ICD 08237

CQ VHF

Ham Radio Above 50 MHz

October 1997

- Phase 3D Launch in Limbo!
- "CQ Universe"—Is Anyone Out There?
- Check Your Insurance Lately?
- CQ VHF Review: ADI AT–600 Dual–Band HT

Plus . . .

- Meltdown! Ham Radio and Nuclear Accidents
- The Next Step for APRS
- Two Easy–to–Build Antennas

On the Cover: John Magliacane, KD2BD, tunes in a signal on the Brookdale Community College ATV repeater in Lincroft, New Jersey. Details on page 80.

U.S. $2.95 CAN / INT'L $3.95

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

WHAT TWIN-BAND RADIO'S SPEAKER-MIC DISPLAYS BOTH BANDS WHILE DELIVERING UP TO 50 WATTS?

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- 200 memory channel option, CMU182.
- CTCSS Encode/Decode standard.
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MIRAGE...100 Watts...$199

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

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Call your dealer for your best price

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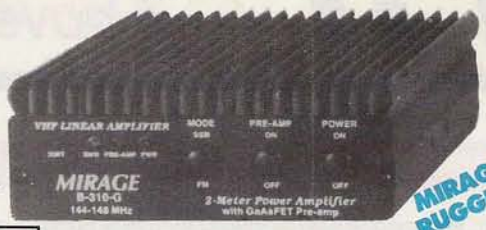
NEW!

B-310-G Suggested Retail



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

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

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

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

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

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

Low noise GaAsFET pre-amp

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

Fully Protected

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

Compact but Powerful

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

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

Free Accessories

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

Plus more . . .

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

Full one year MIRAGE warranty

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

Dual Band 144/440 MHz Amp

$159.95 BD-35 Suggested Retail

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

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

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

Full Duplex Operation

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

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

- ***Automatic frequency band selection*** --you'll never forget to switch bands
- ***Single input connector and single output connector for both bands*** -- easy to use with dual band radios and antennas
- ***First-class strip-line techniques*** -- superb RF performance and reliability
- ***Custom wrap-around heatsink*** -- runs cool
- ***Reverse Polarity Protection*** -- saves your amp if you connect power backward
- ***Automatic RF sense Transmit/Receive switch*** -- makes operation easy
- ***Low input SWR*** -- keeps your handheld safe from overheating
- ***"On Air" LEDs*** -- for each band
- ***Free mobile mounting bracket***
- ***Free 3 foot handheld-to-BD-35 coax cable***
- ***Small size:*** just 5x1¾x5 inches
- ***Full one year MIRAGE warranty***
- ***Legendary MIRAGE ruggedness***

Call your dealer today for your best price!

35 Watts for 2 Meter HTs

B-34-G

$89.95

Suggested Retail

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

- ***35 Watts Output on 2 Meters***
- ***All modes: FM, SSB, CW***
- ***18 dB GaAsFET preamp***
- ***Reverse polarity protection***
- ***Includes mobile bracket***
- ***Auto RF sense T/R switch***
- ***Custom heatsink, runs cool***
- ***Works with handhelds up to 8 watts***
- ***One year MIRAGE warranty***

MIRAGE RUGGED!

35 watts, FM only . . . $69.95

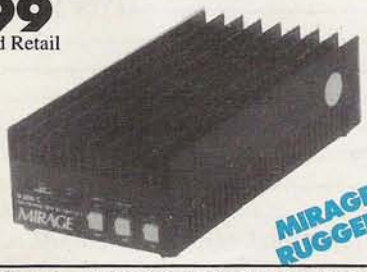
B-34, $69.95. 35 watts out for 2 watts in. Like B-34-G, FM only, less preamp, mobile bracket. 3⅛x1¾x4¼ inches.

160 Watts on 2 Meters!

B-5016-G

$299

Suggested Retail



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

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

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

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

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

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

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

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

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

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

More 160 Watt, 2 Meter Amplifiers . . .

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

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

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

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MIRAGE . . . the world's most rugged VHF/UHF amplifiers

CQ VHF Ham Radio Above 50 MHz

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Next Month: "Build a VHF/UHF SWR Meter" by Dennis Wilkison, KE6UZQ

"Beyond Amazing"
Alinco Presents The Mini HT

So slim, *it hides in a shirt pocket.* Power to work repeaters many miles away. Clear, clean audio. 20 Memories plus a Call channel. And a Lithium ion battery that can go 100 hours between charges!

- 20 memories plus Call channel; each memory capable of non-standard splits
- CTCSS encode plus European tone burst
- 300 mW output
- Large capacity internal 500 mAh lithium ion battery
- Earphone/mic port
- Self-storing telescoping antenna
- Includes soft case, earphone, auxiliary wire "pocket" antenna and snap-in battery charger
- Fast 2-hour charging time
- 2.2" wide, 3.7" high, .41" deep

Alinco DJ-C1T 2 Meter (144 Mhz) Mini HT

- 144 ~ 147.995 MHz transmit range
- Extended receive 118 ~174 MHz including air band (AM)

Alinco DJ-C4T 70 cm (440 Mhz) Mini HT

- 420 ~ 449.995 MHz transmit range

The Alinco DJ-C1T and DJ-C4T represent breakthroughs in mini-radio technology. About the size of a credit card, one can be carried in pocket or purse. With it, you're ready to communicate anytime. Whether you're in business attire or running a marathon, these small, lightweight radios are easy to carry and easier to operate. You'll be amazed at the clean, crisp audio. The lithium ion battery is a revolution in power technology, going as long as 100 hours between charges. Be prepared to answer questions from other hams who see your DJ-C1T or DJ-C4T - even seasoned "veterans" have termed these radios "beyond amazing." The only thing we can add to that, is the low Alinco price!

Accessories Available

EDS-7 Adaptor Cable for use with speaker mics and headsets
EDC-36 Mobile charger
EMS-9Z speaker mic (requires EDS-7)
EMS-41 speaker mic (requires EDS-7)

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The VHF Amateur...Yesterday, Today, and Tomorrow

A look into VHF's recent past—the late 1960s—reveals a vast amount of change as we look into ham radio's future.

Note: The following is based on a presentation I prepared for the 1997 Eastern VHF/UHF Conference in late August.

Last month, I wrote about the latest technological "revolution" to bang on ham radio's door: a ham rig that's completely integrated into a personal computer. A few weeks later, at the Central States VHF Society conference, I came into possession of a small book, entitled *The VHF Amateur*.

Published in 1968, the book was a compilation of articles from a magazine of the same name that was published for several years in the 1960s, and was written by the magazine's editor, Robert Brown, K2ZSQ/W9HBF. It provided a fascinating glimpse at the world of VHF ham radio in the late '60s and an amazing view of how much things have changed in a brief 30 years. What was it like to be a "VHF amateur" 30 years ago?

Thirty Years Ago

Thirty years ago...the VHF "subculture" that we call "weak signal" today (and that the Europeans much more appropriately call "VHF DXing") was mainstream VHF. If you were a VHF operator, unless you were on the cutting edge, *this* is what you did.

Thirty years ago...FM and repeaters were in their infancy and wouldn't begin to make a significant impact for another five to seven years.

Thirty years ago...satellites were still for experimenters. Yes, it had been possible to make two-way contacts via OSCARs 3 and 4, but it wasn't until the launch of OSCAR 6 in 1973 that satellites really became a communications tool for a large number of hams.

Thirty years ago...digital communications as we know it today was a non-entity. There was some RTTY here and there, but it never caught on in VHF circles, and packet was still 15 years off in the future.

Thirty years ago...ATV was there, but wasn't of significant enough impact to rate even a mention in this book.

So...What Was There?

Looking at the state of VHF ham radio in the late '60s through the pages of *The VHF Amateur*, you would see:

- Lots of AM and CW
- Lots of tubes and a couple of nuvistors (anybody remember nuvistors?)
- A two-paragraph discussion of 2-meter EME (moonbounce)
- Equally brief discussions of meteor scatter and ionoscatter
- A few SSB circuits
- How to control antenna elevation—with ropes!
- And other projects for what the book called "the VHF man."

And What Was Cutting Edge?

Here's a quote from Chapter 5, "Frequency Control":

If you are receiving threatening phone calls at all hours of the day and if your neighbors are circulating a petition to have you removed from the air because your AM 50 MHz transmitter comes in on their TV, radio, intercom, hi-fi, tape recorder, kitchen sink, etc., the next item may be of interest to you. Before you give in to your neighbors and operate only after 2 a.m., after the Late-Late Show, why not try nbfm (narrow band frequency modulation)? If your rig uses a VFO, then this system of nbfm can be added to it quite easily.

The project used a germanium diode as a voltage-controlled capacitor to vary the VFO output frequency as you talked. You *received* FM signals in 1968 through "slope detection," tuning your AM receiver slightly off frequency.

One more quote:

Nbfm is used here mainly for local work (50 miles or less) with AM or CW operation used for DX work.

So even single sideband wasn't a major factor in 1968. And what about the higher bands? There was another article on putting a surplus APX-6 transceiver on 1296. It closed with the following:

Twenty years ago, the VHF bands were thought to be useful only for line-of-sight communication; when an opening occurred, there was no one around to take advantage of it. Today we know better. On 1296 MHz, with only APX-6s, contacts have been made in excess of 70 miles from portable locations and for more than 20 miles from home stations. Think of what discoveries you might make if you had an APX-6 on 1296 MHz.

How Far We've Come

Think about it. And then think about the discoveries and advances that *have* been made in the past three decades. Today, the only place you'll find tubes is in very-high-power amplifiers. Satellites are no longer experimental. Today, we have analog satellites, digital satellites, hybrid satellites that do FM as well as SSB and CW, manned space flights with ham stations aboard, and we're awaiting the launch of a VHF/UHF/microwave satellite that's supposed to be the most sophisticated ham satellite ever, as well as the easiest to use.

By Rich Moseson, W2VU, Editor

New, Cool and Blue!

Kenwood continues its renowned dual-band mobile tradition with the revolutionary TM-V7A. Large, cool-blue reversible LCD, ergonomic control panel, 280 memory channels, and computer programmability are just some of the many exciting features. Kenwood's engineering expertise, advanced design reputation and outstanding quality are amply evident in the fun-to-operate TM-V7A dual-band mobile transceiver.

- **Alphanumeric memory capability allows you to recall up to 180 memory channels by name. Frequency, memory channel number, and name (up to 7 characters) are displayed simultaneously. Store call signs, repeater names, cities, etc.**

NOW... Enjoy APRS & EZ-Clone with your TM-V7A

Backlit mic with convenient operator functions including power on/off, volume and squelch controls and direct frequency entry.

Built-in CTCSS, DTSS and page functions

Guide mode serves as an on-board instruction manual

Heavy-duty construction inside and outside

147-channel visual scan (spectrum display)

Programmable memory for storing five operating profiles

Capable of receiving two frequencies on the same band (f²)

Stores 280 memory channels

A Kenwood Exclusive!

Data connector for APRS and 1200/9600 bps packet. Operate voice and data at the same time.

Detachable control panel (2-1/16 x 4-1/8 in.) with 4 multifunction keys

Cool-blue reversible LCD with positive/negative display modes

EZ-Clone PC programming software port.

TM-V7A
FM Dual Bander

Performance, quality, and innovation briefly describe the new TM-V7A dual-band mobile. Look at the easy-to-read large blue LCD display! Storing all of your favorite frequencies is a snap with 280 memory channel capacity (alphanumeric to 180). Unique programmable memory function allows you to store virtually all operating data such as frequency, offset, DTSS code, display setting, and beep function in 5 special channels. Visual scan allows you to graphically see band activity near the current operating frequency. Other features include a user-friendly menu and guidance system, 1200/9600 bps packet, AM aircraft band receive, CTCSS, DTSS, paging, backlit DTMF microphone, detachable control panel (with cable option), and voice synthesizer (VS-3 option). The TM-V7A is truly in a class by itself.

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Digital communications, which didn't exist 30 years ago, has made even the hardest-core HF DXer get onto VHF, or lose out on DX "spots" on his local Packet Cluster node.

AM, the predominant mode 30 years ago, has, with a few exceptions, been replaced by SSB. CW continues to get through when voice can't. But both have been eclipsed in popularity by FM.

FM: More Than Just Another Mode

FM and repeaters have totally changed the face of amateur radio, moving VHF into the mainstream and, in fact, becoming the dominant mode of amateur communications. But FM is not only another *mode* of amateur communications, it's another *means* of amateur communication, with different goals and different methods, and a different mindset from what most old-time hams consider "traditional" amateur radio.

Traditional—meaning HF—ham radio is based on what I'll call the *DX model*. The goal of getting on the radio is to *make contact*. How far can you get? How many different states, counties, countries, or grid squares can you contact? How can you best take advantage of available propagation to stretch your limits and reach out farther than you have before? That's the goal, whether it's on MF, HF, VHF, UHF or SHF, *getting through* is what it's all about. What you say once you make contact is much less important. Anything beyond the basics of callsigns, signal reports, and locations is gravy. This isn't to say that you can't have some fantastic, and fascinating, QSOs with "traditional" hams. I've had many, but they're greatly outnumbered by the "quickie QSOs," 59, 73, Q-R-Zed?

Another "Traditional" Model

But ham radio has traditionally had another model: the *traffic handler*. Here, the goal is *communication*—getting a message through—and all of the DXer's considerations are secondary. You learn about propagation so you can pick the best band for making the most reliable communications link. Making contact is *not* the goal; it's what you do *after* you establish contact that counts for the traffic-handler. And whether it's an informal chat with old or new friends, getting directions to an unfamiliar place, reporting a traffic accident, or passing messages

"FM is not only another mode of amateur communications, it's another means of amateur communication, with different goals and different methods, and a different mindset from what most old-time hams consider 'traditional' amateur radio."

in a public service or emergency net, what counts is what you say or hear, not the fact that you're able to say it on that frequency over that distance at that point in the sunspot cycle.

The FM operator, by and large, is a traffic-handler, even if he or she has never checked into a National Traffic System net and never plans to. The mindset is the same. The message counts more than the contact. Again, think about it: a band opening in the middle of a traffic net is considered interference! The signals from a distant repeater are interfering with the primary goal of prompt, efficient local communications. The enhanced propagation puts you in the same boat as the trucking company dispatcher in Connecticut who can't get through to her trucks because of interference from the taxi dispatcher in Detroit.

Is Different Bad?

Is this bad? No, it's just a different perception of what ham radio is all about. To the "DXer," and I include VHF weak-signal and satellite operators in that category, ham radio is something very different than it is to the "traffic-handler," and I include your standard repeater users and packet operators in that category. Why is it so difficult for the "DXers" to get the "traffic-handlers" to join in what they do? For the same reason most "DXers" avoid repeaters if at all possible: the "traffic-handlers" simply don't see the point of it. But there are a lot of "closet DXers" on those repeaters, that is, hams whose mindsets are right for DXing, but who still think that their only opportunities for DXing lie on HF—beyond the code test.

Looking to the Future

As we approach a new century, a new millennium, and, most importantly for ham radio, a new sunspot cycle, many different groups of hams are asking "where do we go next?"

(Continued on page 83)

CQ VHF Ham Radio Above 50 MHz

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Letters

Your Spot to Speak Out

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

License Reform—Another Proposal

Dear *CQ VHF*:

The debate regarding the current code requirements, the elimination of the Novice class license, and "Little LEO" has become a major concern for many hams. I have been giving this much thought and feel that there is a way to address all of these issues while satisfying many of the concerns I have heard expressed by others. The code is presently a huge step up on the ladder for many hams—particularly the step from five wpm to 13 wpm. I only recently made that step and can relate to the frustration I keep hearing voiced.

I in no way wish to eliminate or relax the present requirements, but only move the rungs a little closer on the ladder to make the climb less frustrating for many hams trying to upgrade. I would suggest the following changes:

(1) Extend the 10-meter SSB 28.300 to 28.500 privileges to the Technician class license. This would let them experience HF and motivate many of them to upgrade. Rather than just hearing the rest of us talk about it, let the experience be the motivation.

(2) Extend a portion of the 17-meter band to the Technician Plus class license. For example, 18.068 to 18.089 CW and 18.139 to 18.168 phone. This band is new and sparsely populated. Let's promote some use of it before it becomes someone else's new band. This band offers almost identical propagation as the 20-meter band. Let these hams experience some of that. Again, let the experience be the motivation.

(3) Let's not eliminate a class of license, but move and redefine it. Currently there is a jump of eight wpm in the code requirement between Technician Plus and General class licenses. This is more than a lot of hams seem to be able to overcome. Maybe we should split the difference with them. Let's place a rung in the ladder to ease the climb. I can also attest to that barrier at 10 wpm that many stumble over or get stuck at. Let those who can pass a nine-wpm code test and the General theory test have half the current General privileges minus the 20- and 40-meter bands. This would give more hams privileges on the 12- and 15-meter bands, which are also underpopulated. We need to use these before we lose them. Instead of eliminating the Novice class, we could place it here, by name only (no grandfather clause applied).

In my view, no changes need to be made to the General, Advanced, or Extra tests. These privileges should be reserved for those able to complete the requirements already in place. This one approach would get us all a little closer to meeting the same goals while promoting and preserving amateur radio as a whole.

Jack Lingner, KC5OFI
Houston, Texas

Dear *CQ VHF*:

In *Origin of Species* Darwin writes, "If any one species does not become modified and improved in a corresponding degree with its competitors, it will soon be exterminated." If amateur radio wants to avoid extinction and move forward, it must evolve or lose the opportunity to be a competitive player for spectrum usage in tomorrow's technology.

Eliminating or limiting CW testing to not more than five wpm can be an effective means of stimulating interest in the hobby and translating the desires of the majority of operators into a positive policy change. The gap between the license classes is wider than at any time before. Standing pat and limiting participation will almost certainly mean stagnation and a slow death for the hobby.

Guy A. Matzinger, KB7PNQ
Cheney, Washington

More on Spread Spectrum

Dear *CQ VHF*:

I just wanted to compliment you on the article "The Debate Over Spread Spectrum," in the August issue. I think that you did an excellent job in distilling the various points of view as expressed in the comments/reply comments on FCC Docket 97-12. Keep up the good work! I would just like to add that, if the FCC enacts the S/S rule changes as proposed by the League and stated in the NPRM, this will have a "chilling effect" on the future of S/S in the amateur radio service. It is unlikely in such a case that TAPR will continue with any S/S activities as we will be left with a set of rules for this emission mode, which, while they appear on the surface to be far more "liberal" than the rules enacted in 1985, are in point of fact, far more restrictive.

Dewayne Hendricks, WA8DZP
Chair, TAPR Regulatory
Affairs Committee
Fremont, California

It's too bad that a mode that seems to have such significant potential in amateur radio and elsewhere is getting bogged down in disputes over rules, and that the perceptions on both sides of the issue are that "the other side" isn't dealing straight with them. It still seems that a series of well-publicized, coordinated tests involving all interested parties would go a long way toward resolving the questions about interference and other concerns.

This 'n That

Dear *CQ VHF*:

First I'd like to commend you on the superb job of publishing a magazine devoted to VHF and UHF events, news, projects, etc. I find only one major glitch though. As I read the articles in *CQ VHF*, I come across the ones about building a power supply, or an amplifier, or some kind of meter. Now, I would love to build one of your projects, but the problem is I'm a beginner in ham radio with no experience in building an electronic or electrical device, and the projects are for the

(Continued on page75)

VHF News

Phase 3D Launch in Limbo

The launch of the international Phase 3D (P3D) satellite has been put into limbo by a conflict between new technical requirements for the satellite's spaceframe and the European Space Agency's political need to launch its second Ariane 5 test flight without additional delays.

The investigation of the launch failure of the first A-5 flight, Ariane 501, showed that payloads are subject to greater stresses during launch than previously believed. This new information prompted AMSAT to strengthen the P3D spaceframe. However, the time required to do that made it impossible to meet ESA's deadline, announced at a July meeting, to have the satellite delivered to the launch site in South America by August 10 to be on time for the scheduled September 30 launch of Ariane 502. Only if that launch is delayed by six to eight weeks would P3D possibly be able to get back on board.

At press time, no alternatives were in place for a P3D launch if 502 takes off without it. AMSAT President Bill Tynan, W3XO, notes that the amateur satellite group has never had a formal launch commitment from ESA, "only a good working relationship...that we'd like to maintain." For additional information on the Phase 3D launch delay, see this month's "Orbital Elements" column.

Six-Meter Restrictions in New Zealand

Updating our story last month on unconfirmed reports that hams in the Auckland, New Zealand, area had lost access to the lower end of the 6-meter band, NZART (New Zealand Amateur Radio Transmitters) President Alan Wallace, ZL1AMW, explains in an e-mail message to *Worldradio* editor Lou Ann Keogh, KB6HP, that "In this country, a special permit is required from our licensing authority (the Ministry of Commerce) for operation below 51 MHz, if the amateur station is within the coverage area of our Television Channel 1."

And the *ARRL Letter* reports that NZART spokesman Terry Carrell, ZL3QL, has said that permits issued to hams in the Auckland area had been revoked after a local broadcaster installed a new Channel 1 (44 to 51 MHz) transmitter in the Auckland Skytower. This, said Carrell, despite earlier assurances from the broadcaster to NZART that it would *not* occupy Channel 1 in Auckland. He notes that ZL hams continue to have access to 51 to 53 MHz.

Sputnik Anniversary Event—From Space

The space age is 40 years old this month, and a special event in space is planned to mark the anniversary of the October 4, 1957 launch of Sputnik I, the world's first artificial satellite. And hams will play a role, just as they did 40 years ago by being among the first to monitor Sputnik's "beep-beep-beep" signal.

A one-third scale model of Sputnik, built by high school students in Russia and France, will be hand-launched from the Mir space station on October 4, 1997, and is expected to "beep" just as Sputnik did, but only for up to two months and *in the 2-meter amateur satellite subband.* The AMSAT News Service reports that the Russian students built the satellite body while the French students built the radio transmitter, which will have output power between 100 and 200 milliwatts and a circularly polarized antenna.

At press time, the downlink frequency had not yet been finalized, but it was expected to be between 145.810 and 145.850 MHz, varying with Doppler shift. AMSAT-France Vice President Gerard Auvray, F6FAO, says best-case receiving gear will be a handheld with a dipole or ground plane antenna, but because the satellite will have no attitude stabilization, a beam with 10 dB gain may be necessary. Use the Keplerian elements for Mir to locate the model, at least during the first few weeks after launch (updated Keplerian elements are available from a variety of sources online and on the air). *(Do you have kids in school? Why not arrange to set up a listening post there for these signals? Most educators would jump at the opportunity. And it's a good way to introduce them to amateur radio.—ed.)*

SEDSAT Help Request

Speaking of schools and satellites, students at the University of Alabama in Huntsville need additional ham help with their SEDSAT satellite project. Dennis Wingo, KD4ETA, has stepped down after eight years as Project Manager and says the students continuing the project "do not know the radio art that well." In particular, help is needed to verify that the satellite's Mode L digital transponder is working properly. In a posting on the AMSAT e-mail reflector, Dennis asks for assistance from the satellite community at large, and particularly from anyone who can help with the Mode L transponder. Those who can help should call Dr. Mark Maier at (205) 890-6642, or contact him via e-mail at <maier@ebs330.eb.uah.edu>.

Kennard, Powell Named to FCC

President Clinton has nominated FCC General Counsel William Kennard as Commission Chairman, succeeding outgoing Chairman Reed Hundt. If confirmed by the Senate, Kennard would be the first African-American to head the FCC. He wouldn't be alone on the five-member panel, however. At the same time, Clinton nominated Michael Powell, son of retired General Colin Powell, to fill another FCC vacancy. The younger Powell is currently Chief of Staff of the Antitrust Division of the U.S. Department of Justice, and has experience in telecommunications law.

Electronic Vanity Applications Flood FCC

After announcing in July that it would give priority to vanity callsign applications filed electronically, and setting an August 6 date for opening "Gate 3" (for Advanced class licensees), the Commission was inundated with nearly 1,200 electronic applications (and only 300 paper ones) on that first day of Gate 3 eligibility. However, the *ARRL Letter* reported that the electronic filing system appeared to be having problems and that many applicants may have filed more than once, believing that their first attempt had failed.

Remember that the vanity callsign application fee rose from $30 to $50 on September 15. Still no word from the

Compiled by the CQ VHF Staff

Product Update

Yaesu VX-1R VHF/UHF Handheld

Yaesu's new ultra-compact dual-band transceiver is, according to the company, the world's smallest dual-band handheld. Its features include 500-mW power output (1 watt w/external power adapter); wide VHF/UHF multi-band receive; 290 memory channels in nine groups; six-character alphanumeric display; built-in CTCSS/DCS encode/decode; built-in CTCSS/DCS tone search; smart search function; dual watch; one touch ARTS (Automatic Range Transponding System); priority channel alarm; and AM airband receive. The North American version comes supplied with a rechargeable lithium ion battery, wall charger, and a belt clip. Size is 81 x 47 x 25 mm (HWD); weight is 125 g with antenna and lithium ion battery.

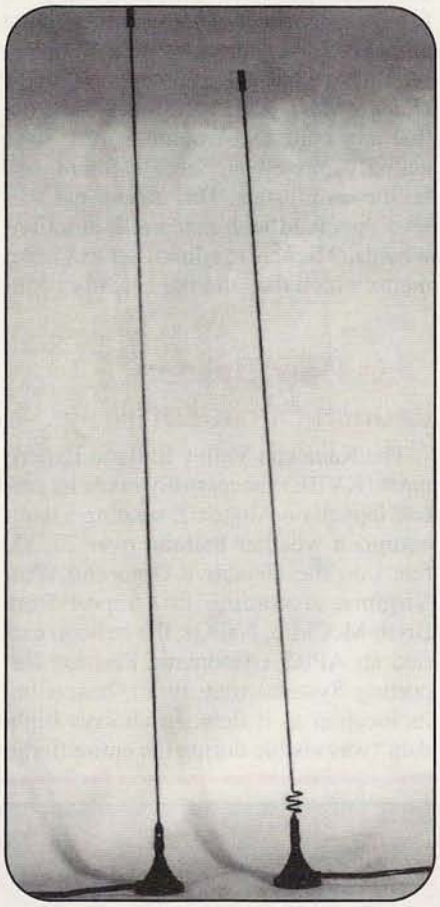
For more information and pricing contact your local authorized Yaesu amateur radio dealer.

Circle 100 on reader service card

MFJ "UltraLite" Mag Mount Antennas

MFJ's UltraLite™ magnet mount antennas for car roofs greatly extend the range of handhelds, according to the manufacturer. The UltraLite eliminates the shielding of your car, and its full-length radiator gives you significant gain over your rubber duck. UltraLites (Model MFJ-1721 for 2 meters only; MFJ-1722 dual-bander for 144 and 440 MHz) weigh less than 2 ounces, are built rugged for mobile use, plus their whips bend and curve to fit any briefcase, travel bag, or glove compartment. They handle 50 watts on 2 meters and 25 watts on 440 MHz (with the dual-band MFJ-1722). SWR typically is less than 1.5:1.

Each magnet mount antenna has a tiny but powerful 1-1/8-inch diameter rare earth magnet and a thin 20-inch stainless steel whip (1/4-wave on 2 meters, 5/8-wave on 440; easy to cut for any frequency up to 500 MHz). The standard nine-foot length of flexible RG-174U coax with BNC connector easily snakes through a closed window or door, and the lightweight cable makes it easy to handle your HT. A free adapter is included for mobile rigs.



List prices: MFJ-1721, $14.95; MFJ-1722, $18.95. The units come with a one-year unconditional warranty. For your nearest dealer or to order, call (800) 647-1800; Fax: (601) 323-6551 or write MFJ Enterprises, Inc., 300 Industrial Park Road, Starkville, MS 39759.

Circle 101 on reader service card

Linear RF Amplifiers from Teletec

Teletec's DXP series amplifiers, with models available for the 6-meter, 2-meter, 1-1/4-meter, and 70-centimeter bands, are high specification, all-mode amps with built-in preamps. These units were designed to be easily installed in-line with most radio systems. They provide high power in a low-profile die cast aluminum heat sink. Guaranteed maximum power outputs: Model DXP-L180 (6 meters), 180 watts; DXP-V175 (2 meters), 175 watts; DXP-V220, 150 watts; DXP-U150 (70 centimeters), 180 watts.

The amps feature automatic mode switching through RF detection and processing. They also detect over-temperature, over-voltage, reverse voltage, and high VSWR conditions. Preamp disable and external keying jacks are accessible at the rear of the unit. RF connectors are SO-239 (type "N" standard on 70-centimeter model).

ATV tuning and repeater tuning options are available at no charge; continuous-duty models are also available.

For more information and pricing, contact Teletec Corporation, 10101 Capital Blvd., Wake Forest, NC 27587, or call (888) 323-6888.

Circle 102 on reader service card

New Svetlana Product Guide

Svetlana Electron Devices, Inc., is offering its new *1997 Audio Tube Product Guide and Catalog*. From pentode to beam tetrode, to power triode, you will find detailed technical information (including performance curves) for each Svetlana audio tube.

For additional information, contact Svetlana Electron Devices Inc., Marketing & Engineering, 3000 Alpine Road, Portola Valley, CA 94028; Phone: (415) 233-0429; Fax: (415) 233-0439; WWW: <http://www.svetlana.com>.

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CIRCLE 99 ON READER SERVICE CARD

Another Delay for P3D—Launch Date in Limbo

An ESA mandate to strengthen the Phase 3D satellite's spaceframe has knocked P3D off the September 30 launch of Ariane 502...unless the launch itself is delayed yet again.

The launch of international Phase 3D (P3D) satellite is in limbo because of conflicting requirements from the European Space Agency to strengthen the satellite's spaceframe and its insistence on meeting the scheduled September 30 launch date for the Ariane 502 booster rocket on which the satellite was slated to fly.

AMSAT-NA President Bill Tynan, W3XO, announced at the Central States VHF Society conference July 27 that P3D officials had determined it would be impossible to have the ESA-mandated modifications completed in time to deliver the satellite to the ESA launch site in Kourou, French Guiana, by August 10, the date set by ESA to receive all payloads for the September 30 launch.

Following is the complete text of the joint AMSAT-NA/AMSAT-DL statement read by Tynan, as provided by the AMSAT News Service:

AMSAT's special event station at the Central States VHF Society conference. Here, Jon Jones, NØJK (center), makes a contact on OSCAR-10, while Keith Pugh, W5IU, AMSAT Vice President of Operations (right) watches and listens. (W2VU photos)

On Wednesday, July 16, a meeting was held in Marburg, Germany between Dr. Karl Meinzer, DJ4ZC, the Phase 3-D Project Leader and AMSAT-DL President, and Werner Haas, DJ5KQ, AMSAT-DL Vice President; and officials of the European Space Agency (ESA). The purpose of the meeting was to discuss the launch schedule for Ariane 502, on which the Phase 3-D spacecraft is to fly. At this meeting, the ESA officials reiterated their intent to launch A-502 at the end of September and said that the launch campaign for this flight has already begun. They stated that, as part of this launch campaign the Phase 3-D spacecraft must arrive in Kourou by August 10th.

Earlier, ESA had informed AMSAT that, following analysis of data from the Ariane 501 flight, they had significantly increased their estimates for the acceleration and vibration environments which spacecraft riding on Ariane 502 are expected to encounter. As a result of this new information, AMSAT has been re-evaluating the structural capabilities of the Phase 3-D spaceframe. As a part of this effort, an independent structural engineer was brought in to review the spacecraft's design and construction. His conclusions were recently presented to Dr. Meinzer and AMSAT-NA people. His report stated that, in order to be confident of surviving these increased launch environments, a number of modifications must be made to the spacecraft. Since that report was presented, substantial effort has been taking place at the Phase 3-D Integration Laboratory in Orlando, Florida, to manufacture and install the recommended structural parts necessary to increase the spacecraft's vibration and acceleration capability.

At the Marburg meeting, Dr. Meinzer made it clear to the ESA officials that this work, made necessary by ESA's new environmental information, would prevent AMSAT from delivering the spacecraft to Kourou by the

"...it was the conclusion of the meeting that, as a result of these ESA specification changes, the Phase 3-D schedule and that of ESA for Ariane 502 are not compatible."—AMSAT statement

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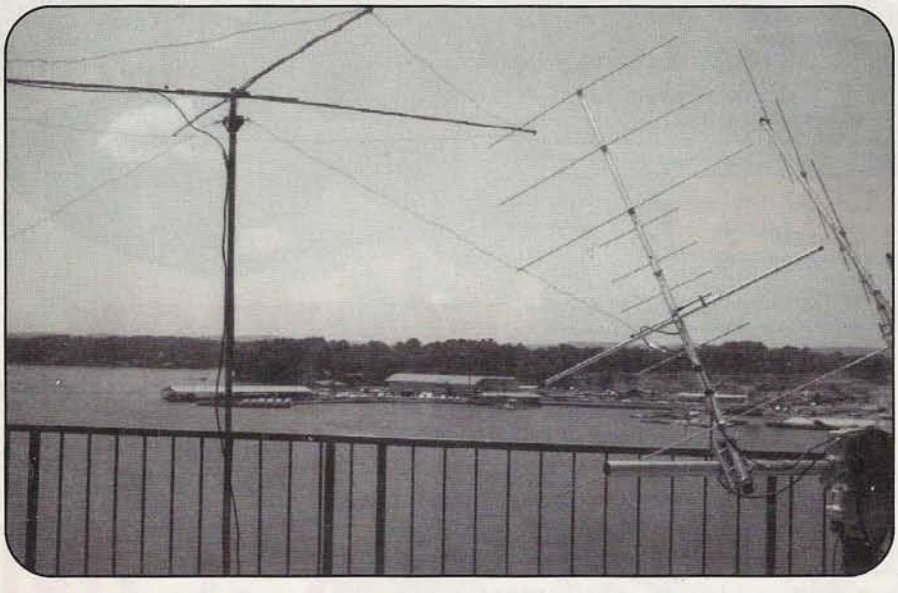
The digital side of the AMSAT station at Central States. In this photo, Roger Ley, WA9PZL, works a pass of KO-23 from the special event station.

specified August 10th date. *Thus, it was the conclusion of the meeting that, as a result of these ESA specification changes, the Phase 3-D schedule and that of ESA for Ariane 502 are not compatible. Thus, unless, something changes, which ESA does not presently contemplate, Phase 3-D will not be able to be launched on Ariane 502.* (emphasis added) Furthermore, in order to maintain the planned mass characteristics of the Ariane 502 vehicle, AMSAT must supply a mass simulator representing the Phase 3-D spacecraft to be sent aloft on the flight. This must be in Kourou by September 5th.

Despite, this very bad news, Dr. Meinzer and other AMSAT officials expressed some degree of confidence the Phase 3D may yet fly on Ariane 502. They based this on a number of activities taking place in the preparation of the launch vehicle that, they believe, could cause a slip in the currently published ESA schedule. The ESA officials attending the Marburg meeting said that, if a slip should occur, which they do not currently contemplate, which results in the two schedules again becoming compatible, efforts would be made to substitute the Phase 3-D spacecraft for the mass simulator. Therefore, AMSAT is continuing in the work of completing the necessary structural modifications to the spacecraft, and conducting environmental testing.

At the time of this announcement, Tynan said no alternate launch possibilities had yet been investigated, and that—if Ariane 502 is launched without P3D on board—it is uncertain exactly when the new AMSAT satellite might be launched. He and other AMSAT officials at the conference believed it was unlikely that ESA would be able to stick to its September 30 launch date and that an additional delay of six to eight weeks might provide enough time to complete the P3D modifications and transport the satellite to Kourou for launch.



This is the four-band OSCAR antenna setup used for the Central States demonstration station, all mounted on the conference hotel's 7th-floor balcony. See text for details.

Center Stage at Central States

Amateur satellites were a major feature of the program at this year's Central States VHF Society conference, held in late July in Hot Springs, Arkansas. There was a special-event satellite station set up in the main meeting room, and it was on the air whenever conference sessions weren't being held, such as during the Friday night flea market.

The station was set up to work both voice and digital satellites, with antennas for four bands attached to the balcony just outside the 7th-floor meeting room. In addition to a pair of 2-meter/70-centimeter Yagis on an az-el (azimuth and elevation) rotator, there was a horizontal loop set up for RS-12's 10-meter downlink and a 15-meter dipole for its HF uplink (used when the digital side took over the 2-meter antenna). A wide variety of contacts were made in a wide variety of places.

