple of million miles away, on the planet Earth, in the city of Van Nuys, in the state of California, on the North American continent, I sat before my radio totally bewildered. All I could do was stare at the lighted dial with a rather strange expression across my face.

"Had this QSO from which I had just signed clear really taken place? Where was the city of Norchelli? Where was the "Great Open Red Plain?" What kind of a radio used Hemgersilod Modulation to generate a single sideband signal? It had to be a practical joke." But there it was in the logbook...0030 Z, April 1.

As my wife and I sat down to dinner, she noticed that I was troubled and asked what was up. I explained about the strange contact I had just concluded with a guy named Kendie.

"I sat before my radio totally bewildered. All I could do was stare at the lighted dial with a rather strange expression across my face. 'Had this QSO from which I had just signed clear really taken place?' "

She listened intently to me and, after a few minutes of silence, she looked directly at me and stated in a most unequivocal way, "So you made contact with another bootlegger. So what's the big deal? The way you talk, someone would think that you had just worked a station on Mars!" ■

Down East Microwave Inc.

New 2304 MHz, 1 Watt transverters are ready!

Call for details

Check our Spring Sprint Specials

Transverters & Down Converters, Linear power amplifiers, Low Noise Preamps, Loop Yagi and other antennas, Power dividers, coaxial components, Hybrid Power modules, relays, GaAsFET, PHEMT's & FET's, MMIC's, Mixers, chip components.

We can interface our transverters with most radios

Please call, write or see our web page

www.downeastmicrowave.com

for Catalog, detailed Product descriptions and interfacing details.

See us and Directive Systems at the Dayton Hamvention Booths: 340, 341 and 342

Down East Microwave Inc.

954 Rt. 519

Frenchtown, NJ 08825

Tel. (908) 996-3584

Fax. (908) 996-3702

CIRCLE 68 ON READER SERVICE CARD

What You've Told Us...

January's survey asked some basic demographic questions as we began our fourth year of reader surveys. The responses were particularly interesting when compared with the results of our first poll, back in 1996.

Our readership has become virtually all-male, at 99%, versus 96% in '96 (what'll happen in '00?), and 73% of you are married. That's a four-year high. We also have a greater number of older and more experienced readers than when we started out. The biggest age group continues to be 45–54 (33% this year), but the 35–44 category has dropped from 29% in '96 to just 16% in '99, while the 65–74 group has grown from its original 8% to 17%.

Four years ago, 42% of you had been hams for two years or less. Today, that number is only 17%. The biggest growth has come in the 6–10 years category, up from 6% to 17%, while the biggest blocks are 3–5 years and 25-plus years, each with 26%. Looking at license classes, Technicians are still number one, but are down from 44% in '96 to 35% today. The biggest increase has been among Extras, who jumped from 12% four years ago to 18% today. Other license classes have held relatively steady.

Finally, the number of you who are active on 6 meters has jumped from 38% in '96 to 53% today. And 68% operate today on 70 centimeters, versus 55% in '96. The microwave bands and 222 have held relatively steady, while 2-meter activity has actually dropped a bit, from 97% to 94%.

This month's winner of a free *CQ VHF* subscription is Lawrence Sanderson, of Manchester, IA. As always, thank you for participating.

CQ VHF Ham Radio Above 50 MHz

Reader Survey—April, 1999

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

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

And, as a bit of an incentive, we'll pick one respondent every month and give that person a complimentary one-year subscription (or subscription extension) to CQ VHF. *This month, we want to test your "EQ," or "Elmer Quotient," to see how you've done at learning from, and teaching, other hams.*

	Circle Reader Service #
1. Have you ever tried to get help from another ham regarding any aspect of ham radio?	
Yes	1
No	2
2. If you answered "no" to Question 1, which answer below best describes your reason?	
I learned all I needed from books, magazines, and/or videos	3
I didn't know whom to ask	4
None of my ham friends know any more about the topic than I do	5
I was afraid people would think I was stupid	6
Other	7
3. If you answered "yes" to Question 1, did you get the help you wanted?	
Yes, easily	8
Yes, but with difficulty	9
No	10
4. If you answered "yes" to Question 3, please indicate how you got hooked up with your "Elmer" (helper).	
Through a radio club	11
Through a national or regional organization	12
On the air	13
Online (e-mail/Internet)	14
Other	15
5. Have you ever offered help to another ham regarding any aspect of amateur radio?	
Yes	16
No	17
6. If you answered "yes" to Question 5, was your offer accepted?	
Yes, enthusiastically	18
Yes, but reluctantly	19
No	20
7. If you answered "yes" to Question 6, were you able to provide the needed help?	
Yes, completely	21
Yes, partially	22
No, helped find other source	23
No, was unable to help	24
8. If you answered "no" to Question 6, which answer best describes your reason?	
No one has asked	25
I don't feel I know enough to teach someone else	26
I'm not good at that sort of thing	27
I'm not giving away my hard-earned knowledge for free.	28
Other	29
9. Does your club have a formal or informal program to "Elmer" new hams and those trying out new things?	
Yes	30
No	31
Don't know	32
Not a club member	33

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

Watch Out for (Too) Rare April DX

All right, so you're new on the air and we'll take pity on you...if you've ever been sent out for a yard of shore line, and gone looking for it, you need to read this.

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

Every April, I just can't help myself. I know I shouldn't do it, but I just can't resist. It's probably not very nice, but after all...it's April on 6 meters.

The band has been open for several hours now between Southern California and the Rocky Mountains. Signals are exceptionally strong, and I easily work KCØDAO, W6OAL/Ø, and NØVSB, among others. As things begin to die down, I swing my beam to the west in hopes of grabbing some F_2 skip to the Far East, Australia, or maybe New Zealand. I dial down to 50.110 MHz, the SSB DX calling frequency, and let the audio run without squelch so I won't miss a thing.

A Faint Signal

After an hour of steady background noise, a faint signal comes through on the calling frequency: it's one of my earlier Rocky Mountain contacts, also trying his luck on working some Pacific DX. He sounds like he's in a good mood, but no one is answering his calls. And, being April—I just can't resist.

I keep the back of the beam toward him, drop my power down to about 15 watts, squeeze my nose, and, in my best south seas accent, set the bait...

I say, chap, who goes there way down in the noise? This is foxtrot-oscar-zero-lima, foxtrot-oscar-zero-lima, foxtrot-oscar-zero-lima, Q-R-Zed?

The author with his "guest op" from French Polynesia, FOØL. (N3JF Photo)

The Rocky Mountain station grabs the bait and calls incessantly for the very rare French Polynesian station, foxtrot-oscar-zero-lima. I count about 15 calls for foxtrot-oscar-zero-lima before there's a big pause, and I know he has just written down the callsign without the phonetics—FOØL—and realized that someone was FOØLing with his brain!

"As things begin to die down, I swing my beam to the west in hopes of grabbing some F_2 skip to the Far East, Australia, or maybe New Zealand."

Always the Good Ham

As a good ham who always abides by Part 97, I come on the air, congratulate him on working the rare DX, quickly give my (real) callsign, and slide off of 50.110. And all because, one April past, I spent an hour trying to contact that well-known French station, tango-zero-alpha-delta...TØAD!

Watch out! Rare April DX from WB6NOA may be coming to your station soon, down in the DX portion of the Magic Band! Welcome to just one more ham radio initiation for the newcomer.

73 de WB6NOA/FOØL

**Gordon West, WB6NOA/FOØL, is still (despite our best efforts) Senior Contributing Editor of* CQ VHF.

Tools and Techniques for Working High-Speed Meteor Scatter

Have you been interested in experimenting with high-speed meteor scatter, but haven't known where to start? K7JA's "tools and techniques" will have you "on the rocks" in no time.

By Chip Margelli, K7JA*
(k7ja@dxer.com)

The subject of high-speed meteor scatter (HSMS) has received a lot of attention recently in the amateur radio journals and on the Internet. To date, most of the published work has dealt with the profound improvements in software used during HSMS operation. This article will, by comparison, focus on the "nuts and bolts" issues of operating and antenna aiming, in the hope that a new body of knowledge will emerge within the amateur community. It's believed that much of the material presented in this article has never been published until now.

Characteristics of High-Speed Meteors

High-speed meteors, used during HSMS operation, are defined as those entering the Earth's atmosphere at a velocity greater than 1,000 kilometers per second (kps). Slow-speed meteors, for the purposes of this article, will be considered those entering the atmosphere at lower velocities (typically 100 kps). Amateurs have successfully exploited slow-speed meteors for years, only recently turning their attention to high-speed meteors because of the daunting technical challenges involved in using them for VHF/UHF communication.

*Chip Margelli, K7JA, is an active HF, VHF, and UHF DX and contest operator and is the Manager of the Engineering/R&D Department at Yaesu U.S.A. in Cerritos, California. Chip and his wife Janet, KL7MF, live in Garden Grove, California.

Photo A. Armstrong Rotator. Note that the rotator's eyes are diligently scanning the sky in search of high-speed meteors. (K7JA photo)

Because of the extremely high atmospheric-entry velocity of high-speed meteors, they develop extraordinarily high ionization when they enter the Earth's atmosphere. It's the intense ionization of high-speed meteors which makes them particularly useful for amateur communication, allowing contacts to be completed in less time, with less power and less antenna gain, as compared to slow-speed meteors.

Of course, the intense ionization is found on the *surface* of the meteor, as the metallic surface of the meteor collides with particles in our atmosphere. As the meteor passes through the atmosphere, layer after layer of its mass is dissipated in an ionized fireball, until the meteor is totally consumed.

In the case of a slow-speed meteor, this ionization process takes place over a relatively long time, which means that the meteor's body (where the ionization takes place) takes longer to pass within the (-3 dB) beamwidth of an amateur's antenna array. Figure 1 shows that a typical slow-speed meteor might take as much as six seconds to pass across the main lobe of an antenna (in this case, a 10-element Yagi). Callsigns can be exchanged in this amount of time.

However, a high-speed meteor covers the same angular range in a fraction of a second, hardly enough to get even a syl-

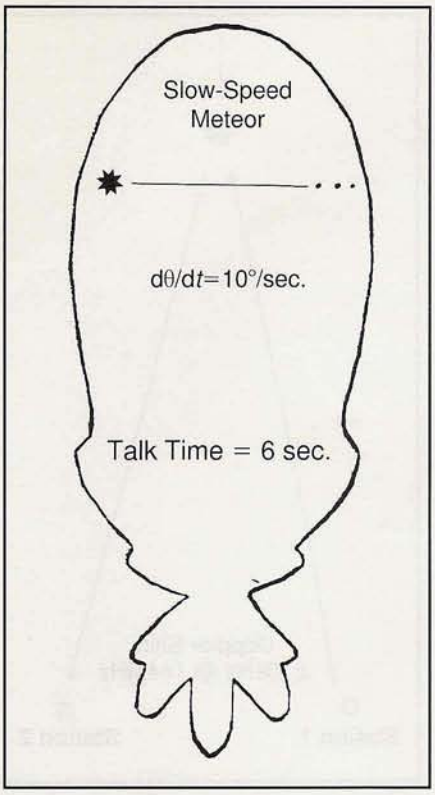


Figure 1. A slow-speed meteor stays within your antenna's main lobe for several seconds, making communication relatively easy.

lable across (see Figure 2). When two amateurs compare notes after an unsuccessful schedule and remark that they only heard "pings," you can be sure that they (unfortunately) encountered a swarm of high-speed meteors. This short time window has led W8WN and others to promote the development of extremely high-speed CW software (transmission and reception at thousands of letters per minute), in the hope of catching the meteor before it passes outside the antenna's field of maximum gain. These high-speed sending and receiving techniques, however, lack the "real-time communication" dimension that most hams find appealing.

Additional Complications

There are other aspects of a high-speed meteor's entry into Earth's atmosphere that can make communication difficult.

For one thing, the atmosphere is seldom of totally uniform density. Pressure differences, high-altitude winds, and the presence of dust particles can all contribute to erratic velocity as the meteor comes in. Erratic velocity means erratic ionization, leading to QSB (fading) on communication paths via the meteor (this effect is similar to the Libation Fading often experienced on moonbounce circuits). Dr. Takoashi Haisen of Japan's Inchiki Shobai University was the first to quantify this effect in his classic paper published in 1957. In this paper, Dr. Haisen defined the average ionization level using the formula

$$A_p = r_i L_1 \{f(O_3/O_2)\} L_2$$

where

A_p = Average Ionization Power in Joules
r_i = Radius of Incoming Meteor
L_1 = H-Plane Inductance of Meteor's Magnetic Field
$f(O_3/O_2)$ = Relative Concentrations of Ozone and Oxygen in Meteor's Path
L_2 = E-Plane Inductance of Meteor's Magnetic Field

The other effect, often observed visually, is that meteors sometimes break up during their entry into the atmosphere. When this happens, multiple signal reflections take place, each at a different phase angle. This leads to a "buzz" characteristic of the incoming signal, not unlike that observed on auroral paths.

These two characteristics affect both slow-speed and high-speed meteors identically. However, because of the much shorter time window within which we may communicate via high-speed meteors, their effects can be much more damaging to communication.

So what options are available for working via high-speed meteors, other than using computer-based CW programs?

What Doesn't Work!

In Figures 1 and 2, you may have noticed that the meteors were shown entering the atmosphere at a 90-degree angle relative to the communication path. This alignment, of course, means that the meteor covers higher a range of angles, relative to your station, than at any other alignment.

"So why can't I point my beam so that I'm aiming along the same line as the meteor's path?" you may rightly ask. After all, it's well known that some meteor showers are known as "north-south" showers, while others are better for "east-west" paths. Doesn't this provide us an opportunity?

In the special case of high-speed meteors, alas, the answer is "no," and the reason has to do with Doppler shift (see Figure 3). If we align our antenna so that it points right at the meteor as it streaks towards or away from us, the reflected signal travels at a different velocity due to the contribution of the velocity of the meteor. It therefore is shifted in frequen-

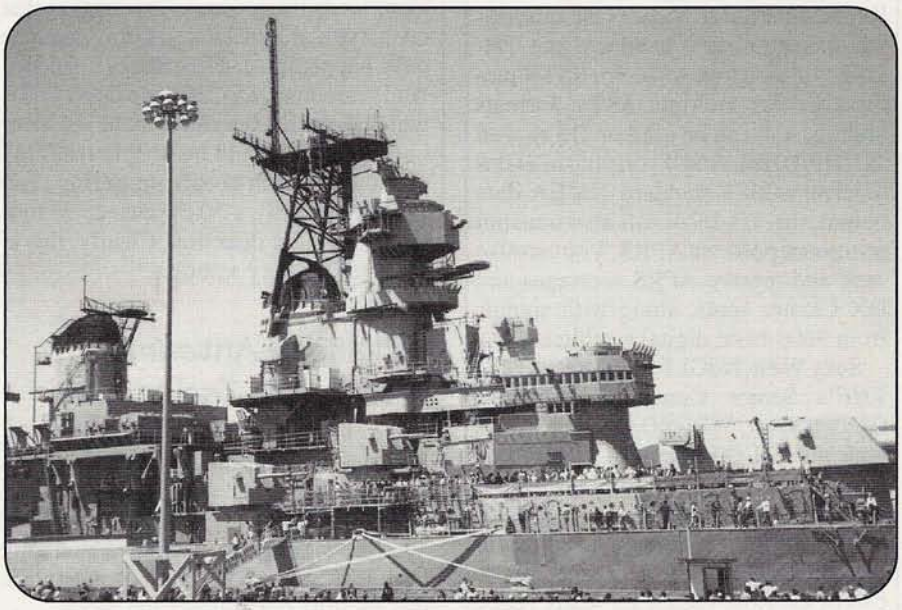


Photo B. Try to be first in line when Navy ships are decommissioned, so you'll have a better chance of picking up a surplus military rotator, as described in the text. (Photo by Margaret Patjens, KA7RYG)

On the Cover

Suzy West, N6GLF, operates from the course of the 1999 Rose Parade in Pasadena, California. She's transmitting not only voice reports on the parade's progress, but also slow-scan television (SSTV) images and her precise position, using the Global Positioning System (GPS) and Automatic Position Reporting System (APRS). And everything except the GPS receiver is in her hands.

The Kenwood TH-D7A HT is a dual-band 2-meter/440-MHz handheld with a built-in packet TNC capable of operating at both 1200 and 9600 baud. APRS software is installed as well, letting the radio operate as a self-contained voice or packet station. Connect the Kenwood VC-H1 Visual Communicator in Suzy's right hand and the TH-D7A will also transmit color SSTV pictures (it has multiple SSTV formats built in, so it can be used on HF as well as VHF/UHF). And if you plug in a GPS receiver with a standard NMEA data output, the TH-D7A will also transmit position reports via APRS. You can also send and receive APRS messages and DX Cluster spots, along with signals from 9600-baud digital satellites.

Suzy West, N6GLF, is the wife of *CQ VHF*'s Senior Contributing Editor, Gordon West, WB6NOA, who reviews both the TH-D7A and VC-H1 in this issue. The Wests live in Costa Mesa, California, with several cats and innumerable radios and antennas. Ham radio communications has been an essential part of the Rose Parade for many years, nearly as much of a tradition within the parade as the New Year's Day event itself is for America. (Cover photo by Julian Frost, N3JF)

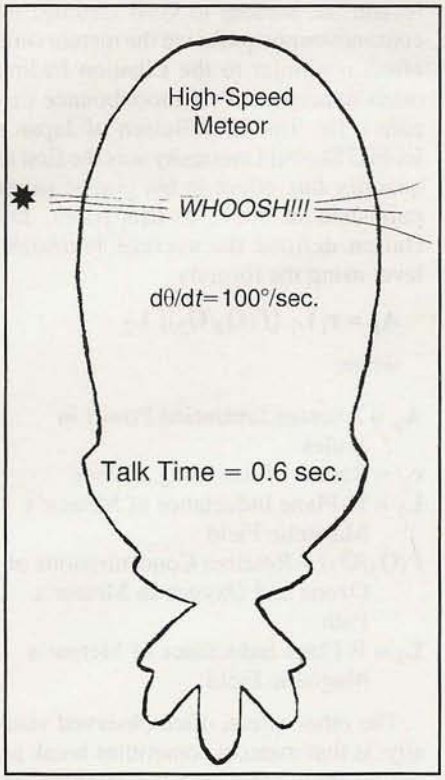


Figure 2. The ionized body of a high-speed meteor whizzes out of the antenna's main lobe before callsigns can be exchanged, using traditional methods.

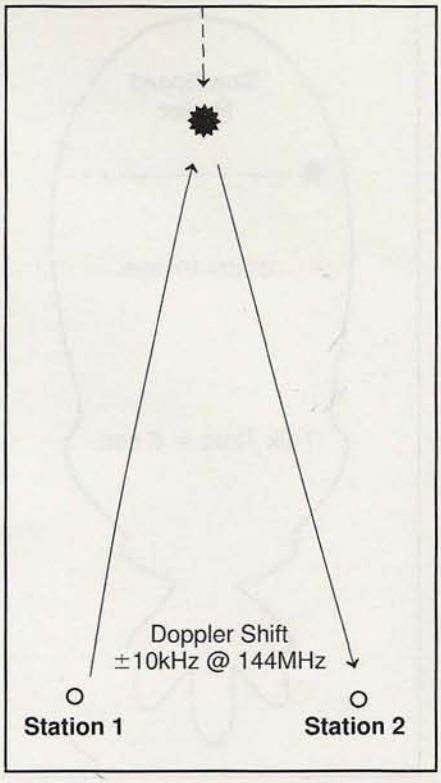


Figure 3. High-speed meteor directly approaching calling stations yields excessively high Doppler shift on transmitted signals.

cy, either upward or downward, and, in the case of high-speed meteors, the Doppler shift is tremendous (on the order of many kHz per second)! Imagine a Doppler shift three times greater than that on a typical Low-Earth-Orbit satellite pass, happening in a fraction of a second! And remember, too, that you don't know which direction the shift would be! Your only solution would be to spin the VFO dial during each receiving period, and you'd have only a 50-50 chance of tuning in the right direction. Clearly, this is *not* a satisfactory solution.

Advanced Antenna Positioning Techniques

It's in the realm of esoteric forms of antenna positioning that one finds the most promise of maximum exploitation of high-speed meteors. I'll discuss three possible techniques, each of which may have some appeal to you as you explore this exciting communication mode.

1. *Armstrong Method*: Depicted in Photo A, the "Armstrong" rotation technique takes advantage of the quick response time of the human brain. Your spouse can often be enlisted to serve in this capacity. The deficiencies of this method, however, are obvious. First, it only works during the night (and only on clear nights, at that), as your spouse has to be able to see the ionized high-speed meteors in order to point the antenna at them. Secondly, there are reasons to be concerned about the effects of RF radiation on the rotating party. Thirdly, and most importantly, it's likely that you will only be successful in negotiating *one* use of your Armstrong HSMS rotator. And replacement cost is *very high*.

2. *Adjustable-Phase Antenna Array*: At a glance, this technique (illustrated in Figure 4) shows great promise. Two or more antennas are connected via a computer-driven phase-adjustment box, allowing the antenna pattern to be swept over a wide range of angles. By adjusting the drive phase to each antenna in the array, the main lobe can be aligned squarely onto the body of the meteor as it enters the atmosphere. A CCD (charged-couple device) camera with a

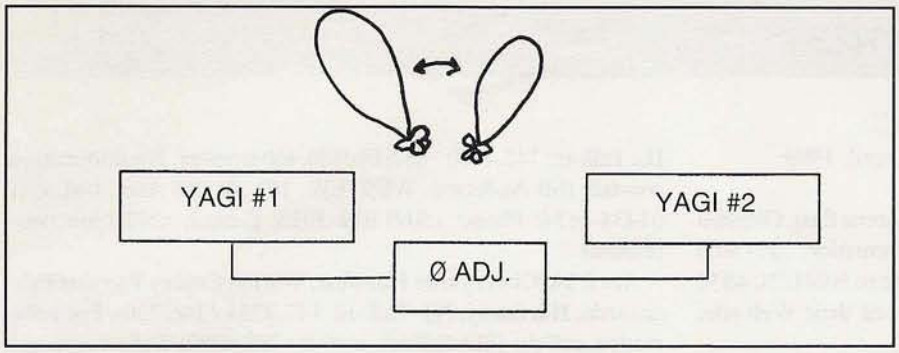


Figure 4. Variable-phase antenna array allows instantaneous alignment of array's main lobe with the body of a high-speed meteor.

wide-angle lens, mounted on the antenna array's mast, detects the glow of the incoming meteor and feeds position information to the computer, which then adjusts the phase to direct the beam at the fast-moving shooting star.

The three disadvantages of this method are: a) Only 180 degrees of the sky can be covered, as the camera cannot see to the rear. From my location on the West Coast, of course, this is not a problem; b) Again, clear weather is required in order for the CCD camera to see the incoming meteor; and c) The required software is not an off-the-shelf item.

3. *Surplus Military Rotators*: For many years, HF DXers have used surplus military propeller-pitch (prop-pitch) adjustment rotators for turning very large arrays. These rotators, built without cost constraints, are without peer when large masses are to be turned. As propeller-driven aircraft were decommissioned in the 1950s and 1960s, these rotators became widely available to hams who knew their way around military surplus yards.

In the case of VHF and UHF arrays used for HSMS, however, the array size is not large. By contrast, the rotator must be capable of rotating the (comparatively small) antenna very, very quickly and must reliably start and stop without shredding its own gears into a million pieces. Again, we turn to the surplus military market for a solution.

The U.S. Navy's "Phalanx" weapon is a warship's last line of defense. A modern, high-tech version of the old "Gatling Gun," the Phalanx uses a very-high-speed rotation system which can zero-in on incoming fighters and missiles at close range, allowing an intruder to be destroyed at the last minute; you may have seen one of these in action in the Steven Segal movie "Under Siege," as deployed on the *U.S.S. Missouri*. This rotator is easily capable of covering the angular range swept by high-speed meteors during atmospheric entry, allowing you to keep even a narrow-beamwidth high-gain array perfectly aligned on the body of the meteor (thus ensuring maximum signal strength). A CCD camera mounted on the boom of the antenna provides all the aiming information required for computer-based rotation control. The Phalanx system's rotator would appear to be ideal for this application!

As Navy ships are decommissioned, watch your local surplus yards for one of these rotators lying around. If you're lucky enough to procure one, you might even be able to find control software on the U.S. Navy's Web site.

Summary

I hope that this article will encourage you to try HSMS. Although high-speed meteors move very quickly across the sky, the tremendous signal strengths of signals reflected by them makes the effort required in station design well worth it. So forget about slow-speed meteors, and move into the fast lane! ■

"This rotator is easily capable of covering the angular range swept by high-speed meteors during atmospheric entry, allowing you to keep even a narrow-beamwidth high-gain array perfectly aligned on the body of the meteor...."

ZEIT

"ATOMIC TIME"

Time Pieces Synchronized to the US Atomic Clock
Accurate to ten billionth of a Second!

You can now have the world's most accurate time 24 hours a day. These smart clocks tune into the radio signal emitted by the US Atomic Clock in Colorado, which deviates less then 1 second over a million year period. They synchronize themselves automatically to the precise time and adjust for daylight savings. These precision ZEIT timepieces are engineered in Germany and are easy to use using the latest in radio-controlled technology. Just set the time zone and the built-in microchip does the rest.
"ZEIT Atomic Time" Precise, Reliable, Convenient

ZEIT Atomic Dual Alarm & ZEIT Atomic PC
Sleek European design with large 2 line LCD display with exact time in hours, minutes, seconds, month and date, or any two US and world times. At 8oz. ideal for travel; incl. dual alarm with nighttime illumination, time zones and lithium battery backup. Super sensitive built-in receiver. 2AA. incl. Black or Silver arch design at 5"x4"x2 1/2" **Sale! $69.95**. Buy any two Clocks & get 20% off 2nd. ZEIT PC with serial cable and software for WIN. Also shows UTC Time in 24 hrs mode. **Sale! $99.95**

NEW
SALE $69.95

ZEIT Atomic Wall Clock

with regular or Roman numerals. For home or office. One AA Battery. Large 12" **Only $79.95** **($99.95 in wood)**

ZEIT Atomic Watches are the world's most accurate watches. Shock-resistant polymer case with built-in receiver, hardened mineral lens, water resistant. Black or white dial & leather band. **Only $149.95**
NEW ZEIT Digital Atomic Sportswatch with UTC etc. **Just $99.95**

Call for full line of atomic clocks & watches
THE FUTURE IN TIME KEEPING
Credit Card Orders call toll free 800-339-5901 24hrs
send checks / money orders for the total amount incl. S & H $7.00 to: **ATOMIC TIME, INC.**
10526 W. Cermark Suite 300 West Chester, IL 60154 - Please mention promotional Code 8484 when ordering
Fax. 708.236.1205 **http://www.atomictime.com**

CIRCLE 63 ON READER SERVICE CARD

Hamfest Calendar

The following hamfests are scheduled for April, 1999:

April 10, 22nd Annual Hamfest, Graham Arena East, Olmsted County Fairgrounds, **Rochester, MN**. For information, call (507) 285-6522, e-mail: <nøhzn@aol.com>, or write to NØHZN, 4552 5th Street NW, Rochester, MN 55901, also see their Web site: <http://members.aol.com/rarchams>. (exams)

April 10, Hamfest and Electronic Show, Spokane Community College, **Spokane, WA**. Talk-in: 146.52 simplex and 147.32 repeater. For information, contact Warren Kelesy, S. 1405 Crestline, Spokane, WA 99203. Phone: (509) 534-8443. (exams)

April 10, 6th Annual North County ARC and LARK Amateur Radio and Computer Flea Market, Twin Mountain Hall, **Twin Mountain, NH**. Talk-in: 147.345 (114.8 Hz). For information, contact Richard Force, WB1ASL, 12 Cottage St., Lancaster, NH 03584; Phone: (603) 788-4428; E-mail: <bhabooks @together.net>. (exams)

April 11, 27th Hamfest & Computer Fair, Jim Grahm Bldg, NCS Fairgrounds, **Raleigh, NC**. For information, contact, W4VFJ, (919) 556-8551; hamfest prereg/dlr inquiries: Wilbur Goss, WD4RDT, 4425 Watkins Rd., Raleigh, NC 27616; Phone: (919) 266-7883. (exams & handicap accessible)

April 11, Framingham FleaMarket, Framingham High School, Framingham, MA. For information, contact Bev Lees, N1LOO, FARA P.O. Box 3005, Framingham, MA 01705; (508) 626-2012. (exams)

April 11, Hamfest, Valley Central HS, **Montgomery, NY**. Talk-in: 146.160 IN/147.760 out 100 Hz PL tone. For information, contact Ed J. Moskowitz, N2XJI, 123 Harold Ave., Cornwall, NY 12518-1701; (914) 534-3492; e-mail: <N2XJI@BANET.NET> (home), <EMOSKOWITZ@BEAR.COM> (work); Web: <www. IDSI.NET/~MSHOVANI>. (exams)

April 16–17, 18th Annual Midwinter Madness Hobby Electronics Show, National Sports Center, **Blaine, MN**. For information, contact RARC, 4737 S. Hwy 101 #276, Minnetonka, MN 55345, or call (612) 537-1722. (exams)

April 17, Spring Fest, Bell County Expo Ctr, **Belton, TX**. Talk-in: 146.820 MHz (-), PL 123.0 Hz. For information, contact Mike LeFan, WA5EQQ, (254) 773-3590; E-mail: <hamexpo@tarc.org>; Web: <http://www.tarc.org>. (exams & handicap accessible)

April 17, Hamfest, Metro East Trade Centre, east of Toronto. **Toronto, Canada**. For information, contact Ian Smith, VE3ITG, <ve3itg@rac.ca>; <http://www.globalserve.com/~ismith>. (handicap acessible)

April 18, SMARTS Fest, Canterbury Park, **Shakopee, MN**. For information, contact SMARTS, P.O. Box 144, Chaska, MN 55318. (exams)

April 23–24, "The Big One" Hamfest, Little Rock Expo Center, **Little Rock, AR**. For information, contact Chairman, K5VZ, Jim Blackmon, 1008 Pine St., Arkadelphia, AR 71923-4919; Phone: (870) 246-6735 (office); Fax: (870) 246-6736; Web: <http://www.aristotle.net/~ares/lrh99.html).

April 25, AARO Hamfest, National Guard Armory, **Galva, IL**. Talk-in: 145.4900 - 88.5 PL/146.460 simplex. For information, con-tact Bill Anderson, WB9TEW, 103 SE 2nd Ave., Galca, IL 61434-1854; Phone: (309) 932-3023; E-mail: <bill@inw.net>. (exams)

April 24, Cherryville Hamfest, Warren County Farmers Fairgrounds, **Harmony, NJ**. Talk-in: 147.375+ / 146.730-. For information, call the CRA II Hotline: (908) 788-4080; Web: <www.qsl.net/w2cra>. (exams)

April 24, Annual ARRL Hamfest, Sonoma Valley Veteran's Memorial Building, **Sonoma, CA**. Talk-in: 145.35, -600, with a PL of 88.5. For information, call Darrel, WD6BOR, at (707) 996-4494. (exams)

April 24, BCRO Hamfest, Bentonville National Guard Armory, **Bentonville, AR**. Talk-in: 145.290. For information, contact Betty, NØXWQ, at (417) 435-2332 (leave message).

April 25, 15th Annual Hamfest, Canfield Fairgrounds, **Canfield, OH**. Talk-in: 147.315(+) N8FAL or 443.225(+) K8EAU or alternate 145.275(-) KD8ED. For information, contact Don Stoddard, N8LNE, 55 S. Witney Ave., Youngstown, OH 44509; Phone: (330) 793-7072. (handicap accessible)

April 25, Bi-Annual Hamfest and ARRL Eastern NY Section Convention, John Jay HS, **Fishkill, NY**. Talk-in: 146.97 MHz. For information, contact Ken Akasofu, KL7JCQ, 8C Hudson Harbor Dr., Poughkeepsie, NY 12601-5367l; phone: (914) 485-9617; Fax: (914) 485-2402; E-mail: <KL7JCQ@iname.com>; Web: <http://www.mhv.net/~fritzing>. (exams)

April 25, Annual Hamfest & 1999 Delaware State ARRL Convention, Nur Temple, **New Castle, DE**. Talk-in: 147.225 +

Operating Notes

For Late March & April, 1999:

March

19–21 CQ VHF Spring Activity Weekend (FM)
(see last month's issue)

28 Good EME Conditions

April

12 144-MHz Spring Sprint
(see "The Sprints Keep Running" this issue)

17–18 CQ VHF National Foxhunting Weekend
(see rules this issue)

20 222-MHz Spring Sprint

23–25 CQ VHF Spring Activity Weekend (SSB/CW)
(see last month's issue)

25 Good EME Conditions

28 432-MHz Spring Sprint

EME data courtesy W5LUU. More contest info is available on the CQ VHF *Web page at:* <http:/www.cq-vhf.com/navhfcon.htm>.

or 224.220/R. For information, contact Hal Frantz, KA3TWG, at (302) 793-1080; E-mail: <hfrantz@snip.net>; Web: <http://www.magpage.com/penndel>. (exams)

VHF Conferences

March 29–April 2, National Hurricane Conference, Orlando Florida. The 1999 National Hurricane Conference will be held from March 29 to April 2 at the Omni Rosen Hotel in Orlando, Florida. Amateur radio operators are specifically invited to attend. The conference opens with two and a half days of training sessions on March 29–31, followed by a general session on the afternoon of the 31st, a variety of workshops on April 1st, and a closing general session on April 2. Topics of particular interest to amateurs include four training sessions: "Marketing Your Emergency Communications Program" (3/29); "The Role of Amateur Radio in Hurricane Communications" (3/30); "Emergency Operations Center Management and Operations"* (3/29–31); and "Basic Public Information Officer's Course"* (3/29–31). (*Limited seating; advance registration required)

Conference registration is $275. For more information, call (850) 906-9224; Fax (850) 906-9228; Web: <http://nettally.com/nhc>. For hotel reservations, call (800) 843-6664 or (407) 996-9840. Request the National Hurricane Conference group rate.

April 9–10, Southeastern VHF Society. The third annual Southeastern VHF Society conference will be held April 9th and 10th, 1999, at the Atlanta Marriott Northwest in Marietta, Georgia. The hotel is at exit 110 of I-75, Windy Hill Road. The hotel rate will be $69.00 per room for single or double occupancy if you reserve before March 18, 1999, and mention the conference. For reservations, call Marriott at 1-800-228-9290.

The conference will feature preamp noise figure testing, antenna gain measurements, a technical program, a flea market, vendor displays, a family program activity, presentation of the K4UHF award, banquet, and door prizes. The technical program will include presentations on EME, noise figure measurements, linear amplifiers, transverters and interfacing, and VHF contest roving. The banquet speaker will be Joel Harrison, W5ZN, ARRL Vice President and avid VHFer.

For more information and a registration form, which includes sign-up for antennas and preamp measurement as well as the family program, please visit the SVHFS Web site at <http://www.svhfs.org/svhfs/>, e-mail to k4sz@stc.net. or write SVHFS, P.O. Box 1255 Cornelia, GA 30531.

April 24–25, Western States Weak Signal Group. The Western States Weak Signal Group will have a get-together on April 24–25, 1999 (with campout on the 23rd), hosted by Ron Hammel, K6WLC, and Dale Snider, KØBGL, at K6WLC's "Antenna Ranch" in Ventura County, California. Program will include speakers on laser and microwave communications, an antenna range, potluck Bar-B-Que on Saturday night and breakfast on Sunday morning. Talk-in on 144.210 USB and 146.52 FM.

For more information, call K6WLC at (661) 245-1009 weekends or (661) 942-1312 weekdays.

CQ 1999-2000 Calendars

Only $9.95 ea. +$2 s/h

Ham Radio's Best Calendars Are Here!

Hot off the presses, our widely acclaimed calendar series is back with CQ's new 1999 editions. You'll refer to your CQ calendar time after time as you search for the schedules of upcoming ham events and conventions. Public holidays and valuable astronomical information will be right by your side, too!

