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COMMUNICATIONS & TECHNOLOGY

MARCH 2003

CQ

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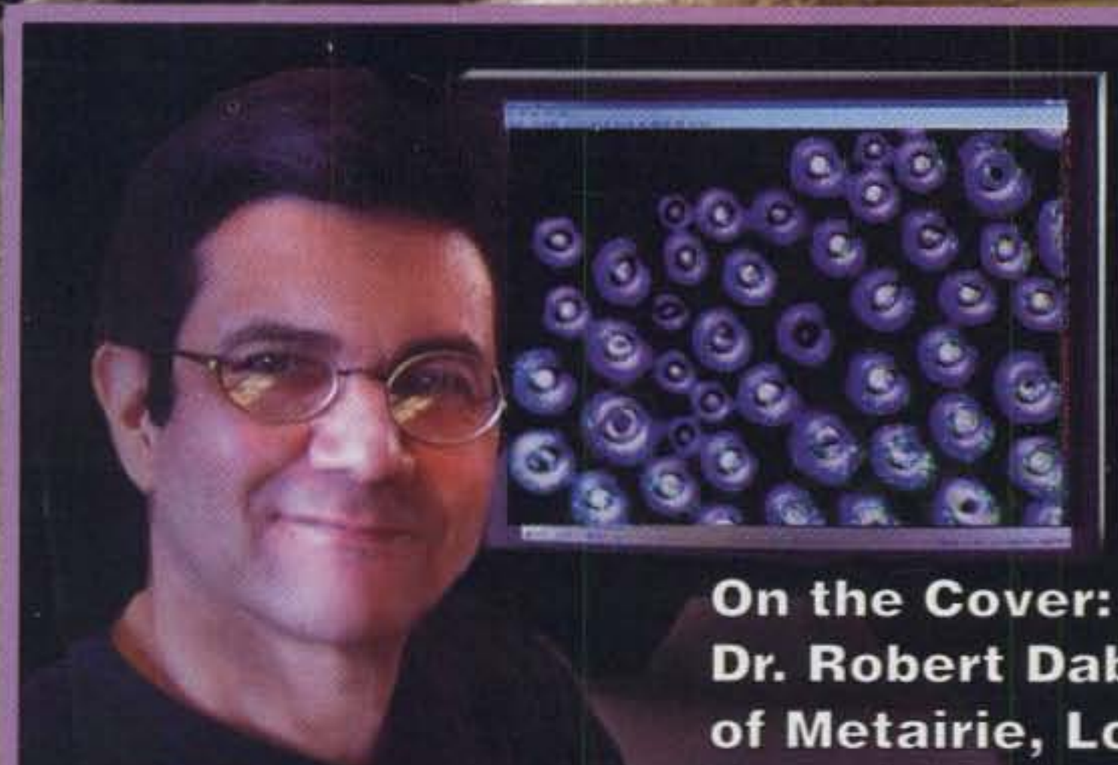
2002 WPX CW Results

CQ Reviews: Ten-Tec Argonaut V



On the Cover: Photomicrographer Dr. Robert Dabdoub, KB5AVY, of Metairie, Louisiana.
See story on page 11.

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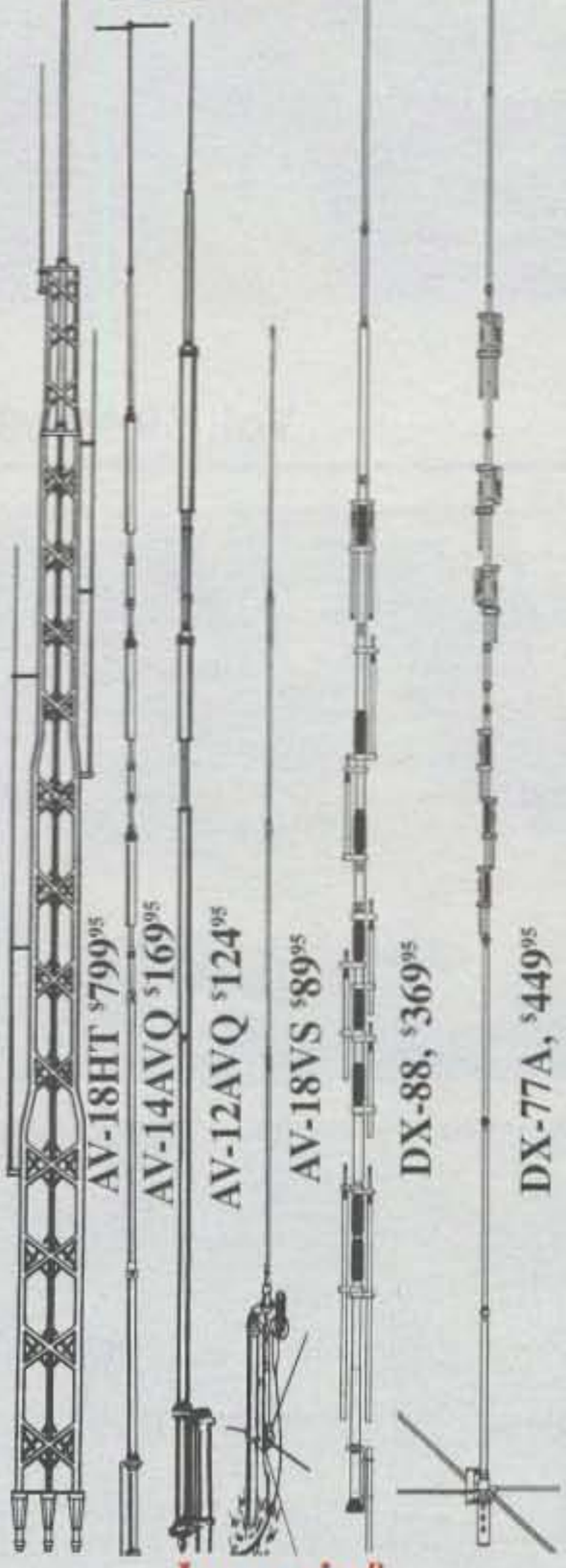

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AV-12AVQ, $124.95. (10, 15, 20 Meters). 13 ft., 9 lbs. The AV-12AVQ also uses Thunderbird beam design air dielectric traps for extremely Hy-Q performance. This is the way to go for inexpensive tri-band performance in limited space. Roof mount with AV-14RMQ kit, $89.95.

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DX-77A, $449.95. (10, 12, 15, 17, 20, 30, 40 Meters). 29 ft., 25 lbs. *No ground radials required!* Off-center-fed Windom has 55% greater bandwidth than competitive verticals. Heavy-duty tiltable base. Each band independently tunable.

Model #	Price	Bands	Max Power	Height	Weight	Wind Surv.	Rec. Mast
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AV-14AVQ	**$169.95**	**10,15,20,40**	**1500 W PEP**	**18 feet**	**9 pounds**	**80 MPH**	**1.5-1.625"**
AV-12AVQ	$134.95	10/15/20 M	1500 W PEP	13 feet	9 pounds	80 MPH	1.5-1.625"
AV-18VS	**$89.95**	**10 - 80 M**	**1500 W PEP**	**18 feet**	**4 pounds**	**80 MPH**	**1.5-1.625"**
DX-88	$369.95	10 - 40 M	1500 W PEP	25 feet	18 pounds	75 mph w/ guy	1.5-1.625"
DX-77A	**$449.95**	**10 - 80 M**	**1500 W PEP**	**29 feet**	**25 pounds**	**60 mph w/ guy**	**1.5-1.625"**

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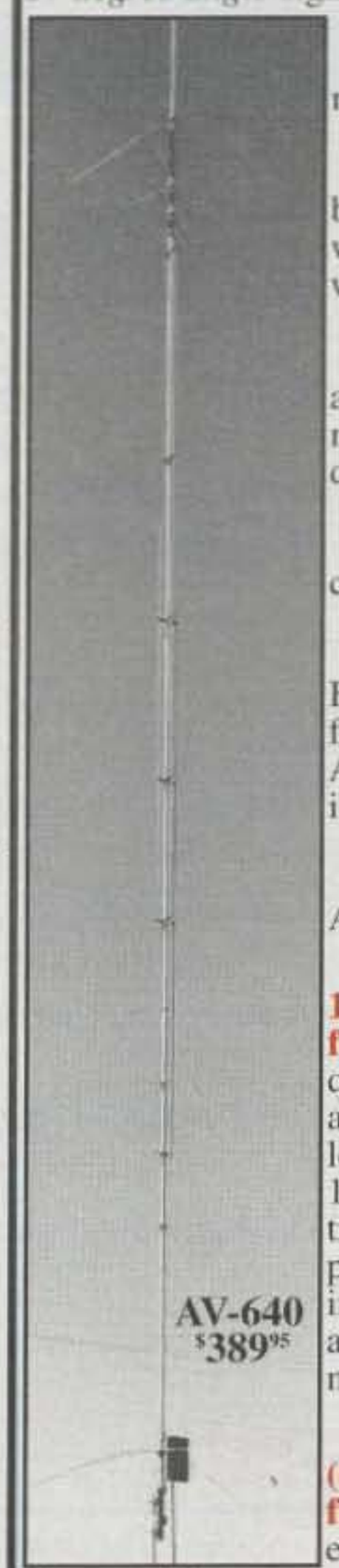

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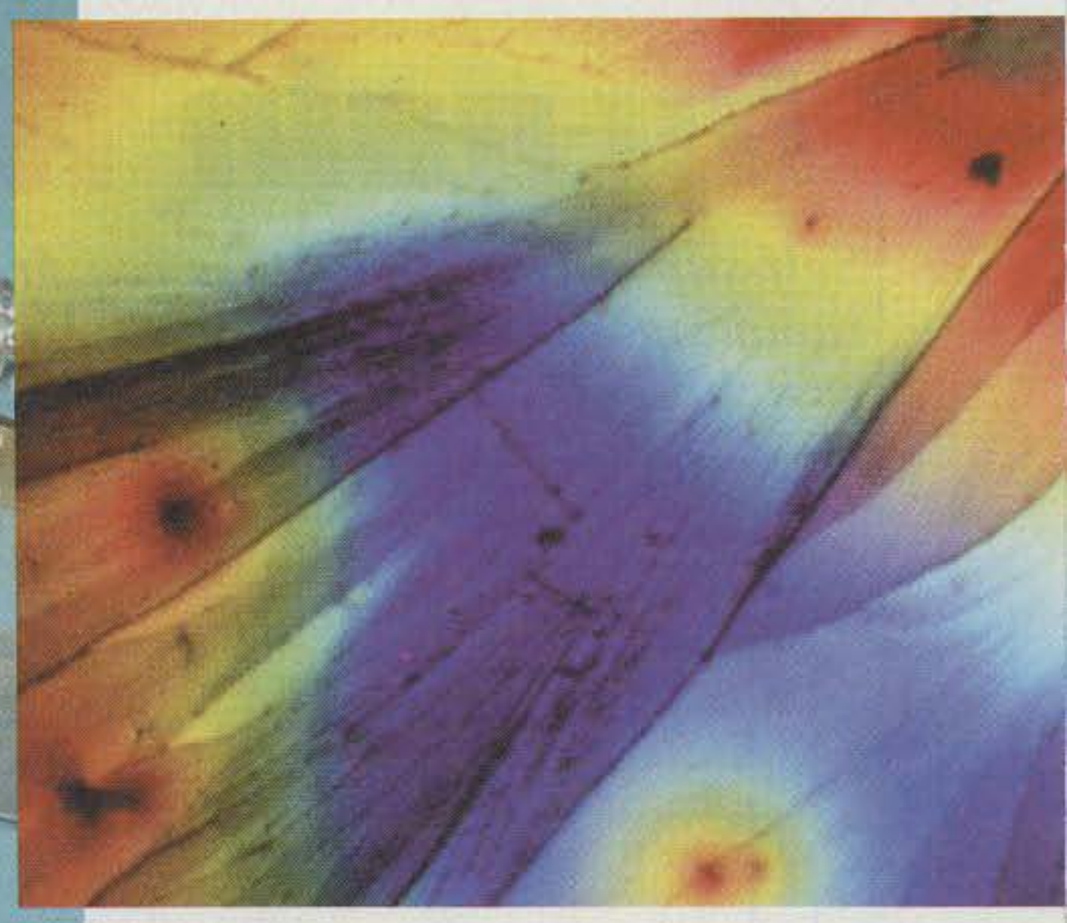

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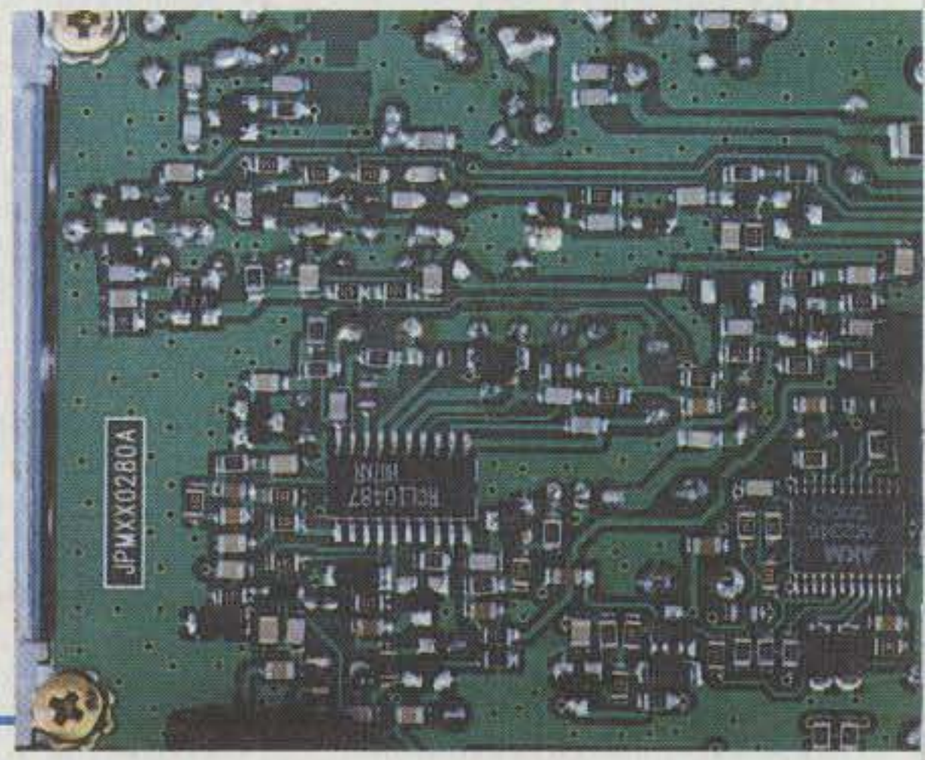

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ON THE COVER: Dr. Robert Dabdoub, KB5AVY, of Metairie, Lousiana, in a montage with some of his equipment (ham and photographic) as well as photos of the "unseen world inside your radio." Story on p. 11. *(Photos by & courtesy of KB5AVY; cover montage by Elizabeth Ryan)*

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TCXO High-stability oscillator (installed at time of purchase only), not shown, $54. 46176 5-pin DIN to RCA female cable, not shown, $10.

Marconi Centennial Marked With Space Station Ham Contact

Princess Elettra Marconi, daughter of the late Guglielmo Marconi, used ham radio to talk with International Space Station Commander Ken Bowersox, KD5JBP, on the centennial of the first two-way transatlantic radio message.

On January 18, 1903, Marconi transmitted a 54-word greeting message from President Theodore Roosevelt to King Edward VII of England, then received a reply from the king several hours later, at his station on Cape Cod in Massachusetts. It was the first time a two-way message exchange had been completed by radio across the Atlantic Ocean.

On January 18, 2003, as part of a weeklong centennial celebration of which special event station KM1CC was a central feature, a ham contact was scheduled at KM1CC between the International Space Station and students from three Cape Cod high schools. Marconi's daughter, in attendance at the event, also took the microphone and told ISS Commander Bowersox, "In (the)spirit of his achievement, and also from Cape Cod, I send this wireless greeting to you in space. Cordial greetings and good wishes." Bowersox responded, "It is amazing how far society and radio communications has come in the last 100 years. It is wonderful to hear your voice across the radio waves."

KM1CC was jointly operated by members of the Marconi Radio Club (W1AA) and the Marconi Cape Cod Memorial Radio Club at the former Coast Guard station in Eastham, Massachusetts, near the original Marconi site, which is now underwater due to erosion.

Future Ham Radio in Space Projects Discussed

Slow Scan TV and a possible plasma cloud experiment were among possible future projects discussed in December at a meeting of the Amateur Radio on the International Space Station (ARISS) International Team. The group included representatives from ARISS partner countries, their national ham radio societies and several national AMSAT groups.

According to the ARRL Letter, a camera for SSTV could be launched later this year, allowing school groups to see as well as hear the astronauts during ARISS contacts. In addition, plans are well under way to activate a 70-centimeter station. Discussions on future possibilities ranged from crossband operation from VHF to 10 meters using PSK-31 and a full-duplex voice repeater to comparing the performance of various solar arrays and even conducting a plasma cloud experiment. No details were available on what that might entail.

Grote Reber, Ex-W9GFZ, Silent Key

Radio astronomy pioneer Grote Reber, formerly W9GFZ, died last December 20 in Tasmania, his home since 1954, according to the ARRL Letter. Reber is known as the father of radio astronomy and was the first person to build a radio telescope dedicated to astronomy. He was also the first person to map the "radio sky," in 1941. Reber credited his amateur radio hobby as being a major factor in his pioneering work. His former callsign is currently held by the National Radio Astronomy Observatory (NRAO) Amateur Radio Club in Socorro, New Mexico.

Project OSCAR Hits 50

No, it has not been fifty years since the first launch of an Orbiting Satellite Carrying Amateur Radio, or OSCAR. That's still eight years away. However, January marked the naming of the 49th and 50th amateur radio satellites carrying "OSCAR" designators. The German SAFIR-M satellite, launched from Kazakhstan on December 19 on a converted Russian ballistic missile, has been designated AATiS OSCAR-49 (AO-49); and Saudisat 1-C, launched on a similar missile the following day, is now Saudi OSCAR-50 (SO-50). OSCAR numbers are assigned upon request by the satellite's builder, and only after a satellite has been successfully launched, orbited and operated on the amateur bands. In addition to the 50 OSCARs launched in the past 42 years, there have been 20 separately numbered Russian amateur satellites in the RS- series, for a total of 70 successful amateur satellite launches since 1961.

ARRL Introduces Amateur "802.11b" Protocol

From the same folks who bestowed the name "Elmer" on an amateur who helps another ham get started, we now have the "Hinternet," a joining of "Ham" and "Internet." According to the ARRL Letter, the term is being used to describe a high-speed multimedia ham radio computer networking, using a modified version of the commercial "802.11b" wireless networking protocol. The ARRL's High Speed Multimedia Working Group has designated the modified system as the "ARRL 802.11b protocol" to differentiate it from the version used by unlicensed (Part 15) wireless networks.