At the Saturday night banquet (the station was not on the air), AMSAT President Bill Tynan, W3XO, accepted a $500 donation from the Central States group toward P3D expenses, and Bill presented a plaque from AMSAT to Central States in recognition of its ongoing support of the amateur satellite program.

P3D and Beyond

There were also several satellite-related forums during the conference. Bill Tynan's announcement about the P3D launch delay was made during a presentation by AMSAT Vice President Keith Pugh, W5IU, on preparing to work the new satellite. Tynan took off his AMSAT-President hat to present a personal proposal for "A Possible Phase 3D Follow-On Project," in which he set forth a plan for having AMSAT groups in North America, Europe, and Asia each build and launch a geosynchronous amateur satellite that would orbit over their

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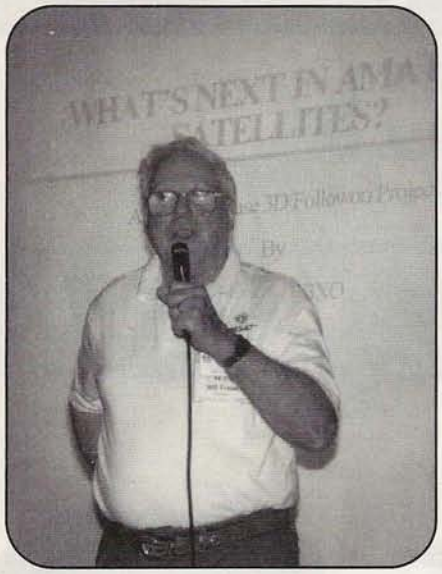


What's next in amateur satellites? After announcing yet another delay in the launch of the Phase 3D satellite, Bill Tynan, W3XO, made a presentation on his personal view of where the amateur satellite program should be heading from here.

part of the world. And once all three birds were in orbit, under Tynan's concept, they could be linked together (via ground stations) to provide full-time, worldwide satellite communication.

Tynan's proposal showcases one side of a debate currently going on among AMSAT board members. Some, like Tynan, want to continue to pursue ambitious satellite projects after P3D is in orbit; others feel it's time to take a break from major-league satellites and concentrate on building up the fleet of low-orbit digital microsats, such as AO-16. The debate has become a central feature of the AMSAT-NA board elections still under way at press time.

Rocket Science 101

The final satellite-related forum at the Central States conference was a look at satellite tracking software, hosted by software designer Mike Owen, W9IP, and titled "Rocket Science 101." Rather than get into the features of specific programs, Mike used his "Nova for Windows" program to illustrate what goes into tracking the orbit of any given satellite. The best part of Mike's presentation was his ability to explain complicated orbital concepts in terms that most everyone in the room could understand. The satellite program needs more people like Mike, able to demystify the "rocket science" aspects of satellite communication, to help draw new people into this aspect of amateur radio.

AMSAT Annual Meeting & Space Symposium

Speaking of conferences, October's the month for AMSAT-NA's annual meeting and space symposium. This year's event will be held in Toronto. Among the many speakers will be *CQ VHF*'s own editor, Rich Moseson, W2VU. His topic will be using The Weather Channel as a tool for learning how to explain complex information, whether meteorology or satellite communication, in ways that most people can understand (it's easier for most people to find The Weather Channel than to find Mike Owen). For more details on the AMSAT meeting, see the "VHF Conferences" section of this month's "Hamfest Calendar."

Scouts in Space

Many astronauts have scouting backgrounds, but the AMSAT News Service (ANS) reports a first for scouts in space: a contact between a former scout on the Mir space station and the U.S. National Boy Scout Jamboree in Fort A.P. Hill, Virginia. More than 200 scouts, some of whom hiked more than an hour from their campsites in the middle of the night, listened in to the 4:30 a.m.(!) contact between K2BSA, the Jamboree ham station, and Mike Foale, KB5UAC, aboard Mir.

Mike was able to talk to 10 scouts during the Mir pass, including a visiting scout from Siberia, with whom he spoke in Russian. During the contact, Mike noted that this was the first time that he was able to make a group contact and the first time that the Moscow ground station could simultaneously listen to the contact. Mike also mentioned that he had been involved with scouting in Germany at one time. This was the first ever amateur contact between scouts at a National Boy Scout Jamboree and a Scout in orbit, according to ANS.

Scouts were amazed at the strong signals and that Mir could be viewed with the naked eye. A staff member overheard one of the scouts commenting after the Mir contact, "this kind of makes you want to look up in the sky more often...."

K2BSA was a regular on the RS-12, FO-20, and FO-29 satellites during the late July/early August event, which was attended by over 30,000 scouts from around the world.

"Scouts were amazed at the strong signals and that Mir could be viewed with the naked eye. A [Jamboree] staff member overheard one of the scouts commenting after the Mir contact, 'this kind of makes you want to look up in the sky more often...' "

CQ VHF Donation to MIREX

CQ VHF has donated two Kantronics 9612+ TNCs to the MIREX (MIR amateur radio EXperiment) program as part of an upgrade of the packet capabilities on the Mir space station. At press time, we were waiting to hear whether one of the units had made it aboard the Soyuz capsule that was bringing two new cosmonauts and a load of supplies to the ailing Russian space station.

MIREX Education Director Miles Mann, WF1F, says the ham station aboard Mir has become very important to the crew members. Mann noted that, after the accidental cable pull that shut down all station power last summer, the first thing the crew turned back on was their communication link with ground control...and the second thing turned back on was the ham station.

Inside AO-27

AMRAD-OSCAR-27 is the amateur side of a commercial satellite called Eyesat. It includes a cross-band FM repeater and has become a very popular beginner's satellite. Recently, there's been some confusion regarding what AO-27 can and should be used for, and the AMSAT News Service posted the following FAQ (Frequently Asked Questions) list from AO-27 Control Operator Michael Wyrick, N4USI:

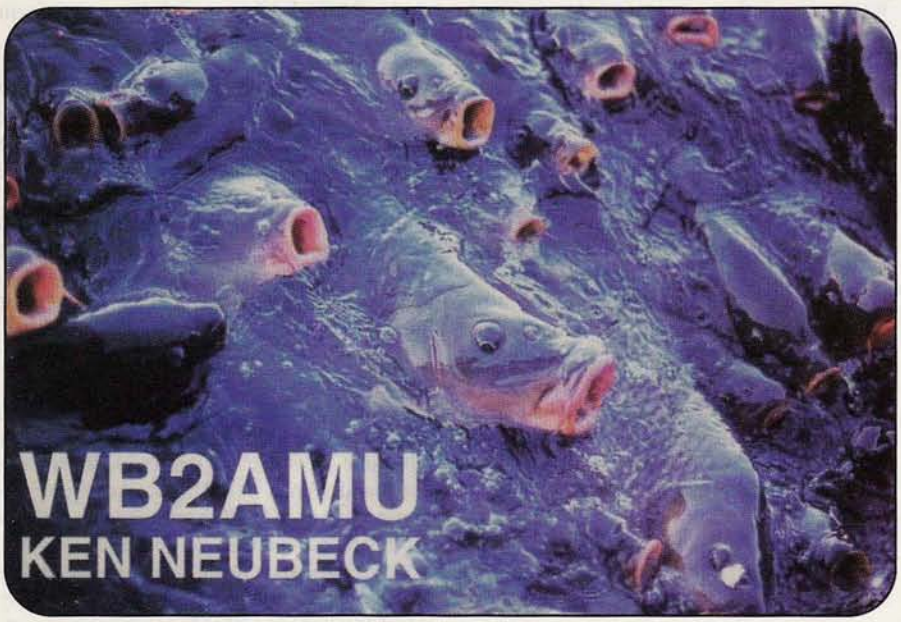
When Can AO-27 Operate?

The satellite contains batteries and solar panels that could run the transmitters during

Picture This!

Readers' "Phun Photos"

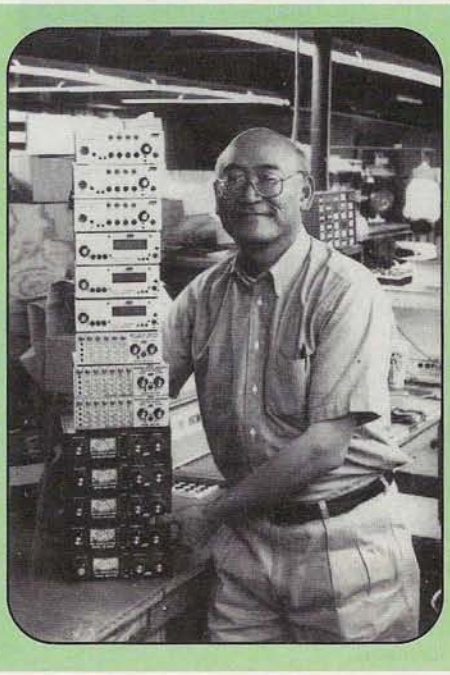
If you've got a cool snapshot to share with us, but don't have a whole article to build around it, send it in to "Picture This," along with a brief description of who and what we're seeing. If we like it, too, and have the space, we'll print it (no pay, just glory). Send your color prints to *CQ VHF*,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



Back to School! CQ VHF *contributor Ken Neubeck, WB2AMU, sent us a copy of his QSL card. Looks like what you'd see on 50.125 during a band opening if you could see as well as hear the operators! I don't know, Ken...there's something fishy about the whole thing!*

Happy Anniversary, MFJ! MFJ Enterprises celebrates its 25th anniversary this month with a "thank you" to its customers for their business and loyalty over a quarter-century. "Without our customers, this dream would not have been possible," says MFJ President and Founder Martin F. Jue, K5FLU (pictured here with a stack of the company's products).

Starting out in 1972 with a single product—an active audio filter kit that sold for $9.95—MFJ today produces over 500 different amateur radio products. In addition to its line of amateur radio accessories, MFJ also manufactures and sells Mirage and Ameritron amplifiers, plus the Vectronics line of antenna tuners and accessories. MFJ Enterprises employs 200 people in its four factories, all located in Starkville, Mississippi, where Jue began the business in a hotel room 25 years ago.



Everything Grows Big in Texas! When Mike Baker, W8CM, moved from Ohio to Texas recently, he quickly got into the "Texan" way of doing things: big! Towering over 70 feet into the Texas sky are Mike's 2-meter and 432-MHz arrays—two sets of stacked 9-element beams on 2 meters (36 elements total), with a 2 x 2 array of 18-element 432 Yagis tucked inside (72 elements total). All of the antennas are from M², and the H-frame is "homemade with materials from local Texas Towers and lots of mechanical discussions with Gerry, K5GW...note that there is mast room left for later additions of Yagis for 220 and 1296 MHz." Mike says the 6-meter array is coming next...but on its own tower!

Q & A

Questions and Answers About Ham Radio Above 50 MHz

Q: I've got a question on spacing and mounting multiple antennas on vehicles, i.e. cars, vans, and boats. To minimize interaction and interference between multiple antennas, I remember from somewhere a rule of thumb on spacing antennas. It had to do with a certain multiple of a wavelength apart (say 1/2 wave minimum). For example, 50, 144, 220, 440 whips on mag-mounts on a minivan, or...marine VHF, Loran, CB, 144/440 dual-band on a boat. Also on the boat mix in a GPS and RADAR antennas.

Any help you can give would be appreciated. Thanks and 73,

Steve Westfall, KK7AP
via e-mail

A: We asked two of our resident antenna experts, Joe Carr, K4IPV, and Rick Littlefield, K1BQT, for their suggestions. Joe's reply was brief and to the point:

There is no really good answer, but half wavelength of the lower frequency is a bare minimum. You might just have to accept the fact that there will be some interaction.

Rick agreed, but offered some practical advice as well:

I guess it all depends upon a lot of factors. Two tuned elements can live fairly close if they appear non-resonant to each other, although some distortion of the omni-directional pattern may occur. If they're close in frequency (146 MHz and 154 MHz) or if they have a harmonic relationship (440 MHz and 146 MHz), the problem gets much more critical. If they're broadside to each other, the effect will be much greater than if they are above and below each other (tip-to-tip spacings of 1/4 wave should more than enough). So, as you can see, it's not a simple problem.

One thing to try might be this: Take a VSWR reading on the existing antenna. Then temporarily clamp the new antenna into the spot where you really *want* to put it. Go back and see if it significantly changes the VSWR of the existing antenna (by 2 or more). If so, then you've probably got too much interaction. Also, check to see if the VSWR is good for the new antenna. If the VSWR is significantly upset, move the new antenna around until there appears to be little interaction. Anytime something is introduced into the near field that significantly changes VSWR, either drastically improving or degrading it, then you know that there is serious interaction that will affect both pattern and overall performance.

Thanks to both Rick and Joe for sharing their expertise.

Q: I recently got my Tech license and have since been bitten by the satellite bug. Unfortunately, I don't have an Internet account with World Wide Web access (e-mail has been hard enough to get). Which leads us to my dilemma: I have no way of obtaining AMSAT bulletins. On the cover of *CQ VHF*, it lists amateur satellites, and I have found many informative articles on the subject. But the information I need most (i.e., AMSAT updates) is missing, It's kind of hard to work satellites when you don't know where they are. In the future, could you include the AMSAT bulletins in *CQ VHF*? I am primarily interested in satellites capable of voice, especially the Mir space station. The AMSAT bulletins would be of great help to me and many other resource-limited hams. Thank you for your support. 73.

Ryan, KC7YPJ
Victor, Idaho (via e-mail)

A: We publish many AMSAT bulletins (or stories based on them) in our "VHF News" segment. We haven't gotten into publishing Keplerian Elements, which I think is what you're looking for, because of a) the amount of space they'd take up and b) the four- to six-week lead time on publication of each issue. Low-orbiting satellites (including Mir) need to be updated more often than the high-flying "birds," shuttle flights change schedule constantly, etc., so some elements will be out of date by the time we get to print. Others, however, are pretty accurate for a few months at a time, so if there's enough interest from readers, we can consider periodically running element sets for different amateur satellites.

Don't despair, though. As long as you have e-mail capabilities, you may receive AMSAT bulletins and Keplerian updates yourself. Simply "subscribe" (no cost) to one or more of AMSAT's four e-mail "listservers," AMSAT-BB (a very busy discussion group among active satellite operators), ANS (the AMSAT News Service with weekly news bulletins and updates), SAREX (messages relating to ham radio contacts with shuttle astronauts), and KEPS (regular updates of Keplerian elements).

You'll probably want to "subscribe" to ANS and KEPS. To do so, just send an e-mail message to <listserv@amsat.org> saying, for example, "subscribe ANS KC7YPJ@juno.com". To get off one of these lists, just send another message, substituting "unsubscribe" for "subscribe." One you're signed up, any message sent to the list will be transmitted to you as an individually-addressed e-mail message. Some of these lists are "receive-only." For example, you may not post messages to the ANS or KEPS lists; but the others, particularly AMSAT-BB, are two-way lists in which you may post to the list as well as receive messages posted by others.

While this is a free AMSAT service, we encourage you and anyone interested in satellite communication to help support these efforts by becoming a member of AMSAT (In the U.S., membership is $30/year, payable to AMSAT-NA, 850 Sligo Ave., Silver Spring, MD 20910).

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

Are You Covered? A Guide to Insuring Your Radios

So you think your homeowner's insurance covers your ham gear? It might, but, as W9FX found out, it might not...a lesson he learned in the nick of time.

By Brad Pioveson, W9FX*

Author's Note: I am in no manner connected with, employed, or otherwise compensated by any insurance agent, agency, or underwriter. I'm only a ham concerned about potential disaster occurring to my station!

Fellow hams, here's a quiz for you: You're at work. Your rig, a modern solid state affair equipped with dual 12-volt DC and 115-volt AC power supplies, is on your operating desk at home. Because the weather forecast mentioned thunderstorms, the coax cable leading to the antenna is disconnected from your transceiver. Lightning strikes, hitting the AC power mains, to which your equipment was still connected. The rig is a total loss. Is it insured?

Your house burns. All your personal belongings, including your ham radio equipment, have been destroyed. You have homeowners' insurance, so you feel confident that your radio equipment will be replaced. Are you sure?

If, like many hams, you're relying solely on your homeowner's insurance policy for protection, the answer to both the above questions is a qualified "maybe."

"What?!," you say. "That's why I pay megabucks for my homeowner's insurance. It covers my personal property." Well, read on...

Your homeowner's insurance protects you financially if your home or property is damaged or destroyed. But does that always include your ham gear? Not necessarily.

A Qualified Maybe

Recently, a friend and I operated in the Rover category of an ARRL VHF contest. In this case, we were using his vehicle, rigs, and antennas, along with some of my accessories. During a lull in the activity, a question occurred to me: Had I been operating in this mode with my equipment, mobile or portable, would the radios be covered by my homeowner's insurance policy?

Within a few days, a renewal notice for my homeowner's insurance arrived, along with a copy of the new policy. I undertook a complete review of the coverage, limitations, and exclusions of my policy, which, as you may know, is much like trying to wade through a swamp while wearing lead boots. This review revealed some potentially disastrous language. My policy states that it does not cover any loss to "electronic apparatus,"

Brad Pioveson, W9FX, has been licensed since 1963 and is active on both VHF and HF. He particularly enjoys designing and building antennas. Preparing this article saved him from a very nasty $12,000 surprise!

It's Never Too Soon...

My research into radio insurance couldn't have come at a more propitious time. On June 30, 1997, I faxed a station inventory to Ham Radio Insurance Associates. I then phoned them and provided a credit card number to pay the premium for my new radio insurance policy. Since new policies become effective on the first day of the month following subscription, my equipment was insured beginning July 1.

On July 14, my 2-meter Yagi, perched 75 feet above ground, was struck by lightning. The charge traveled down several parallel paths including coax, telephone, and rotator cables. In spite of the fact that my equipment was disconnected from the antenna system, the massive surge of energy found—and ravaged—my VHF station equipment, along with various other accessory items. The final tally of equipment damaged or destroyed came to nearly $12,000 (at replacement value).

How did all this damage occur if my antenna was disconnected? Well, my coax cables were lying on my desktop, not (so I thought) touching any equipment. Also on the desktop was a can of contact cleaner—touching both the barrel connector on my 144-MHz feedline and the power supply housing of my Henry 2002 amplifier. The charge traveled through the can, puncturing both sides of it in the process, into the frame of the amp, thence onward, following parallel paths through the 220/110-volt AC wiring circuits and the station's interconnects and control circuits.

Two days later (when telephone service to my home was finally restored) I was able to call HRIA. Bill Hill, W3WH, again answered the call. I apologized for having to file a claim after having had the insurance policy for such a short time, but he immediately put me at ease by telling me that "these things happen."

Within a few short days, a claim form arrived. The form requested that I list the damaged equipment and return it, including a photograph of the damaged equipment, repair or replacement cost estimates from a manufacturer or dealer, and purchase receipts, if available. As I write this, estimates of repair or replacement costs are being assembled.

Have you checked YOUR insurance policy lately? It's not too soon...

regardless of where it is located, if the equipment is designed to be powered by a vehicle power supply (read that as 12 volts DC)!

Oh, Boy...

A quick call to my agent began with a simple statement and a question: "I'm a ham radio operator. Is my radio equipment, when it's located on my premises, covered by this policy?" His response: "Yes, of course it's fully covered." I then drew his attention to the specific language of the policy section called "Property Not Covered: electronic apparatus."

I read the paragraph in question to him and explained that most of the solid state gear that hams use today is designed to operate from 12-volt DC power supplies, even though, in most cases, the equipment is kept in a home station. For a moment, there was only silence. Then he told me that he'd get back to me. Soon thereafter, he called back and, somewhat apologetically, told me that I was right in my interpretation of the insurance policy language. In fact, he commented, "You know, if I were trying to write language into a policy to specifically exclude ham radio equipment from insurance coverage, that's how I'd write it."

My agent had contacted the home office of The Cincinnati Insurance Company (the underwriter of my policy) and asked for a clarification on the language I'd pointed out to him. The office told him that any piece of electronic equipment designed with only provisions for a 12-volt DC power supply, even when located in my home, is *not* insured. If the radio equipment has dual power supplies, such as 12-volt DC and 115-volt AC, only $1,000 of coverage applies, and that's effective only when the equipment is located in the home.

My agent was very apologetic for his error. He told me that, although his office handles the insurance business of several hams, in his 20-plus years of experience, this question had never before arisen—something of a miracle considering the number of thunderstorms that annually pound us here in the Midwest.

If the results of a mini-survey I conducted are accurate across the board, there's a 1 in 3 chance that, if you're depending on your homeowner's plan to cover your radio gear, you, too, may be in for a very nasty surprise.

In this article, you'll find out what to look for in your homeowner's policy, and what questions to ask your insurance agent in order to determine if your radio equipment is adequately insured in the event that "what if..." comes to pass. Also, we'll take a look at three ham radio-specific insurance packages.

The Current State of Affairs

I've been a ham a long time (almost 34 years) and the equipment populating my shack has grown quite extensive. A quick look around the station revealed that my HF and VHF/UHF multimode transceivers, 6-meter SSB rig, brick amps, 2-meter handheld, FM and multimode rigs, keyer, DSP noise filters, TNCs, and, even my IBM laptop computer are all capable of being powered by a vehicular power supply (12-volt DC) and so are excluded from coverage by my homeowner's insurance policy.

A Mini-Survey of Insurance Carriers

Not all insurance policies carry the same limitations and exclusions as does The Cincinnati Insurance Company (and I'm not trying to pick on them; they just happen to be my carrier). To learn which companies exclude or limit radio equipment coverage from their policies, I conducted a mini-survey. In each case, I either spoke directly with a claims person or asked that the local agent contact either the claims office or underwriters. To each, I explained the dilemma in which I found myself and asked what limitations or exclusions applied with their companies' plans.

My first call was to the local claims office of State Farm Insurance. The adjuster I spoke with told me that there are no special limitations on radio equipment or other "electronic apparatus" in their standard homeowner's plans. "Radio equipment," he said, "as long as it's located at home, is covered as regular personal property just the same as your toaster and television." He quickly added the standard insurance jingle, "Claims are, of course, subject to whatever deductible amount is stated on your policy." In this area, deductible amounts usually range from about $100 to $500 per claim.

Next, I contacted a claims adjuster for Pekin Insurance, another popular company in this area. He and I compared notes and policies regarding the coverage of radio equipment (his brother, it turned out, is a ham!), and he found no such limitation or exclusion on DC-powered—or any other—radio equipment, as long as it's located on the insured's premises. If it's in your car, it's not covered.

He did, however, suggest that the best course of action for anyone with a substantial investment in radio equipment is to have the equipment "scheduled" (see "Riders on the Storm" below). And he noted that even if covered, the overall limitations of your policy might be reached before your ham gear gets paid for. In the insurance trade, he explained, it's standard for a home's contents to be covered at 75% of the value of the dwelling. So, for example, if your home is insured for $80,000, your personal property coverage would be $60,000 (this amount will be listed on the first page of your homeowners' insurance policy renewal certificate in a section entitled "Personal Property."). This could be a problem for a well-equipped ham.

"Take, for example, " he said, "a case in which your house burns. You have $10,000 worth [replacement cost] of radio equipment in your basement or toy room and carry $50,000 insurance coverage for your home's contents. If your radio equipment is destroyed along with

Insurance Coverage Table

Carrier	Limitations/ exclusions of radio equip.?	Premium per $100 of replacement cost?	Antenna/tower/ rotator coverage available?	Mechanical/ electrical breakdown coverage available?	All risk coverage included in basic policy?	Equip. covered while mobile?	Equip. covered while portable?
Allstate	No	(1)	Yes (2)	No	No	No (4)	Yes (4)
ARRL	No	$1.50	No	No	Yes	Yes	Yes
Cincinnati	Yes	Rated	Yes (2)	No	No	No (4)	No (4)
Hartford	Yes	Rated	Yes (2)	No	No	No (4)	No (4)
Ham Radio Ins. Associates	No	$1.50	Yes (3)	Yes (3)	Yes (5)	Yes	Yes
Hamsure	No	$1.60 (6)	No (7)	No	Yes	Yes	Yes
Pekin	No	(1)	Yes (2)	No	No	No (4)	Yes (4)
Prudential	No	(1)	Yes (2)	No	No	No (4)	Yes (4)
State Farm	No	(1)	Yes (2)	No	No	No (4)	Yes (4)

(1): Included as regular, unscheduled personal property in basic homeowners' policy
(2): If not attached to the dwelling, towers, antennas, and rotators are included as "Other Structure" in homeowners' policy.
(3): Available option. Not included in basic coverage.
(4): Subject to specific language of policy and interpretation by adjusters. See text.
(5): Insured equipment is not covered in the event of flood or earthquake.
(6): $1.60 per $100 of *market value* of equipment. See text.
(7): Rotator coverage is available. Antenna and tower coverage *is not* available.

Table. A summary of the results of the mini-survey of insurance policies.

all your other furnishings and belongings, you'll probably reach the limit of coverage on your personal property claim by replacing furniture, appliances, TV sets, and other personal property, long before the radio equipment ever gets paid for."

A claims person for a *really* big insurance company, The Hartford, graciously grabbed up a copy of a standard homeowner's policy when I called. She read, verbatim, the familiar paragraph excluding DC powered equipment. When asked how she, as an adjuster, would view a claim on damaged or destroyed ham ra

dio equipment located at my home, she said "I'm afraid we'd interpret the language [of the exclusion] the same way that [the Cincinnati] would. We'd exclude the damaged equipment from coverage."

At my request, a local agent contacted Prudential's underwriters. According to the agent, Prudential "will cover the ham radios just like any other piece of unscheduled personal property." An Allstate agent who contacted that company's claims office for me found that they, too, have *no* exclusion regarding amateur radio equipment, unless, of course, it's being operated in your vehicle.

The results of my mini-survey (see the Insurance Coverage Table for a quick reference) indicate that, of those companies contacted, 4 of 6 (66%) consider ham radio equipment located *in your home* to be regular personal property and, therefore, insured by your homeowners' policy. On the other hand, 2 of 6, or 33%, consider DC-capable radio gear to fall into the policy category called "Property Not Covered," and dual-supply gear comes under "Special Limits of Liability" with its $1,000 limitation. It is possible to buy (at extra cost) what the insurance folks call "scheduled personal property insurance," or "riders."

Riders on the Storm

A rider is a special policy sold to cover a specific piece or pieces of personal property which otherwise would not be covered by the standard homeowner's policy. That's what my local insurance agent suggested I do when I discovered and pointed out the troubling language of my homeowner's policy. He could not, though, quote a rate for this additional insurance. Instead, I was told that I would have to write up a list of my equipment, including purchase prices, dates, and serial numbers, and let him submit it to the underwriter for review and "rating."

In fact, none of the folks I spoke with could quote a rate at which ham radio equipment would be insured as scheduled personal property. That task, they said, is accomplished by "raters," and only after a written description of the property is submitted to them. Unfortunately, no raters were available to be interviewed.

All of the insurance representatives who were contacted agreed that a home tower, antenna, and rotator installation are covered by a standard homeowner's policy as "Other Structures." I was told that "Other Structures" is insurance-speak for outbuildings or structures on your property that are not attached to your house. Remember, though, that the deductible amount still applies. And—if your rotator is equipped with a 12-volt DC power supply—insurance coverage for that part of the installation might be limited or excluded. Fortunately, DC-powered rotators are really rare.

Special Policies

What other insurance options exist for hams? My first thought was the ARRL-sponsored insurance plan I'd seen advertised. It's administered by Albert Wohlers & Co. (see "Resources" for contact information on all ham radio insurance providers mentioned here). I wondered, however, if other coverage was available, and I wondered if other hams were as ignorant as I had been about the coverage provided them by their homeowner's policies. So my research into insurance coverage for ham equipment began in earnest.

My first stop for information was the Internet. After a query posted on the VHF reflector drew only three responses, I did an Internet search, using the term "Ham Radio Insurance" as the search criterion.

Two "hits" resulted. One returned item pointed to the ARRL Web page, where the terms of, and an application for, the ARRL/Wohlers policy was found. I noted that in order to purchase the ARRL-sponsored plan, one must be a member of the ARRL. The second returned item pointed to a Web site operated by Ham Radio Insurance Associates, Inc. (HRIA) of Canonsburg, Pennsylvania. This Web page not only detailed a policy specifically designed for amateur radio equipment (as does the ARRL plan), but also

Some homeowners' policies exclude or limit coverage on electronic equipment that can be powered by 12 volts DC. Since most modern ham gear runs on 12-volt DC, you're in trouble if your policy is one of them.

listed some optional features not offered by the ARRL. No membership in any organization is required for eligibility to purchase the HRIA policy. Additionally, for an extra fee, insurance can be purchased to cover mechanical and electrical breakdown. That last item intrigued me, so I called HRIA.

The HRIA Approach

Bill Hill, W3WH, patiently answered my questions. Basic coverage of commercially manufactured radio equipment (and computers, accessories, and the like) is offered at the same rate as that quoted by the ARRL plan ($1.50 per $100 of replacement cost). Sorry, homebrewers, but handmade equipment is not eligible for coverage from HRIA.

For an extra $1.00 per $100, HRIA will sell "mechanical and electrical breakdown coverage," which Hill described as a type of extended warranty plan for equipment that's less than five years old. This extended warranty plan is also subject to a $50 per claim deductible, and, once insured, the equipment will be eligible for renewal of coverage for up to 10 years after the first year it's insured. So, if, as Hill suggested, you happen to be working 6-meter scatter and the finals go in your Yaesu FT-920, and if you've opted for the mechanical and electrical repair insurance, the repair bill is covered, minus the deductible, of course. The equipment is *not* covered, however, if it's being electrically repaired or tuned. So, if you're adjusting something and your screwdriver slips and you fry your finals, you're on your own (in more ways than one!).

HRIA also offers insurance on towers, rotators, and antennas, as long as the equipment isn't homebrew. One requirement applies: HRIA requires a photograph of the antenna and tower installation prior to the issuance of insurance on these items. Tower, antenna, and rotator coverage is a bit more costly. Hill quoted the cost at $3.00 per $100 of the replacement cost of the installation and noted that the deductible amount for towers, antennas, and rotators is $250 per loss. In contrast, the ARRL/Wohlers plan does not offer antenna, rotor, or tower protection at all.

Hamsure's Options

A scan of current amateur literature revealed the existence of yet another firm offering radio insurance: Hamsure of Orland Park, Illinois. Tom Harvey, WB9CZR, answered the telephone when I called.

Hamsure, he told me, does business a bit differently than either the ARRL or HRIA. His firm insures equipment for what he termed its "market value," not its replacement cost. When I asked Tom how one establishes the market value of a radio or accessory, he suggested that hams should refer to such publications as *Amateur Radio Trader*, *The Yellow Sheets*, or the classified ad sections of popular amateur magazines.

The reasoning behind insuring for market value, he said, is to insure the equipment for what it's actually worth versus what some people equate with the perceived "new equipment for old" policies of his competitors. As a result, he said, Hamsure's premiums are lower ($1.60 per $100 of the *market value* versus $1.50 per $100 of *replacement cost* from ARRL and HRIA).

Additionally, Hamsure requires surge protection and lightning arrestors be installed in the power supply and RF lines associated with covered equipment. Antennas and towers are exempted from coverage, but antenna rotators may be insured. Tom said that *all* equipment must be insured, not just specific radios (or not just, say, your mobile equipment). In explaining why, Tom drew an analogy to homeowner's insurance policies: "We know from statistics that most home fires occur in the kitchen. We can't allow, though, just the kitchen of the home to be insured. The theory of insurance is that "many pay for the loss of the few," and in order for that philosophy to work, hams must insure all their equipment."

Tom added that he makes presentations at radio club meetings where he discusses the insurance needs of hams. In those presentations, he tells hams that if they are relying on their homeowner's policies for protection of their radio equipment, they are underinsured. The underwriter for Hamsure's policies by the way, is The Hartford Steam and Boiler Company, which I was told is not associated with The Hartford, mentioned elsewhere in this article.

Neither HRIA nor Hamsure charges an administrative fee, which, for ARRL insurance, runs $7.00 per year. On the down side, HRIA, the ARRL, and Hamsure all list minimum annual premiums of $25.00, so, if you don't have much equipment to insure, you might want to consider other options.

Covered Risks

Homeowners' policies, including rider policies for scheduled personal property,

insure one's property only in the event of certain specified occurrences, which you'll find listed in your policy, usually in a paragraph entitled "Perils Insured Against." Typical perils that are covered include fire, tornado, lightning, hail, wind damage, theft and/or burglary, vandalism, and so forth. Perils *not* covered by your homeowner's insurance are also listed in the policy. These may include earth movement, including earthquake and subsidence; flood; power interruption, unless the power interruption occurs on the residence premises; acts of war; nuclear damage of any type; and neglect. And, equipment located in a vehicle may either be completely excluded or subject to limitations, as noted above.

In contrast, the ARRL plan offers "all risk, all location" insurance policies. That means that your radio and computer equipment is insured whether located and/or operated in your home, at a Field Day event, on a hilltop, or in your car, RV, or boat. It also means that, regardless of the source of damage, whether theft, earthquake, flood, or other catastrophic event, your equipment is still fully insured.

Hamsure's policies are, like the ARRL's, all risk, all location. HRIA also advertises its policy as being "all risk." I learned, though, that the HRIA policy *does not* cover damage caused by earthquake or flood (Apparently, the definition of the term "all risk" is also subject to some interpretation). There are no location limitations on any of the three ham policies.

The Hamsure, HRIA, and ARRL plans all list deductible amounts as $50 per claim. W3WH and WB9CZR both explained that, for example, if my station were hit by lightning and three pieces of equipment were destroyed, the $50 deductible would apply only once, not $50 per piece of equipment.

Homework Required

Whether you choose to purchase radio insurance from ARRL, HRIA, or Hamsure, or add a rider to your homeowners' plan, it will be necessary to submit, in advance, a full inventory of your equipment, including make, model, purchase date, serial number, or other identifying information. You *do* have it all written down somewhere with a copy of your list kept in a safe place off your premises, don't you? What if, in a worst case instance, your house or apartment burns, and with it, your equipment... along with your list?

Hmmm...you don't have one of these lists prepared? Well, don't feel too bad. I didn't, either. As I went about this chore, I considered that the agony of having to crane my neck around to the back panels to obtain the serial numbers of my gear was my punishment for not having done this task at the time the equipment was purchased. The alternative, though, wasn't a very inviting prospect, so I persevered. Now is a good time for you to get it done, too, whether or not you're in the market for insurance, since police departments need the serial numbers of stolen items so that they can be entered into the NCIC stolen property database. Describing a handheld as "an ICOM 02AT with a small scratch on the right side of the case" just isn't adequate.

It's also a good idea to do what Bill, W3WH, suggested: He recommended that hams carry the inventory process a step further and take photographs of the

station equipment and keep them on file with the paper inventory. In fact, if a camcorder's available, you might consider using it to make a videotape record of all your furnishings and belongings. Then put it all in a safe-deposit box or some other safe location *outside* your house.

How Much?

How much insurance do you need on your equipment? HRIA and the ARRL/Wohlers both offer "replacement cost" insurance packages. When you insure your rigs, you're required to state the current replacement cost of your listed gear. Your premium is based on the replacement cost you establish for your gear.

For example, if you were to insure an ICOM 751A, which initially cost about $1,200, it should be insured for the cost of a similar new rig, say, the ICOM 756, which lists on "the street" at around $2,000. Similarly, if you owned an older piece of equipment. like a Murch UT-2000 Ultimate Transmatch, which, for the uninitiated, is a wide range antenna tuner, it, too, should be insured for replacement cost. While it only cost about $200 when it was new (about 20 years ago), the replacement cost is far in excess of that figure, so you'd list the replacement value as being the cost of a new, similar unit. Whether, in the event of the destruction of the tuner, you'd prefer an MFJ or a Nye Viking product is your choice. You should establish the replacement cost accordingly. The total premium, whether you're dealing with the ARRL or HRIA, is based on 1.5% of the replacement cost of the listed equipment, not what you paid for the unit. Depreciation of the equipment is not a factor in their policies.

Hamsure's policy, on the other hand, is based on "market value," or how much a similar radio would cost you in today's marketplace. So you'd insure your 751A for about what you'd expect to pay to buy another 751A *today*. Hamsure's premium is based on 1.6% of the market value of your listed equipment.