Enjoy 15 months of use (January 1999 through March 2000) with this year's editions. Each month you'll be treated to some of the greatest photography in all of amateur radio.

The 1999-2000 CQ Radio Classics Calendar—Is there a ham anywhere who can resist the allure of a classic piece of ham equipment? You'll be transported back to a simpler time with these 15 magnificent images of some of the finest in state-of-the-art ham gear, vintage 1923-1980. Collins, Hammarlund, Hallicrafters, National, Barker & Williamson, Globe, Central Electronics and more. Don't miss this great collectible calendar.

The 1999-2000 Amateur Radio Calendar— no ham should be without at least one! Features 15 professional color photographs of some of the most unusual stations, biggest antenna systems, and dramatic and beautiful operating locations in North America displayed on your wall! From a cozy shack in the garage to desert sunsets, every month brings new inspiration to the shack.

Available directly from CQ and from your local dealer!

For Fastest Service call 1-800-853-9797 or FAX 516-681-2926

MasterCard VISA DISCOVER AMERICAN EXPRESS

CQ Communications, Inc., 25 Newbridge Road, Hicksville, NY 11801

Q & A

Questions and Answers About Ham Radio Above 50 MHz

The following questions were directed to "Antennas, etc." editor Kent Britain, WA5VJB, who responds to each.

Q: I read your article in *CQ VHF* on the 432 beam and wanted to ask a few questions.

1. The RadioShack I checked did not have the #10 copper. I have made a J-Pole using the wire in Romex (electrical cable) with VSWR near 1.2 and wanted to ask if you think it would work for the driven element. I also wanted to try a metal clothes hanger cut to the correct length.

2. I have a 13B2 and would like to mount the 432 above it just as a contest setup, using wood screws into a broomstick (or PVC) mounted atop the same mast. Does your design only work as an end mount or could I find the level point and make a center mount? Also, how far above should it be?

3. Most lumber yards (home centers) sell wood in eight-foot lengths. Do you have the data for a 96-inch boom?

4. Any data for a 6-meter version?

73, Mike Fisher, N3VOP
Mount Airy, Maryland

A: Hello, Mike. Let's answer your questions one at a time:

1. Sure, I pick up my copper wire at the building supply places, too. Metal clothes hanger wire is a different diameter, so there would be a length correction factor. And it's hard to solder to that iron wire.

2. No problem mounting it in the middle like that. Find the balance point and put a U-clamp there. Keep the mast as far away from the directors as possible. A wood/PVC mast doesn't help much, since you're running the coax through there, anyway. Just keep the mast an inch or so away from the director elements and you'll be fine.

3. That length gets real tricky and construction tolerances increase. I haven't tested on a boom that long as yet.

4. I've got a few ideas in the computer, but haven't built up models thus far. And since it's 18 degrees out there at the moment, it may be awhile.

Q: I am going to build one of your 2-meter FM cheap Yagis (the three-element version). Should I make the driven element out of #10 copper wire and the other two out of 1/8-inch aluminum ground wire (like the 440 version)?

73, Carl Johnson, KF4WXK
Cary, North Carolina

A: Hello Carl. I used 3/16-inch in the article because I think it's a little stronger. As long as you protect it, it should work fine. Many of my cheap Yagis are mounted in my attic.

Q: In reference to your February, 1999, *CQ VHF* article on pages 48 to 51 on microwave dishes:

I have been slowly but steadily building a parabolic dish for 1296 receive for ATV (amateur television) here in Salem, Oregon. Some of us hams out here have been cursed with 50-foot-plus runs of 9913 on 1296 loop Yagis that sometimes just don't seem to cut the mustard. One day a few months ago, my wife Deanna, KC7RDQ, happened to get a children's science magazine with various projects for young kids to build. Well, my stepson is a little young for some of this stuff, so she tossed it in with my ham magazine pile (*CQ VHF*). I eventually looked through it and found parabolic dishes in three sizes: 12, 18, and 24 inches. Way too cool since the manufactured home park we live in forbids ham antennas but accepts 18-inch dishes.

On a clear night, from my roof, I can see Eagle Crest hill and the flashing red marker lights where the ATV repeater lives. I tossed this idea around with a few of the local ATVers and sketched this out on a napkin. Needless to say, I have a feeling that my homebrew parabolic for 1296 receive is going to blow away the loop Yagi (in price and performance).

I'm feeling optimistic about this. In the next week or two, weather permitting, I should have a moment to make a test run on the roof. I just had the PC Electronics downconverter retuned for best signal and all that is left is to cut a chunk of 9913 coax, feed it into the house, point the dish and turn it on. The total cost for my dish is around $75. That's purchasing the dish and some machine bolts brand new and digging the rest of the stuff out of a metal scrap yard for another couple of bucks. What are your thoughts?

Brian Woodley, KC7LWZ
Salem, Oregon

A: I don't want to blow away too much of your optimism, but for a parabolic dish to bring a wavefront to a point, the dish needs to be 10 wavelengths across. Five wavelengths will work, but that's really pushing it.

On the 23-centimeter band (1296 MHz) that would be 1.1 meters. I don't think you're going to get very much efficiency out of something a little over 1 wavelength across (this is why you don't see many dish antennas on 20 meters!). My Scientific Atlanta Antenna Calculator predicts about 9 dBi gain for an 18-inch dish on 1296, about the same as a four-element Yagi.

The following question was directed to "Digital Data Link" editor Don Rotolo, N2IRZ:

Q: I'm getting into Linux now, and I'm wondering if it will interface directly from computer sound card to the radio (since Linux has AX.25 built in). We're starting to explore APRS here, too. Maybe you can recommend some packet-to-internet-gateway software for us to use?

73 de Joe Mastandrea, N2DLY
Papillon, Nebraska

N2IRZ responds:

A: I have to admit that I'm not much of a Linux guru, and I'm not really aware of what is available out there. I am certain, however, that there are NOS stacks for Linux, many of them. Try some of the links from <http://www.tapr.org>.

I do know of networking and user software for DOS and Windows called FlexNet, which (among many others) has a driver for a sound card for 1200-baud packet. Try <http://www.home.pages.de/~flexnet> for info.

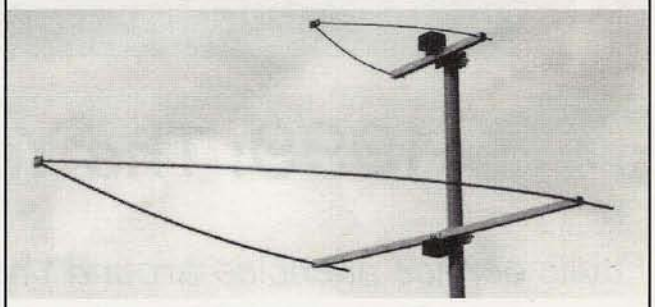
Most packet people frown greatly upon packet-wireline gateways. It is called packet radio for a reason. Nonetheless, I'm not aware of any software specifically for this purpose, though most flavors of NOS can do the job. There are dozens of NOS variants out there: JNOS, TNOS, WNOS, MFNOS, and so on. Try a web search on RADIO and NOS, that should turn up a lot.

Good luck, not only in your search for cool Linux stuff, but in your newfound computer knowledge.

WB6NOA's review in this issue of the Kenwood TH-D7A includes a reference to APRS "I-gates," which I'm assuming is shorthand for an Internet gateway. He makes specific reference to the K4HG-2 I-gate in Miami, Florida. You might be able to find some info on K4HG's Web site, <http://www.aprs.net>, or on APRS developer WB4APR's Web site at <http://web.usna.navy.mil/~bruninga/ aprs.html>.—ed.

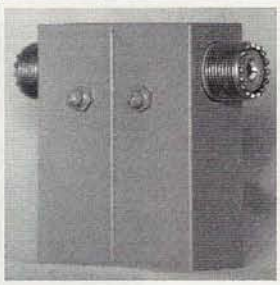
Do YOU have a question about any aspect of "Ham Radio Above 50 MHz"? We'll do our best to give you a clear, concise answer—or if it's not a question that has just one easy answer, then we'll invite readers to offer their solutions. Send your questions to: Q & A, *CQ VHF* magazine, 25 Newbridge Rd., Hicksville, NY 11801; via e-mail to <q&a@cq-vhf.com> or via our Web page at <http://www.cq-vhf.com>. Be sure to specify that it's a question for "Q & A."

HF/VHF/UHF OMNIS



OUR NEW OMNIANGLE HORIZONTAL OMNIS:

- HAVE **4-5 TIMES** THE BANDWIDTH OF HALOS.
- FEATURE VIRTUALLY **NO RAIN DETUNING**
- **WEIGH LESS** 1 LB(2M) 1.5 LBS(6M)
- **COST LESS** $54.00-OA-144, OA-222, OA-432 $63.00-OA-50 $74.00-OA-28
- HAVE A **TRULY OMNIDIRECTIONAL** PATTERN
- BUY DIRECT OR FROM AMATEUR ELECTRONIC SUPPLY
- HARNESSES AVAILABLE FOR STACKING



INTERMOD FILTERS

PATENTED, ASYMMETRICAL NOTCH FILTERS

- USE ON DUAL BAND RIGS
- MODELS FROM 6M-70cM
- NO VOLTAGE REQUIRED-PASSIVE
- INSERTION LOSS TYPICALLY 0.5dB
- HT, MOBILE, FIXED MODELS
- CUSTOM FILTERS
- 2M-VHFDN152 $62.00

Par Electronics, Inc. 6869 Bayshore Dr. Lantana, FL 33462 561-586-8278 FAX 561-582-1234
E-Mail par@rf-filters.com WEB http://www.rf-filters.com

CIRCLE 74 ON READER SERVICE CARD

BATTERIES

BUY DIRECT FROM US, THE MANUFACTURER!

YAESU

FNB-2	10.8v @ 600 MAH
FNB-4	12v @ 750 MAH
FNB-4A	12v @ 1000 MAH
*FNB-10(S)	7.2v @ 1200 MAH
FNB-12(S)	12v @ 600 MAH
FNB-17	7.2v @ 600 MAH
FNB-25	7.2v @ 600 MAH
FNB-26	7.2v @ 1200 MAH
**FNB-26(S)	7.2v @ 1500 MAH
FNB27	12v @ 600 MAH
**FNB-27(S)	12v @ 800 MAH
**1/4" longer than FNB27	
FNB-31	4.8v @ 600 MAH
FNB-33(S)	4.8v @ 1500 MAH
FNB-35(S)	7.2v @ 600 MAH
*FNB-35(S)(S)	7.2v @ 1500 MAH
FNB-38	9.8v @ 600 MAH

*1 1/3" longer than FNB38 case

BATTERY ELIMINATORS AVAILABLE

SPECIAL FOR THE MONTH OF APRIL

10% OFF ON ALL ICOM IC-T8A REPLACEMENT BATTERY PACKS

Monthly Discounts Applicable to End-User's ONLY
Look for May's Special of the Month

Powerpac+®

6 V for Camcorders & 12 V for 2-way

Prices and Specifications subject to change without notice

DISCOVER VISA MasterCard

NYS residents add 8 1/2% sales tax. Add $5.00 for postage and handling.

W & W MANUFACTURING CO.
800 South Broadway, Hicksville, N.Y. 11801
WORLD WIDE DISTRIBUTORSHIPS AVAILABLE. PLEASE INQUIRE.
E-Mail: w-wassoc@ix.netcom.com Web Site: http://www.wwassociates.com
In U.S. & Canada Call Toll Free (800) 221-0732 • In NYS (516) 942-0011 • FAX (516) 942-1944

MADE IN THE U.S.A.
SEND FOR FREE CATALOG AND PRICE LIST

CIRCLE 79 ON READER SERVICE CARD

1999: The Year of the Drill

Public service agencies around the country are gearing up to deal with computer glitches as the calendar changes centuries, including drills that often involve ham radio. This month, we look at some Y2K drills, after a review of 1998's "Year of Disasters."

Plane crashes, severe weather, and the anticipated arrival of the year 2000 have all spawned renewed interest in amateur radio emergency communications. This year may come to be known as the "Year of the Drill" as emergency management agencies drill to be prepared. Drill because January 1, 2000, *will* happen and the potential for computer failures exists because of a date programming glitch. Drill because North America has seen two airplane crashes in the waters just off of the east coast.

This month, we take a look at devastation in 1998, some food for thought as groups prepare for events that we hope will never happen, and events we know are likely to occur.

1998: A Disaster a Month

In a year dominated by destructive and deadly Atlantic hurricanes and El Niño-spawned storms, the nation's top emergency manager praised communities across the country that joined in the national movement during 1998 to make America safer and more resistant to natural disasters.

"We've made tremendous strides in reducing the threat of future disaster risks in 1998," James Lee Witt, director of the Federal Emergency Management Agency (FEMA), said. "We're committed to staying on this course until America becomes a nation of disaster-resistant communities. We are changing the way American deals with disaster."

Witt's emphasis on disaster prevention is based on a desire to cut the economic and emotional costs of disasters. Weather-related deaths in the U.S. rose to about 460 in 1998, compared to 168 in 1997. "We must stop the tragic loss of lives and devastating disruption of communities by natural disasters," Witt said.

Photo A. President Clinton talked in his 1999 State of the Union address about the need to prepare for problems that may result from computer glitches as the year 2000 begins. (White House photo)

Disasters Everywhere

While placing top priority on preparing for and preventing disasters in 1998, FEMA had an active year of reacting to disasters that occurred anyway. The agency responded to 65 major disasters declared by President Clinton, involving 34 states; Puerto Rico and the U.S. Virgin Islands in the Caribbean; and the Marshall Islands and Micronesia in the western Pacific. In addition, FEMA authorized 54 fire suppression grants covering six states, including multiple wildfire outbreaks in Florida and Texas.

According to agency figures, nearly half of the year's declared disasters resulted from such high-impact incidents as the ice storms that paralyzed the Northeast in January; the massive California floods in February; tornadoes and floods in the Southeast during the winter and spring attributable to El Niño; Atlantic hurricanes and tropical storms; and the October floods in Texas. A record number of 17 tornado-related disasters were declared, topping the previous high of 13 set in 1992.

As we have reported continually in this column for the past year, there has been, and will continue to be, a place for amateur radio in emergency communications.

SwissAir Crash Story Raises Awareness and Questions

Our December, 1998, article on hams responding to the crash of SwissAir Flight 111 off Nova Scotia raised comments and discussion about the use of amateur radio in an emergency. Arthur Ashley, N1NHZ, a member of the Eastern Massachusetts Amateur Radio Emer-

"Weather-related deaths in the U.S. rose to about 460 in 1998 compared to 168 in 1997."— James Lee Witt, Director, Federal Emergency Management Agency

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

gency Service and the Boston area Salvation Army SATERN group, discussed the need for land-sea and land-air communications with a disaster at sea. Many comments on the various Internet discussion groups raised the concern of using amateur radio equipment to provide land-to-sea and land-to-air communications on non-amateur frequencies, as hams responding to the SwissAir crash were asked to do.

Most agreed that emergency management agencies should have equipment in place and advance agreements to provide these communications links. However, a key point was overlooked. The amateurs providing emergency communications during the early hours following the downing of the SwissAir aircraft were interested in saving lives and doing whatever it took to provide the necessary communications links.

Mike Krueger, N6MIK, an Assistant RACES Radio Officer/Training Officer in Orange County, California, said:

If a tragedy like the SwissAir crash happened in the U.S., responding ARES and RACES groups would be placed in the same situation as those responding to Peggy's Cove. Multiple agency responses mean multiple radio systems and operating protocols. As "non-paid employees" of our agencies, we need to be familiar with the public safety radio system, and feel at home operating on it with "full time" employees.

Limiting our groups to only amateur radio restricts our ability to serve. Staffing a command post is one of the biggest benefits that we can offer to law and fire agencies. The police officers or firefighters who have been assigned to handle communications will be able to assist in a capacity more aligned with their skills, and a trained, dedicated, and willing communications expert will be on the air.

The U.S. has several mutual aid frequencies set aside for nationwide use, as do states and counties. Most agencies that would respond to a disaster have mutual-aid agreements and radio inter-agency radio plans with nearby agencies. In California for example, the Civil Air Patrol (a division of the US Air Force) is authorized to use CLEMARS, the statewide law enforcement mutual aid frequency, and every MedEvac helicopter and private ambulance in Orange County has a fire department radio on board. Additionally, there are several frequencies in the aviation band reserved for ground-to-air communications.

RACES groups can provide valuable services in addition to operating command post radios. Amateur frequencies can be used to relay health and welfare traffic (such as lists of evacuated residents) to the EOC (emergency operating center), or to request additional equipment or information from adjacent counties. SAR (search-and-rescue) members equipped with APRS (automatic position reporting system) beacons installed in backpacks let the command post know the exact location of each team...the list is only limited by your imagination—and training.

(Editor's Note: Remember, our communications skills *and* training *are at least as valuable to emergency response agencies as our equipment and frequencies. And it is perfectly legal for hams and ham equipment to operate—with authorization—on non-amateur frequencies in an emergency. The FCC's Part 97 rules specifically state, in §97.403, that, in an emergency, amateurs may use "any means of radio communication at (their) disposal to provide essential communication needs.". So, if emergency managers ask you—with proper authority—to use non-amateur frequencies for essential communications, you'll only be hurting ham radio if you say no.)*

Photo B. Hams in Monroe County, Pennsylvania, have an excellent working relationship with emergency management officials. Pictured here (left to right) are county ARRL Emergency Coordinator John Lewitzky, N3ZQJ; County OES Director Harry Robidoux; and Asher Resh, N3EFW, County RACES Officer.

Less Than 250 Days...

In his 1999 State of the Union address (Photo A), President Clinton said,

We must be ready for the 21st Century from its very first moment, by solving the "Y2K" computer problem. If we work hard with state and local governments and businesses large and small, the "Y2K problem" can be remembered as the last headache of the 20th century, not the first crisis of the 21st.

The Y2K issue is worldwide and refers to electronic and computer system problems that may occur because of the inability of date-sensitive devices to compute "2000" when systems move from 1999 to the Year 2000 (Y2K). Virtually all systems that rely on computers or electronic devices that refer to date and time may be affected by Y2K in one way or another. This includes power, dispatch and communications systems, 911 systems, microcomputers, and much more.

In a recent FEMA survey of state emergency management directors concerning Y2K issues at the state and local levels, the directors reported that, although Y2K fixes are well under way in state-level emergency preparedness offices, the emergency service systems of many counties and municipalities remain untested. (*See February's "In the Public Interest" for more on the "Y2K bug," including background and tests you should do on your computer.—ed.*)

FEMA officials continue to urge the emergency management, fire and emergency services communities, and the public to get ready *now* for Y2K.

According to FEMA Deputy Director Mike Walker,

It is very important that counties, municipalities, school districts, and other organizations that have not yet begun to work on Y2K issues, start now. While some failures will be minor annoyances, some may have more serious consequences. Generally states and the larger local governments are aware of and making some progress toward resolving Y2K issues, however, many smaller local governments as well as some state and territorial gov-

ernments seem not to be aware of the problem. Clearly the most serious potential for problems is at the local level, and this is what we are concerned about.

Y2K Workshops

In February and March, FEMA conducted Y2K Consequence Management workshops around the country to identify critical issues, assess vulnerabilities, review contingency plans, and consider policies and decisions that need to be taken to deal with possible Y2K consequences. Participants included state Y2K emergency coordinators, emergency managers, and state fire marshals, as well as regional representatives of FEMA's Federal Response Plan partners.

Many states reported that they have not developed contingency plans specifically for Y2K problems; instead they plan to address problems under existing emergency plans or they expect to have their systems Y2K compliant in time. Most states expressed some level of concern over the possibility of power failures, especially where power is provided by smaller utilities. Other areas of concern cited by the states include limited or lack of resources to assess, test, and validate systems and fixes for Y2K problems.

"Every community, every organization, and every individual has an obligation to learn more about their vulnerabilities and take action to prevent potential problems before they occur." Walker said. "Potential problems need to be identified and addressed now."

Maryland Advances the Clock

In December, 1998, Montgomery County, Maryland near Washington, D.C. conducted a full-scale Year 2000 exercise. Major systems were tested in real-time with clocks that were rolled ahead. Here are some of the communications issues raised during the exercise, according to county officials' review of the drill, posted on the Internet:

The readiness of the Emergency Operations Center should be tested for all alternate means of communications. While it was anticipated that telephone communications would be disabled during the exercise, it was determined that many of the cell phones and some of the two-way radios brought in by the utilities could not be used in a casehardened basement room. To maintain communications it was necessary to patch to outside areas. The Emergency Operations Center should include arrangements for alternate and redundant systems. Arrange for space and printer connections for laptops. Many agencies have back-up or supplemental systems on laptops if the main systems go down. Alternate communication links should be established to avoid dependency or overuse of a single system.

During the exercise, communications were established through pagers, cellular telephones, enterprise electronic bulletin boards, Internet, two-way radio communications, and RACES (Radio Amateur Civil Emergency Service). Through our fire service, the urban search and rescue team has the capability to set up an independent and self-standing communications network. The network was activated and a satellite connection was established directly to Australia to test our communications and to obtain information about early Y2K impacts.

Flexibility is essential to maintaining communication links. It was necessary to swap out radios with the utilities and to have a utility two-way radio in the EOC to resolve communications problems when it was simulated that telephones were not operable.

Consideration should be given to having multi-jurisdictional and multi-agency exercises with other private and public partners including hospitals and utilities. The participation of the hospitals, Bell Atlantic (telephone), PEPCO (electric), Washington Gas, WSSC (water and sewer), Rockville, Takoma Park, and Gaithersburg, RACES, Red Cross, Maryland Emergency Management Agency (MEMA), National Guard, MCPS (public schools) and others added much dimension to the exercise in testing multi-agency communications and coordination.

Colorado's Y2K Response

"ARES in Colorado is getting a lot of inquiries and attention regarding our preparedness and plans to support served agencies," says Mike Morgan, N5LPZ, ARRL Colorado Section Emergency Coordinator. According to a posting on the ARES list server, Mike says, "I have built a preliminary framework that addresses our plans."

The Colorado Section has decided to make Y2K preparedness a sectionwide activity. We will be building awareness and training with repeater clubs, assuring our own equipment is Y2K-compliant, and working closely with served agencies and community groups to help prepare response and contingency plans.

The Colorado Section views Y2K preparedness and potential response as a key and coordinated initiative for 1999. The section leadership plans to build awareness by developing a plan to visit ham radio/repeater clubs to discuss the Y2K issue and how members can help.

Mike hopes that ARES groups will discuss the Y2K issue and that they will visit local agencies, both served and unserved, to build awareness of ham radio capabilities. This is also a great time to publicize ham radio support.

Steps will be taken to make sure that all repeaters are Y2K compliant and that they have backup power capabilities. Information and training will be provided on backup power. Morgan is encouraging statewide drills around the Y2K scenario and is working on recruiting additional members and ham radio support for New Year's Eve. He also suggests identifying other ways that amateur radio can support the community if needed and if resources are available. Finally Morgan suggests that groups look for ways to recognize participants either by letter, certificate, or other means.

"Routine" Emergency Drills

Other groups routinely participate in annual simulated emergency tests. One recent drill in Pennsylvania focused on the possible consequences of a moderate earthquake striking a popular tourist region in the Pocono Mountains. Hams (Photo B) provided multiple agency links by supplying communications for the Monroe County Office of Emergency Services (OES), the Pocono Medical Center, several fire companies, a local church being used as a shelter, and East Stroudsburg University. Two Search and Rescue units also participated in the earthquake exercise.

Monroe County OES Director Harry Robidoux encourages all amateurs to work with the Office of Emergency Services in a "new spirit of cooperation toward the common goal of serving the citizens of Monroe County during their times of need." By combining efforts of

"If we work hard with state and local governments and businesses large and small, the 'Y2K problem' can be remembered as the last headache of the 20th century, not the first crisis of the 21st."— President Clinton, 1999 State of the Union Address

"Steps will be taken to make sure that all repeaters [in Colorado] are Y2K compliant and that they have backup power capabilities. Information and training will be provided on backup power."

ARES, RACES, Skywarn, NTS (National Traffic System) and the Office of Emergency Services, Robidoux said, those responsible will be able to address the county's growth and "position amateur radio to continue to be a viable resource for emergencies in the new millennium." This spirit of cooperation is leading to the installation of a complete amateur radio station at the OES covering HF, 6 meters, 2 meters, and 440 MHz, as well as packet and APRS.

According to broadcast reports, groups in West Virginia recently focused on their readiness to face emergencies and how to overcome disaster in a worst-case scenario. John Pack, Emergency Services Director, said, they'll use ham radio operators if the phone service goes out. "They have helped in the past when, in disasters, we've lost phone services in isolated areas by being able to set up mobile radios to help us. And they're actively wanting to participate in this and will be participating with us." The state hopes to have most 9-1-1 centers prepared to avoid all potential Y2K glitches by September.

In Walpole, Massachusetts local amateurs routinely hold all-day emergency communications seminars or workshops. These free workshops are open to all amateur radio operators and those interested in emergency communications. The seminars provide the background and information to serve amateur radio operators when they need to respond to a communications emergency. They include overviews of emergency communications and five 1-hour training sessions on such topics as NTS Traffic/Message Handling, Net Operations, Net Control Operation, a basic introduction to first aid, hazardous materials and "Go Kits" (what to bring with you when responding to an emergency).

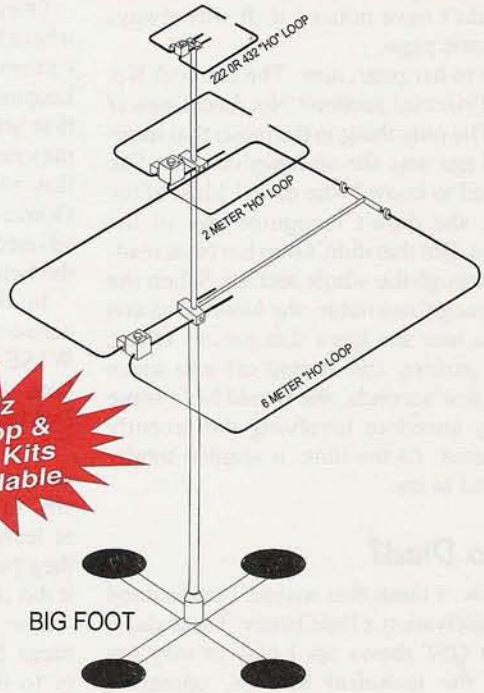
The presentations are given by hams well-versed in the subject matter. Robert Macedo, KD1CY, local ARES Skywarn Coordinator, says the training is a worthwhile endeavor not just for emergency communicators but for anyone who is an amateur radio operator and wants to learn more about the hobby. At the conclusion of the presentation there is a roundtable discussion or open forum, at which participants talk about where we are today in emergency communications and where we would like to go.

Let's Hear From You

Much of this month's column is based on reports from hams around the U.S. We've also had reports in recent months from Puerto Rico, Cuba, and Central America. Do you have a story to tell? We're always looking for stories of how you are serving in the Public Interest. Drop us a line c/o *CQ VHF* or by e-mail to wa3pzo@cq-vhf.com or cq-vhf@cq-vhf.com. ■

M² inc.

YO!
TRY OUR NEW
"HO" LOOPS!



HO=HORIZONTAL OMNI-DIRECTIONAL
NO MORE WEATHER WORRIES!
2M=2 MHZ UNDER 1.5:1
NO POWER LIMIT–GO AHEAD RUN THAT KW!
EASY ADJ. FOR PERFECT MATCH EVERY TIME.
BUILT LIKE A BRICK FOR YOU TREE BASHERS.
LIGHTWEIGHT BUT RUGGED 3/8 ALUM. TUBE
MACHINED, SEALED CONNECTOR BLOCKS
OVER 6 DBD GAIN* FOR A SINGLE MOBILE @7'
STACK 2 FOR OVER 10 DBD MOBILE.
STACK 2 AT HOME AT 26' & 30' FOR 11+ DBD
PERFECT FOR NET OPERATIONS OR BEACONS.
NEW LOW PRICE 2M, 222 & 432. ***$39 EACH***
GORGEOUS *GOLD, BLACK, BLUE & GREEN*
ANODIZED COLORS. $15 EXTRA IN STOCK NOW!
STACKING HARNESSES. MASTS AND BASE OPTIONAL.
*GAIN INCLUDES GROUND REFLECTION GAIN

432 MHz "HO" Loop & Stacking Kits Now Available.

GET HUNDREDS OF MILES OF RANGE FROM YOUR MOBILE!!

M² Antennas
7560 N. Del Mar Ave., Fresno, CA 93711 (209) 432-8873 Fax: 432-3059
Em:m2sales@aol.com Visit www.m2inc.com and see your local dealer

Steps and Stumbles

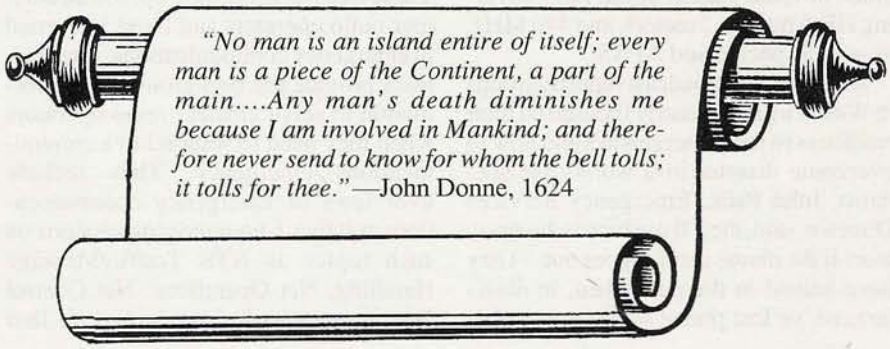
Welcome to the global village of ham radio, where anything worth doing is worth doing poorly while you're learning. And where you stand to learn the most from the people you like the least.

My mother had routine ways of doing things, and I suspect that's true of most mothers. Usually, these routines just sort of fade into the background and go largely unnoticed. But the way she read the newspaper annoyed the heck out of me when I was a teenager. She would pull off the rubber band, unfold the paper, check the index in the bottom left corner, turn to an inside page and spend 10 minutes or so poring over *the* page. She was oblivious to anything on the front page. "War Declared"—no, not interested. "NRA Asks Congress to Ban Guns"—nope, wouldn't have noticed it. It was always the same page.

On to her page, now. The comics? No. The financial section? No. Local news? No. The only thing in the paper that interested her was *the obituary column*. She wanted to know "who died." Most of the time, she didn't recognize any of the names. But that didn't stop her from reading through the whole section. When she did recognize a name, she would stop and tell us how she knew that person. Often, after pausing and staring off into space for a few seconds, she would have some funny anecdote involving the recently deceased. At the time, it seemed totally morbid to me.

Who Died?

Now, I think that maybe I understand her motivation a little better. These days, when *QST* shows up, I may or may not read the technical articles, operating events, contest results, and such. But there is one section that I almost always read sooner or later: "Silent Keys." Not that I read through all the names listed—just three call districts.



"No man is an island entire of itself; every man is a piece of the Continent, a part of the main....Any man's death diminishes me because I am involved in Mankind; and therefore never send to know for whom the bell tolls; it tolls for thee."—John Donne, 1624

Over the years, I've lived in five states where I made a lot of friends in ham radio. I'm not very good at writing letters and keeping track of people. But I still feel that sense of connection even though I may not be in daily contact. I think it was this sort of feeling that the poet John Donne was talking about when he advised, "never send to know for whom the bell tolls..."

In the last few months, I've come across two callsigns that gave me pause: W1SE and W1FB. I had worked with both Lee Aurick, W1SE, and Doug DeMaw, W1FB, at ARRL HQ back in the '70s and '80s. Life is uncertain at best, and neither of them were "spring chickens" in those days, so it's not surprising—at least not in an actuarial sense—that they passed on. But at some other level, it did surprise me.

Lee and Doug were both dedicated hams. Doug was much more of a celebrity to the general ham population. For years, almost every issue of *QST* carried an article by him. After retiring from HQ, Doug was also a frequent contributor to *CQ*. If you flip through the *ARRL Handbook*, you'll still find a lot of projects that Doug designed and wrote about. And he often spoke at major hamfests, so a lot of the older hams had a chance to meet him in the flesh.

Lee was well known in the ham *industry*, but much less so to the general ham population. He worked for *CQ* (briefly) and for *QST* as the Advertising Manager. Although he attended most of the major hamfests, his time was spent romancing advertising dollars. Once in a while, he contributed an article to the magazines on a simple construction project, but unless you have the habit of reading mastheads, you probably would not have recognized his name or call.

They were very different personalities, too. Lee was the image of the consummate salesman. I suspect he spent more time picking out his clothes and making sure that they were perfectly coordinated than most high-roller CEOs. Even at picnics, Lee looked like he had just stepped out of a *GQ* fashion shoot. He must have gone to the barber shop at least once a week, too. A walking image of success.

I had the opportunity to sit in on a few Managers' Meetings during my time at ARRL HQ. Lee usually sat quietly, chew-

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

"Lee [Aurick, W1SE] and I were good friends and shared a lot of similar interests. We started work at HQ within a few days of each other, and roomed next door to each other before we moved our families to Connecticut."

ing on his unlit pipe stem, perfectly calm and composed. Somehow he managed to project a refined and reserved presence without coming off as aloof. He was the embodiment of his callsign: WISE.

"GQ" versus "CQ"

Doug was certainly not a slob, but his choice of dress could be described as retro engineer (*maybe like he just stepped out of a* CQ *fashion shoot?—ed.*). The slacks and shirt may or may not have been color coordinated, and the shirt tail may or may not have been tucked. When a tie was called for, it may have been a stylish one, or it may have been out of style by 10 years. My guess is that being in style would have ranked near the bottom of Doug's value hierarchy.

In the meetings, Doug was much more outgoing and talkative than Lee. There was a boisterous quality about Doug, and he always had a twinkle in his eye when told jokes and stories, particularly the ones reserved for the guys in the lab.

On the air, the two had largely different interests, too. Doug liked CW and was a journeyman operator. He seemed to get a kick out of ragchewing with Soviet hams during the cold Connecticut winter nights. He frequently joked that Russian mothers had no imagination because every ham over there seemed to be named Vlad. Doug had little interest in contests, racking up impressive band-country counts, SSB-operation, or 2-meter FM. That's not to say that he thought there was anything wrong with these activities; they just didn't interest him personally.

Lee, on the other hand, was very interested in FM operation, as well as various modes and bands on HF. He was very active in the Newington Amateur Radio League (NARL), a local club to which many HQ staffers belong. NARL had two repeaters on the air in those days. Besides being a significant on-the-air presence, Lee could always be counted on to join in any work parties at the repeater site. He was also active in a number of public service projects.

Lee was constantly looking for ways to improve his own HF station, too. When he realized that the soil around his house was poor for grounding purposes, he bought several large spools of wire and rented a small trenching tool. It took him two or three weekends to get all the wire buried in his backyard (heaven help the new owner of that house if his hobby is gardening instead of radio).