For more on this topic, see this month's VHF-Plus column ("IEEE 802.11b: Friend or Foe?") on page 81, and last month's Digital column ("A Cheap and Easy High-Speed Data Connection," Feb., page 61). *(Editorial note: We applaud the technical progress, but let's send the Hinternet, and Elmer, out to the hinterlands and try to come up with terms that actually attract people.)*

Five MHz Experiment Ends While FCC Action Awaited

The ARRL quietly let its authorization for experimental operation on 5 MHz expire on January 1 while waiting for a final FCC decision on establishing a permanent ham band at 5250-5400 kHz. The FCC last year proposed a secondary allocation for hams on the band segment, which would be known as 60 meters, and it seemed like clear sailing until the National Telecommunications and Information Administration (NTIA) – the FCC's counterpart for government telecommunications matters – filed objections after the comment deadline had passed. According to the ARRL Letter, ARRL officials have been meeting with various government agencies to work out a compromise that would allow amateur operation while meeting NTIA concerns. ARRL Chief Executive Officer Dave Sumner, K1ZZ, said he expects an FCC decision early this year, but would not speculate on what the Commission's decision would be. Fifteen amateur radio clubs and individuals participated in the four-year experiment on 60 meters under the League's experimental license, WA2XSY.

Doing the Ducie DX, Redux

A second DXpedition to Ducie Island (see last month's article on VP6DI, the first operation) is scheduled for this month, with operations planned for about a week, beginning March 8. According to The Daily DX, the new operation will include nine operators from five countries, with stations on all bands from 160-6 meters plus the AO-40 satellite, on CW, SSB and RTTY. The callsign will be VP6DI2 ... yes, that's a two at the end, not a zee (or zed). Repeat after us, VP-6-DI-2.

ARRL to Offer License Renewal to Non-Members

The ARRL will now process license renewals and modifications (such as address changes) for non-members, for a fee of $12. The service previously had been available only to members (at no fee). Applicants may mail their renewal/modification forms to the ARRL/VEC, along with a check for $12 made out to ARRL, or may bring the form and payment to any ARRL/VEC license exam session. Renewals may be filed only within a 90-day "window" before the expiration date or within a two-year grace period after expiration. The W5YI Group has long been offering a similar service for a $6 fee. Renewals and modifications (not involving vanity calls) sent directly to the FCC or processed on the FCC website continue to be free of charge.

Gernsback Publications QRT After 94 Years

Poptronics magazine, the successor to *Popular Electronics* and *Electronics Now*, published its final issue in January, 2003. According to the ARRL Letter, the magazine's editor and publisher, Larry Steckler, said "After 94 years of publishing electronics magazines, Gernsback Publications is no longer in operation." Steckler said a new online version of *Poptronics* should soon be available and that negotiations were under way "to provide an alternative publication to *Poptronics* subscribers."

Additional and updated news is available on the Ham Radio News page of the CQ website at <http://www.cq-amateur-radio.com>. For breaking news stories, plus info on additional items of interest, sign up for CQ's free online newsletter service. Just click on "CQ Newsletter" on the home page of our website.

zero bias

BY RICH MOSESON, W2VU

Shaking Hands on the Radio

"Thanks for knocking on my door," said the voice on the radio. "I know there are a lot of you out there and I really want to shake hands with each one of you..." This was the unique pileup management style of Michael, operator of club station M0RAD, just outside Stratford-Upon-Avon in England, last Christmas Eve. And he had quite a pileup going.

"I'm not going to talk about radio today," Michael told one caller. "I just want to shake hands with as many hams as possible and wish them a Merry Christmas and a peaceful new year." Just the same, he made time for a bit of friendly chatter with everyone he contacted. During the course of the half-hour or so that I was listening (and occasionally calling—I did finally get through), I learned about where he lived, that his only child was grown and on his own, and that his wife had just bought him a new car as a Christmas present.

What fascinated me, beyond Michael's easygoing pileup management and friendliness on every contact, was his whole concept of "shaking hands" on the radio. What a wonderful way to describe what we do on the air, especially when we're making brief DX QSOs. Likewise, the idea that someone calling you on the radio is "knocking on the door" of your house adds to the warm and personal image he was creating on the air. We were all just people, using the magic of radio to step inside each other's houses, shake hands, share a holiday greeting, and go on our way. This personal, one-on-one, interaction with people we've never met before (or perhaps with old friends), and who may be half a world away, is at the heart of what makes ham radio unique—"shaking hands" across the airwaves. I hope you had a very Merry Christmas, Michael, and thank you for giving me fresh inspiration about this marvelous hobby we share. Oh, and enjoy your new car, too!

More Ham Radio Moments

This contact was not unusual. Something like it happens nearly every time I get on the radio. I make contact with a ham someplace and some little thing happens to keep me inspired and keep me excited. This is exactly the sort of "ham radio moment" I talked about in last December's "Zero Bias." Reader Murray Green, K3BEQ, ran with the idea, asking members of his club—The Green Mountain Repeater Association in the Washington, DC area—to share their most interesting on-the-air stories in the club newsletter. A half dozen responded to this initial request, with some very interesting reminiscences. Elsewhere is this issue, you'll find "The Nine-Minute QSO," the story of how WB2UDC uses one such "ham radio moment" over and over, to get people interested and excited about amateur radio. If you'd like to briefly share some of your "ham radio moments" with us, we'll do our best to find space for as many as possible, either in print or on our website.

In subsequent e-mails with Michael in England, he described one "ham radio moment" he experienced on Christmas Day, telling me that "a call from an 86 year old operator to wish me Good Cheer confirmed my approach to our hobby. During the short QSO and without prompting, I was informed that his wife had recently passed away, and that he was alone for the Christmas, with only his radio for company. I did not offer condolences, as I am sure he had heard it all before. He just wanted a little company for Christmas Day and a friend to chat to. We spoke for just a few minutes, as he was aware of the pileup and did not want to take up too much time. Well, I did spend a little more time with him, listening to an old timer who has forgotten more than I will ever know about radio. We all need friends to talk to, and I was so happy to make a new one on Christmas Day..."

Again, it wasn't rare DX or some famous personality, but it was the kind of QSO one remembers, one that reminds you what ham radio is all about—in other words, a "ham radio moment." Tnx, Michael, for sharing it with us.

Back to the Clusters

Speaking of ham radio moments, if you read my editorial last May, you might recall the "enrichment clusters" that my hometown of Bloomfield, New Jersey, started running in its elementary schools, and my experience leading a four-week mini-course on hobby radio. Well, I'm at it again—helping another group of 5th and 6th graders to discover the joys of radio beyond their local Top Hits station. I just finished the second of four sessions. My plan for this session was to spend most of the time doing shortwave listening, but there wasn't much there of interest to the kids, and after I told them about some of my weekend contacts—with a YL in South Africa operating the Lions Club contest, a Frenchman in Honduras, and people in Labrador, Brazil, and Guadeloupe—one of them asked, "Why don't you bring in the radio you talk to people with?" I told him that I did—it was the same radio we were using for SWLing—and they all said, "Then let's talk to somebody." (Forget this listening stuff, we want to talk! Yes!) How could I say no?

We tuned around 15 meters and, lo and behold, there was SM7CRW calling CQ DX. After a quick explanation of what CQ DX means ("He wants to talk to someone far away, and we're pretty far away from Sweden"), I gave him a call and we spent the next 10–15 minutes chatting. I told him about the cluster program, and John told us about Oland Island, where he lives, and which is home to over 300 species of birds, making it a popular tourist destination for birders and ornithology students, including groups of American students who come over each year to see the rookeries where baby birds hatch and grow.

What does information about birds and tourists have to do with ham radio? *Everything!* This is the essence of our hobby, what makes it so special. I'd much rather hear about the people I'm talking with (like Michael) or the places where they live (like Oland Island) than what kinds of radios and antennas people are using. I have nothing against radios and antennas—I love radios and antennas (I was using an IC-746 and a High Sierra multiband mobile antenna on a tripod)—but what I really want to hear about are people, places, and events. Why? They're much more interesting.

Side benefit: Twenty more young people can now find Sweden and the Baltic Sea on a world map ... and they have a reason to want to. *Somebody who's there is talking to them!* Side note number two: I was too busy

on the radio to go to the map. John explained over the air where he was and several of the kids went over to the map and immediately found the right spot (even though Oland Island itself was not identified on the map). So there is hope for American students and geography ... and there is help in the form of amateur radio. Next up: the world of VHF, complete with scanning, and hopefully some IRLP contacts with faraway hams through a local repeater. Stay tuned.

31 Years Later...

For at least a half century, one of the primary benchmarks of accomplishment in amateur radio has been getting confirmation of contact with hams in 100 different countries, or "entities," as we call them, since places like Alaska and Hawaii are not true countries but count as such in the world of ham radio. The CQ DX Award and ARRL's DXCC Award are the "diplomas," as they call them in Europe, attesting to this level of accomplishment, which qualify you as a "real DXer."

Some people who are truly dedicated to the art of contacting and QSLing hams around the world become "real DXers" by this standard in a year or less. Some of us take a little longer... or a lot longer. Take me, for example. I was first licensed (as WN2QQN) on October 27, 1970, made my first contact on November 9, 1970 with WA3JYO, and my first DX contact about six months later, on May 20, 1971, with VE3FIA. Forget that he was closer to me than many of my US contacts to that point, he was in another country and that was all that counted. When his QSL card arrived, it pushed my DXCC total to 2 (the US was #1). On December 29, 2002—31 years, 7 months, and nine days after making my first DX contact— my card from ZK1MA in the North Cook Islands (a little more exotic than Ontario) arrived for confirmed country #100 and qualified me for the CQ DX SSB Award, plus both mixed and phone DXCC. While I was counting such things, I discovered that I also qualified for our own WPX Mixed and WPX SSB awards, so it looks like I'm going to need to make space on my walls for five new certificates.

Could I have done it sooner? Sure, but radio has always been one of many things going on in my life, and DXing has always been one of many things going on in my ham radio life. My CQ colleague and Worked All Zones Award Manager K5RT predicts that now that I've reached this milestone, I'll really get hooked on trying to build up my totals for endorsements, other awards, etc. He's already planning a station upgrade for me that I can't afford. But I appreciate it, and believe that one important part of keeping interested in any hobby is dreaming about moving up to the next level of involvement. Even if I never get that beam and tower or kilowatt amplifier (for which my neighbors would be thankful), thinking about it, talking about it, even planning how to set things up if it ever comes to pass, are all critical parts of keeping my interest high. I think my next goal will be qualifying for at least the basic level of our other two awards, WAZ and USA-CA, the USA Counties Award. I'm not sure which one will be more difficult, but my computer tells me I'm well on my way toward both of them. We'll see how long *these* take at my current rate!

By the way, one note of interest: In going through my cards, the value of contests in award-chasing became immediately obvious. I didn't count, but at least half of those contacts (probably closer to 2/3) took place during contests. The pattern was clear—late October (CQ WW SSB), mid-December (ARRL 10M), early March (ARRL DX SSB), and late March (CQ WPX SSB). The message is clear, too: If you want to work new countries, get on during the big contests. Message for me: If I want to work *counties,* get on during state QSO parties. Message for all of us: Let's get on the air and shake some hands.

73, Rich, W2VU

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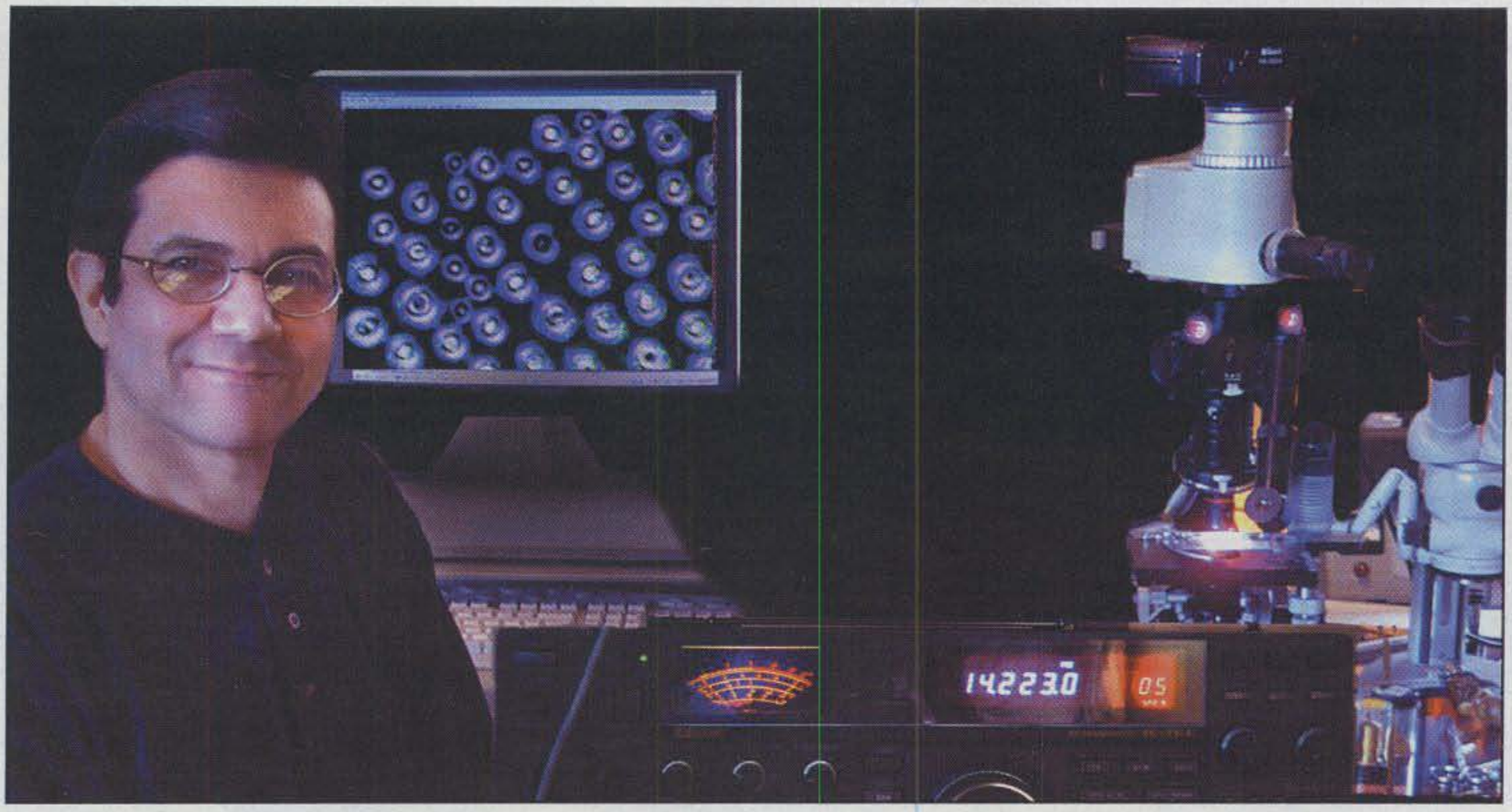

Do you ever wonder what's REALLY going on inside your radio? KB5AVY, a geneticist and a pioneer in photomicrography, takes a look inside our rigs and shows us a world most of us have never even imagined.

The Unseen World Inside Your Radio

BY DR. ROBERT DABDOUB,* KB5AVY

Many people don't realize there is so much beauty under a microscope. They think scientists are only looking for cancer cells. How many people would believe there is beauty in the glaze of an insulator, in corrosion, in a drop of oil, or in the microorganisms thriving inside one melted transformer? When viewed with the eye of an artist and captured by the camera, they become portals to a vast, if tiny, landscape.

I never took these things for granted. I knew there were beautiful patterns in nature and that under the microscope you could focus on and isolate them. Isolating and capturing the images on film is a time-consuming, labor-intensive endeavor (see the sidebar, "The Art—and Science—of Photomicrography").

A microconductor becomes a cobbled stone. A sample of cholesterol crystallizes into a pattern of windswept leaves. The DNA strands of life look like a string of sapphires. Colchicine, a drug used in the treatment of gout, is a green field populated by yellow flowers.