Don't Delay!

Unless you're ahead of the game, you should take action to adequately insure your equipment soon. Start by taking the time to review your current situation and calculate the replacement cost of your radio gear (and the remainder of your household's personal property, while you're at it). Compare the amounts you calculate with the limits of your current insurance policy, taking any deductible amount into consideration.

Also, you should take the time to read your homeowner's policy. If there is trouble afoot, that is, if your policy has a limitation or exclusion on your radio gear, it will most likely be found in a section called "Coverage C—Personal Property." In that section, look for a subsection entitled, "Property Not Covered." Also, while you're there, take a look at the subsection entitled, "Special Limits of Liability." The language may be a bit thick, but wade through all of it and try to determine whether your gear may be the target of one or more of the listed limits or exclusions.

Based on your review, if you have any questions or doubts about whether or not your radio equipment is insured, by all means, contact your insurance agent and ask him or her to contact the claims office or underwriters of the issuing company for clarification. Remember, my agent was only too happy to answer my initial question. He and I had both assumed that my radio equipment was covered. And we were both wrong! ■

Resources

For additional information on amateur radio-specific insurance coverage, contact the following:

ARRL Ham Radio Insurance—administered by Albert H. Wohlers & Co., 1440 N. Northwest Hwy., Park Ridge, IL 60068-1400; Phone: (800) 503-9230; Internet: <http://www.arrl.org/field/regulations/insurance/equipment.html>.

Ham Radio Insurance Associates (HRIA)—P.O. Box 201, Canonsburg, PA 15317-0201; Phone: (800) 545-8881; Internet:<http://www.gaic.com/hria/hria.htm>.

Hamsure—7901 Laguna Lane, Orland Park, IL 60462; Phone: (800) 988-7702; Internet: <http://www.ameritech.net/users/hamsure/hamsure.html>.

Hamfest Calendar

The following hamfests are scheduled for late September and October, 1997:

Sept. 28, BARCFest '97, Boulder County Fairground, Longmont, CO. Talk-in: 146.70-. For information, call (303) 673-0289.

Oct. 3–4, Hamfest '97, Jones Center for Families, Springdale, AR. Talk-in: 146.70- or 146.76-. For information, contact Northwest Arkansas Amateur Radio Club, P.O. Box 24, Farmington, AR 72730, or call Brian Spain, (501) 789-2690.

Oct. 4, Fall Hamfest, Fairleigh Dickinson University, Teaneck, NJ. Talk-in: 146.790 -600. For information, call Jim Joyce, K2ZO at (201) 664-6725, no calls after 10 p.m. (exams)

Oct. 4, Hamfest, Knights Stadium, Fort Mill, SC. Talk-in: 147.03 -600. For information, contact YCARS Hamfest, 2129 Squire Road, Rock Hill, SC 29730, or call George Trunk, AB4BG, at (803) 4344. (exams)

Oct. 4–5, 4th Annual Hamfest and Computer Show, Bahia Shrine Auditorium, Maitkand (Orlando), FL. For information, contact Gerry Skinner, K4LVZ, 3311 Ellwood Ct., Winter Park, FL 32792 or call (407) 679-4244.

Oct. 5, Hamarama, Bucks County Drive-in, Warrington, PA. Talk-in: 146.52 (simplex). For information, contact Brian Taylor (215) 257-6303 between 7 and 9 p.m.

Oct. 5, 9th Annual Hamfest, PAL (Police Athletic League) Club, Huntington, IN 46750 or call (219) 786-0057. (exams)

Oct. 5, Hamfest, Oakbrook Terrace, IL. Talk-in: 147.255+ & 444.825+. For information, contact George (773) 545-3622, Dean (708) 331-7764, or Cora (773) 486-6823; write to CARC 5631 W. Irving Pk. Rd., Chicago, IL 60634.

Oct. 5, Hamfest, Muscatine County Fairgrounds, West Liberty, Iowa. Talk-in: 146.85 -600. For information, call Rob Boorman, KBØMRZ, (319) 351-3399 or Bud Pitt, WBØMEW (319) 264-1788; WWW: <http://soli.inav.net/~icarc/>. (exams)

Oct. 5, Hamfest, New York Hall of Science parking lot, Flushing Meadow Park, Queens, NY. Talk-in: 444.200 WB2ZZO repeat, 146.52 Simplex. For information, contact Arnie Schiffman, WB2YXB (718) 343-0172. (evenings only)

Oct. 11, Hamfest and Computer Fair, Hinks Elementary School, Alpena, MI. Talk-in: TBARC 146.760. For information, send SASE to TBARC, P.O. Box 764, Alpena, MI 49707, or call Bill, N8YKG (517) 354-8867.

Oct. 11, Augusta Hamfest, Evans Middle School, Evans, GA. For information, call (706) 560-9600; or write to P.O. Box 3072, Augusta, GA 30914.

Oct. 11, Hamfest, President's Hall, Kitsap County Fairgrounds, Bremerton, WA. Talk-in: 145.31 (-) offset KC7FA repeater or 146.52 simplex. For information, contact Susan Johnson AB7MD, P.O. Box 1226, Poulsbo, WA 98370; e-mail: <sujohnso@linknet.kitsap.lib.wa.us>.

Oct. 11, Hamfest, Unit Building, Tampa, FL. Talk-in: 146.94. For information, call J. F. Strom, K9BSL, (813) 822-9108; or write to 233-34th Avenue North, St. Petersburg, FL 33704-2241.

Oct. 11–12, MemFest '97, Big One Expo Center, Memphis, TN. Talk-in: (in/out) 147.03/147.63. For information, call John Lovett, AC4GF (901) 758-0661, Fax: (901) 937-8660. (exams)

Oct. 12, Long Island Hamfair, Briarcliffe College, Bethpage, NY. Talk-in: 146.85 repeater (136.5 PL). For information, call LIMARC 24-hour infoline (516) 520-9311, or write to P.O. Box 392, Levittown, NY 11756. (exams)

Oct. 12, Maysville Hamfest, Maysville, NC. For information, contact Jo Ann Taylor, WD4JRY (919) 393-2120.

Oct. 12, HamFair '97, Ingham County Fairgrounds, Mason, MI. Talk-in: 145.39. For information, call Chuck McNease, N8CM, or Linda McNease, KC8DPZ, at (517) 694-2757.

Oct. 12, Nutmeg Hamfest/Computer Show, Fairgrounds, Durham, CT. For information, contact Gordon Barker, K1BIY (860) 342-3258; 9 Edgewood Road, Portland, CT 06480. (exams)

Oct. 18, 14th Annual Tri-Cities Hamfest, Appalachian Fairgrounds, Gray, TN. For information, contact P.O. Box 3682 CRS Johnson City, TN 37602.

(Continued on page 82)

VHF Conferences

Oct. 3–5: Mid-Atlantic States VHF Conference, Pennsylvania (specific location uncertain at press time). Sponsored by Mt. Airy VHF Radio Club (Pack Rats). Informal get-together Friday night, registration and forums all day Saturday, banquet Saturday night. Followed by Hamarama hamfest on Sunday. For registration information, contact John Sortor, KB3XG, 1214 N. Trooper Rd., Norristown, PA 19403; Phone: (610) 999-7658; e-mail: <johnkb3xg@aol.com>.

Oct. 3–5: Western States Weak Signal Society Technical Conference, Montecito-Sequoia Lodge, Sequoia Nat'l Forest, California. Program features at least seven technical forums, from 6-meter EME to K7XC's "VHF Contesting and What it Takes to Win (Regardless of Category)". Conference registration is $15 in advance, $20 at the door, non-ham family members free. Make checks payable to WSWSS and mail to Bob Earl, KD6UIH, P.O. Box 332, Midway City, CA 92655. For hotel reservations, call (800) 227-9900. Mention the Western States Weak Signal Society Conference.

(Continued on page 82)

Operating Notes

For late September and October 1997:

September

20–21 ARRL 10 GHz Cumulative Contest - 2nd wknd

October

4–5 IARU Region 1 UHF/SHF Contest(Europe/Africa)
16 Moon Perigee (closest to Earth)
18–19 ARRL International EME Contest - 1st wknd
21 Orionids meteor shower peak

More contest info is available on the CQ VHF *Web page at:* <http://members.aol.com/cqvhf/navhfcom.htm>.

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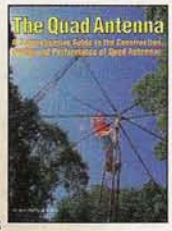
by Bob Haviland, W4MB

Second Printing



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

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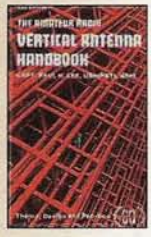
The Vertical Antenna Handbook

by Paul Lee, N6PL



Learn basic theory and practice of the vertical antenna. Discover easy-to-build construction projects for anyone!

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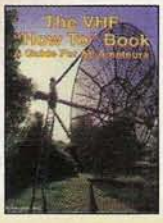
The VHF "How-To" Book

by Joe Lynch, N6CL



This book is the perfect operating guide for the new and experienced VHF enthusiast.

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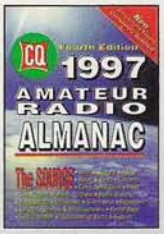
1997 Amateur Radio Almanac

by Doug Grant, K1DG



This volume is filled with over 600 pages of ham radio facts, figures and information. CQ's almanac is a resource you'll refer to over and over again. If it's ham radio, it's in The Source!

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The Packet Radio Operator's Manual

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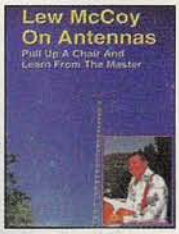
McCoy on Antennas

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!

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W6SAI HF Antenna Handbook

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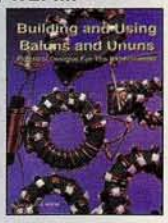

This volume is the source for the latest information and designs on transmission line transformer theory. Discover new applications for dipoles, yagis, log periodics, beverages, antenna tuners, and countless other examples.

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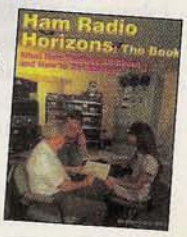
by Peter O'Dell, WB2D



Written by Peter O'Dell, WB2D, this is a book about ham radio that every beginner can enjoy! If you want to get in on the fun and excitement of Amateur Radio, Ham Radio Horizons is the perfect way to get started. HRH is full of tips from expert hams in: DXing, Contesting, Serving the Public, Ham Radio in Space, Experimenting, Digital Communications — you name it! This exciting book is an excellent gift to a prospective ham or for use in your club's licensing classes and library.

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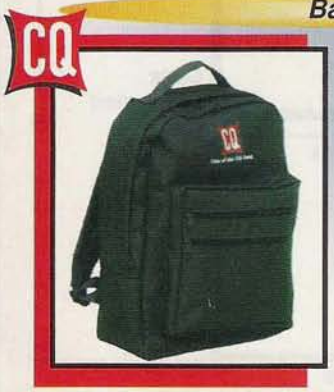

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The "Simple Easy" 2-Meter Antenna

Shed those "rubber duck blues," and knock 'em dead with a signal that speaks with authority. Oh yes, this antenna is fun to build, will fit in your attic, packs more punch than a J-Pole, and is smaller, too.

By Lee Aurick, W1SE*

So your friends have been telling you that you aren't always "full quieting" into the repeater from your home? But you're not allowed to put an antenna outside. What to do? Moving closer to the repeater might be one solution, but hardly a practical one.

Luckily, the antenna described here will fit easily into your attic, packs twice the punch of the commonly used J-Pole, and has many times the gain of the virtual "dummy load" antenna which came with your handheld. It could just be the low-profile gain antenna that you've been looking for.

The "Simple Easy" is a square loop, full-wavelength antenna. Actually, it's two half-wavelength antennas formed into a loop. This gives it 3 dB gain over a dipole or other half wave antenna. (For amateur use, the gain, or improvement in performance, of virtually all antennas is compared to a half-wavelength dipole antenna, which is considered to have 0 dB gain.†) It's not magic, just math: twice the antenna, twice the gain.

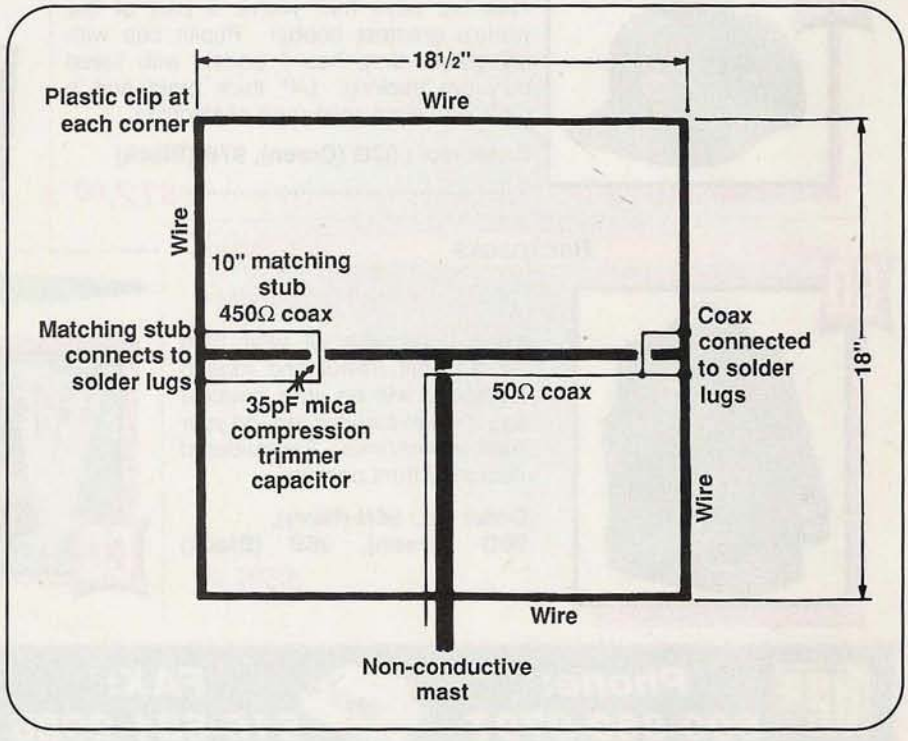


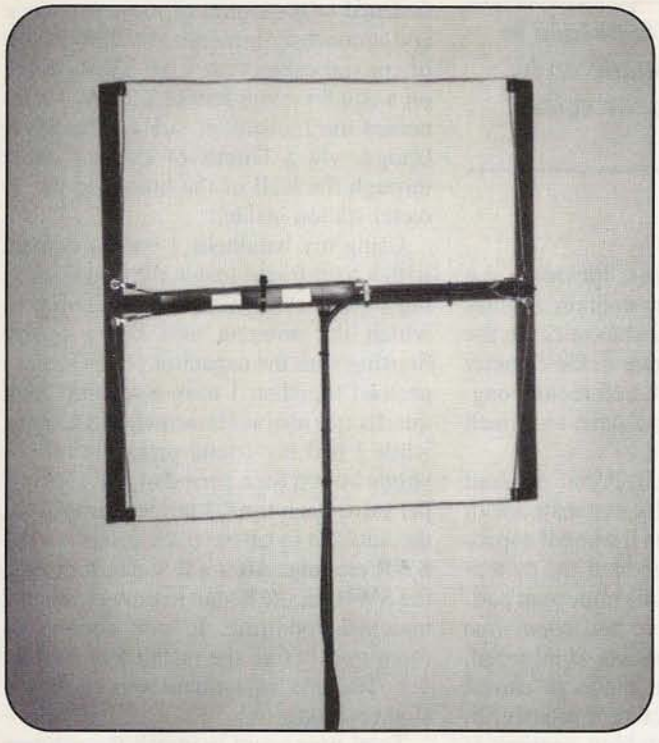
Figure. The "Simple Easy" 2-meter square loop antenna. Note dimensions and locations of matching section and capacitor. You may use virtually any material at hand to make the H-frame, as long as you stay close to the dimensions shown.

†*Gain compared to a dipole is expressed in* dBd, *or decibels over a dipole. Another standard is* dBi, *or gain over* isotropic, *a theoretical antenna that radiates equally in all directions. A dipole has a gain of 2.15 dB over an isotropic antenna, so if you see gain figures expressed in both dBd and dBi, subtract 2.15 from the dBi figure to arrive at the equivalent gain in dBd.—ed.*

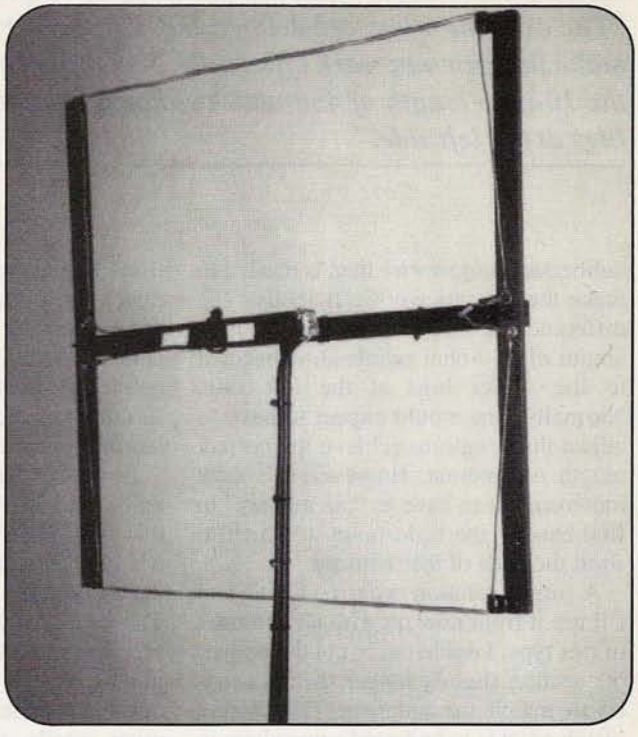
Lee Aurick, W1SE, retired in 1987 from the ARRL, where he was QST *Advertising Manager. Since then, he has been busy developing and describing VHF antennas for restrictive environments.*

Another important antenna consideration, besides gain, is *polarization*. An antenna that has its principal radiation in the vertical plane is said to be *vertically polarized*. Repeater antennas are vertically polarized so that they'll radiate uniformly in all directions, making them *omnidirectional*. It helps if you also use a vertically polarized antenna. Not doing so could place you at a great disadvantage, and can mean as much as a 25-dB loss, each way, for signals into and out of the repeater.

The common J-Pole is a half-wavelength antenna, just like a dipole, and so is said to have 0 dB gain. Sure, it has the advantage of being omnidirectional, and that's fine for the repeater, which has to serve stations in all directions. But, heck, your task is to get *into* the repeater from



A front view of the completed "Simple Easy" 2-meter square loop antenna. It really is simple to build.



An angled view of completed square loop showing capacitor mounted at end of matching section.

your QTH. To do that, if you're not full-quieting, you need some extra help.

The "Simple Easy" Antenna

The antenna described here contains a full-wavelength of wire, and is vertically polarized. The antenna's 3-dB gain (half an S-Unit) is achieved by combining the radiation pattern of the two half-wavelength sections into a "bi-directional" pattern; that is, the antenna radiates forward and backward. Radiation off the sides is greatly reduced. Well, after all, you can't have your cookies and eat them, too. It's a small price to pay for an antenna that may be turned in any direction you wish to favor. You'll just radiate off the "back" as well as the "front."

Easy to Build

The antenna is easy to construct. It's formed on a wooden frame that looks like an H. The two vertical sides are each 18 inches long, and the horizontal cross-piece is 18-1/2 inches long. The model shown here is made from 3/8-inch by 3/4-inch wooden strips, but please don't feel that it's necessary to search overly long for the exact same size. Virtually any similar size of wood or PVC material may be used. You're also free to use your own creativity in joining the pieces together; for instance, they could be glued or stapled. I used #6 bolts and nuts wherever something was fastened to something else.

Once the frame is built, cut a 72-inch length of wire into two identical pieces, run it through the plastic clips at each corner of the H, and then fasten each end to a solder lug at the points shown in the Figure. Each wire is then *almost* one half-wavelength long. The rest of the length is made up by a unique matching section, which—in the way it's used—will help you understand some things that happen in antennas and matching sections.

The coaxial cable feed point is shown at the right side in the Figure. The antenna may be fed with a length of any suitable 50-ohm coaxial cable, such as RG-58 type or better. The center conductor is connected to one solder lug, and the shield to the other solder lug. This connection point is the center of one half-wavelength section. Following along, to the top and bottom of the H, the wires are then routed through the plastic clips at each corner, to the solder lugs at the center of the opposite side. This is the center of the second half-wavelength section. The two center sections, which are at current loops, are in the vertical plane, and the antenna is truly vertically polarized. The matching section, described below, is then connected to the solder lugs at the center of the second section.

"The antenna described here packs twice the punch of the commonly used J-Pole, and it has many times the gain of the virtual 'dummy load' antenna which came with your handheld."

Prior to installing the wires and the matching section, you can give the frame a coat of black paint, for cosmetic purposes only. But, if your antenna will be mounted in the attic, only you'll know if it's not painted. To keep the matching section from "waving in the breeze," place a small piece of Styrofoam between the twinlead and the cross-piece, and secure it with a nylon tie. Any non-conductive material will do.

Matching the Antenna

The matching is so simple that it takes only a few minutes. The antenna wires are

"The antenna wires are deliberately cut shorter than is needed to make the antenna work efficiently. The difference is made up by the 10-inch length of 450-ohm twinlead, connected to the solder lugs at the left side."

deliberately cut *shorter* than is needed to make the antenna work efficiently. The difference is made up by the 10-inch length of 450-ohm twinlead, connected to the solder lugs at the left side. Normally, one would expect to have to adjust this length to achieve the correct length of antenna. However, it's very inconvenient to have to "cut and try" to find exactly the right point at which to short the ends of the twinlead.

A simple solution occurred to me, and I'll use it from now on with all antennas of this type. I deliberately cut the matching section slightly *longer* than is needed to match the antenna. The correct match point is to be found somewhere in the matching twinlead, shorter than the full 10-inch length of the twinlead, measured from the beginning of the solder lugs to the ends. I then solder a small 35-picofared, compression-type mica capacitor across the ends of the matching section. The antenna wires, including the matching section, now contain slightly more wire than is needed to resonate the antenna at any frequency in the 2-meter band. The antenna is, therefore, too long. In other words, we now have too much *inductive reactance*.

So how do we make it shorter, without the "cut and try" usually associated with this task? Here's where the small capacitor connected to the ends of the matching section gets to play its important part. The capacitor is able to add *capacitive reactance*. As the capacitor is adjusted, this capacitive reactance acts to cancel out a part of the inductive reactance. In other words, the matching section is made *electrically* shorter as the capacitor is adjusted, and the antenna can be accurately matched to the 50-ohm coaxial cable in less than five minutes. Sure beats "cut and try." (*For more info on capacitance versus inductance, see this month's "In Theory" column.—ed.*)

"As the capacitor is adjusted, this capacitive reactance acts to cancel out a part of the inductive reactance. In other words, the matching section is made electrically shorter as the capacitor is adjusted...."

The Matching Procedure

The antenna should be mounted to a temporary mast, and in the clear by at least three or four feet. Antennas don't "like" to be close to conductive objects, such as humans, houses, or other antennas. I erected this antenna in my back yard, on a short, non-conductive mast, fastened to the center of the cross-piece and connected, by means of a short length of coaxial cable, to a VHF SWR bridge on a small table a few feet away. I connected the transmitter side of the SWR bridge, via a length of coaxial cable through the wall of the house, to the 2-meter station inside.

Using my handheld, I was in contact with a ham friend inside the house, talking on the same simplex frequency to which the antenna was being tuned. Starting with the capacitor plates closely pressed together, I took a reading each quarter of a turn as I unscrewed the plates, while I had my friend press the microphone button for a period of two seconds per turn. Each time, I moved away from the antenna to observe the effect on the SWR reading. After a few quarter turns, the SWR needle began to move toward a matched condition. It took about five more tries before the match was exactly 1:1. The last adjustment was merely a slight tweak.

Total time spent to match the antenna perfectly: less than five minutes. The most important ingredient: the VHF SWR bridge. If you don't have one, there is no way you can match this antenna, or even know what's going on with any of your VHF antennas. Borrow one, if you must. (*Or build your own! See "Build a VHF/UHF SWR Bridge," elsewhere in this issue.—ed.*)

How Well Does the Antenna Work?

I mounted the antenna five feet above ground in the driveway and connected it to my handheld. The first test was at three watts, to two repeaters approximately eight miles away; both replied solidly to my ID. I reduced power to a 1/2-watt and got the same result.

That evening, after my friend returned home, we made another test to determine how well the repeater could hear me. My friend reported signals as "full quieting," even at a 1/2 watt. As the acid test, to confirm the antenna's vertically polarized radiator, I temporarily rotated it 90° to provide a horizontal orientation. No response from either repeater, at any power level. The antenna clearly had sufficient gain, polarization, and directivity to reach repeaters well beyond the range of a rubber duck or even a J-pole.

Give the "Simple Easy" a try. I think you'll like it. ■

Ontario DX Association Meteor Scatter Tests, October 4 through 26, 1997

The Ontario DX Association (ODXA) of Ajax, Ontario, will conduct tests for sporadic meteor detection on 10 meters (29.050 MHz) each Saturday and Sunday morning during October at 0900–1100 UTC. Operation will be mainly CW. We are seeking signal reports from anyone who hears our signal. We will use standard meteor scatter procedure: 15 seconds transmit followed by 15 seconds receive. We will transmit on the first 15 seconds of each minute, using the call-sign VE3ACK.

Send reports to Philip Gebhardt, VA3ACK, P.O. Box 52, Greenbank, ON, Canada, L0C 1B0 or to <pgebhardt@compuserve.com>. For further information or updates on the experiment, check the ODXA Web site at <http://www.grove.net/~odxa/>.

ADI AT-600 Dual-Band Handheld

If you're looking for a full-featured dual-band HT at a budget price, check out the ADI AT-600.

By Gordon West, WB6NOA*

For some time now, ADI Communications has been building its reputation in the amateur industry by selling mobile and handheld transceivers and accessories for, generally, about 20% less than comparable equipment from more established manufacturers. It does so without skimping on features and still offers relatively good transmit and receive specifications.

So far, all of ADI's ham rigs have been single-band FM radios, operating either on 2 meters or 70 centimeters. So it was a "natural progression" that ADI develop a full-featured, low-priced VHF/UHF handheld: the AT-600. This radio lists for less than $400 with the 2.5-watt battery pack ($20 more with the 5-watt pack), but it has been seen selling significantly below list at recent hamfests.

I was eager to try one out, so a random unit was pulled out of stock at Premier Communications, ADI's U.S. distributor.

Let's Start with the Box

The packaging for safe UPS mail-order delivery of the handheld was excellent. The battery is in one part of the Styrofoam packing, with the head of the transceiver in another, a little wall charger in a third compartment, and the rubber antenna in a fourth. Surprisingly, the sturdy belt clip has already been factory attached. That's nice. The little handheld antenna also bears the marks, "VHF/UHF," and this is nice, too! How many of you have a whole box full of antennas, and you wonder which ones are single-band and which ones are dual-band?

A Little Confusion

I plugged in the charger, rotated a little rubber boot that protects the "DC IN" receptacle, and put the unit on charge overnight. Next morning, I checked how warm the little wall charger got, and it was stone cold. Something wrong here.

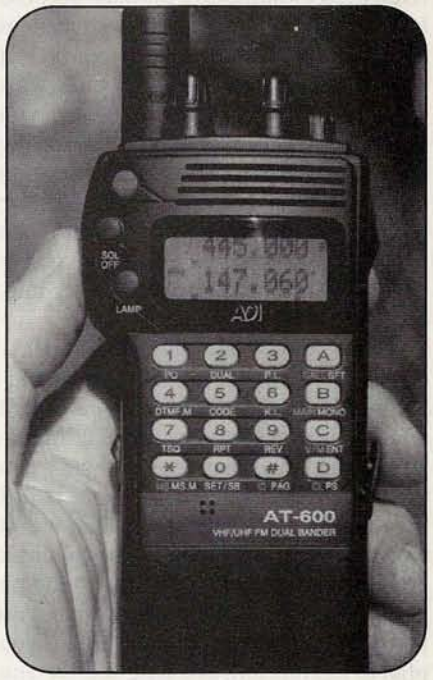
After close examination, I discovered that ADI used the same style jack for both "DC IN" (looking for a regulated 12-volt connection) and, way down at the bottom of the battery pack, "Charger IN." Cockpit error at my end—I had accidentally plugged the little "wall wart" charger into what should have been 12 volts DC instead of the direct connection to the battery with 9 volts DC at 100 milliamps. Luckily, no harm was done, but it took me the better part of the morning to get enough charge on the battery to continue my test.

ADI has introduced a faster drop-in charger, but, like all other manufacturers' handhelds, the battery and charger are unique to ADI and there's not a ghost of a chance of getting a boost from, say, the similar-looking Alinco-style battery charger. However, I hear the battery *is* similar to a Standard CNB151/152.

Turn It On, Turn It On...

The ADI dual-bander powers on with a firm push of the orange button on the top left side. It gives a distinctive "beep bop" tone and then shows UHF on the top of the screen and VHF on the bottom. The display is green with dark blue LCD characters. It was completely readable in both bright daylight and at night, but didn't seem to have the contrast of some other handhelds I've seen that feature a light gray background and jet black numbers. Don't get me wrong, though: the display is indeed adequate, and can be seen at almost any angle.

To the left of the display is a squelch override button, although the squelch controls themselves are conveniently located as the inside knobs on both the VHF and UHF control dials. This puts two volume and squelch knobs right on the top of the unit, making for uncomplicated operation on your belt. A third control on top of the radio is a tuning dial.



ADI's AT-600 dual-band handheld includes most of the features found on more expensive radios, but at a budget price. (Photos by the author)

I tried the unit in the dark, and the lamp function works well. Actually, the keys had excellent backlighting even without the lamp. The only problem was that you couldn't tell what the subfunctions were for each key—but, now that I think about it, not many other sets illuminate both the actual keys and the subfunctions printed just below them.

On the Air

I first went to the 2-meter band by pushing the "B" button once and watching the

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

main band cycle down to 146 MHz with a single beep. When you push the "mono" "B" button again, it gives you two beeps, indicating UHF band selection.

I then key-entered 146.520 to try a couple of simplex tests with another mobile unit. When I went to transmit, nothing happened. It took me about 30 seconds (I was having one of those slow days) to realize I was actually pushing the incorrect part of the side-mounted push-to-talk (PTT) button. My finger was naturally resting on the "function" part of the button, and this won't cut it for PTT. I realized that the actual PTT switch was located down at the bottom of the dual-purpose button, and you really had to squeeze it hard in order to get the set to transmit. But once I learned where the PTT button was, I had no further problems. Of course, you can also add a speaker microphone on the top jacks if you plan to run this unit on your belt, and you can then use that for both transmit and receive. Plus, you can use the options menu to select either or both bands to hear on the speaker-mic. Slick audio system!

Audio output from the built-in speaker was good, similar to many other handhelds, which are loud enough in a crowd when held close to your ear, but impossible to hear in a noisy environment when you're wearing the radio on your belt. I then added the ADI speaker/mic, and it was so loud, I immediately had to turn it down. Running the ADI speaker mic on your shoulder will certainly give you plenty of audio output. Same thing if you plan to run this unit as a base station: any external speaker plugged into the top-mounted jack will give you more than enough audio with excellent fidelity.

The audio was good on transmit, too. On-the-air reports indicated the ADI handheld had "full audio sound." Several stations were convinced I was using a regular mobile unit and a big base station mic because of the full-sounding audio. I assured them I was simply speaking into the stock mic built into the AT-600.

Not Just FM

Next I wanted to listen to the AM aeronautical band. This unit is advertised as receiving 108- to 137-MHz AM aircraft. I checked out the instruction book, which shows you how to go into the "menu set" mode and select AM. To my surprise, I found that the AM portion of the radio goes all the way from 100 MHz to 174 MHz. So if you really want to get back to the old days of 2-meter AM, you have the capabilities with this set. However, I would caution you not to use AM on 2 meters because there won't be many other AM operators to figure out that you're not using FM. I also discovered a menu item that allows for automatic AM to FM switchover at 136.995 MHz. This allows you to listen to both AM aeronautical calls and FM 2-meter calls without having to worry about switching from AM to FM.

What Was That Frequency?

Talk about memory! The ADI AT-600 allows you to store 60 memories in VHF and 60 memories in UHF, *including* a 6-character alphanumeric name for each. In addition to storing the frequency and ID name, each memory can hold AM or FM mode, repeater offset frequency, paging mode or code squelch mode, and CTCSS tone encode or decode mode. And I'm happy to say that both encode and decode capabilities are included—not just encode as in other handheld radios that may require an optional decode board. This unit has both boards built in!

Plus, if you're not interested in storing alphanumeric names for each channel, the available memory channels increase to 100 each on VHF and UHF. That's quite a bunch!

Many Menu Choices

As I was looking into storing a few channels in memory, I entered the set menu mode and was surprised to find over 28 different menu items to customize the radio.

Some of the more interesting menu items are the automatic repeater offset, a menu item for full duplex to talk on VHF and hear yourself come out on UHF when operating through a dual-band repeater system, plus CTCSS tone search for identifying an unknown tone. You can also "clone" memories between two AT-600s or an AT-600 and a lap-top computer with soon-to-be-released software.

If you're cloning 100 channels of VHF and 100 channels of UHF, it will take about six minutes "over the air" with DTMF tones. A much faster way that only takes about 30 seconds is to hard-wire two AT-600s together and do a memory dump from one unit to another. And, as soon as the software is available from Premier, it will take you just a couple of seconds with a personal computer to load a list of channels into the AT-600.

The push-to-talk (PTT) switch on the AT-600 can be tricky. Be sure you press the lower part of the side button, as the top part is the "function" switch.

Additional menu items include the option to select a 1-kHz digit when using the keypad for frequency entry; all sorts of paging options; cross-band repeater transmission; selectable battery saver time sequences; time-out timer, and a built-in voltage readout to let you know exactly how your battery is doing.

Straightforward Operation

The general operation of the transceiver is straightforward, without any major difference between this set and other manufacturers' dual-band sets. There are, however, little quirks you must remember. For instance, when you're in the set mode choosing which subaudible tone to transmit, the tone frequency in hertz is increased by pushing the pound (#) key several times. But to decrease the tone frequency, you don't press the opposite star (*) key, but rather the middle "0" key. Once you understand this, though, it goes real quickly. You can also select tones by holding in the function button (at the top of the PTT switch) and rotating the top control knob.

Finally, there are tone beeps to let you know when you have selected tone 110.9,

On the Test Bench

Here's what the ADI AT-600 looked like on the test bench:

VHF receiver sensitivity (12 dB sinad): 0.13 µV
UHF receiver sensitivity (12 dB sinad): 0.14 µV
Squelch threshold: 0.17 µV
Audio output power: 520 mW
Transmit power (high setting):
7.2 volt battery: 3 watts VHF, 2.8 watts UHF
13.2 volt battery: 5.2 watts VHF, 5.0 watts UHF
Typical 13.8 VDC high-power current, 1500 mA
Receive current consumption, moderate volume, 175 mA
Receive current squelched, 85 mA
Frequency deviation on transmit, 4.2 kHz

sort of a standard, which gives you a "home base" if you're not able to easily see the display.

Good Intermod Rejection

I hooked the AT-600 onto an external antenna, and the intermod rejection was very good. And if there were any signs of intermod on the external antenna, I could hit the ATTENUATE button and knock down the intermod at the cost of a slight decrease in reception sensitivity. I'd hoped that I could selectively tag different memorized channels with the attenuate command, but, unfortunately, the this feature works on all displayed frequencies and can't be pre-programmed for only a few of them in memory.

A Heckuva Value

For a dual-bander that lists for under $400, and has an even lower "street price," the ADI AT-600 is one heckuva value for all of the features you'll get—even if you only use about half of them! I know I certainly liked the included subaudible tone decode. It's about time!

While you may think you'll never need pager tones, automatic turn-on, or automatic shut-off, these might be features you'll want to explore after a year or so of owning this equipment. And judging by a quick inspection on the inside of the case, this new dual-band, 2-meter/440-MHz handheld from ADI will keep running for many years to come.