A Study in Contrasts

At League HQ, their jobs were vastly different, too. Doug was in charge of the Technical Department, which produces and/or edits all the technical content of *QST* and most of the other ARRL publications. Lee, as I mentioned, was head of the advertising department, one of the

• DIP switch programmable
• Miniature in size
• 37 EIA tones, 27 non-standard tones from 33.0 to 254.1 Hz included
• Reverse Burst built-in
• Easy 3 wire hookup

SS-64 CTCSS Encoder
.66" x 1.08" x .21"

SS-64 DIP Switch Programmable CTCSS Encoder $28.95

• Fully enclosed CTCSS encoder
• All 32 EIA tones from 67.0 to 203.5 Hz included
• Perfect for mobile / base applications

TE-32
5.25" x 3.3" x 1.7"

TE-32 Multi-Tone CTCSS Encoder $49.95

TP-3200 Shared Repeater Tone Panel

• 51 CTCSS Tones
• 106 DCS Codes
• Supports 157 Repeater Subscribers
• On-Line Computer Help
• Repeater CW ID
• Air Time Loading & Analysis Graphs
• Signalling Formats: CTCSS DCS & DTMF

• Eight programmable, selectable messages
• Fully field programmable via included keypad
• Meets all FCC identification requirements

ID-8 Automatic Morse Code Identifier
1.85" x 1.12" x .35"

TP-3200D Table Top Version $269.95 each
TP-3200RM-A Single Rack Mount version $279.95 each
*TP-3200RM-B Triple Rack Mount version $279.95 each
*Holds up to three TP-3200s

ID-8 Automatic Morse Station Identifier $69.95

Call or write to receive our full Product Catalog or visit our Web site for complete information at:
http://www.com-spec.com

COMMUNICATIONS SPECIALISTS, INC.
426 WEST TAFT AVENUE • ORANGE, CA 92865-4296
(714) 998-3021 • FAX (714) 974-3420
Entire U.S.A. (800) 854-0547 • FAX (800) 850-0547
http://www.com-spec.com

CIRCLE 64 ON READER SERVICE CARD

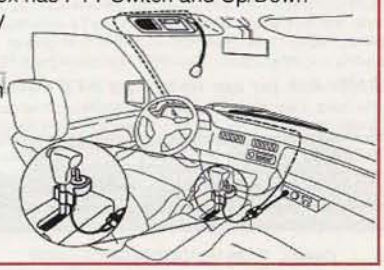
AM-7500E
Professional Desktop Microphone

• 4 Band Graphic Equalizer - 270Hz, 540Hz,1kHz, 2kHz
• 3 Stage Compressor
• Flexible Metal Goosneck
• Angled VU Meter
• Rotary Output Volume Control
• Momentary and Locking PTT Switches
• Up/Down Frequency Controls
• On-Air (Transmit) Indicator LED
• Battery Check Circuit
• Non-Modulation Warning Circuit

ADONIS USA
A DIVISION OF RF LIMITED

MS-100
Mobile Microphone

• Virtually Handsfree Operation of Your Radio-Increases Safety!
• Sun Visor Mounted Speaker/Microphone
• Flexible Boom Microphone Extends 9 Inches
• PTT Control Box Straps to Gear Shift or Other Convenient Location
• Control Box has PTT Switch and Up/Down Frequency Buttons
• Mic Gain Control on PTT Control Box



PO BOX 1124
ISSAQUAH WA 98027
TEL: (425) 558-9592
FAX: (425) 558-9704
www.rflimited.com

CALL FOR FULL LINE COLOR CATALOG

CIRCLE 76 ON READER SERVICE CARD

GET HOT!

GET A **BLOWTORCH**
LOOP YAGI
FOR **2304** OR **3456 MHz!**

CHECK OUT our ultimate 13 and 9 cm 76 element **LOOP YAGIS** with over 23 dBi gain. Check the new rugged boom. Scrap your old dish! Get better performance with low windloading. Welding goggles optional!

DIRECTIVE SYSTEMS
RR # 1 Box 282 Dixon Road
Lebanon, ME. 04027
Tel: (207) 658-7758 Fax: (207) 658-4337
www. directivesystems.com

CIRCLE 67 ON READER SERVICE CARD

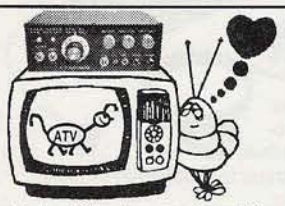
INSURANCE
for
AMATEURS

Insure all your radio and computer equipment.
(except towers and antennas)

HAMSURE
E Mail:hamsure@ameritech.net
www.ameritech.net/users/hamsure/hamsure.html
800-988-7702
Available only in 48 contiguous US
Discount for AARA members

CIRCLE 71 ON READER SERVICE CARD

Rochester HAMFEST
June 4-6, 1999
Atlantic Divn Convention
www.rochesterhamfest.org
300 White Spruce Blvd
Rochester, NY 14623
716-424-7184



GET THE ATV BUG!

Any Tech or higher ham can transmit live action color and sound video from their camcorder, just like broadcast, to other hams. *It's fun, low cost, and easy!* Uses any TV set to receive, add our TC70-10 ten watt 420-450 MHz Transceiver, and antenna - no other radios. See ARRL Handbook page 12.46.

HAMS: Ask for our free10 pg ATV Catalog!
We have it all, downconverters, transmitters, antennas, amps, etc. for the 70, 33, 23 and 3cm ATV ham bands.

P. C. Electronics
2522 PAXSON Ln. ARCADIA, CA 91007
CALL (626) 447-4565 OR FAX 626-447-0489
WEB:WWW.HAMTV.COM - Email: TOM@HAMTV.COM

CIRCLE 75 ON READER SERVICE CARD

main sources of revenue for the ARRL. The pressure on the Technical Department is pretty much constant, while Advertising experiences intense pressure around closing time each month, followed immediately by lulls. Both men adapted well to the demands of their jobs.

Lee and I were good friends and shared a lot of similar interests. We started work at HQ within a few days of each other, and roomed next door to each other before we moved our families to Connecticut. For two years or so, I worked directly under Doug in the Technical Department. Doug and I saw things from very different perspectives.

He had an amazing ability to create projects that looked like they came off the assembly line of a major manufacturer—flawless appearance. I don't recall anyone ever mentioning the word "beautiful" in any conversation having to do with the construction projects that *I* created. In fact, my ex-wife complained frequently that when I did a household repair, she knew it would work flawlessly, but chances were real high that it would be as ugly as sin. This same capacity carried over into my electronic projects; they always worked, but usually looked like you-know-what! I think that annoyed Doug.

Doug did a series of articles called "First Steps in Amateur Radio" that the ARRL eventually turned into a small book. It was easy for him to produce picture-perfect projects, and I thought there was an implication in his writing that a new ham should expect things to be just as easy for him as they were for Doug. The major presupposition to my approach was that anything worth doing is worth doing poorly while you're learning. For me, the important thing was to begin moving toward a goal and correct the mistakes as you went. For Doug, it seemed to be to get all your ducks in a row before you take the first step. Now, I don't know if either one of these views is more right than the other, but then Doug and I saw things from very different perspectives.

On the surface, we were polite to each other, but our relationship became more strained as time went on. When a job that I was interested in opened up in a different department, I transferred out of the Technical Department. Over the years, we remained courteous with each other when our paths crossed, but I always sensed a lot of tension between us.

While I worked full-time at CQ, I wrote a book designed to educate would-be hams about some of the wonders of our hobby (*Ham Radio Horizons: The Book*). Dick Ross, CQ's owner and publisher, sent an advance copy of the book to Doug and asked him to comment on it, with the idea of using some of his words for jacket quotes. Doug wrote back a letter outlining all the things he did *not* like about the book. Some of the criticism was certainly justified—it never made it to the *New York Times* Bestseller List, that's for sure.

Later on, when Rich Moseson asked me to write this column for *CQ VHF*, I titled the first installment "First Stumbles in Amateur Radio," which was a little dig at Doug. I have no idea if Doug noticed it or if anyone even caught the inside joke.

Time goes by, and then one day you find a couple of callsigns you recognize in the Silent Keys column. One was your friend, and the other was not, yet you have the same sad feeling when you see each listed there. A friend of mine keeps telling me that you learn almost nothing from the people that you get along with. But those people who push your buttons are the great teachers in your life. Maybe he's right, I don't know.

The Ham Community

My mother grew up in a rural area, and her sense of community was very strong. That's something that I've envied but never felt, at least not when you think of a community as being tied to a certain geographic area. But I *have* felt that sense of belonging in the ham community. In a very real sense, my radio friends have become my village.

You are new and starting out in ham radio. I don't know if you'll feel that sense of connection with the other hams that you meet along the way. I don't know if they'll become your fellow "villagers" scattered through the urban sprawl. Nor do I know if you'll meet someone along the way who pushes your buttons. You probably won't buy a 70-pound punching bag, tape his name to it, and hang it in your basement to pound on everyday when you come home from work. Maybe you'll be smart enough to simply stop and ask yourself what you can learn from this other person who sees life from a very different perspective.

"Never send to know for whom the bell tolls..." ■

"Emma's Challenge"—U.S. Style

If you're a ham under age 25 and like to design and build radios, this article's for you! And if you're a manufacturer, ham organization, or government agency that wants to promote radio design skills among young Americans, this article's for you, too!

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

Americans have always enjoyed a good challenge. And, if it comes from our "cousins" in England, all the better. Here's the deal: Great Britain's 1998 "Young Amateur of the Year," Emma Constantine, 2E1BVJ, has issued a challenge to hams in the UK to design and build a portable 6-meter FM transceiver, and to do it for less than 50 British pounds (roughly $80 U.S. at current exchange rates). Can young hams in America meet the challenge?

Goal: Getting New Hams on the Air

Emma's goal, according to the January, 1999, issue of *RadCom*, the monthly magazine of the Radio Society of Great Britain (RSGB), is to challenge hams "to produce a rig for beginners which is practical, not too technical (to build), and which works."

Why is such a rig needed? According to the magazine report, Emma explained:

> One thing that struck me very forcibly, on my travels [as Young Amateur of the Year], were the limited opportunities for...newly licensed operators, not through the license conditions but through the lack of scope for practical development. It seems that there are lots of projects around to build receivers, test equipment, and simple HF CW transmitters. However, once licensed, many beginners...are pushed into black box operating on the 70-centimeter band.

England has two Novice class licenses. Novice Class A grants limited HF code privileges, with a maximum power output of 3 watts; and Class B grants voice privileges on the 6-meter and 70-centimeter bands, also subject to the 3-watt power limit.

According to *RadCom*, there were several reasons for choosing 6 meters as the band for which these beginner's rigs should be built, including construction techniques are not as critical on 50 MHz as on higher frequencies and should be "within the scope of most novice builders;" all license classes in Great Britain have access to 6 meters; reasonable range is available from most places, "with the possibility of lift conditions" (what we know as "skip"); reasonably priced and accessible components; and relative ease of developing basic equipment (versus transceiver designs for higher frequencies).

Emma's Challenge

The example proposed by Emma was a 3-watt, two-channel FM transceiver with a tunable receiver and built-in telescoping whip. It would also have a metal case and internal battery pack, along with sockets for plugging in external power and antenna.

Competitors must submit practical designs by the end of 1999 for possible publication in one of four sponsoring ham magazines in Great Britain; must provide a complete a complete parts list, including sources and prices, plus a pc board layout design; and at least one unit must be built and available for inspection by the judges. Prizes will be awarded to the top individual and group entrants. The British Radiocommunications Agency (their equivalent of our FCC) has pledged its support, along with a £1,000 sponsorship (roughly $1,600); the RSGB has agreed to publicize the competition, and additional sponsors are being sought.

Extending the Challenge

As we suggested last month in reporting briefly on Emma's Challenge in "VHF News," *CQ VHF* is willing to take the lead in sponsoring a U.S. version of the design challenge. Our Technician class hams are not subject to the same restrictions as British Novices, so there's not necessarily the need to match their program point-by-point. Plus, we would want to encourage young hams to try their hands at designing and building a radio, so we will probably limit the competition to those under age 26, perhaps with separate categories for high-school-age and college-age hams.

We will be seeking support and co-sponsorship from other ham magazines, organizations and radio clubs, and perhaps schools, government agencies, and the telecommunications industry. This competition could provide an excellent opportunity for amateur radio to build and/or strengthen our relationships with related organizations outside the traditional ham radio industry.

Your input is welcome. Ideas and suggestions on the specifics of the design competition should be directed to me, *CQ VHF* Editor Rich Moseson, W2VU (w2vu@cq-vhf.com); potential sponsors and supporters should get in touch with *CQ* and *CQ VHF* Advertising Manager Arnie Sposato, N2IQO (n2iqo@cq-vhf.com). Both of us may be reached by regular mail at 25 Newbridge Road, Hicksville, NY 11801.

We'll look at everything, talk it over with people both inside and outside the CQ organization, and do our best to come up with a solid, broadly supported, radio design challenge for young hams by the end of 1999. ■

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

A Mini Course in Microphones—Part I

The right microphone can do wonders for your on-air "image." But how do you choose between the many types and styles available? Never fear, K4TWJ is here...with the information you'll need to make the right choice.

OK friends—we've discussed some always-beneficial theory during the recent months; now let's apply some of that knowledge to making our amateur radio life more rewarding and enjoyable.

Let's start with a simple question: What would you say are the two most popular and influential, yet taken-for-granted accessories in amateur radio today? The answer, naturally, is keys and microphones (sort of obvious from this month's title, eh?). Why so? Well, in addition to being necessary for communications, these two items establish the image you project to others and directly influence how you sound on the air. Personally appealing mics (and keys) also add a touch of glitz, glamour, and individuality to any home, mobile, or portable setup. They help us to feel (and sound) special!

Can a microphone really do that, you ask? Yes indeed! A good mic matched to your voice can make you sound better on the air than you do in person—really! Appearance (the mic's as well as yours) also plays a big part in attitude and confidence, as the pros have confirmed (Photo A). Conversely, an ultra-cheap or poorly interfaced microphone can make your voice sound muddy, distorted, and/or barely readable. Of course, you still need to speak into it with a clear and pleasant voice. Microphones are good, but they're not miracle workers.

Photo A. Shure's classic model 55 microphone has enhanced countless center-stage activities with famous names of the times like Red Skeleton, John F. Kennedy, Elvis Presley, and Dinah Shore. Truly, it's the hallmark of professional broadcasting—and a collector's pride! Photo courtesy Shure Brothers.

What about generic or rig manufacturer-supplied mics, you ask? Aren't they any good? Of course they are, and that's what most folks use—just like most folks use disposable Bic pens rather than Mont Blanc pens for writing. A more "personalized" mic (or pen), however, will set you apart from the crowd.

Maybe an example will help clarify that statement. One of my favorite mics is the classic Astatic "D-104 Silver Eagle" that *73* magazine once awarded me for being a leading writer in amateur radio (Photo B). But even a classic can be customized for your voice and your radio. I modified my D-104 by substituting a

By Dave Ingram, K4TWJ

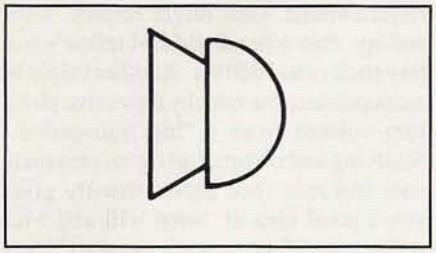


Figure 1. Schematic symbol for a microphone. There are many different types of mics, but only one symbol in a circuit diagram.

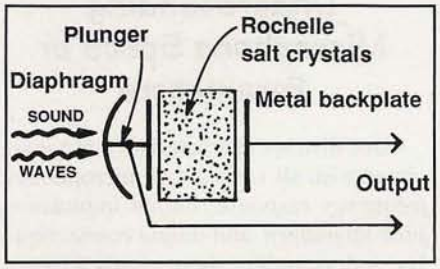


Figure 2. The "innards" of a crystal mic element. Special salt crystals vibrate to generate a voltage that corresponds to the sound waves coming through the diaphragm.

Heil HC-3 element, bypassing its in-base preamp, adding blocking capacitors, and installing a plug to match my rig, and it performs like a million bucks. I love it! Another one of my favorite mics is the Heil HM-10 mounted on a swing-away boom so it doesn't occupy valuable desk space yet delivers amazing SSB "punch" and sound quality (Photo C). Other neat ideas you might like include totally rebuilt Mickey Mouse telephones, replicated candlestick microphones, and, well, the possibilities are endless! That's enough "good ideas hype." Now let's delve into more specifics and the technical aspects of mics.

Microphones Simplified

At their most basic, all microphones are *transducers* that, through use of an internal cartridge or element, convert sound waves into tiny voltage equivalents. Several different types of microphones (microphone elements, to be exact) are available to fit a variety of needs and applications, so let's begin with a quick overview of the more popular types—crystal, carbon, dynamic, and condenser or electret—and how they work. Simple descriptive figures of each type have also been included for easy understanding, starting with the schematic symbol for a microphone in Figure 1.

Crystal Microphones

First is the classic crystal microphone (cartridge) that enjoyed widespread popularity during the heyday of vacuum tube rigs and AM in the 1940s and 1950s. That's because a crystal element exhibits a high output impedance and high output level, both parameters matching tubes perfectly.

Crystal cartridges utilize the *piezoelectric effect*. That is, a small voltage is produced when you tap on a piece of quartz crystal. In a crystal mic, as illustrated in Figure 2, a package of *rochelle salt crystals* (which are similar to quartz) is used in the mic element. Place your hand in front of your mouth as you talk and notice the pressure from sound waves; they also apply pressure on a crystal element's diaphragm which, in turn, applies varying-with-voice pressure on the crystals. Wires connected to the diaphragm and a rear metal plate then route the voltage to a rig (or other item) for amplification and use. By nature of their design, crystal mics are a bit fragile and also sensitive to extremes of heat. They also tend to be slightly tinny sounding (most noticeable in low-cost "replacement" cartridges). This tinniness usually results in a high-pitched audio sound on FM or AM, but gives good articulation and punch on SSB.

Carbon Microphones

Next are carbon microphones and elements, items that were also popular in eras past, but are now limited to use in non-wireless telephones. As illustrated in Figure 3, a carbon mic element acts like a sound-controlled variable resistor. It consists of a round casing filled with carbon granules and fitted with metal electrodes and strips, plus a diaphragm assembly. Sound waves cause the diaphragm to move, which causes compression of the carbon granules. This, in turn, causes a proportional-to-sound change in resistance. A DC voltage is applied to the cartridge, so resistance changes become voltage changes that are transformer-coupled to a rig's audio input stage.

Carbon mics require operating voltage plus transformer isolation to work. Consequently, they're challenging to interface with modern rigs. They're also peaked in the mid-audio range and can produce a "Wolfman Jack" sound if and when adapted to on-the-air use.

Surely, the most famous carbon mic ever made was the classic "candlestick" mic of the 1930s. It looked like an upright telephone of that same era and its mouthpiece resembled a mic symbol (Figure 1). Finding a candlestick mic today is nearly impossible, but its case would make a terrific housing for a modern electret mic element. Class all the way! Whew!

Dynamic Microphones

Dynamic microphones are widely used today in recording studios, broadcast, and amateur radio applications. They are rugged, easy to interface with high- or low-impedance circuits, and, perhaps most importantly, sound great. They operate on the same basic principle as a small electric generator (Figure 4). In this design, a small magnet coupled to the element's diaphragm moves within a coil of wire, thus inducing a small voltage in the coil. Wires from the coil are then cable-connected to a rig's audio input socket for signal amplification. Two popular variations of this design (which also work on the small generator principle) are the *controlled magnetic* and *controlled reluctance* mics/elements. (Reluctance *is a*

Photo B. Legendary Astatic D-104 is unquestionably the most well-known and admired microphone in amateur radio's proud history. This timeless beauty is in a class of its own!

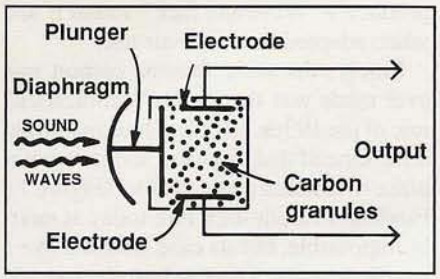


Figure 3. A carbon microphone works in the same basic way as a crystal mic, but uses carbon granules inside the element. Today, you'll find carbon mics mostly in wired telephones.

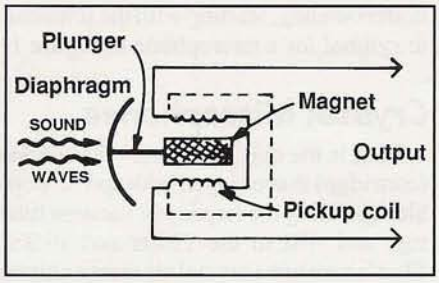


Figure 4. A dynamic mic is actually a tiny electric generator. Sound waves cause a magnet to vibrate and the magnet induces an electric current in the pickup coil that surrounds it.

measure of opposition in a magnetic circuit; sort of the equivalent of resistance in an electrical circuit—ed.).

Two classic and highly collectable "dynamic family" mics are the famous Shure 55SH and 520DX ("Green Bullet") shown in Photo D. The 55SH wide audio response is ideal for entertainers, AM/FM radio, and sound reinforcement systems. The 520DX has quite a limited audio response and may possibly be an unrealized "best microphone to-date" for SSB.

Electret Microphones

Finally, electret microphones/elements are hot items today. They are small in size and can be made with a wide or custom-peaked audio response to fit various applications. Operation of an electret mic is best visualized by first comparing it to a condenser mic as illustrated in Figure 5.

Basically, this microphone's element is an open-air capacitor with two plates: one at the element's rear and the other comprised of the element's front diaphragm. Sound waves cause the diaphragm to move, varying plate-to-plate spacing, and producing a change in capacitance. A preamp converts changes in capacitance to changes in voltage for amplification. The preamp, in turn, receives its operating voltage from an isolated or "phantom" power supply in its mated amplifier.

Virtually all modern handhelds use electret microphones, and their preamp—are you ready for this?—is built into the element's case! But wait, you say, some electret elements are small, indeed tiny! Yep, and there's a teeny-tiny *barebones* preamp circuit included in the element's case. Bigger mics give designers a little more space. In most electret mics for mobile use, the preamp is housed in the mic case rather than the element itself. And electret desk mics generally have the preamp in the mic base. But in all cases, there's a preamp at the far end of the mic cord. Preamps need power. And that's why transceivers designed to use and/or come supplied with an electret mic provide an output (phantom) voltage at their mic input connector, to power the preamp.

Furthermore, all electret mic preamp circuits are not alike in size or voltage requirements. One might require more voltage than a handheld FM talkie's battery pack could deliver. Another might be susceptible to burnout by excessive phantom voltage from a "big transceiver." Studying and comparing rig service manuals and mic spec sheets usually gives you a good idea of "what will and what will not interface or work together" (produce and accept compatible voltages). Next month, we'll get into a few tips for working with electret mics.

Photo C. Modern-style Heil microphones are responsible for many of the most impressive sounding FM, AM, and SSB signals on the air today. They're available as element-only or complete microphones with cable and plug to match "KenYaeCom" transceivers.

Understanding Microphone Specs or Parameters

Four distinct characteristics are associated with all varieties of microphones: *frequency response, output impedance, pick-up pattern,* and *output connections.* By understanding these characteristics, also known as *specifications*, or "*specs*," we can compare one mic or element with another and also imagine how a particular mic will sound in actual use. A brief explanation of each spec follows.

Frequency Response Curve

First, and probably most significant, is a selected microphone's *frequency response curve.* Generally, listed specs like "response is 100 Hz to 10,000 Hz" tell only a fraction of the story, as they don't provide any tangible details of output level variations within that range—prime factors that describe how the mic sounds in actual use. A mic listed with a response of 100 Hz to 10,000 Hz, for example, could exhibit 5 or 6 dB more output between 500 Hz and 4000 Hz than at lower or higher frequencies. It might also exhibit an additional peak of maybe 3 dB between 3000 and 4000 Hz. As a result, a "wide frequency response" mic that seems like it would produce rich and full-bodied FM-quality audio may, in actual use, exhibit a "peaked for SSB," or voice-range-only, response.

So, how do you interpret a mic's frequency response curve? Two noticeably different examples we can use to answer that question are shown in A and B of Figure 6. Chart "A," incidentally, matches Shure's legendary 55SH full-range broadcast quality mic (a treat for FM), and Chart "B" matches Shure's famous 520DX "Green Bullet" mic (again, possibly an overlooked treasure for SSB).

Photo D. Close-up view of two ever-popular microphones, world-famous for their distinctive sound quality. Left is Shure's narrow-range 520DX "harmonica mic" and right is Shure's full range 55SH broadcast mic. In addition to traditional gray, 55SH has also sported red, green, and blue grill cloth during eras past. Photo courtesy Shure Brothers.

First, notice that audio frequencies of 50 to 20,000 Hz are marked below either chart's horizontal edge, and output level, with zero dB corresponding to approximately 130 microvolts, is marked beside the chart's left vertical edge. Notice the model 55SH illustrated in "A" rolls off bass by 10 dB at 40 Hz, compared to its full/normal output of between 200 and 1500 Hz. It also has a slow rising 5-dB increase between 1500 and 10,000 Hz (the high articulation range, plus a bit more) with an additional 5 dB peak around 6000 to 7000 Hz to emphasize "sss" sounds and add presence. Viewed another way, bass tones below 3000 or 4000 Hz are 3 to 5 dB below normal output and tones between 10,000 and 20,000 Hz are down 5 to 12 dB. Overall, this mic can be expected to pick up sounds in a most realistic manner, plus emphasize medium-high tones to give the impression the person speaking into the mic is actually in the room with you.

Now, study the model 520DX microphone's frequency chart in Figure 2B. This mic's 0 dB or full output range is between 1000 and 3800 Hz, with lower frequencies rolling off 5 dB or more at and below 300 Hz. Upper frequencies drop 5 dB at 4500 Hz, and then drop completely at 5000 Hz. Now remember what we said about dBs, or decibels, in our past two columns. Every 3 dB gain or drop is equivalent to doubling or halving a previous power level. This classic microphone is presently sold mainly for in-hand use with a harmonica, but it should also produce some high "talk power" for SSB DXing. The 520 was originally made to fit on a desk stand with a grip-to-talk bar for two-way radio applications during the 1950s, but full-bodied AM communications "ruled the roost" at that time and this mic never received its due recognition. Shure changed the 520's stand mounting hole to support a built-in volume control, and the "Green Bullet" gained fame in the world of blues music.

It would be most interesting to check out this mic's sound and performance on SSB today. Ah, but frequency response charts are not always available for all mics, especially "el cheapos," you say. True indeed—and that leaves us with only two choices: try a mic with your voice (and rig!) before you buy it or take a chance and hope for the best. As Dirty Harry would say, "Do you feel lucky, kid?"

Output Impedance

Another important microphone characteristic is *output impedance*, with

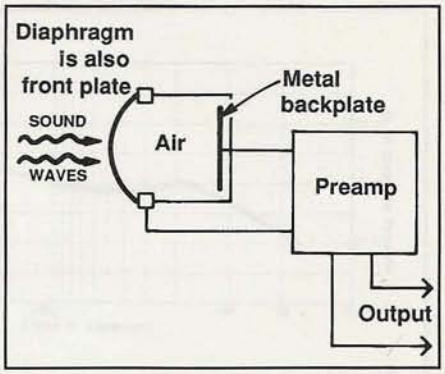


Figure 5. A condenser or electret mic doesn't produce its own voltage, so voltage from the radio and a preamp are required. The element acts like a capacitor, with varying sound pressure changing the capacitance, and thus the voltage, of the mic circuit.

"high" (2000 ohms and above) and "low" (typically 600 ohms and below) being the two most common varieties. High impedance mics were mainly popular during the heyday of vacuum tubes and are fading out today. The length of their cable should be less than 25 feet to minimize RF pickup. Low impedance mics match

RF LINEAR POWER BOOSTER AMPLIFIER KIT $39.95

A quick and simple boost for signal generators, transmitters, and other low power devices, this kit can boost power up to 1 watt over a frequency range of 100 KHz to over 1000 MHz. Operates on 12 to 15 vdc @ 250 mA, via a 2.1mm male power jack. 38 dB gain at 10 MHz, 10dB at 1000 MHz. Optional case $14.95

Computer Service Technician $59.95

The definitive guide to software and hardware troubleshooting, the CST covers processors, motherboards, CD-ROM, disk drives, tape drives, printers, memory chips, diagnostic programs, BIOS, chipsets, video, I/O ports and much more. Includes hundreds of illustrations, diagrams, and charts.

WIGWAG FLASHER BOARD $4.95

At first glance, it may appear to be an ordinary circuit board, but add a couple of lamps and a little bit of voltage (12VDC), and you have a great flashing light system. We include a basic hook-up diagram so you can make a lamp flasher with time delays. Two lamps give the "wig-wag" effect, which is sure to get attention. Ideal for model train applications, commercial displays, and a multitude of other applications you think up yourself. **Small DC motors can be made to run and reverse at fixed intervals, so you can drive your cat or toddler crazy with a little creativity!** Timing is set via a 4060B CMOS binary counter/oscillator, and pads on the circuit board allow selection of times from about 1.2 seconds to 10 minutes. The unit will handle about 2 amps without heatsinks. However, heatsinks are recommended and required for larger currents. Transistors should be insulated from the heatsinks.

YAESU FT-50 &VX-1R HARD-TO-FIND SPEAKER/MIC PLUG $7.50
Special plug on one end, tinned on the other for easy connection. Ideal for packet, etc.

THE FINE PRINT: * PRICES SUBJECT TO CHANGE WITHOUT NOTICE * GATEWAY IS NOT RESPONSIBLE FOR PRINTING ERRORS * MASTERCARD, VISA AND DISCOVER ACCEPTED * YES, WE'LL TAKE YOUR CHECK – SORRY, NO C.O.D.s * $10 MERCHANDISE MINIMUM ON MAIL ORDERS * SUPPLY OF SOME ITEMS IS LIMITED * PRICES DO NOT INCLUDE SHIPPING * UPS GROUND SHIPPING/HANDLING WITHIN THE CONTIGUOUS U.S. (ITEMS REQUIRING ADDITIONAL AMOUNTS ARE NOTED)...$5.00 FOR THE FIRST ITEM, $0.50 FOR EACH ADDITIONAL ITEM. RESTOCKING CHARGE MAY BE ASSESSED ON RETURNED ITEMS.

BEFORE THEY INVENTED DRAWING BOARDS, WHAT DID THEY GO BACK TO?

gateway ELECTRONICS, INC

8123 PAGE BLVD * ST. LOUIS, MO 63130 * (314)427-6116
9222 CHESAPEAKE DR. * SAN DIEGO, CA 92123 * (619)279-6802
2525 FEDERAL BLVD. * DENVER, CO 80211 * (303)458-5444
MAIL ORDERS CALL TOLL-FREE 1-800-669-5810
FAX ORDERS (314)427-3147

CIRCLE 69 ON READER SERVICE CARD

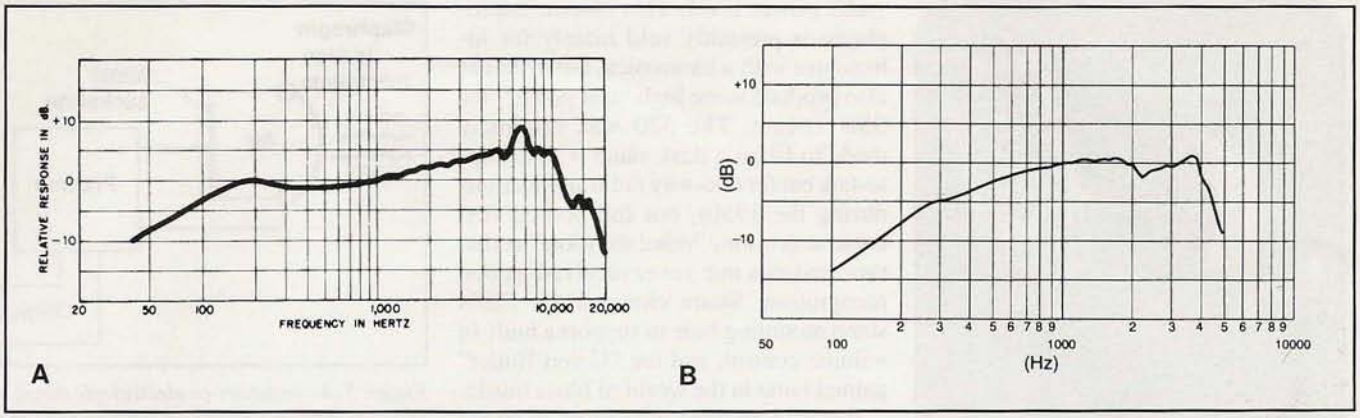


Figure 6. Frequency response curves are different for each microphone and are useful for imagining how a particular mic will sound in actual use. Figure 6A is the response curve for a Shure 55SH microphone, and Figure 6B shows the response curve of a Shure 520 DX mic. Response curves are calibrated horizontally in Hz and vertically in dBs. Discussion in text. (Graphs courtesy Shure Brothers)

solid state gear and so are very popular today, plus they can be cabled to sound/recording equipment several hundred feet away without introduced hum or RF pickup. Older model vacuum tube transceivers usually "like" high impedance mics; newer/solid-state transceivers usually "like" low impedance mics. Improperly matched mics and transceivers typically exhibit altered frequency response and various degrees of distortion.

Pickup Pattern

In addition to frequency response and impedance, microphones are also considered according to their sound *pickup pattern*, that is, whether they hear best in one, two, or all directions. Most (but not all!) microphones used in amateur radio applications exhibit maximum sound pickup directly in front of their grill (a unidirectional or cardioid pickup pattern). Some mics designed for stage and studio exhibit bidirectional or omnidirectional (full 360 degree) pickup patterns. When they're used in a ham shack, special planning of location is often necessary to cancel undesired reverberations. This effect can be more than just echo, as some frequencies may reflect and return out of phase and thus alter the mic's sound. Although it's not always possible, trying a mic before purchasing it is quite desirable.

Output Connections

Finally, there are always considerations of microphone connections and hookup with a rig—an area that often proves most confusing of all. Indeed, entanglements here often drive folks to just selecting a mic made to match their rig and fitted with a prewired plug rather than trying to decipher all the associated complexities. It makes sense for sure. Some rigs use unbalanced mic wires, some use balanced wires, and some use phantom power. Some mics match these requirements, some can short out a rig's mic voltage, and some may be damaged by a rig's phantom voltage. Understand, this area is not overly complex, it just takes magazine space to explain. And, since we are now out of space, we'll pick up with that topic—getting connected—next month in Part 2 of our discussion on microphones. Stay tuned!

73, Dave, K4TWJ

Oops...

We were all still recovering from our Thanksgiving dinners when we put the February issue "to bed," and since we are what we eat, we turkeys let a few things slip by that shouldn't have.

First, in the reader survey question about which modes you operate, we somehow left out CW as an option. We apologize to the CW operators among you and assure you it was simply an error, not a conspiracy.

Second, in our "Artist in Resonance" cartoon on page 43, we neglected to credit Lisa Roberts, KF6NWO, as the cartoonist (sorry, Lisa). Plus, we didn't catch that what should have been a capacitor (to have the coil in resonance) actually looked like the schematic symbol for a battery. A battery and a coil will not produce resonance...just heat.

Thanks to all of our eagle-eyed readers for keeping us on our toes.

Resources

For more information on the microphones and elements mentioned in this article, contact:

Astatic Microphones: CTI Audio, Inc., 341 Harbor St., Conneaut, OH 44030; Phone: (Sales): (800) 421-3161 or (440) 943-0110 (Cust. Svc.): (888) USA-D104; Fax: (440) 943-0104; E-mail: <sales@astatic.com>; Web: <http://www.ctiaudio.com>.

Heil Sound, Ltd., 5800 North Illinois, Fairview Heights, IL 62208; Phone: (618) 257-3000; Fax: (618) 257-3001; E-mail: <info@heilsound.com>; Web: <http://www.heilsound.com>.

Shure Brothers, Inc., 222 Hartrey Ave., Bldg. 1, Evanston, IL 60202; Phone: (800) 516-2525 or (847) 866-2200; Fax: (847) 866-2279; E-mail: <sales@shure.com>; Product support e-mail: <productapps@shure.com>; Web: <http://www.shure.com>.

Product Update

MFJ's Compact Antenna Tuner

MFJ has announced its newest compact antenna tuner, the MFJ-922 VHF/UHF Dual Band Antenna Tuner. The MFJ-922 has a single meter that reads SWR and power. It covers VHF from 136 to 175 MHz and UHF from 420 to 460 MHz. You can read power up to 150 watts in two ranges: 60 watts or 150 watts. Measuring only 4 x 2 x 1 1/4 inches, the MFJ-922 is appropriate for HTs, mobile rigs, or amplifiers up to 150 watts. SWR tuning tool is included.