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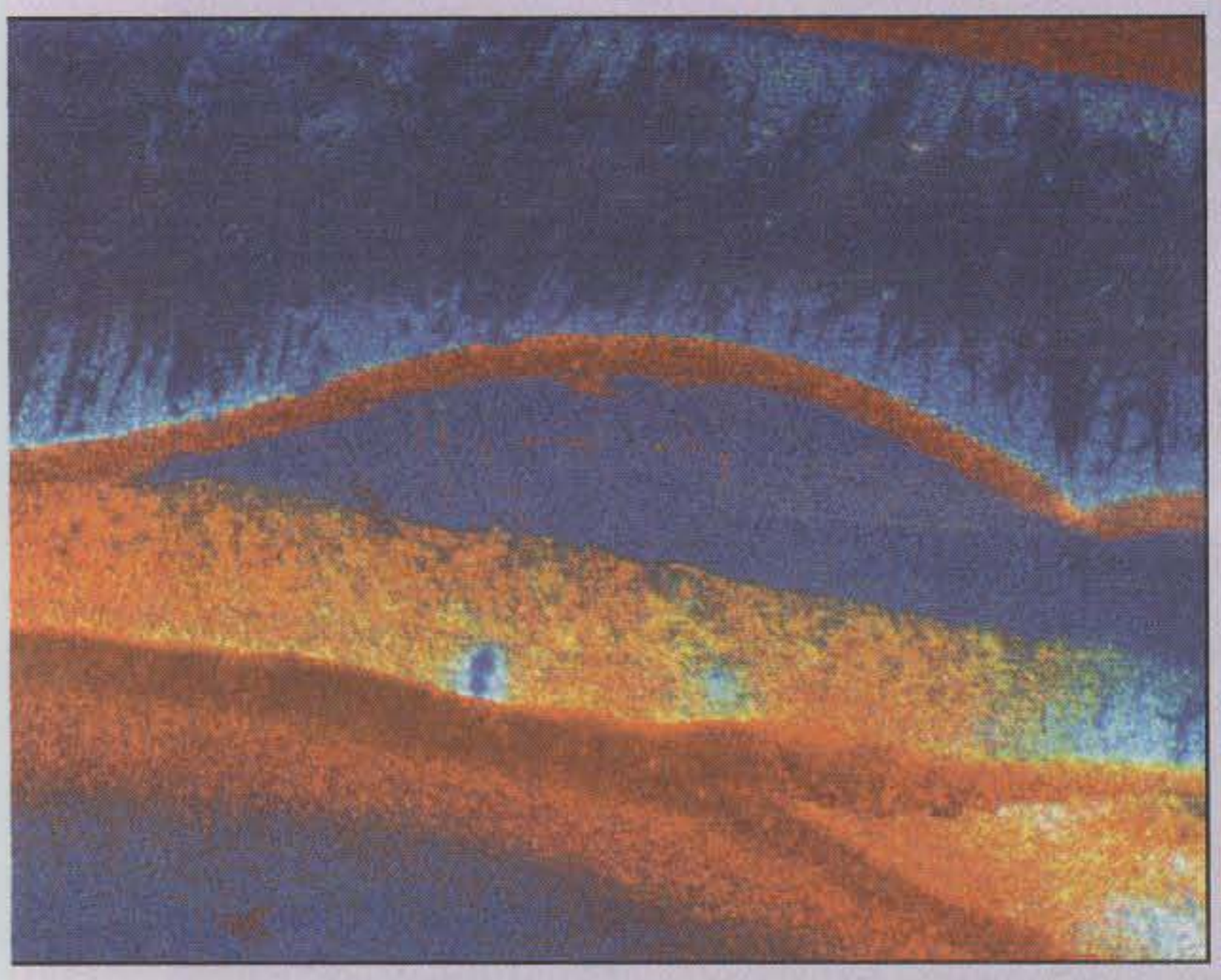
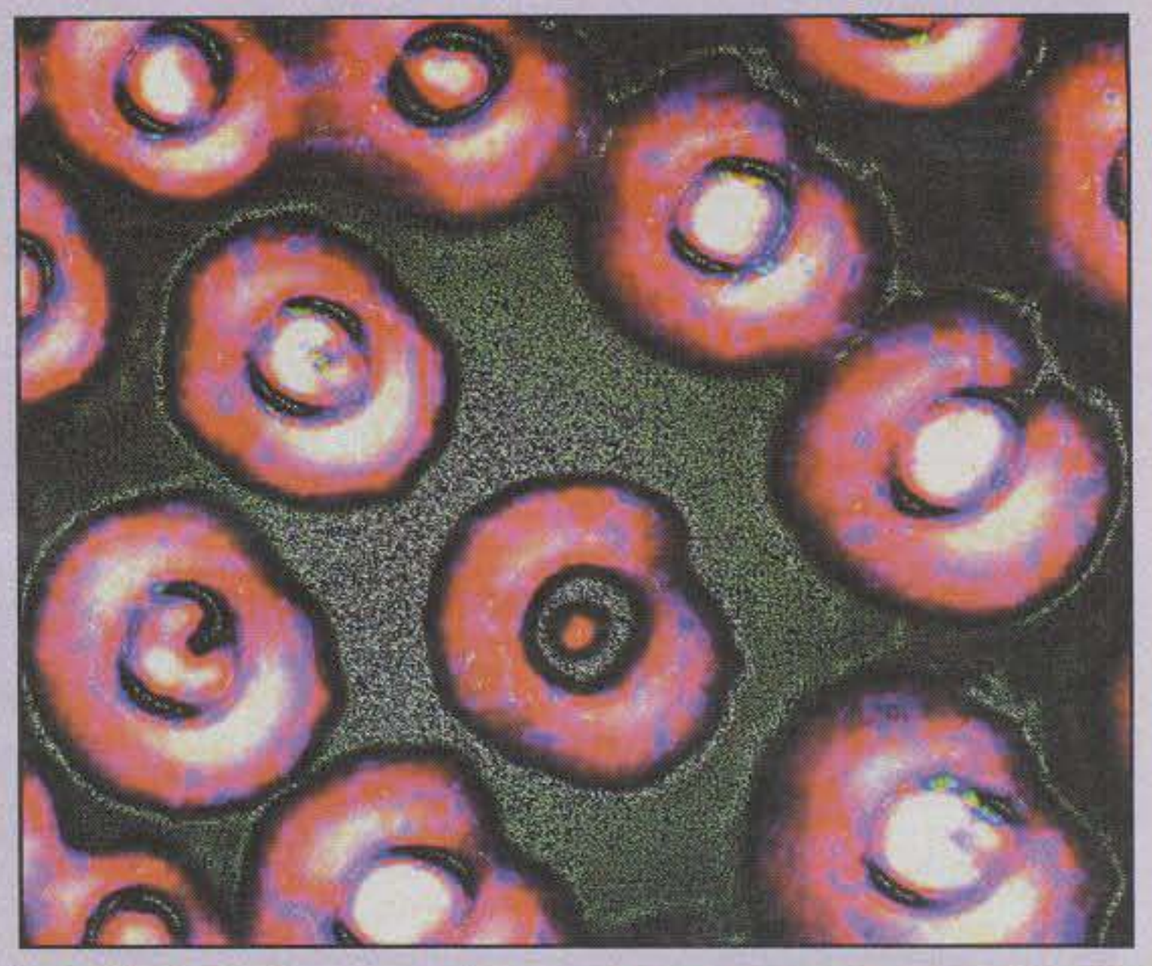
Starting Young

I got my first camera, and my first radio, when I was a school boy. After periodic floods in my native Honduras, I used to wander in the mountains searching for injured animals. I also wanted to record driftwood and eroded mud flats with my camera. Here in New Orleans, my other hometown, I spent one year documenting the moving waters of the Mississippi River. Later, when I became a scientist and moved on to the business of studying chromosomes, the genetic picture of life, I continued searching for beauty, this time at the molecular level. First I wanted to excite kids with the field of science, and I thought showing the beautiful side of the microscopic world was a good way of accomplishing this.

Fascinated by my first discoveries, I began experimenting on my own time and tried focusing on other subjects, some mundane, yes, but beautiful. I looked at electronic compo-



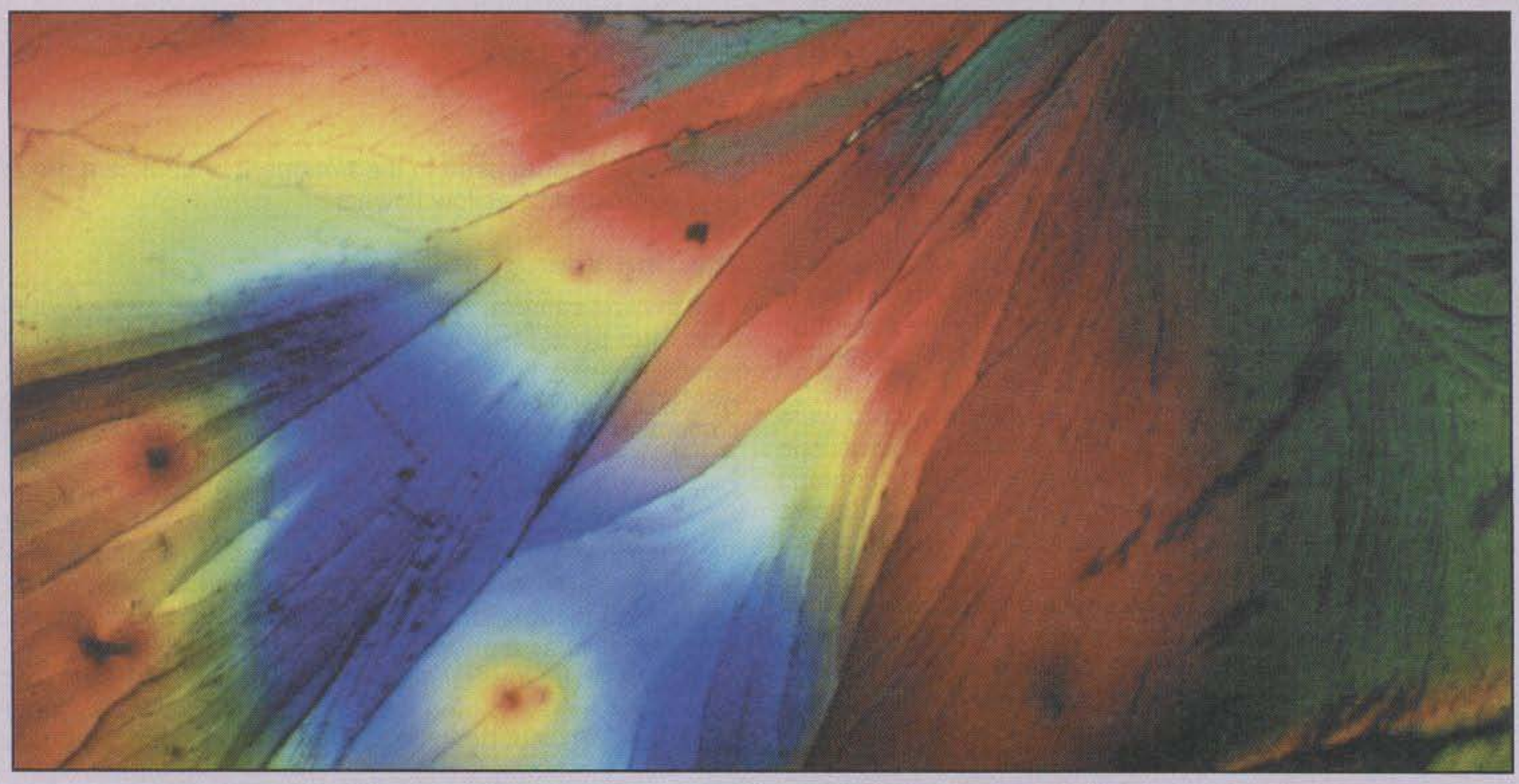


(Upper left-hand corner) Oxidation and corrosion on antennas, microelectrodes, and copper wiring can be set off by grimy hands and cigarette smoke.

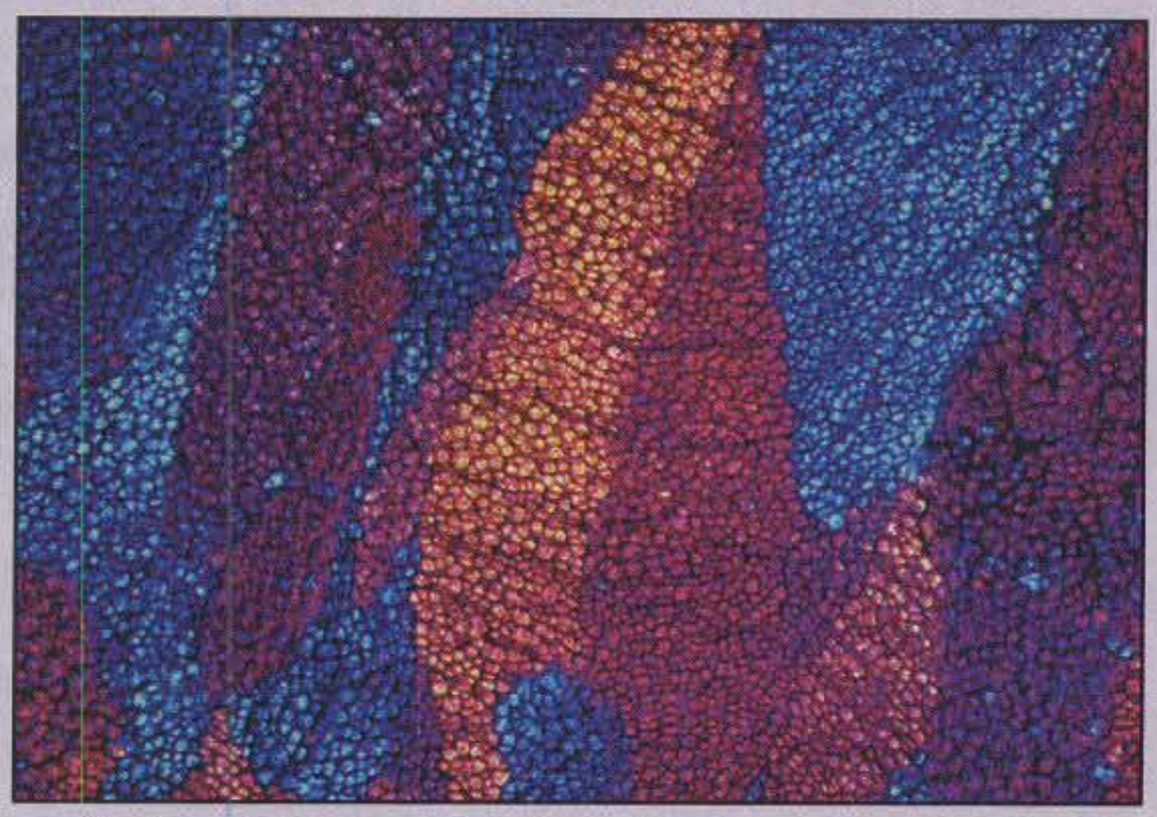
(Upper right-hand corner) Colonies of bacteria produce beautiful, complex patterns, but in warm humid places they can infect your electronic gear.

(Photo at right) Fungi, as seen here, can infect the steel and plastic casing of handie-talkies.

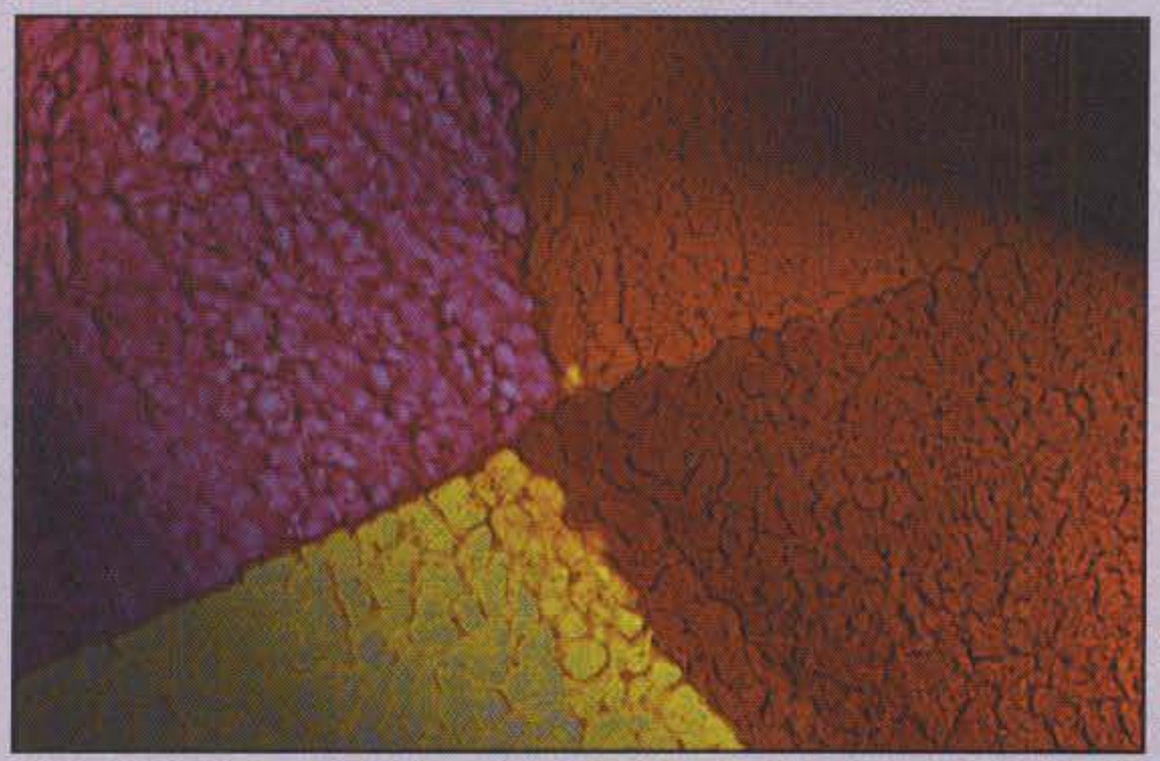
(Bottom photo) Extreme close-up view of silver coating often used in electronic components.



Green oxidation inside a linear amplifier, caused by bacteria.



Oxidation and antenna corrosion can be generated by the touch of grimy hands contaminated with tobacco or grease.



Displaying features about 3 millimeters wide, the surface of an insulator crumples into an enchanted desert.

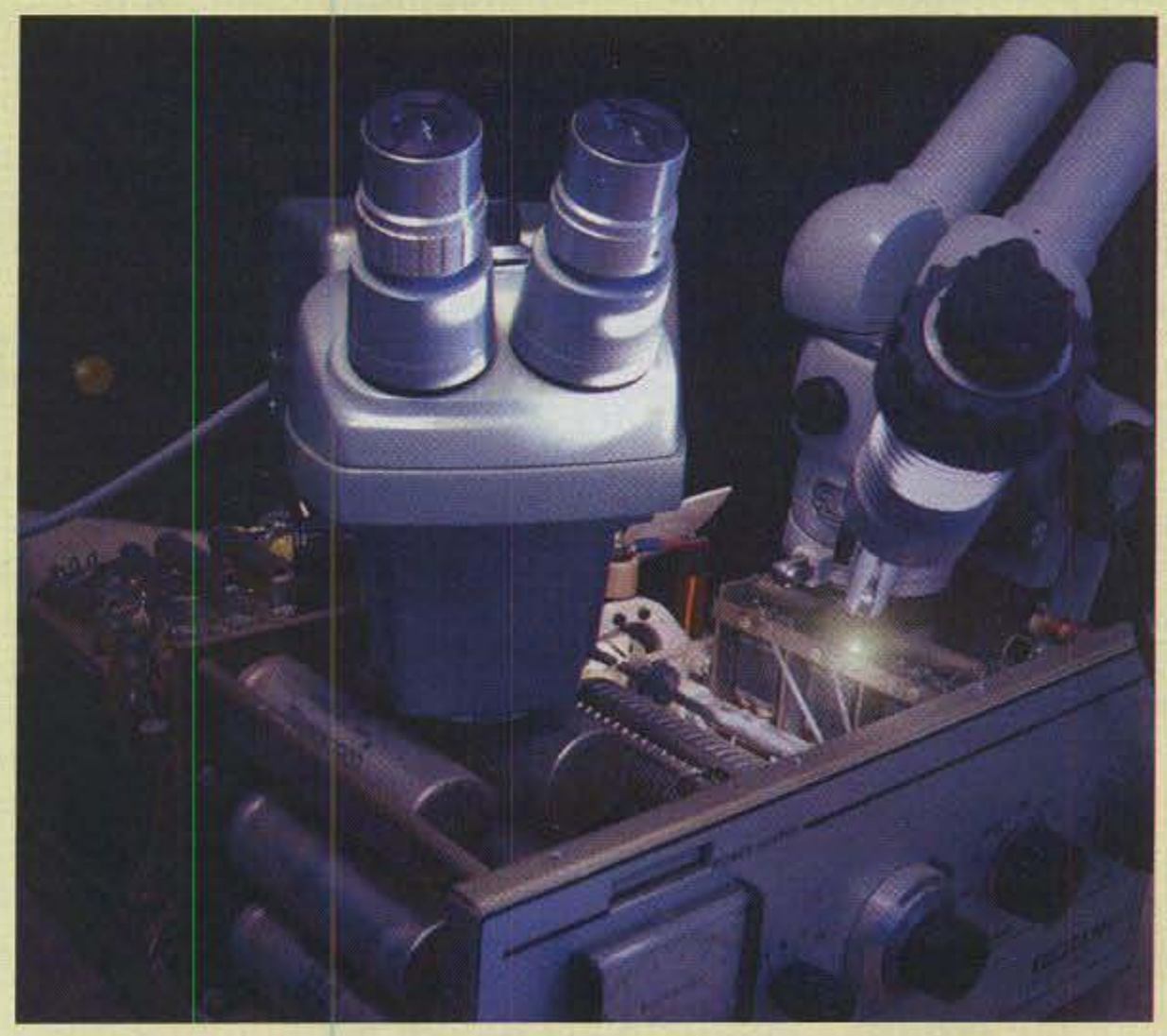
Coffee and sugar can keep you awake during a DXpedition, but if you spill it on your radio, it will creep under the steel cover and sit on the electrical contacts.