So, if you're on a budget and are looking for a full-featured, dual-band handheld for under $400, check out the new ADI AT-600. ■

Resources

For further information on the ADI AT-600, contact Premier Communications, 20277 Valley Boulevard, Unit J, Walnut, California 91789; Phone: (800) 666-2654, (909) 869-5711; Fax: (909) 869-5710; Internet: <http://www.adi-radio.com>.

A Quick Meter Shunt

How WE2R used a piece of hookup wire to extend the range of a junkbox milliampere meter and, in the process, proved to himself that Ohm's Law really does work.

By Charlie Zusman, WE2R

Editor's Note: In his June article on using kits to assemble a 2-meter transverter, WE2R mentioned that he was able to extend the range of a milliammeter by adding a piece of hookup wire as a "shunt." We didn't have room to go into detail in that issue, but we asked him to tell us more about it for this follow up.

The instructions for my Hamtronics transmit converter suggest using a 500-milliampere (mA) meter in series with the power supply, both to ensure that things are working properly and to provide an adjustment aid. With no drive applied, the converter should draw 90 mA, and, at full power, it should draw 400 mA. Readings appreciably different from this point to trouble.

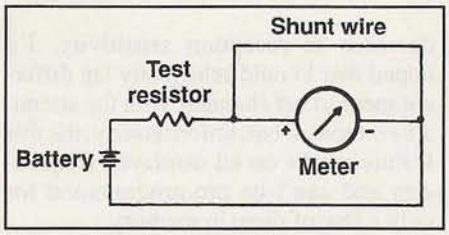
My junkbox contains several meters purchased at hamfests, and I found one rated at 300 mA.[1] It was a hefty unit and looked sort of like it was manufactured when radio communication was just a gleam in Guglielmo Marconi's eye, but it could be made to serve.

Extending Meter Range

The range of a current meter is extended by using a *shunt*, a resistance placed in parallel with the meter, across its terminals. The current to be measured is divided, with part of it going through the shunt and bypassing the meter, and the rest going through the meter, causing it to give a reading.

You can calculate the resistance of the shunt if you know the meter's internal resistance (the formula is in the *ARRL Handbook*—I'm still using the 1993 edition). But I used a hands-on, "cut-and-try" approach.

Since I needed only to measure approximate currents, I didn't require complete accuracy—a ballpark reading would do,



Schematic of the meter and shunt wire, with a test voltage and resistor attached. See text for details.

as long as it stayed within the range of the meter and didn't peg, or pin, the meter during adjustment. I knew that just a small resistance was needed, and figured that a length of hookup wire connected across the meter terminals would work. The challenge was to find the length of that wire (the longer the wire, the greater the resistance).

Back to the Junkbox

Digging through my junkbox again, I found a battery holder for two AA batteries, a 10-ohm and a 5-ohm resistor, some alligator clip leads, some thin (26-gauge) hookup wire, and the meter. For the brainwork, I used Ohm's Law and a handheld calculator.

An alkaline battery supplies 1.5 volts, so two of them in series will yield 3 volts. Using Ohm's Law[2] in the form

$$I = \frac{E}{R}$$

to solve for current, 3 volts into a 10-ohm load should yield .3 amp, or 300 mA. Using the clip leads, I connected it all up, and, sure enough, the meter went to the end of its scale at 300 mA!

Next I "guesstimated" and cut a 10-inch length of hookup wire. I connected it across the meter and it gave me a mid-scale reading, just about right.

As a further test, I replaced the 10-ohm resistor with one of 5 ohms. Here again, using Ohm's Law, 3 volts divided by 5 ohms gives a current of .6 amps, or 600 milliamps, which should peg my meter without the shunt. But, with the shunt in place, the 600-mA-calculated reading gave an actual reading of about 200 mA, good enough for my purposes.

Using the Meter and Shunt

Without the shunt and with no drive applied to the converter, the meter showed the converter was drawing the proper 90 mA, indicating that it was working properly. Then, with the shunt in place and drive applied to the converter, I was able to make adjustments with the meter staying on scale and could infer that the readings were within range.

I used resistors of 10 ohms and 5 ohms, because they're handy values and I happened to have a couple. Other low values would work just as well; simply plug the different numbers into the formula.

Solving for power with the formula P = IE (a derivation of Ohm's Law), my 600 mA of test current at 3 volts comes to 1.8 watts, so 2-watt resistors should do fine for the tests.

A Word of Caution

What I've described here involved low voltage and low current values, so I felt safe in experimenting. Even so, the tests were done quickly, with the leads un-

"The range of a current meter is extended by using a shunt, a resistance placed in parallel with the meter, across its terminals."

"Using Ohm's Law in the form I = E/R to solve for current, 3 volts into a 10-ohm load should yield .3 amp, or 300 mA."

clipped while I was thinking and calculating so as to avoid having things heat up and drain the batteries. Care is always in order when working with electricity.

I'd also like to emphasize that the method I used worked because I did not require accuracy, just relative readings. But it was a fun exercise in using junkbox parts, and I was able to prove to myself that Mr. Ohm was really on to something with the law that bears his name. ■

Notes

1. My original article last June about the transverter identified the range of this meter as 350 mA. That was a typographical error. It is actually 300 mA, as noted here.

2. In case you've forgotten, Ohm's Law lets you calculate either current (I), voltage (E), or resistance (R) as long as you know two of the three values. Using high-school algebra, you can rearrange the basic formula, E = IR, to solve for current (I = E/R) or for resistance (R = E/I).

Web Site Update

CQ VHF's on the "Hit List"

In mid-July, we passed the 5,000-"hit" mark on the *CQ VHF* Web site (yes, we know NASA got 45 *million* hits in one day when Pathfinder landed on Mars). A "hit" is recorded each time someone accesses your site.

We recently added the SM5INC "Fieldhunters List" to our site. A *field* is the big 10° latitude by 20° longitude rectangle enclosing all the 1° x 2° *grid squares* that begin with the same letters (such as "FN" in FN30). Johnny Ryden, SM5INC, maintains a standings list on each band and we're pleased to be able to help him make it readily available on the Web.

If you haven't paid us a visit on the Web yet, please drop by anytime. The address is <http://members.aol.com/cqvhf/> (and don't forget that last "/").

Finally, our sister magazine, *Popular Communications,* is also on the Web. You can link to the *Pop'Comm* page from *CQ VHF*'s home page, or you can go there directly by accessing <http://www.popcomm.com>.

CQ VHF Ham Radio Above 50 MHz

Reader Survey—October, 1997

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'd like to ask about your involvement in emergency and public service communications.

	Circle Reader Service #
1. Please indicate whether you have *ever* been a participant in:	
Emergency communications	1
Disaster communications	2
Severe weather net	3
Public service event/activity (e.g., bikathon)	4
Emergency/disaster drill	5
Emergency training net	6
Message-handling (traffic) net	7
Other public service communications/activities	8
2. Please indicate whether you *regularly* participate in:	
Emergency communications	9
Disaster communications	10
Severe weather nets	11
Public service events/activities (e.g., bikathon)	12
Emergency/disaster drills	13
Emergency training nets	14
Message-handling (traffic) nets	15
Other public service communications/activities	16
3. Please indicate which, if any, of the following groups you belong to (circle all that apply):	
ARES (Amateur Radio Emergency Service)	17
CAP (Civil Air Patrol)	18
MARS (Military Affiliate Radio Service)	19
Public-service-oriented radio club	20
RACES (Radio Amateur Civil Emergency Service)	21
REACT (Radio Emergency Associated Citizens Teams)	22
SAR (Search and Rescue) Group	23
SKYWARN (Severe weather spotter)	24
Other emergency/public service group	25
4. Please indicate whether you feel you'd be prepared to respond and provide needed communications if a major emergency or disaster occurred in your community.	
Yes	26
No	27
Not sure	28
Not interested	29

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

"CQ Universe"—Is Anyone Out There?

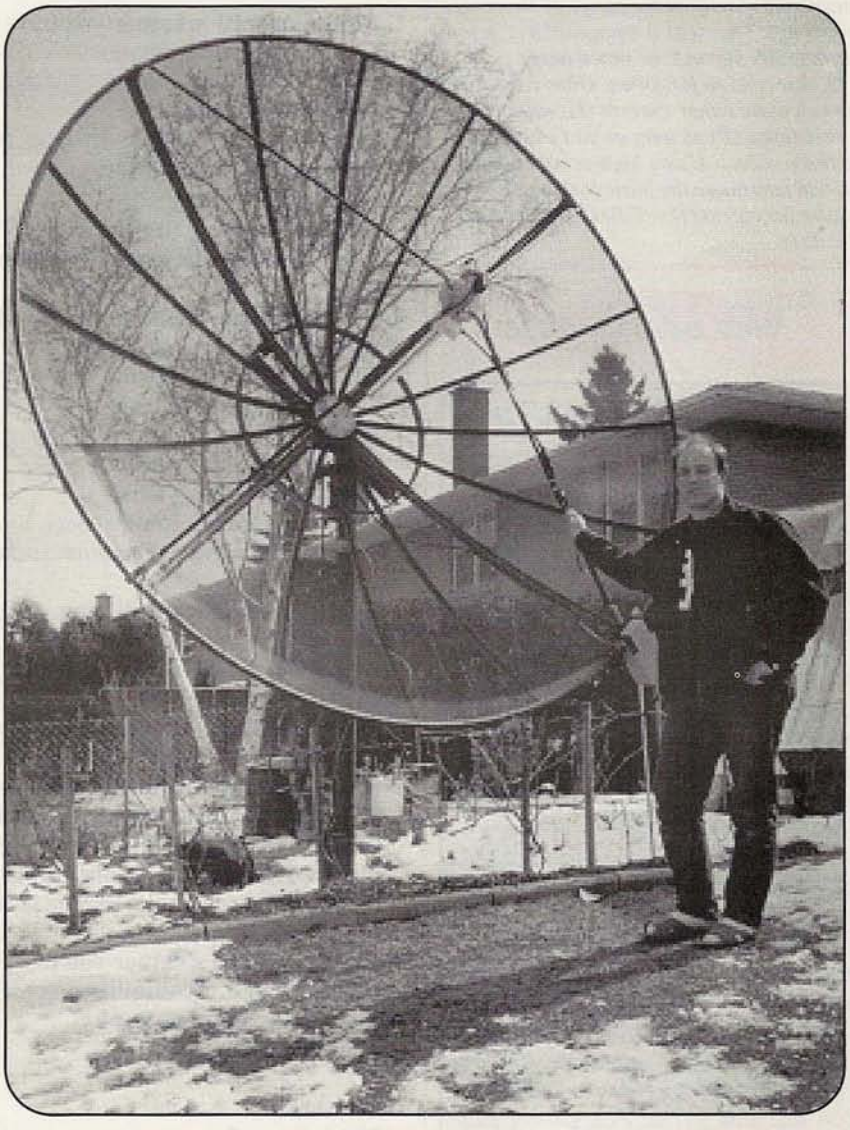
A look at the growing role of ham radio operators in SETI—Search for Extra-Terrestrial Intelligence—and what you'll need to build your own SETI "station."

By Denis Jakac, VE3ZXN*

Are we alone in this vast universe? I think that, at one time or another, just about everyone has asked that question while gazing up at the skies. I know I have, many times. And now, through my involvement in amateur radio, I'm getting the chance to help listen for an answer to that age-old question.

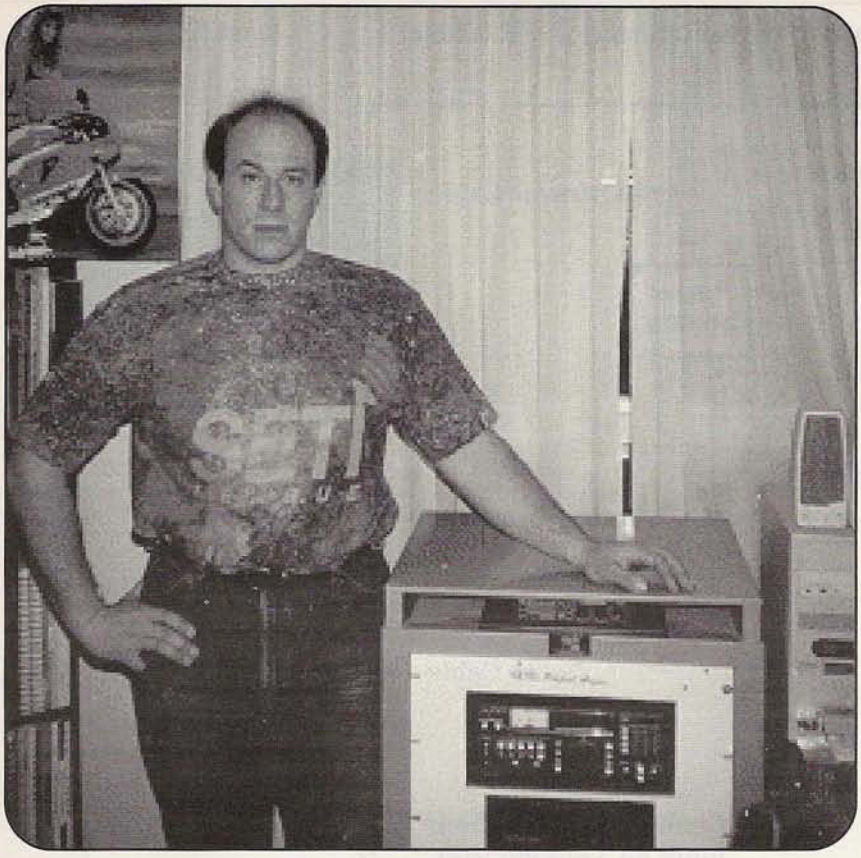
After years of doing nothing but reading and wishing I could have something to add to "SETI" research, I discovered The SETI League, Inc. It was after joining this organization, that my SETI interests began to grow on a large scale. I learned that the SETI League's goal is to have 5,000 amateur stations on-line worldwide as participants in its "Project Argus" all-sky survey.

Big, expensive radiotelescopes are very sensitive but highly-focused. If we knew where to listen for signals from other civilizations, one of these "big ears" would be far better-suited for receiving any messages than would 5,000 or 10,000 amateur stations. *If we knew where to listen.* A network of 5,000 amateurs scattered around the world can do something no radiotelescope can: listen in many directions simultaneously. And that's the whole idea behind Project Argus. If the Project Argus participants, who are collectively scanning the whole sky, can detect possible signals from extraterrestrial sources, then we can give the pros with the radiotelescopes an idea of where to point and what to listen for.



The author with his SETI antenna, a 10-foot mesh satellite TV dish with a 1- to 2-GHz helix feed. (Photos courtesy of the author)

**Denis Jakac, VE3XN, listens for signs of life on other planets from his home in Etobiceke, Ontario. His SETI station was the first to be activated in Canada.*



The author's SETI station consists of an ICOM R-7000 receiver, a Timewave DSP-599ZX digital signal processing unit, and a Pentium-Pro 150-MHz computer with a Sound Blaster 16 sound card.

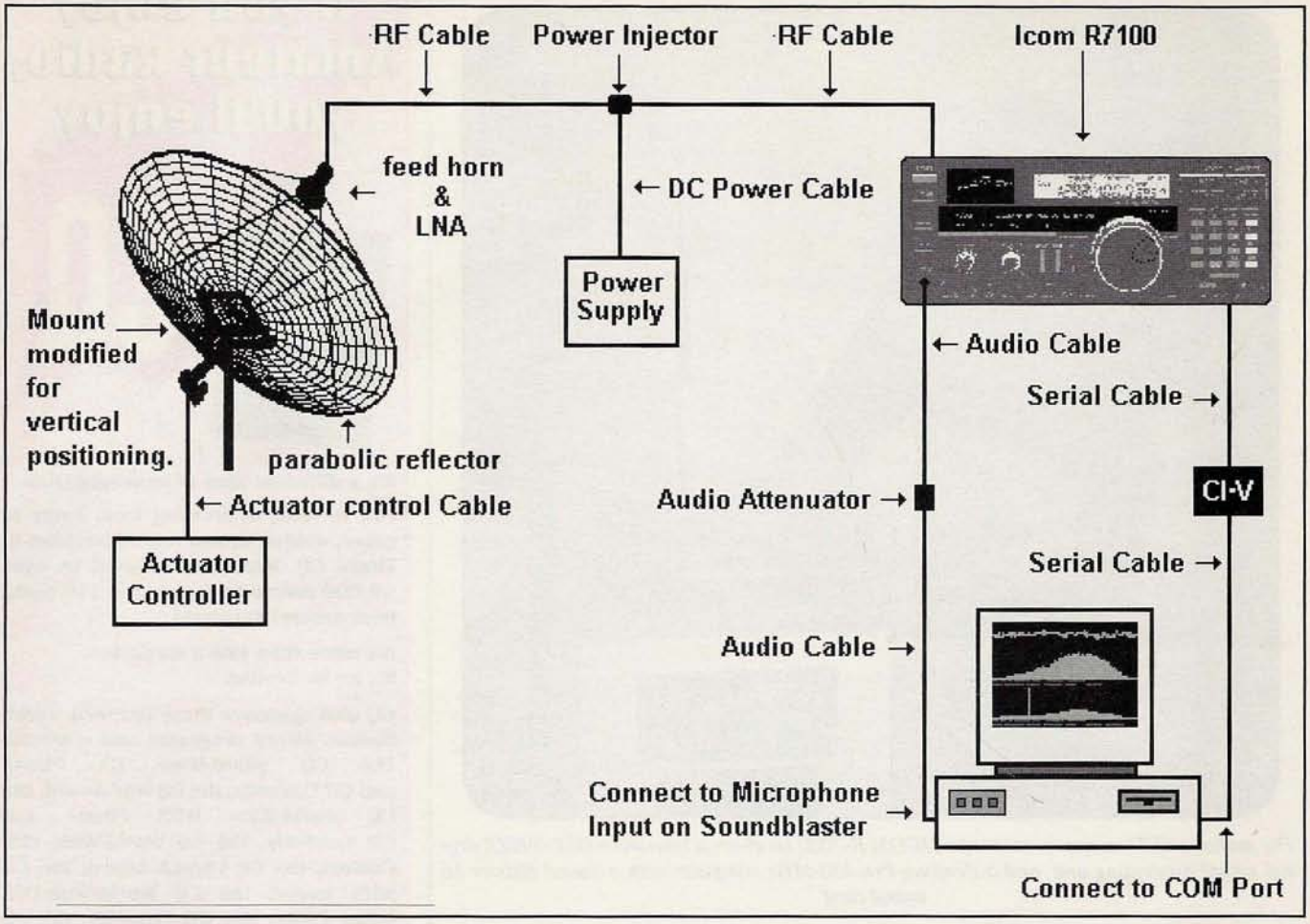
The frequency range of interest is 1420 to 1660 MHz., the so-called Hydrogen/Hydroxyl line. Every element has a spectral "signature," a frequency at which it naturally emits radiation. Astronomers determine the makeup of stars and planets by looking for these "signature" frequencies. The spectral frequency of neutral hydrogen atoms, the most common element in the universe, is roughly 1420 MHz. Hydroxyl (hydrogen+oxygen) gives off signals at about 1660 MHz. As it happens, the area between these frequencies is among the quietest "regions" of the spectrum (part of the so-called "microwave window" between 1 and 10 GHz in which there's very little stellar or other natural noise).

Since H (hydrogen) + HO (hydroxyl) combine under the right conditions to create H_2O (water), scientists refer to this region of the spectrum as "the water hole." Based on the assumption that any civilization with radio astronomy would be aware of this region (due both to its quiet and to the abundance of hydrogen and hydroxyl in the universe), SETI researchers believe this "water hole" is a natural spot for civilizations to send out interstellar messages. Therefore, this is where Project Argus members are concentrating their efforts.

Building a SETI Station

Project Argus involves amateur SETI receiving stations which are owned, maintained, and operated (and paid for) solely by the participant. It is my goal here, as a layman, to describe how simple it can be to assemble an average amateur SETI station. Of course, just like your amateur radio station, it can grow quite involved once you're into it. I've included a diagram of a basic SETI system which will give you an idea of what is involved (see Figure).

First off, you need a dish or a Yagi array with sufficient gain. What is sufficient? It seems that you're best off with a dish; a 10-foot TVRO (satellite TV Receive Only) dish will suit nicely (*To get the same level of gain, about 32 dBi, without a dish, you would need an array of four to eight Yagis, according to SETI League Executive Director Dr. Paul Shuch,*



Block diagram of a typical amateur SETI station, consisting of a microwave antenna, receiver, and computer with sound card. (Diagram by, and courtesy of, Daniel Fox, KF9ET)

N6TX. Shuch also notes that a Yagi array will have a narrow bandwidth and will be able to tune only "a tiny slice" of the spectrum of interest, which, he says, "is why most of us use dishes."—ed.). A 10-foot dish is widebanded and doesn't have too narrow a beamwidth, but it also won't provide much sensitivity beyond a few light years. But who's to say how much power an E.T.I. (Extra-Terrestrial Intelligence) source may be transmitting? How large an antenna array? Do they have an inter-stellar repeater? How about an out-of-this-world version of those "big gun" moonbouncers here on Earth whose huge arrays allow us little guys a rare EME contact? *(Alpha-Centauribounce?—ed.)*

Back to the dish. The best thing about the whole deal is that no rotator is needed. Since Project Argus is based on an all-sky survey and not necessarily individual targeted stars, the dish can operate in "drift-scan" mode, using the Earth as the rotator. My station uses the original dish mount, locked in position facing due south, and set at a particular elevation or declination.

A feed for the dish must be constructed or purchased and can vary in design. This can be a Chaparral-type feed, used widely in the TVRO industry, or a few-turn helix. Ideally, you would want a feed with which you can receive both right- and left-hand circular polarization, to make sure you can cover all polarization phases. You'll also want to have a receive LNA (low noise amplifier) mounted at the dish to provide minimum noise/maximum signal amplification. As far as cable goes, unless you opt to mount a downconverter at the feed, use the best you can afford. My station presently uses 9913 coax, which will be upgraded to Heliax (hardline) in the near future.

Listening Equipment and Techniques

In the shack, you don't have too many options. Unless you use a downconverter to bring the 1.4- to 1.6-GHz signals down to frequencies your current equipment can receive (several converter options are presented on the SETI League Web site, see "Resources"), you'll have to use an all-mode radio which covers this frequency range. Typical radios are ICOM's R7000, R7100, R8500, and R9000, and the new AOR 5000.

There are different approaches you can use as far as scanning (listening) goes. Most Project Argus participants have opted to scan one frequency a day. Since sensitivity increases with integration time, the more time we spend on one channel, the greater the chance we have of hearing "the signal." I should clarify "hearing the signal." You won't actually hear it, but *see* it. This is a job for *DSP (digital signal processing)*.

After you connect the coax cable to the receiver, you want to select the upper sideband mode. Experts have theorized that any signal we might hear will most likely be a pulsed-type carrier maximiz-

"One station may search for years, never hearing a single peep, but 5,000 stations worldwide could greatly enhance the possibility of receiving a signal from an extraterrestrial civilization."

ing on power generation at the transmitting end. This carrier will generate a tone in USB mode which will be recognized by the DSP program. The audio output of the receiver is fed into a computer sound card. Here, it is digitized and processed by FFT (Fast Fourier Transform) and displayed/recorded on your computer. The DSP processing allows you to dig 20dB or so into the noise. There are various DSP software programs currently available, many of which can be browsed through and downloaded from the SETI League Web page.

My present system is processing 12.5-kHz chunks of bandwidth at a resolution of 12.2 Hz. This is derived by dividing 12.5 kHz by the 1024 points in my FFT software and is an acceptable approach among our participants: close enough to the system's design goal of 10-Hz resolution. Bandwidth choice is based on several factors, each of which could be an article in itself, and is left to the individual SETI enthusiast to decide (again, see "Resources" for additional information).

In Numbers, There Is Knowledge

One station may search for years, never hearing a single peep, but 5,000 stations worldwide could greatly enhance the possibility of receiving a signal from an extraterrestrial civilization. I feel that we are now in an age where the tools to succeed are within our grasp. Technological advances are increasing at a dramatic rate. Computer processing power almost doubles every year. Maybe if there is enough public interest and support, one day Congress will reinstate NASA's funding for SETI research, and we amateurs won't have to go it alone.

Will You Join Us?

I hope that I have sparked some interest among the readers of *CQ VHF*, and that—with your help—one day we will achieve our goal, finally answering the question: "Are we alone?" ■

Editor's Note: CQ VHF *would like to thank the SETI League, Inc., and Executive Director Paul Shuch, N6TX, for providing technical assistance and illustrations for this article.*

Resources

For additional information, station options, and photos, visit the SETI League's World Wide Web page at <http://www.setileague.org>, contact The SETI League, Inc., P.O. Box 555, Little Ferry, NJ 07643, or send e-mail inquiries to <info@setileague.org>. Detailed technical articles on station design considerations are also available on the SETI League Web site at <http://www. setileague.org/articles/articles.htm>.

Reader Snapshot !

Meet CQ VHF Readers...Ray (W6JXW) and Sheryle (KF4NYE) Schneider

Ray and Sheryle Schneider of Big Stone Gap, Virginia, sent us this photo of them taken at the Dayton Hamvention earlier this year. For those of you who haven't been to Dayton, Ray and Sheryle are in the stands overlooking the main arena, one of *five* large exhibit halls packed with ham radio manufacturers and dealers. And then there's the flea market...

"This was our first time at Dayton," say Ray and Sheryle. "We snapped up some good buys, found some items we could not find anywhere else, and learned a lot. We plan on going next year."

The Schneiders also say they enjoy reading *CQ VHF*, "especially articles on working Mir and satellites."

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

KF6HVJ: Overcoming Adversity with Ham Ingenuity

Hi-tech "Yankee ingenuity" is keeping one ham on the air and active, even as his eyesight dims. Here's the story of KF6HVJ's "magnified reader" ham station.

By Gordon West, WB6NOA*

"There's not a darn thing wrong with my brain," says Marvin Rohrs, KF6HVJ. "It's just getting harder and harder to see!" Rohrs suffers from macular degeneration, the slow process of good vision going bad with increasing age. But the diagnosis didn't keep him from being an active ham. In fact, it was one factor which made him decide to get his ham license after many years of interest. Rohrs sees amateur radio as his "open door" to the world even as his eyesight slowly diminishes.

Really BIG Type

Marvin wants to share with other visually-impaired hams (and everyone else) how he gets around on the radio dials with his homebrew "magnified reader." He uses a Sony Handycam camcorder fixed on a mount and "macro" focused one foot away from a movable board. On this board, he places any item he wishes to read—including the control head for his VHF/UHF ham rig!

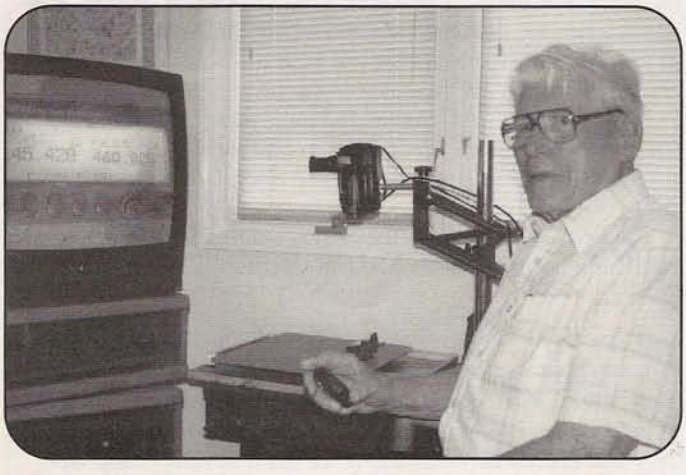
The camcorder takes the image and sends it to the video input of his VCR, which then converts it to TV Channel 3 and displays the image on a 32-inch color television. The VCR was necessary only because this TV had no direct video input. Marvin first used this system to read the textbook to study for his ham ticket. He mixed his reading with audio theory cassette tapes and whizzed through both the Novice and the Technician exams on the first attempt.

Put Your Radio on TV

The radio Marvin selected for his reader was the Kenwood TM-V7A dual-band mobile rig with the "cool blue" LCD display. The rig was preprogrammed with all of the local VHF and UHF open repeater channels, plenty of simplex frequencies, and tons of public safety receive channels. The detachable control head, including the display, is mounted flat on the moving board of his video reader. The microphone controls all the functions, so there is little need to make adjustments on the control head itself.

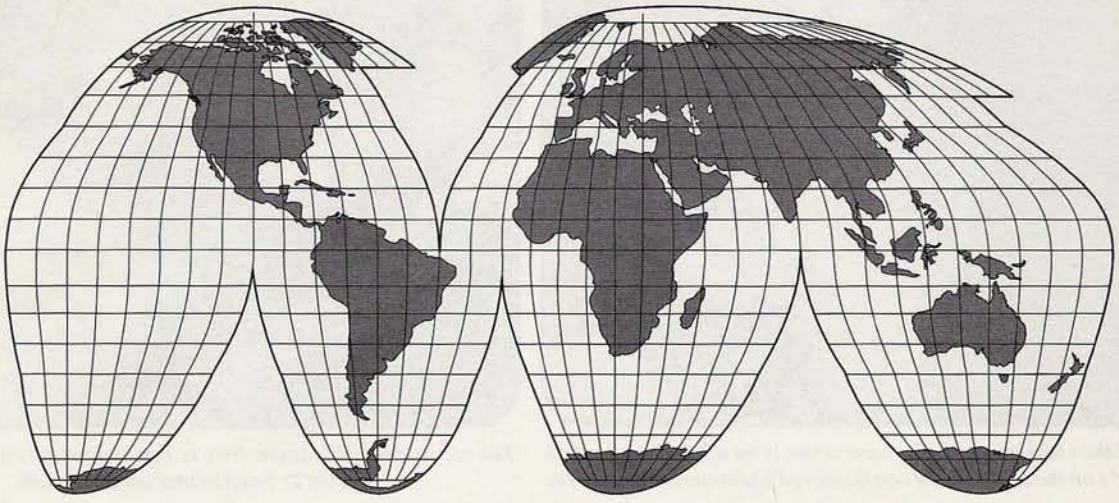
The Handycam is focused remotely on the entire head, taking about three inches of display information and putting it onto that big 32-inch screen. This, Marvin can read with little difficulty! He can electronically zoom in for a closer look at the

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



Marvin Rohrs, KF6HVJ, built a special video camera mount to send small images to a large-screen TV. (Photos by the author)

A close-up view of the Kenwood TM-V7A display, as it appears on Marvin's 32-inch TV screen.



Announcing: The Great '98 5A Challenge

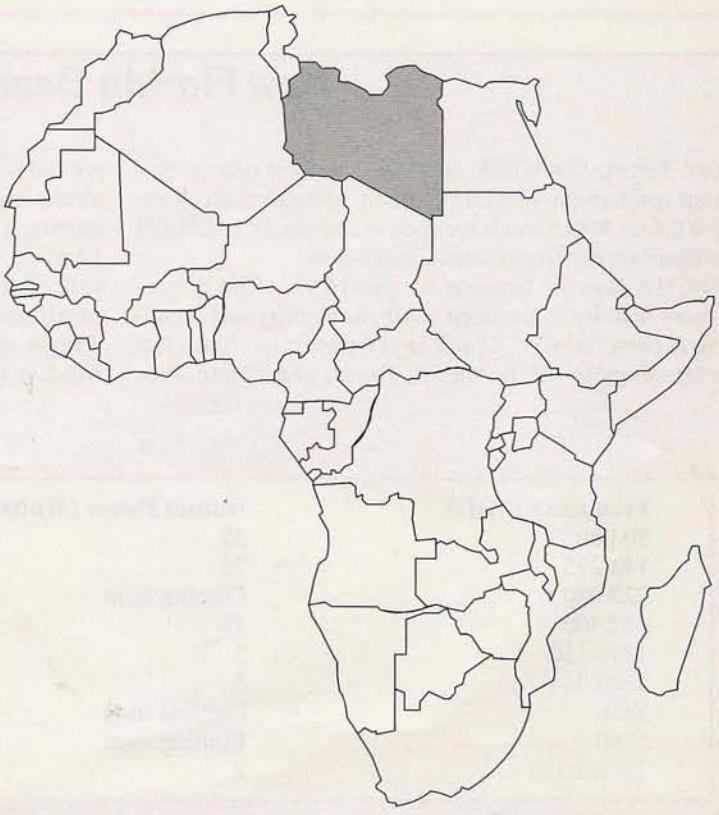
How would you like to work Libya on 6 meters? Now how about working on 6 meters FROM Libya? G3WOS has an invitation for serious 6-meter ops...

By Chris Gare, G3WOS*

As 6-meter operators, we are always chasing after new countries, and it's very frustrating when we know that there has been one active for several years but only a lucky few have managed to work it.

"We're looking for a group of committed 6-meter operators to go to Libya for a two-week period in June, 1998, and really put the 5A callsign on the 6-meter map for the first time."

For those of us in Europe, one of these countries is Libya, 5A. Even though Abubaker, 5A1A, has worked a few stations on six in the last couple of years,



** Chris Gare, G3WOS, is Chairman of the UK Six Metre Group (UKSMG).*

The VBW-1 Antenna: A "VHF Broadband Wonder"

Here's an easy to build, almost omnidirectional, broadbanded antenna covering 25 to 110 MHz. It's a nice, very low-cost weekend project for beginners and experts alike.

By Arnie Coro, CO2KK*

Ever wondered if an easy-to-build *broadband* VHF antenna really exists? Have you asked yourself if, in addition to being broadbanded, that antenna will also provide almost omnidirectional coverage? Finally, if you found that "broadband VHF wonder," could it pick up both vertically and horizontally polarized waves?

If someone came along with a "YES" to all three questions, I'm sure many VHF enthusiasts would keep on reading, and then begin to collect the materials to start building. Well, keep reading and start building! This article is about a very simple and effective general purpose antenna—developed after a lot of rooftop and backyard real-life experiments—and it answers those questions with a resounding "yes," "yes," and "yes"! This easy-to-duplicate omnidirectional antenna covers from 25 to 110 MHz, and it picks up both horizontally and vertically polarized signals equally. I call it the VBW-1, for *VHF Broadband Wonder*.

Uses for the VBW-1

I use my VBW-1 for a wide variety of purposes, such as monitoring the 27-MHz band for *E*-skip openings, working mode A 10-meter downlink satellites, scanning the 30- to 50-MHz band, monitoring 6 meters, and watching TV channels 2 to 6, *plus* listening to FM stations right to the end of the FM broadcast band! But it's not just a receive antenna. The VBW-1 also lets you *transmit* on the 11-, 10-, and 6-meter bands. And, as an extra bonus, it's a very quiet antenna (see "Don't Be Surprised").

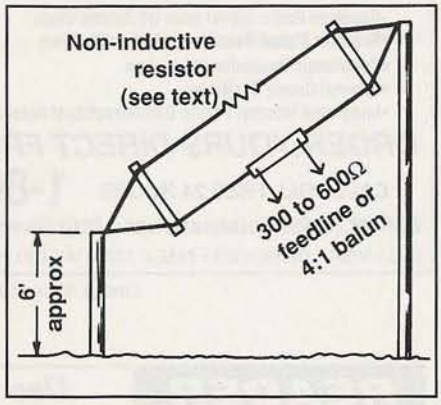


Figure 1. The VBW-1 antenna is a modified version of the Terminated Tilted Folded Dipole (TTFD or T2FD) antenna developed nearly 50 years ago by W3HH, and popularized in a CQ *magazine article in 1951. See text for construction details.*

Operating Theory

The VBW-1 is a modified, scaled-up-in-frequency version of the well-known TTFD, or *Terminated Tilted Folded Dipole* antenna, now so popular among commercial users of the High Frequency (HF) spectrum from 3 to 30 MHz. (For more on the background and theory of both the TTFD and the VBW-1, see "The Theory Behind the Antenna.")

Basically, it consists of a dipole antenna with its ends folded back over themselves (with separation) and *connected to each other in the center* through a non-inductive resistor. The antenna is then mounted at a 20 to 40° angle relative to the ground (see Figure 1). HF communications system operators need this kind of skywire to fully exploit the fast frequency changing capabilities of the newer breed of professional grade transceivers.