The MFJ-922 VHF/UHF Dual Band Antenna Tuner costs $79.95 and comes with MFJ's No Matter What™ one-year limited warranty.

To order or for your nearest dealer, call (800) 647-1800; Fax: (601) 323-6551; E-mail: <mfj@mfjenterprises.com>; or check out dealer/ordering information at: <http://www.mfjenterprises.com>.

Circle 100 on reader service card

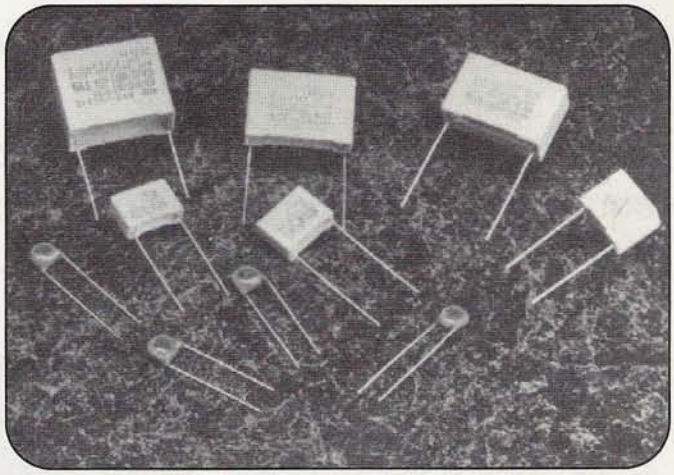
Ventronics Metal Oxide Varistors

Ventronics, Inc., of Kenilworth, New Jersey, has introduced a new line of varistors to its Surface Mount Devices (SMDs), along with adding 9-mm and 18-mm models to its current leaded Metal Oxide Varistors (MOVs) in 5-mm, 10-mm, 14-mm, and 20-mm sizes.

MOVs are extremely effective as protection for electronic and electrical equipment because of absorption of abnormal voltages and lightning pulses. Common uses include safeguarding switching inductive loads in transformers, relays, coils, ground fault interrupters, power supplies, communications equipment, smoke detectors, security systems, motor controls, and microprocessors.

The new SMD PV series MOVs have an operating range of from 11 to 300 volts rms with surge currents ranging from 100 to 1200 amps. The units are encapsulated in thermoplastic material meeting UL 94V-0 flammability standards. Products are readily available on tape and reel. The two sizes offered would be equivalent to leaded disc varistors of 5 mm and 7 mm.

The leaded MOV units cover a range of from 4 to 1355 volts AC rms, with maximum energy capabilities or from 0.3 joules



to in excess of 600 joules. Withstanding surge currents range from 100 to 6500 amps, with a maximum clamping voltage range of from 22 volts to more than 3 kV. All items have full UL/CSA/VDE approvals.

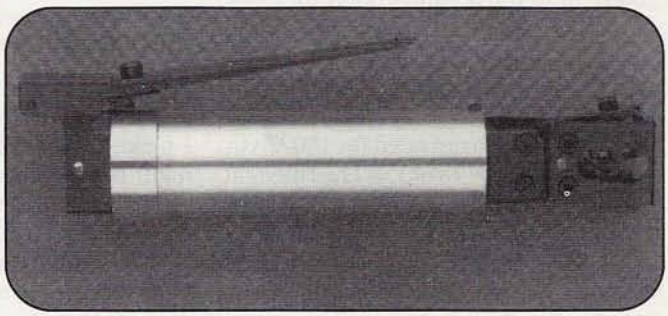
Leaded disc MOV units range in price from less than $0.05 each, and the SMD MOVs start at approximately $0.15 each. Availability is in bulk, lead formed, or on tape and reel for automatic insertion.

For additional information, contact Ventronics, Inc., 346 Monroe Ave., P.O. Box 142, Kenilworth, NJ 07033; Phone: (908) 272-9262; Fax: (908) 272-7630; E-mail: <ventronics@prodigy.net>.

Circle 101 on reader service card

Jensen Series 500 Crimp Tool

The long handles on the new Jensen crimp tool give it a high mechanical advantage and lower the chance for wrist pain with extended use. The comfortable handle grips and high strength frame give it a long tool life. The Series 500 Crimp Tool can be used to terminate coax, modular, CATV, and insulated terminals. It comes with a Lifetime Guarantee.



For more information, contact Jensen Tools, 7815 S. 46th Street, Phoenix, AZ 85044; Phone: (800) 426-1194 or (602) 968-6231; Fax: (800) 366-9662 or (602) 438-1690; Technical FaxBack® Service: (602) 968-6241, x271. Internet: <http://www.jensentools.com>.

Circle 102 on reader service card

Electronics in the Great Outdoors

Installing a network node in a remote location often means having equipment in unheated, uninsulated buildings, and having to figure out how to run the power you'll need for it all. N2IRZ shares one approach.

Late last fall, I relocated most of my packet node equipment to the tool shed. I could have kept it in the basement, where it stays relatively warm and dry, but I wanted to get a better idea of the conditions that remotely installed equipment might face. I guess I just enjoy the punishment of doing it the hard way. This month, we'll take a look at electronic equipment and the great outdoors.

Out to the Tool Shed

The tool shed is located about 100 feet behind the house, right next to my Rohn 45 tower. Having the equipment in the house was fine, but the feedline losses (even with one-inch hardline) were killing my receive sensitivity. I had considered relocating just the radios, but some experimentation showed that the TNCs had to be out there as well because of distortion of the modem audio. Since I'm running PC/FlexNet, the computer had to go out there, too...sigh. The shed has no power, no heat, a family of mice, and (my favorite) wasps.

When I installed the hardline, I had the foresight to run a multi-conductor cable along with it. I had no specific use in mind, but figured that I'd eventually want to control a rotator or something. The largest wires are 10 gauge, enough for 30 amps, but they're not rated for 110 VAC, so I'm limited to 12 volts. If I had thought about it, I would have run some Romex for electrical power out there at the same time, but that would have required an electrical permit, something I wasn't prepared to handle at that time.

The first consideration was getting power out there. Swearing off 120 volts, and thus avoiding the need for an electrical permit, was the first decision. There was no reason at all that I couldn't do everything I wanted with just 12 volts. So, I picked two of the heavy wires in the multi-conductor cable and connected my power supply to them. I started by installing some automotive-type lights, not only for testing, but also so I could see at night (I don't have much free time during daylight hours).

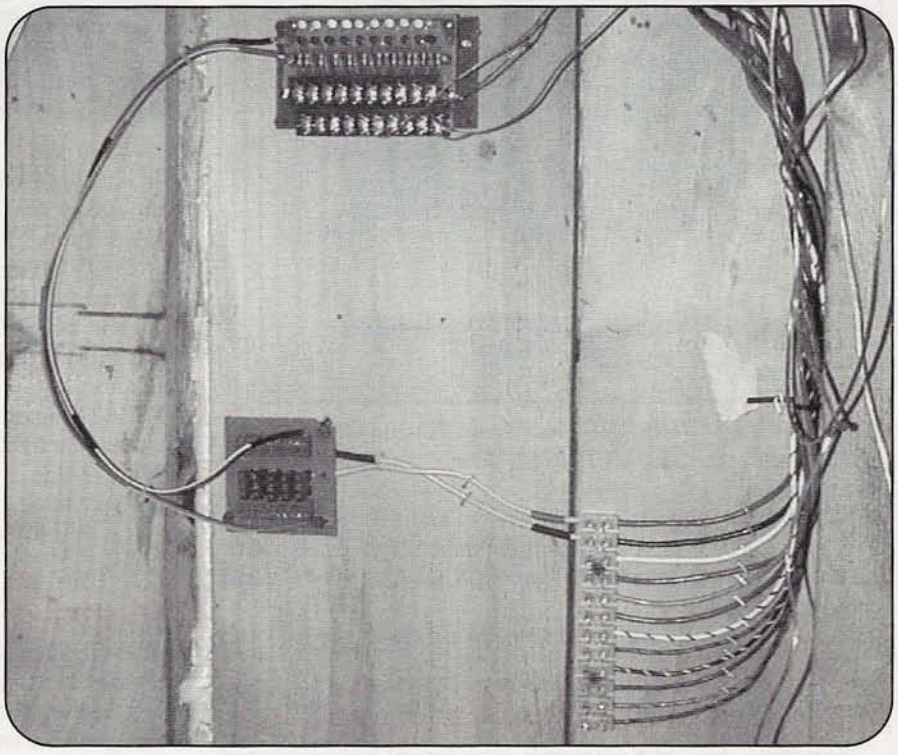


Photo A. A view of the power distribution system in the shed. Here, only the two main power wires are connected (I didn't use the sense wires until later). To the left is the homemade fuse panel, built on perfboard. The connections are soldered on the underside. Above is the low power panel, with all the indicators glowing green. When a circuit trips, that LED turns red.

With the lights on, the total current draw was about 3 amps, and the voltage was a reasonable 13.2 volts—a little bit of a drop from the 13.8 at the power supply, but nothing to worry about. Then, I put a load onto the line to bring the current draw up to the 16-amp limit of my power supply. My load was simply 130 feet or so of 18-gauge wire, coiled loosely and hanging in the air for cooling, though I could have used a couple of car headlamps instead.

Meeting Resistance

Measuring the voltage, I was a little shocked to find that it had dropped to 10.5 volts! A little bit of thought provided the

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

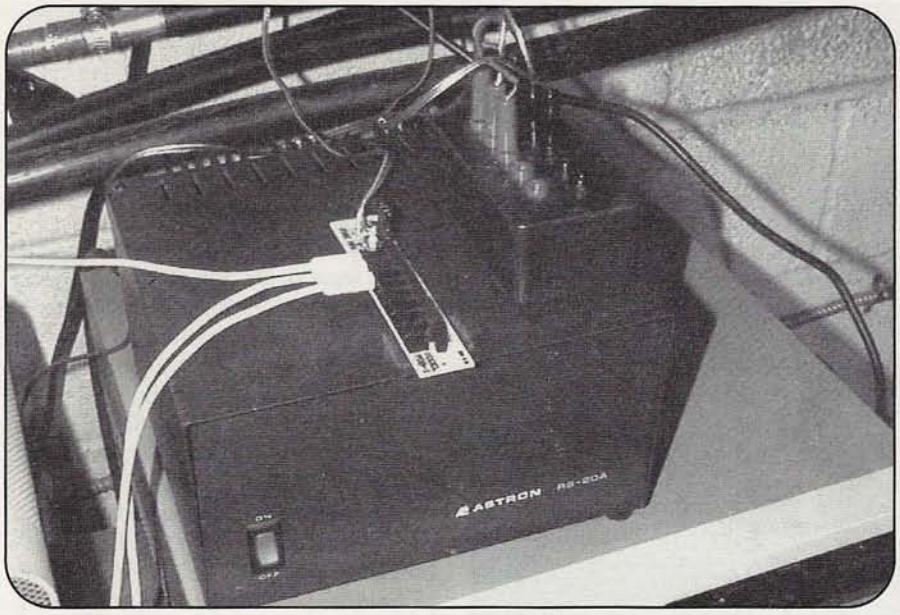


Photo B. Some other power distribution options. The Banana jack box is homemade, but commercial versions are available. These are great for higher current applications, such as transmitters. The power distribution board is the perfect solution for TNCs and other low current devices, but they're no longer available commercially.

reason for the drop: the ohmic resistance of my 10-gauge cable! The run was about 100 feet, so the total distance for the electricity to travel was 200 feet (100 there, and 100 back). *The ARRL Handbook* tells me that 10-gauge wire has a resistance of about 1 ohm per thousand feet, so I was dealing with a resistance of 0.2 ohms. Since V = I • R, I was dropping 16 • 0.2 = 3.2 volts. My precious voltage was being converted into heat! If my transmitters were to key up, they would malfunction at such a low voltage.

I might have simply turned up the voltage coming out of the power supply, but during periods of low current draw, the voltage would rise too high. What I needed was some automatic way of keeping the voltage regulated, despite the long cable run. That's when I remembered that 20-amp open-frame power supply I bought many years ago from a surplus house. It didn't have a case, but it did have the exact feature I needed: remote sensing.

Built just for instances like this, some higher-end industrial power supplies have two voltage sense terminals, which are used to regulate the output voltage. When the load is close to the power supply, you usually just strap the sense terminals to the output terminals and ignore the losses along the wire. However, when the wires are long, as in this case, you simply run two more wires out to the distant end to sense the voltage. Since the input impedance of the sense terminals is very high, the current on the sense wires is milliamps or less. That means that ohmic losses can be ignored and voltage at the remote location can be regulated, effectively canceling out the effects of the long load wires.

If you ever get a chance to own a power supply with remote sense terminals, take it. This feature can come in handy. In this case, I couldn't have set up the site without it.

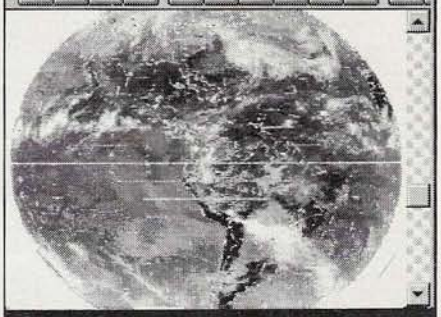
The Big Chill

With winter at hand, I decided to see if the equipment could withstand the extreme cold we sometimes see. It rarely gets below zero here in New Jersey, but single digits are not uncommon. At this point (early February), the coldest weather has passed, and all went well. I took the site out of the network to avoid disruption, but I keep it on the air and test it regularly and haven't had a problem.

If I hadn't been so interested in experimenting with the setup, I probably would have used some kind of temperature control. The first step to controlling the temperature is to get the equipment in some kind of housing—there's no way I could heat the whole shed! I saw a number of likely enclosures at the local Home Depot, including large plastic tool boxes, coolers, and storage boxes, all under

PC HF Facsimile 8.0

File Receive Edit View Help



For Windows 95/98 $179.95

SSC is proud to announce PC HF Fax 8.0 for Windows 95 & 98. Now you can receive weather Fax, FEC, RTTY, Morse Code, Navtex, Amtor and Sitor while working with other software. The package comes with our new Windows FSK demodulator, software, manual and database. Just plug it in, connect your receiver, and you are copying the world! Call or write for our FREE Products Catalog.

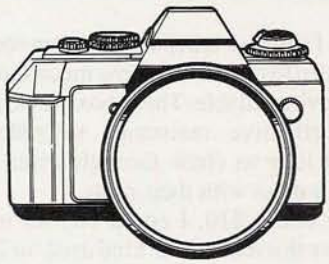
Visa and MasterCard Welcome

Software Systems Consulting

SSC

615 S. El Camino Real
San Clemente, CA 92672
Tel: 949/498-5784
Fax: 949/498-0568
support@ssccorp.com
http://www.ssccorp.com

CIRCLE 78 ON READER SERVICE CARD



Photos Wanted!

CQ Staff Photographer Larry Mulvehill, WB2ZPI, is planning his travel itinerary for 1999 and could use some input from our readers. If you know of a particularly photogenic setting that might make a good cover or calendar shot, why not let us know about it? It might be a great antenna installation or a neat mobile setup, an interesting shack, or even a busy electronic workbench with work in progress. Don't be shy about recommending your own setup, either! If you can provide a snapshot or two for reference, great. If a snapshot isn't available, a short verbal description will help.

Send your photo ideas and snapshots to Larry Mulvehill, WB2ZPI, at 32 Comanche Drive, Oceanport, NJ 07757. If you'd like your snapshots returned, please include an SASE. The sole reward for your help will be the gratitude of your fellow readers. Be sure to include information about how Larry can get in touch with you.

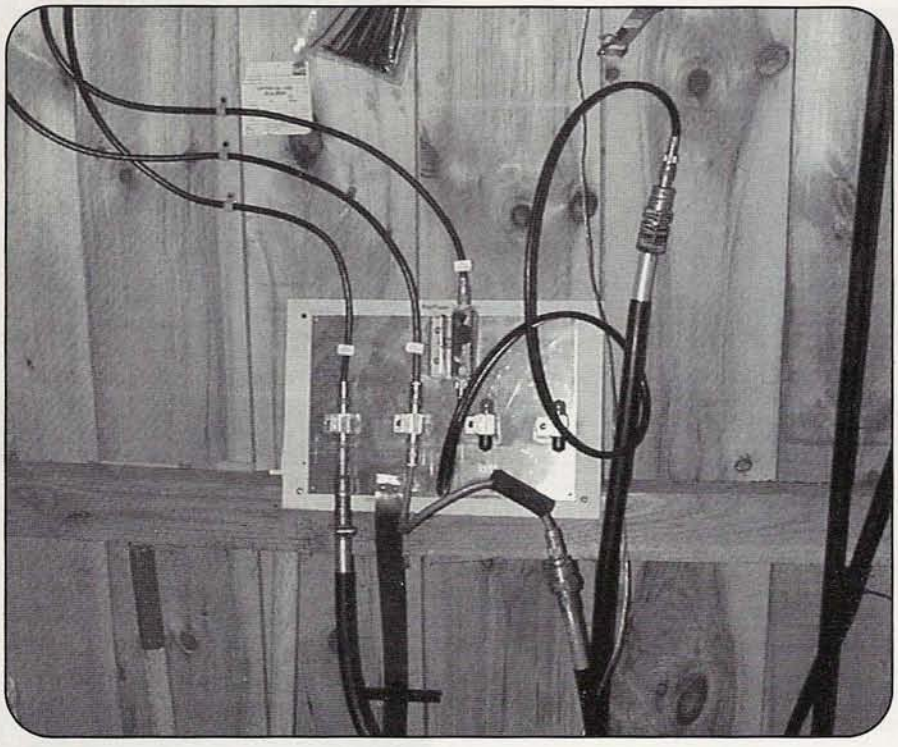


Photo C. The lightning protection panel in the shed. Every antenna wire goes through this panel, and all the equipment is grounded here. The wide copper strap leads to a system of four ground rods, interconnected by heavy bronze cable, which also serve as grounds for the tower. It might seem like overkill, but ground rods are cheap.

$100. I suppose it depends on how secure you need to make it and how much money you have available. These boxes also provide effective resistance to rodents, which love to chew through wires and make a mess with their nests.

For under $10, I could buy an inexpensive thermostat, the kind used for 220-volt electric heat. This kind can switch high current safely, while the more common mercury-bulb type is rated at less than 1 amp. Set the thermostat as low as it will go—50 degrees in my case—and connect a light bulb to it. Be careful if you decide to use line voltage, but at 12 volts, it's OK to leave wires and terminals exposed. Select the wattage of the light bulb to give you the heat output you want; the higher the wattage, the more heat you can expect. In a plastic cooler, which is well-insulated, a 10-watt bulb is plenty.

Power Distribution

Power distribution at 120 volts is determined by the local electrical codes, so I won't even discuss it, other than to mention that having the inspector look things over is cheap insurance. It just isn't worth avoiding a permit for this kind of thing.

At 12 volts, we have a number of tricks available. First of all, I wanted to have easily serviced yet reliable connections. I bought a heavy-duty European-style power strip at Radio Shack, mounted it to the wall, and connected the wires to it (Photo A). From there, I went to a homemade fuse panel, which limits each circuit to a maximum of 10 amps. You can make one with screw terminals or power blocks, or even salvage one from a car (from a junkyard, not your neighbor's!). I use this panel to connect directly to the radios and other high-power consumers.

One set of wires leads to the low-power panel, which is for consumers of 2 amps or so. This particular panel uses screw terminals, Raychem PolySwitch self-resetting fuses for overcurrent protection, and LED indicators to show status (OK or tripped). I can tell at a glance if there's a problem.

Some other options are Banana jacks for higher-current devices and one of my precious power boards, both seen in Photo B.

The banana jack system is available from MFJ, but, being a cheapskate, I built my own inside a plastic project box. It also helped that my junkbox had everything I needed. The banana jacks I used, from Mueller, are rated at 15 amps, so I try to limit the current for any one circuit to less than that. One of the MFJ power strips can handle 30 amps! For higher currents, the only reasonable option I've found is terminal bolts, like those on the back of a power supply.

The power boards are another story. These were made and sold by Amateur Networking Supply, but they ceased operation in 1997, and there are no more. Power came in through a 7.5-amp fuse and went out through individual TNC-type coaxial power jacks. Simple patch cords connect the power board to the TNCs and TEKK radios, making for a neat and easily serviced installation. There was even an indicator LED to show power OK and fuse blown. I would include the pc board pattern, but the original boards had small slots punched in them for the tabs of the power jacks, instead of drilled holes. This made it difficult to solder. If you send me a SASE at the RATS address (see "Resources"), I'll send a pc board pattern and some construction notes.

Does It Compute?

The last critical item was the computer. I went the lazy way and used an old 286 laptop I had which runs off 12 volts. After all, I only need a single serial port and a few megabytes of hard disk space. It worked fine, even at the coldest temperatures, but the LCD screen started to get sluggish below freezing. Best $80 I ever spent.

If I had really wanted to go wild, I could have built a computer with no moving parts. MS-DOS 6.22 comes with an application named RAMDISK, which allows you to use regular RAM as a solid-state disk drive. System boot could be handled by a floppy, if you're willing to gamble, or you can get a solid-state bootable drive for under $100 (and eliminate the RAMDISK as well). The power supply fan should be OK to leave running, but, if you insist, it's possible to provide alternative means of cooling. If you do, be careful in there, some voltages can be dangerous.

What about sites like my shed, where only 12-VDC power is available? OK, there's the laptop solution, but that might be a bit limiting. Looking inside my Pentium's 230-watt power supply, I discovered that it has only four outputs: +5V/12A, + 12V/10A, -5V/0.5A, and

–12V/0.5A. The +12 volts was real easy, and the +5 volts not much more difficult. The negative voltages required DC-DC converters, about $20 each. Giving it a little thought, and some judicious current measurements, I found that the biggest power consumer was the hard disk, followed by the motherboard itself. I decided I could get away with under one-half the power supply's ratings (5A for each positive supply, and 100 mA for the negative supplies).

One word of caution: The computer still needs a well-regulated source of power or you may damage it. I recommend the above ideas for hard-core enthusiasts only. Everyone else can just get one of those small DC-AC power inverters and be done with it for under $60. A capacity of 100 watts, with an occasional peak of 150 watts, will be plenty.

Lightning Protection

On a somewhat related subject, I want to touch briefly upon lightning protection. Here in New Jersey, it isn't as critical as, say, Florida, and a 35-foot tower beneath a 75-foot tree is somewhat less likely to see a direct hit. Nonetheless, some protection is required. If you want to protect against a direct hit, it will cost you a tidy sum. There's little you can do about it, really, when your antenna melts. Fortunately, most of your problems will be related to nearby hits, and it's a lot easier to protect against this. Photo C shows my PolyPhaser grounding panel, with a few surge protectors mounted. Note the wide copper strap leading to the ground system.

One common misunderstanding about lightning is that it's not DC. A large fraction of the energy is in the 100-kHz and above range. What this means, in practical terms, is that we need to treat lightning grounds as RF grounds: lots of surface area, low impedance to ground, etc. There's so much to know, I could write a book on the topic, but luckily I don't have to—the folks at PolyPhaser already did it. They sell a book titled *The Grounds for Lightning & EMP Protection*, by Roger Block. This reference book explains in detail what must be done to control lightning energy and why. If you're thinking about installing lightning protection, this book will teach you how to do it more effectively. It's well worth the price.

Looking Ahead...

That's all the space we have for this month. I hope you found this information practical and useful. With FlexNet sites being added nearly every weekend, powering sites is something we have to do often, and adding computers to the mix makes it interesting. We're entering that time of year when we can climb the towers again and fix whatever broke, add on to the antenna farm, and enjoy the great outdoors. I'm not yet sure what we'll look at next month—there's so much to cover—but I've started looking at other forms of data outside of Packet. Let's make it a surprise. Until then, 73.

—N2IRZ

Resources

When contacting these sources, please mention that you heard about them in *CQ VHF*!

PolyPhaser Corporation makes lightning protection devices and publishes an excellent book on lightning protection. Contact them at P.O. Box 9000, Minden NV 89423; Phone: (800) 325-7170; Internet: <http://www.polyphaser.com>.

Raychem PolySwitch resettable fuses are distributed by DigiKey. A catalog is available by calling (800) 344-4539, or on their Web site, <http://www.digikey.com>. You can also visit Raychem at <http://www.raychem.com>.

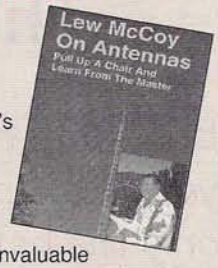
MFJ Enterprises makes several power distribution panels, the MFJ-1112, 1116 and 1118, all based on Banana jacks. Contact them at P.O. Box 494, Mississippi State, MS 39762; Phone: (800) 647-1800; Internet: <http://www.mfjenterprises.com>.

RadioShack has an extensive line of items that are useful for custom power distribution solutions. If you don't have a store nearby, you can get a catalog from (800) 843-7422, or visit them at <http://www.radioshack.com>.

For a pc board pattern for the ANS power distribution board, along with some construction notes, send a business-size SASE to me c/o RATS, P.O. Box 93, Park Ridge, NJ 07656.

CQ BOOKS

McCoy on Antennas
by Lew McCoy, W1ICP



This is truly a unique antenna book that's a must read for every amateur. Unlike many technical publications, Lew presents his invaluable antenna information in a casual, non-intimidating way for anyone!

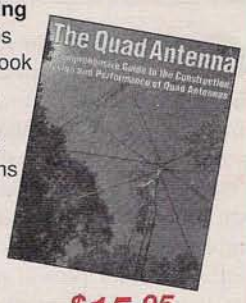
Order No. MCCOY $15.95

W6SAI HF Antenna Handbook
by Bill Orr, W6SAI

Nearly 200 pages filled with dozens of inexpensive, practical antenna projects that work! This invaluable resource will guide you through the construction of wire, loop, yagi and vertical antennas.

Order No. HFANT $19.95

The Quad Antenna
by Bob Haviland, W4MB
Second Printing



You'll enjoy this authoritative book on the design, construction, characteristics and applications of quad antennas.

Order No. QUAD $15.95

MasterCard VISA DISCOVER AMERICAN EXPRESS

Please add $4 shipping & handling
Free shipping & handling for orders $50 and over

CQ Communications, Inc.
25 Newbridge Road
Hicksville, NY 11801
Phone: 516-681-2922
Fax: 516-681-2926

or call toll-free 800-853-9797

The Mercury ARA Battery Pack

Build your own battery pack, using long-lasting D cells to make sure you've got power when you need it. KE6UZQ's club project includes not only the battery pack itself, but accessories to check your charge and protect your gear against reversed polarity damage.

Editor's Note: Sitting in this month in the "Project Corner" is Dennis Wilkison, KE6UZQ. Dennis has been licensed since 1995, but has been involved with amateur television (ATV) for decades, supplying vidicons (TV camera tubes) to ham friends in Los Angeles in the late '60s. Dennis says the code was always the obstacle between him and a ham license, but once he got his Technician ticket in 1995, he felt challenged to learn it. He got his Tech Plus in 1997, then upgraded to General ticket in late 1998. Currently, Dennis is Vice President and Activities Chairman of the Mercury Amateur Radio Association, South Bay Chapter. His article started out as a club project.

So here it is! The moment you have both anticipated and dreaded. You've just received your first emergency call for help. It's your big moment. Your adrenaline is pumped. You've been trained, you're prepared, and you're ready to go. You key up to respond and offer your services. You've made contact! The other person replies and states the nature of the emergency. Can you help? Of course you can. You key up to say so, and your battery goes dead!

Undoubtedly the most frustrating experience in the life of an amateur radio operator is to attempt to provide emergency communications and find the battery is *dead*. Time and again, I have listened to horror stories similar to the one related above, often expressed even by experienced hams. Our club charter, with its focus on emergency communications service, has to include in that focus individual preparedness for emergencies. Club members have often commented on how much trouble it was to be in an activity, such as parade, and have to change battery packs just when something interesting or timely was happening. We brainstormed the problem, and the following low-cost, rugged solution was born (see Photo A).

Photo A. The Mercury ARA battery pack. This eight-D-cell, 12-volt battery pack is the basis of a standardized power system used by members of the Mercury Amateur Radio Association in California. The pack and its various accessories use the ARES national power connectors. (Photos courtesy of the author)

This article describes the construction of a special, but simple, 12-volt battery pack. It can use either standard alkaline D cells, or the renewable ones. The battery holder is a durable, low-cost item found in many parts stores. The interface is the Silicon Valley Emergency Coordination (or SVECs, pronounced "es-vex") connector, a Waldom/Molex series two-position plug, which allows anyone in California's Silicon Valley to use someone else's power source (the SVECs connector is described more thoroughly below). There's even a way to check the alkaline cells for remaining energy, if you use the Duracell batteries with the measuring stick.

Send Your Batteries Packing

A battery pack may appear at first to be simple to build. Still, there are several important factors to be considered and incorporated to turn a battery holder into a useful, functional, versatile, and portable energy source. The first factor is the energy source itself. It should be compact and replenishable. There are two ways to replenish energy in this pack: 1) buy a new set of dry cells from the store, or 2) purchase more expensive rechargeable cells and recharge them. Rechargeable cells require an additional charger and have one significant downside: batteries designed to be recharged typically do not have the voltage or the capacity of alkaline dry cell batteries. More on this subject in a moment.

The battery pack design shown in Figure 1 produces 12 volts, using eight standard "D" cells, which are readily available in three disposable versions: 1) carbon zinc (some studies have shown

By Dennis Wilkison, KE6UZQ (wilkison@worldnet.att.net)

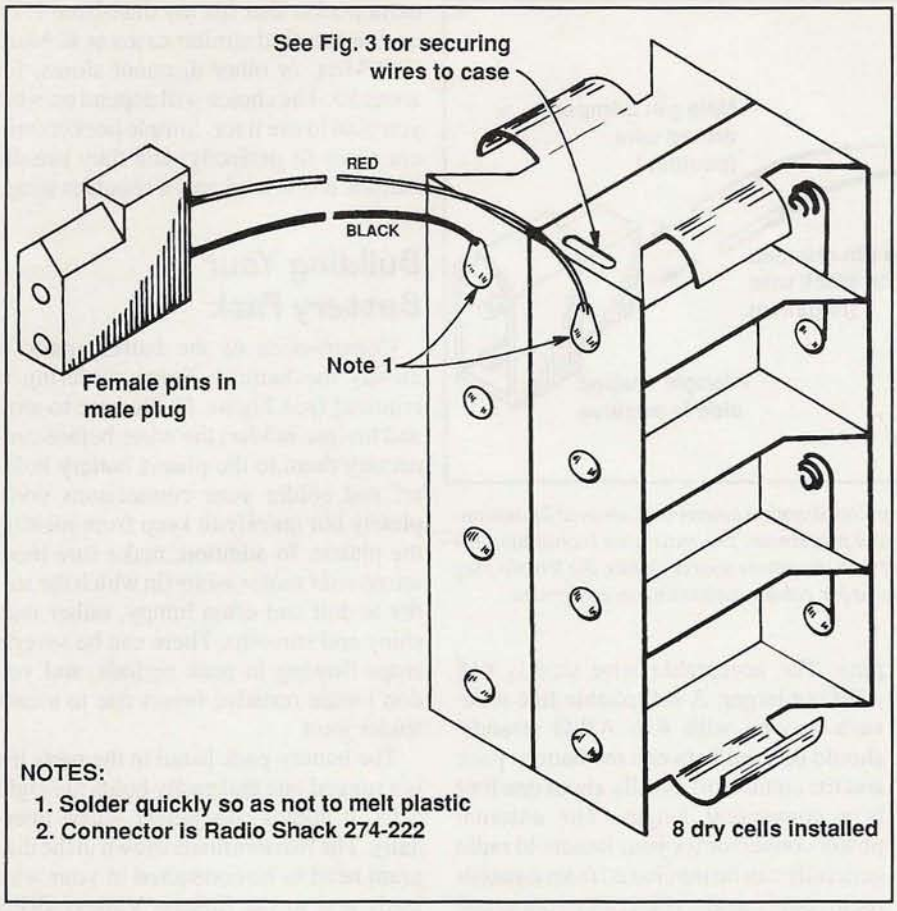


Figure 1. The basic 12-volt battery pack (minus the batteries). Wires are quickly soldered to the contacts on the 8-D-cell battery holder, then pins for the Molex connector (see text and Figure 2) are crimped onto the ends of the wires. Also shown is the male half of the SVECs connector (see Figure 2).

that these less-expensive cells actually have a better life per dollar than the more expensive premium cells); 2) high-performance alkaline cells (these have a longer life per cell, but also cost more); and 3) renewable cells from Ray-o-Vac (renewal rechargeable alkaline battery, part no. 713, size D/LR20). Duracell has provided an excellent feature with its attached battery check measuring stick. This allows some level of testing of the pack in the field when it's not in use.

You'll notice that I didn't mention nickel cadmium, or NiCd, batteries. NiCds come in a "D" cell, but each one produces only 1.2 volts, making them unsuitable for many 12-volt applications. Here's the problem: eight alkaline D cells will initially provide a voltage of 12 volts (8 x 1.5 volts), which decreases slowly with usage over time until it is too low to be useful. Eight rechargeable NiCd cells, on the other hand, only produce 9.6 volts initially (8 x 1.2 volts). This voltage holds pretty steady until the charge is nearly depleted, then drops rapidly—some will say suddenly—toward zero. What this means is that a used alkaline battery pack will still produce a higher voltage than a newly charged NiCd pack. End result? The NiCd cells may work in many cases, but your radio's power output will be substantially reduced, since the lower voltage can only drive a correspondingly lower current, thereby delivering less power. Worst-case scenario: some applications may not accept the reduced voltage at all. (if you look inside a typical AA NiCd pack capable of producing 12 volts, you'll find 10 cells, not eight).

Also, since alkaline cells have higher amp-hour ratings (a measure of cell capacity) than NiCd cells, they last much longer for a given output power. This means the total use time for a rechargeable cell will be shorter than for a standard dry cell. Yet, it has the advantage of reusability and, overall, there is a cost savings in reusing rechargeable cells, which is why they are popular.

An interesting compromise is to use the newer rechargeable alkaline cells from Ray-o-Vac. The battery pack described here accommodates any one of these types, though it's bad practice to mix them. Newer battery technologies are also available now, but a treatise in batteries beyond what has been mentioned would detract from the objective of this article, and so is left for another writing.

The Silicon Valley/ ARES Connector

A key factor for consideration is the interface between the battery and the world. The SVECs connector (Figures 1 and 2) is a popular interface device in the ARES and RACES groups in Northern California (*Actually, it's popular nationwide and has been designated by the ARRL as the standard ARES power connector—ed.*).

The SVECs connector is a Waldom/ Molex 03-09-X022 housing set using 0.093-inch (2.36-mm) diameter contacts for 12-amp operation. The connector protocol consists of male and female two-circuit polarized devices. They are passive friction lock housings with a

Photo B. A pocket camera case, available at most discount stores for between $5 and $10, offers a perfect fit as a case for the D-cell battery pack...with a possible bonus—see Photo C.