The Art—and Science—of Photomicrography

Wonderful things go completely unnoticed when you are walking down the street, looking at a leaf's surface, or even excavating the tomb of a 3000-year-old mummy. Photomicrography, the art of photographing microscopic objects, helps reveal splendor that cannot be seen with the naked eye. Author Roberto Dabdoub, KB5AVY, is a pioneer of electro imaging, which works on the principle of producing an image by passing high-voltage electricity through an object. This technology is a great breakthrough for science, and Dabdoub uses it to make art as well.

Dabdoub's images include the ordinary, such as a leaf's surface or a radio transistor, as well as the unusual, such as a dinosaur bone or a human chromosome. He combines a passion for the world around him and a background in science with a desire to create and to point out what others miss. His unique vision yields a vividly abstract look into the world on its smallest level.

In addition to the radio-specific art featured in this exclusive *CQ* article, Dadoub has written a book on photomicrography, *Micro Art,* due to be published this spring by Pelican Publishing Co. The book examines the relationship between art and science, a relationship that, Dadoub says, in this age of technological dominance is evermore important.



Capturing the beauty of micro invaders with two dissecting microscopes equipped with ultraviolet illuminators. →

nents, red wine, coffee, sugar, Mardi Gras beads, and many tissue samples, including the cloth from a 3000-year-old mummy. I also experimented with human sperm, the AIDS virus, and the effects of high-frequency electricity in plants and animals.

Photographing through the microscope can be much more difficult than regular camera work. A concentrated beam of light usually illuminates the translucent objects from below. However, the variety of subjects I photographed also called for the mastery of other types of lighting, such as dark field, phase contrast, interference contrast, epifluorescent, and cross polarization.

My First Ham Radio Experience

When I was a boy, I asked my dad (HR2AD), who at the time was the director of Tropical Radio in Honduras, to give me one of his ham radios so I could become a "radio aficionado" like him. Instead, Dad rummaged through his shack for materials he knew would make a better learning experience for a 9-year-old. Using a hodgepodge of wires, resistors, and old tubes, he built a radio able to transmit Morse code. It took him 15 minutes to build it. An hour later, I was modifying the circuitry so it would transmit audio! I also increased the power so it would broadcast music into a tiny area of Honduras. I named it *Radio Lima Loca.*

When a ham told Dad he had heard the Beatles coming out of the Santa Teresa church's PA system, he knew trouble was in the air. He pointed one of his electronic divining rods, and in less than an hour busted my illegal heat sink. To his surprise, he learned that his 15-minute creation had mutated into a bizarre radio transmitting system. The dipole antenna connected to the device was hanging between two coconut trees and had two large avocado seeds as insulators. It looked more like a food creation than an antenna for a broadcasting station. Copper wires and Pyrex® glass tubes, scrapped from a nearby chemical waste plant, were used throughout the system. In spite of the horrendous SWR it must have had, the thing seemed to work fine. It was heard pretty much everywhere in the village, with a signal stronger than the VOA (Voice of America), or so the *campesinos* claimed.

Fortunately, the incident did not last long enough to generate any real damage to my father or the town. My mother, a school teacher who believed in discipline, made sure I stayed away from guacamole and any discarded lab equipment in the school. I believe this wacky experience encouraged me to pursue a career in science and began my desire to learn more about electronics and, of course, Mexican food.

I was first licensed in Honduras as HR1RD. After I came to the United States, I became KB5AVY.

Radio Under the Microscope

Ham radio equipment can be damaged by microorganisms such as bacteria, protozoa, and fungi. They feed on organic stuff that adheres to radio components, such as lipids, skin, sugar, animal dander, human breath, and sweaty hands. Organic acids generated by bacteria such as Aspergillus can affect electrical contacts, creating oxidation. The photos that accompany this article illustrate some very close-up looks inside typical ham gear and the amazing organisms that live there! Enjoy the unseen world inside your radio, but take a close look at the effect you can have on your personal environment. ■

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New!

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It includes coax RF choke balun, coax feed line, counterpoise wire and safety rope. Handles 200 Watts PEP.

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The base can support a lightweight multiband vertical antenna -- like the all band Hy-Gain 18AVS and the bandswitching MFJ-1795 -- and provide a semi or permanent installation.

You can easily set up and take down vertical antennas for stealth operation and hide the base by covering it with dirt.

The MFJ-1904 is a 2x2 foot *stainless steel* square with reinforcing bends that greatly strengthens it. Folded and tapered six-inch *stainless steel* legs firmly anchor the MFJ-1904 into the ground.

Built-in antenna mount with SO-239 coax connector and two U-bolts lets you mount most standard and homebrew vertical antennas.

Standard 3/8-inch x 24 mobile mount is built-in for MFJ Mobile Whips, bug catchers, *Hustlers* and screwdriver antennas.

Two handles make carrying and removing the base fast and easy. You can also attach radials for improved performance.

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MFJ-1910
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HF mini-Bugcatcher

Highly efficient 40 - 6 Meter base-loaded 5½ foot Bugcatcher mobile antenna . . . Use light duty mounts

Become an *"HF Mobileer"* almost instantly with this *new* MFJ high-efficiency *mini-bugcatcher* mobile antenna! Have tons of fun rag-chewing and DXing on the HF bands. Turn boring drives into fun-filled ham adventures.

MFJ-1624
$79.95
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Attach a simple mount to your vehicle (*mounts*: trunk lip, MFJ-347, $39.95; mirror or luggage, MFJ-342, $9.95; tri-magnet, MFJ-338T, $19.95) . . . **Screw** in your MFJ *mini-bugcatcher* . . . **Throw** your rig into your car, plug into cigarette lighter and turn power down to 20 Watts (to avoid overloading your cigarette lighter; MFJ-1624 handles 300 Watts PEP). **Operate!**

Bugcatcher design uses large highly-efficient *air-wound* inductor -- far out performs other compact HF antennas. *Exclusive* built-in inductive matching network keeps SWR low. 5½ foot whip collapses to 2½ feet for easy storage and low garages. Base loaded for minimum wind load and light duty mounts. Change band by moving *wander lead*. 3/8x24 in. mount.

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Operate from apartments, homes, hotels, campsites, beaches or any antenna restricted area. Work all bands 40, 30, 20, 17, 15, 12 and 10 Meters.

DXCC, *WAZ, WAC, WAS have been won with the MFJ-1621!* Compact 6x3x6 inch cabinet has 4½ foot telescoping whip, built-in antenna tuner, field strength meter and 50 feet coax. Handles 200 Watts.

MFJ Super High-Q Loop

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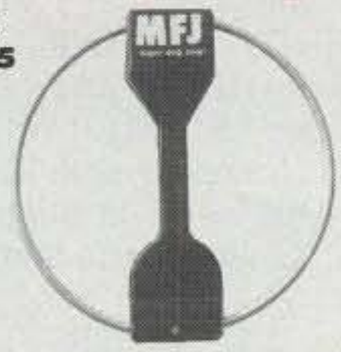

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Results of the 2002 CQ WW WPX CW Contest

BY STEVE BOLIA,* N8BJQ

A combination of some challenging propagation (I didn't say bad) and a final tune up for WRTC for some of the teams made the 2002 running of the CQ WW WPX CW Contest quite interesting. One never knows what to expect in late May. If you read the random comments, you will notice varying reports of conditions, from terrible to great, depending on where you operated from and your choice of bands. There were some very close races and good scores from all areas of the world. ZX5J broke the 10 meter world record, the Northern California Contest Club broke the club record, and several new continental records were set.

DX

Two of the top three Single Op All Band (SOAB) scores were generated from the island of Aruba in 2002. Scott, KØDQ, piloted P41P to his first win in the WPX CW. Scott has now won five legs of what may be contesting's toughest feat—winning both modes of the CQ WPX, CQ WW, and ARRL DX Contests. Second place went to OHØXX operating as OC4WW. Right behind Olli was AE6Y as P40Y, with P3F (5B4AGN) fourth, and JM1CAX at JY9NX taking fifth. K6LA as PJ2U finished sixth, with FM5BH seventh, Oceania champ KH6ND eighth, low power leader PX2W (PY2YU) ninth, and EU leader SN7Q (SP7GIQ) tenth.

IV3NVN "borrowed" ZX5J's fine station and easily won the 10 meter category and set a world record in the process. SMØCXU at HZ1AB broke the Asiatic record with his second-place finish. LT1F (LU1FAM) was third, OD5/OK1MU fourth, and low power champion L51EXU (LW1EXU) fifth. PY3DX as PU3A was the 15 meter champion, with European record holder 9H1EL as 9HØA right on his heels in second place. W5ASP piloted ZF1A to the North American title and third high world, followed by 9K9O and TM7XX (F5MUX). OH4A (OH6QU) was the 20 meter winner, edging FM5GU by 35K for the title. IKØYVV was third, right on their heels, with Gary, VA7RR, at XM7SZ fourth, and U.S. champ Mike, K9NW, fifth. YV1DIG as YW1D turned in the top 40 meter score, followed by 9A5E and UA2FB. TAØ/YU7AV and GW7X (GW3NJW) rounded out the top five. RV2FW topped the 80 meter box, with Z39Z (Z32AF) second, TAØ/Z33F third, YU1KX fourth, and OK1RR fifth. RN2FA was the Top band champion. S57M finished second, LY2BW third, YZ1W (YU1YV) fourth, and R1MVI (RA1ACJ) fifth.

The top three spots in the low power leader box went to South America. PX2W (PY2YU) turned in an outstanding score for the win, followed by FY5FY and L73F (LU5FF). Asia champion ZC4DW was fourth, with NF4A (N4PN) turning in the top North American score on his way to fifth.

LT1A (LU1FAM) edged out L51EXU (LW1EXU) for the 10 meter title, followed by EA9AZ. UAØJQ was the 15 meter winner; EA8FT was second and HA8MD third. YT7A topped the 20 meter leader box, with CT3KN second and HG4F third. In one of the closest races, S53F edged out YZ1U (YT1UR) and WE1USA (WA1LNP) for the 40 meter title. LZ2L (LZ2LDS) topped OK2ZV and UR3HC for the 80 meter title. Low band honors went to SQ2HEB, followed by UT1FA and 9A3RE.

JY9NX operated by JM1CAX continues to dominate the Tribander/Single Element category. Koji won both modes in 2001 and again in 2002. His score this year is also the fifth highest Single Op All Band score. Second place went to K2QM at PJ4M with U.S. champion NR1DX third, low power leader L73F (LU5FF) fourth, and HA8JV fifth.

YT1LT edged out RN6CF for Rookie honors. Both were low power entries and topped 1.3 million points. YU8/OK1CRM was third, with YZ1KA fourth and DJ9AO fifth. These guys bear watching. They could very well be challenging the leaders in the near future.

QRP honors went to ZC4BS with an outstanding 2.5Meg point effort, good for an Asiatic record. Finishing in second place was

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Low Power Single Ops Tanya, RN3AX (28 MHz), and Mike, RW3AX (All Band) in their "his and hers" shack.

TROPHY WINNERS AND DONORS

SINGLE OPERATOR, ALL BAND

WORLD: Steve Bolia, N8BJQ Trophy. Won by: **P41P operated by Scott Redd,KØDQ.**
USA: Dennis Motschenbacher, K7BV Trophy. Won by: **Charles Fulp, K3WW**
EUROPE: Ivo Pezer, 5B4ADA/9A3A Trophy. Won by: **Krzysztof Sobon, SN7Q (SP7GIQ).**
OCEANIA: Tom Morton, K6CT Trophy. Won by: **Mike Gibson, KH6ND**.
CANADA: Radio Amateurs of Canada (RAC) Trophy. Won by: **Ron Vander Kraats, XM3AT.**
JAPAN: The DX Family Foundation Trophy. Won by: **Mieko Inoue, JAØQWO**.
WORLD LOW POWER: Steve Bolia, N8BJQ Trophy. Won by: **Hamilton Oliveira Martins, PX2W (PY2YU).**
USA LOW POWER: Steve Bolia, N8BJQ Trophy. Won by: **NF4A operated by Paul Newberry, Jr., N4PN.**
ZONE 3 HIGH POWER: Jim Pratt, N6IG Trophy. Won by: **KU6W operated by Daniel M. Craig, N6MJ.**
USA ZONE 4 HIGH POWER: Society of Midwest Contesters Trophy. Won by: **NT5C operated by Jim George, N3BB.**
USA ZONE 4 LOW POWER: Society of Midwest Contesters Trophy. Won by: **John Bayne, KK9A.**
USA QRP/p: CQ Magazine Trophy. Won by: **KG1D operated by Tom Frenaye, K1KI.**

SINGLE OPERATOR, SINGLE BAND

WORLD: Pedro Piza, Sr., KP4ES Memorial Trophy. Won by: **ZX5J operated by Simone Candotto, IV3NVN (28 MHz).**
WORLD 7 MHz: William D. Johnson, KVØQ Trophy. Won by: **Paolo Stradiotto, YW1D (YV1DIG).**
WORLD 3.5 MHz: Lance Johnson Digital Graphics Trophy. Won by: **Victor Maximenko, RV2FW.**
OCEANIA: Steve Bolia, N8BJQ Trophy. Won by: **Mike Sivcevic, VK4DX (14 MHz).**
USA: Kansas City DX Club Trophy. Won by: **John Yodis, K2VV (21 MHz).**
USA 28 MHz: Bernie Welch, W8IMZ Memorial Trophy. Won by: **Bob Patten, KW4CW (N4BP).**
USA 21 MHz: Wayne Carroll, W4MPY Trophy. Won by: **Fritz Reuning, KC4D (K4OAQ).**

MULTI OPERATOR, SINGLE TRANSMITTER

WORLD: Ron Blake, N4KE Trophy. Won by: **Station 3V8BB operated by YT1AD, YU1RL, YU7NU, 4N1FG, S56A.**
USA: Austin Regal, N4WW Trophy. Won by: **Station KT1V operated by NT1N, AG9A, KT1V.**
USA ZONE 4: Society of Midwest Contesters Trophy. Won by: **Station NØNI operated by NØNI, NØAV, KØKD, KØRX.**

MULTI-OPERATOR, MULTI-TRANSMITTER

USA: Yankee Clipper Contest Club Trophy. Won by: **Station WC4E operated by WC4E, K4OJ, N4KM, T93M, K1TO, N4GI, K4FB, W1CW, W1YL.**

CONTEST EXPEDITION

WORLD: Steve Bolia, N8BJQ Trophy. Won by: **Daniel Marlow, PJ4M (K2QM).**

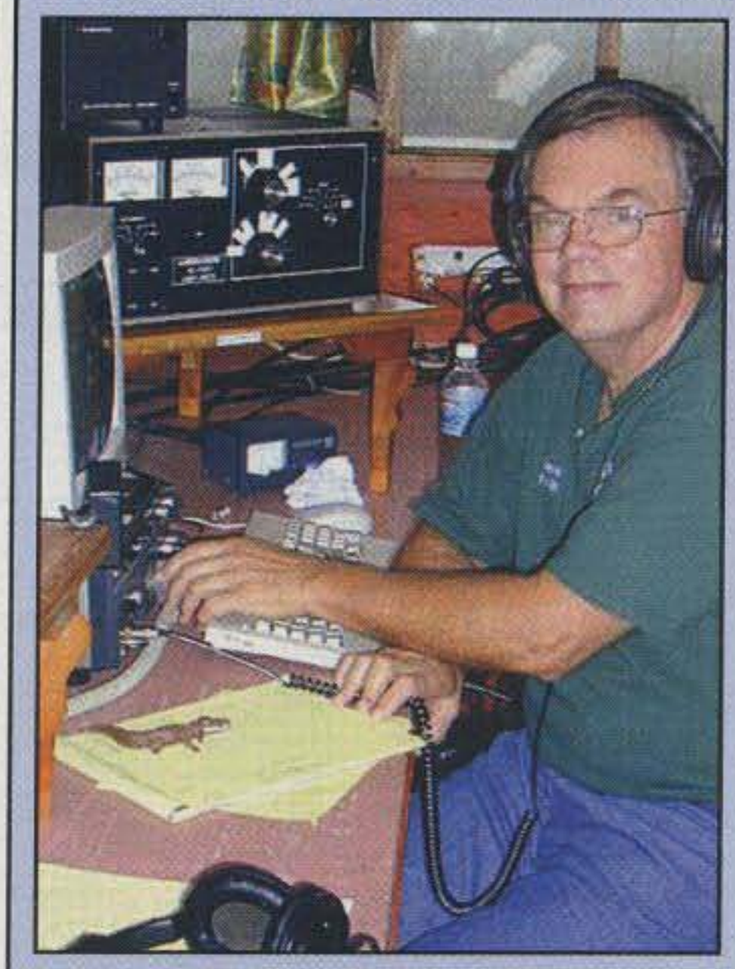
COMBINED SSB/CW

SINGLE OPERATOR, ALL BAND WORLD: Al Slater, G3FXB Memorial. Won by: **Andrew Faber, AE6Y (ZF2AF & P40Y).**
EUROPE: Les Nouvelles DX Group Trophy. Won by: **Vrbovszki Pal, HA8JV.**
USA: Steve Bolia, N8BJQ Trophy. Won by: **Ken Claerbout, K4ZW (KN1DX).**

Club (SSB & CW)

WORLD: CQ Magazine Trophy. Won by: **Northern California Contest Club.**
USA: Oklahoma DX Association Trophy. Won by: **Potomac Valley Radio Club**.

Steve Merchant, K6AW
CQ's New WPX Contest Director



Steve Merchant, K6AW, CQ WPX Contest Director beginning with 2003.

Steve, K6AW, was raised in Minnesota and was licensed in 1956 as KNØDNM. While still a Novice, he became involved in traffic handling and developed an early interest in contesting. Steve has held the callsigns KØDNM, N4TQO, and W6EMS. He currently also holds the call OHØZZ.

In recent years Steve has been quite active in contest expeditions to locations such as VK9L, HV, OHØ, 8P, and HC8. A regular operator at the N6RO, KC1XX, and HC8N multi-multi stations, he is also one of the founders of the HC8 superstation.