Build Your Own VBW-1

The exact dimensions for the VBW-1 are as follows:

1. Overall length: 4 meters or approximately 13 feet;

2. Separation between the upper and lower elements: 20 centimeters or approximately 8 inches.

Use #14 or #12 PVC-covered wire to build a folded dipole, then break it in two halves as shown in Figure 1. The next, very easy step is to attach *two* center insulators, one at the top of the folded dipole and the other at the bottom. I've made the insulators with PVC pipe, acrylic plastic, or polyethylene taken from the center of a coaxial cable from which the copper wire was removed by heating. Insulators should be about 10 centimeters, or approximately 4 inches, long.

On the top insulator, you must install a *non inductive* resistor or group of resistors, which bridges across it, providing *resistive loading* to the antenna (more about this later). The bottom insulator is used to attach the feedline, as you would with any other dipole antenna. In the case of the VBW-1, it may be fed in several different ways (we'll cover that also in more detail later).

Arnie Coro, CO2KK, is a professor at the University of Havana and the host of two internationally broadcast programs on Radio Havana's shortwave service. This is his second article for CQ VHF.

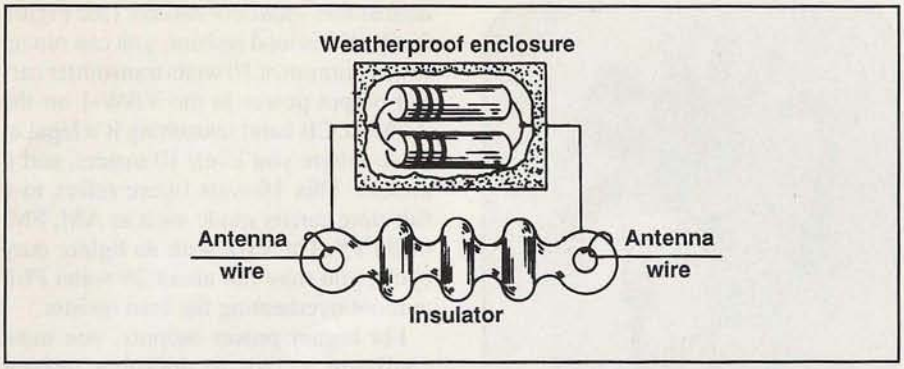


Figure 3. If you're using the VBW-1 at power levels above 10 watts, you'll need a heavier-duty terminating resistor. Here, the author has tied together a dozen 2-watt, 4700-ohm resistors in parallel to form a single, 24-watt, 390-ohm resistor. See text for details.

searching for elusive sporadic-*E* openings. By the way, in this configuration, the VBW-1 also makes an excellent emergency TV antenna!

Another option is to use 450-ohm, open-wire ladder line, or, in fact, any open-wire line within the impedance range of 200 to 600 ohms. It won't make much difference, especially if you use (as I do) a simple antenna matching system or tuner.

If you follow this approach of a direct feed with a parallel line of any type, then you must install some kind of balanced to unbalanced coupling and matching system between the antenna feedline and the radio equipment. This is because practically all existing radio equipment uses coaxial cable inputs and outputs. You may use a 4:1 balun, when feeding via a 300-ohm line, directly matching a 75-ohm coaxial cable input. Or the open-wire line may be matched via a simple antenna tuner, providing either a 75- or 50-ohm unbalanced output to the equipment. The connection from the antenna tuner to the receiver, transmitter, or transceiver is then made via a short length of coaxial cable.

"Install your VBW-1 antenna as high and in the clear as possible. Note that, because this is a tilted antenna, it must be mounted at a 30° to 45° angle!"

I use the antenna tuner approach as it's easy to build and provides an excellent match to the VBW-1 as well as additional harmonic suppression when I transmit with it. The antenna tuner also provides increased selectivity at the input when receiving, which is important when using any broadband antenna system.

Another way of feeding the VBW-1 is via a specially built 6:1 balun, connected right at the antenna terminals to a 75-ohm

The Theory Behind the Antenna

The TTFD, or Tilted Terminated Folded Dipole, was invented by G. L. Countryman, W3HH, in the 1940s and was tested in actual practice during the early 1950s. It was described by its inventor as a "squashed rhombic" because it used a terminating resistor, like the terminated rhombic unidirectional broadband antenna also popular at many professional communications installations.

The theoretical design first appeared in *QST* in 1949 (see "Resources"), but was little noticed by hams. A practical antenna based on that theory was first published in *CQ* in 1951 and quickly became very popular. For some reason, though, W3HH never published the theoretical analysis which led to his design, so the way by which he arrived at the dimensions of the original prototype TTFD remains a mystery. As John Heys, G3BDQ, says in the "Transmitting Loops" section of his book, *Practical Wire Antennas*,

> ...it bears a superficial resemblance to an ordinary folded dipole, but its dimensions, the use of a non-inductive terminating resistor and the all important 20 to 40 degrees tilt result in an aperiodic or non-resonant, vertically polarized radiator, that has a frequency ratio of at least 4:1.

My findings are that, at the higher end of the HF spectrum and lower VHF frequencies, the antenna tends to pick up both vertically *and* horizontally polarized signals with near equal strength. Although its critics point out that, at some specific frequencies, there is little radiation from the antenna and much power is wasted at the terminating resistor, the fact is that, in practice, these antennas do perform a very useful service, providing HF transmitting stations with a low cost, almost omnidirectional, broadband and fairly easy to match system.

Longtime users of TTFDs told me that efficiency was lower compared to a standard half-wave dipole cut for a specific operating frequency, but that, as the frequency went up, the TTFD's efficiency also took an upward swing, making it a very practical general purpose communications antenna. The price you have to pay for the broadbanded, single feedline antenna is perhaps a 1- to 5-dB loss, compared with a half-wave dipole cut to the operating frequency—something that could easily be compensated for by running high transmitter power.

Among my findings during several years of experimental work with the VHF versions of the antenna was the fact that the separation between the upper and lower wires of the folded dipole had to be slightly more than what was used at HF frequencies. So the VBW-1 uses the more or less standard formula for the length of the antenna 100/freq in MHz, or approximately one-third of a wavelength at the lower operating frequency, while the separation formula is modified from the 3/freq in MHz used on HF to 5/freq in MHz, which seems to offer much better overall SWR performance from 25 to 110 MHz. The results of those formulas are in meters, but you may convert them to feet by simply multiplying the metric results by 3.28. Don't worry about rounding off the numbers; this antenna is not too critical with regard to its dimensions!

Calculating and Building the Terminating Resistors

The value and power dissipation ability of the terminating resistor in the VBW-1 is critical, especially when using the antenna with a high-power transmitter. Ideally, the resistor value should be in the 390- to 400-ohm range. But for receiving and for transmitting with up to about 10 watts of carrier power, with the usual transmit and receive duty cycle characteristic of amateur radio, a pair of 680-ohm, 2-watt carbon film resistors will provide a nice match (giving you 340 ohms with 4 watts dissipation, as shown in Figure 2).

If you need to run higher power, you may follow two approaches: 1) try to obtain a high-power, non-inductive resistor of 25, 50, or even 100 watts dissipation and 400 ohms; or 2) make one yourself using a combination of series and parallel connected, 2-watt carbon film resistors. For 25 to 30 watts dissipation, which will be more than enough for SSB transmitters up to the 100-watt class, a combination group of 12 resistors of 2 watts each is used. I don't recommend using more than 12 resistors in the termination for the VBW-1, as it will be very difficult to achieve a low inductance termination with so many units connected in a series-parallel combination.

My favorite arrangement is made from 12 carefully selected 4700-ohm, 2-watt carbon resistors, configured in the following way: Connect the resistors in parallel pairs. They will form 2350-ohm, 4-watt units. Now connect the six pairs of resistors in parallel to form a single 390-ohm resistor with 24-watt dissipation ability (see Figure 3). Assembling this combination requires good layout work and careful soldering. The resistors must also be protected from the weather, something which is fairly easy to do by placing them in a plastic container, leaving enough room for ventilation since the resistors do heat up in operation, especially while running on AM, FM, or RTTY modes.

The references at the end of this article will provide additional information on how to make the terminating resistors for HF-range TTFD antennas.

coaxial cable downlead. When using this second approach, you may get away without the antenna tuner or antenna matching unit. Perhaps the SWR figures obtained while transmitting on the 27-, 28-, or 50-MHz bands will fall below the critical 2:1 ratio normally accepted as the upper limit for solid state finals. But that's something I can't tell you for sure as it will depend on many external factors, such as the location of your antenna and the nature and distance of nearby objects. So, my advice is to use the VBW-1 with an antenna tuner, regardless of whether you're feeding it directly via a balanced transmission line or are using a balun at the antenna terminals and a coaxial cable downlead. (*For more on using*

What You've Told Us...

The questions in our July survey were the same as those asked last June, and the results, by and large, have been remarkably consistent. Among the people who responded to the survey, 86% said that their issue of *CQ VHF* was addressed to them, and, of those, 94% said it was a subscription copy. The postal service is doing its job quite well, as 99% of you said your issue arrived on time.

Most of you still seem happy with what you're reading in *CQ VHF* (whew!): 77% of you say the magazine meets your needs; 69% feel it meets the needs of newer hams, and 47% say it meets the needs of experienced hams—interesting that neither of those numbers is as high as the one that *really* counts, whether the magazine is right for *you*.

Just over half of you (56%) would like to see more beginner-level technical articles and projects (check out our two antenna projects this month); 42% would like more operating-related articles (OK, tell us what *you're* up to!) and the same number say "it ain't broke, don't fix it!" Twenty-eight percent want more high-level technical articles and projects, and 23% want more news/opinion related articles.

Thanks for keeping us posted on what you'd like to see in *CQ VHF*. We'll do our best to keep the magazine full of interesting and educational articles.

This month's winner of our free one-year subscription for replying to our June survey is F. W. Hollenbeck of Lambertville, Michigan. Thank you again for your responses.

75-ohm feedline with "50-ohm" ham gear, see Arnie's article, "Yes, All My Coax Cables are 75 Ohms," in the July, 1997, issue of CQ VHF.—*ed.*)

Installing Your VBW-1

Follow standard antenna installation practices and *please be extremely careful*. **Stay away from power lines, don't work alone, and follow all safety rules.** I spent two weeks in bed last year after falling from my roof while performing antenna work by myself in violation of established safety procedures. *Don't do antenna work if there is the slightest chance of a thunderstorm anywhere nearby*. And if you *do* see a dangerous cloud, **STOP** and **GO DOWN**.

Install your VBW-1 antenna as high and in the clear as possible. Note that, because this is a *tilted* antenna, it *must* be mounted at a 30° to 45° angle! My tests showed that, from 25 to 110 MHz, it works best at a height of no more than about 6 meters (20 feet) above the ground or roof. The ideal tilt angle is as close as possible to 45°. Although some publications specify 40° as the optimum figure, in practice I couldn't really find a measurable difference between a 40° and a 45° tilt angle with my experimental setups! The prototype VBW-1 seems to work nicely at a 30° degree tilt, and it still performed rather well at a 20°slope, too. (*Countryman's original design called for a slope of approximately 30°.—ed.*)

When I installed the antenna horizontally, the SWR curve showed much bigger "bumps" than when it was properly tilted. I didn't test the antenna in a completely vertical position because it was too difficult from a mechanical point of view, requiring no less than a 5-meter length of insulated mast, which was not available. In further tests, moving the antenna around the compass showed *some* directional effects; in other words, the VBW-1 seems to be slightly directional, or show a small amount of gain, in the direction in which it is tilted when using a metal mast or tower to support it. This is something that may be put to good use in some cases. And yes, you're right: the VBW-1 requires only *one* mast, which is yet another advantage over other similar broadband systems.

In Closing

My eight years of experience with this antenna have shown that it's an excellent all-around performer, much quieter than any other broadband antenna that I've ever tested, very easy to build, and even easy to repair in case of any breakdowns. Plus, as some of my friends who are familiar with it point out, it's nice to have that feedline in the shack, as you can test almost anything by simply connecting it to the VBW-1. ■

Resources

For more information on the TTFD (Terminated Tilted Folding Dipole) antenna, you'll have to do some serious digging. But here's a selected bibliography if you really want to learn more about this antenna:

1. "An Experimental Allband Nondirectional Transmitting Antenna," by G. L. Countryman, W3HH, *QST*, June, 1949, p. 54.
2. "Performance of the Terminated Folded Dipole," by G. L. Countryman, W3HH, *CQ*, Nov., 1951, p. 28. (*This is the article that first brought the TTFD to wide attention.—ed.*)
3. "More on the T2FD," by G. L. Countryman, W3HH, *CQ*, Feb., 1953, p. 28
4. "The T2FD," by Donald L. Stoner, W6TNS, *CQ* (Novice column), June, 1957, p. 92.
4. *CQ Antenna Roundup*, 1963 pp. 68 and 70 (a reprint of #3).
5. *Practical Wire Antennas*, by John D Heys, G3BDQ, Radio Society of Great Britain (RSGB), 1989, pp. 46–49.
6. *Radio Communications*, July, 1986 "Technical Topics" by Pat Hawker, G3VA, p. 113.
7. *Update*, 24 January 1986 West Kent Amateur Radio Society England.
8. "Broadbanding the Dipole" in "Technical Topics," *Radio Communications*, RSGB, June 1987.
9. "Improved HF broadband wire antenna" Drs. Brian Austin and A. P. Fourie, *Electronic Letters*, 12 March, 1987, pp. 276-277.

Reader FEEDBACK!

In a companion piece to CO2KK's article (July, 1997 CQ VHF*) on using 75-ohm coax for nearly all amateur applications, we reprinted an Internet discussion on using CATV hardline and connectors. In one message, Rod Johnson, KA7YOU, described homebrewing hardline connectors from plumbing fittings. Rod said he had found the idea "many years ago" in a ham magazine, but had forgotten which one and when. We asked anyone who did remember the article to let us know so we could give proper credit. We heard from two readers, including the author of the original article.*

First, Harold King, WA1DVS, mailed us a copy of a 73 article from December, 1980, entitled "Cheap Connectors for Half-Inch Hardline—at your neighborhood hardware store," and written by Keith Carter, WD4LWC. Next, we received the following letter from Bud Weisberg, K2YOF, along with a copy of his April, 1980, article in Ham Radio *magazine, entitled, "Homebrew Hardline-to-UHF Coaxial Cable Connectors."*

Dear *CQ VHF*:

In response to your request (p. 19, July '97 *CQ VHF*) for a source of the idea of using compression unions as hardline connectors, I'm enclosing a copy of my *Ham Radio* article of 17 years ago. This, by the way, was followed some months later by an identical scheme in *73* magazine, then still later by a somewhat similar piece in *QST*; it's amazing how different folks can come up with the same idea around the same time! I got the idea from studying an Andrews connector after being given a reel of Times W&C CATV hardline; I know of no earlier article involving the use of plumbing fittings.

If I were rewriting it today, I would simply add the admonition to use dull dikes (diagonal cutters) to trim the center conductor. In most CATV cable, the wire is copper-clad aluminum; by using well-worn dikes, the copper is swaged over the aluminum and makes for a neat soldering job.

I can't really subscribe to KØCQ's history of coax [in the same article]. Coax was an industrial/military product long before it was available to ham budgets and the idea of two conveniently sized water pipes is a bit simplistic (though it might be the genesis for the rigid feed found in high-power broadcast transmitters). From the reading I've done on the subject, coax first appeared on the scene in the 1930s, and I'm inclined to believe it was designed and intended for then-new FM and TV broadcast use....This involved hi frequencies—from 40 MHz up—which were at the time called "the UHF" (this is likely why Amphenol called the SO-239/PL-259 connectors its UHF series).

The standardized impedance was centered around 75 ohms; I'm not certain why, but...it might have been a matter of habit; hams and others of that time often used twisted-pair lamp cord (75–90 ohms) to feed their antennas. The military, either during or just prior to, World War II, adopted the 50-ohm standard (for whatever reasons). War-surplus coax was the first coax most hams latched onto, and 50 ohms became the *de facto* standard. Once manufacturers replaced the 3-terminal phenolic antenna connection with the SO-239, *de facto* became *de jure*.

So it appears that Bud Weisberg, K2YOF, gets credit for first publishing the idea in Ham Radio *in 1980, with secondary credit to Keith Carter, WD4LWC, who published the same concept later the same year in 73. Thanks to both Harold and Bud for filling in the history of this excellent example of ham resourcefulness.*

—W2VU

The Sport of Ham Radio

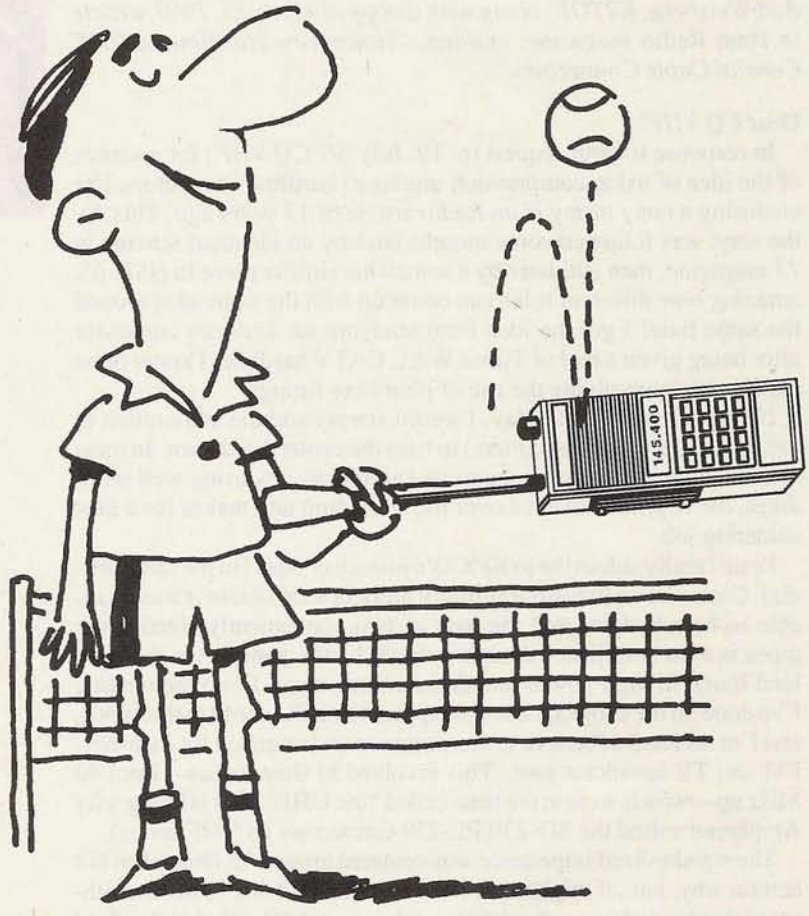
Even if you're not into the competitive aspects of our hobby, there's still a lot to gain from approaching ham radio as if it were a sport.

"Practice does not make perfect. Practice makes permanent. If you are doing something that is inefficient and practice it, you just become very consistent at being inefficient."

Edgar Levy gave me that sage piece of advice. He is also very quick to point out that he is not the originator of it and that I shouldn't give him credit for it. But he is the first person that I heard it from, and it really hit home.

Edgar gives tennis lessons at the local park a couple of mornings each week. He is the best coach I've ever had the pleasure of working with—not just in tennis, but in any sport. In a few short weeks, he's made a world of difference in my game. And I have watched him work with several other new people of varying skill levels. All who listen to him improve, and most people listen because he has a gentle way.

After teaching tennis for three hours or so, Edgar is off to the golf course to hit a bucket of balls and work on his swing. He decided to take up golf this summer and is progressing quite well at it. Will Edgar ever turn pro in golf and start teaching it? Probably not, but my guess is that he will continue to improve and become a very respectable player. Oh, yes, I forgot to mention that Edgar is 79 years young.



The Sport of Ham Radio

In a number of places around the world, notably Eastern Europe, ham radio is considered a sport. There is particular emphasis on the competitive side of things, such as bunny hunts (*also called foxhunts and hidden transmitter hunts.—ed.*) and operating contests of one sort or another.

In the U.S., we've tended to emphasize the social and technical aspects of the hobby without consciously thinking of ham radio as a sport. A notable exception to this is the contest-DX community, which acts as if ham radio is a sport whether or not they consciously think of it that way. There's also the FCC licensing ladder, ranging from Novice or No-Code Tech up through Extra, which is similar to the structure of some of the martial arts.

And then there are aspects of the hobby, such as emergency preparedness and traffic handling, that emphasize practice and preparation. Just as in sports, skills have to be learned, and proficiency increases with supervised practice.

So, in spite of the fact that many hams would consider themselves dyed-in-the-wool couch potatoes of the first magnitude, the simple truth is that our hobby resembles a sport on many levels. If it walks like a duck, swims like a duck, and quacks like a duck, there is a real good

By Peter O'Dell, WB2D

Hidden transmitter hunts are one of the many ways in which ham radio resembles a sports activity. Practice, teamwork, and competition are key to both. (KØOV photo)

chance that it *is* a duck. So, as a new ham, what can you learn by drawing an analogy between sports and ham radio?

Building up Skill Levels

I'd like to offer one caveat before we begin: No matter how good a ham you are or become, there is little chance that Nike will offer you a couple of million dollars to endorse its products. For that matter, it's fairly rare for any of the ham radio manufacturers to use this endorsement approach to advertising. A few do, and I have no idea what the *quid pro quo* is, but I'd be willing to guess that the *quid* was much lower than any recognized sport. That out of the way, let's proceed.

Regardless of what you do in ham radio, there are skills involved, even though you may not think of what you're doing as a skill. For instance, just talking on a repeater takes a certain amount of skill. Admittedly, there's little skill involved in pushing the PTT button and blabbing away. But there is skill in actually communicating. There is skill in sounding like you know what you're doing. There is skill in "fitting in" with the local group.

"...in spite of the fact that many hams would consider themselves dyed-in-the-wool couch potatoes of the first magnitude, the simple truth is that our hobby resembles a sport on many levels."

So, there are some basic skills, right? Yes. How do I know what they are? Actually, that's pretty easy. Edgar says that if you want to be a good tennis player, watch the best (the professionals) and do what they do, which is not what most tennis pros teach a beginner. Particularly, Edgar talks about focusing on the execution of the swing and particularly where the racket finishes (the follow through). How does that compare to ham radio? Well, we don't have any "pros," but every group has one or two people who are recognized leaders. Pick out those people the others seem to turn to and learn from what they do. Notice how they conduct themselves on the air.

For one thing, they tend to avoid cute jargon—you know, the silly stuff like "I'm destinated" (no one uses that piece of silliness anymore, right?) or 10 signals and so forth. I'm not suggesting that you imitate some other operator. Just notice the *structure* of how he communicates and adopt that structure. To some extent, this may vary from one part of the country to another, but here are some things

that I've noticed that I think are pretty much universal. But don't take my word for it. Compare these ideas to what you hear in your area.

I've lived in a lot of different cities, and I have yet to find a repeater group that likes a motormouth operator. You know the sort, the guy who talks on and on and on whether or not he has anything to say. Skillful communications involves a lot of listening, *really listening*, to what the other operator is saying.

Take some time out and listen to the other hams on your local repeater. What are they interested in? What are their families doing? Most people love to talk about their kids or grandchildren. So, if you've listened and made some mental (or written) notes, the next time you hear Bob sign on to the repeater, you can jump in and start a real conversation. After the usual pleasantries, just ask him an open-ended question (one that can't be answered with a "yes" or "no"). For instance, you might say something like "I heard you mention that Billy made it onto the varsity basketball team. How is he doing?" And continue to really listen as Bob tells you how Billy is doing. You can ask a few follow up questions, too.

Learning What's Appropriate

If it's a busy repeater or busy time of day, you'd do well to keep the conversation relatively short. This is another skill you can practice: Develop an idea of what's appropriate for a given situation. Conversation patterns that are appropriate after midnight might be highly frowned upon during rush hour—you don't have to be a rocket scientist to figure that one out.

How do the locals give their callsigns, and how often? What's the pattern? For instance, most groups I know of frown on the overuse of cute phonetics such as *Willy Billy Eight Not Always Sober*. To be sure, they have their place. Ham radio is fun and should be—*it's a hobby*—but the cute stuff gets boring real fast. If you must use it, use it sparingly.

In communication, humor can be a great ally, or it can a particularly efficient means of hanging yourself. I have a quirky sense of humor and have a knack of spotting some of the absurdities in life (my own top the list). There have been a number of studies of communications that consistently show that the "listener" derives most of the meaning of any communication from something other than the meaning of the words. One study suggests that the meaning of the words only account for about 7% of the meaning that the listener derives, while tone of voice is about 38% and visual cues explain the remaining 55%. Even if those figures are off quite a bit, there is no denying that we're missing all the visual data in conversation occurring over radio.

I've learned the hard way that there are some real dangers in humor at the expense of someone else. First of all, some people may simply not recognize that you're teasing them. They can't see the twinkle in your eye. They can't see the half smile that darts across your face. They can't see the wink. A second potential land mine in this form of humor is that some folks have a real thin skin. Over the years, I've made more than my share of enemies by letting my sense of humor get out of hand on the radio. In some cases, I was able to clear up the misunderstanding. In others, I wasn't. Finally, I decided that the best course of action was to reserve any "good natured teasing" for the club meeting or some other face-to-face situation.

Remember, too, that ham radio is a "family oriented" hobby, which means that you may have all sorts of people listening in at any time. Save the bathroom humor, risqué jokes, and "adult" comments for the coffee shop after the meeting. There's enough pollution in the air these days without adding more verbal fertilizer to it.

There are any number of other techniques or rules for sounding "professional" in this amateur hobby of ours. Just notice how the good operators do it. Again, notice the structure of their communications. Notice what works and adopt those habits. It's the same as in sports. With a little practice, you'll be regarded as a "natural" or a "born ham."

Personal Growth

There's another area in which sports and ham radio overlap: continued growth. This is just another way of saying that you are continuing to learn and improve. I think this is probably the intent of the FCC's approach to the licensing ladder. Unfortunately, some hams have concluded that once they have their Extra and a kilowatt, there is nothing left to learn or accomplish. What a pity. There are numerous facets to ham radio. If you have mastered one, why not try another?

"Well, we don't have any 'pros,' but every group has one or two people who are recognized as leaders. Pick out those people the others seem to turn to and learn from what they do."

You need not abandon the one that you've mastered, but why limit yourself?

I once heard Dave Sumner, K1ZZ, Executive Vice President of the ARRL, remark that he had a goal of learning one new phase of ham radio each year. I don't know if he has met that goal or not, but he is certainly one of the most versatile hams around. The skills that he's learned have made him enormously qualified to head up the day-to-day operations of the League. Very few of us have dedicated our lives to ham radio the way that Dave has. But we can always keep ourselves open to growth.

Another "ham's ham," Clark Stewart, W8TN, is a close friend of mine. Over the years, I've watched Clark as he evolved in the hobby. His accomplishments to date include DXing (Honor Roll), contesting, DXpeditions, numerous awards, satellite operation, 144- and 432-MHz moonbounce, packet, and repeaters (both building and maintaining). How did he start? Back in the late '60s, he chased DX on 6-meter SSB. Then one thing led to another. Underlying it all was always the idea that there was something else to learn, something else to try, something else to accomplish. If someone else could do it, so could he. And so can you.

There's a famous story of Sir Edmund Hillary, who failed in his first attempt at climbing Mount Everest. In spite of his "failure," the British rightly regarded him as a hero of the time. Upon returning to Great Britain, he was invited to appear in Parliament as recognition of his status of national hero. When he walked in, he saw a huge photograph of Everest. Without thinking where he was, the story goes, he ran to it and began pounding on it, shouting, "I'll defeat you yet. You've grown as high as you can, but I am still growing. I will defeat you." He did.

So, perhaps in the summer of your 79th year, you—like Edgar Levy—will decide to take up golf. In the meantime, have you thought about chasing DX on 6 meters, working moonbounce or satellites, or upgrading your license? ■

Meltdown! Ham Radio and Nuclear Accidents

If you live near a nuclear power plant, then the ARES/RACES training in your area is bound to include preparations for a nuclear accident. This month, Bob shares two first-hand experiences.

March, 1979—The ARRL Eastern Pennsylvania Section Emergency Coordinator (SEC) awoke to the news of an "unusual event" occurring at the Three Mile Island nuclear power plant. That SEC was me. By the time I got into work that day, the "patient" had gone critical, plans were being made for a five-county evacuation, and the terms "meltdown" and "potassium iodide" were becoming household words during the nation's worst nuclear accident.

June, 1997—As I began to work on this column, yet another "unusual event" occurred at Three Mile Island. This time, thankfully, the patient was cured.

This month, we'll examine the various stages of, and responses to, a nuclear power plant accident and the role played by amateur radio.

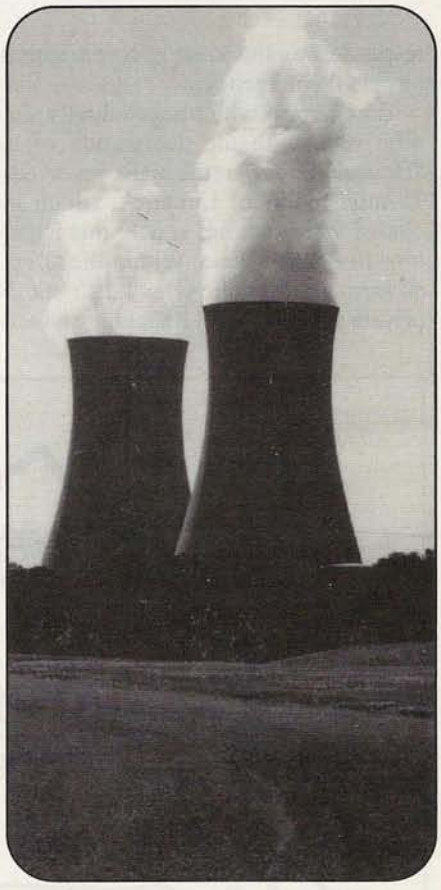
Do you live within 10 miles of a nuclear power plant? Nearly five million Americans do, according to FEMA, the Federal Emergency Management Agency. FEMA also notes that 35 of the 50 states either have commercial nuclear power plants or are within the *emergency planning zones (EPZs)* of such plants in adjacent states. Most of these plants are located in the eastern half of the U.S.

Federal regulations for commercial nuclear power plants require that the plant operator demonstrate the adequacy of both onsite and offsite radiological emergency preparedness efforts to protect public health and safety. The Nuclear Regulatory Commission (NRC) requires that plant operators exercise their onsite emergency plans annually. And FEMA requires that affected state and local governments exercise their offsite radiological emergency plans every two years.

All elements of the plan must be exercised every six years, and several "core objectives," such as protective action decision-making, radiological field monitoring and public warning, must be demonstrated during every exercise. In general, detailed emergency plans are required for jurisdictions within 10 miles of a commercial nuclear plant—the 10-mile EPZ. In addition, jurisdictions within a 50-mile EPZ must be prepared to deal with contaminated agricultural products. A state must conduct an *ingestion pathway exercise* somewhere in the state once every six years. This involves potential sources of radiation exposure through the ingestion of contaminated water and foods, such as milk or fresh vegetables. Ham radio is often part of these emergency plans.

There Once Was a Nuke Plant Near Philly...

A recent simulated accident at the Limerick Generating Station in suburban Philadelphia triggered a federally required exercise to review the ability of state, county, and municipal governments and the utility to respond to an accident at the nuclear facility. State Department of Environmental Protection radiation experts at both the plant and at Pennsylvania Emergency Management Agency (PEMA) headquarters in Harrisburg tracked the exercise scenario just as if it was a real nuclear accident. Several hundred plant staff, elected officials, emergency managers and responders participated both on-site and in the communities surrounding the power plant. PEMA officials explained that the activation of state, county, and municipal emergency operating centers (EOCs) with full-staff



Cooling towers at the Limerick Generating Station, a nuclear power plant near Philadelphia, Pennsylvania.

By Bob Josuweit, WA3PZO

Emergency Classification Levels at Nuclear Power Plants

Unusual Event: These are events, minor in nature, which indicate that something out of the ordinary is happening or has happened at the plant. These events, by themselves, do not create a major problem; however, some of these events could indicate a lowering of the level of safety of the plant.

Alert: These are events which indicate an actual or potential lowering of the level of safety of the plant. Any radioactive releases are expected to be small fractions of the guidelines established by the U.S. Environmental Protection Agency.

Site Area Emergency: These are events of major concern to off-site authorities because they indicate actual or likely major failures of plant systems needed for the protection of the general public. Any radioactive releases are expected to be less than EPA guidelines except near the site boundary.

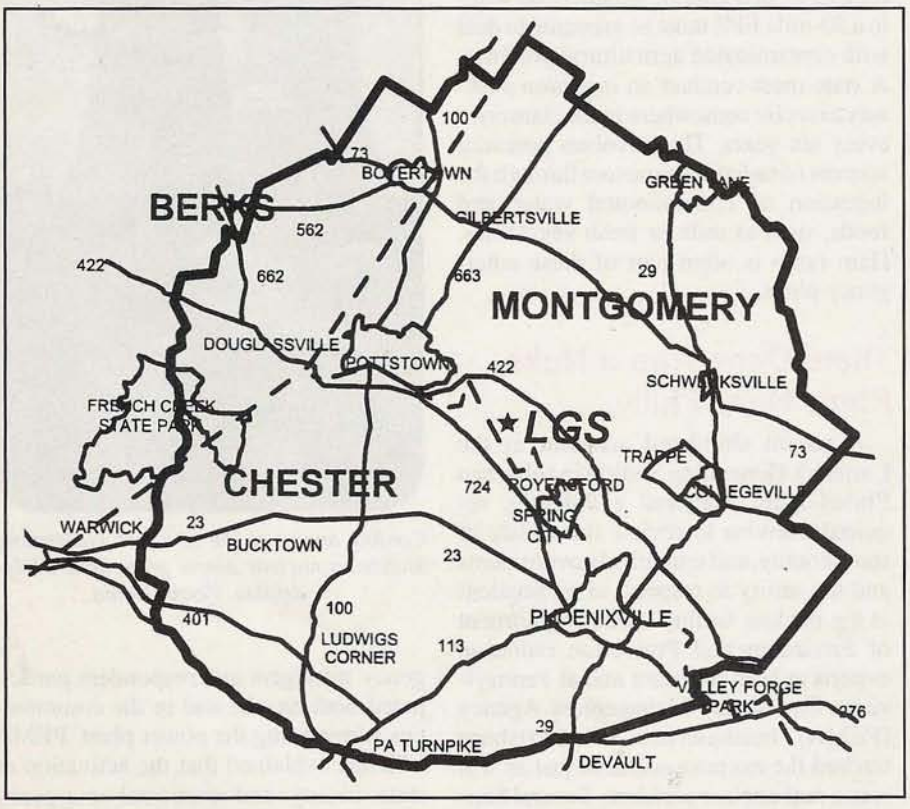
General Emergency: These are events of grave concern to off-site authorities as these events indicate that substantial core damage or fuel melting is occurring or has occurred with a chance of losing containment integrity. Any releases of radioactive material are expected to exceed EPA guidelines beyond the immediate site area.

response was the same as a response to an actual emergency.

The exercise, which began shortly after 4:00 p.m. with the declaration of an "Unusual Event" at the plant, involved a 10-mile radius of Limerick, which included three counties and 43 municipalities in Pennsylvania. Within the affected area are 13 public school districts, 34 private schools, and 11 health care facilities. Let's follow the events that took place in Montgomery County, where the Limerick plant is actually located.

RACES Activation

Upon being notified that an Alert Status has been declared, County RACES Officer Tom Gibson, W3EAG, activated the RACES paging system and determined which RACES operators were available. These operators were dispatched to each of 20 "risk municipalities" as well as the county EOC. Along with Gibson at the EOC were ATV specialist Ron Cohen, K3ZKO, Operations (OPS) Room Liaison Bob Lees, W3ZQN, and 2-meter Net Control Operator Gil Axford, W3DJL. W3EAG and others were assigned to maintain liaison with other counties in the affected area and to monitor the county Emergency Alert System station on the AM dial. At the same time, four surrounding counties also activated their ARES/RACES groups.



The 10-mile Emergency Planning Zone (EPZ) around Pennsylvania's Limerick Generating Station. Note that it includes parts of three counties.

"Upon being notified that an Alert Status has been declared, County RACES Officer Tom Gibson, W3EAG, activated the RACES paging system and determined which RACES operators were available."