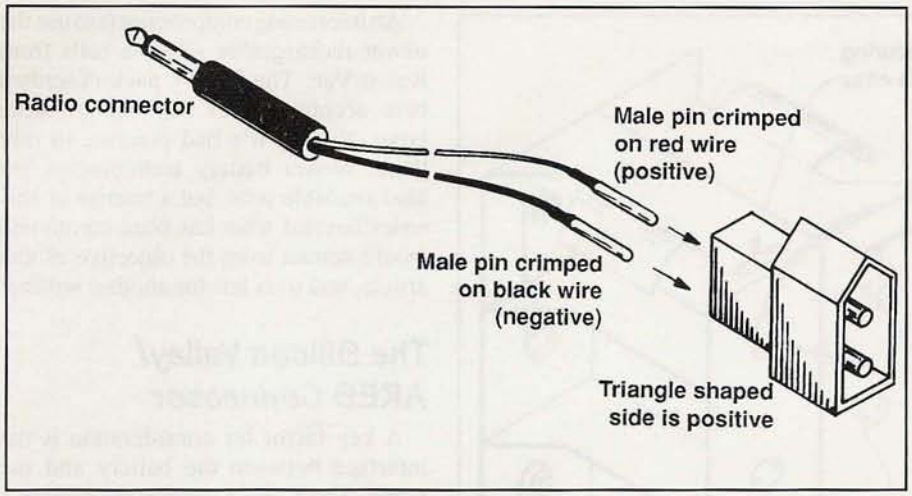


Figure 2. Details of the Silicon Valley Emergency Coordination connector (adopted for nationwide ARES use by the ARRL), pin connections, and placement. The male plug (containing the female pins and seen in Figure 1) always connects to the power source; while the female plug (containing the male pins) shown here is used for cables connecting to equipment.

temperature range of -40 to 105 degrees Celsius. They are not sealed or gas tight. The two-circuit housing is "keyed" to prevent reversal by having a triangle on one side of the housing and a square on the other. The male plug (Waldom/Molex 03-09-2022) with female pins (Waldom/Molex 02-09-1104 used with wire size 14 to 20 AWG) is located on the battery pack side to prevent shorting when the pack is in a pouch or storage package with other devices. The male pins (Waldom/Molex 02-09-2103) in the female receptacle (Waldom/Molex 03-09-1022) are recessed and enclosed.

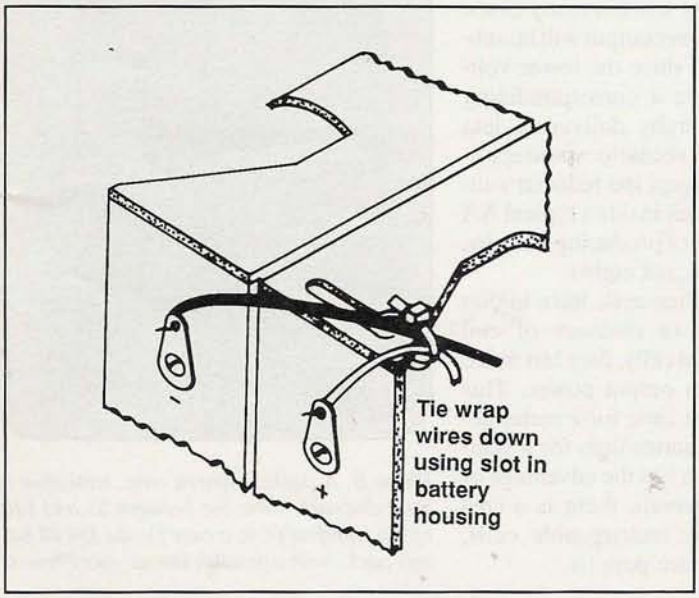
All the accessories, such as your handheld radio, emergency light, scanner, etc., are attached to a female jack with male pins. The acceptable wire size is #18 AWG or larger. A soft pliable fine wire, such as one with #36 AWG strands, should be used between the battery pack and the connector; usually about one foot is a convenient length. The external power connector for your handheld radio generally can be purchased from amateur radio supply dealers that carry your brand of HT, or from local electronics stores, such as RadioShack, or through mail-order services.

A third factor is portability. Thought should go into how to haul around such a pack. A carrying case is an excellent approach. It can be like the one I chose that was on special at Target (see Photos B and C; it's simulated leather with an extra pocket that fits my dual-band HT), or you can find similar cases at K-Mart, Wal-Mart, or other discount stores, for about $5. The choice will depend on what you plan to use it for. Simple pocket camera cases fit perfectly, and they usually include a belt loop and a shoulder strap.

Building Your Battery Pack

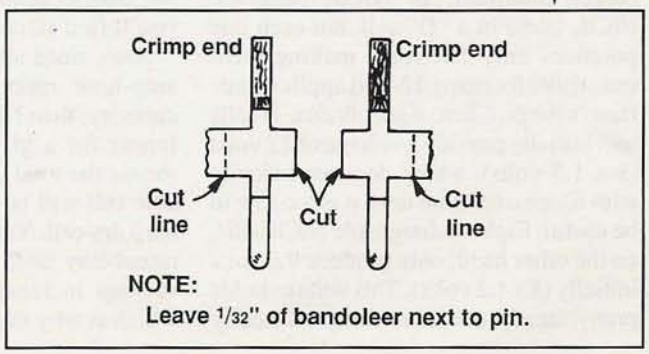
Construction of the battery pack is mostly mechanical. Some soldering is required (see Figure 1). Be sure to strip and tin (pre-solder) the wires before connecting them to the plastic battery holder, and solder your connections completely but *quickly* to keep from melting the plastic. In addition, make sure there are no *cold solder joints* (in which the solder is dull and often lumpy, rather than shiny and smooth). There can be several amps flowing in peak periods, and you don't want resistive losses due to a cold solder joint.

The battery pack listed in the parts list is a rugged one that easily holds the eight cells. It comes completely wired internally. The two terminals shown in the diagram need to be connected to your wire leads and to the Silicon Valley/ARES Connector. Place one tie wrap to provide a strain relief between the wire and the battery package, as shown in Figure 3. The tie wrap needs to be anchored to the case in order to serve as a strain relief so that tugging on the leads pulls on the case and not on the solder connection. You could also loop the wires through the slots in the housing to form a simple



← *Figure 3. Detail of recommended method of securing wires to the battery holder. A simple tie-wrap will provide enough strain relief to keep most accidental tugs on the wire from breaking a connection at the battery terminals.*

Figure 4. Don't completely remove the bandoleer from the male connector pins if you buy them at RadioShack. You'll need to leave 1/32 inch of the connecting material intact on either side to keep the pin from sliding out of the connector.



Parts List

Batteries

Standard D Cell:	Sanyo	GES-AC2D
	Duracell	MN1300
	Eveready	E95
	Ray-o-Vac	813

Or Renewable Cells from Ray-o-Vac, part no. 713 (size D/LR20)
Available at Wal-Mart or Target.

Battery Holder

Tech America	910-0343 (Recommended)
RadioShack	Not as sturdy

Connector

RadioShack	274 -222 (one complete connector w/pins)
Frys' Electronics	1651278 (three complete connectors w/pins)
Tech America	order 1 910-2772 (two-circuit receptacle)
	order 1 910-2775 (2 circuit plug)
	order 2 910-2762 female sockets for 14-20 AWG wire
	order 2 910-2765 male pins for 14-20 AWG wires
Waldom Electronics	1545PRT (three complete connectors w/pins and sockets)

Wire

Use stranded wire #18 gauge or greater size (greater size means a *smaller* number, such as #16 AWG), but use wire with fine strands. High-quality speaker wire works well.

Tech America	910-2086, #14 AWG (19 strands 27 AWG, good flexibility)
	910-1671, #14, AWG (monster speaker cable, excellent flexibility)
	910-1675, #14 AWG (monster speaker cable, best flexibility)
	910-2084, #16 AWG (26 strands 30 AWG)
	910-2082, #18 AWG (16 strands 30 AWG)

Case

K-Mart, Wal-Mart, Target, or any camera store

Crimp tool

Waldom Electronics	Recommended crimp tool is W-HT-1919, available at Allied Electronics

In-line Fuse

RadioShack	270-1217
Tech America	900-2468, use AGC or AGA fuses

Tech America sells an ATC add-a-line fuse adapter. It plugs into your current holder in the vehicle. It provides two fuse holders and a pigtail with a 10-amp circuit. This is a quick fix for a simple vehicle installation to get at 12 volts DC. It makes a great portable adapter for your radio.

Pin Extractor

RadioShack	274-223

Photo C. The camera case that Dennis got had not only a pocket for the battery pack, but also a spare pocket that easily held his HT.

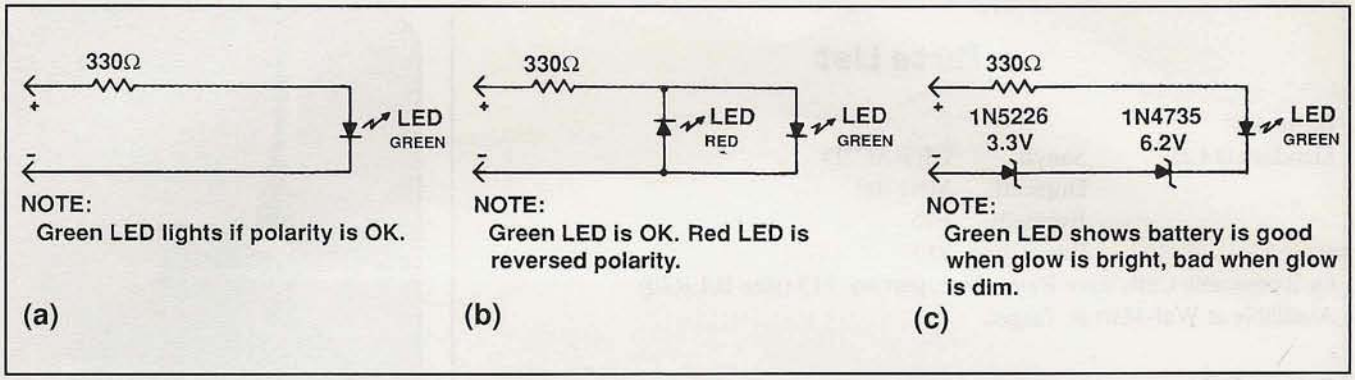
strain relief. If you choose the latter method, be sure the batteries will still easily fit in the holder.

A word of caution on the RadioShack pins for the SVECs connectors: they come as a bandoleer strip. Do not cut off the entire strip, as it acts as the mechanism that keeps the pins from going all the way through the housing. Leave about 1/32 of an inch of the strip on each pin. See Figure 4 for details.

Adding Accessories

Once your basic battery pack is completed, there are several accessories you might want to add.

A polarity-protector/dead-battery tester can be built as illustrated in Figure 5. The simplest tester uses a single resistor and LED, as shown in Figure 5a. If you're not red/green color blind, you can also use separate red and green LEDs (or a dual LED from RadioShack) as shown in Figure 5b. The red/green circuit could be modified by adding two Zener diodes (one each 1N5226 and 1N4735) to differentiate a good battery from a weak battery (Figure 5c). Any of these testers should be used before hooking up your radio to prevent damage from reversed battery polarity. Photo D shows a polarity tester (on the right), as well as a fin-



Simple circuits for testing battery polarity and charge. In Figure 5a, the green LED (light emitting diode) will light if the polarity is OK; in Figure 5b, the green LED shows correct polarity, and the red LED glows if the polarity is reversed. Finally, Figure 5c is a circuit for a quick battery tester—the green LED will glow brightly if the batteries are good and dimly when they need to be replaced.

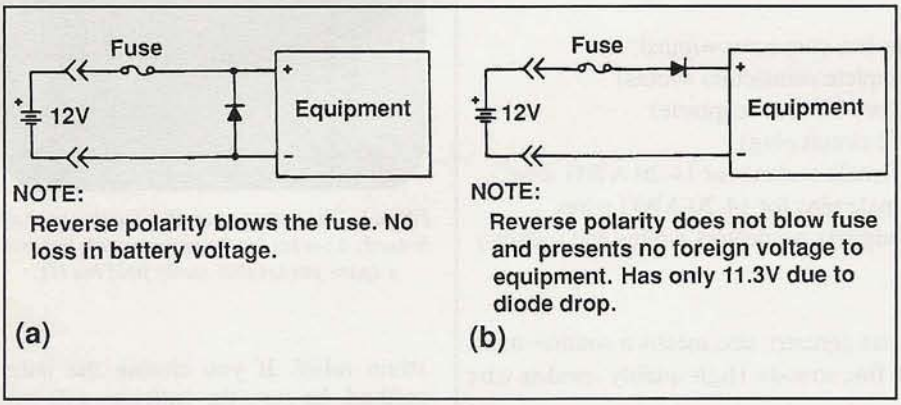


Figure 6. Alternate polarity protection circuits (see text for details). In Figure 6a, the diode in series with the power line won't permit reverse current flow, but it will drop the voltage to the equipment from 12 volts to 11.3 volts. If you don't want the voltage drop, you can put the diode across the line as in Figure 6b. This will blow the fuse in the event of reversed polarity but will maintain full voltage when current is flowing.

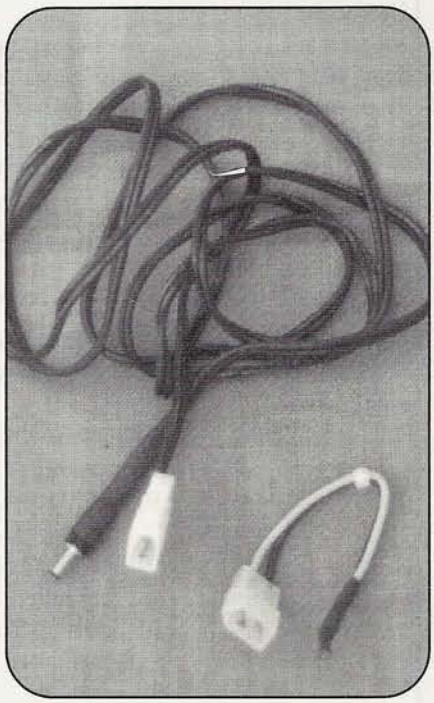


Photo D. Accessories make the ham—pictured here are a connecting cable from the battery pack to the radio (left) and one of the polarity/charge testers described in the text.

Looking Ahead in CQ VHF Ham Radio Above 50 MHz

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

- "Make Your HT Talk Forever," by Ken Collier, KO6UX
- "Hollywood Ham Watch," by Bill Tracy, KE6EJQ
- "222 MHz—The Forgotten Band," by Bill Cameron, KB2BZP

Plus...

- "Understanding the Computer in Your Ham Shack," by Lew Ozimek, N2OZ
- "*CQ VHF* Reviews:
  - M^2 "HO" Loop Antennas, by Gordon West, WB6NOA
  - ICOM IC-746, by Rich Moseson, W2VU

If you'd like to write for *CQ VHF*, you may download our writers' guidelines from the *CQ VHF* World Wide Web site at <http://www.cq-vhf.com> or FTP to <ftp://ftp.cq-vhf.com/cqvhf> and look for the file, "writguid.txt." Or, you may send a written request along with an SASE (self-addressed stamped envelope) to *CQ VHF* Writers' Guide-lines, 25 Newbridge Road, Hicksville, NY 11801.

ished connecting cable between the battery pack and the radio.

Another protective accessory you can build is a fuse connector interface, which can be added or built into in each of your accessories. Figure 6 shows two versions of the adapter. The version in Figure 6a with the series diode (1N4001 or equivalent that will handle the current) will reduce the voltage to the accessory. This may not be practical, however, so the version in Figure 6b, with a series fuse with a "bucking diode" (1N4001), is provided as an alternative. This will blow the fuse

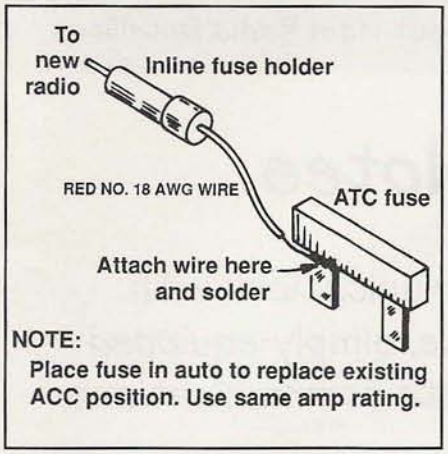


Figure 7. One step beyond...if you want to make this battery pack part of a complete emergency kit, you can wire up a 12-volt line from the "hot" side of your vehicle's "acc" fuse, through an in-line fuse connector. TechAmerica offers a premanufactured version of this same device.

if incorrectly hooked up, thereby protecting your valuable HT. Yet, for correct polarity connections, there is no voltage drop. For this version, be sure to keep spare fuses and make them fast-blow.

There are variations of the source side of the Silicon Valley/ARES connector that make a complete emergency kit. One such arrangement is an automobile fuse block adapter. An auto fuse adapter can be made to provide a special connection to an automobile fuse block using the ATO automobile fuse found in all later model U.S. and some foreign vehicles. This adapter can be found ready-made in the TechAmerica catalog (part no. 900-2386), or it can be made from a fuse by soldering a wire to the hot end of a fuse in the block (see Figure 7). An in-line replaceable fuse and a clip lead for ground completes the emergency automotive power source end assembly. This assembly, with a Silicon Valley/ARES Connector on the other end, makes a complete cable for your emergency kit.

Ready for Emergencies

Completion of the battery pack means you need to find a place for it in an emergency. The best place is in your emergency kit. A second pack also can be placed in the car. They are not expensive and will make the difference in an emergency. A final word: if you choose renewable batteries, they hold a charge many times longer than NiCd batteries but should be checked periodically. In any case, you wouldn't want your battery pack to "wake up dead." *Be Prepared.*

Acknowledgments

A special thanks to my "Elmer," Don "Wookie" Wilkins, KA6PSL. He provided creative thoughts and editorial guidance in writing this article. Thanks also to MARA club members who debugged and made the trial runs on the battery pack, and who contributed thoughts on the accessories. ■

Resources

Allied Electronics, 7410 Pebble Dr., Fort Worth, TX 76118; Phone: (800) 433-5700; Fax: (817) 595-6404; Internet: <http://www.allied.avnet.com>.

Digi-Key, 701 Brooks Ave. South, Thief River Falls, MN 56701-0677; Phone: (800) 344-4539 or (218) 681-6674; Fax: (218) 681-3380; Internet: <http://www.digi-key.com>.

TechAmerica, P.O. Box 1981, Fort Worth, TX 76101-1981; Phone: (800) 877-0072; Fax (orders): (800) 813-0087; Internet: <http://www.techamerica.com>.

Tune In With...

CQ VHF Ham Radio Above 50 MHz

Something this good could only come from the publishers of CQ

A NEW magazine for all ham radio operators who are active or interested in operating on the amateur bands above 50 MHz!

Don't Miss A Single Issue. Subscribe Today!

In every issue you'll find...
- Operating articles
- Projects you can build
- Technical articles
- Product reviews
- Beginner's articles
- News and Columns
- New things to try

and topics like...
- Repeaters & FM
- Amateur television
- Packet radio
- VHF/UHF "weak signal"
- Amateur satellites
- and much more!

	USA	VE/XE	Foreign Air Post
1 Year	☐ 24.95	☐ 34.95	☐ 44.95
2 Years	☐ 45.95	☐ 65.95	☐ 85.95

If mailing in subscription order, please enclose check or credit card information with expiration date (MasterCard, Visa, Amex and Discover accepted).

Please allow 6-8 weeks delivery

CQ VHF Magazine, 25 Newbridge Road, Hicksville, NY 11801
Phone 516-681-2922 , FAX 516-681-2926

AO-27 Operating Notes

You can make very effective long-distance communications with AMRAD OSCAR 27 (AO-27) using an inexpensive, simply-equipped FM satellite station. If you've never tried satellite communications, AO-27 may be the best place to start.

Satellites offer the most predictable long-distance amateur communications above 50 MHz. There are two factors, however, that keep some amateurs from becoming satellite operators. They are: a) the need for specialized satellite equipment; and b) complicated operating techniques.

AO-27 is perhaps the best "beginner" satellite because you can operate it with somewhat "generic" FM equipment and with very basic operating techniques. This article will tell you what equipment you need to operate on AO-27 and give you the information you need to successfully make contacts through this satellite.

Photo A. AMSAT-NA President Keith Baker, KB1SF, uses a handheld station to listen for a signal from AO-27 during the 1998 AMSAT Satellite Symposium in Vicksburg, Mississippi.

My First Contact on AO-27

I must admit I'm a newcomer to AO-27. While I have a lot of experience with other amateur (voice and CW) satellites, I avoided using AO-27 because I didn't want my "big gun" satellite station to prevent some newcomer from getting his or her first satellite contact. I decided to make a few contacts on the satellite for the purpose of writing this article (since it would be inappropriate for me to give "operating notes" on a satellite I never used). I made my first contact on AO-27 with VA3FWN in Ontario, Canada, on 20 December 1998 at 1624 UTC.

AO-27 Frequencies

AO-27 has a 2-meter VHF uplink (where you transmit) and a 70-centimeter UHF downlink (where you listen). Unlike the SSB/CW satellites that have a broad range of uplink/downlink frequencies, the FM AO-27 has only one of each (I'll explain why later). The uplink frequency is 145.850 MHz and the downlink frequency is 436.800 MHz. This satellite closely resembles a cross-band repeater except that, since the satellite is moving, there's a noticeable *Doppler shift* on both the uplink and downlink frequencies. Doppler shift is the same effect that causes a change to the frequency of the whistle on a passing train. I'll give you a practical way to compensate for the Doppler shift on AO-27's frequencies later in this article.

What Equipment You'll Need

To communicate through AO-27, you'll need a pair of headphones, a VHF transmitter, a UHF receiver, and antennas for both the uplink and downlink bands. Let's now discuss the specifics of the equipment.

Why do you need the headphones? Because you're transmitting and receiving at the same time. Your receiver is picking up your transmitted signal while you're talking. Without the headphones, your microphone might pick up your signal and produce feedback. Headphones prevent this from happening.

Just about any 2-meter FM rig will serve as your transmitter as long it can tune the range of 145.845 to 145.855 MHz in 5-kHz or smaller steps. For convenience, you should have at least three memories available for the transmit frequencies (more on this later). Five watts

By Ken Ernandes, N2WWD (n2wwd@cq-vhf.com)

Photo B. A pass of AO-27 interrupted the regular program at the AMSAT conference, as operators and observers converged on the hotel parking lot to try their luck.

of power is adequate to get a useful signal to the satellite.

Likewise, you can use as your receiver any 70-centimeter FM rig that can tune from 436.790 to 436.810 MHz in 5-kHz or smaller steps. Again for convenience, you should have at least five memories available for the receive frequencies. That's right—three memories for transmit, five for receive.

While beam antennas are preferred (particularly for the downlink; see Photos), most common antennas will work as long as the satellite is not in a one of the antenna's *nulls* (points of minimum sensitivity in an antenna's signal pattern). Just as an example of fixed antennas on AO-27, VA3FWN's QSL card lists a quarter wave antenna for VHF and an "eggbeater" for UHF. (By the way, VA3FWN also lists 5 watts of transmit power and he had a "full quieting" signal on my end.)

Handheld Satellite Stations

The most elegant AO-27 stations I've seen are handheld. Amateurs operating these handheld AO-27 stations have given several interesting demonstrations at recent AMSAT symposia. The 1998 AMSAT Symposium in Vicksburg, Mississippi was spontaneously interrupted when the hotel parking lot filled with about a half dozen handheld stations (see Photo A) and many more observers (Photo B) as AO-27 made a pass. These handheld satellite stations usually consist of a dual-band HT with a handheld dual-band antenna. Most use the Arrow II Satellite antenna shown in the picture. (The name "Arrow" derives from the aluminum arrow shafts that make up the antenna's elements.)

The "Arrow" Antenna

The Arrow II Satellite antenna has a three-element VHF beam and a seven-element UHF beam on the same boom, with the elements perpendicular to each other. The basic unit, Model 146/437-10 ($73), comes with a foam grip that makes it easy to point the antenna and track the satellite across the sky. Model 146/437-10W ($132) also has a duplexer filter installed to accommodate use with a dual-band HT. (See "Resources" for details on how to contact Arrow Antenna.)

At the AMSAT conference, Chuck Duey, KIØAG, demonstrated an effective way of using the Arrow antenna on AO-27 (Photo C). This involves getting the best overall polarization match between the satellite's antennas and the Arrow's VHF and UHF beams. The technique involves pointing at the satellite while rotating the Arrow's beam elements to get a good receive signal. You need to continue rotating the Arrow while transmitting and simultaneously listening to your signal. You have a good alignment when you hear yourself clearly on the downlink. You will need to periodically adjust the element orientation by this procedure during the pass.

Pass Predictions

AO-27 is in a sun-synchronous orbit. This is a special orbit type in which the highest elevation passes occur at more or less the same time each day (see February's "Orbital Elements" for more on sun-synchronous orbits). For middle latitudes in the Northern Hemisphere, AO-27 makes passes around 10:30 a.m. and 9:30 p.m. local standard time (approximately 11:30 a.m. and 10:30 p.m. during daylight savings time). These times are only a rule of thumb; you normally get two or three consecutive passes centered around this time, with usually an hour and a half between the end of one pass and the beginning of the next. (There is generally about 1:41 from the middle of one pass to the middle of the next pass.) Passes typically last 10 to 15 minutes over any one location.

Table. Doppler Profile for a Typical AO-27 Pass

Uplink (MHz)	Downlink (MHz)	Comment
145.845	436.810	Beginning of Pass
145.845	436.805	
145.850	436.800	Mid-Pass
145,850	436.795	
145.855	436.790	End of Pass

Table. If you're using a dual-band HT with 5-kHz tuning steps to operate AO-27, set up five consecutive memory channels as shown here, then tune through them during the course of each pass, adjusting both your transmit (uplink) and receive (downlink) frequencies to compensate for Doppler shift. See text for details.

This rule of thumb for tracking AO-27 should be good enough if you're using fixed antennas and are somewhat patient. If you want to use beam antennas, such as the Arrow II, you also need to know where to point the antennas to follow the satellite across the sky. Another rule of thumb I can give here is that the morning passes go from north to south and the evening passes go from south to north.

If there are two consecutive passes within range of your station on the day you want to work the satellite, the earlier one will pass east of you and the later one will pass to your west. These two passes will occur about 50 minutes before and after the listed times, with the maximum elevations of about 30 to 45 degrees, and will be near the east or west direction (as applicable). If, on the other hand, there are *three* consecutive AO-27 passes within range of your station that day, the middle one will pass approximately straight overhead, at the listed time (the first pass will be to the east and the third will be to the west).

If you want more accurate antenna pointing information, you can make pass predictions on your computer using satellite tracking software. If you plan to be outdoors or away from your computer during the pass, just print out the pass information and bring the sheet of paper with you.

AO-27 Operating Schedule

AO-27 usually operates only during the morning pass. The spacecraft has very limited electrical storage in its on-board battery, and that is dedicated to the primary payload, the commercial "Eyesat-A" transponder. AO-27 is the secondary payload and therefore usually only operates when the spacecraft is in sunlight.

Doppler Compensation

The Doppler effect is an increase or decrease in frequency that occurs when a sound or radio source is moving relative to the observer. The scenario you're probably most familiar with is the increase in the pitch of a train's whistle as it moves toward you, followed by a decrease of the whistle pitch after the train passes. Satellites move fast enough to have very noticeable Doppler shift on VHF and higher radio frequencies. On AO-27's FM signal, Doppler shift sounds like distortion and fading on the signal.

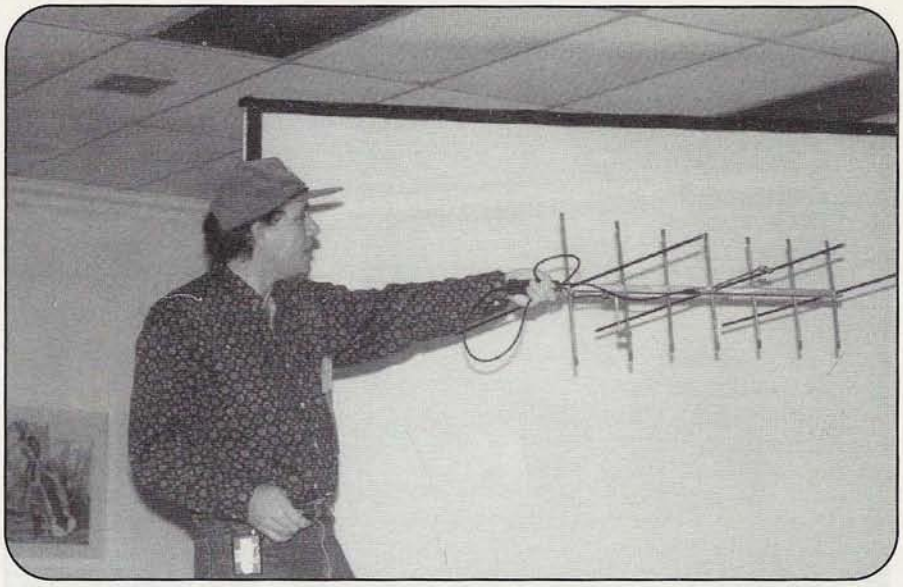


Photo C. Chuck Duey, KIØAG, demonstrates technique for lining up polarization of the Arrow antenna with the polarization of signals coming down from the AO-27 satellite. See details in text.

The observer (you) have to compensate for Doppler shift. The satellite cannot correct for Doppler since there is normally more than one user at a time, each at different locations on the Earth's surface. Except in unusual circumstances, the Doppler shift is different for each user (depending on how quickly the satellite is moving toward or away from the user). Each user adjusts his or her uplink and downlink frequencies so that the Doppler shift is neutralized from the satellite's point of view.

So how do you neutralize the Doppler shift from the satellite's point of view? First, keep in mind that in the early part of the pass, the satellite is moving *toward* you, so the uplink and downlink frequencies will be shifted to a *higher* frequency. Likewise, when the satellite is moving *away* from you (later in the pass), the frequencies are shifted to a *lower* frequency. To compensate for Doppler, you need to transmit at a *lower* frequency on the uplink and receive on a *higher* frequency during the early portion of the pass (i.e., while the satellite is moving toward you). You should be tuned "on frequency" at the middle of the pass. In the later portion of the pass, you need to transmit at a *higher* frequency and receive on a *lower* frequency.

This sounds more confusing than it really is. The easiest way to do the Doppler correction is to set aside some memories in your radio and switch from one frequency to the next, based on what sounds better coming from the satellite. You need to be receiving at the same time you're transmitting (i.e., have a full duplex link) to know how well your uplink signal sounds. The Table lists the three uplink frequencies and five downlink frequencies (in 5-kHz steps) in the order in which you would use them during a pass. Because the satellite uses FM, 5-kHz steps are adequate to provide reasonable tuning. However, if your radio can tune finer than 5-kHz steps, you'll get smoother transitions (but you'll have to tie up more memory channels).

So Why Aren't There More FM Satellites?

This is a very common question. After all, most hams today have FM equipment. Furthermore, Doppler correction for SSB and CW needs much finer tuning steps because these modes have smaller bandwidths. But there are two good reasons why FM satellites are not common.

The first reason is that electrical power is a precious commodity on a spacecraft. FM is a *full duty cycle* mode: full power is consumed any time the satellite is transmitting. On the other hand, SSB uses *amplitude modulation,* in which the transmit power varies between zero and full based on volume. FM is very inefficient in terms of power consumption when compared to SSB. It is because of this relatively high FM power consump-

tion that AO-27 is limited to direct sunlight operations.

The second reason that FM satellites aren't common is also an efficiency consideration: bandwidth. A single FM channel typically occupies about 16 kHz of bandwidth, while an SSB signal uses about 3 kHz. Thus, you could have five SSB channels in the same space as one FM channel. Most FM satellites have only a single channel, while satellites designated for SSB and CW usually accommodate multiple users over a range of frequencies.

Because of these efficiency considerations (and because it's much easier to detect weak SSB and CW signals) many amateur satellites use SSB and CW for modulation modes. There will be new FM satellites in the future, but FM will probably never become a dominant mode for amateur satellite communications.

Summary

You can communicate on AO-27 with a station as simple as a dual-band FM HT and a handheld antenna. Operating techniques are similar to those used on a repeater, except that you need to make frequency adjustments to compensate for the Doppler effect. This means being able to listen—through headphones—while you're transmitting.

The satellite is available for use during 10- to 15-minute passes that usually occur between 9:00 a.m. and noon local standard time (10:00 a.m. to 1:00 p.m. daylight time). This satellite will greatly extend your HT's communications range, giving North American stations (for example) coverage of much of the continent during each pass. ■

Resources

Arrow Antenna may be reached c/o Allen Lowe, NØIMW, 1803 S. Greeley Hwy, #B, Cheyenne, WY 82007; Phone: (307) 638-2369; Fax: (307) 638-3521; E-mail: <arrow146@aol.com>; Web: <http://members.aol.com/arrow146/>.

An excellent reference book for practical satellite operations is *How to Use the Amateur Radio Satellites*, by Keith Baker, KB1SF. This book is available from AMSAT, 850 Sligo Avenue, Suite 600, Silver Spring, MD, 20910; Phone: (301) 589-6062; Fax: (301) 608-3410; Internet: <http://www.amsat.org>.

Announcing

Spring Sprints Keep on Running

The ARRL decided to cancel its annual VHF "Spring Sprint" competitions, but groups of VHF contesters around the country have banded together to keep the events alive. Here's how they'll be "run" this year.

By Dave Bostedor, N8NQS*
(vhfuhf@voyager.net)

After the ARRL announced its intention to cancel the Spring Sprints, VHF newsletters and other VHF groups stepped up to the plate and expressed a willingness to receive logs, tabulate scores, and distribute certificates, according to the old Sprint rules. The plan is to receive logs by all means, including mail, e-mail, and postings to various VHF reflectors over the Internet. They will then be compared to determine award status, and certificates will be mailed to the winners. Here are the rules for the 1999 Spring Sprints:

1999 Spring VHF/UHF Sprints

1. Object: To work as many amateur stations in as many 2 degrees by 1 degree grid squares as possible, using authorized amateur frequencies on the 50, 144, 222, 432, 902, 1296, and 2304-MHz bands.

2. Contest Periods: The 144-MHz Sprint will be from 7 p.m. until 11 p.m. local time on Monday, April 12, 1999; the 222-MHz Sprint will be from 7 p.m. until 11 p.m. local time on Tuesday, April 20, 1990; the 432-MHz Sprint will be from 7 p.m. until 11 p.m. local time on Wednesday, April 28, 1999; the 902-MHz, 1296, and 2304-MHz Sprint will be from 6 a.m. until 1 p.m. local time (note time change from other bands) on Saturday, May 8, 1999; the 50-MHz Sprint will be from 2300 Z Saturday, May 15 until 0300 Z Sunday, May 16, 1999.

3. Exchange: Grid-square locator (Exchange of signal report is optional).

4. Scoring:

4.1. QSO Points: Count one point for each complete QSO.

4.2. Multiplier: The total number of different grid squares worked. Each 2 degrees by 1 degree grid square counts as one multiplier.

4.3. Final score: Multiply QSO points by multipliers. Each Sprint is scored separately.

5. Reporting: Scores must be submitted no later than two weeks after the closing of the event to:

144-MHz Sprint: Rocky Mountain VHF+ Group, P.O. Box 473411, Aurora, CO 80047

222-MHz Sprint: *50 MHz DX Bulletin*, 12450 Skyline Blvd., Woodside, CA 94062

432-MHz Sprint: North East Weak Signal Group, 458 Allentown Rd., Bristol, CT 06010

902, 1296 and 2304-MHz Sprint: Badger Contesters, 2342 Glendale, Appleton, WI 54914

50-MHz Sprint: Great Lakes VHF/UHF Group, 434 Pattie Ave., Jackson, MI 49202

All Sprint Internet log submissions in ARRL format to: <wz1v@ntplx.net>. ■

**Dave Bostedor, N8NQS, is Editor of the* Great Lakes VHF/UHF Newsletter.

Cheap Circular Polarization? It CAN Be Done!

There are many ways to generate a circularly polarized signal, but you don't have to spend a whole bunch of bucks. The secret? Don't put all the elements on the same boom.

So you want to improve your performance on satellite contacts and you decide you're going to invest in a pair of circularly polarized antennas for the job. But then you look at the price tag, times two, and you think that this just might have to wait.

Have no fear! Cheap Yagi Man is here! Let's see how we can build you a circularly polarized antenna for 435 MHz. But first, let's talk about *why* you'd need a circularly polarized antenna to begin with.