Steve's experience in contest administration includes four years of managing a U.S. domestic contest and serving as an advisor for the CQ/RJ RTTY contests. He has been a member of the CQ WW Contest Committee for three years. A past president of the Northern California Contest Club, he currently also serves as a director of the Northern California DX Foundation.

Welcome aboard as the new CQ WPX Contest Director, Steve!

UN4L, followed by HG5Z (HA1CW), LY3BA as LY7A, and JA6GCE. Single band leaders were JR3RWB on 10, RZ6HX on 15, LY5G (LY2FE) on 20, US5QQF on 40, OL4W (OK1IF) on 80, and YT1R (YU1RA) on Top band.

USA

The U.S. race was quite interesting this year. We have a first-time winner: Chas, K3WW, edged out Ken, KN1DX (K4ZW), for the U.S. crown. The margin of victory was roughly 14,000 points. Also in the mix in third place was Dan, N6MJ, as KU6W. WC1M and KT3Y rounded out the top five. KF3B (N3RS) finished at number six, with K3CR (LZ4AX) seventh, W6XR (N2YX) eighth, NT5C (N3BB) ninth, and N5RZ tenth.

KW4CW operated by Bob, N4BP, turned in an outstanding 10 meter score to lead the U.S. Scott, N9AG, as WO8CC, did very well from N8NR's station, but did not have the same kind of propagation that Bob had. John, K2VV, edged out KC4D (K4OAQ) for the 15 meter title, with W5TM (W5AO) third, WZ1R (N1RR) fourth, and K7UAZ (N4OGW) fifth. Mike, K9NW, was the 20 meter champion, with WZ5V second, K7RI (LU9AY) third, W5FO fourth, and K9QVB fifth. W3BGN topped the 40 meter box, followed by WE1USA (WA1LNP), KØRF, NU5A (K5GN), and N5DO. Low band activity was a bit sparse, but there was some. W7DRA edged out NA2X for the win on 80 meters, and K1VW had the patience to stick it out on Top band for the win, with NØTT second and AI4AA (K4WI) third.

NF4A with N4PN at the key was the low power, champion with KK9A second, KS9K (N4TZ) third, NZ8O (W8MJ) fourth, and N1UR fifth. KN4Y was the 10 meter leader; N6MU was the 15 meter winner; and K9QVB took the top spot on 20 meters. WE1USA (WA1LNP) turned in an excellent 40 meter score, and AI4AA (K4WI) was the Top band low power winner.

NR1DX turned in the top Tribander/Single Element score, followed by AG1C (N2GC), KZ5D, N6CW, and N3UM. WD5K, NX6T (K6AM), WD4AHZ, NA4K, and W8IQ were the top five finishers in the low power section. K8KHZ turned in the top Rookie score, followed by AE6AX and AE1X.

K5KG topped the Single Op Assisted category, followed by AF1Z (K1PT), K2PLF, K3KO, and K9NR. W1US (K1LZ) had the top 15 meter score, as did WY3T on 20.

K1KI as KG1D was the U.S. QRP champion, with WQ1RP (K1RC) second, WJ9B

third, N7IR fourth, and AA1CA fifth. Single band leaders were NE5D on 10, WA6FGV on 15, and W6YJ on 20.

Multi-Ops

The top three Multi-Single stations all established continental records. 3V8BB finished on top with a new African record, followed by 8P4A with a North American record and P3A with an Asiatic record. The 3V8BB score nearly broke the world record set by P49V in 2001. Fourth place went to NP4Z, with U.S. leader KT1V fifth. WW4T placed sixth, followed by YM3LZ, AM6IB, YT6A, and CS8W.

KT1V topped the U.S. Multi-Single entries, with WW4T second, KQ2M third, NO2R fourth, and KM4M fifth. KZ4DX, NØNI, NM5O, NC7J, and WX6V rounded out the top ten.

The top two Multi-Multi stations also established new continental records. A61AJ is the new Asiatic record holder and 2002 champion. Second place, and a North American record, belong to 6Y2A. RT9W edged out ES9C for third, with WL7E fifth, LY7A sixth, 9A7A seventh, U.S. leader WC4E eighth, followed by HG3DX and AL7NJ. The TI5N crew did what may be our first QRP Multi-Multi and turned in an excellent score from TI5KD's fine QTH.

WC4E was the U.S. champion, followed by NY4A, NE6N, W4MYA, and KX7M. The remaining members of the top ten were NR6O, W5XS, WR3L, NT6K, and AK3Z.

The Rest of the Story

Entries were up slightly from 2001, and the number of electronic logs went up as well.

WORLD TOP SCORES

SINGLE OPERATOR ALL BAND

P41P (KØDQ)	12,230,052
OC4WW (OHØXX)	11,058,312
P4ØY (AE6Y)	10,700,004
P3F (5B4AGN)	10,127,064
JY9NX (JM1CAX)	9,942,384
PJ2U (K6LA)	9,053,040
FM5BH	8,270,112
KH6ND	7,996,774
*PX2W (PY2YU)	7,814,556
SN7Q (SP7GIQ)	6,634,037
DF3CB (LY1DS)	6,463,926
K3WW	6,168,000
KN1DX (K4ZW)	6,152,718
OHØR (OH2PM)	6,104,280
KU6W (N6MJ)	6,051,277
S58A	5,899,009
WC1M	5,720,197
KT3Y	5,609,940
DL1IAO	5,601,468
KF3B (N3RS)	5,574,096

28 MHz

ZX5J (IV3NVN)	6,787,440
HZ1AB (SMØCXU)	3,667,994
*LT1F (LU1FAM)	2,344,895
OD5/OK1MU	2,160,328
*L51EXU (LW1EXU)	2,118,168
*EA9AZ	1,551,560
EX2M	1,510,340
9A5Y (9A3NM)	1,486,327
*LP5F	1,357,979
YZ1AU	1,293,666

21 MHz

PU3A (PY3DX)	5,746,284
9HØA (9H1EL)	5,389,008
ZF1A (W5ASP)	4,852,224
9K9O (9K9O)	4,297,504
TM7XX (F5MUX)	3,274,796
K2VV	3,032,421
KC4D (K4OAQ)	2,916,244
JH7XGN	2,819,342
UR6F (UXØFF)	2,817,612
IQ3X (IV3SKB)	2,790,612

14 MHz

OH4A (OH6QU)	3,152,848
FM5GU	3,117,520
IKØYVV	3,000,831
XM7SZ (VA7RR)	2,917,995
K9NW	2,916,960
TAØ/Z37M (Z31GX)	2,770,304
TI3M	2,709,360
S59ABC (S51DS)	2,668,284
YO4NF	2,640,410
RJ9J (RA9JR)	2,593,764

7 MHz

YW1D (YV1DIG)	2,860,110
9A5E	2,535,820
UA2FB	2,481,124
TAØ/YU7AV	2,187,068
GW7X (GW3NJW)	2,045,520
PY2NDX	1,971,172
UA9CI	1,965,529
HA8DU	1,838,200
MØTTT	1,829,284
UR8QX (UR8QX)	1,819,593

3.5 MHz

RV2FW	760,886
Z39Z (Z32AF)	630,360
TAØ/Z33F	577,408
YU1KX	402,435
OK1RR	395,632
*LZ2L (LZ2LDS)	383,526
OM3ZWA	343,621
OH2BCI	340,101
*OK2ZV	322,640
OK1WF	312,950

1.8 MHz

RN2FA	242,000
S57M	195,776
LY2BW	176,820
YZ1W (YU1YV)	161,616
R1MVI (RA1ACJ)	158,760
*SQ2HEB	149,129
YL2PQ	143,613
*UT1FA	91,410
*9A3RE	84,747
*YU1EA	71,550

LOW POWER ALL BAND

PX2W (PY2YU)	7,814,556
FY5FY	4,918,300
L73F (LU5FF)	4,616,608
ZC4DW	4,359,910
NF4A (N4PN)	4,160,208
WP3C	3,815,643
UP6P	3,756,202
XL3NA (VA3NA)	3,735,212
OK2PP	3,489,237
YZ9A (YU1NW)	3,455,848
KK9A	3,271,524
AN7GTF	3,250,755
9AØDX (9A3PA)	3,124,730
YL/RZ3BY	3,020,820
KS9K (N4TZ)	2,886,102
KH7CD	2,677,476
NZ8O (W8MJ)	2,489,200
YBØGJS	2,407,439
HR3J (JA6WFM)	2,177,883
SM5G (SM5JBM)	2,129,026

28 MHz

LT1F (LU1FAM)	2,344,895
L51EXU (LW1EXU)	2,118,168
EA9AZ	1,551,560
LP5F	1,357,979
PY7IQ	1,033,900
JH9VSF	677,943
YU1AU	630,924
UN7GM	574,632
T94NO	473,480
4X1VF	441,639

21 MHz

UAØJQ	1,735,396
EA8FT	1,581,235
HA8MD	1,564,998
XV9SW (SM5MX)	1,407,536
OT2H (ON4TT)	1,305,034
N6MU	1,176,136
YU7KWX (YU7CF)	1,083,316
OK1DDO	1,017,792
UA3DPX	930,510
LU5FB (LU1AEE)	813,780

14 MHz

YT7A	2,114,460
CT3KN	1,763,310
HG4F	1,652,708
VK4DX	1,623,804
K9QVB	1,488,616
LY5A (LY2PAJ)	1,478,880
LY6A (LY2BM)	1,428,480
UN9LN	1,181,500
S57Z	1,132,716
UA9JLL	1,103,706

7 MHz

S53F	1,060,605
YZ1U (YT1UR)	1,051,090
WE1USA (WA1LNP)	1,010,225
S54A	944,350
G3TJE	798,183
YZ1V (YZ1ZV)	785,242
UW2F (UTØFT)	551,088
UT8AS	378,000
USØHZ	377,487
HBØ/HB9HAW	363,550

3.5 MHz

LZ2L (LZ2LDS)	383,526
OK2ZV	322,640
UR3HC	300,810
HA4FV	283,008
LY3NT (LY1DI)	219,020
RU6FA	201,865
PY7ZY	152,581
LY3CW	144,628
SP9DUX	93,740
UA6AKD	84,150

1.8 MHz

SQ2HEB	149,129
UT1FA	91,410
9A3RE	84,747
YU1EA	71,550
LZ1DQ	50,952
OK2SNX	45,312
EU6DX	28,886
LY2GW	26,622
LZ2RF	15,488
VE3OSZ	13,923

TRIBANDER/SINGLE ELEMENT

JY9NX (JM1CAX)	9,942,384
PJ4M (K2QM)	5,017,584
NR1DX	4,631,235
*L73F (LU5FF)	4,616,608
HA8JV	4,456,756
*ZC4DW	4,359,910
8S5A (SM5AJV)	4,165,412
EY7AF (EY8AF)	4,091,451
AN5FV (EA5FV)	3,893,192
AG1C (N2GC)	3,371,200
OL5Y (OK1FUA)	3,350,520
*AN7GTF	3,250,755
RZ3AZ	3,245,508
*9AØDX (9A3PA)	3,124,730
RA9SG (RA9SG)	2,834,520
RN6AL	2,778,844
KZ5D	2,777,456
VA3UA	2,611,785
RM3C (RA3CW)	2,577,960
N6CW	2,259,965

28 MHz

*PY7IQ	1,033,900
DK2GZ	476,346
*VK4TT	409,165
*HP1AC	115,746
OH6NJ	101,835

21 MHz

XM3ANX (VE3ANX)	2,397,408
*VE3MQW	490,091
*PY2RH	457,996
*EA4EFJ	158,613
*JJ6TWQ	135,884

ROOKIE

*YT1LT	1,325,092
*RN6CF	1,308,619
YU8/OK1CRM	717,402
*YZ1KA	707,272
*DJ9AO	278,640
*SP5HNK	259,794
*SP9IBJ	99,640
*VK8JAC	86,265
*K8KHZ	34,430
*UA9QFF	23,577

BAND RESTRICTED

*RN6CF	1,308,619
*UR5FCM	153,360
*JG1OWV	114,582
*SP9IBJ	99,640
*RA3WDK	88,894

QRP/p

ZC4BS	ALL	2,515,388
UN4L	ALL	2,291,625
HG5Z (HA1CW)	ALL	1,916,967
LY9A (LY3BA)	ALL	1,861,034
JA6GCE	ALL	1,264,300
YT7TY	ALL	1,247,688
KG1D (K1KI)	ALL	1,214,667
SM3C	ALL	1,038,510
OT2A (JK3GAD)	ALL	920,710
WQ1RP (K1RC)	ALL	869,372
JR3RWB	10M	139,105
DF9ZP	10M	48,900
RZ6HX	15M	512,601
YU1LM	15M	365,760
GØDCK	15M	255,024
SM0GNS	15M	220,281
UT2UZ	15M	218,964
LY5G (LY2FE)	20M	617,100
PA3ELD	20M	232,883
OK1DSA	20M	220,286
G3LHJ	20M	166,704
W6YJ	20M	156,845
US5QQF	40M	101,652
OL4W (OK1IF)	80M	190,452
EW6CU	80M	131,200
RW3VZ	80M	120,761
OK1IR	80M	119,997
OM4K (OM4AA)	80M	84,796
YT1R (YU1RA)	160M	12,282

MULTI-OP, SINGLE TRANSMITTER

3V8BB	19,041,135
8P4A	18,516,960
P3A	18,176,342
NP4Z	11,575,710
KT1V	10,527,680
WW4T	10,316,890
YM3LZ	10,122,690
AM6IB	9,164,650
YT6A	9,143,420
CS8W	8,675,405
L75FM	8,491,920
KQ2M	8,219,792
HG1S	8,184,912
F9IE	8,011,038
NO2R	7,923,032
OM7M	7,670,604
KM4M	7,579,332
RM6A	7,440,610
KZ4DX	7,345,092
9A9D	7,259,630

MULTI-OP, MULTI-TRANSMITTER

A61AJ	42,766,232
6Y2A	38,821,328
RT9W	17,731,000
ES9C	17,464,886
WL7E	15,799,925
LY7A	13,889,116
9A7A	13,449,240
WC4E	13,263,255
HG3DX	12,524,434
AL7NJ	11,913,135
NY4A	11,725,350
VC6X	10,878,621
OL5T	10,840,744
NE6N	10,426,290
W4MYA	10,165,218
KX7M	8,049,483
NR6O	7,963,584
WX5S	7,611,400
TI5N	7,454,528
SN4L	6,495,034
WR3L	5,823,280

*Low Power.

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SB-14 • Tri-band 52/146/446MHz w/fold-over
Gain & Wave: 52MHz 0 gain 1/4 wave • 146MHz 3.5 dBi 1/2 wave center load • 446MHz 6dBi 5/8 wave center load • VSWR: 1.5:1 or less • Length: 43"
• Conn: PL-259 • Max Pwr: 120W (FM)

SBB-7/SBB-7NMO • Dual-band 146/446MHz w/fold-over
Gain & Wave: 146MHz 4.5dBi 6/8 wave • 446MHz 7.2dBi 5/8 wave x 3 • Length: 58" • Conn: SBB-7/PL-259/SBB-7NMO NMO • Max Pwr: 70W

SBB-5/SBB-5NMO • Dual-band 146/446MHz w/fold-over
Gain & Wave: 146MHz 2.5dBi 1/2 wave • 446MHz 5.5dBi 5/8 wave x 2 • Length: 39" • Conn: SBB-5/PL-259/SBB-5NMO NMO • Max Pwr: 120W

SBB-2/SBB-2NMO • Dual-band 146/446MHz
Gain & Wave: 146MHz 2.15dBi 1/4 wave, 446MHz 3.8dBi 5/8 wave center load • VSWR: 1.5:1 or less • Length: 18" • Conn: PL-259 or NMO Style • Max Pwr: 60W

B-10/B-10NMO • Dual-band 146/446MHz cellular look-a-like
Gain & Wave: 146MHz 0dBi 1/4 wave, 446MHz 2.15dBi 1/2 wave • Length: 12" • Conn: B-10 PL-259/B-10NMO NMO • Max Pwr: 50W

NEW C757/757NMO Challenger Series • Dual-band 146/446MHz w/fold-over
Gain & Wave: 146MHz 2.15dBi 1/2 wave, 446MHz 5.5dBi 5/8 wave x 2 • VSWR: 1.5:1 or less • Length: 38" • Conn: PL-259 or NMO Style • Max Pwr: 80W

NEW C767/767NMO Challenger Series • Dual-band 146/446MHz w/fold-over
Gain & Wave: 146MHz 3.6dBi 1/2 wave center load, 446MHz 6.0dBi 5/8 wave x 2 center load • VSWR: 1.5:1 or less
• Length: 40" • Conn: PL-259 or NMO Style • Max Pwr: 80W

COMET UHV-6
Fold-Over Position

COMET NEW UHV-6 • HF/6M/2M/70cm Mobile Antenna 40/*20/*17/15/10/6/2M/70cm
Gain & Wave: 2M 2.15dBi 1/2 wave • 70cm 5.5dBi 5/8 wave x 2 • VSWR: HF 1.6:1 or less, 6M-70cm 1.5:1 or less • Length: 44" (min); 78" (max) • Max Pwr: HF 120W SSB, 6M 200W SSB/100W FM, 2M/70cm 100W FM • *L-18 optional 17M coil • *L-14 optional 20M coil • L-3.5 optional 70-80M coil • Features: • 6M/2M/70cm operation is constant. You CHOOSE the HF coils you want to add, up to four stock or optional. One vertical, the rest horizontal. • Easily mounts to standard trunk/door mount in minutes. • Economical • Fold-over hinge built in • Select the duplexer or triplexer for your specific radio(s): CF-706A, CF-530, CFX-514N.

40M Thru 70cm!

Maldol NEW EX-107B/EX-107BNMO • Dual-band 146/446MHz
Gain & Wave: 146MHz 2.6dBi 1/2 wave, 446MHz 4.9dBi 5/8 wave x 2 • VSWR: 1.5:1 or less • Length: 29"
• Conn: PL-259 or NMO Style • Max Pwr: 100W

COMET NEW CP-5M
Universal mount and coax cable combo.
Heavy-duty, adjustable RS-730 trunk/van/SUV/truck door mount and deluxe cable assembly. 16' 6" length w/18" mini RG-188A/U type coax, gold-plated conns. Max antenna – 70".