Each county EOC establishes an Operations or Situation Room. This room is made up of representatives from various county departments, the Red Cross, and other agencies. Each representative serves as a contact point for his or her department and disseminates important information from the county to the respective departments and agencies. Lees was the RACES point of contact. Any message to be sent from this nerve center would go to Lees before it went to the RACES operating room. He would check the message to make sure all information was filled in and that it was legible.

Advance Planning

County RACES operators had worked closely with county officials to develop a series of messages which could be transmitted as is or have a few blanks filled in. These are similar in format to the ARRL numbered radiograms. Each of the messages is kept on file at both the county and municipal EOCs. The EOCs are able to supply copies of the messages to the RACES operators when they arrive on location. Each operator is then able to fill in the blanks and deliver the message to the appropriate person.

Once the "risk municipality" EOCs reported in on the RACES network, the

"LGS" Message Texts

Hams in Montgomery County, Pennsylvania, working with county officials, developed a series of standard messages to be used during an accident at the Limerick Generating Station. Here are some samples:

LGS Bravo -
Limerick Generating Station has declared a site area emergency at ____ hours X
Protective action recommended at this time X
Issue dosimetry to emergency workers

LGS Charlie -
Sirens to be sounded at ____ hours X
EAS message to follow X
Notify hearing impaired persons.

LGS Echo -
Department of Health has authorized Potassium Iodide (KI) to be taken by Emergency Workers X
Radiological Officer to provide guidance on use.

LGS Foxtrot -
A State of Disaster Emergency has been declared by Governor at ____ hours X
Consult LGS Briefing Guide for specifics.

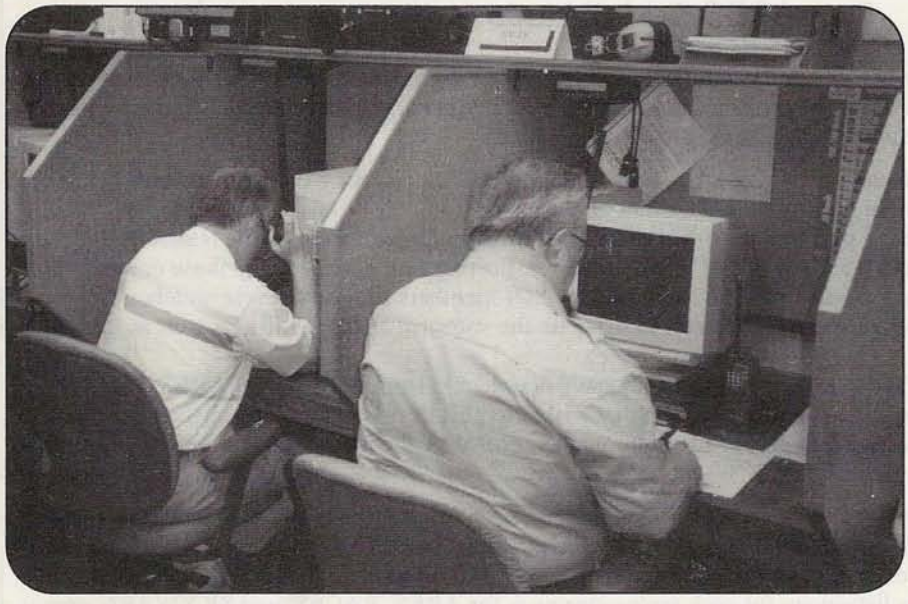
LGS Golf -
Limerick Generating Station Incident has de-escalated to _____ at _____ hours.

county EOC began to send all outgoing messages via the RACES network, freeing up the county Emergency Management Radio System for other traffic. One of the first messages to be sent from the EOC was "LGS Alfa," one of the prewritten fill-in-the-blank messages:

1 R W3EAG 31 Montco EOC 1620 June 24
Limerick Generating Station has declared an Alert at 1619 hours X
No release of Radioactivity at this time X
No protective action recommended X
Advise county EOC of Municipal EOC activation

Parker

By having such standardized messages, there was no confusion caused by trying to understand someone's handwriting or terminology. After the messages were sent, each Municipal Liaison



RACES operations at the Montgomery County, Pennsylvania, Emergency Operating Center (EOC). This was the hub of drill activity.

Congratulations!

The County Commissioners of Montgomery County, Pennsylvania, recently showed their appreciation for the work of the county RACES group by issuing the following proclamation:

Whereas Montgomery County (PA) has over 500 licensed Amateur Radio operators, 105 of whom are members of the county's Radio Amateur Civil Emergency Service (RACES) and Amateur Radio Emergency Service (ARES); and,

Whereas these Amateur Radio operators donate their talents to provide emergency radio communications, which is a valuable community service in time of crisis and emergency; and,

Whereas the Montgomery County Department of Public Safety often works directly with operators in response to emergency situations, and as public officials we deeply appreciate the operators' enthusiasm, skill and professionalism; and,

Whereas the Amateur Radio Operators are also making important contributions towards improving technology for emergency services; now,

Therefore We, the Montgomery County Commissioners, proclaim June 22-28, 1997, as National Amateur Radio Awareness Week to recognize the public service contributions made by Amateur Radio operators and urge all county residents to pay tribute to these volunteers who assist us in times of emergency and crisis.

Has your group been honored for its work in public service or emergency communications this year? We would like to hear about your efforts and acknowledge them. Drop a line to bjosuweit@aol.com or CQVHF@aol.com.

Officer would, as appropriate, announce the information being passed by RACES to the various township officials. Additional RACES operators were requested and dispatched to transportation staging areas and reception centers. Had schools been in session, the RACES operators would also have been assigned to the school district offices.

When the site area emergency was declared, reserve operators were dispatched for 24-hour operations at some 49 locations. The county radio officer is also supposed to let the EOC Operations Officer know when the pool of unassigned RACES operators falls below 10. As important messages were passed to all EOCs and reception was acknowledged, two other elements came into play. These were ATV operations and instructions for all emergency workers to read dosimeters (devices indicating radiation exposure levels) every half hour.

ATV Pictures

K3ZKO and Ray Henry, W3ZVY, provided amateur television (ATV) pictures from one of the municipal EOCs and the Limerick cooling towers. A television feed was provided from the RACES operating room to a monitor in the Operations Room. As county officials requested wind speed and direction to determine where a possible radioactive plume would travel, one official was overheard commenting that they had their answer by looking at the television. The ATV picture showed the plume remaining vertical, indicating little or no wind.

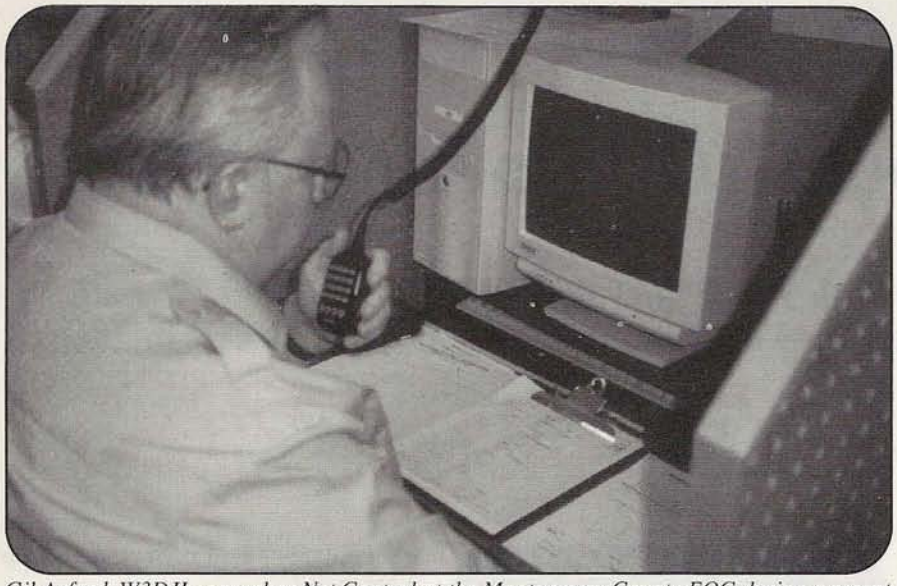
The event which probably had the greatest impact on those at the County EOC was a speech by the County Radiological Officer. He provided instructions to all emergency workers, including RACES operators, on radiological exposure control and record-keeping. Instructions and demonstrations were provided on the use of a Direct-reading Dosimeter (DRD) and a Thermoluminescent Dosimeter (TLD). Instructions were also provided on the use of Potassium Iodide (KI), which prevents damage to your thyroid gland

New ARES E-Mail Lists

If you've got e-mail and are involved with emergency communications, you can get linked up with other hams sharing similar interests. Karen Johansen, KC5FCU, ARRL Emergency Coordinator for Jefferson Parish, Louisiana, has set up an Internet domain of "ares.org" and is offering several mailing lists to hams. They include:

- ares@ares.org—A nationwide ARES listserver; a means by which ARES, RACES, and SKYWARN members can freely exchange ideas and information that could benefit all in the event of a disaster;
- storm@ares.org—This listserver is used to post hurricane and other severe weather information by the National Hurricane Center, the Severe Storms Forecast Center, and the Naval Weather Center. Postings are made only by these organizations;
- weather@ares.org—This listserver is for ARES, RACES, and SKYWARN members to report severe weather, hurricane measurements, or other information that might be of interest to those on the <storm@ares.org> list, as well as other subscribers; and
- newsletter@ares.org—A listserver for those who would like to receive newsletters from the different ARES, RACES and SKYWARN organizations from around the country. Any group that wishes to post its newsletter in this listserver must first send a copy to <info@ares.org> for the Web administrator's approval. Approval by the majority of the subscribers is also required for continued posting.

To subscribe (or unsubscribe) to any of these lists, send your request to <info@ares.org>. This listserver forwards to only four people. They are ARES members who will answer any questions you may have, or help you join or leave a listserver.In addition, Karen says Whitman Internet Services (a commercial internet service provider) has offered to set up and maintain up to three ham radio emergency services listservers for each state—one each for ARES, RACES, and SKYWARN organizations. For more information, authorized officials of these groups should contact Bob Whitman at bwhitman@bwhitman.com.



Gil Axford, W3DJL, served as Net Control at the Montgomery County EOC during a recent emergency drill involving the Limerick Generating Station.

caused by radioactive iodines that may be part of a radioactive release. In Pennsylvania, KI should only be taken when advised to do so by the Secretary of the Department of Health (rules vary in other states). While the county EOC is built to protect workers, there is always a possibility that a worker would need to leave the EOC for reassignment.

Evacuation and Reception

Once an evacuation has been recommended or ordered, mass care shelters need to be set up to house the evacuees. Here, the surrounding counties have the responsibility to support the operation. Montgomery County's neighbor to the south, Chester County, had a double role in this scenario. First, part of the county is in Limerick's 10-mile EPZ (see map) and was subject to evacuation. Secondly, the county is large enough that it could also house evacuees in outlying areas. Three other counties also acted as host or reception counties.

After the drill ended, Henry Tamanini, Consultant for Safety Procedure to PECO Energy (the plant operator), conveyed his appreciation for "a job well done to the amateur radio operators for their participation and professional communications assistance for this exercise."

Dealing with the Unknown

When a flood or tornado hits your community and you're called out to provide communications, you know how to stay out of harm's way, how to drive around the flooded highway. You can generally be assured that your family is safe. With a nuclear power plant accident, though, if there is a radioactive release into the air, you can't see it. You wonder, what, if any, long-term effects the accident might have on you or your family. The county plans are set up to protect the emergency response worker as well as the general public. Plans are in place to move residents and emergency workers to safe locations. But still, there is that feeling of "What if?"

How Safe Are We?

The worst commercial nuclear power plant accident in U.S. history occurred at the Three Mile Island nuclear plant near Harrisburg, Pennsylvania, in 1979. A minor mechanical malfunction compounded by human error damaged the nuclear reactor core and threatened to release radioactive materials into the environment. With assistance from government officials and nuclear scientists, a serious release of radioactive materials was avoided. Only very low levels of radiation were detected near the site.

Nuclear power plants, transportation of radiological materials, and disposal of radioactive waste all pose risks. But operators of facilities and transporters of radioactive waste are cautious in the packaging, handling, and shipping processes. Also, since they are closely regulated by a variety of federal, state, and local agencies, the likelihood of an incident is remote. FEMA says about three million shipments of radioactive materials are made each year by highway, railroad, aircraft, and ship. No deaths or serious injuries have ever been attributed to the radioactive nature of any materials involved in a transportation accident.

Many guidelines and procedures have been implemented since the accident at Three Mile Island. Here, amateurs in five counties work together to provide important information in time of need. While we all hope that these nuclear drills are only for practice, they do exercise many elements which occur during *other* disasters. Some of the common components include county-to-municipal EOC communications, evacuations, and mass care. By participating in these exercises, amateur radio operators can be better prepared to serve in the public interest, whatever the nature of the disaster that strikes.

Next month...

Next month, we'll start getting ready for the holidays by taking a look at setting up a public display for passing messages via amateur radio. ■

What Would YOU Do for 3 dB?

If moonbounce is your thing, you might go to great lengths to add 3dB of gain to your system—maybe even the lengths that Tim went to a few years back...

October...cool, crisp afternoons, shorter days, NFL football, and the first weekend of the ARRL EME Contest. If you haven't tried your hand at EME (Earth-Moon-Earth, or moonbounce) yet, this is the time to start.

Hundreds of stations, ranging from the very small to the very large, will be aimed skyward anytime the moon is visible (see contest rules, elsewhere in this issue). Anyone with a 15-foot Yagi, receive preamp, and a 100-watt "brick" amplifier, along with some patience and understanding, can work a dozen or more of the "big boys" over the next few months, just after moonrise and just before moonset. Carefully tune the very bottom of the 144- and 432-MHz bands, and you'll hear quite a bit of CW EME activity.

For a complete primer on how to make contact via the Moon, take a moment to review "To The Moon, Alice," Parts 1 and 2, which appeared in the October and November, 1996, issues of *CQ VHF* (*See "Resources" for information on obtaining back issues.—ed.*). But be careful, though, you might get hooked, as I did back in 1991, and begin building a bigger VHF station.

The Central States VHF Society Conference, as always, was full of interesting speakers. Here, Wes Atchison, WA5TKU, talks about EMI in the hamshack. (W2VU photos)

The Price of 3 dB

And speaking of EME, I have a question: What would you do for 3 dB (decibels)? What *is* 3 dB? Half an S unit? On HF, I defy anyone to detect a 3-dB difference in power level. But what about terrestrial VHF work? Well, it might help with those L O N G-haul CW Tropo Qs out beyond 500 miles. On EME, however, 3 dB *is everything*! I know of many EMEers who have spent their entire summers re-engineering their arrays, chasing a dB or less.

What I Did for 3 dB?

Operating through the first half of the 1994 ARRL EME contest with only 350 watts left a lot to be desired! Conditions that year were disturbed, at best, with aurora causing quite a bit of signal degradation and absorption. Working eight stations took two days of constant calling, only to hear "QRZ?" or worse, nothing at all. Copying over 100 stations that weekend and not working even *one* European was disappointing. I needed more soup! What to do?

Sunday, I remembered Dave, NR6E, mentioning that a 2-meter amplifier was available from the estate of Joel, N6AMG. I quickly sent Dave an e-mail to inquire about it. Joel's brother, Larry was handling everything and offered a companion 6-meter amp as a package deal. I couldn't say no!

Tim's Travels, Episode 144

Now...to transport them from the Bay Area to Reno. Driving my old "beast," an aging Dodge D100 pickup (since replaced with a 1985 Ford F150 4 X 4), also left a lot to be desired. But my brother was on the road to Idaho, so his truck was out, and another friend with a truck had prior commitments. So I was forced to use "The Beast." What joy.

Don't get me wrong—it was a great mountaintop rig, but long drives in heavy traffic was not its niche. Regardless, I fixed the spare, found the chains, topped off all fluids and, at 3:00 a.m. Saturday, I was off. The first challenge was crossing Donner Summit. It was cooold and slushy, but totally deserted. I made great time to Dave's place in Benicia, California. We had breakfast, then headed out to Joel's place.

Such a station he had assembled! The 30-foot dish was still up—what a sight!—432-MHz EME must have been a real blast from here. We loaded up the gear and headed back to Benicia, and then I left for home, having been on the road 11 hours so far.

Then the fun started. Shortly after getting under way, it began to pour. By the time I made it to a gas stop in Auburn,

By Tim Marek, K7XC

Rod Bloksome, KØDAS (right), presents Lisa Lowell, KAØNNO (left) with her second place award in the CSVHFS States Above 50 MHz contest.

California, conditions over the pass had me worried. All around me were broken clouds, blue sky, and melting snow. As I got higher and higher, traffic began to slow to a crawl. Near Nyack, the freeway became a two-lane parking lot. Darn! "Chains Required to Traverse the Summit" Prepared for this (I thought!), I found a wide spot, and broke out the Snowmobile suit.

From this point on, Murphy was my copilot. Prior to this trip, I had changed tire sizes but forgot to see whether the old chains still fit. They didn't! I managed to install one, barely—completely out of balance as it covered only 80% of the tire—while the other was way too small. For the remaining chain to fit, I had to put on the original size spare in only the twilight of sunset.

Thoroughly soaked, I then traveled 30 miles at 15 mph, worried that the out-of-balance chain would fly off. Outside of Truckee (past the summit), I paid a guy my last $8 to crawl underneath and take them off. After what seemed like an eternity, I arrived home at 9:00 p.m., cold, tired, and *very* hungry. After a quick bite, I staggered off to bed, dead tired from 18 hours on the road.

Was It Worth It?

Over the following weekend—during a time when the moon conditions were much worse than those of the contest—I turned on the new amp and called Dave, W5UN, in Texas. He came right back with "Hi Tim" and "Os" (*indicating an excellent signal—ed.*). To date, the amp has held rock steady at 800 watts output hour after hour after hour. The total price may have been a bit high, but the results have been *well worth it*! So I ask again: What would *you* do for 3 dB? Hmmm?

Activity Reports

From Dave, N7DB CN85:

6/24/97 p.m.—Another opening into FL tonight. Began at 00 Z to N7ML DN45 then picked up W1LP/MM EL57 @ 0029 Z. A number of FL & LA stations in around 0100 Z. Also KB5HFM EL59 @ 0134 Z.

From Oscar, CO2OJ EL83:

6/24/97—An unusual 6-m opening started about 23:30 UTC, I still heard stations up to 03:45 Z. Worked stations in MO, IL, MS, AR, OK & KS with 57–59+ signals with only 5 watts. Why didn't something like this happen during the last two contest weekends? Oh, the magic band. I love this hobby!

From Mike, KF4HYB FM02:

6/24/97—Starting at 0030 Z through 0430 Z, including scatter into EM40, 50, EL49; single hop to EM04 through EM34 & EL08; double hop into DM13, 33, 34, 43, 62, 91 & a few in the low DNs that were too weak to pull out.

From Jay, KØGU DN70:

6/24/97—Finally, some really good conditions on 6 m with a big opening to the northwest. Some signals were pinning the meter. The kind of signals that have you checking 2 m (but nothing heard). I could hear the W7s working east on double hop.

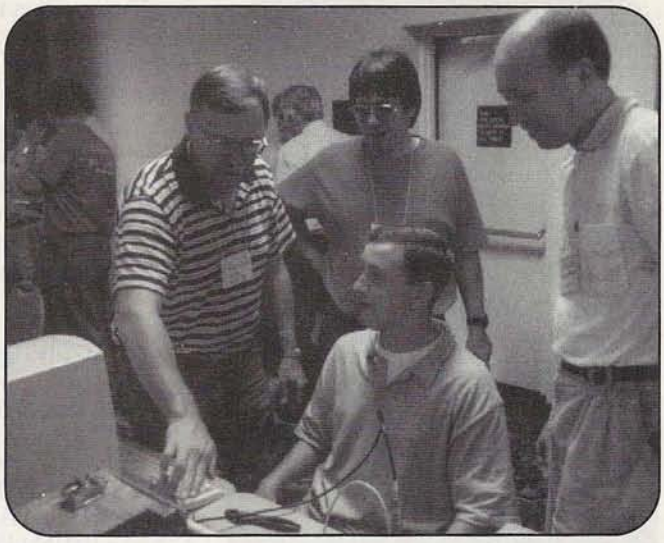
From Pat, WA5IYX EL09:

6/24–25/97—Almost 12 Hours of TV *Es*, with the FM MUF portion broken into several segments. As can be seen, sometimes a wide spread in azimuth in at the same time there. In-state Tropo signals were a masking problem here through local noon and again in the evening. Likely more than a few "rare" grids represented in the above!...I suspect that much of this day's *Es* was being "born" rather close-in to this location and was only suddenly becoming evident on VHF when it had moved "far enough" away.

From Clint, W1LP/MM:

Nice, long-lasting, widespread 6-m opening from EL57 in the Gulf of Mexico from 2330 Z, 7/24/97 to 0350, 7/25/97. Made 291 QSOs, 121 Grids, 41 States and VE2, VE3, VE7...all in 4 hours and 20 minutes of one continuous pile-up. What a blast! What a shame it couldn't have been during the contest. Double hop and lots of short skip, but nothing heard on 2 m. I only have halo for 2 m at the moment though as I am on a different ship (S.S. Marine Duval) from my usual ride and had to drag power supplies, anten-

A DX visitor. SMIRK Secretary-Treasurer Pat Rose, W5OZI, brought Mexican amateur Rafael Ortiz, XE2OR, as his guest to the Hot Springs, Arkansas, conference.



Noise figure measurement was a popular activity Friday night at CSVHFS. Here, from left, are Al Ward, WB5LUA; Dave Robinson, WW2R; Al's son and assistant, Bryan Ward, N5QGH (seated); and James Dietrich, WAØRDX.

nas, and coax which usually stay aboard (and are still aboard) the Chemical Pioneer.

Also, keep an ear out for Dave, N1NLX/MM (using my antenna, HI!) from the Chemical Pioneer, he's on 2 m only at the moment. I'm on 6 m & 2 m and will be QRV until late August primarily in the Gulf, but occasionally on the east coast. Still hearing NØLL/B in the noise at 0450 Z. Without fail, it's always the last one to go. 6-m VUCC worked from EL57, EL67, EL77, EL84, EL94 and even home—FN41.

From Larry NØLL EM09:

26–27 June—2-m *E* skip info from Kansas: 2255 WB3KRW FN20, 2256 N2KFC FN30, 2256 W1AJR EN91, 2303 WB2JTI FN30, 2304 K2DMZ FN20, 2305 WA3DRC, 2306 AA2UK FM29, 2321 W1COT FN31, 2322 K1ZE FN41, 2323 W2GKR FN31, 2324 W3YY FN11, 2327 WB2CUT FN20, 2352 KB3PD, 2353 K2ZRJ FM29, 2354 WB3F FM19, 0017 N4KWX FM08, 0018 KD4UPF FM08, 0025 W3BO FN20, 0024 N2QK, 0032 N3AQE FN10, 0032 AB3D FM29, 0033 KD2I FM29, 0053 WA2FGK FN21 & 0054 N2HLT FN12.

From Kyle Chavis, WA4PGM:

6/27/97—2-m *E*-skip to NW. We had a 1 hour *E*-skip opening to EN34, 35, 36, 44, 45, 52, 53, and 62 from 0020 Z to 0110 Z, signals was very strong. Two new grids!

From George, KØFF EM49:

6/25/97—The 6-m opening lasted about 4-1/2 hours. I ran contest style at 50.270 and gave almost 100 QSOs to the deserving throng. Only two stations referred to their name as a "first personal" and I gently reminded them to leave that term on 11 meters. Took a few breaks from Grid-test and had a couple of 10- and 15-minute genuine conversations with some interesting folks. Worked rigs from 8 watts/longwire to kW/four Yagis and everything in between. All signals sounded good and most were *very* loud. Occasionally, I stood by for the weakest ones. Used no processor & moderate power. A good time was had by all. 6 meters at its best. 'Bout time.

From N8PUM EN66:

6/26/97—I worked the following via 2-m *E*-skip: K4KAE FM02 00:25, K4AGV EM96 00:26, K4QI FM06 00:34, W4MW EM95, WA1ZMS/4 FM07 & K1WW FM15. All new grids for me.

From Ken, N8CGY EN74:

6/26/97—Had a great time tonight on the bands. Worked KD4IFN in TN on 10 m at 2227 Z; realizing this was kinda short skip, I told him that I was listening for 6 m to open and, sure enough, before I could finish with him, 6 m popped open to Jacksonville, FL. at 2248 Z. Worked many stations fast and furious on 6 m until 0020 Z, when I worked W8WN EM77 & KC8CNV EN80.

Again realizing this was short skip, I began listening on 2 m and 10 minutes later, I heard K4KAE in FM02. Try as I might, I couldn't attract his attention, although others down state were! Eventually, W4WM, in EM95 called me & I worked my first 20-m *E*s of the season. Everyone came out of the woodwork, locals everywhere calling like it was 20 m! It was fantastic! 2 m finally died out at 0055 Z. On 6, double-hop arrived at 0234 Z to CN84, CN85 and others.

At 0247 Z, the 6-m band quieted down so I went to the kitchen for a cup of joe. Then I heard KØGU in DN70 break the squelch commenting to someone local "Yep it's gone, let's go up 100" (No it wasn't, Jay!) Geez, what fun it has been! I still heard bursts of DX occasionally but was too pooped to get up from the chair. Best DX: 6 m, W7EW CN84, 3002 km; 2m, N4TJ in FM04, 1197 km.

From Jay Hainline, KA9CFD EN40:

6/27/97—Wow! Finally! Worked 30 stations and the 2-meter band was still open to the east coast. Starting at 0014 Z with WA3DRC FN20. Also worked FN10, FM29, FN30, FM19, FN30, FN21, FN20. Still going on at 0100 Z.

From Rich, NØHJZ EN34:

6/26/97—144 MHz *Es* tonight 0019 Z–0105 Z into VA & NC. Many stations worked in FM07, 08, 15, 16, 17, 18 & EM95. Possible *Es* on 222 too! Moved to 222.100 with a few guys from VA and heard someone just above the noise for about 5 seconds 0102 Z on SSB. Anyone hear me?

From Tom Hammond, WD8BKM, EN82:

6/27/97—What a great mode! Came in from mowing the lawn and just happened to turn on the rig. I don't have 6 m, so I can't track an opening and predict when the MUF reaches 2 m. Pure luck; makes it more intense. Logged the following on 2 m *Es*: N4UK EM84 0044 Z, W4MW EM95 0043 Z, W4UE EM90 0044 Z, W4LK EM93 0046 Z, WD4AFY EM92 0046 Z, N4TJ FM02 0049 Z, & K4KAE FM02 0050 Z. Grids are lined up right in a row from EM90 to EM95 and one grid either side. Amazing how directional the *Es* cloud appears to be.

From Ken, N4UK EM84:

6/26/97—6 meters was hopping with activity from all single hop areas from west to northwest to north early this evening. I decided to "waste" my time and call non-stop on 144.200. The acorn developed a hairline crack at 2301 Z when WAØBWE in EN34 was worked. A sign of good things to come? After a dinner break, I resumed calling at 0020 Z. Almost worked WØRRY in EM24 This is the first *Es* opening on 2 meters that I have experienced that wasn't centered on a single area. I heard lots of others calling me, but local lightning crashes and others on 144.200 made

it difficult at times. It's been a long dry spell on 2 meters!

From Jeff, N4ZWQ:

27 June 1997—Two-meter *Es* log. I had been on the road for two or three minutes and turned on the rig to hear W9NLP in EN52. Wow, *E*-skip! This makes up for missing my evening bike ride! Beginning at 0032 Z, I worked W9NLP EN52, WA2VOI EN35, NØHJZ EN34, W9NVK EN62 & KAØRYT EN34 with my mobile station, a FT290RII w/ Mutek internal preamp, Mirage B108 amplifier w/ preamp off (80 W), and a M^2 Sqloop 18" above roof level of my S-10 Blazer on the spare tire rack.

From Charlie Betz, NØAKC EN44:

Great band opening to VA, NC. First contact was with WA4PGM FM07 @ 0028 and ended with WT4C FM16 @ 0100. Worked a total of 14 stations in six grids with four of those new ones for me! I was hoping it would move just a bit more north as I'm desperately looking for a contact with someone in WV; that would have been a new state. Oh well, maybe next time.

From Lew Sayre, W7EW CN84:

Finally, a significant dose of 2X-hop *Es* on 6 m. For two hours and 20 minutes, I experienced a run to most of the east coast, making 110 Qs from EL98 to FN31 with e-mail Rx reports from further away. Most of the Qs were 3000–4100 KM distant. The pile-ups were spirited but reasonably well behaved... standing by patiently while specific stations/fields were called for and worked. The few stations who kept calling when another station had been responded to were noted and specifically not worked. Stations that called with full callsigns were logged rapidly.

Two instances really stand out: Informing a FNxx station that I understood that he might be having 2-m *Es* propagation. That station said "just a minute while I check." He then came back rapidly with his voice two octaves higher, saying "My gosh, It's open. Goodbye." The other was in the middle of a roaring pile-up. I was sure I heard a station call starting with PA3 (*That's the Netherlands, if you're not up on your prefixes.—ed.*) I just about needed to access my power supply to cardiovert myself as I asked the assembled to stand by for any EU stations. Everyone was most gracious in doing so...and of course, nothing was heard...so it was back to the pile-up. Am still a little shaky over that one...as I think west coast to Europe *can* be done via *Es*. Thanks to all who played and plied the 6-m *Es* with me today! Who knows what tomorrow will bring?

In Conclusion...

Es conditions in late June and early July showed some signs of life in selected parts of the country while others were *still* waiting for their first good opening of the season. Mother Nature sure likes to test our patience! Many thanks to the countless stations who supply me and others with a sometimes-overwhelming volume of data. I wish I could share it all here, but space is, of course, limited. So keep the reports coming in to Tim Marek, K7XC, *CQ VHF* Weak Signal News, 360 Prestige Ct., Reno NV 89506; via e-mail: <K7XC@VHF.RENO.NV.US>; Fax (702) 972-5011; Phone (702) 972-4722.

73 from DM09bp de Tim, K7XC

Resources

Back issues of *CQ VHF* may be ordered for $3.50 apiece, postage included. Send your order, with check or money order made out to CQ Communications, Inc., or major credit card number and expiration date, to *CQ VHF* Back Issues, 76 N. Broadway, Hicksville, NY 11801; Phone: (516) 681-2922; Fax: (516) 681-2926. Be sure to specify which issue(s) of which magazine you'd like.

Of Mic-E and Men

It's the next step for APRS—a unit that lets you send position information over a regular voice radio, without a TNC or separate GPS receiver. And it's called Mic-E.

It's almost here! Before we begin the main topic of this month's column, I want to remind you that time is running out to sign up for this year's Digital Communications Conference (you'll probably receive this issue in mid to late September, or even in early October if you're buying it on the newsstand). The 16th annual ARRL/TAPR Digital Communications Conference (DCC) is being held in Baltimore, Maryland, on the weekend of October 10 through 12, and, if you're able to get there, it will be well worth your time.

This year's conference promises to be the largest one ever, with a full schedule of presentations and seminars. More information is in the sidebar, but even if you can only show up for a day, I guarantee you'll have a great time. Hope to see you there!

APRS Matures

Digital data is hardly a dying aspect of amateur radio, despite what last month's doom and gloom might have made you think. As I've noted before, the Automatic Position Reporting System (APRS) is one application for packet radio that is just starting to come into its own. Undoubtedly a stroke of genius, Bob Bruninga WA4APR's APRS concept is one of those once-in-a-lifetime ideas. Sure, the Sproul brothers helped popularize it for the masses, writing both a Mac and a Windows version, but I still remember sitting in the audience and feeling the excitement when Bob first presented the idea at the ARRL Computer Networking Conference (now the DCC) in Teaneck, New Jersey (*APRS was discussed in detail in the August 1996 "Digital Data Link"—ed.*).

The MicEncoder semi-kit as received from TAPR. All that's missing is the GPS receiver.

Now, APRS has reached the next level of technology. To meet the demands of APRS users, who had to buy not only a TNC, but a GPS receiver and a second radio as well, the idea of the *microphone encoder* was born.

Mic-E on the loose?

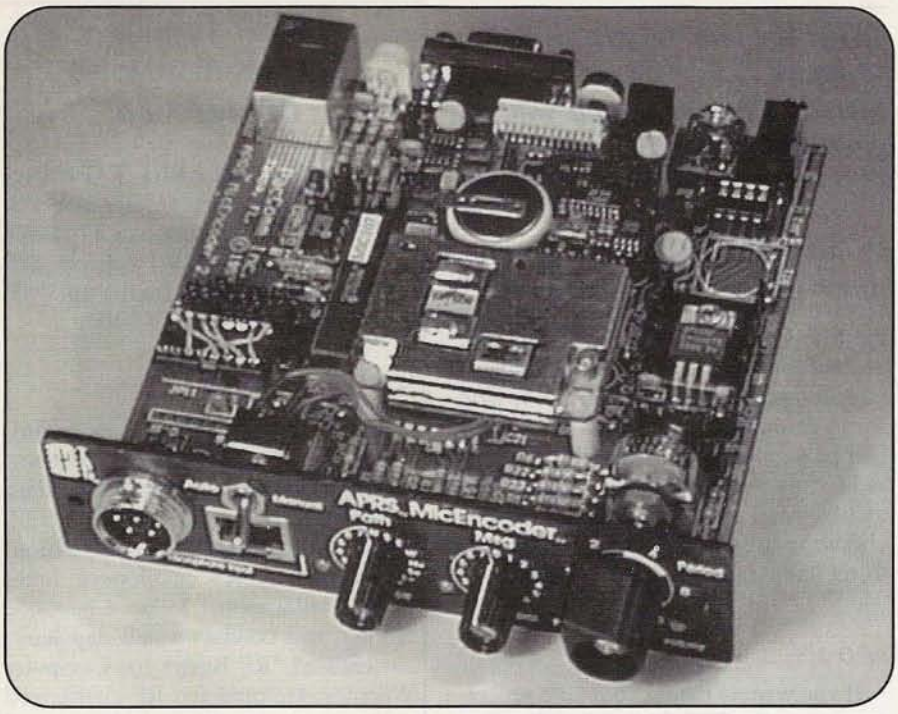
The TAPR APRS™ MicEncoder™ replaces the TNC in mobile APRS applications. By fitting in line with your regular mobile radio, it eliminates the need for a TNC, second radio, and antenna by simply integrating the APRS position report into a brief data burst at the end of a voice transmission. The Mic-E™ (pronounced "mickey," like the mouse) can also be programmed to send APRS position reports at timed intervals, much like a dedicated TNC. Any of a number of GPS receivers can be mounted internally, making the tiny (5 x 1.25 x 5.74-inch) and light (less than a pound, including GPS receiver) Mic-E unit really convenient for mobile or hiking use. And an added convenience is that you don't need to modify the radio in any way to use the MicEncoder—a big advantage when using someone else's radios.

Putting Mic-E to Work

If you're a net control for a public service event or emergency net, it's often desirable to know *where* your resources are. For example, you might find it handy to know the exact location of each fire-fighting unit when battling a large forest fire, or to be able to verify the position of

"Digital data is hardly a dying aspect of amateur radio, despite what last month's doom and gloom might have made you think."

By Don Rotolo, N2IRZ



The assembled Mic-E, with a GPS-20 installed, ready to be fitted into the case.

each checkpoint team in a bicycle race (especially if some of your units are mobile). But to insist that each team carry both a voice radio and a digital radio might be an excessive burden, especially when you add the second set of batteries, antenna, TNC, and related cables.

For everyday usage, any voice repeater could be equipped with a true DCD (Data Carrier Detect) adapter, which could switch all these bursts of data over to another transmitter (instead of the repeater's output) tuned to the local APRS frequency. It might be helpful for your spouse to be able to see exactly where you are during your commute (or, on second thought...). The applications are endless and, because it eliminates the need for another radio, TNC and antenna, it's cost-effective, too.

TAPR calls this a semi-kit: PacComm Packet Radio Systems supplies the pre-assembled pc boards, and the user is expected to solder in a connector, a few knobs, and a GPS receiver (which can also be connected externally), plus set a few jumpers. Even a beginner could put one together in a few hours.