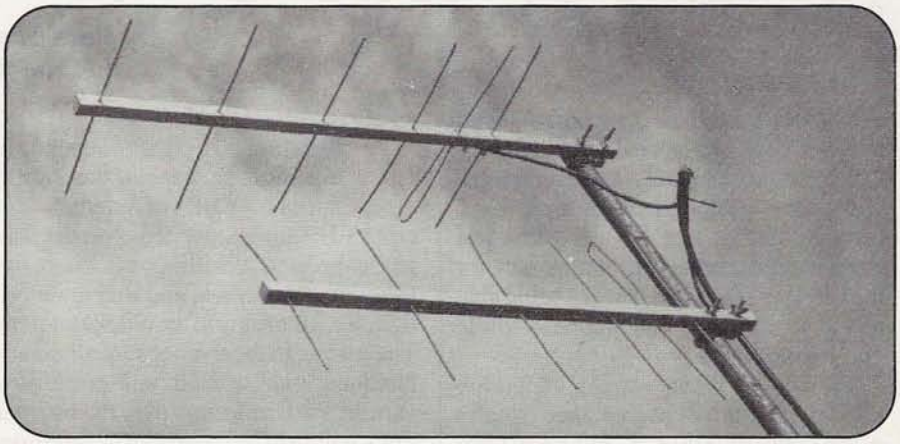


Photo A. Circularly polarized "Cheap Yagis." There's no need to have your circularly polarized satellite antennas on a single boom. Just build one quarter-wavelength ahead of the other, feed them through a phasing harness, and mount them 90 degrees apart.

Round & Round the Antenna Goes...

If you've been reading this magazine for more than a month or so, you'll know that the convention for hams on VHF is to use *vertically polarized* antennas for FM work and *horizontally polarized* antennas for SSB and code operating. This means that the antenna elements are vertical on an FM station and horizontal for an SSB antenna. We won't get into the reasons why now, except to point out that *cross-polarization*—in which one station is vertically polarized and the other is horizontal—can result in signal strength losses of as much as 20 dB (decibels). But what do you do when one station's antenna is slowly, but constantly, spinning between vertical and horizontal polarization?

Impossible, you say? Not if that antenna is mounted on a satellite, which spins to maintain its stability in orbit. When the polarization of a signal is constantly changing, your best bet is a *circularly*

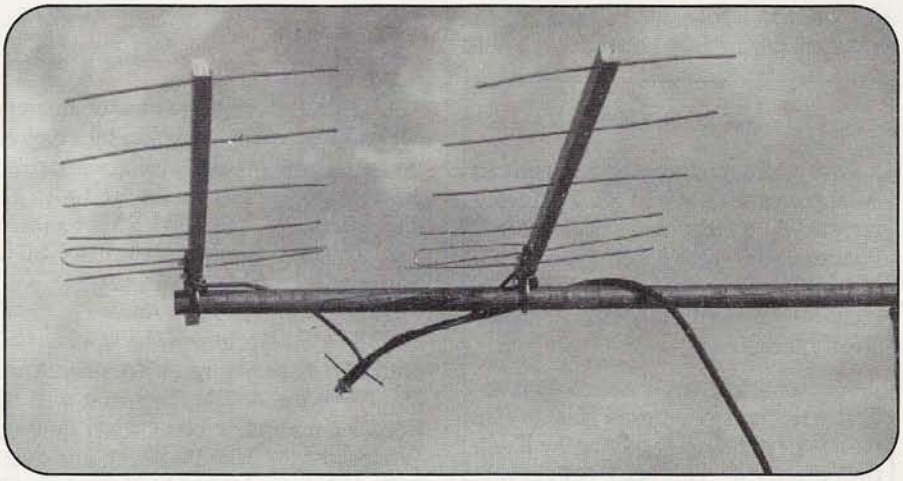


Photo B. Here we're using two antennas, mounted side by side like in Figure 1a. The antennas are in phase and give 3 dB more gain. This is the cheap ham's "stacked array" for terrestrial use. Mount the antennas as far apart as the phasing harness will comfortably allow. For vertical polarization, turn the page sideways.

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

"You can build three sets of these antennas for a fraction of the cost of the coaxial transfer relay that you need [to change polarization] with the single boom designs!"

polarized antenna. Here's how to build one—Cheap Yagi style.

The Cheap Yagi Approach

Most circularly polarized antennas consist either of a helically wound coil or of crossed vertical and horizontal Yagi elements fed through a *phasing harness*, a special cable designed to keep the signals in each antenna from canceling each other out! In most cases, all of the elements are on a single boom for ease of feeding and rotating to follow a satellite. *But they don't have to be!* (See Photo A.)

Mounting the horizontal and vertical elements on two different booms means you can use the tools and techniques described in past columns for building Cheap Yagis, and just build two for each of your uplink (transmit) and downlink (receive) bands. You can even "stack" them for terrestrial use. If you look at Photo B, and Figure 1a, you'll see two antennas, mounted side by side. These antennas are in phase and give 3 dB more gain than one antenna alone.

"But why didn't you build everything on one boom?" you might be asking.

Well, to be able to change polarization, I would have had to use some of those fancy (read *expensive*) coaxial transfer relays. You can build three sets of these antennas for a fraction of the cost of the coaxial transfer relay that you need with the single boom designs! And parts like coaxial transfer relays are virtually unobtainable for satellite operators in third-world countries, and even some areas of the U.S. (If you're a true diehard for single boom circularly polarized antennas, the two antennas can be built on a single

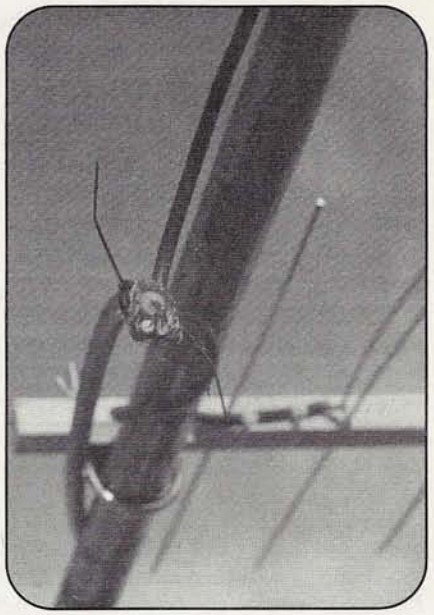


Photo C. The coax splicing might not be up to "professional" specifications, but it works and it most likely presents less loss than using PL-259s. Feel free to use BNC or N connectors. And if you're using the antenna outdoors for extended periods, be sure to use waterproof sealant whether or not you use connectors.

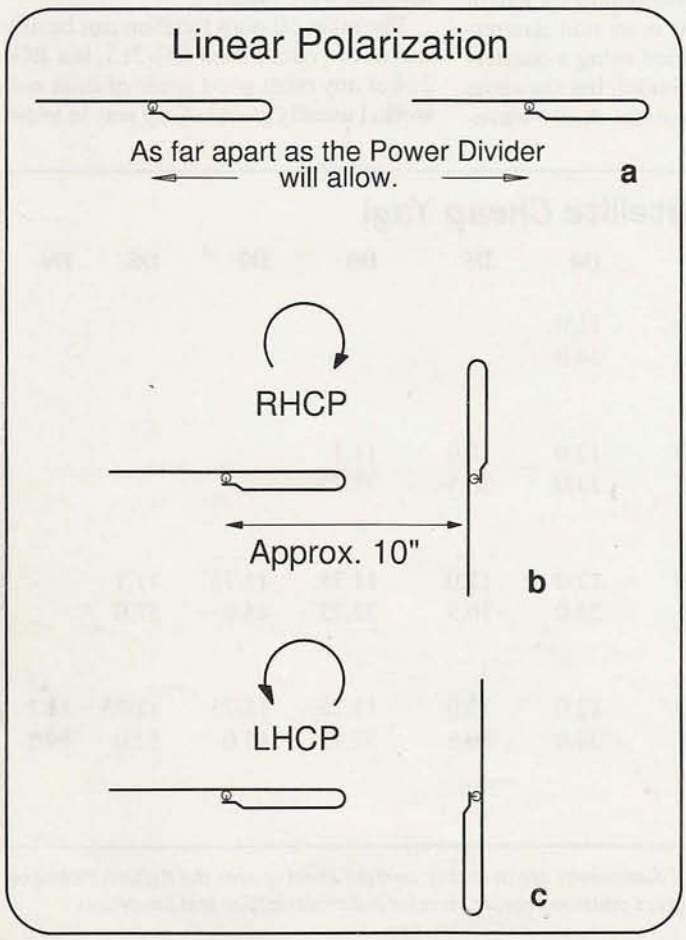
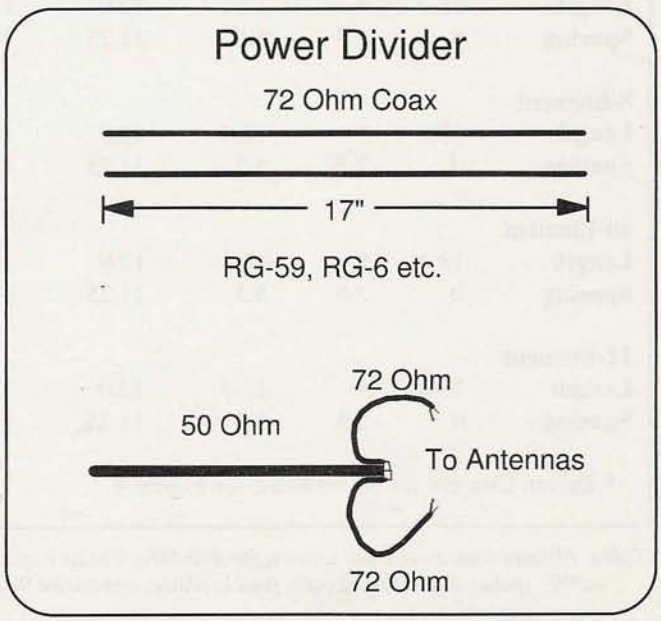


Figure 1. Arrangement of antennas for different polarizations. In Figure 1a, the elements are parallel for linear polarization and added gain. To achieve right-hand circular polarization (RHCP), as in Figure 1b, turn one antenna 90 degrees, with the folded portion of the driven element on top. Putting the folded portion on the bottom (Figure 1c) produces left-hand circular polarization (LHCP).

Figure 2. A power divider/phasing line is needed to feed two antennas with one signal. For the antennas described here, cut two 17-inch pieces of 72-ohm coax, connect one end of each to one antenna, then splice them both to the 50-ohm feedline from your radio.



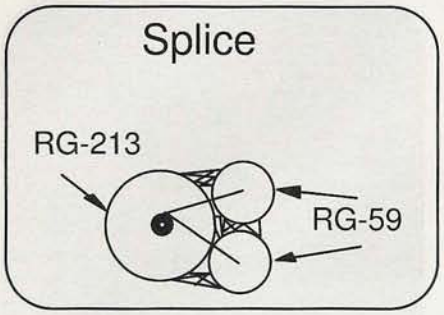


Figure 3. Detail of cable splicing between 50-ohm feedline (RG-213 in example) and the two lines of the phasing harness/power divider (RG-59 in example). BNC or N connectors may also be used.

boom. But there will be a few areas were the elements will be *real close together*. Just build one of the two antennas 6.5 inches farther along the boom than the other and use the same phasing harness as in Figure 2.)

I've included dimensions here for four different versions of this antenna: 6, 8, 10, and 11 elements (see Table). My NEC antenna modeling program predicts 11.2-dBi gain for the 6-element version; 12.6-dBi for the 8-element; 13.5-dBi for the 10-element; and 13.8-dBi for the 11-element versions. The 6-element has as 30-dB front-to-back (F/B) ratio and all the others should be over 40 dB F/B. The biggest field test of these designs was three years ago when N5EM made up an array for Field Day, using 16 of the 11-element versions. I understand they had a killer signal!

Building the Antennas

Please refer back to my previous columns on 70-centimeter Cheap Yagis for the basics of building these antennas. The original "Cheap Yagi" column in the August, 1998, *CQ VHF* is your best starting point, followed by this past February's issue (see "Resources" for information on ordering back issues). Everything is the same except for the element dimensions, which are listed here (see Table). Again, with all the Cheap Yagis, if you want to mount the antennas outside, a good coat of spar varnish, clear coat, or even house paint will greatly extend their operational life. Be sure to leave 4 inches on the back of the boom for the U-Bolt, and leave 6 1/2 inches more on the back of other boom.

Making the Phasing Harness

The phasing harness that lets you feed both antennas in phase requires a length of 72-ohm coax that is an odd quarter-wavelength long. I tried using a quarter-wavelength power divider, but the cable just wasn't long enough. A 3/4-wavelength power divider worked out quite well. You need two pieces of coax, each 17 inches long. The 17 inches includes the inch or so you use at each end. I used two lengths of RG-59 (remember, the phasing harness is 72-ohm coax, not 52). RG-6 also works pretty well, but it's hard to find any RG-6 these days that's not using aluminum shielding. Copper-shielded RG-6 is OK, provided you can find it. Connect the center conductors of the two pieces of the phasing harness to your 50-ohm feedline, and connect all the shields together as well, but be careful to avoid shorting the shields and the center conductors.

My coax splicing in Photo C and Figure 3 may not be up to NASA specs, but it works. By all means, if you want to use BNC or N connectors feel free to use them; I just wanted to show that you don't actually have to use connectors. My splice job probably has less loss at 435 MHz than PL-259 connectors, which is why I try to avoid PL-259s anytime I can. A little RTV sealant and some electrical tape would be a good idea if you plan to use the antennas outside for an extended period of time. I also used a tie-wrap to keep everything in place once the connections were made.

The main 50-ohm feedline can be any length of coax. I used RG-213, but RG-214 or any other good grade of coax will work. I usually go out of my way to avoid

Table. 435 MHz Satellite Cheap Yagi

	Ref	DE	D1	D2	D3	D4	D5	D6	D7	D8	D9
6-Element											
Length	13.4	*	12.4	12.0	12.0	11.0					
Spacing	0	2.5	5.5	11.25	17.5	24.0					
8-Element											
Length	13.4	*	12.4	12.0	12.0	12.0	12.0	11.1			
Spacing	0	2.5	5.5	11.25	17.5	24.0	30.5	37.75			
10-Element											
Length	13.4	*	12.4	12.0	12.0	12.0	12.0	11.75	11.75	11.1	
Spacing	0	2.5	5.5	11.25	17.5	24.0	30.5	37.75	45.0	52.0	
11-Element											
Length	13.4	*	12.4	12.0	12.0	12.0	12.0	11.75	11.75	11.75	11.1
Spacing	0	2.5	5.5	11.25	17.5	24.0	30.5	37.75	45.0	52.0	59.5

* Driven Element for all versions; see Figure 4

Table. Element dimensions and spacing for 435-MHz Cheap Yagis. All dimensions are in inches, and the spacing uses the Reflector element as "0" inches. Build two of each, feed in phase, and mount 90 degrees apart to provide circular polarization. See text for details.

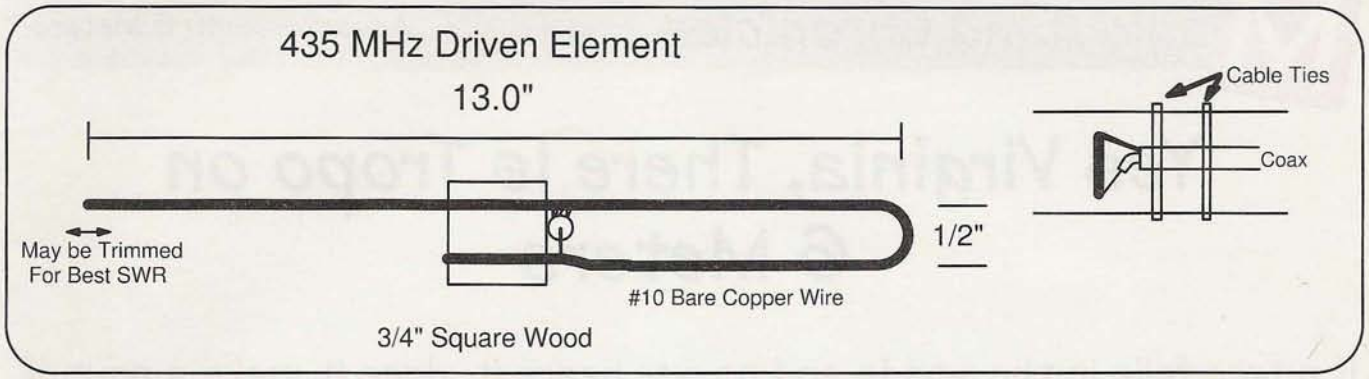


Figure 4. Detail of dimensions for driven element of all the antennas described in this month's column. See Table for dimensions and spacing of other elements.

RG-8 because most of that stuff gets very lossy after a few years. This will probably be a topic for a future article, but I only have one piece of RG-8 in my entire station. (It has terminal lugs on each end and is used to ground a roof top tower!)

Mounting Your Yagis

Mount the antennas as far apart as the phasing harness will comfortably allow. Another alternative is to mount one antenna a quarter wavelength, or 90 degrees (6 1/2 inches) in front of the other one and rotate its polarization 90 degrees (look closely at Photo A). By doing that, we generate a radio wave that appears to be spinning to the right. So the antennas in Figure 1b are *RHCP, Right Hand Circular Polarization.*

Next, we can flip one of the antennas over. This moves the antenna phasing 180 degrees, and presto, we have a radio wave that appears to be spinning *to the left.* So Figure 1c shows the *LHCP*, or *Left Hand Circular Polarization* set up.

Just by changing holes on a U-bolt (Photo D), we have the choice of linear (horizontal or vertical), LHCP, or RHCP polarizations. On Field Day and portable operations, these antennas lie down flat, taking up a whole bunch less space than the single boom CP designs.

Now for the technical guys who are good at picking flyspecks out of pepper: yes, the few inches of horizontal separation between the two antennas does mean that when looking 30 or 40 degrees off axis from the antenna, the antenna is elliptically polarized (sort of an egg-shaped circular polarization). But, hey, the whole idea is to point it where it works best.

What about 2 Meters? (And My Shop?)

Yes, I realize that most amateur satellites operate on two bands, with the most common combination being 435 MHz and 145 MHz (Mode B, Mode U/V, or Mode V/U, whatever your preference). When I started to build up this circularly polarized antenna, I looked around the shop and decided I'd better build the smaller one. Then the question came up, just how many antennas did I have in here? Well, a quick inventory counted 65 antennas in the shop. The depressing part was that was just the top layer! And that's not even counting the antennas out in the shed and the garage! Maybe it's time to do my spring cleaning, for 1985!

"Then the question came up, just how many antennas did I have in here? Well, a quick inventory counted 65 antennas in the shop. The depressing part was that was just the top layer!"

Want a 145-MHz circularly polarized version? Before I add #66 and #67 to the pile, perhaps one of our readers may want to give it a try. Just use the 144-MHz designs from October, 1998, *CQ VHF*. Mount one antenna 19 inches in front of the other. The 3/4-wavelength phasing harnesses would now be 48 inches long.

And before you ask, no, I haven't come up with a "Cheap Az-El Rotator" to help you track the satellites. You're on your own for that one! ■

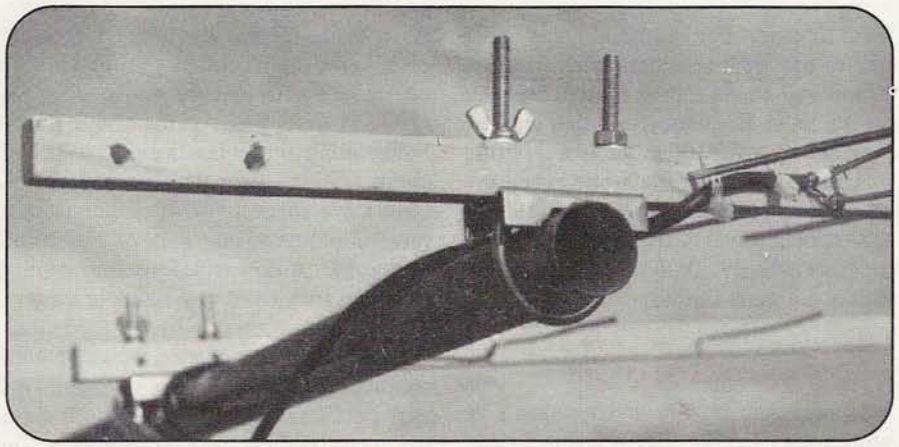


Photo D. Two pairs of holes for the U-clamp allow the antenna to easily be rotated by 90 degrees to provide any type of polarization that you need (see text for details).

Resources

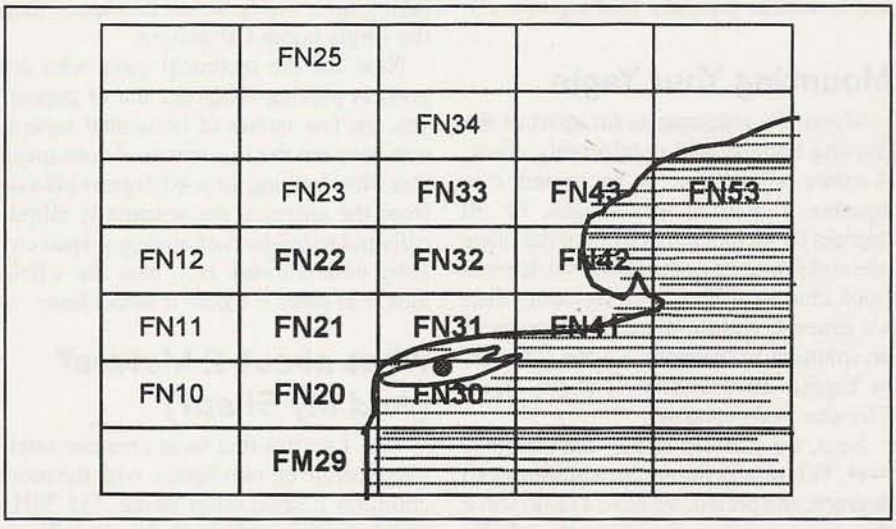
Back issues of *CQ VHF* are available for $4 each, postage included, to U.S. addresses. Write *CQ VHF* magazine, 25 Newbridge Rd., Hicksville, NY 11801; Phone: (516) 681-2922; Fax: (516) 681-2926. Be sure to indicate which issue(s) of which magazine you'd like, and include check, money order or credit card number and expiration date. We hope to have online ordering available very soon.

Yes Virginia, There Is Tropo on 6 Meters

If a tree falls in the woods and no one hears it, does it make a sound? If there's a band opening on six and no one works it, was it still a band opening? We don't know, either, but there's a lot of potential on the Magic Band that goes unrealized due to inactivity.

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

When VHF operators talk about tropospheric propagation (tropo), they generally refer to openings that they heard and/or worked on 2 meters. Yet, while it's not always obvious, there are significant tropo openings on the Magic Band throughout the year, particularly for stations located in coastal areas. Unfortunately, many of these openings are missed because of low activity; yet some great distances can be covered, even with low power.



Grids heard or worked on 6 meters by WB2AMU (FN30) in the January, 1999 ARRL VHF contest. Bold type indicates grids worked; normal type indicates grids heard. Several contacts beyond normal groundwave range appear to have been the result of a tropo opening along the coast.

What Is Tropo?

Tropospheric openings are generally the result of ducts forming in the atmosphere between two different weather fronts, usually a cold front meeting a warm front. Radio signals caught inside one of these ducts can travel beyond their normal line-of-sight range, sometimes up to 200 or 300 miles on VHF bands like 2 and 6 meters. These distances are less than sporadic-*E* range, however, because the tropo ducts occur at height levels that are significantly lower than propagation which occurs in the ionosphere (lower than 80 kilometers). Usually, the size of the duct will determine the frequency that can be carried in it, and it will generally be one or more—but not all—VHF bands. Thus, tropo conditions heard on 6 meters may not necessarily be heard on 2 meters at the same time.

In fact, tropo is often spotted on 2-meter FM because hams will sometimes find themselves keying repeaters from other areas on the same frequency as their local repeater. For example, hams using one of the local repeaters here on Long Island will sometimes get into a repeater on the same frequency in Atlantic City, New Jersey, over 150 miles away. I bring this point up to show that tropo events are discovered often on 2 meters because of the regular use that the band gets from repeater activity. On 6 meters, the situation is not quite the same.

Six-Meter Tropo

In previous feature articles that I've written for *CQ VHF*, I've pointed out surprise tropo-related openings that were discovered by accident during various operating events that occurred at what are normally quiet times on the Magic Band. For example, in a recent article on special event stations (see the January, 1999, issue), we made over 40 contacts in a three-hour period on 6 meters, with some noticeable tropo extensions into central Pennsylvania from our setup in eastern Long Island.

I came to the conclusion then that there are probably significant tropo-extensions that occur several times a month on 6 meters throughout the year, depending on

"The QSO covered a distance of over 275 miles, a new personal record for me via non-skip means on 6 meters. Again, it...revealed the presence of a tropo opening."

the weather patterns, that are missed due to low activity levels on the band.

In certain areas of the country, such as California, there are a lot of 6-meter repeaters, so tropo conditions—such as the southern California to Mexico path or the Hawaii to California path—can be spotted on 6-meter repeaters. Sometimes, monitoring the beacon portion of the band will reveal a beacon coming in by way of tropo from areas not normally heard through either line-of-sight or sporadic-*E* propagation.

Right Place, Right Time

You can get some good distances from these type openings, particularly if you're in the path of the duct. Sometimes, locations near ocean areas are good places to be. I saw this first-hand during this year's ARRL January VHF Sweepstakes. I was running a QRP portable operation, running 10 watts into a portable three-element Yagi from a bluff on the north shore of Long Island (Grid FN30), just a few hundred yards from Long Island Sound.

There was a lot of activity on 6 meters when the contest started and I found that I was hearing stations coming in from grids to my north that I normally can't hear, because they're in between the areas I can reach either by normal line-of-sight or via short sporadic-*E*. I heard Chip, W1AIM, in FN34 as well as signals from Canadian stations in FN25. Before it was over, I had worked a number of stations in southern New Hampshire and Maine (in grids FN43 and FN53), a generally difficult area for me to reach from FN30, with relative ease despite my 10 watts and small antenna.

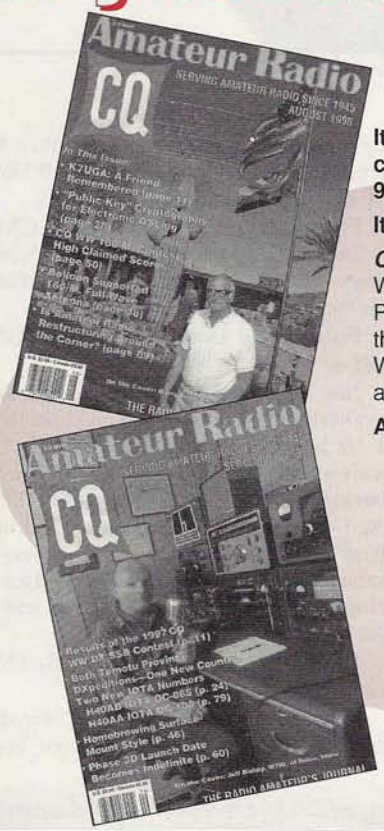
I couldn't believe it when I was able to work N1HOV in FN53, after another station, W1PM, told him I was calling him. He was coming in very well and he heard everything I sent in just one transmission (no repeats). The QSO covered a distance of over 275 miles, a new personal record for me via non-skip means on 6 meters. Again, it was a major event that revealed the presence of a tropo opening.

Later, when I talked to hams who participated in the contest from locations further inland, they said that they didn't detect the tropo enhancement that I worked from my location next to Long Island Sound. It would appear that I had the luck of the draw by choosing a location that put me in the path of the duct. While it's not always a hard and fast rule, locations near large bodies of water, such as bays and oceans, seem to be good spots to be when such an opening occurs.

This goes to prove that tropo-related openings can occur at any time during the year on 6 meters and that you should not give up on the band when there is little skip activity present—especially if you're lucky enough to live along the coast. But watch those weather maps and make some noise on the Magic Band. ■

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

If you enjoy Amateur Radio, you'll enjoy CQ



It's a different kind of ham magazine. Fun to read, interesting from cover to cover, written so you can understand it. That's *CQ*. Read and enjoyed by over 90,000 people each month in 116 countries around the world.

It's more than just a magazine. It's an institution.

CQ also sponsors these fourteen world-famous award programs and contests: The CQ World-Wide DX Phone and CW Contests, the CQ WAZ Award, the CQ World-Wide WPX Phone and CW Contests, the CQ World-Wide VHF Contest, the CQ USA-CA Award, the CQ WPX Award, the CQ World-Wide 160 Meter Phone and CW Contests, the CQ World-Wide RTTY Contest, the CQ 5 Band WAZ Award, the CQ DX Award, and the highly acclaimed CQ DX Hall of Fame. Accept the challenge, Join the fun. Read CQ.

Also available in Spanish language edition. Write for rates and details.

SUBSCRIBE TODAY!

CQ The Radio Amateur's Journal
25 Newbridge Road, Hicksville, New York 11801
Phone: 1-516-681-2922

For Fastest Service FAX 516-681-2926

	USA	VE/XE	Foreign
1 Year	☐ 27.95	☐ 40.95	☐ 52.95
2 Years	☐ 49.95	☐ 75.95	☐ 99.95
3 Years	☐ 71.95	☐ 110.95	☐ 146.95

MasterCard VISA AMERICAN EXPRESS DISCOVER

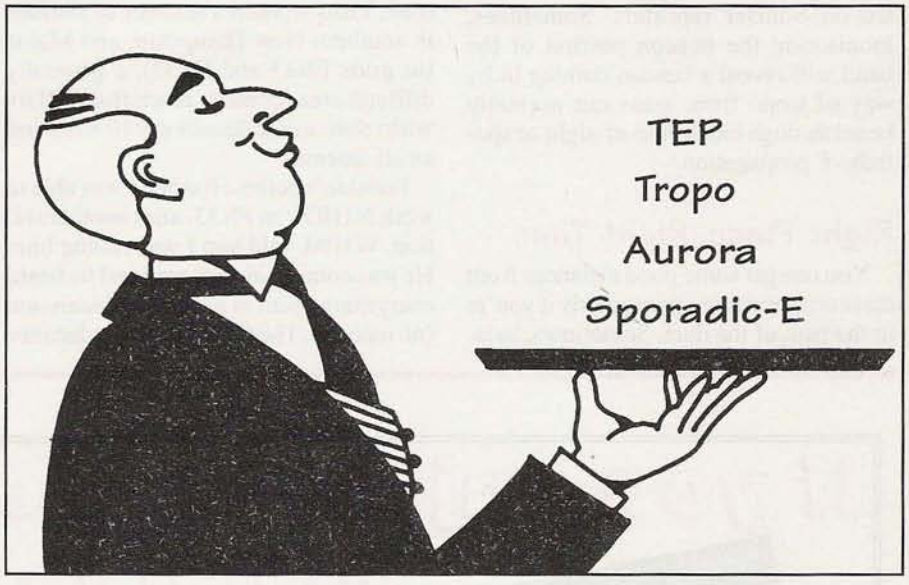
A Propagation Smorgasbord

Looking back to the beginning of the year, we see a little of this and a little of that in the propagation department, plus an overall increase in weak-signal activity fueled by HF+VHF multimode rigs.

January was an interesting month from a VHF/UHF propagation perspective. There was a little sporadic-*E*, a little tropo, a little aurora, a little TEP (transequatorial propagation), and a little bit of long-haul mixed-mode propagation. Generally, the openings that did occur were few in number and brief in duration, with the highlight being several 6-meter openings between the southwestern U.S. and Australia (VK)/New Zealand (ZL).

In addition, activity levels picked up for the ARRL January VHF Sweepstakes, with most reports indicating higher activity levels than in past years—much of it credited to the new crop of HF/VHF multimode radios—but only average to below-average propagation. Plus, despite the winter weather, there was a significant amount of rover activity (for the uninitiated, "rovers" are contest stations that travel to two or more grid squares during the course of a contest; they can be worked again for credit in each new grid that they activate).

We'll move right into the reports posted on the Internet, starting with general reports of band openings, followed by close-ups on the Caribbean, the U.S.-to-VK/ZL path, and, finally, a look at a few reports from the January VHF contest.



Activity Reports

From Ken Neubeck, WB2AMU, FN30:

Throughout January, there were openings of short duration on 6 meters from sporadic-*E*, meteor scatter, and aurora. On January 12, at 2215 Z, there was a brief aurora opening in which I heard W1TDS (FN32) and WA3WUL (FM29) from my QTH in FN30. Distortion was severe and the opening was brief, with no further signals heard after 2240 Z.

From Peter Heins, N6ZE:

Aurora noted north of Pittsburgh, PA, 14 Jan 99, 1000 Z. It was white and low in sky, duration approx. 10 minutes. Observed from an altitude of 37,000 ft.

Sporadic-E Out West...

From Pat Dyer, WA5IYX, EL09:

E-skip on 6 meters 1/15/99 from 0130–0440 Z, here in San Antonio, Texas; several unidentified Ch. 2 & 3 TV stations in via *E*s, with the programming indicating a spread over a few time zones, plus the following 6-meter beacons: 0250 NØLL/B; 0255 WBØRMO/B; 0256 XE2UZL/B; with some Colorado SSB to after 0440.

I hope that some of you were able to check out the Lowell digisonde plots at <http://digisonde.haystack.edu/search.htm> for the magnetic storm effects Jan 13 in the 2100–2300 Z period. The lowering of the F_2 layer along with its F_2 (ionization) increase is what caused the MUF (maximum usable frequency) to rise so rapidly then. Seeing their MUF drop from the high-30s to under 10 MHz in 30 minutes was dramatic!

From Larry Hogue, W6OMF, CM98:

Just worked Shep, W7HAH, in DN26 and Jerry, KC7YVZ in DN13...all into CM98 and on 50.126, 1/16/99, approx. 0200 Z.

From Dave Booth, KC6WFS, DM04 (#1 of 3):

Just had a very nice QSO with Doug, WØAH, in DM78 on 50.400 AM for the last 1 1/2 hours (0300–0430 Z, 1/16/99). There were a few others that came in while we were having fun: KC5OJT DM93, NØIPL DM76, AL1V, NØKQY DM98, and several others from the east that I did not hear. Was very nice to hear several stations on 50.400 AM tonight. Hope to hear more soon. I think DX will only get better from here on out.

From Brian Allen, NØVSB, DM79 (#1 of 3):

Six meters is open from Colorado to Midwest; maybe California soon. Missed

Compiled by Rich Moseson, W2VU (cq-vhf@cq-vhf.com)

"[Six meters] has been opening approx. usual times 2300 Z or so; stations being worked are PY (Brazil), LUs (Argentina), and CXs (Uruguay). Band openings usually last till about 0100 Z or even later at times." —WP4O, Puerto Rico

most of the opening, but 6 m was open to EM77, EM73, EM57, EM00. 03:00–04:00 GMT, 1/16/99. Listening on 50.125 for CA now, as signals are coming up on 10 meters.

From KC6WFS, DM04 (#2 of 3):

From DM04 (California), working DM95, DM65, DM86, EM15. 50.125. Time is 05:23 Z, 1/16/99.

From NØVSB, DM79 (#2 of 4):

Very weak, but 6 m is just open into Southern California. Worked WA5LIG/6 in DM13 (RST 33) 06:20 GMT 1/16. Listening and calling on 50.125, but no other takers yet.

From NØVSB, DM79 (#3 of 4):

Six meters again opened up from Colorado into the South (TX, LA) and then the Midwest (IL, OH), and then very strong into southern California. Opened at approx. 01:00 and closed around 04:00 GMT, 01/16/99. Might make for an interesting January contest if this continues!