Maldol MSG-1100C
Spring absorbs vibration and impact

Maldol NEW MSG-1100F • Dual-band 146/446MHz w/spring whip
Gain & Wave: 146MHz 3.5dBi 1/2 wave, 446MHz 6.0dBi 5/8 wave x 2 • Length: 43" • Conn: PL-259 • Max Pwr: 150W

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USA TOP SCORES

SINGLE OPERATOR ALL BAND

K3WW	6,168,000
KN1DX (K4ZW)	6,152,718
KU6W (N6MJ)	6,051,277
WC1M	5,720,197
KT3Y	5,609,940
KF3B (N3RS)	5,574,096
K3CR (LZ4AX)	5,508,408
W6XR (N2YX)	5,151,357
NT5C (N3BB)	5,119,260
N5RZ	5,111,653
AA3B	5,024,883
NR1DX	4,631,235
K5YA	4,285,229
N9RV (W8LVN)	4,190,700
*NF4A (N4PN)	4,160,208
KR7O (N6TV)	4,153,296
W5KFT (K5PI)	4,100,092
K4RO	3,771,690
KC7V	3,612,525
NU1P (K1MK)	3,502,692

28 MHz

KW4CW (N4BP)	1,034,346
WO8CC (N9AG)	228,739
*KN4Y	102,816
WW4M (W4ZV)	80,150
NJ4U (K4EA)	60,140
W6VNR	27,354
*KX9DX	18,972
*WD6DX	16,380

21 MHz

K2VV	3,032,421
KC4D (K4OAQ)	2,916,244
W5TM (W5AO)	2,103,121
WZ1R (N1RR)	2,069,382
K7UAZ (N4OGW)	1,916,430
N8BJQ	1,618,050
KM5G	1,418,450
KC5FU (N5QQ)	1,284,023
*N6MU	1,176,136
*K7ON	430,360

14 MHz

K9NW	2,916,960
WZ5V	2,259,423
K7RI (W7/LU9AY)	1,902,840
W5FO	1,688,580
*K9QVB	1,488,616
*K9BG	748,512
*NJ3K	176,605
K3VA	161,007
*WØETT	136,654
*W3BYX	53,568

7 MHz

W3BGN	1,683,990
*WE1USA (WA1LNP)	1,010,225
KØRF	762,196
NU5A (K5GN)	655,690
N5DO	383,090
*WK4Y	176,421
*W9SE	153,573
*WS4NC (N4VHK)	54,489
K7OX	19,201
*KU6T	13,908

3.5 MHz

W7DRA	6,837
NA2X	4,508

1.8 MHz

K1VW	7,930
NØTT	1,995
*AI4AA (K4WI)	1,472

LOW POWER ALL BAND

NF4A (N4PN)	4,160,208
KK9A	3,271,524
KS9K (N4TZ)	2,886,102
NZ8O (W8MJ)	2,489,200
N1UR	2,059,200
WD5K	1,819,179
NX6T (K6AM)	1,734,866
AA6PW	1,723,700
N4IG	1,529,088
WK2G	1,460,592
WD4AHZ	1,363,348
NA4K	1,353,037
W8IQ	1,260,438
NK4A (NF4A)	1,196,279
WA1Z	1,147,240
WO3Z	1,135,443
NR4X (K4SB)	1,099,791
K1HT	1,095,028
KQ1F (K1XM)	1,089,880
K4EU	1,036,164

28 MHz

KN4Y	102,816
KX9DX	18,972
WD6DX	16,380

21 MHz

N6MU	1,176,136
K7ON	430,360
K3GW	138,390
K9WA	124,120
N2GM	80,012

14 MHz

K9QVB	1,488,616
K9BG	748,512
NJ3K	176,605
WØETT	136,654
W3BYX	53,568

7 MHz

WE1USA (WA1LNP)	1,010,225
WK4Y	176,421
W9SE	153,573
WS4NC (N4VHK)	54,489
KU6T	13,908

1.8 MHz

AI4AA (K4WI)	1,472

TRIBANDER/SINGLE ELEMENT

NR1DX	4,631,235
AG1C (N2GC)	3,371,200
KZ5D	2,777,456
N6CW	2,259,965
N3UM	1,995,840
*WD5K	1,819,179
*NX6T (K6AM)	1,734,866
W4SAA	1,660,828
KAØGGI	1,585,366
*WD4AHZ	1,363,348
*NA4K	1,353,037
*W8IQ	1,260,438
K3MD	1,164,999
*W2TZ	1,026,368
*KV8Q	803,574

ROOKIE

*K8KHZ	34,430
*AE6AX	7,056
*AE1X	2,325

ASSISTED

K5KG	4,671,753
AF1Z (K1PT)	3,523,566
K2PLF	3,014,610
K3KO	2,219,700
K9NR	2,215,080
WN9O (W9IU)	2,004,792
WM6A (K6TA)	1,274,115
N4GG	1,176,436
N2BJ	901,075
K9UQN	799,800

21 MHz

W1US (K1LZ)	1,928,609

14 MHz

WY3T	320,226

QRP/p

KG1D (K1KI)	ALL	1,214,667
WQ1RP (K1RC)	ALL	869,372
WJ9B	ALL	717,876
N7IR	ALL	698,904
AA1CA	ALL	442,890
W4DEC	ALL	272,568
W8VE	ALL	197,250
W5KDJ	ALL	164,800
K6SE	ALL	111,936
K8ZT	ALL	108,153
NE5D	10M	5,474
WA6FGV	15M	116,856
W6YJ	20M	156,845
NU4B	20M	35,453

MULTI-OP, SINGLE TRANSMITTER

KT1V	10,527,680
WW4T	10,316,890
KQ2M	8,219,792
NO2R	7,923,032
KM4M	7,579,332
KZ4DX	7,345,092
NØNI	6,857,766
NM5O	5,405,036
NC7J	2,656,636
WX6V	2,496,695

MULTI-OP, MULTI-TRANSMITTER

WC4E	13,263,255
NY4A	11,725,350
NE6N	10,426,290
W4MYA	10,165,218
KX7M	8,049,483
NR6O	7,963,584
W5XS	7,611,400
WR3L	5,823,280
NT6K	1,956,544
AK3Z	418,528

**Low Power.*

Markus, DN1MA (third from the left), at a Morse Code course. The course ended two weeks before the WPX CW, and Markus was on 21 MHz, High Power in the contest. Second from the left is 14-year-old Martin, who passed his Class 1 exam before the contest, but was waiting for his callsign.

About 1600 electronic logs were received, most via e-mail. Of these, the robot processed 1412 Cabrillo logs, saving me countless hours that had previously been spent opening e-mails and sending replies. Thanks, Trey, N5KO. The remaining logs were converted to Cabrillo and also made it into the log-checking database. The WPX robots will again be serving you in 2003. Please send in your log as Cabrillo and send to the proper robot. If all is correct, you should get a reply back within a few minutes giving you a tracking number and a confirmation. If there is a problem with your log, you will get a message back with an explanation. Follow the suggestions to fix the log and resubmit it. You can resubmit as many times as necessary to get it correct. This saves us lots of time and ensures that your log will be placed in the proper category.

If you need help with Cabrillo, there is an explanation on the WPX website. If your logging software does not support Cabrillo, there are a couple of programs available that can be used to convert your log to the proper format. If you use one of these, make sure that all required information (including serial numbers sent and received) is in the log.

Over 1.3 million log entries, and 11,300 callsigns which were reported three or more times, were cross-checked by the log-checking software. The software identifies unique

MFJ DX Beacon Monitor

Get *up-to-the-minute* worldwide DX band conditions in *minutes* on 14, 18, 21, 24, 28 MHz bands using the International Beacon Network of 18 worldwide beacons!

MFJ DX Beacon Monitor lets you instantly see on world map which beacon you're hearing on your transceiver . . . No need to copy 22 wpm CW . . . Positively identify beacons even if CW is weak, fluttery or distorted . . . Tells you where to point your antenna . . . Fascinates visitors . . .

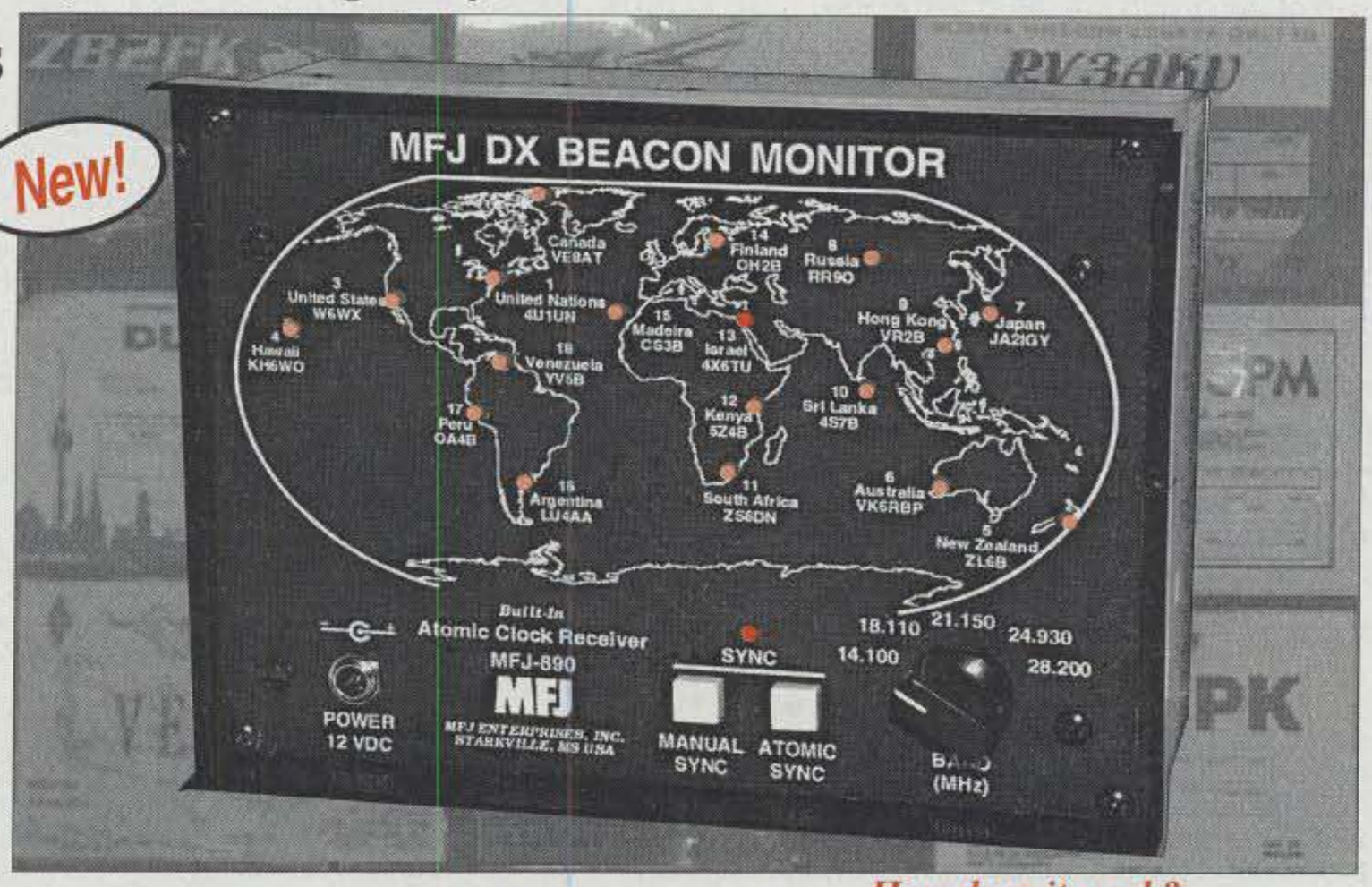
MFJ-890
$99.95

Get up-to-the-minute worldwide DX band conditions in minutes on 14, 18, 21, 24, 28 MHz bands using the International Beacon Network of 18 beacons throughout the world!

MFJ's new* DX Beacon Monitor *lets you instantly see which beacon you're hearing on your transceiver -- an LED lights up on its world map to show you the beacon location and where to point your antenna.

It's fascinating to hear and watch each beacon location light up as they become active across the world.

It's great for DXers, contesters, ragchewers and SWLers.



The International Beacon Network

The *International Beacon Network* provides a reliable source of signals for determining HF propagation 24 hours a day.

It consists of 18 beacons evenly located throughout the world.

Each beacon transmits on 14.1, 18.11, 21.150, 24.93 and 28.2 MHz.

The transmit sequence moves westward from New York across North America, Asia, Pacific to Africa, Europe and South America.

On each frequency, each beacon transmits for ten-seconds -- its call sign at 22 wpm CW and a one-second dash at 100 Watts and three one-second dashes at 10, 1, 0.1 Watts.

When each beacon completes a transmission it goes silent on that band and switches to the next higher band.

For more information see Oct/Nov, 1994, Sept, 1997 *QST* and Jan 1999, Sept/Dec 2001, Jan 2002 *Practical Wireless* of U.K.

How are band conditions?

Tune to a beacon frequency. If band conditions are good, you'll hear each beacon identifying in Morse and four dashes each at a lower power level.

The more beacons you hear, the more open the band is to different parts of the world.

The more dashes you hear per beacon, the better the quality of propagation and the more robust the band is. If you hear the 100 milliwatt dashes from many beacons you know *the band is wide open!*

In just three minutes you'll know how band conditions are worldwide.

It's interesting to see how propagation vary from day to day -- what beacons you can hear and at what power level.

You may find that the band is wide open but nobody is on.

Which band is best to reach a particular part of the world?

By storing the beacon frequencies in your transceiver's memory, you can quickly check all five bands to see which band has the best propagation to a particular part of the world.

MFJ DX Beacon Monitor lets you instantly see on world map which beacon you're hearing

You don't have to copy CW at 22 wpm to identify a beacon.

When you *hear* a beacon, an LED instantly lights up on a world map to show you its location. **You** can positively identify each beacon -- even if the signal is weak, and the CW is fluttery or distorted.

The world map display also tells you where to point your antenna.

How does it work?

The transmit sequence of the beacons are precision timed using GPS (Global Positioning Satellites).

The *MFJ DX Beacon Monitor* duplicates this precision timing sequence and lights an LED to show which beacon is transmitting. A microprocessor and a *built-in WWVB atomic clock receiver* provides ultra precise synchronization. Has manual sync for use *anywhere* in the world. MFJ-890 is not a beacon receiver that receives beacons directly.

The MFJ-890 is a self-contained stand-alone unit. It requires no antenna and no connection to your transceiver or receiver. 6¾Wx5¼Hx3D in. Use 12 VDC or 110 VAC with optional MFJ-1312D, $14.95.

Free MFJ-890 Instruction Manual

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Protected by MFJ's famous *No Matter What™* one year limited warranty. MFJ will repair or replace (at our option) your MFJ-890 *no matter what* for one full year.

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(Keyboard, paddle not included.)

Plug this new MFJ CW Reader with built-in Keyer into your transceiver's speaker/phone jack and key jack.

Now you're ready to compete with the world's best hi-speed CW operators – and *they won't even know you just passed the code test!*

Sends and Reads 5-99 WPM. Automatic speed tracking. Large 2-line LCD shows send/receive messages. Use single or iambic paddle or computer keyboard. Easy menu operation. Front panel speed, volume controls. 4 message memories, type ahead buffer, read again buffer, adjustable weight/sidetone, speaker. RFI proof.

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http://www.mfjenterprises.com for instruction manuals, catalog, info

calls, busted calls, busted serial numbers, and calls not appearing in the other station's log. Thanks to Bruce, WT4I, for an excellent software suite which has made the log-checking end of contest administration almost enjoyable (I said *almost*).

As many of you know, the 2002 WPX was my last one as its director. It has been my pleasure to serve you for the last 20 years. The WPX contests have a very loyal following, and to you I say thank you for your support. Steve Merchant, K6AW, will be taking over starting with the 2003 WPX SSB Contest. I'm very confident that he will bring some fresh ideas to the contest and will do an excellent job.

A big thanks as always to those who participate. You are the contest. With over 4000 calls worked 20 or more times, there were lots of stations active. Without your support, the contests would not be nearly as much fun. Each year brings out some nice DX and a host of special prefixes and contest expeditions. While you don't have to have a special prefix to have fun (and be a multiplier), it sure makes it fun for the rest of us to work the DX and the exotic prefixes. Thank you.

Check out the expanded WPX contest results section on the CQ website <www.cq-amateur-radio.com> for some additional WPX-related items. You will find some material that is no longer in the magazine, as well as additional material that has been added. Your comments on the content and suggestions for future use of this resource are appreciated.

The 2003 WPX CW Contest will be held on 24 and 25 May. Mark your calendars and enjoy the contest. If you have not tried the WPX, this is the perfect opportunity. Cabrillo logs should be sent to <wpxcw@kkn.net>. Check the WPX contest website at <http://home.woh.rr.com/wpx/> for more log information. Questions pertaining to the WPX contest may be sent to <K6AW@cqww.com>. See you in the contest!

73, Steve, N8BJQ

QRM

I used the Chilean special prefix 3G1X. My home call is XQ1IDM....**3G1X**. Great high band conditions, but no one on the low bands....**6Y2A**. A6 and OD are my new ones, vy hpi! Am JA's 3rd class licensed, only 10W output and using whip ant. Up abt 13mh, tnx 4 ur works....**7K2PBB**. On business trip in Algeria. Operation was only possible after working hours. Weekend here is Thursday–Friday. Bands open to Europe 24 hrs a day. Fantastic, even if I had only wire antennas. I hope I gave a new multiplier/country to a few needy ones....**7XØDX**. Equipment worked well all contest, but can't say that for propagation! All U.S. stations were worked skewed path to Central America! Seems we are going out of DX propagation on 10 meters soon! Tnx to all who give me points!....**9A5Y**. Fifteen meters was open the full 48 hours!....**9HØA**.