TAPR offers the kit for $149 ($134 for members), plus $7 shipping. If you're not a member, then it would pay to join ($20) just to get the discount, and then the other benefits of membership end up costing a measly $5. (Come to think of it, it's worth joining TAPR even if you DON'T buy the kit. TAPR is simply the best organization of its kind).

"To meet the demands of APRS users, who had to buy not only a TNC, but a GPS receiver and a second radio as well, the idea of the microphone encoder was born."

Putting It All Together

After unpacking the kit, the first thing you'll notice is the excellent Heathkit-style assembly instructions. Since the hard part (the pc board) is pre-assembled, there really isn't much to be done—just strip and install a bunch of wires, if you plan on using the 8-pin round microphone connector. This part of the assembly process takes only a few moments and can even be skipped if you like. One word of caution: Attach the microphone jack to the front panel *before* you solder the wires to the pc board. Otherwise, the jack doesn't mount properly.

Jumping into It

The next step is to set all of the on-board jumpers correctly. There are nearly a dozen jumpers, allowing the Mic-E to be extremely flexible. Each jumper's purpose and setting is explained in great detail. The default settings are usually just fine, but check each one just to be sure (in the kit I had, one wasn't in its default position).

"If you're a net control for a public service event or emergency net, it's often desirable to know where your resources are."

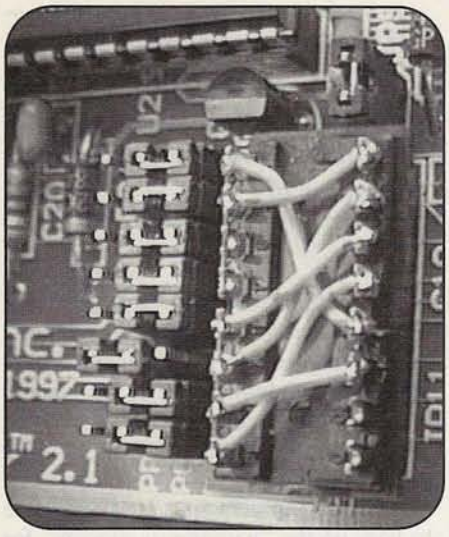
After the jumpers are all set, you have to wire up the "*personality module*" for your particular radio. This is just a component header connecting certain signals from the Mic-E to the proper pins on the microphone connector. This lets you make a "module" for each kind of radio you might ever want to use, and you just plug in a new module to switch radios.

The first step to making a personality module is to figure out which pins have which function in your radio. The signals you'll need are Push-To-Talk (PTT), microphone audio (TXA), receive audio (RXA), radio ground (GND), and, if available, microphone ground and microphone power.

Using a row of eight two-position jumpers all set to one position, you move one jumper, corresponding to the pin on your radio carrying the PTT signal, to the appropriate position. This leaves the remaining seven jumpers in their original positions, and allows the Mic-E both to detect when you're transmitting and to control the radio's PTT.

Building a Personality

Next, you assemble the personality header module itself. The kit, as received from TAPR, comes with two 16-pin machine-pin IC sockets, to be used as the header modules. The instructions explain how to cut up little pieces of solid wire, which is provided, to make the connections from one side of the socket to the other. Personally, I prefer to use the solder-type forked component headers, such as Mouser 151-316T2 or Digi-Key A103-ND/A110-ND. These look like IC sockets, but have little forks on top where you can solder on the wires. They also come with a plastic cover so you can close up the module after you've built it, and they have a flat surface on which to write



A close-up of a Personality Module Header. This one is wired for an older ICOM mobile, the author's IC-25H.

down which radio it's for. Although the provided IC sockets will work fine, especially if you glue down the wires, I prefer the stability of a soldered connection.

Next, just connect the pins on one side of the personality module header to the correct pins on the other side. For example, using an ICOM radio with a round 8-pin mic connector, you'd connect header Pin 15 (GND) to header Pin 6 (GND on the ICOM), Pin 14 (PTT) to Pin 5, Pin 13 (RXA) to Pin 8, and so on. Once these six connections are made, the personality module is done.

Signal Notes

A few notes on these signals: On some radios, the received audio isn't available

"After the jumpers are all set, you have to wire up the 'personality module' for your particular radio."

on the microphone connector. For these radios, you have to use the external receive audio jack found on the back of the Mic-E. Not all radios use a separate ground for the microphone audio, but if yours does, you should connect it to help avoid ground loop problems. Lastly, you can power the Mic-E directly from the radio if there's power to the microphone available on the mic connector. If you choose to use this power source, be sure to set jumpers 6, 13, and 14 properly.

Mounting the GPS

If you want to mount your GPS receiver, such as the GPS-20 that TAPR offers for $169, within the Mic-E case, you simply solder the wires from the GPS interface connector to the pc board and mount the GPS to the board with the hardware provided. There's even a hole on the back panel for you to mount a BNC connector, if you'd rather not run the antenna wire through the back panel.

If you have a complete GPS unit, and not just a receiver board, there's an RS-232 connector, as well as a 3.5-mm stereo jack, both on the back panel, for the external GPS data. These ports (they're connected in parallel) are also used for programming the Mic-E with the included DOS/Mac software. This involves setting your callsign, APRS symbol, and a few other simple parameters which are retained in the Mic-E memory.

1997 Digital Communications Conference

The 16th annual ARRL/TAPR Digital Communications Conference will be held October 10 through 12, 1997, at the Holiday Inn BWI Airport, 890 Elkridge Landing Rd, Linthicum, MD 21090; Phone: (410) 859-8400.

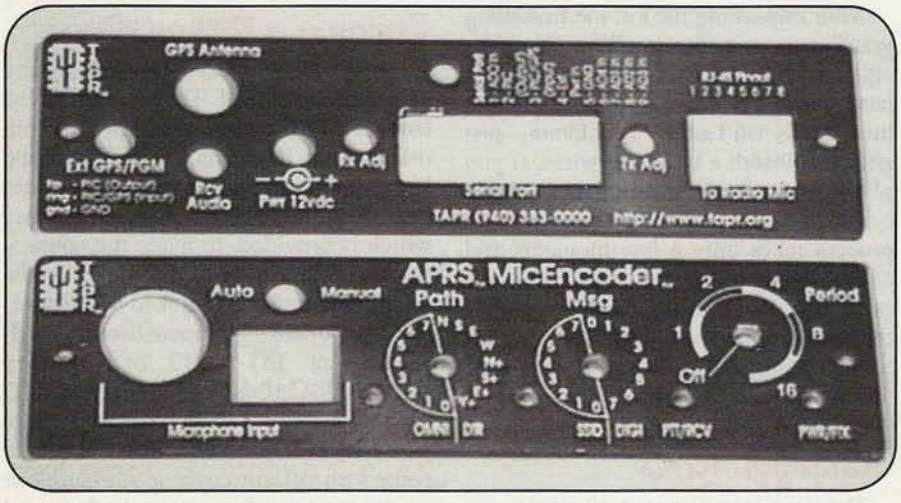
Program Highlights

Starting Friday at 1:00 p.m., a full-day seminar on APRS will be conducted by Bob Bruninga WB4APR, Mark Sproul, KB2ICI, Keith Sproul, WU2Z, Steve Dimse, K4HG, and other nationally known APRS developers. Later Friday afternoon, Mike Cheponis, K3MC, will conduct a half-day seminar entitled "RF Basics for Computer Weenies: Helping the RF-challenged get the most out of the new high-speed wireless toys."

The main portion of the conference will be held on Saturday, with a number of papers and other presentations on beginning, intermediate, and advanced topics. Saturday evening's banquet features a presentation by Yutaka Sakurai, JF1LZQ, the vice-president of Japan's Packet Radio Users Group (PRUG).

On Sunday, Dewayne Hendricks, WA8DZP, Phil Karn, KA9Q, and Tom McDermott, N5EG, will conduct a seminar focusing on Spread Spectrum system design and theory.

To register for the conference, contact TAPR (see "Resources"). Registration does not include hotel reservations, which you'll have to make on your own.



A close-up view of the front and rear panels.

A Case of Strength

The last step, after you've verified that everything is working properly, is to assemble the outer case. This is a solid aluminum extrusion (able to withstand being run over by a car) with heavy aluminum end panels held in place with self-tapping screws, in typical PacComm style. That's all there is to it!

In monitoring the Mic-E support forum (see "Support," below), the one question that keeps coming up is that of power. You should be aware that the Mic-E

Introducing Digital Television—Part 2

In his last column, KB9FO explained the basics of digital TV. This month, he looks at potential ham use and the basic question: Where do you start?

Home (and ham) use of digital TV may be on the horizon, but there's a lot of confusion in every aspect of digital video. Let's start with a warning: *Just because the sign says DIGITAL doesn't mean that whatever you have will work with another DIGITAL device.* There is, in fact, *no consistent standard for digital video.*

The $120 Wavecom Jr. from ATV Research was a hit at the Dayton ATV get-together. The 2.4-GHz unit is intended for low-power Part 15 use, but can be easily adapted for higher-power ham use on this shared band. See "ATV at Dayton" for more information.

Analog vs. Digital

The term digital is being applied very loosely these days, so let's set some discussion boundaries.

Regular old analog TV—what we now send on the 70-centimeter and higher bands—is identical to the NTSC video used in broadcasting, closed circuit, industrial, schools, and your 90-year-old Aunt Emma's black and white Dumont TV set. NTSC (see "Video Alphabet Soup") analog TV is 100% compatible, backwards and forwards. Any piece of NTSC analog video equipment will work with any other piece of NTSC analog video equipment that's ever been made or will ever be made. You can go to any store or flea market and confidently buy any monitor, camera, video recorder, receiver, and TV set, and plug it together and it will work (assuming that nothing's broken).

Even the stuff that gets stored as VHS, S-VHS, Video 8, Beta, BetaED, Super-Beta, Hi-8, 3/4-inch Cartrivision, and any of another 100-plus videotape formats that are no longer available, all had the same inputs/outputs. It all worked on a compatible set of standards that describe the picture attributes. The number of scan lines, the aspect ratio, the bandwidth, the color signals, the timing pulses were all standardized. Digital is not. *If I send a digital TV signal, unless you have the exact same digital decoding system, you can't watch it.* Period.

Now let's look at digital TV. There are three basic varieties out there today.

1) The stuff which has been flying around for a while is nothing more than an analog TV signal which has been converted to digital bits (in most cases, decimated of detail to squeeze a lot into a little space, known as digital compression—up to 60:1), and transmitted to you via a direct-to-home digital dish. This signal has no better or higher definition than analog NTSC since it starts *as* an analog NTSC picture.

2) High Definition TV, the analog signal transmitted via satellite in Japan that has more info per picture frame than regular old NTSC TV; and

3) True digital HDTV, stuff few of you have actually seen, for which there is almost no equipment made to generate it, and which no one yet can transmit because its 1.2 gigabytes-per-second trans-

"If I send a digital TV signal, unless you have the exact same digital decoding system, you can't watch it. Period."

By Henry Ruh, KB9FO

mission rate has to fit into a 270-megabit or narrower transmission path. It has up to six times more detail per picture than what we watch today (this is not to be confused with *finer*, that is, higher frequency detail, such as sharper edges or smaller lines).

But What about the "PEG"s?

Whoa, what about MPEG, JPEG, and all that other stuff we read about? Aren't those standards? Yes and no. They are standards for either production or transmission (not the same thing) and within their framework, you can still have a lot of variances. For example, MPEG consists of a block of frames called a *GOP*, or *Group of Pictures*. In the group of pictures, there is an initial frame, which is sent in full, then you skip several frames, send an intermediate frame, which is a partial picture, then skip a few more frames, then send a full picture again.

What's the problem, you ask? Well, here's a typical scenario: I send the 1st, 7th and 14th frames because my MPEG encoder has chosen to send those frames, digitally compressed, so that a MPEG decoder set to the same frame rate can rebuild the pictures I did not send. But if your decoder is set for receiving the 1st frame, 6th frame and 12th frame, you get nothing after the first frame. Oops!

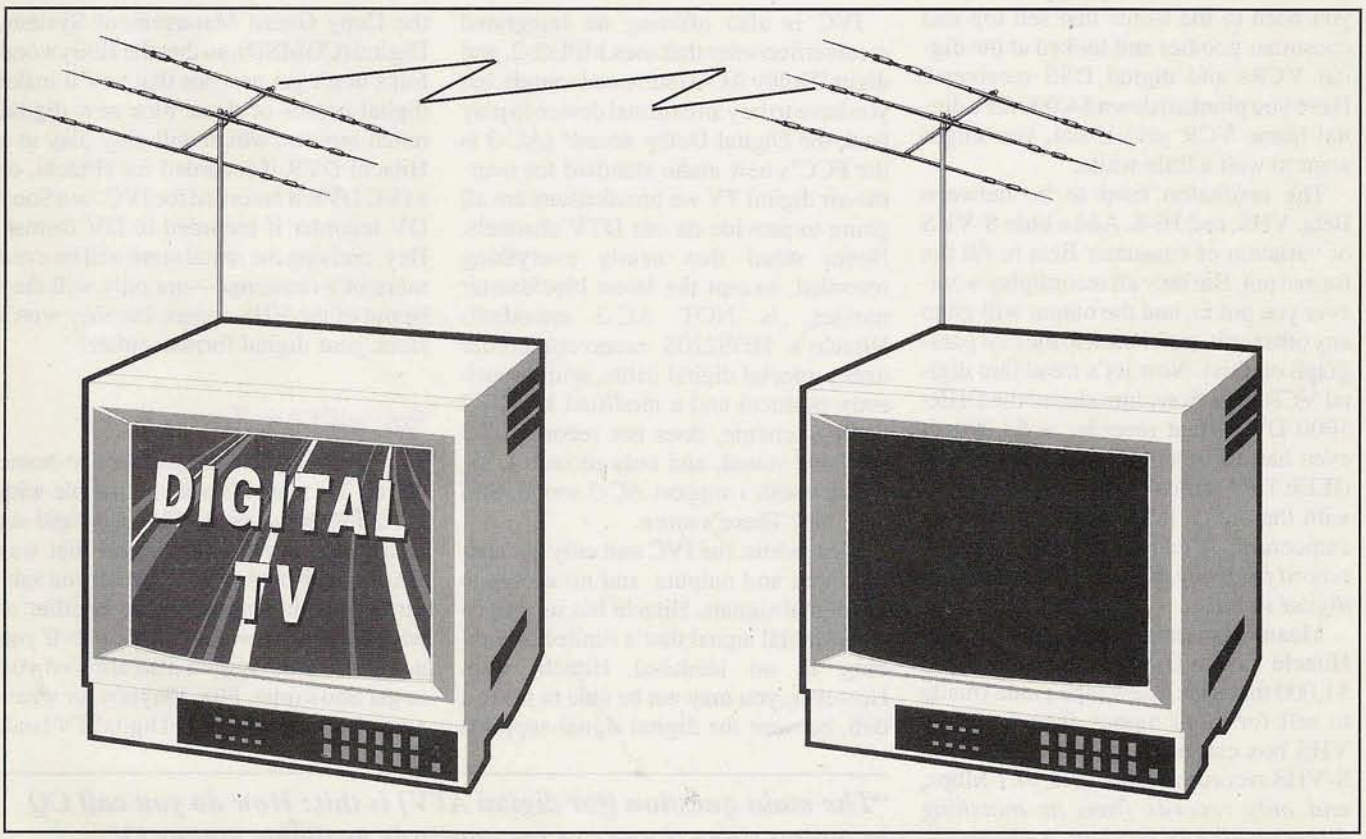
Because we're dealing with digital information, I can also control what you can and cannot record. A simple push of the button at my end can insert a digital secret word that says you can't record my transmission because your digital decoder has been told not to. Not some silly "copy protection" signal, such as extra sync pulses and white pulses in the vertical interval that can be easily removed by a $49 device, but more robust signals

ATV at Dayton

Those of you who made it to the Dayton ATV gatherings had a real treat. A lot of us are now having lots of fun using the Wavecom Jr 2.4-GHz ATV units from ATV Research (13-1 Broadway, P.O. Box 620, Dakota City, Nebraska 68731; Phone: (800) 392 3922; Internet: <http://www.atvresearch.com>). ATV Research President Mel Shadbolt, WØKYQ, is a long-time ATVer and was editor of the original *ATV Experimenter* publication in the 1960s.

Bill Parker, W8DMR, presented his how-to and a live demo to a packed house at the Friday night ATV gathering and shared his perfect pictures and stereo sound with us. A complete system (receiver, transmitter, power supplies, and built-in patch antennas) is $120, or $112 in quantity.

With a few simple mods, these can go from microwatt Part-15 power to watts-level ERP. By removing a small resistor pad and adding an MMIC and a good antenna (two-foot parabolic or Yagi), range can easily be 20 miles line-of-sight with several watts ERP. Perfect for links or local QSOs, or try that skyscraper for a passive reflector. I found that the huge metal signs on expressways serve as great beam benders when I'm operating mobile at 2400 MHz! Plan now to attend the 1998 Dayton Friday night ATV gathering!



There are no standards among the competing digital TV systems coming into the marketplace, so signals sent for one system will be impossible to receive by units built for other systems. This is like being able to watch CBS, but not NBC (unless you buy a separate NBC receiver).

such as those used in satellite transmissions, where all you see is a series of black and white streaks. But even more so—all you receive is a blank screen. Or, I can just change the data rate by 1 bit per frame, so alternate frames are inverted because your decoder does not know to drop one bit per frame. Or worse.

But What about the FCC?

Hey, why are you rockin' the boat when the FCC says NTSC broadcasting has to go away in 2006? Don't bet the farm on it! All us TV-watching folks have to be able to receive the new digital TV service (note this is not HDTV service, but DTV service) and I, for one, am not going to rush out and replace all my NTSC TV sets with DTV sets yet. In fact, I might just buy a few more NTSC TV sets and VCRs NOW, before the prices go up to include V chips and other stupid stuff mandated by Big Brother to control what I can watch. (*Opinions expressed here are those of the author and don't necessarily reflect those of the magazine, and all that other stuff.—ed.*)

Why would anyone create a transmission system which is so different that it can't be received on all receivers? I dunno, but it has already happened. Have you been to the stores that sell top end consumer goodies and looked at the digital VCRs and digital DSS receivers? Have you plunked down $4,000 for a digital home VCR yet? If not, you might want to wait a little while.

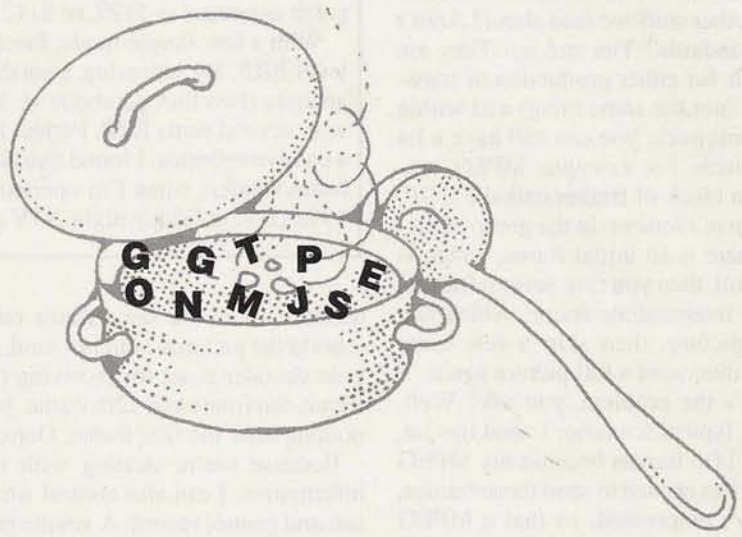
The confusion used to be between Beta, VHS, and Hi-8. Add a little S-VHS or variation of consumer Beta to fill the format pot. But they all record/play whatever you put in, and the output will go to any other unit. (refer back to the first paragraph on this). Now let's tread into digital VCR land. Sony introduced the DHR-1000 DV format recorder at $4,000. It even has a Firewire digital input/output (IEEE 1394 standard), but will only work with the digital data stream from a DV camcorder. *It cannot directly digitally record from any direct-to-home satellite digital signal.*

Meanwhile the folks from JVC and Hitachi have a D-VHS recorder around $1,000 that uses a new tape grade (made to sell for more money than its lowly VHS box can normally fetch) using an S-VHS recording system, at 14.1 Mbps, *and only records from its matching direct satellite TV receiver.* A single tape can hold seven hours of programming, provided you subscribe.

Video Alphabet Soup

Techno-jargon isn't the sole province of hams. Here's what the various video-related initial groups mentioned this month stand for:

GOP—Group of Pictures (sorry, Republicans. The "Grand Old Party" has competition for its initials)
JPEG—Joint Picture Experts Group
MPEG—Motion Picture Experts Group
NTSC—National Television Standards Committee (or, as it's often referred to in the TV industry, "Never Twice the Same Color")



JVC is also offering an integrated receiver/recorder that uses MPEG-2, and digital Dolby AC-3 (surround sound), but you have to buy an external device to play back the Digital Dolby sound! (AC-3 is the FCC's new audio standard for over-the-air digital TV we broadcasters are all going to provide on our DTV channels. Never mind that nearly everything recorded, except the latest blockbuster movies, is NOT AC-3 encoded!) Hitachi's HDS220S receiver/recorder uses a special digital cable, with proprietary protocol and a modified MPEG-2 coding scheme, does not record AC-3 surround sound, and only records DSS, which doesn't support AC-3 sound. Still with me? There's more.

Meanwhile, the JVC unit only has analog input and outputs, and no access to the digital signals. Hitachi has its proprietary digital signal that's limited to dubbing to an identical Hitachi unit. However, you may not be able to make a dub, because the digital signal supports the Copy Guard Management System, Digital (CGMSD), so that the Hollywood folks don't get nervous that you'll make digital copies of those nice new digital rental movies, which will only play in a Hitachi DVR if recorded for Hitachi, or a JVC DVR if recorded for JVC, or a Sony DV recorder if recorded in DV format. Hey, cruising the rental store will be even more of a challenge—not only will they be out of the VHS copies, but they won't stock your digital format, either!

Satellites, Too

Likewise, the EchoStar direct-to-home digital TV signal is not compatible with DirecTV. Now, your old C/Ku-band sat dish would receive any signal that was "in the clear" and those to which you subscribed. Didn't matter what satellite or what content provider you choose. If you got HBO, your system also allowed you to get Showtime, Flix, Playboy, or whatever else you wanted. In Digital TV land,

"The main question [for digital ATV] is this: How do you call CQ in digital video if none of the currently available digital TV equipment is compatible with anything made by anyone else?"

"What we need to develop is a universal conversion program that will allow any computer video to receive any other computer video, much as the slow-scan operators have programs to receive any version of SSTV."

if you buy an EchoStar system and decide that Direct TV has a show you want, guess what, you can't get it, *unless you buy a Direct TV dish.* EchoStar and AlphaStar are not compatible.

Likewise, the digital recorders being sold for these services are not compatible. If I record a signal from EchoStar, and you have Direct TV, you can't watch it on your digital VCR. These are program service provider choices. We were not asked to participate. Which brings us, finally, to the question of digital ham TV.

Digital ATV

The main question is this: How do you call CQ in digital video if none of the currently available digital TV equipment is compatible with anything made by anyone else?

Those of us in slow-scan TV from the early days of eight-second pictures and P7 tubes, when the different modes came along, were able to adjust the scan rates and, with a little work, change the memory of our 400s, 800s, and even Robot 1200s, and still stay in the game. Today you would be hard-pressed to buy a dedicated slow-scan unit, because computers and software can handle any format. Slow-scan went computer, and the old hardware is now dirt cheap or trashed. But, at the same time, the large number of SSTV operators who used to be on the air, generating equipment mods, having fun, and exchanging pics dwindled down to those who wanted to play graphics artist on their computer and show off the latest whiz-bang, store-bought Adobe program. It went from experimentation to appliance operation.

Similarly, ATVers' experimentation with digital TV will have to start with local groups of ham buddies who all agree to experiment together with one particular digital TV signal system. Their results, if affordable and available elsewhere, can then be adopted by others. If we adapt the "CUseeMe" digital system into a transmission system for digital TV, minus the phone lines, we can begin on one common platform. As results and desire drive us to better picture systems, we will migrate. But it's still unlikely that any one digital system will be compatible with any other digital system.

The Challenge for ATVers

What we need to develop is a universal conversion program that will allow any computer video to receive any other computer video, much as the slow-scan operators have programs to receive any version of SSTV. Then we'll be able to call CQ in digital TV and be seen. This will be the next big challenge to ham TV. Meanwhile, have lots of decades of fun with our analog TV stuff—it will be around for a long time.

Comments, questions? E-mail ATVQ @aol.com, or visit the ATV Web site, with links to many others, at <http://www.stevens.com/atvq/>. 73,

Henry, KB9FO

Letters *(from page 7)*

ham who is experienced and has done major projects like the ones published in your magazine.

So what I would like to see is some very simple projects that a person with no electronic or electrical building experience can undertake. Then, as the year progresses, the projects get a little bit harder and a little bit more technical. This, then, would eventually lead to a ham with the *knowledge* and *experience* to build an advanced piece of equipment. 73s,

Jeff Ober, KE6JMD
Palmdale, California

Jeff—The project building experience of our readers varies from the complete beginner to the expert veteran (and every point in between). The projects you pointed out are aimed at the more experienced builder. However, we have also had several beginners' projects, and our (relatively) new "Project Corner" column by Dave Ingram, K4TWJ, will assume a steady stream of projects for newcomers and old-timers alike. Meanwhile, you might find what you're looking for in Dave's new book, 33 Simple Weekend Projects, *available from CQ (see our ads for more information).*

Dear *CQ VHF*:

I am responding to your comment "It's hard to represent an organization to which you don't belong" in the May 1997 issue.

I have been a member of ARES for over six years, and I never felt that it should be a requirement to be a member of ARRL to be an ARES EC! No part of ARES says ARRL-ARES and I take offense to your comment! I have served ARES well and how you can say " I don't belong" and "I don't represent" just because I can't afford to spend the extra money is outrageous! I have been an Assistant EC for over two years.

I defended your magazine to one of my friends who asked if it was a "No-Code pencil neck geek" magazine And I said "NO"...well, maybe I was wrong. By the way, I came in as a No-Code almost seven years ago and now am an Advanced.

Thomas "Trip" Carswell, KT4WO
(ex-KD4FNQ)
Sylva, North Carolina

I'm sorry that you took offense at my comment that it's hard to represent an organization to which you don't belong. You may *belong to ARES without belonging to the ARRL. Nonetheless,* ARES is an arm of the ARRL. *Someone who holds an Emergency Coordinator position is NOT an "ARES EC." He or she is an "ARRL EC." The position is a leadership appointment in the ARRL Field Organization (not the ARES Field Organization), and, as such, anyone who holds the EC title is a representative of the ARRL (as well as ARES). The ARRL feels that, in order to represent the League, you must belong to the League. I find it hard to argue with that logic.—W2VU*

And finally...

Arnie Coro, CO2KK, passed along the following letter he received about his 75-ohm coax article in the July, 1997, issue of CQ VHF*:*

Hi, Arnie!

Boy, I was sure glad to see your article on 75-Ohm coax in *CQ VHF* (which just arrived today)! Congratulations!

I must disagree with you on one point, though...when I replaced my Belden 9913 on 432 with 75-ohm TV hardline, I did not see "no measurable change" as you did. I saw the signal improve by about an S-unit! 73.

Chip Margelli, K7JA

Components and Circuits—Part 2

In this second half of a two-part article, W6TNS talks about capacitors and inductors. After reading both last month's and this month's columns, you should have a better understanding of the component questions on the Novice/Technician test.

Capacitors are found in virtually every electronic product and are one of the most useful components in the electronic stew we call a circuit. About the time that I was a teenager, capacitors were called "condensers." Then, I guess to avoid confusing condensers with the evaporator part of an air conditioner, the "powers that be" substituted the term "capacitors."

In its most basic form, a capacitor consists of two plates or electrodes separated by what is called a *dielectric* material (see Figure 1). The dielectric is a type of insulator that can *store* an electric charge. Typical dielectrics include air, mica; plastic, paper soaked in an electrolytic solution, and various ceramic materials. For larger values, strips of tinfoil, separated by a paper or plastic dielectric, are rolled into a compact form. Sometimes a metallic substance is evaporated on the dielectric to make a capacitor. Whatever is used, the dielectric material has a significant effect on the value of the capacitor. Figure 1 also shows the schematic (symbolic) representation of a capacitor. Note that the plates can be made in any shape or size.

You'll Get a Charge out of This!

The most useful characteristic of a capacitor is its ability to hold an electrical charge. I'm not sure what they teach in high school science classes today, but my instructor introduced me to capacitors in the form of a Leyden jar. This was composed of a glass jar with an insulating stopper in the top. Going through the center of the insulator was a metal rod. The end of the rod on the outside of the jar had a ball on it, and the other end was immersed in an electrolytic solution inside the jar. The outside surface of the jar was lined with metal foil, which formed the other "plate" of the capacitor. When you applied a static electricity charge to the ball, it would be stored in the dielectric. Then, to illustrate the point that it retained a charge, the teacher would touch the ball to someone who immediately received a memorable jolt as the stored electricity was released.

There is a modern day equivalent of the Leyden jar. It's the picture tube inside your television set. The tube is coated both inside and out with a conductive material. The dielectric is the glass between the two metallic surfaces. When you turn on the TV, many thousand of volts are applied to the tube. Even hours after the set is turned off, the charge remains. ***Never, ever*** *touch that red wire that clips on to the side of the TV tube or you will get a painful (and possibly* ***lethal****) demonstration of how a capacitor holds a charge.*

While I was writing this, nature provided another example of a capacitor. I was jolted out of my computerized trance when a bolt of lightning struck a building less than a mile away. The cloud traveling over the area was highly charged and represented one plate of a capacitor. The Earth was the other conductive "plate," and the air between these two objects was the dielectric. When the charge on the cloud reached the *breakdown point* of the dielectric (the point at which the insulating properties of a material are overcome and it becomes a conductor), a bolt of lightning was released which discharged the cloud.

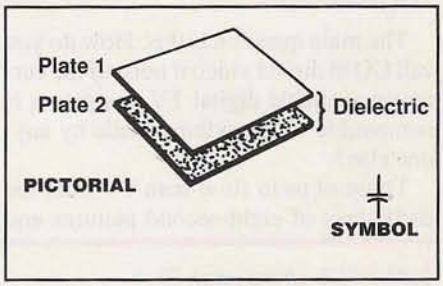


Figure 1. A capacitor consists of two plates of a conducting material, separated by an insulating material known as a dielectric. The dielectric stores and later releases an electrical charge. Also shown here is the schematic symbol for a capacitor.

Measuring Capacitance

The basic unit of capacitance is referred to as the *Farad*. A 1-Farad capacitor will have 1 volt across the capacitor when a charging current of 1 ampere flows for one second. The Farad is an extremely unwieldy value, however, and is seldom seen in electronic equipment. Practical values are the *microfarad* (μF)

By Donald L. Stoner, W6TNS

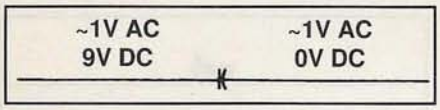


Figure 2. A capacitor in a series circuit will allow AC current to pass unchanged, while blocking DC current. This is quite useful in filtering applications.

which is 10^{-6} Farad, the *nanofarad* (nF or 10^{-9} Farad) and the *picofarad* (pF, which is 10^{-12} Farad).

Capacitance increases as the plates are moved closer together, but this also reduces the voltage breakdown of the dielectric (that's what caused the lightning bolt). How does one get usable values of capacitance in such a tiny component without the plates touching each other? The answer is the dielectric. Capacitor manufacturers don't use air; rather, the dielectric is made of ceramic for small values and plastic for larger values. The dielectric is rated in a *K*-value. Air has a constant or K factor of 1, while some ceramics achieve a K of 30,000.

Uses of Capacitors

Why do we use capacitors in electronic circuits? For one thing, they can be used in a series circuit to block direct current (DC) while passing alternating current. Once a capacitor has been charged, the charge stabilizes. One plate will exhibit a positive charge, for example, but the other plate will not. However, when the value of the charge on the positive plate changes, the changing value will appear on the other plate. We can use this effect to prevent the DC voltage found in one circuit from being passed on to a second circuit. But the changing value of charge impressed on the DC will appear to pass right through the capacitor as shown in Figure 2.

Here's an example: My satellite dish uses a low-noise amplifier at the dish, and voltage is fed to the amplifier via the connecting coaxial cable. In other words, the cable carries both the voltage to power the amplifier in one direction and the signals the dish receives in the other direction. A capacitor is used at the control box to block the DC on the coax (to prevent it from being shorted out), but the signal from the satellite passes through the capacitor to the processing circuitry in the control box.

This same effect can be used to advantage when a capacitor is used *in shunt* with a circuit. One application of this type is the filter capacitor. These are used in a power supply that converts alternating current into direct current. Figure 3 shows a common arrangement used to get rid of an AC signal when it's not wanted. The 9 volts DC might be used to power sensitive electronic circuits. In this case, we want as little as possible of the original AC signal (called "ripple") on the 9-volt circuit. In Figure 3, the AC "goes through" the capacitor and is shorted to ground, but the DC voltage isn't affected.

By the way, filter capacitors used in power supplies almost always are the type described earlier, using rolled up tinfoil separated by paper soaked in an electrolytic solution. As you might suspect, these are called electrolytic capacitors. The symbol is shown in Figure 4. Note the polarity marks added to the previous capacitor symbol; this type of capacitor is polarized and must be connected with the plus mark to the positive voltage source. If reversed, excessive current will flow inside the capacitor, heating the electrolytic solution until steam forms and...*whamo*!

Variable Capacitors

Capacitors are often used in radio equipment to trim circuits to an exact frequency. Let's say you need a capacitance of exactly 10.32795 pF. You can't use a fixed value of capacitor for this—the manufacturer just could not make so many values of the same item. Thus, some element of the capacitor must be made *variable*.

It's possible to change the size of the plates, the spacing between them, or the interleaving of many plates. You used to see examples of the latter in radios up until the 1980s, or so. The multiplate variable capacitor was used to select the station being received by the radio. Modern radios use a *variable capacitor semiconductor diode* to do the same thing. The symbol representing a variable capacitor is also shown in Figure 4.

Introducing Inductors

The characteristics of an inductor are just the opposite of a capacitor. A capacitor stores energy in an electric or electrostatic field. But an inductor accomplishes the same thing by storing energy in an electromagnetic field.

Every electronic product contains inductors, since every wire or length of copper foil on a printed circuit board exhibits a small amount of inductance. In some cases, such as long copper traces on the "mother board" for a high-speed computer, this is undesirable. But in most cases we purposely use inductors to achieve some result.

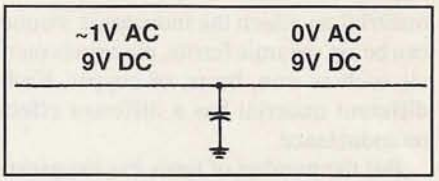


Figure 3. In a "shunt" circuit, the AC current will be "shunted" to ground by passing through the capacitor while the DC current will continue on into the rest of the circuit (this is one way to remove traces of AC from what should be a DC-only current).

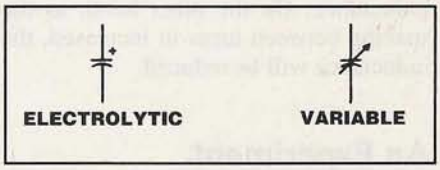


Figure 4. Two specialized types of capacitors are electrolytic and variable capacitors. Their symbols are shown here. See text for discussion of their use in circuits.

If a piece of wire is formed into a coil, its inductance value rises dramatically. The material the coil is wound on is known as the *core*. Wound in this manner, wire takes on the properties of an inductor or coil. See Figure 5 for the symbol for an inductor.

Farad, Meet Henry

The unit of inductance is called the *Henry*. But, like the Farad, this is a very large value. Inductors are more often rated in *millihenries* (mH) or *microhenries* (μH). Several parameters affect the exact value of inductance, including the core diameter, the length of the core and the number of turns used to make the coil. The spacing between turns of wire in the coil also affects the inductance. The core

Figure 5. These are schematic symbols for inductors, whose functions, in many ways, are opposite to those of capacitors. See other diagrams and text for explanations.

material on which the inductor is wound can be air, ceramic ferrite, or various metals such as iron, brass, or copper. Each different material has a different effect on inductance.