From NØVSB, DM79 (#4 of 4):

Broken record...6 meters is open *again* into Southern California from Colorado. Worked KC6WFS (DM04), KD6BIS (CM93), and KJ6HI (DM03). Where is everyone else? 04:25 GMT, 1/16/99.

From KC6WFS, DM04 (#3 of 3):

Six meters just opened to the north (1700 Z 1/16), working VE7VDX CN89 on 50.125. 5/9 here in DM04.

TE and Tropo in the Caribbean

From Ed Rodriguez, WP4O, FK78:

1/24/99—Band has been opening approx. usual times 2300 Z or so; stations being worked are PY (Brazil), LUs (Argentina), and CXs (Uruguay). Band openings usually last till about 0100 Z or even later at times. Best contact was on 2 meters with CX1DDO at 2350 Z on 144.300. I was running 100 watts into an 8-el. quad up 25 feet (rig IC-746) with a Landwhier preamp. Signals on 6 meters have been noticeably getting stronger every night, LU2EG and I compare notes.

KP3A, KP4EIT, and KP4HX have been active during this period also. On the 21st thru the 22nd, I was copying Peter, PY5CC, 59 plus into my QTH in San Juan in FK78. I will be returning to my QTH in Aguadilla FK 68 on the 26 of Jan. Haven't heard any thing towards EU and the U.S.

From Oscar Morales, Jr, CO2OJ:

On this, my first 1999 2-meter opening, worked only a few stations from South Florida and K5LOW, EM22, and WA4EWA, EM63. Conditions were better in the early morning (1200 UTC), but at that time I had a *terrible* noise level on 144.200 MHz. Dean, W4WHN, told me that K5LOW had a big pile-up there, but the noise on my end was 10 dB over S9!! During the morning, I talked several times with Bill, WA4EWA, and he always had a 59+++ signal. Somebody installed a coaxial cable between our antennas and we were the owners of the band. Nothing heard besides our CQs!

At 1030 local time (1530 UTC), I made my last CQ but it seemed that everybody was at work. As Carl said, maybe it will be necessary for hams to put a beam up on the top of the buildings where we work.

From Ed Rodriguez, WP4O, FK68:

On 26 and 27 Jan, nothing heard on 6 meters today. At 0001 Z 28 Jan, first station heard on 50.110 is a ZP station (Paraguay). This was unusual, as I usually hear the TE moving from east to west. After Paraguay, the PY stations entered and the weakest of the countries was LU (Argentina) LU2EG, 52 report, I didn't try 2 meters tonight. Station here in Aguadilla, Puerto Rico (FK68) is IC 756 with 100 watts into a 4-el. quad up 15 feet (but I am 300 feet above sea level on a cliff overlooking the ocean).

The U.S. to Australia/ New Zealand—Plus ZL9CI

Wintertime in the northern hemisphere is summertime south of the equator, and December and January are prime months for 6-meter sporadic-*E* in the southern hemisphere. Mix it up with some other propagation modes (see WB2AMU's "Mix 'n Match Propagation" article in February's issue) and you've got some good 6-meter openings between the southwestern U.S. and Australia/New Zealand. Here are some reports:

From Ron Marosko, Sr., K5LLL, EL29:

Worked VK4AFL, VK4APG, and VK4KK on 6-m freqs ranging from 50.107 to 50.170 between 0220 Z and 0300 Z, 1/10/99. Sigs were 5X3 at best on SSB and 529 on CW for VK4KK. VK4APG, Peter, was in QG62lp. Running 100 watts to 6-el. beam at 40 ft.

Good to hear six open for DX again.

From David Batcho, N5JHV, DM62:

Australia is also coming into DM62. Worked VK4KK and VK4APG and my first Tasmanian: VK7GK. ZL video and audio very strong here. Where the heck was the ZL9?? (*Dave is referring to the ZL9CI DXpedition on Campbell Island, south of New Zealand; see box.—ed.*)

Now In Seattle!
RADIO DEPOT
ALINCO ELECTRONICS INC. KENWOOD
STANDARD
ICOM YAESU
ADI ASTRON BENCHER
CUSHCRAFT HEIL JPS
KANTRONICS LARSEN MAHA
MALDOL MIRAGE MFJ
AND MORE
1-800-291-9067
(206)763-2936 Local/Info
Competitive prices • Friendly service
Prompt shipping at reasonable cost
5963 Corson Ave. South, #176
Seattle, WA 98108
M–F 10:00am-6:00pm Pacific
Sat.10:00am-5:00pm

CIRCLE 77 ON READER SERVICE CARD

KB6KQ
LOOP ANTENNAS
• OMNIDIRECTIONAL
• SMALL SIZE
• PRE-TUNED
• HORIZONTAL POLARIZATION
• ALUMINUM CONSTRUCTION
• MOBILE or BASE OPERATION...
In response to your demands
NEW 10 METER ANTENNA $99.00 plus $20 s/h
6M-$95.00 ppd; 2M, 222 or 432 Mhz - $50 ppd...
Stacking harness for 2 antennas - $40.00 ppd
Need custom masting? CALL
KB6KQ ANTENNAS
NORM PEDERSEN
70 ARROWHEAD DR., CARSON CITY, NV 89706
(702) 885-7885 OR 841-1880 (FAX)
KB6KQNORM@aol.com

CIRCLE 73 ON READER SERVICE CARD

Roof Towers
GLEN MARTIN ENGINEERING
13620 Old Hwy 40
Boonville MO 65233

Model	Ht.	Base	Ant. Ld.	UPS ppd
RT-424	4.5'	24"	6 sq. ft.	$162.00
RT-832	8'	32"	8 sq. ft.	$234.00
RT-936	9'	36"	18 sq. ft.	$394.00
RT-1832	17.5'	32"	12 sq. ft.	$528.00

(660) 882-2734

CIRCLE 70 ON READER SERVICE CARD

"I talked several times with Bill, WA4EWA, and he always had a 59+++ signal. Somebody installed a coaxial cable between our antennas and we were the owners of the band. Nothing heard besides our CQs!"—CO2OJ, Cuba

From Jack Henry, N6XQ, DM12:

It's very interesting the different footprints we were having. In San Diego, DM12, I had VK2s instead of the VK4s. Worked VK2TWR, VK2DN, VK2VC, VK2XK, VK2FLI, VK2APG, VK2GN, and VK9VS. All SSB except VK2DN. Wasn't a pegging-the-meter-type opening. I had to struggle with some of the calls and reports because of high QRN. I could hear others calling, but they were just at the threshold.

The VK9VS reported to be in Norfolk Island could have been Jim, VK9NS. I was fairly sure of the "victor" phonetic, but I can see with the QSB how if I missed the first syllable on "november" I may have mistaken it for victor? Wouldn't be the first call I messed up.

Several have been asking about my trip to Bolivia. I will be in CP 15 thru 30 March and will be very active on 6 meters. 500 watts and medium size beam. I will have more info when I find out exactly where in CP I will be.

From Chris Edmondson, VK3CE:

Hi all. Just had a call from Bernie, VK3YTT, who worked ZL9CI at 0324 UTC from Morwell, Australia. Peter, VK3KAI, in Churchill, also made the path.

From Mike Foubister, ZL3TIC, RE66:

11 Jan, 99—0105 W5UWB 5/9 into Christchurch 50.105. At 0115 WA5UFH 5/7 50.105. Also lots of backscatter from ZL2 and 4; also VK2 and 3. At 0120 55.250 and 260 up to 5/9 with NTSC frame "buzz"; could not hear any audio on 59.750 so MUF must have been between 55.250 and 59.750!! Very strong 45.170 and 240 also 57.240, 250, 260 5/9++. Earlier was copying ZL9CI but very weak.

From Ken Jewell, VK3AKK:

Approximately 10 minutes ago at 0319 Z 11 Jan, I worked ZL9CI on 6 meters from Campbell Island on CW at 559. He had worked previously VK3AMK, VK3BDL, and VK7IK/3.

From Mike Foubister, ZL3TIC, RE66:

14 Jan 99—2216 very strong ZL1 TV 45.240, 250, 260 all 5/9++ worked ZL1ADP; 2230 very strong VKs; 2330 XE1KK/B strong up to 5/8; approx. 2355 ZL3NW worked N6XQ; 2345 49.750 up to 5/9

15 Jan 99—0105 W6JKB/5 5/5 50.105; 0130 other weak Ws on 50.110 but too weak to copy; 0135 55.260 NTSC video up to 5/9 but no audio on 59.750; 0200 W6JKB/5 on CW.

From Chip Margelli, K7JA:

No excitement in the contest. No *E* on six. No exciting tropo on two. But I did work VK2DN at 0239 UTC Sunday night (1/25) on 50.110 MHz CW! Without going to a snow-covered mountain top to do it! I hope your weekend was fun. Mine was FB!

January Contest Lowlights

Well, we could go on for another three pages here if we reprint all of the reports on the January VHF contest posted to the Internet VHF reflector—five or six more pages if we include the claimed scores. Suffice it to say that, in general, propagation was mediocre to poor, activity was up due to many new stations on the air, and the rovers were out in force despite the winter weather, activating a wide variety of rare and not-so-rare grid squares.

What we will share with you is the online competition for the *lowest* score! There were four entrants...

Dan Evans, N9RLA:

Anyone want to compete for lowest score??

Unfortunately, I only got to operate for about an hour, late Sunday evening. By that time, most everyone had called it quits, I guess. Propagation seemed pretty poor on 2 m, my only band this time. No time or equipment to Rover this time, so I got on from my "makeshift" home station. 3 QSOs, 3 grids, for a grand total of 9 points!

Cliff Buttschardt, K7RR:

Well, I'll rival you for the lowest score! I had only five contacts and five grids for three hours' effort! The sleet was just too much for us in CM95. The winds were severe, allowing only 432 operation and 144.2 SSB mobile. I know—California is supposed to be sunny, but not this weekend! This morning I heard that it was snowing on the valley floor in Both Fresno and Bakersfield.

Oscar Morales, Jr., CO2OJ:

I won that lowest score contest. In more than 18 hours of "white noise," worked only 9 QSOs/5 grids on 2 m and 4 QSOs/3 grids on 6 m. Not a record, but...a worst average.

Pete Heins, N6ZE:

My (2 watts & a whip) operation from EM79 (Cincinnati/Northern Kentucky Airport), in Covington, Kentucky, netted 3 QSOs on 6 m in EM79. About 1 dozen stations heard on 6 & 2 meters during the first hour of the Jan VHF SS. Can anybody beat this?

Note: The ARRL awarded South Florida First Place Certificates (Sept '92 VHF QSO Party) to K1FJM/4 and N4XIH in Homestead, Florida, for their dual entries of 1 QSO in 1 Grid on 2 meters. The one-QSO contest effort represented the "rebirth" of weak signal activity in Homestead, just 3 weeks after Hurricane Andrew ripped through. ■

The ZL9CI DXpedition to Campbell Island

Auckland and Campbell Islands, which have the prefix of ZL9, are located south of New Zealand, at about the point where the Pacific Ocean, the Tasman Sea, and the Southern Ocean, all come together. A group of hams, including VHFer Jon Jones, NØJK, made a DXpedition to Campbell Island in January, operating on HF plus 6 meters. Here's an update from Jon:

6 m. *Big* opening to Japan yesterday (Jan 14). Wow! Almost 70 guys! We will keep at this at the same times throughout the weekend. When not in use, the 6-m station is always on beacon mode from 1530 Z to 1000 Z. There is always someone in earshot in-case someone calls. 73 from the ZL9CI Team

(Note that Campbell Island is over 1,500 miles from ZL1—Northern New Zealand—so working ZLs on 6 meters or hearing ZL video may or may not indicate propagation to ZL9CI. Good Luck—Jon NØJK)

CUBEX QUAD ANTENNA CO.
40 YEARS OF QUALITY ANTENNAS
SKYMASTER H.F. KITS FROM $275.95
PRE-TUNED H.F. QUADS FROM $389.95
Quad Antennas From 2 Through 40 Meters
2 METER 4 EL. PRE-TUNED $49.95 + S&H
6 METER 2 EL. PRE-TUNED $69.95 + S & H
BEST PRICES ON DOUBLE BRAIDED "DACRON" ANTENNA ROPE
visit our new web site http://www.cubex.com
Write Or Call For Free Catalog
228 HIBISCUS STREET, JUPITER, FL 33458
(561) 748-2830 FAX (561) 748-2831

CIRCLE 65 ON READER SERVICE CARD

DELPHI INTERNET™
Get online with CQ VHF Ham Radio Above 50 MHz on Delphi!
To sign up dial
1-800-365-4636
with your computer & modem, and enter ELECTRONIC at the sign-up password prompt! You can find CQ VHF Magazine in the Radio & Electronics Forum (GO HOB RADIO).
http://www.delphi.com/electronic

CIRCLE 66 ON READER SERVICE CARD

Prairie Palaces

Unless hams band together and wield their political clout, warns N3DF, our hobby may be killed off—not by the Internet or even commercial interests that want our frequencies—but by restrictive covenants (CC&Rs) that limit our rights to put up antennas.

I hope things are going well in your part of the country. Here in Colorado, the economy is booming. Jobs are plentiful and construction is seemingly everywhere. We have some great new public works: a $4 billion airport (you may have read about the baggage system), a $500 million convention center, and a $250 million ball park (we could use a couple of good pitchers). On top of that, we have the 1998 Super Bowl champion Broncos, world-class skiing, and legendary beer.

A state so blessed can't help but attract new residents. About 50,000 people moved here last year (net in-migration). That's a lot, considering a total state population of only about 3.9 million. Some of these newcomers competed for the available older houses and a few built custom homes on large lots. Most, however, bought tract homes in developments. Who can blame them? Three-car garages, whirlpool baths, and vaulted ceilings appear to be the norm. They allow "prairie palace" living at a relatively affordable price. Scores of these developments dot the countryside in the Denver metro area.

The Curse of the CC&Rs

Virtually all of the homes in the new developments come with an extensive set of covenants, conditions, and restrictions (CC&Rs). Most older developments, marketed over the past 20 years or so, are encumbered by them as well. CC&Rs are contractual promises that run with the deed and bind the current and all future owners of the property. These CC&Rs contain a lot of prohibitions. Typically, you (the homeowner) can't leave a boat or RV in the driveway for too long. You can't paint the house fuchsia without permission from the homeowners' association. Most importantly, you can't erect an external ham radio antenna.

Well, so what? A dedicated ham moving today to Colorado can surely accept the limited choices afforded by older housing, which come without CC&Rs, for the sake of putting up an antenna to work the ham satellites. That's fine, although I can't help but remember that my parents moved into their house in the New York City suburbs in 1954, before the era of CC&Rs. I was six years old and there were no hams in the family. As a high school student in the 1960s, I got my Novice license and built a Heathkit HF/VHF station (Novices had 2-meter voice privileges back then). My father said, "Let's put up some antennas and see who you can work." My dad and brother later got their licenses, as well. This story is unlikely to be repeated in a CC&R-controlled development.

It is clear to me that, in another decade or so, a majority of Colorado homeowners will live under CC&Rs that prohibit external ham antennas. As time continues, the size of that majority will increase. The day will come, perhaps even within my lifetime, when a house in Colorado that is not subject to CC&Rs will be a relatively rare find.

I know of Colorado radio clubs that have wonderful programs to attract and license middle- and high school-aged kids. Already, some of these youngsters find that advancing beyond the HT stage can be discouraging due to CC&Rs. How many thousands of amateurs and would-be amateurs in Colorado will be prevented by CC&Rs from fully developing their interest in ham radio in coming decades? How many will be lost nationwide?

Time for Ham Action

Current federal law (the Telecommunications Act of 1996) voids any CC&Rs that prohibit the erection of small broadcast satellite antennas. Someday soon, the amateur community must band together to secure legislation that will void any CC&Rs that prohibit external amateur antennas. If we don't, fully engaging in ham radio is going to be a privilege enjoyed by a rapidly diminishing percentage of my fellow Coloradoans, and my fellow Americans. ■

The opinions expressed in this column are those of the author and do not necessarily reflect the views of CQ VHF *or its publisher, CQ Communications, Inc.*

If you have an opinion on this issue or another matter of importance to the VHF ham community, we'd like to hear from you. Well-reasoned, well-written commentaries will be considered for our Op-Ed page. If we publish your Op-Ed article, we'll give you a complimentary one-year subscription (or extension of your current subscription) to CQ VHF. *Submissions not accepted for the Op-Ed page may also be considered for Letters to the Editor.* CQ VHF *reserves the right to edit all submissions for length and style.*

By Neil Friedman, N3DF*

*Neil D. Friedman, N3DF, is an attorney/CPA in Boulder, Colorado, where he receives WWV better than you do. He's been passed over for the Dayton Hamvention's "Ham of the Year" award 34 times.

(Rubber) Duck Tales

The ubiquitous "rubber duck" antenna—everybody's got 'em, everybody hates 'em, but everybody uses 'em. Here are some tips to help you get the most out of your radio's rubber duck.

We're back with another installment of "Short Skip," our new column of "bits and pieces" of interesting or useful VHF information that aren't long enough to make up a full feature article. Once again, our host this month is Arnie Coro, CO2KK.

—W2VU

Hose Clamp Saves Rubber Duckie

Have you ever lost a rubber duckie handheld radio antenna?

It usually happens at the worst possible time...and although you can replace it simply with a quarter-wavelength of wire, the fact is that one generally ends up buying a replacement antenna.

"To avoid losing my last 'helically wound, plastic-protected short vertical,' or rubber duck, I have installed an adjustable hose clamp that keeps it from turning the wrong way in the BNC female connector and falling out."

To avoid losing my last "helically wound, plastic-protected short vertical," or rubber duck, I've installed an adjustable hose clamp that keeps it from turning the wrong way in the BNC female connector and falling out. I just put the hose clamp over the BNC itself, in a position that will not allow the rubber duckie to turn and get lost! Hose clamp cost...about 50 cents. Look at the price tag for a high-quality rubber duck and you'll see that the little hose clamp's cost and the time to fit it are both well worth the effort...even when compared with flea market prices for "surplus" rubber ducks.

**Arnie Coro, CO2KK, is an active VHFer and a regular contributor to* CQ VHF. *He is known around the world as the host of two shortwave programs on Radio Havana Cuba, and he is a professor at the University of Havana.*

Rubber Duck Antennas... They're Not All Alike!

After losing a second rubber duckie antenna (and before building my hose clamp duck-protector), I replaced it with another one lent to me by a friend. To my surprise, with this "new" antenna, I could access a faraway repeater while running the rig on low power, something the "lost" antenna could not do.

I was really interested in seeing what the difference between them was, so at a radio club meeting, I asked several 2-meter HT owners to let me try their rubber ducks on my radio. Using the distant repeater for comparison, and much to our amazement, we found that *not all rubber duckies are created equal*!

The shorter ones provided the worst performance, something that we all expected; but we also found out that some antennas of almost equal length showed quite a difference in performance.

Step two was to do a more "scientific" experiment, by powering the rig from an AC to DC regulated supply and measuring the relative field strength with a nice professional field intensity meter. This was done in a large parking lot...no obstructions for maybe 50 or more wavelengths around.

"...at a radio club meeting, I asked several 2-meter HT owners to let me try their rubber ducks on my radio. Using the distant repeater for comparison, and much to our amazement, we found that not all rubber duckies are created equal!"

Results showed that it's worth testing different helically wound and rubber- or plastic-covered antennas if you want to run your 2-meter handheld with the most efficient one. We watched in amazement as some antennas exhibited much higher losses than others which looked almost identical. Finally we tested both a quarter-wavelength whip and a half-wavelength end-fed vertical. As expected, signals went up dramatically when using either the whip or the end fed antenna.

So...maybe you'd like to run some similar tests and install the most efficient rubber duck available. But don't forget that it's always a good idea to carry a quarter-wave whip or a 300-ohm TV twinlead J-pole when you're traveling... just in case you need that extra little bit of talk power.

Accessing a distant repeater during a road emergency, for example, is always going to be a lot easier with the better antenna, and, if you need to keep in contact using battery power, the more efficient antenna may allow you to run the rig in the low power setting and conserve battery life. ■

By Arnie Coro, CO2KK* (inforhc@mail.infocom.etecsa.cu)

Letters

Your Spot to Speak Out

CQ VHF *welcomes comments and suggestions from readers. We'll print a representative sampling each month, and we reserve the right to edit letters for length or style. All letters must be signed and show a return mailing address or valid e-mail address. Writers' names will be withheld from publication upon request. Address letters to: Letters,* CQ VHF, *25 Newbridge Rd., Hicksville, NY 11801; or via e-mail to <letters@cq-vhf.com>. Please specify that it is a letter for* CQ VHF *magazine.*

A Sympathetic Chord

Dear *CQ VHF*:

The January *CQ VHF* arrived during the time of each new year that I devote to examining the past 12 months and planning for the coming year. I try to evaluate the state of my personal and professional life and even give some thought to my hobby. Your editorial struck a very sympathetic chord. In thinking about where ham radio is now and where it may be going, the concern topping my list was leadership...

The future will be full of digital, cellular, and satellite communications. The spectrum will start at VHF and go up from there. These frequencies and modes will define the technical training ground that has always been a part of ham radio. It will, if leadership takes us there.

Everyone in the ham "establishment" who is concerned about the health and future of the hobby needs to examine his own stewardship. What kind of ambassador am I? Based upon my behavior, would a non-ham find our hobby an attractive one? Would a neophyte ham find in me a kinship and a reason for continuing in the hobby? Every time I turn on my equipment, I need to be mindful that my on-the-air conduct might influence people I'll never know or meet in their hobby choices...

Our hobby, in a mirror-image reflection of American life, has become a collection of separate interests pulling in different directions. We need a leadership to show us the wisdom of tolerance and the power of working in a unified manner that will serve our common interests. Ninety-eight percent of my HF operating time is spent on CW, but I believe we must work for regulations which will allow us to share at least a part of the 80 to 10 spectrum with those possessing VHF licenses. Whether they know the code or not isn't important. Making the hobby a richer, fuller experience for all of us is. Leadership in that direction goes through a minefield; those who provide it will have to be heroes, indeed. 73,

Joe Veras, N4QB
Birmingham, Alabama

A Sounding Board

Dear *CQ VHF*:

Just a few words about ham radio and your magazine. When I subscribed a year or so ago, I was hoping to see articles on the latest in VHF/UHF, of which there have been a few. However, there seem to be too many who want to use the magazine for a sounding board for all their complaints. Or they want to impress someone about how hi-tech they are and don't have time to learn an outmoded mode like Morse code. When I see the latter complaint, I feel that the writer is probably a repeater surfer and just doesn't know how effective CW is for weak signal work.

I have taught beginners' classes for ham radio and have had six-year-old kid and men and women in their upper 60s who mastered the code with little problem, so it should be a piece of cake for a hi-tech person.

One article that I liked was on using logarithms to figure power gain and loss (December, 1997, issue). This sure would help someone taking the higher written ham radio tests. I always like to see pictures of and articles about super antenna arrays (the kind I can't do here). That was a good cover picture of W4ZD's EME array on the December ('98) issue. How about something on low-noise preamps and easy-to-clone power amps for 222 and up? It would also be interesting to see comparisons of VHF/UHF gain antennas. 73,

Curt Fouse, K8UC
Washington, West Virginia

Curt—We believe a magazine should be a form of two-way communication, and we try to provide a forum for all opinions on important matters. As for "repeater surfers," I hope you're taking some time to stop in on one or more of your local repeaters and telling folks there about all the cool stuff you're working at the bottom end of the band; and if you succeed in sparking some interest, then perhaps inviting a "surfer" or two to come operate with you. There is no substitute for first-hand experience and a one-on-one relationship with an "Elmer."

Mix 'n Match Propagation

The following letters were directed to Ken Neubeck, WB2AMU, regarding his article, "Mix 'n Match Propagation," in the February 1999 issue:

Dear Ken:

Bravo!! What a great article in the February issue of *CQ VHF* on "Mix 'n Match Propagation." The language was clear and the examples added the necessary practical touch to the article. It not only confirmed what I had suspected was happening on 6 meters, but told me why it was occurring. Now, I'll be much more aware and "ready" for the possible mixed modes of propagation at certain times of the year. *Wonderful job*!

Lefty Clement, K1TOL
Lewiston, Maine

Dear Ken:

I want to thank you for all of your articles and books. The article in this month's *CQ VHF* is one of the most enlightening that I have read.

Jim Hoover, N1HOV
Torsham, Maine

Incendiary Cartoon

Dear *CQ VHF*:

Page 43 of my February '99 issue of *CQ VHF* caught fire when the inductor in the cartoon heated up to past 451 degrees. For resonance, you need a capacitor, not a battery. The title should have been "Artist in Heat." Otherwise, keep up the good variety, especially WA5VJB's articles. If you took the $150 W2NJS used to have his FM rig professionally installed, and gave it to Kent, he could assemble a complete contest-winning VHF/UHF station! Best regards,

Rick Campbell, KK7B
Portland, Oregon

Rick—Thanks for setting us straight on that "hot issue." And thank you for giving us the opportunity to correct an oversight and identify the cartoonist as Lisa Roberts, KF6NWO.

borhood. But more important than the coupons and the directory of local businesses is the knowledge that someone knows you're there, and cares enough to come say "Hi"...you feel welcome in your new community.

As Pete O'Dell explains in this month's "Beginner's Corner" column, ham radio is a community, one that crosses many geographic boundaries, but is very much a community nonetheless. And every community needs a Welcome Wagon.

What Ryan Needs to Do

Of course, even the Welcome Wagon can't keep up with every person who moves into town, especially a big city like Chicago. Sometimes, the new neighbor needs to call the Welcome Wagon and ask to be welcomed! I have to wonder whether Ryan and/or his brother made the effort to talk to the "old men making lunch plans" on the local repeater. Perhaps they'd have been invited to join them. Perhaps those "old men" had some valuable experience to share. Perhaps the help they're so desperately seeking was sitting out there waiting to be asked. Maybe over lunch. Maybe at a club meeting.

But many new hams are reluctant to make that first move. Some fear rejection, especially if they've heard stories of old-timers telling newcomers to get lost or publicly berating them for some minor lapse of on-air etiquette. Some are just shy, something that's quite common in ham radio. There are probably as many reasons as there are silent hams. So it falls to us, those who are active, those with even a little bit of experience, to open the door and invite them in.

Your Mission...

Last month, Neil Dabb, KC7GCL, wrote about recruiting young people to ham radio. He titled it, "Mission Impossible?" If you're old enough to remember the TV show by that name (and, unfortunately, you probably are), then imagine you're Jim Phelps and you've just walked into the telephone booth containing the hidden tape message:

Good evening Mr. Phelps. There are one hundred new ham radio operators in your community who have never been on the air, who have no idea of the opportunities available to them, and who have no idea how to make contact with other hams in the community. If they don't make contact soon, they'll be lost to the hobby forever.

Your mission, should you choose to accept it, is to go to your radio club and volunteer to head a welcoming committee for new hams. Recruit active, involved, friendly club members to join you in your efforts. Contact the American Radio Relay League for a list of new licensees in your area. Then reach out to them, make them feel welcome, and help them enter fully into the community of amateur radio.

"Your mission, should you choose to accept it, is to go to your radio club and volunteer to head a welcoming committee for new hams....Don't assume that someone else will do it. They won't."

Don't assume that someone else will do it. They won't. Don't assume these new hams will find you on their own. They won't. Don't assume that they'll get on the air and become active without your help. They won't.

Good luck, Jim And one more thing: If you choose not to accept this assignment, your hobby will self-destruct in five to 10 years.

But again, it's a two-way street. If you're a new ham, don't wait for someone to come to you. Talk to people on the repeaters. Introduce yourself. Add something interesting to the conversation. Ask about going to a club meeting. And if you don't know where to find a club in your area, call the ARRL for help at (800) 32-NEW-HAM.

A Final Challenge

Ryan's letter brings up one other significant problem facing ham radio today: boring conversations! Old men making lunch plans. Your final challenge for this month is to try to make your on-air conversations interesting enough to capture someone else's interest, to prompt them to key their microphones and ask to join in. And when they do, by all means, welcome them with open arms. They are the future of amateur radio. ■

Help Wanted

If you're involved with a project or activity that you think would be of interest to your fellow *CQ VHF* readers, we'd like to hear from you. Article submissions are welcome, as are "Op-Ed" opinion pieces if you have a point of view you'd like to share about a VHF-related topic. You can contact us by mail at 25 Newbridge Rd., Hicksville, NY 11801 (send an SASE for writers' guidelines), by e-mail to <cq-vhf@cq-vhf.com>, or via our World Wide Web page, <http:// www.cq-vhf.com>. We look forward to hearing from you.

Short Skip

The following letter was directed to author Arnie Coro, CO2KK, about our new "Short Skip" column, which premiered in the February issue:

Dear Arnie:

Tnx so much for the great articles in *CQ VHF* magazine's February issue! It's always good to hear from you there. The last three articles I read were back in mid to late 1997, and I was hoping that you would write again soon. It's always interesting to get different ideas and see different things done differently in other countries. For instance, here in the U.S., 145.500 to 145.800 MHz on the 2-meter band is usually reserved for experimental activities, such as communication between the space shuttle and Earth. I looked through my repeater guide and couldn't find any U.S. repeaters here. As a matter of fact, the 1999 ARRL guide doesn't even have a listing for the 145.600 Cuban machine! Perhaps it is a new installation since the book was printed. 73 es good DX,

Arnie Stenborg, KB1CKJ
Hanover, Massachusetts

Arnie S.—You'll find more "Short Skip" from Arnie C. in this month's issue. And we're planning to keep you supplied with regular doses of CO2KK articles in the future as well.

Y2K Correction

The following letter was directed to "In the Public Interest" editor Bob Josuweit, WA3PZO:

Dear Bob:

Your article in the February, 1999 issue of *CQ VHF* is very interesting and timely. There is at least one very small error, on page 58. In Table 2, July 1, 1999, is identified as "Start of IRS Fiscal Year 2000." That is about three months early. The IRS, like all federal agencies, has a fiscal year starting October 1. The fiscal year end moved from June 30 to September 30 in the late '70s. I work for the IRS and we are very aware of when the fiscal year ends. We usually start running short of money a few weeks before year end!

Vollie Miller, W4TDB
Via e-mail

replacement for him after his term expired last year and has not been active. Dietz says a new organization, the Oklahoma Repeater Coordination Group, has been formed with the goal of "continuing on where ORSI left off." Dietz says he continued to function as state frequency coordinator after his term expired because no replacement had been named, and he has agreed to continue doing so for the new group. There's been no public response as yet from any ORSI officers or directors.

TO-31 Satellite Open for Use; Others Have Problems

The TO-31 satellite, also known as TMSAT, has been opened for general amateur use, according to the AMSAT News Service. TO-31 is a 9600-baud digital satellite with an uplink on 145.925 MHz and a downlink on 436.925 MHz.

Meanwhile, the RS-16, WO-18, and KO-23 satellites were all off the air at press time, and SEDSAT (SO-33) continued having power problems that keep it from going into service. WO-18 and KO-23 are having software problems that are expected to be temporary. Attempts to send commands to RS-16 have been unsuccessful. In addition, DOVE (DO-17) remains off the air and unresponsive to ground control after nearly a full year.

On the good news side, OSCARs 16 through 19 celebrated their ninth anniversary in orbit in January. And while the 17 and 18 birds are having difficulties, AO-16 and LO-19 are functioning normally and remain the workhorses of digital amateur satellite communications.

N2WWD Named to AMSAT Strategic Planning Team

CQ VHF Satellite Editor Ken Ernandes, N2WWD, is one of eight amateur satellite operators named to AMSAT-NA's Strategic Planning Team, which will review AMSAT's current mandate and make recommendations to the group's Board of Directors on whether any changes in that mandate are needed. All of the team members are either AMSAT officers or hams involved in developing hardware and software for current and future satellite projects.

Moonbounce Pioneers Are Silent Keys

Two EME (Earth-Moon-Earth) pioneers died within days of each other in January, both at age 92. On January 21, Orrin "Hank" Brown, W6HB, died in California. According to the *ARRL Letter*, Brown engineered the west coast end of the first-ever amateur EME contact in 1960. He later went on to become the marketing director for Eimac, the tube manufacturer.

Four days later, John DeWitt, Jr., N4CBC (ex-W4ERI), passed away at his home in Tennessee. In 1946, while an Army Lieutenant Colonel, DeWitt led the team that bounced the first radio signal (a radar transmission) off the moon, proving that radio waves could pass through Earth's atmosphere and into space. In civilian life, DeWitt made a career in broadcasting, eventually becoming president of radio station WSM in Nashville.

Getting Started Videos

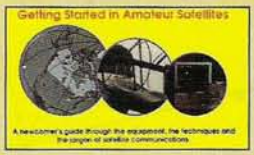
Getting Started in Ham Radio– How to select equipment, antennas, bands, use repeater stations, grounding, basic soldering.

Getting Started in Packet–De-mystify packet. Info on making contacts, bulletin boards, networks, satellites.

Ham Radio Horizons–Step-by-step instructions for the prospective ham on how to get involved.

Getting Started in VHF–Intro to VHF. Repeater usage, packet, satellites and more exotic VHF op modes.

Getting Started in Amateur Satellites– How ops set up stations. Locate and track ham satellites.



$19.95 each–
Buy more and save!
Buy 2 or 3 for $17.95 each
Buy 4 to 6 for $15.95 each
Buy all 7 for your Club for only $99.95!!

Getting Started in DXing– Top DXers share experiences with equipment, antennas, op skills and QSLing.

Getting Started in Contesting– Advice and op tips from Ken Wolf, K1EA, K1AR and others!

Name _____
Address _____
City _____
State _____ Zip _____

Qty
_____ Getting Started in Ham Radio
_____ Getting Started in VHF
_____ Getting Started in DXing
_____ Getting Started in Packet Radio
_____ Getting Started in Ham Satellites
_____ Getting Started in Contesting
_____ Ham Radio Horizons
_____ Total Videos X $_____
= $_____
Shipping/ handling $_____
Total $_____

Also available in PAL format.

U.S. and possessions - add $4 shipping/handling. *FREE S/H on orders $50 and over.
Foreign - shipping/handling charges are calculated by order weight & destination. *A $4 credit will be applied for Foreign orders over $50.

Call Toll-Free 1-800-853-9797

Credit Card No._____ Expiration date_____

Method of payment ☐ Check ☐ Money Order ☐ Visa ☐ MasterCard ☐ Discover ☐ American Express

CQ Communications, Inc., 25 Newbridge Rd., Hicksville, NY 11801/516-681-2922; Fax 516-681-2926

Basics

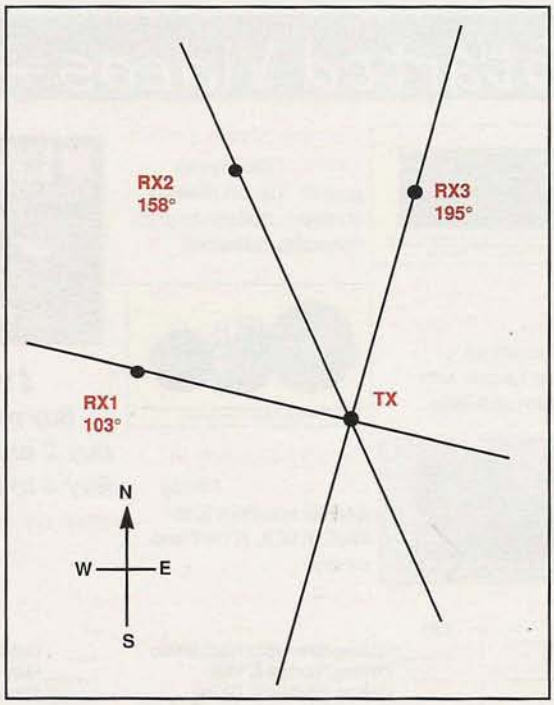
Radio Direction Finding

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. It's also a lot of fun!

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.

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.



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!

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

Some T-hunters use a Doppler detection system, a high-tech alternative to triangulation. This is the same system used by police departments to track stolen cars equipped with LoJack® RF alarms.