My first CW contest going solo. Dabbled in the contest, yet enjoyed my time. Never heard code at such rates. Worked in search and pounce mode. Surprised at what 3 watts and a long wire can do! Wished that the runners would vary speed occasionally.... **AA3WI**. My first go at WPX. Friday evening conditions were pretty hot on 15 and 20 meters. Saturday was not so hot. Slow going, and hard-earned QSOs. Sunday was somewhat better for working stateside sta-

CW & SSB CLUB COMPETITION

NORTHERN CALIFORNIA CONTEST CLUB	**253,543,497**
POTOMAC VALLEY RADIO CLUB	**150,471,922**
BAVARIAN CONTEST CLUB	123,252,416
FRANKFORD RADIO CLUB	107,268,452
SLOVENIA CONTEST CLUB	104,666,915
FLORIDA CONTEST GROUP	99,777,113
CONTEST CLUB FINLAND	97,777,684
YANKEE CLIPPER CONTEST CLUB	87,493,882
URAL CONTEST GROUP	79,308,129
RHEIN RUHR DX ASSOCIATION	79,104,666
RUSSIAN CONTEST CLUB	74,776,194
SOCIETY OF MIDWEST CONTESTERS	69,919,662
KAUNAS UNIVERSITY OF TECHNOLOGY RADIO CLUB	61,558,302
TUPY DX GROUP	51,401,115
ARAUCARIA DX GROUP	50,050,466
MARCONI CONTEST CLUB	45,943,583
YU CONTEST CLUB	42,803,498
CROATIAN CONTEST CLUB	40,962,009
SOUTH EAST CONTEST CLUB	38,784,853
KIEV CONTEST GROUP	38,446,798
SOUTHERN CALIFORNIA CONTEST CLUB	37,291,328
HA DX CLUB	36,165,223
LES NOUVELELS DX GROUP	35,649,120
SARAJEVO CONTEST GROUP	34,238,870
LITHUANIAN DX GROUP	30,613,581
BASHKIRIAN DX CLUB	29,277,133
URE	29,138,198
WORLD WIDE YOUNG CONTESTERS	27,209,292
APHRODITE CONTEST GROUP	25,368,383
UKRAINIAN CONTEST CLUB	24,899,573
SOUTHWEST OHIO DX ASSOCIATION	24,614,384
CENTRAL TEXAS DX AND CONTEST CLUB	24,307,081
NORTH TEXAS CONTEST CLUB	23,387,228
BC DX CLUB	22,127,905
SP DX CLUB	20,958,845
SOUTHERN CROSS DX GROUP	20,337,729
WILLAMETTE VALLEY DX CLUB	20,178,691
LATVIAN CONTEST CLUB	18,772,677
SHAKHAN CONTEST CLUB	18,472,116
TENNESSEE CONTEST GROUP	16,871,516
MAD RIVER RADIO CLUB	16,437,730
NORTH COAST CONTESTERS	15,766,974
TOP OF EUROPE CONTESTERS	14,125,579
CONTEST CLUB SLOVENIA	12,881,013
OKLAHOMA DX ASSOCIATION	12,769,297
GRAND MESA CONTESTERS OF COLORADO	12,535,817
TEXAS DX SOCIETY	11,866,128
CRIMEAN CONTEST CLUB	11,472,232
CROATIAN DX CLUB	11,313,158
SKY CONTEST CLUB	11,234,105
WESTERN WASHINGTON DX CLUB	10,581,935
GRUPO ARGENTINO DE CW (GACW)	10,470,104
CENTRAL ARIZONA DX ASSOCIATION	9,738,105
VRHNIKA CONTESTERS	9,735,548
Z30M CONTEST TEAM	9,234,792
CZECH CONTEST CLUB	9,045,959
RADIO CLUB ARGENTINO	8,597,839
CHILTERN DX CLUB	8,050,251
SRR	6,988,922
MOSCOW CONTEST CLUB	6,459,353
ALGARVE DX GROUP	6,226,788
CENTRAL SIBERIA DX CLUB	6,152,897
UA2 CONTEST CLUB	6,151,061
EASTERN IOWA DX ASSOCIATION	6,134,556
UNION FRANCIASE DES TELEGRAPHISTES	6,029,398
KANSAS CITY DX CLUB	5,641,349
MINNESOTA WIRELESS ASSN	5,329,516
LYNX DX GROUP	4,608,061
CAROLINA DX ASSOCIATION	3,936,764
LU-CG	3,883,509
NOSTA	3,672,351
UDXC	3,438,981
GUARA DX GROUP	3,084,725
ODESSA CITY YOUNG RADIOAMATEUR CLUB	2,795,370
HSDXA	2,733,360
CONTEST CAMBRIA	2,730,336
A.R.I.	2,686,528
NORTHERN NEW YORK CONTEST CLUB	2,510,779
BSB - DX GROUP	2,499,895
FOX CONTEST CLUB	2,462,671
SP CONTEST CLUB	1,987,759
MACEDONIA CONTEST TEAM	1,702,792
VOJVODINA CONTEST CLUB	1,566,674
ROCHESTER (NY) DX ASSN.	1,409,610
KENTUCKY CONTEST GROUP	1,323,076
RYAZAN	1,220,764
VLADIMIR RADIOCLUB	1,213,382
OBNINSK "QRU" CLUB	1,074,083
IVANOVO'S DX CLUB	1,026,660
WEST PARK RADIOPS	736,900
YV DXPERTS TEAM	708,496
RADIO CLUB TANDIL	634,900
CENTRAL SIBERIA DX CLUB	603,424
CENTRAL SIBERIA DX CLUB	603,307
LOW LAND CRAZY CONTESTERS	381,955
RADIOCLUB MAIKOP	158,569
KRASNOYARSK	129,602
BERGEN A.R.A.	109,306

CQ WW WPX CW CONTEST
ALL-TIME RECORDS

The contest is held each year on the last full weekend of May. The All-Time Records will be updated and published annually. Data following the calls: year of operation, total score, and number of prefix multipliers.

WORLD RECORD HOLDERS
Single Operator

1.8	IH9/OL5Y('98)	341,068	182
3.5	EA8/OH2KI('96)	1,358,852	347
7.0	LU1IV('97)	7,671,456	702
14	EA9LZ('98)	5,708,498	758
21	A45XR('99)	6,557,697	843
28	ZX5J('02)	6,787,440	857
AB	P4ØW('94)	14,168,115	845

Multi-Operator Single Transmitter

P49V('01)	19,760,774	1034

Multi-Operator Multi-Transmitter

HC8N('99)	54,697,072	1264

U.S.A. RECORD HOLDERS
Single Operator

1.8	K1ZM('95)	40,446	107
3.5	K1ZM('93)	406,080	288
7.0	KI1G('96)	2,573,408	587
14	K2VV('01)	3,523,488	762
21	NU5A('99)	4,411,299	789
28	WW4M('01)	2,547,046	674
AB	AJ1I('01)	8,213,226	849

Multi-Operator Single Transmitter

KM9P('01)	10,691,724	964

Multi-Operator Multi-Transmitter

KM3T('01)	21,103,320	1110

CLUB RECORD
Northern Calif. Contest Club('02).....250,320,141

WPX (Prefix) RECORD
HC8N('99).....1264

QRP/p RECORD
P4ØW('97).....4,018,208

CONTINENTAL RECORD HOLDERS

AFRICA

1.8	IH9/OL5Y('98)	341,068	182
3.5	EA8/OH2KI('96)	1,358,852	347
7.0	EA9AZ('01)	4,212,447	547
14	EA9LZ('98)	5,708,498	758
21	5X1Z('01)	6,362,352	782
28	ZS4TX('01)	4,602,028	722
AB	3V8BB('01)	13,639,976	908

ASIA

1.8	4X4NJ('96)	259,420	170
3.5	5B4/UA9YAB('01)	1,332,058	338
7.0	9K2ZZ('94)	3,383,676	487
14	4Z6DX('91)	4,614,030	743
21	A45XR('99)	6,557,697	843
28	HZ1AB('02)	3,669,994	659
AB	P3A('01)	10,723,620	870

EUROPE

1.8	SP5GRM('97)	249,516	261
3.5	LY2BTA('96)	967,974	399
7.0	UA6LAM('96)	3,760,164	701
14	CT2A('95)	4,231,598	826
21	9HØA('02)	5,389,008	933
28	9HØA('01)	3,965,315	841
AB	OHØZ('00)	7,240,444	893

NORTH AMERICA

1.8	VA1A('99)	103,680	120
3.5	FM5BH('97)	833,490	315
7.0	V26BA('97)	6,227,550	659
14	FM5BH('98)	4,642,866	762
21	ZF1A('99)	5,330,129	799
28	FM5GU('01)	2,849,769	621
AB	WP2Z('99)	12,506,280	890

OCEANIA

1.8	KX6DC('88)	12,240	45
3.5	KX6DC('89)	258,258	143
7.0	ZM1A('98)	5,144,480	592
14	N6VI/KH7('95)	3,103,932	606
21	KH6ND('99)	6,107,256	813
28	KH6ND('00)	1,523,008	424
AB	KH6ND('02)	7,996,774	862

SOUTH AMERICA

1.8	YV1OB('86)	11,550	35
3.5	YX3A('89)	1,004,060	305
7.0	LU1IV('97)	7,671,456	702
14	YW1A('91)	4,617,456	732
21	PU3A('02)	5,746,284	813
28	ZX5J('02)	6,787,440	857
AB	P4ØW('94)	14,168,115	845

MULTI-OPERATOR SINGLE TRANSMITTER

AF	3V8BB('02)	19,041,135	1065
AS	P3A('02)	18,176,342	1046
EU	9A7A('01)	10,915,020	1044
NA	8P4A('02)	18,516,960	1056
OC	AH2R('01)	11,541,420	957
SA	P49V('01)	19,760,744	1034

MULTI-OPERATOR MULTI-TRANSMITTER

AF	6V6U('97)	9,938,896	758
AS	A61AJ('02)	42,766,232	1244
EU	4OØA('00)	20,932,902	1143
NA	6Y2A('02)	38,821,328	1274
OC	KH7R('97)	11,760,354	822
SA	HC8N('99)	54,697,072	1264

QRPp

AF	5Y4FO('92)	649,057	311
AS	ZC4BS('02)	2,515,388	521
EU	LY5A('01)	2,331,414	646
NA	TI5X('01)	2,568,470	615
OC	FO8JP('86)	572,131	259
SA	P4ØW('97)	4,018,208	632

tions, but DX was still rather tough....**AGØT**. Thanks to Rich, KL7RA, for the hospitality to let us explore all kinds of interesting Alaska propagation phenomena. Slow start, but good pile-up Sunday morning....**AL7NJ**. Did 15 meters last year, so 10 meters was the choice this year. Condx into U.S. very poor the whole weekend. Worked only a few southern U.S. Was it a CQ contest? Yes, it was, called 2724 times CQ!!!....**DK2GZ**.

Very pleased to have put the very old and rare in contest French prefix F3 in WPX. It has been the first time in years. The last F3 prefixes were issued in the early '50s.... **F3GJ**. This really is the best contest of the year with plenty to work at all times of the night and day. The bands were not quite as good as last year, although most bands showed activity through the night. Good evidence of greyline DX and 10 meters was open and active....**G3OOU**. WPX CW is always a great opportunity for those chasing in-year CW band points to fill in a number of new slots as well as to work some new prefixes.... **G3TXF**. I QRV on 160 meters single band. The condition was very poor on 160, so I could not hear DX stations' signals. I could QSO with only JA stations. Same-country QSO point is very useful in this condition. I hope to up the activity in off season on 160 meter

CONTINENTAL LEADERS

AFRICA

1.8	No Entry	
3.5	ZS4TX	43,758
7	No Entry	
14	*CT3KN	1,763,310
21	*EA8FT	1,581,235
28	*EA9AZ	1,551,560
AB	*7XØDX	1,024,500

ASIA

1.8	JE1SPY	1
3.5	RK9AY	137,522
7	UA9CI	1,965,529
14	RJ9J	2,593,764
21	9K9O	4,297,504
28	HZ1AB	3,667,994
AB	P3F	10,127,064

EUROPE

1.8	RN2FA	242,000
3.5	RV2FW	760,886
7	9A5E	2,535,820
14	OH4A	3,152,848
21	9HØA	5,389,008
28	9A5Y	1,486,327
AB	SN7Q	6,634,037

NORTH AMERICA

1.8	No Entry	
3.5	W7DRA	6,837
7	W3BGN	1,683,990
14	FM5GU	3,117,520
21	ZF1A	4,852,224
28	KW4CW	1,034,346
AB	FM5BH	8,270,112

OCEANIA

1.8	No Entry	
3.5	No Entry	
7	*YC1VBH	39,156
14	*VK4DX	1,623,804
21	No Entry	
28	*VK4TT	409,165
AB	KH6ND	7,996,774

SOUTH AMERICA

1.8	No Entry	
3.5	*PY7ZY	152,581
7	YW1D	2,860,110
14	PY2NY	2,282,160
21	PU3A	5,746,284
28	ZX5J	6,787,440
AB	P41P	12,230,052

MULTI-OPERATOR SINGLE TRANSMITTER

AF	3V8BB	19,041,135
AS	P3A	18,176,342
EU	AM6IB	9,164,650
NA	8P4A	18,516,960
OC	4D1Q	666,328
SA	L75FM	8,491,920

MULTI-OPERATOR MULTI-TRANSMITTER

AF	No Entry	
AS	A61AJ	42,766,232
EU	ES9C	17,464,886
NA	6Y2A	38,821,328
OC	ZL6QH	4,057,432
SA	ZX3S	3,610,240

**Low Power*

The ops at TI5N (QRP, Multi-Multi). Left to right: W8QZA, CX6VM, TI5KD, NØKE, and W1XE.

band....**JE1SPY**. The maximum output power in the contest was 5 watts. Went to a park on top of a hill by bicycle. Had to go home early in the afternoon due to a closing in thundercloud....**JR1NKN**.

Used an Elecraft K2 set at 4.9 watts. After years of QRO, this is the first contest I entered using QRP. Just casually operating, I was amazed at how many stations came back to me on the first call. Enjoyed the contest and had lots of fun....**K6SE**. I love this test! Working everybody is great! 100W and a gp vertical is tough plowin' from the west coast. Still a ton of fun and still worked A61AJ for a new one on CW!....**K7VI**. I started the contest with two broken amplifiers and one broken 20 meter antenna. Fortunately, nothing else broke until 9 days after the contest when a lightning strike took out the rest of my station. I really enjoyed my first low power entry in this contest ....**KK9A**. Great to get activity from the Middle East in this one; A61AJ had a local sounding signal on 20 and 15, but ET3PMW was just a whisper. Still loads of fun as always!.... **KS7T**. I just got my new call (ex-K8EP) for my location here in VT. Ten meters never opened to shape, just opened late to EU both days. Seemed like U.S. participation was down bit. Always amazes me what great DX calls you when you CQ in these things. Congrats to 6Y2A....**N1UR**.

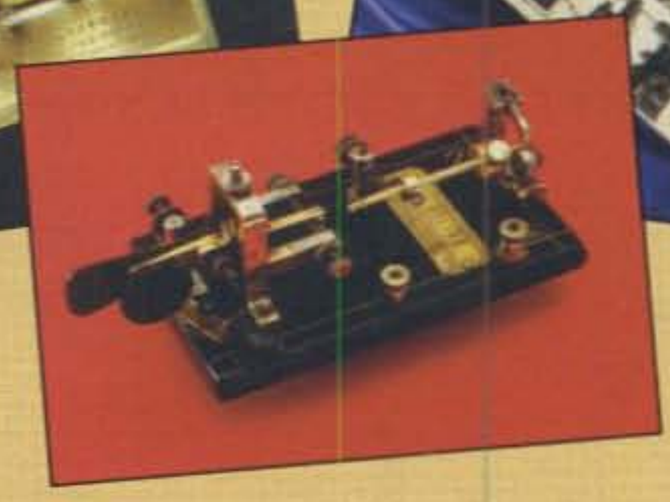
Variable propagation made the contest interesting....**N7IR**. I tried it this year without the packet cluster. I felt so alone!!!....**NY4I**. Fifteen meters was magnificent since the beginning of the contest and there were loads of stations to work. I was thrilled to work KH6ND and two Alaskan stations with too much ease! I only operated 16:5 hours and that's why the small number of Q's ....**SV1DKL**. First attempt from Asia on the island of Bozcaada (AS-099). There were some problems with power electricity on the island and I was out of the contest for 3.5 hours. Anyway, I enjoyed the contest. 73 to all....**TAØ/Z37M**. Thanks to Keko (TI5KD) for hosting our first QRP multi-multi effort. We were pleased with our results, despite the problem with solar activity. Some highlights were working A61AJ on 40 through 10, YI9OM on 20 and 15, and SM5CEU, RV2FV, and WL7E on 80 meters....**TI5N**. Just getting going, visitors arrived, got rid of visitors and flu arrived, no more contest. Couldn't hear CW for coughing and sneezing hi hi ....**VK5GN**. Condx better than expected . . . still got to play golf with K2TW on Saturday....**W3BGN**. Spent a lot of time reading N8NR's old ham magazine collection while pushing the CQ button. Ten meters let us down this year....**WO8CC**. Vy poor antenna equals poor results, hi hi. Will try better next year....**YC1VBH**. Eighty meters is not the most favourable band for contesting from Africa, but it sure is fun!....**ZS4TX**.

The impressive antenna farm at AY8XW, a Multi-Single entry from Argentina.

(Continued on page 106)

CQ 2003 calendars

10th Anniversary



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Ten meters wasn't too good for the 2002 CW weekend of the CQ WW WPX Contest. An interesting event happened in the ionosphere and kept 10 meters from opening as it did in 2001. K9LA explains what happened, why it happened, and why the WWV numbers didn't predict it.

What Happened to 10 Meters During WPX CW 2002?

BY CARL LUETZELSCHWAB,* K9LA

In 2001, operating as WW4M, Bill Tippett, W4ZV, set the USA record for single-op single-band on 10 meters in the CQ WW WPX CW Contest. For the 2002 contest he was hoping to break that record, because forecasted WWV numbers indicated much higher flux levels and similar *K*-indices compared to the previous year. However, 10 meters wasn't very cooperative in 2002. It never opened directly to Europe on Saturday, long path to JA in the morning was extremely weak, and Sunday was even worse.

Fig. 1 shows Bill's rate (QSOs per hour) for 2001 and 2002 from the start of the contest (Friday evening) until just before noon on Saturday. It's quite obvious that 2002 just wasn't producing the Qs as 2001 did.