But the number of turns has the greatest effect. As the number of turns is doubled, and other factors remain the same, the value of inductance will increase by four. Other factors influencing inductance values include the coil diameter and the spacing between the turns. The larger the diameter of the coil, the greater the inductance. On the other hand, as the spacing between turns in increased, the inductance will be reduced.

An Experiment

When a current is passed through an inductor, lines of force are created. You can demonstrate this by winding some wire on a steel nail. Connect the two wire ends to a flashlight battery and the electromagnet you have just created will attract and hold steel objects like paper clips. The intensity of the electromagnetic field is affected by the same factors that control inductance. Picking up steel objects is not a unique property; any magnet will do this. What is unique is the ability of an inductor to store energy in its magnetic field.

Another property of inductors is that they oppose the flow of alternating current—just the opposite of a capacitor. When an inductor is connected to a source of DC voltage (a battery, for example), the lines of force expand from the coil. But in doing so, the expanding lines cut through the turns of the coil and induce a current flow in the coil. However, this current flow is exactly *opposite* from the current caused by the battery. Thus, there's an opposition to current flow in the inductor which is actually created *by* the current flow in the inductor.

Eventually the DC current flow reaches a maximum, the lines of force stop expanding and no opposition current is created. When this happens, the current flow through the inductor is limited only by its DC resistance. However, when you disconnect the battery, the lines of force around the inductor collapse and induce the stored voltage in the inductor. If you happen to be holding the wire ends of an inductor at this instant (and it has sufficient inductance), it can cause a shock from the collapsing field. This is the principle on which an ignition spark coil works in your car.

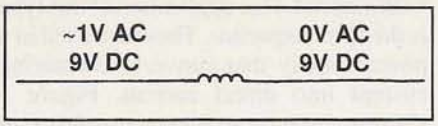


Figure 6. An inductor in a series circuit will pass DC current and block AC current. This is exactly opposite of what a capacitor will do in the same spot.

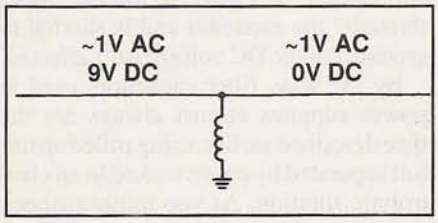


Figure 7. Using an inductor in a "shunt" circuit allows the DC current to pass through the inductor to ground while the AC current continues on into the rest of the circuit. Again, this is opposite of a capacitor's function in this circuit.

An inductor works exactly the opposite of a capacitor in series and parallel circuits. Let's modify the earlier drawings by substituting inductors for the capacitors. The revised circuit is shown in Figures 6 and 7. Let's apply DC, with an AC signal impressed on it, to the inductor. Now the DC has no trouble passing through the inductor since it is a steady value and the lines of force created by in are not changing. The AC signal, on the other hand is varying, causing expanding and contracting lines of force (because of the alternations) which are opposed by the inductor. Thus, on the output side of the inductor the DC is unchanged and passes through with ease. But the AC, which was impressed on the DC, is greatly suppressed. The larger the inductor, the greater the suppression of the AC component.

The action of an inductor can also be used in a shunt circuit as shown in Figure 7. Let's impress the same AC voltage on the DC and apply it to the inductor. Now the DC voltage is shorted to ground by the low resistance of the inductor, but the AC signal is relatively unaffected. The larger the inductor, the less the effect on the AC signal.

Variable Inductors

Inductors, just like capacitors, sometimes need to be made variable to achieve the exact values required. The easiest way of accomplishing this is to insert or

Figure 8. Schematic symbol for a variable inductor. These serve similar roles to variable capacitors in tuning the inductance of a circuit to an exact value.

remove a core material. The lines of force can be aided or opposed if a material other than air is used for the core material. For example, if iron is used, the magnetic lines of force are concentrated in the material and the inductance of the coil is increased. The symbolic representation of a variable inductor is shown in Figure 8. Note that the variable inductor symbol may or may not include the solid lines representing a core.

If the core material is brass (usually silver plated to reduce loss in radio frequency circuits), the non-ferrous material impedes the lines of force and the inductance is decreased below its value with an air core. Note that in the case of either an iron or brass core, some losses will be introduced in the inductor, when compared to an air core. Most tunable inductors employ cores of powered iron. A ceramic material called ferrite is also used to greatly increase inductance.

Taking on Toroids

There is one more form of inductor that you should know about and which may be mentioned in your test. If the core is a donut shape cast of powdered material, it's known as a *toroid*. The turns of the inductor are wound on the toroid and virtually all the lines of force are contained *within* the core. It's very difficult to make toroids variable, so they're usually found in filters or other circuits where fixed values of inductors are required. The schematic symbol for a toroid inductor is the same as for the fixed inductor.

Next Month: RF Safety

That just about covers the subject of basic circuit components. Next month, we'll tackle the new exam element which was added to ham radio tests earlier this year with questions involving the radiation of radio frequency energy and its potential affect on humans. We'll discuss this next month...In Theory. For now,

73, Don, W6TNS

A Different Experience

Responding to July's "Op-Ed" by Duane Mantick, WB9OMC, this month's writer, AD5X, says both he and his daughter found a warm welcome to our hobby.

In the July 1997 issue of *CQ VHF*, Duane Mantick, WB9OMC, wrote an "Op-Ed" article entitled, "A Mode of Operating Should be a Choice, Not a Barrier." I found Duane's article interesting; however I do disagree with many of his arguments. Of course, I could be wrong (my wife will attest to the fact that I often am). However, I would like to comment on Duane's article.

Duane made the comment that when he was a Novice, he suffered through QRM, much of which he believes was aimed at Novices by higher class licensees. I guess I've experienced exactly the opposite. When I was a Novice (1964), I never experienced this problem and, in fact, had many QSOs with General and higher class licensees. Duane may comment that things changed a lot between 1964 and 1974, when he got his Novice license. Well, if they did, then they've changed back again.

My 15-year-old daughter Stephanie, AC5NF, recently upgraded from Tech to Tech-Plus and immediately got on 40-meter CW. As I looked over the QSOs in her log book from her brief 1-1/2 week Tech-Plus "career," I see that over 50% of her QSOs have been with Advanced and Extra class hams. I can't tell from the calls how many of the other QSOs were General and Tech-Plus or Novice operators. In any case, my daughter would proudly show me her copies of the QSOs, and in *all* cases everyone was extremely helpful and encouraging. She has certainly never been aware of any intentional interference.

Phil Salas, AD5X, is Senior Director of Radio Product Development at Alcatel Network Systems (originally Collins Radio) in Richardson, Texas. He has been a ham since 1964.

Mass Class

Duane complained about the "mass class," where large numbers of hams are dragged through the No-Code Technician study and then dumped on the bands. I submit that the reason there is a "mass class" is because it is easier to get a Tech license than it is to get a Novice license (you don't have to learn the code). However, I suggest that most hams started in a similar manner. When I got my Novice license, I didn't know any other hams. I had to learn operating procedures by listening to others on the air. I certainly do agree with "Elmering" new hams whenever possible, but this can't happen universally. Sometimes you just have to learn things on your own.

Duane suggested that the written exam be made more stringent. I hate to break this to you, Duane, but one thing we *don't* do in our society today is make things more difficult. We only make things easier. Just compare today's multiple choice CW tests with the solid copy tests of the past. Compare today's question-and-answer "study material" with the textbook-style license manuals of the past. Good luck on this one!

Join the League If You Want to Change It

Duane wants the ARRL to "stop whining about the code" and instead work on a more stringent written exam and an Elmering system. It is interesting that Duane criticizes the ARRL for not doing what he wants, but then he emphasizes that he is not an ARRL member. The ARRL is the only organization that represents U.S. hams both domestically and internationally. And the ARRL reflects what its membership wants. If those who don't agree with the ARRL don't join, there will be no changes to the status quo. I recommend that Duane join the ARRL and work for the changes he wants. Even W5YI and W2NSD are ARRL members.

"Duane made the comment that when he was a Novice, he suffered through QRM, much of which he believes was aimed at Novices by higher class licensees. I guess I've experienced exactly the opposite."

Duane thinks that the Tech-Plus class should be eliminated. I disagree. I've seen a number of new hams get in through the Tech ranks, and then get interested in HF. They then learn the five word per minute (wpm) to get access to some of the bands, and then upgrade from there. My daughter followed this path.

Duane wants to see time-in-grade before upgrading. My daughter went a year as a Tech before she got interested in HF. Then, she passed her five wpm (and the General theory) and immediately got on 40 meter CW. One and a half weeks later, she became a General by passing her 20-wpm code test! She planned on upgrading to Advanced in another week, and Extra a week after that! Should we hold someone back from upgrading who shows this kind of interest because they haven't spent enough time in grade? I think not.

By Phil Salas, AD5X*

"I hate to break this to you... but one thing we don't do in our society today is make things more difficult. We only make things easier."

Duane says that it is not that he can't learn the code, he just isn't interested. Therefore he shouldn't have to learn it. Let's take this a little further. "I'm not interested in electrical principles, so why should I have to learn them? I just want to operate." Or, "I'm not interested in propagation. If the band is dead, I'll switch to another band." Or, "I'm not interested in test equipment so I shouldn't have to learn about it. I just want to operate." Or, "I'm always going to use a calculator, so I don't need to learn to add and subtract without one." Or, "I'm not interested in U.S. history, so I don't need to learn it."

You can go on and on. Where do you draw the line? I've sure had to do a lot of things in my life that I wasn't interested in doing. I wonder how many required high school and college courses the average person takes that he is not interested in. How many things does one have to do on the job that are not of personal interest but are job requirements? Incidentally, I submit that you can learn 20 wpm code with far less effort than the average high school student spends taking one semester of required history.

On the Code Question

Personally, I do believe in the current code requirements. Learning Morse code at the speeds required takes a learning commitment a good bit beyond that required to learn the theory with today's question and answer books. Morse code is an appropriate part of communications history. As I mentioned above, we all have to take some history in primary and secondary school. Why not here? The added benefit is that CW can be used for communicating and many people find it a fun mode of operation.

"I don't look at the CW requirements as barriers to this hobby. I look at them more as part of a goal that you must achieve to earn your amateur privileges."

Finally, if Morse code is so de-emphasized, no one will learn it since it does take extra effort. My daughter sure didn't want to learn it. And guess what? She loves it. She told my XYL (N5UPT) to upgrade "because Morse code is so much fun." And although she's now an Extra, my daughter still spends 100% of her time on CW. She has yet to pick up the mic!

In conclusion, I don't consider the CW requirements as barriers within this hobby. I look at them more as part of a goal that you must achieve in order to earn your amateur radio privileges. The most satisfying accomplishments in life are those things that you make a commitment to achieve, and then work hard to achieve them. ■

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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.*

On the Cover

John Magliacane, KD2BD, demonstrates the amateur television (ATV) repeater at Brookdale Community College in Lincroft, New Jersey. The repeater is owned by the college's student radio club and operates on 426.250/ 439.250 MHz. With an antenna mounted atop a 350-foot tower, the ATV repeater covers a large portion of northern New Jersey. In addition to two-way, ham-to-ham contacts, the repeater also carries NASA TV programming during shuttle flights. More information about the Brookdale ATV repeater is available on the World Wide Web at <http://www.njin.net/~magliaco/atv.html>.

John himself has been a ham since 1982 and holds an Advanced class license, as well as an FCC commercial radio operator's license. He works in Brookdale's Advanced Technology Center, developing computer software for the Linux operating system and designing/building communications-related electronics projects.

Most of John's ham activity is on VHF and UHF, with a particular interest in satellite communication. John designed and built the "KD2BD Pacsat Modem" for packet satellite use in 1994, is the ham radio columnist for *Satellite Times* magazine, and has been publishing weekly "SpaceNews" reports since 1987. It is, according to John, "the first space news-letter read in space."

What's the next frontier for ATV? In this month's "In Focus" column, Henry Ruh, KB9FO, challenges amateurs to develop a universal translator for the many incompatible digital TV "standards" being adopted by various manufacturers. And he says you shouldn't be too quick to toss out your old (or new?) analog TV. (Cover photo by Larry Mulvehill, WB2ZPI)

Basics

The 6-Meter DX Windows

Six meters is unique among VHF/UHF bands in that it can regularly support long-distance (DX) contacts without help from satellites or the moon. To hold down interference between U.S. and foreign (DX) stations, certain frequencies have been set aside informally as "DX windows."

For DXers Only

You should avoid these frequencies for domestic contacts, including those between stations in the mainland U.S. and the southern tier of Canadian provinces. (From a U.S./Canadian perspective, Alaska and Hawaii, Canada's northern provinces, the Caribbean, and Mexico, are all considered DX.) On the other hand, if you want to work DX, the DX windows are the place to look for foreign stations calling CQ.

The main 6-meter DX window goes from 50.100–10.125 MHz, with a calling frequency at 50.110 MHz. (Note: There's a proposal to expand this DX window up to 50.200 MHz to accommodate the rapid growth of 6 meters in Europe and Africa, but for now, it's only a proposal).

In addition, there's a Pacific DX window from 51.000–51.100 MHz for stations in Asian countries which don't permit amateur operation below 51 MHz. West coast stations should listen for DX here and should keep these frequencies clear of domestic QSOs.

Calling, Not Chatting

If you call CQ on 50.110 looking for DX—or answer a DX station calling CQ there—please remember to move off of the calling frequency (QSY) for your contacts. Be courteous and clear the calling frequency. And don't forget to listen for DX stations throughout the DX window. If the band is active and you leave your dial set on the calling frequency, you might miss out on some great DX!

CTCSS Tone Frequencies

The following is a listing of the 42 standard CTCSS (Continuous Tone-Coded Squelch System) tone frequencies, along with the Motorola PL® designators often used to describe them. Many repeaters require that you transmit a CTCSS tone along with your signal in order to have your signal retransmitted by the repeater. CTCSS is usually used to minimize interference to and from other repeaters, not to restrict access.

Frequency (Hz)	"P/L" Designator	Frequency (Hz)	"P/L" Designator
67.0	XZ	136.5	4Z
69.3	WZ	141.3	4A
71.9	XA	146.2	4B
74.4	WA	151.4	5Z
77.0	XB	156.7	5A
79.7	WB	162.2	5B
82.5	YZ	167.9	6Z
85.4	YA	173.8	6A
88.5	YB	179.9	6B
91.5	ZZ	186.2	7Z
94.8	ZA	192.8	7A
97.4	ZB	203.5	M1
100.0	1Z	206.5	8Z
103.5	1A	210.7	M2
107.2	1B	218.1	M3
110.9	2Z	225.7	M4
114.8	2A	229.1	9Z
118.8	2B	233.6	M5
123.0	3Z	241.8	M6
127.3	3A	250.3	M7
131.8	3B	254.1	ØZ

Hamfest Calendar *(from page 27)*

Oct. 18–19, International Hamfiesta, Texas National Guard Bldg., El Paso, TX. Talk-in: 146.88 repeater. For information, contact Clay Emert, K5TRW, P.O. Box 23010, El Paso, TX 79923, or call (915) 859-5502. (exams)

Oct. 19, 15th Annual Kalamazoo Hamfest, Hazel Grey Bldg., Kalamazoo County Fairgrounds, Kalamazoo, MI. Talk-in 147.040 K8TIW repeater. For information, contact Al McNeil, K8CRH, (616) 657-4482 or send SASE to 816 E. Michigan, Ste. 102, Paw Paw, MI 49079-1215; e-mail: <amcneil@net-link.net>.

Oct. 19, Foothills ARC Hamfest, Hose Company No. 1, Greensburg, PA. For information, contact Al Compton, N3LQX, 555 Agnew Rd., Greensburg, PA 15601; WWW: <http://dns.pulsenet.com:80/~ares/>.

Oct. 19, Annual Hamfest, Salem Community Activity Center, Salem, IL. Talk-in: 147.27/147.87. For information, call Daisy King, AA9EK (618) 532-6606.

Oct. 19, Tailgate Electronics, Computer/Amateur Radio Fleamarket, Albany and Main St., Cambridge, MA. Talk-in: 146.52 & 449.725/444.725 -pl2A - W1XM/R. For information, call (617) 253-3776, or write W1GSL, P.O. Box 397082 MIT BR., Cambridge, MA 02139-7082.

Oct. 19, TradeFest '97, Bucks County Community College, Newton, PA. Talk-in: 145.25/-. For information, call (215) 752-1202 or e-mail: <sewall@erols.com>. (exams)

Oct. 25, 11th Annual Hamfest, Computer/ARRL State Convetion, Sumter County Exhibition Center, Sumter, SC. Talk-in: 147.015. For information, contact Steve Bregger, KD4HTS, P.O. Box 52302, Shaw AFB, SC 29152-0302, or call (803) 983-4251.

Oct. 25, Hamfest Minnesota & Computer Expo, St. Paul Civic Center, Hopkins, MN. Talk-in: 146.16/76 repeater. For information, contact Hamfest Minnesota & Computer Expo, P.O. Box 5598, Hopkins, MN 55343, or call the Hamfest Minnesota Hotline at (616) 535-0637. (exams)

Oct. 25, 3rd Annual Swap-Toberfest Convention, Polk County Fairgrounds, Rickreall,OR. Talk-in: 146.86 repeater. For information, contact Garry Zinn, KC7BSX (503) 838-2008.

Oct. 26, Hamfest, Sellersville Fire House, Sellersville, PA. Talk-in: 145.31. For information, contact Hamfest Hotline, Linda Erdman (215) 679-5764, 2220 Hill Road, Perkiomenville, PA 18074. (exams)

Oct. 26, 24th Annual HamFiesta/Computer Show, Marion County Fairgrounds coliseum, Marion, OH. Talk-in: 147.90/30 repeater. For information, write Karen Eckard, N8KE, 6583 So. Street, Meeker (Marion), OH 43302, or call (614) 499-3565.

Oct. 26, Hamfest, 4H Building, Iowa State Fairgrounds, Des Moines, IA. Talk-in: 146.22/82. For information, contact Hamfest Iowa '97, Randal Lees, NØLMS, 1575 Northwest 78th Street, Clive, Iowa, 50325-1255, or call (515) 279-4241; e-mail: <rclees@raccoon.com>. (exams)

Oct. 28, 13th Annual SwapFest, St. Charles County Community College, St. Peters, MO. For information, call Allen Underdown, NØGOM, (314) 939-9444, or write 4136 Towers Road, St. Charles, MO 63304; e-mail: <wbrco@val-uenet.net>; SwapFest HomePage: <http://lakers.cybercon.com/wurmborn/swap.html>.

Oops...

Reader Patrick Wintheiser, WØOPW, caught a typo in our August power supply project, "Build a 25-Amp, 12-Volt MOSFET Power Supply." In the text on page 18, we say that "The R8, R9 voltage divider provides a voltage to a unity gain buffer (U2a)...", but in the schematic on Page 19, the resistors in the voltage divider are labeled R7 and R8. The schematic is correct.

Plus, even though it's too late to do anything about it now, we messed up the Web site address in the announcement (p. 81, August) of the Eastern VHF/UHF Conference. For future reference, the correct URL for the North East Weak Signal (NEWS) Group is <http://www.connix.com/~wz1v/news vhf.html>. We regret any inconvenience that may have resulted from this error.

Finally, on page 36 of our June issue, we published two thoroughly messed up Web addresses for joining mailing lists for owners of ACC and Link repeater controllers. The correct URLs are as follow: For the ACC owners' mailing list: Point your Web browser to <http://www.engrng.pitt.edu/~rrc2/acc.html>, and for the Link owners' list, go to <http://www.engrng.pitt.edu/~rrc2/link.html>. You may also access either of these locations from the Link Communications home page at <http://www.link-comm.com>. (Tnx to VE3MFE for catching this one.)

VHF Conferences *(from page 27)*

Oct. 10–12: ARRL/TAPR Digital Communications Conference, Holiday Inn BWI Airport, Linthicum, MD (near Baltimore). See this month's "Digital Data Link" column for more details.

Oct. 17–19: AMSAT-NA Annual Meeting and Space Symposium, Delta Hotel, 801 Dixon Rd., Toronto,Ontario, Canada. Features a variety of technical and operating talks related to amateur satellite communication, plus AMSAT-NA's annual business meeting. Followed on Sunday by annual meeting of the International Amateur Radio Union (IARU). Registration is $25 U.S. before Sept. 15, $30 U.S./$42Cdn after Sept. 15 and at the door. To register, contact AMSAT-NA, 850 Sligo Ave., #600, Silver Spring, MD 20910; Phone: 301-589-6062; Fax: (301) 608-3410. For hotel reservations, call: U.S. (800) 877-1133; ON/PQ (800) 668-1444; rest of Canada (800) 268-1133; Fax: (416) 675-4022. Ask for special AMSAT rate of $96 Cdn (approx $73U.S.) per night.

Oct. 24–26: Microwave Update '97, Holiday Inn Conference Center, Sandusky, Ohio. Two full days (Friday and Saturday) of seminars, with parallel family program, preceded on Thursday by tours of A.R.E. Surplus, Fair Radio, and CTR Surplus, all in the local area. Conference wrapup on Sunday morning. Registration is $40 before October 2, $45 after October 2; Saturday night BBQ dinner is $15. For registration information, contact conference host Tom Whitted, WA8WZG, 4641 Port Clinton East Rd., Port Clinton, OH 43452; Phone: (419) 732-2944; e-mail: <wa8wzg@wa8wzg.com>. For hotel reservations, call 419-626-6671.

Line of Sight *(from page 6)*

Last month in *CQ VHF*, we had two points of view on where to go next with digital communications, because 1200-baud, text-based, packet, revolutionary 15 years ago, is obsolete today. The leadership of AMSAT, which didn't even exist 30 years ago, is currently debating what to do next in the amateur satellite program, once Phase 3D is launched.

Other communities in our VHF "world" need to focus on the same questions that the digital and satellite people are already asking in their groups: What next? Where do we go from here? How do we keep this thing that we enjoy relevant in today's world? And how do we get new people to get involved? I have a few suggestions, of course:

First, face facts. Not everyone is going to be interested in everything, and if you're involved in a VHF sub-specialty, it's highly unlikely that you'll ever get the majority of other hams interested in doing what you do.

Second, your goal should be to identify and encourage those who *do* show an interest in what you enjoy.

Let's take VHF DXing, for example. If you're a DXer, look for the people who see the fun in DXing. Listen to the repeaters around you, especially those that may be in linked systems. Listen for those hams who take special pleasure in seeing who they can work through the links, or who jump in to work the faraway station who pops in on a band opening. Take names and callsigns, and make a point of contacting them afterward. Tell them it sounded like they had fun talking to that ham three states away, and that you and your friends do that all the time on SSB. Then invite them to come visit your station and try it for themselves, or to join your group for the next contest.

But don't stop there. If there's any sign of interest, follow up. Call on the phone with a specific invitation ("I'm going to Tom's house on Wednesday to watch him work some moonbounce. Want to join me?"); go to local club meetings, seek them out in person and encourage them. "Elm" them (which, I presume, is what an "Elmer" does).

And if you'd like to learn more about VHF DXing, seek out the DXers among us. Get on simplex during a contest (we publish schedules and rules for all the biggies) and tell the contesters you contact that you'd like to learn more about VHF DXing. Ask around at club meetings, on the repeater, etc. Somebody's bound to know somebody who knows somebody who's into that, or any other, specialty, and who'll be more than happy to introduce you to it.

Each One Teach One

For years now, I, along with many others, have been encouraging the "each one teach one" approach to new-ham recruitment. If each ham can identify one person who's excited by the idea of talking (or typing) on the radio, and brings that one person into the hobby, and does this only once every five years, then the hobby will double in size every five years.

We need to take the same approach to encouraging new hams to broaden their horizons. Whatever your particular passion is in ham radio, whether it's VHF DXing, or digital networking, or traffic-handling, or anything else, share it. If every five years each person identifies and successfully encourages one person—just one person—to get involved with an specific activity of interest, then a steady rate of growth is virtually guaranteed.

But the long-time hams can't just sit back and wait and complain that nobody's coming. This isn't *Field of Dreams*. You have to go out looking, and you have to follow up.

This magazine can provide exposure to all the different activities available on ham radio today (with your help, of course, in writing and submitting articles) and we do our best to do just that. But a magazine article can only kindle a spark of interest; real, successful recruitment can't be done through a magazine. It must be one-on-one. Because ham radio isn't something you only *read* about. It's something you *do*.

Where is ham radio heading? Wherever we—each of us and all of us—choose to take it. And it's up to each and every one of us to play a role in creating ham radio's future.

Help Wanted

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

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:arnie cq@aol.com.

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Advertising Rates: Non-commercial ads are 20 cents per word including abbreviations and addresses. Commercial and organization ads are $1.00 per word. Boldface words are $1.50 each (specify which words). Minimum charge $2.00. No ad will be printed unless accompanied by full remittance. All ads must be typewritten double-spaced.

Closing Date: The 1st day in the third month preceding date of publication (example: Jan. 1 for the March issue). Because the advertisers and equipment contained in Ham Shop have not been investigated, the Publisher of *CQ VHF* cannot vouch for the merchandise listed therein. The publisher reserves the right to reject any advertisement. Direct all correspondence and ad copy to: CQ VHF Ham Shop, Attn: Bernadette Schimmel, 76 N. Broadway, Hicksville, NY 11801.

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FOR SALE OR TRADE: 126' spool of RG-225 teflon coax (high-power, high-temperature, good for ***indoor*** use up to 450 MHz). Will sell for $200 + shipping (or you pick up in Metro NYC/NJ area). Prefer to trade for 6/2-meter transverter of similar value. Rich Moseson, W2VU, c/o *CQ VHF*, 76 N. Broadway, Hicksville, NY 11801.

WANTED: Older model bugs, unusual bugs, and miniature hand keys. State price, condition. Dave Ingram, K4TWJ, 4941 Scenic View Drive, Birmingham, AL 35210

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Ground Plane Antennas—6 Meter $29.95; 2 Meter $23.95; 222 MHz $21.95; 440 MHz $19.95; 920 MHz 1/2 wave $17.95 plus shipping. W2DGJ Products, 4900 SW 94th Avenue, Cooper City, FL 33328.

Learn Code by Hypnosis—http://www.qth.com/cweasy/ or 1-800-425-2552.

Model MBP2.4, Precision, 2.4 GHz, low phase error, narrow band pass filters $148.00 each or best offer, quantity available 2525. Fax P.O. or request for information to AMR-LORAN at (609) 764-1643.

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Looking Ahead in CQ VHF Ham Radio Above 50 MHz

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

- "Where Does VHF Begin? Is 10 Meters Really a *VHF* Band?" by Arnie Coro, CO2KK
- "Rockets into the Ionosphere," by Ken Neubeck, WB2AMU
- "Staffing an Emergency," by Richard Ferguson, KAØDXM
- "Speak to the Stars: Planning a Successful SAREX Contact," by Donna Reid, N3LAK

Plus...

- "Build a VHF/UHF SWR Meter," by Dennis Wilkison, KE6UZQ
- "An *Efficient* HT Power Supply," by Phil Salas, AD5X
- "dB or Not dB? That Is the Question," by Ron Hranac, NØIVN
- "Ham Radio at the Virginia Air and Space Center," by Ken Pierpont, KF4OW

If you'd like to write for *CQ VHF*, you may download our writers' guidelines from the *CQ VHF* Web site at <http://members.aol.com/cqvhf/> or FTP to <ftp://members.aol.com/cqvhf/General> and look for the file, "writguid.txt." Or, you may send a written request along with an SASE (self-addressed stamped envelope) to *CQ VHF* Writers' Guidelines, 76 N. Broadway, Hicksville, NY 11801.

"The VX-1R is smaller than most pagers!"

"Over 19 hours of use from the rechargable lithium ion battery!"*

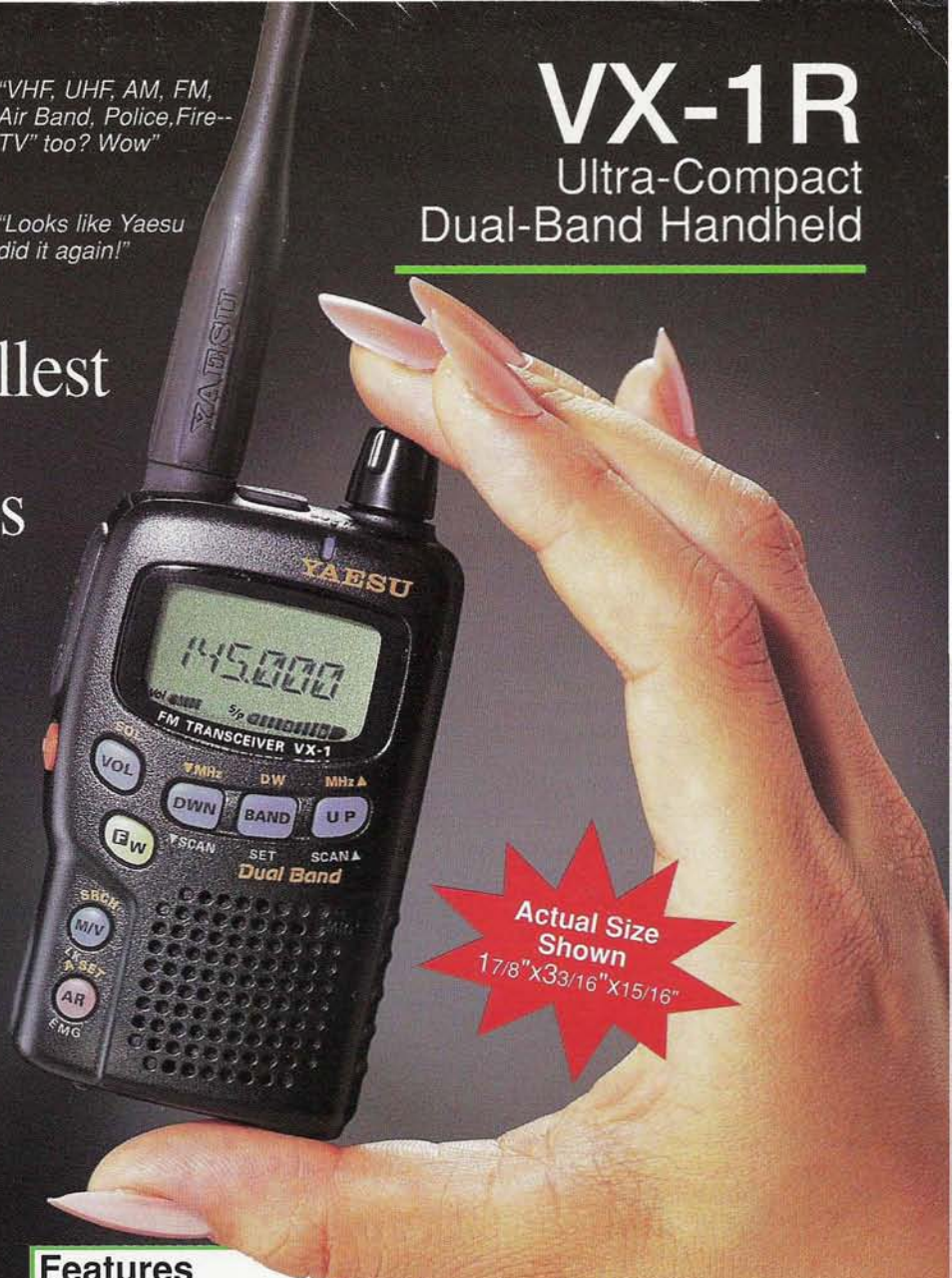
"VHF, UHF, AM, FM, Air Band, Police, Fire--TV" too? Wow"

"Looks like Yaesu did it again!"

VX-1R
Ultra-Compact Dual-Band Handheld

The world's smallest HT with all the high-tech features you'd want in the world!

The ultra-compact size of the VX-1R Dual-Band is the first thing you notice as you cradle it in your palm. But the high-tech features make this radio one you must have now! Simple combinations, using seven buttons and one knob, control this marvel of engineering. One soft key touch, and wide receive VHF/ UHF--76~999 MHz RX (except cellular);144~148, 430~450 MHz TX, or AM/FM Broadcast, Aircraft, Police, Fire--even TV, spring to life! Touch again for Yaesu-exclusives, SmartSearch™ and ARTS™, or Priority Channel Alarm. Built-in CTCSS and DCS Encode/Decode for 2m/440 amateur bands, CTCSS/DCS Tone Search, and Dual Watch, are included along with 291 Memory Channels in 9 banks with 500 mW power output. Backlit LCD Display shows 6-character alphanumeric capability; backlit keypad makes operation easy in dim light. And, although the VX-1R is the world's smallest dual-band HT, you get over 19 hours* of use with just a 1 hour recharge from its long-lasting lithium ion battery! Big features, small size--the most satisfying combination in the world!



Features

- Frequency Coverage
  Wide Multi-Band Receive
  RX: 76~999 MHz**
  TX:144~148, 430~450 MHz
- AM/FM/TV Broadcast Receive
- AM Aircraft/Public Safety Receive
- CTCSS Encode/Decode
- DCS Encode/Decode
- CTCSS/DCS Tone Search
- Dual Watch
- SmartSearch™
- Auto Range Transpond System™ (ARTS™)
- Priority Channel Alarm
- ADMS-1D Windows™ Programmable
- 1 Watt External Power Supply
- 80 Minute Rapid Charger
- Flexible Antenna, Belt Clip, Hand Strap

**Cellular blocked

*Battery Life: 5-5-90 duty cycle.

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...leading the way.SM

For the latest Yaesu news; hottest products, visit us on the Internet! http://www.yaesu.com

Look on the brighter side of handhelds

Kenwood's new TH-G71A dual-bander (144MHz/440MHz), with its distinctive illuminated keypad and 6 watts of power, has what it takes to shine in any situation.

TH-G71A 144/440/MHz FM DUAL BANDER

If you're looking for a compact dual-bander with all the right features, yet without the price tag that usually goes with high performance, there's no better choice than the TH-G71A.

Just hold it in your hand and it's immediately clear how well our new handheld transceiver is engineered. The ergonomic design, **illuminated keys** and **backlit display** all combine to make operation a breeze. As does the menu mode, which allows you to customize the TH-G71A by adjusting all major settings to your choice. Besides being easy to use, it also boasts extraordinary power – up to 6 watts (VHF) or 5.5 watts (UHF) of RF output (selectable) with its **high-performance antenna.** The speaker provides **powerful, refreshingly clear audio.**

Of course, power is only part of the picture. Features count. And you can count on the TH-G17A to offer what you'd only expect to find in far more expensive HTs. There are **200 memory channels** – allowing you to store transmit and receive frequencies independently. Memory data can even be edited and stored on your PC. Multiple scan functions are available, including programmable band scan, memory scan with memory channel lock-out, MHz scan and call scan. For each band there are TO (time-operated), CO (carrier-operated) and seek scan resume modes. With the Memory Name function you can choose to identify each channel with up to **6 alphanumeric characters.** DTMF memory and CTCSS tone encode/decode are provided.

The TH-G71A also scores well for stamina and reliability, boasting long battery life – thanks to a variety of power-saving features – and **MIL-STD 810E** compliance for rain & shock resistance. So there's no need to go easy on this dual-bander. It's built better and brighter in every way.

- **6W (VHF), 5.5W (UHF) at 13.8V DC**
- **PC programmable**
- **200 memory ch. with alphanumeric display**
- **MIL-STD 810E (rain & shock)**
- **CTCSS tone scan**
- **Wide-range coverage (incl. aircraft receive)***
- **DTMF memory (10 ch. up to 16 digits)**
- **Multiple scan modes**
- **Key illumination**
- **High-performance antenna**
- **HI/LOW/EL power output selectable**
- **TM-V7A remote control (DTMF remote)**

** Specifications are guaranteed for Amateur Bands only*

ISO 9001
JQA-1205

KENWOOD
Amateur Radio Products Group
97ARD-1662

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KENWOOD ELECTRONICS CANADA INC.
6070 Kestrel Road, Mississauga, Ontario, Canada L5T 1S8

The TH-G71A has not been approved by the F.C.C. This device is not, and may not be, offered for sale or lease, or sold or leased until the approval of the F.C.C. has been obtained. Pending approval (10/97).