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.

On the other hand, KØOV says Doppler systen aren't very sensitive to weak or horizontally polarized signals. "On our local hunts," he says, "beams work better than Dopplers....Beams may be 'low-tech,' but they win the hunts around here."

Whether you take the low- or high-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. ■

Connecting with Packet Networks

There are three ways of making contact with someone on packet radio. If the person is nearby, within range of your transmitter and antenna, you can connect directly. To do that, simply type "C-space," and the call of the person you want to contact. Then press return.

But if you're too far apart for a direct connection, you'll need to use a *packet network*.

Network stations are called *nodes* or *switches*. They receive, briefly store, and then forward your packets either to another ham, a bulletin board or another network node station.

Using "TheNet" Nodes

The most common nodes are part of networks using "TheNet" or "NetRom" software. You connect to the node and, from there, connect again, either to another node or to the station you're trying to contact.

Nodes generally don't use regular ham callsigns. Instead, they use shorter "aliases" which are intended to give you some idea of what they do or where they're located. So, if you live in Raleigh, North Carolina, you connect to "RNC." The WA2SNA bulletin board in Northern New Jersey uses the alias, "BBSNNJ." It *is* legal, by the way, since the node sends out its callsign along with its "alias."

If you're not sure how to route your message, connect to the node, then type "nodes" and it will send you a list of other nodes that it can contact. You then use the same "C <callsign or alias>" command to connect to the next node in line.

The node acknowledges each of your transmissions itself, then retransmits what you sent with your callsign followed by a "dash-15." That means your message is being relayed through a network node. You can then string together as many nodes as you need to reach the station you want to contact.

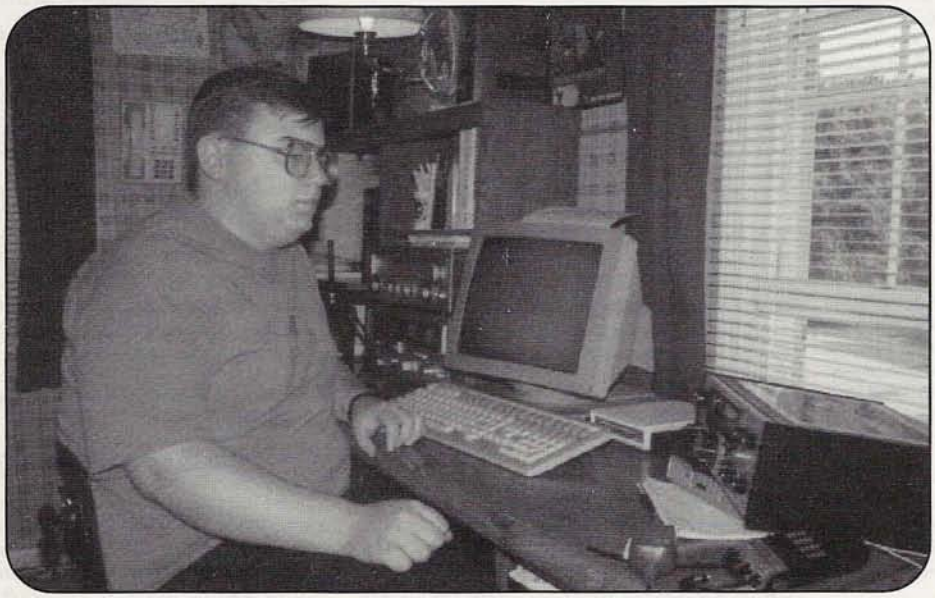
When you're done with your contact, you need to disconnect—generally by typing "B" or "BYE" and pressing "enter." Often, you must disconnect separately from each link in the chain. This can be good, though, if you want to explore what the different nodes along the way have to offer. If your first disconnect dropped all the links, then you'd have to rebuild the chain for each new connection.

If you get confused, sending the node a "/h" or "/?" command will generally bring you to a help screen. Many nodes include the procedure for getting help in their sign-on messages, so be sure to read those carefully. One final note: After you've disconnected, you may still be in "converse" mode, so you may have to tell your TNC to re-enter the "command" mode before you make your next connection.

Other Networks

While "TheNet" and "NetRom" are the most commonly-used networks, there are several others in use around the country. These include the ROSE network and Texnet, among others. Each uses a slightly different approach to getting you hooked up with a faraway station. And the digital ham radio satellites have their own special system for relaying information. What they all have in common, though, is their ability to let you relay real-time contacts (except on satellites), messages, files, and computer programs.

If the tips we suggest here don't seem to work for you, try to make a direct contact with a packet station in your area (look for a regular callsign with a "*" before it and no numbers after it), and ask for help. You might even make a new friend in the process. ■



Packet networks can expand your VHF horizons by connecting you with other hams and packet "servers" (automated stations performing a specific function beyond the range of your own signal. Here, Lenny Mack, KB8KTC, operates his packet station in Fair Lawn, Ohio.

CQ VHF Hamlink

CQ VHF "Hamlink" offers *free listings* of clubs, licensing classes, and exam sessions for up to four months at a time! *Plus*, for $1/month or $10/year, we also offer listings of **ham-related** *personal* Web sites (*commercial* **ham-related** Web listings are $5/month or $50/year).

Web site listings must be accompanied by payment in full in check or money order in U.S. dollars and mailed to *CQ VHF "Weblink,"* Attn: Bernadette Schimmel, 25 Newbridge Road, Hicksville, NY 11801. Credit card orders are accepted by mail, phone (516) 681-2922, or fax (516) 681-2926. Club, class, and exam listings may be submitted to *CQ VHF* "Clublink," or via the Web at <hamlink@cq-vhf.com>. Be sure to say what it is in the subject line (e.g., Club Listing).

Club Listings

CA, El Cajon, Amateur Radio Club: Meets 2nd Thursday of each month at 7 p.m. La Mesa Church of Christ, 5150 Jackson Dr., La Mesa, CA. Visitors welcome. Repeater: 147.420 (output) 146.475 (input) 107.2 PL. Nets: WAMO/YL/Young persons (<16); E-mail: <KF6ILA@hotmail.com>; Web: <http://www.eylar.com/arcec/>.

CA, Fortuna, Redwood Amateur Radio Club: Meets 1st Tuesday of every month at 7 p.m., CDF building, 118 Fortuna Blvd., Fortuna, CA. Repeater at 147.090+.6. Info e-mail: <KE6JQW@aol.com>.

CA, Fremont, South Bay Amateur Radio Association (SBARA): Meets the 3rd Wednesday of every month (except June abd December) at 7:30 pm., Freemont Community Center, 40204 Paseo Parkway, Fremont, CA. For information about SBARA, see our club Web: <www.qsl.net/sbara>, e-mail: <sbara@qsl.net).

CA, Fullerton Radio Club: Meets 3rd Wednesday of every month at Fullerton Senior Center at 340 W. Commonwealth Ave., Fullerton, CA at 7:30 p.m. PST. Tuesday night net repeater 147.975, 8 p.m. PST. Visitors welcome. For more info, visit Web site at: <http://ourworld.compuserve.com/homepages/kc6yhm>, or call Mike Cramer, KC6YHM, (714) 996-4510.

CA, Sacramento Amateur Radio Club: Meets 2nd Wednesday of every month at 7 p.m., Sacramento Blood Bank, 1625 Stockton Blvd., Sacramento. Visitors welcome. Repeater W6AK 146.91- PL100. Info at P.O. Box 161903, Sacramento, CA 95816-1903 or Tom, KQ6EO, at (916) 722-9358, or e-mail: <ke6eo@jps.net>; Web: <http://home.sprynet.com/sprynet/w6ak>.

CA, Santa Barbara Amateur Radio Club: Meets 3rd Friday of month September–May at 7:30 p.m., County Schools Auditorium, 4400 Cathedral Oaks Rd., Santa Barbara. For more information about SBARC, see club Web site: <http://www.sbarc.org>; or call (805) 569-5700.

CA, South Orange Amateur Radio Association (SOARA): Meets 3rd Monday, Monthly, 7:30 p.m., Norman P. Murray Community Center, Mission Viejo, CA. Visitors welcome. Primary Repeater: 147.645(-). For information write: SOARA at P.O. Box 2545, Mission Viejo, CA 92690, call (949) 249-1373, or e-mail: <soara@cahaba.com>.

CA, Ventura County Amateur Radio Club: Meets 2nd Friday of each month at 7:30 p.m., Oxnard Public Library, 251 S. "A" Street, Oxnard. For more information about VCARC, see club Web site: <http://www.fishnet.net/~k6mep>, or call (805) 642-5770.

CO, Bicycle Mobile Hams of America: National non-profit club of bicyclists who use VHF radios for emergencies, lost riders, route information, chatting, etc. 450 members in 46 states, 6 countries. Annual Forum at HamVention. Net: 14.253, 1st & 3rd Sundays, 2000 UTC. E-mail: <hartleyal@aol.com>. For info, sample newsletter, send SASE to BMHA, Box 4009-CV, Boulder, CO 80306-4009.

FL, Clearwater Amateur Radio Society: Meets 7:30 p.m. 2nd Tuesday of each month, Clearwater Red Cross, 624 Court St. Linked repeaters: 146.97 (103.5), 224.94, 444.15 (103.5) and 444.575 (131.8) Club net: Wednesday at 8 p.m. Web: <www.fgcarc.org/cars>; E-mail: <k2sec@amsat.org>. Paul E. Knupke, Jr., KR4YL <pk@ij.net>.

FL, Englewood Amateur Radio Society: Meets 3rd Friday of each month at 7:30 p.m., Room 400 of Englewood United Methodist Church, 700 East Dearborn St., Englewood. Two-meter net at 7:30 p.m. all other Fridays (146.700). For more information about EARS, visit Web site at: <http://www.flnet.com/~crosby/ears>, or call Jack, W4JS, at (941) 475-1929.

FL, Highlands County Amateur Radio Club: Meetings held 3rd Monday of each month, 7 p.m. Agri-Civic Center Conference Room 3, South US 27, Sebring, FL. Visitors are welcome. Repeaters at 147.045 +.6, 442.350 +5.0, with packet on 144.970. Web page: <http://www.strato.net/~hamradio>; E-mail: <hamradio@strato.net>.

KY, Mammoth Cave Amateur Radio Club: Meetings held 3rd Tuesday of each month, 7 p.m. at "Doc Cady Memorial Club Room" in the lower level of th Glasgow City Hall, East Public Square, Glasgow, KY. Visitors always welcome. ARRL exams given at 9 a.m. on 2nd Saturday of each "even" month (e.g., Feb, Apr, Jun). Club repeaters are 146.940- and 444.925+. A net is held every night at 8 p.m. local time on 146.940. Contact Bill Wilkinson, KE4KRN Publicity Committee at: <bwilkinson@glasgow-ky.com> for information. Visit our Web site: <http://www.scrtc.blue.net/mcarc/>.

MA, Falmouth ARA: Meets last Thursday of every month at 7:30 at Falmouth Town Hall. All levels of exams given at 9 a.m. 2nd Saturday of every month at Falmouth Town Hall. Rptr1446.655/70cm. 444.250pl141.3/. Boston link, 445.175pl.141.3. For more info, see our Web: <http://www.falara.org>. Membership available on the web.

MB, Canada, Winnipeg Amateur Radio Emergency Service Inc. (WARES): Callsigns VE4YWG (Public Service Communications), VE4EOC (City Emergency Operations Centre). Meetings 3rd Tuesday of month, 1930h Sir Wm Stephenson Library, 765 Keewatin St. Membership open to all licensed amateurs at least 18 years of age living in or near Winnipeg and interested in emergency amateur communications. E-mail Jeff Dovyak, VE4MBQ, Emergency Coordinator at: <ve4mbq@ve4umr.ampr.org>; Web site: <http://www.geocities.com/CapeCanaveral/Hanger/1632/wares.html>.

MD, Baltimore Radio Amateur Television Society: Meetings held at 3 p.m. on 1st Saturday of the month at the Pikesville Public Library, 1301 Reisterstown Rd., Pikesville, MD. BRATS sponsored FM repeaters are the 147.030/224.960/447.325 MHz linked system (main), 145.130, 224.800, and 443.350 MHz. BRATS also sponsors second oldest ATV repeater in the country, the W3WCQ repeater, input 426.250/1253.250-output 439.250/911.250. BRATS holds nets in the 147.03 system, Sunday 8 p.m. Listening Post, Monday 7:30 p.m. Horsetraders, 9 p.m. Traffic and information, Wednesday 8 p.m. Newsline, Thursday 9 p.m. ATV, Saturday 1 p.m. News Bulletin, 1:20 p.m. Answer Men. Club activities include public service events, field day, hamfests, ATV repeater linking, amateur classes. Membership open to all. For more info, write, BRATS, P.O. Box 5915, Baltimore, MD 21282-5915, call (410) 461-0086, e-mail: <brats@smart.net>; Web: <www.smart.net/~brats>.

MO, Morely: Tri-County Amateur Radio Club, (TRICO): Callsign KBØZAW. Meetings 2nd Tuesday of every month at 7 p.m. at Scott County Emergency Management Agency in Morely, Missouri. Membership open to all licensed hams and their family members. Visitors are encouraged and welcome. ARRL exams given with prior requests. The club repeater, 146.730-. Net held every Thursday at 8 p.m. local time, on 146.730-, and every Sunday at 9 a.m. on 3.905. Contact Clay Adams at <kc5pin@ldd.net> for info. Web site: <http://www.geocities.com/capecanaveral/hall/2819>.

NC, Charlotte: 2-meter SSB net, 144.220 USB, Wednesday nites @ 9:30 p.m. est/edt. Net control stations are Wilton/WB4PCS & Bill/W4GRW both are in Charlotte area of EM95. This net is now 5 weeks old & we have been averaging 20 check-ins each week (purpose is to increase activity on 2-meter SSB & promote fellowship).

NC, Onslow Amature Radio Club, WD4FVO: Meets 1st Tuesday of every month at 7 p.m. in banquet room of Fishermans Wharf Resturant, located on Hwy 17 on the bank of New River in the heart of Jacksonville, NC. Exams are last Tuesday of every month at 7 p.m. in Onslow County Agricultural Building on College St. For more info, contact Ed Napoleon, KC4JKW, at <kc4jkw@gibralter.net>, or Rob DeVega, KF4OVM, <kf4vom@yahoo.com> or visit our Web site: <http://www.qsl.net/wd4fvo>.

NC, Stanly County Amateur Radio Club: Meetings held every 4th Thursday at Stanly Community College. Two-meter nets held at 9 p.m. (local), Wednesday (146.985), and Friday (147.390). Six-meter rag chew each Thursday at 8:30 p.m. (50.135). For more info, visit web site: <www.qsl.net/scarc>.

NY, Brooklyn, Kings County Repeater Association (KCRA): Meets 3rd Tuesday of the month (except July & August), 7:30 p.m., at Fort Hamilton Army Base, Building 213, Brooklyn, NY. Visitors welcome. Call Don, W2DON, at (718) 248-0752 for more information. Club repeater (WA2ZWP) 146.430, up 1 MHz, PL 136.5. Web: <http://www qsl.net/kcra>. VE exam sessions last Tuesday every month (except July, Aug., Dec.), 7 p.m. P registration a must. Call Harvey, KB2EA, at (718) 948-2290 to register.

OH, Cleveland Area, Cuyahoga Amateur Radio Society: Meets 3rd Wednesday of every month except December at 8 p.m. at Busch Funeral Home community room, 7501 Ridge Rd., Parma, Ohio. June, July, and August, "Picnic Meetings" are held at the Cuyahoga County Metropolitan Park. Repeaters are on 146.82(-), 443.825 & 444.75 (+), 53.83 & 53.01 (+), plus digipeater at 145.07, and club simplex frequency of 146.475 MHz. For more info, contact club president, Tom Wayne, WB8N, at (440) 232-4193 or at <wb8n@en.com>.

OH, Hocking Valley ARC: Meets 1st Tuesday of every month at 7:30 p.m. in EMA building at 56 S. Market St., Logan, OH. Packet Node LOGAN: AA8BJ-2 on 145.53 MHz, club net Wednesdays at 9 p.m. on 147.345+. E-mail: <aa8bj@hotmail.com>

OH, Lawrence County, Amateur Radio Emergency Service: Meets 3rd Monday of every month at 7 p.m., EMA/911 building, 515 Park Ave., Ironton, OH. Net every Thursday night 9:30 p.m. local time on repeater 146.715. Info e-mail: <wn8f@wwd.net>, or visit web site at: <http://www.wwd.net/user/syrinix/ares.html>.

OK, Tulsa: American Airlines Amateur Radio Club. Repeaters 145.345, 147.000+, 147.000-, 449.875, autopatches on 147.00 and 145.345. Club meetings held last Saturday of the month at 9 a.m. local time at Lil Abners Restaurant, Catoosa, OK. W5YI VE testing for all amateur radio classes held immediately following meeting. For more info on VE testing, club activities, and map on how to find Lil Abners Restaurant, see club Web page: <http://www.webzone.net/n5jk/aaarc.htm>.

PA, Lambda Amateur Radio Club (LARC), Philadelphia: Since 1975, the only open and visible public service-oriented ham club for gay and lesbian hams. Monthly newsletter, HF skeds, Internet listserv and IRC, hamfest meetings, chapters, DXpeditions. Lambda Amateur Radio Club (ALRC), P.O. Box 56069, Philadelphia, PA 19130-6069; E-mail: <lambda-arc@geocities.com>.

PA, Monessen Amateur Radio Club: Meetings 3rd Monday of month at Mon Valley Community Health Center, Monessen, PA, 4th floor at 7:30 p.m. Everyone welcome. Repeaters on 147.27+, 443.8+, 224.58+. Net on Tuesday at 8 p.m. on 147.27+. For more info, contact Allan, N3UML, P.O. Box 26, Sycamore, PA 15364, (724) 852-6449 evenings.

PA, Philadelphia: The Holmesburg ARC meets last Thursday of each month at the NE Philadelphia Naval ASO at 8 p.m. Repeater - 146.685. General interest, classes. For more info: <www.harcnet.org>; <WA3PZO@harcnet.org>.

TX, Greater Houston area, Brazos Valley ARC: Meets 1st Thursday of each month at 7:30 p.m. at Sugar Land Community Center, 226, Matlage Way, Sugar Land, TX (across street from the Main Post Office). Talk in frequencies are 145.46 - (PL 123) and 444.55 + (PL 103). For info, contact B-VARC, Box 1630, Missouri City, TX 77459-1630; Irv Smith, KK5QQ, (281) 437-4803. <http://hal-pc.org/~bvarc>, <bvarc@hal-pc.org>.

UT, Rocky Mountain Radio Association (RMRA): Offers Utah, Wasatch Front, unique UHF to 6, UHF to 2, and UHF to HF remote gateways. Net Thursday at 9 p.m. on 447.900 PL 114.8 UHF/6-meter gateway open 24 hours on 448.700 PL 114.8. Visit the RMRA Web site: <www.inconnect.com/~rmra>; or e-mail: <rmra@inconnect.com> for more information.

VA, Alexandria, Mt. Vernon ARC (K4US, MVARC): Meets 2nd Thursday of every month (except Dec.), 7:30 p.m. at Mt. Vernon Governmental Center, 2511 Parkers Ln., Alexandria, VA. Repeater frequency is 146.655. If interested, write to P.O. Box 7234, Alexandria, VA 22307, or contact Bob, KT4KS, at (703) 765-2313.

WV (Bluefield) East River Amateur Radio Club (ERARC): Meets 1st Monday of every month at Ryan's Steakhouse, 7 p.m., in the Bluefield, VA, WalMart shopping plaza. See our Web page at <www.inetone.net/erarc/> for information on VE EXAMS, weekly breakfast meeting, club info, and weekly ARES net. Info: <w4vt@sera.org> or call KD4ZUA at (540) 326-3419.

WV, Plateau Amateur Radio Association, Inc. (PARA), Oak Hill, WV: Meetings held the first Tuesday of every month, 7:30 p.m. in the basement of the New River Pawn Shop, 328 Main Street, Oak Hill, WV. Mailing address is PARA, P.O. Box 96, Fayetteville, WV 25840. Repeaters are 146.790-; 147.075- and 443.300+. For more information, contact Juddie Burgess, KC8CON, Secretary, at <kc8con@usa.net>.

Exam Sessions

FL, Clearwater: Examinations held 2nd Monday of each month, (except December) at 7 p.m. at the Salvation Army at 1625 North Belcher Rd. For more information, contact John Townsley, AE4GB, at (727) 376-6705, e-mail: <ae4gb@gte.net>, or Mike Branda, K4HN, e-mail: <k4hn@amsat.org>. Paul E. Knupke, Jr., KR4YL <pk@ij.net>.

FL, Englewood: ARRL exams held 3rd Saturday of each month, 9:30 a.m., Englewood Chamber of Commerce building, 601 South Indiana Ave., Englewood. Two-day advance reservation required. For info and reservations, call Jack, W4JS, at (941) 475-1929.

FL, Highlands County: Examinations held 4th Monday of each month, 7 p.m. Agri-Civic Center Conference Room 1, South US 27, Sebring, FL. Walk-ins are welcome. Web page: <http://www.strato.net/~hamradio>; E-mail: <hamradio@strato.net>.

IN, Evansville: Exams held once a month on a Saturday morning starting at 9 a.m., local time at Evansville Red Cross, 111 Diamond Ave., Evansville, IN. No pre-registration for sessions. For more information, call Terry Brooks, AA9MM, at (812) 421-9135. (Exam dates: 1/30, 2/27, 3/27, 4/24 (ARRL Nat'l Exam Day), 5/22, 6/19, 7/31, 8/28, 9/25 (ARRL Nat'l Exam Day), 10/30, and 12/04).

NC, Wilmington: Azalea Coast Amateur Radio Club will hold a VE testing session the 2nd Saturday of even numbered months at UNCW Morton Hall at 10 a.m. All persons wishing to take the amateur radio tests, please arrive before 10 a.m. Test candidates only. For further information call (910) 791-1566.

OH, Cleveland Area: Cuyahoga Amateur Radio Club holds exam sessions on 2nd Sunday of each odd-numbered month (except May), at the Olde Independence Town Hall, 6652 Brecksville Rd. (Rte 21), Independence, OH. Sessions start at 9 a.m. Fee is $6.95 and a valid ID and copy of your FCC license is required (if you are already licensed). For more info, contact Gary Dewey, NI8Z, at (216) 642-1399 or at <gdewey@en.com>.

PA, Monessen Amateur Radio Club: Test session 1st Sat. of even months (Feb, Apr, Jun, etc.) 10 a.m. at New Eagle Boro Bldg. Main St., New Eagle, PA. Walk-ins welcome but pre-registration preferred. For more info contact Allan, N3UML, (724) 852-6449, P.O. Box 26, Sycamore, PA 15364.

PA, Parkway Philadelphia: The Philmont Mobile Radio Club sponsors exams on 1st non-holiday Thursday of each month at Franklin Institute, 20th and Ben Franklin Pkwy, Philadelphia, PA. Walk-ins welcome. Exams start at 6:30 p.m. For more info contact, Dusty Rhoades, ND3Q, at (215) 879-0505.

TX, Houston: Meets 2nd Tuesday of each month, 6:30 p.m. Strake Jesuit High School. Bellair @ S. Gessner (SW Houston) Pre-registration requested, walk-ins accepted. Sponsored by Brazos Valley ARC (B-VARC). Call Cass Germany, KG5IT, at (713) 682-6897; e-mail: <cassg@hal-pc.org>.

Personal Web Site Listings

Jim Bridge, KQ6BS, URL: <http://www.qsl.net/kq6bs>. Specialty: weak signal.

"The Radio Picture Archive," URL: <http://www.e-etc.com/rpa> (corrected). Speciality collection of pictures of radios.

Commercial Web Site Listings

Byers Chassis Kits: Aluminum chassis and cabinets kits, VHF & UHF antennas and parts. Catalog: Callbook address. E-mail: <k3iwk@herd.net>; <http://herd.net/byerschassiskits>.

CCT®, Inc.: Antennas—High Efficiency Unique Designs HF to UHF. Computer Systems, Sub-Systems, CPU & Motherboard Upgrades, Components. High Voltage Capacitors, Parts. CCT® Radio: <http://www.cctnetwork.com>.

Communications Specialists, Inc.: Manufacturers of Tone Signaling Equipment including CTCSS encoders and decoders, Morse Station IDers, Repeater Tone Panels and much more. Please see our ad in this issue; <http://www.com-spec.com>.

KMA Antennas: VHF, UHF, HF log periodics, Yagis, and unique 6-meter antennas. Custom designs for commercial and private use also avaliable. Please mention *CQ VHF* when you visit <www.qsl.net/w4kma>.

MS-Windows Software: RAC Callbook CD-ROM, Ultimeter Weather Stations and more, info <n2ckh@cybercomm.net>; Web: <www.QTH.com/n2ckh.bytewise.org>

Teletec: Manufactures 6, 2, 1 1/4 meter and 70 cm Linear Amplifiers as well as Receive Preamplifiers; <http://www.Teletec-usa.com>.

Woodhouse Communication: Antennas and publications for weather satellite imaging: <www.view2earth.com>.

Advertisers' Index

It's easy to advertise in CQ VHF.
Let me know what I can do to help.
Arnie Sposato, N2IQO.
Tel: 516-681-2922, Fax: 516-681-2926
e-mail:arniecq@aol.com.

1999 Calendars, Books, Cards & Videos!

33 Simple Weekend Projects

by Dave Ingram, K4TWJ

Do-it-yourself electronics projects from the most basic to the fairly sophisticated. You'll find: station accessories for VHF FMing, working OSCAR satellites, fun on HF, trying CW, building simple antennas, even a complete working HF station you can build for$100. Also includes practical tips and techniques on how to create your own electronic projects.

Order No. 33PROJ....$15.95

W6SAI HF Antenna Handbook

by Bill Orr, W6SAI

Inexpensive, practical antenna projects that work! Guides you through the building of wire, loop, Yagi and vertical antennas.

Order No. HFANT.....$19.95

The NEW Shortwave Propagation Handbook

by W3ASK, N4XX & K6GKU

A comprehensive source of HF propagation principles, sunspots, ionospheric predictions, with photography, charts and tables galore!

Order No. SWP $19.95

Amateur Radio Equipment Buyer's Guide

This 144-page book is your single source for detailed information on practically every piece of Amateur Radio equipment and accessory item currently offered for sale in the USA complete with specs and prices. Also includes the most comprehensive directory of Ham product manufacturers and dealers in the USA.

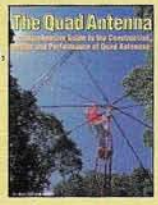
Order No. EBG.....$15.95

The Quad Antenna

by Bob Haviland, W4MB

Second Printing

An authoritative book on the design, construction, characteristics and applications of quad antennas.

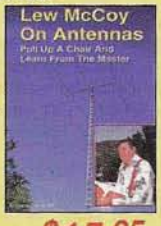


Order No. QUAD $15.95

McCoy on Antennas

by Lew McCoy, W1ICP

Unlike many technical publications, Lew presents his invaluable antenna information in a casual, non-intimidating way for anyone!

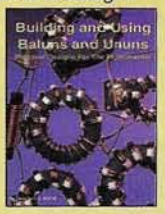


Order No. MCCOY $15.95

Building and Using Baluns and Ununs

by Jerry Sevick, W2FMI

This volume is the source for the latest information and designs on transmission line transformer theory. Discover new applications for dipoles, yagis, log periodics, beverages, antenna tuners, and countless other examples.

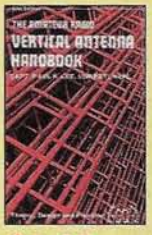


Order No. BALUN . . . $19.95

The Vertical Antenna Handbook

by *Paul Lee, N6PL*

Learn basic theory and practice of the vertical antenna. Discover easy-to-build construction projects.



Order No. VAH.....$9.95

Keys, Keys, Keys

by Dave Ingram, K4TWJ

You'll enjoy nostalgia with this visual celebration of amateur radio's favorite accessory. This book is full of pictures and historical insight.

Order No. KEYS $9.95

Getting Started Videos - "How-To," Tips, Techniques & More!

Ham Radio Horizons: The Video . . *Order No. VHOR*
Getting Started in VHF . . *Order No. VVHF*
Getting Started in Ham Radio . . *Order No. VHR*
Getting Started in DXing . . *Order No. VDX*
Getting Started in Packet Radio . . *Order No. VPAC*
Getting Started in Amateur Satellites . . *Order No. VSAT*
Getting Started in Contesting . . *Order No. VCON*

Only $19.95 each
Buy more and save!
Buy 2 or 3 for $17.95; Buy 4 to 6 for $15.95
Buy all 7 for your Club for only $99.95

FREE SHIPPING on orders over $50*

CQ Award Pins

If you've earned any of CQ's Awards, you can also display the corresponding CQ Award pin. Available for WAZ, 5 Band WAZ, 160 Meter WAZ, CQ DX, CQ DX Honor Roll, WPX, WPX Honor Roll, and USA-CA awards. **ONLY $5.00 EACH.**

Playing Cards

Top quality, plastic coated playing cards.

ONLY $9.95 per deck

1999/2000 Calendars

Fifteen month calendars - January 1999 through March 2000

Please specify Amateur Radio or Classic Radio Calendar

Fax us at 516-681-2926
Call us toll free at 1-800-853-9797

Name _____ Callsign _____

Street Address _____

City _____ State _____ Zip _____

Qty	Item #	Description	Price	Total Price
U.S. and possessions - add $4 shipping/handling. *FREE S/H on orders $50 and over. Foreign - shipping/handling charges are calculated by order weight & destination. *A $4 credit will be applied for Foreign orders over $50.			Shipping/Handling	
			Total	

Method of payment ☐ Check ☐ Money Order ☐ Visa ☐ MasterCard ☐ Discover ☐ American Express

Credit Card No. _____ **Expiration date** _____

CQ Communications, Inc., 25 Newbridge Rd., Hicksville, NY 11801/516-681-2922; Fax 516-681-2926

HF ENTHUSIASM

Yaesu, Choice of the World's top DX'ers

Over 40 years of experience in HF transceiver design has firmly established Yaesu as the choice of the world's top DX'ers. The knowledge that produced unequaled RF technology and design that is found in the State of the Art FT-1000MP can also be found in the miniature FT-100. The FT-100 while small in size 6.3"×2.1"×8.1"(160 W×54 H×205 D mm :w/o knob) is large in features and performance. This is accomplished by using the most advanced manufacturing techniques and component mounting technology. High Dynamic range RF front-end technology and Advanced Digital technology such as DSP sets a new standard of receiver performance for miniature HF transceivers. The single piece die cast frame, dual cooling fan system and revolutionary RF high power design technique keeps the FT-100 running cool and smooth in the most adverse operating environments. (TX Power output=100W HF, 50W VHF/20W UHF) The TX Equalizer offers crisp, clear and clean TX audio reproduction that until now was only found in top of the line HF base stations. The optional ATAS-100 (active tuning antenna system) ushers in a new age of mobile and field day operation (from HF to UHF frequencies). Add the optional ATBK-100 base kit (Good for limited space, simple setup.) and you've got a base station that ranks among the best in the world.

Features

- Frequency coverage:
  RX : 100 kHz-961 MHz (cellular blocked)
  TX : 160-6 m/144-148 MHz/430-450 MHz
- Power output : 100 W (160-6 m), 50 W (144 MHz), 20 W (430 MHz)
- DSP Bandpass Filter, Notch Filter, Noise Reduction, and Equalizer
- IF Noise Blanker
- IF Shift
- SSB, CW, AM, FM, AFSK, Packet (1200/9600 bps) operation
- Detachable Front Panel
- Two Antenna Jacks (HF/50 and 144/430)
- VOX
- Dual VFOs
- Available IF bandwidths of 6 kHz, 2.4 kHz, 500 Hz, and 300 Hz (6 kHz, 500 Hz, 300 Hz filters optional)
- Built-in Electronic Memory Keyer
- Speech Processor
- Built-in CTCSS and DCS for FM operation
- Automatic Repeater Shift and Auto-Range Transponder System
- Smart Search™ Automatic Memory Channel Loading System
- 300 memory Channels
- Quick Memory Bank (QMB)
- Bright LCD with multi-function display
- Optional FC-20 External Antenna Tuner
- Compatible with ATAS-100 Active-Tuning Antenna System. Add the optional ATBK-100 base kit

FIELD COMMANDER

FT-100

Ultra-Compact HF/VHF/UHF Transceiver

YAESU

Choice of the World's top DX'ers

For the latest news, hottest products:
Visit us on the Internet! http://www.yaesu.com

©1999 Yaesu USA, 17210 Edwards Road, Cerritos, CA 90703 (562) 404-2700

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.

Explore the new opportunities of APRS™ with a handheld transceiver built for the future.

TH-D7A DATA COMMUNICATOR 144/440MHz FM Dual Bander

Meet Kenwood's new TH-D7A, an FM dual-band (144MHz/440MHz) handheld transceiver equipped with a TNC and all the features needed for easy amateur radio data communications — and especially APRS.

The TH-D7A offers exciting new adventures in Ham radio with a wide range of data communications options — including simple packet operation using the AX.25 protocol and the Automatic Packet/Position Reporting System (APRS), which is rapidly gaining popularity worldwide. You can also send and receive SSTV images using Kenwood's VC-H1.

APRS (Automatic Packet/Position Reporting System)

- **Position/directional data**
  Hook up to an NMEA-0183 compatible GPS receiver and you can transmit your exact position for automatic calculation of distance, current speed and heading. Manual input of latitude/longitude is also permitted.
- **Versatile messaging**
  Transmit your own alpha messages (up to 45 characters),. bulletins, comments (up to 20 characters), and fixed messages (8 patterns).
- **Station List**
  Store received APRS data in up to 40 memory channels
- **Grid square locator**
- **TX interval** (0.5/1/2/3/5/10/20/30 min.)
- **Packet path selection for Digipeat**
- **Weather station & PHG data reception**

Visual Communicator Control

- **Text superimpose function**
  Add your call sign, RSV reports, comments, etc.
- **VC-H1 shutter**
  Command a connected VC-H1 to initiate transmission
- **Fast FM**
  Send an image in just 14 secs (approx).
- **SSTV transmission mode selection (9 modes)**

- **Dual receive for voice & image transmissions (VHF only)**

FEATURES

■ Built-in 1200/9600bps TNC (1 packet, 1 frame, 256 bytes) compliant with AX.25 protocol ■ Dual receive on same band (VHF only) for both voice and data (two frequencies simultaneously) ■ Large (12 digits X 3 lines) dot-matrix LCD, multi-scroll key, menu mode & other user-friendly features ■ 200 memory channels with 8-character memory name input ■ 16 backlit keys ■ Built-in CTCSS (38 EIA-standard subtone frequencies) ■ 16-digit, 10-channel DTMF memory ■ MIL-STD 810C/D/E water resistance ■ High-gain dual band antenna ■ High-speed (9600bps) PC-based packet communications for chat, BBS, etc. ■ Kenwood Skycommand System (KSS) II for remote control of fixed HF transceiver– TS-570S/D(G) or TS-870S (requires optional PG-4R) ■ Monitoring DX cluster, TM-742A/TM-V7A remote control (DTMF remote), etc.

ISO 9001
JQA-1205
Communications Equipment Division
Kenwood Corporation
ISO9001 certification

KENWOOD
Amateur Radio Products Group
98ARD-1837

KENWOOD COMMUNICATIONS CORPORATION
AMATEUR RADIO PRODUCTS GROUP
P.O. Box 22745, 2201 E. Dominguez St., Long Beach, CA 90801-5745, U.S.A.
Customer Support/Brochures (310) 639-5300
KENWOOD ELECTRONICS CANADA INC.
6070 Kestrel Road, Mississauga, Ontario, Canada L5T 1S8

INTERNET
Kenwood News & Products
http://www.kenwood.net
Kenwood Bulletins
ftp//ftp.kenwood.net