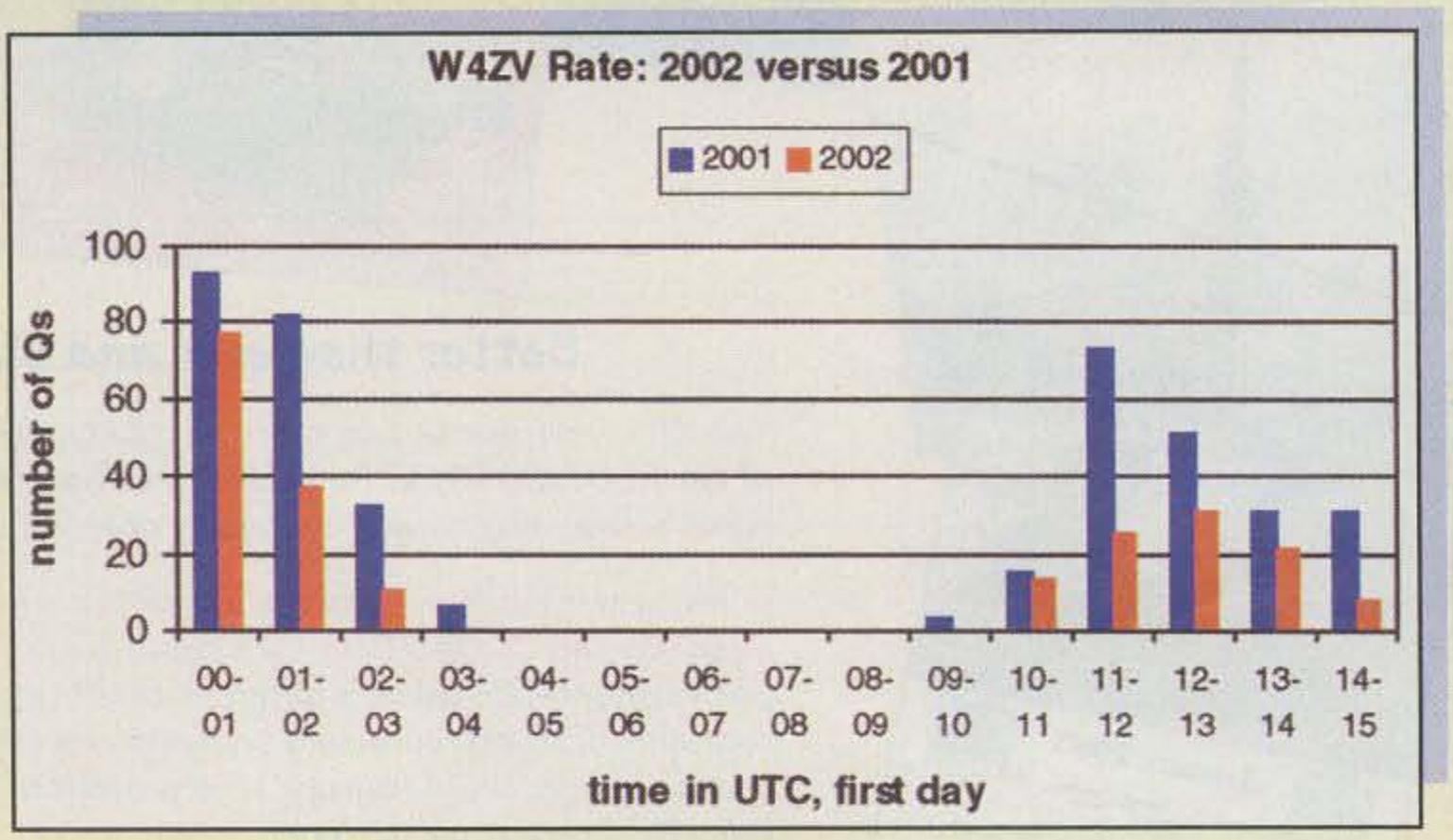

Fig. 1– WW4M rate (W4ZV op.), 2002 versus 2001.

What Happened?

To see what happened, let's look at ionosonde data (reference 1) from stations along the path from W4ZV's QTH to Europe. Fig. 2 is an azimuthal equidistant map (from DXAID software by Peter Oldfield) centered on W4ZV's QTH at 1400 UTC on the first day of the 2002 contest.

The auroral oval is for a *K*-index of 1 (a quiet geomagnetic field). Great circle paths out of W4ZV are straight lines on this map.

Three ionosonde stations are shown on the map: Wallops Island (VA), Goose Bay (Labrador), and Sondrestrom (Greenland). Wallops Island is along the path to EA, I, and SU. Goose Bay is along the path to Scandinavia and western European Russia. Sondrestrom is along the path to eastern European Russia and VU.

*e-mail: <k9la@arrl.net>

Fig. 3 shows *F2*-region critical frequency data for the three stations. The tic marks along the x-axis in fig. 3 (and in all subsequent figures) are in 2-hour increments.

The *F2* region critical frequency, *foF2*, is the highest frequency sent straight up (vertical incidence) that is returned to Earth. Any higher frequency goes through the *F2* region. The value of *foF2* directly indicates the amount of ionization in the *F2* region—a higher *foF2* means more ionization.

As can be seen, *foF2* at Wallops Island was higher on the first day of the contest in 2002 than in 2001, and was lower on the second day of the contest in 2002. At both Goose Bay and Sondrestrom, *foF2* was about the same on the first day for both years and was lower on the second day in 2002.

This suggests that, at least on the first day, 10 meters should have been just as good in 2002 as in 2001. However, it wasn't, so we need to dig a bit deeper. What we'll look at next is the height of the maximum electron density, *hmF2*, in the *F2* region. The parameter *hmF2* is not directly measured by an ionosonde; it comes from a best-fit calculation based on *foF2* and the ionosonde measurement of virtual height, along with the assumption of a parabolic *F2*-region electron density. Fig. 4 shows the *hmF2* data for all three stations.

Three important observations can be made with respect to the *hmF2* data.

The first observation is that the data was sparse in 2002, especially at Wallops Island and Goose Bay. This indicates something unusual might have been going on, which resulted in *hmF2* not being calculated.

The second observation is that on average, *hmF2* was higher in 2002 than in 2001. This has implications to the MUF (maximum usable frequency), as both the amount of ionization and the height of the ionization determine the MUF. More ionization increases the

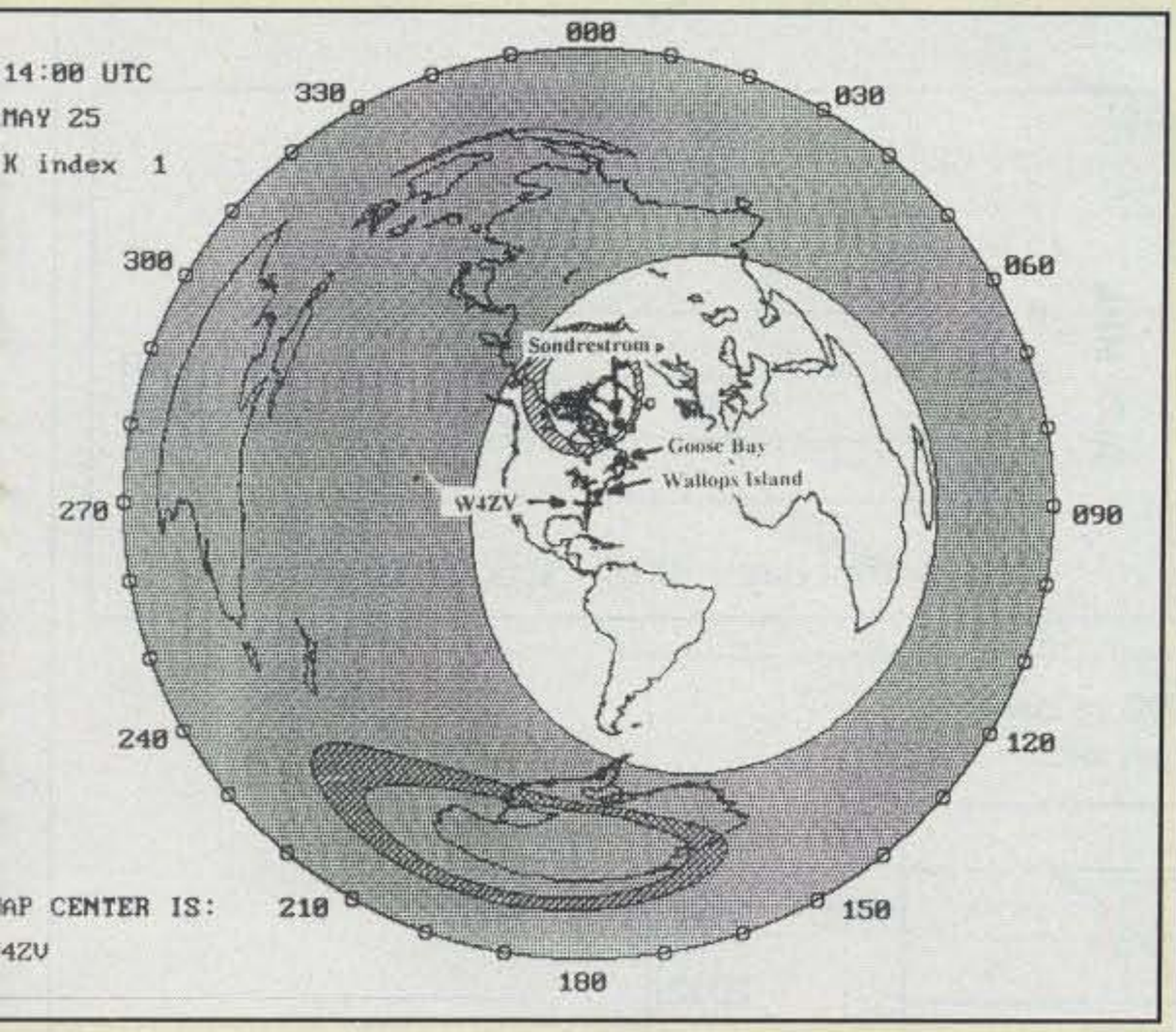

Fig. 2– W4ZV's QTH and the ionosonde stations.

MUF, but a "higher" ionosphere decreases the MUF (because the electromagnetic wave encounters the ionosphere at a larger angle of incidence—at less of a grazing angle).

Fig. 5 shows the MUF(4000)*F2* data (the MUF for a 4000 km *F2* hop) based on the Sondrestrom data. It is only shown for Sondrestrom simply because there was more height data available from that ionosonde than from the other two stations.

This data now makes sense when compared to what actually happened. In general, the MUF in the 2002 contest was at least several MHz lower than in the 2001 contest. This was more evident on the second day than on the first day. Apparently it was low enough to keep 10 meters from opening to Europe, but it wasn't low enough to affect 15 meters too much.

A comment is in order about this MUF data. It should be regarded as representative of what was happening at high latitudes. I am not implying that RF from W4ZV encountered the ionosphere right over Sondrestrom.

Now we know what happened: The MUF along the W4ZV-to-Europe path was lower in 2002 than in 2001.

Why Did It Happen?

The third observation with respect to the *hmF2* data gives us a clue as to why it happened. Note that the *hmF2* data in fig. 4 is more cyclic in nature in 2002 (best seen in the Sondrestrom data). The Sondrestrom MUF(4000)*F2* data of fig. 5 also shows this. All of this suggests that an atmospheric gravity wave caused a traveling ionospheric disturbance.

An atmospheric gravity wave (AGW) is a freely propagating wave in the neutral atmosphere, and the two dominant forces are gravity (acting downward) and buoyancy (acting upward). The ionospheric manifestation of an AGW is a traveling ionospheric disturbance (TID).

AGWs propagating in the ionosphere are categorized according to the periodicity and horizontal speed of the TID. From fig. 5, this one had a period of several hours. This puts it in the "large-scale" category, defined as a periodicity of an hour to several hours and a horizontal speed of approximately 300m/sec or higher. The source of a large-scale AGW is primarily thought to be an energetic event in the auroral oval.

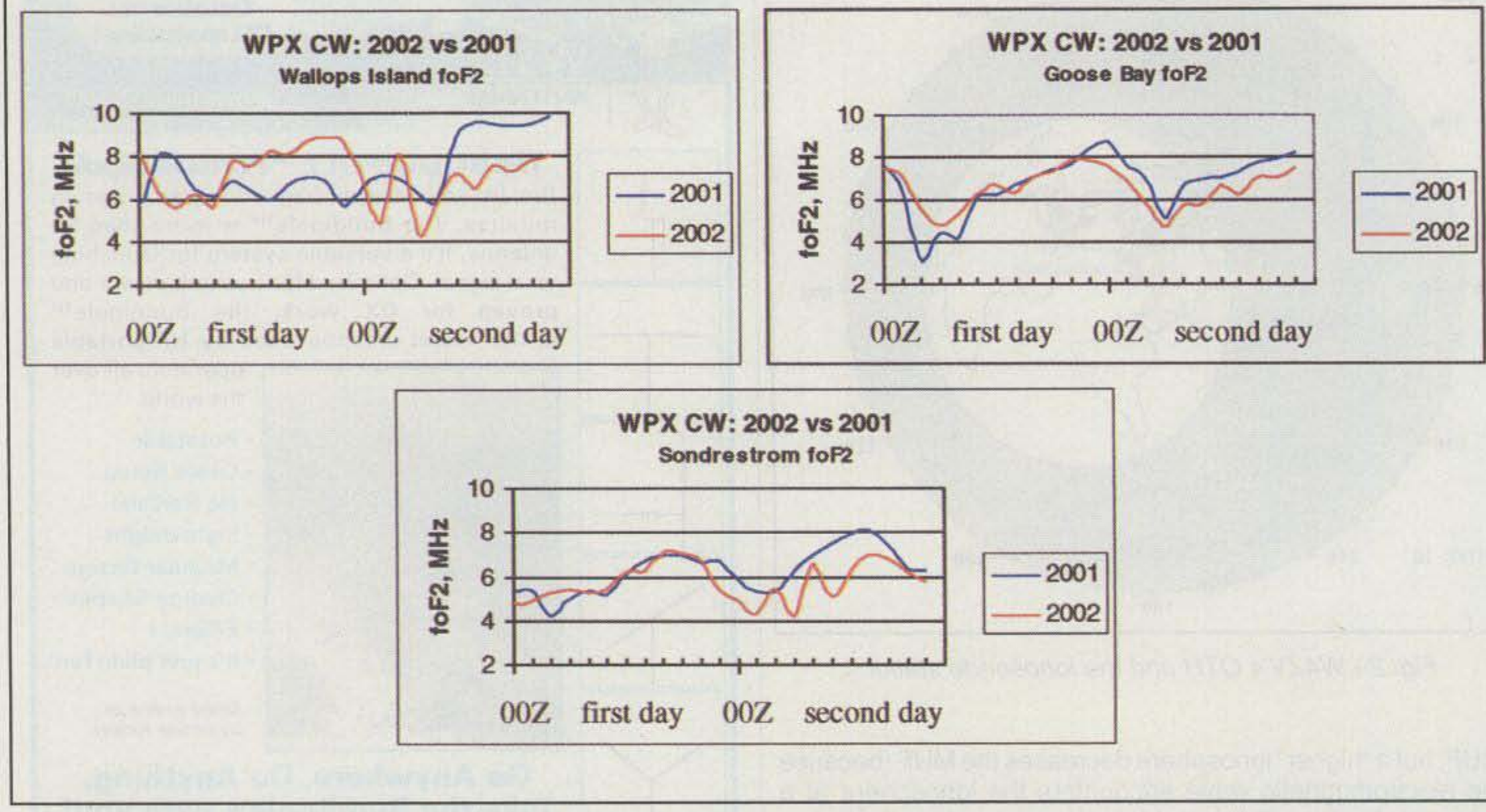

Fig. 3– Wallops Island, Goose Bay, and Sondrestrom foF2 data.

The resulting TID propagates toward the equator and can do so for thousands of kilometers. For more reading on AGWs and TIDs, see references 2, 3, and 4 (three of many papers about AGWs and TIDs).

Since the source is thought to be an energetic auroral event, fig. 6 shows the *K*-index from the Ottawa (Canada) observatory (along the path from W4ZV to Europe) starting several days before the contest for both years. The contest periods are annotated as "1st day" and "2nd day."

In 2001 the *K*-index was mostly 2 and below, with several excursions to 3 and 4 throughout the days before the contest and during the contest. For all intents and purposes, the geomagnetic field was relatively quiet.

However, 2002 was a different story. Although the contest period in 2002 appeared to be a bit quieter (geomagnetically-speaking) compared to 2001, there was a 12-hour period before the 2002 contest (specifically 0900 UTC to 2100 UCT on May 23) in which the 3-hour *K*-indices hit 6, 7, 6, and 5. A check of the USAF/NOAA Report of Solar and Geophysical Activity for May 23 indicated that two shock waves were detected by the ACE (Advanced Composition Explorer) spacecraft. These were believed to come from the multiple CMEs (coronal mass ejections) that occurred on the sun the previous day.

The first shock resulted in the solar wind speed jumping from 400 to 600 km/sec, and this caused a sudden impulse of 87 nT (nanoTeslas) on the Boulder magnetometer at 1051 UTC. The second shock, boosting solar wind speeds to near 1000 km/sec, caused a 26 nT sudden impulse on the Boulder magnetometer at 1545 UTC.

Now we know why this happened: The sudden impulses due to the shock waves caused an energetic auroral event that generated an atmospheric gravity wave, and that resulted in the traveling ionospheric disturbance seen in the *foF2, hmF2,* and MUF(4000)*F2* data.

What Did the WWV Numbers Say?

Table I shows the numbers reported by WWV for the two contest dates:

The 10.7 cm solar flux was considerably higher and the *A*-indices were a bit lower in 2002. From this data, one would have expected that 10 meters in 2002 would have been at least as good as (or maybe even slightly better than) 2001. As we've seen, though, it wasn't.

Why didn't the WWV numbers catch this? The problem with 10.7 cm solar flux and the *A*-index is that they are coarse indicators of propagation. They lack any detailed insight into the range of ionospheric processes involved in HF propagation (especially with respect to short-term issues). Let's take a closer look at both of these measurements.

10.7 cm Solar Flux

10.7 cm solar flux (measured daily at Penticton, British Columbia) is at a wavelength that is about 1 million times short of the energy needed to ionize any atmospheric constituent. Thus, it has nothing to do with the ionization process. That's the bad news. The good news is:

1. It is an objective measurement (using a dish and a 2800 MHz receiver) rather than a subjective measurement (like counting sunspots and trying to determine the impact of a small group

Date	10.7 cm solar flux	Boulder *A*-index
May 26, 2001	147	10
May 27, 2001	147	05
May 25, 2002	189	03
May 26, 2002	189	09

Table I– Ottawa K-indices.

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SS-12	10	12	1⅜ x 6 x 9	3.4
SS-18	15	18	1⅛ x 6 x 9	3.6
SS-25	20	25	2⅞ x 7 x 9⅝	4.2
SS-30	25	30	3¼ x 7 x 9⅝	5.0

MODEL SS-25M

DESKTOP SWITCHING POWER SUPPLIES WITH VOLT AND AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SS-25M*	20	25	2⅞ x 7 x 9⅝	4.2
SS-30M*	25	30	3¼ x 7 x 9⅝	5.0

MODEL SRM-30

RACKMOUNT SWITCHING POWER SUPPLIES

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25	20	25	3½ x 19 x 9⅝	6.5
SRM-30	25	30	3½ x 19 x 9⅝	7.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M	20	25	3½ x 19 x 9⅝	6.5
SRM-30M	25	30	3½ x 19 x 9⅝	7.0

MODEL SRM-30M-2

2 ea SWITCHING POWER SUPPLIES ON ONE RACK PANEL

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25-2	20	25	3½ x 19 x 9⅝	10.5
SRM-30-2	25	30	3½ x 19 x 9⅝	11.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M-2	20	25	3½ x 19 x 9⅝	10.5
SRM-30M-2	25	30	3½ x 19 x 9⅝	11.0

MODEL SS-12SM/GTX

MODEL SS-10EFJ-98

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ICOM IC-F11020 & IC-F2020
KENWOOD TK760, 762, 840, 860, 940, 941
KENWOOD TK760H, 762H
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MOTOROLA HIGH POWER SM50, SM120, & GTX
MOTOROLA RADIUS & GM 300
MOTOROLA RADIUS & GM 300
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VERTEX — FTL-1011, FT-1011, FT-2011, FT-7011

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SS-12MC
SS-10MG, SS-12MG
SS-101F, SS-121F
SS-10TK
SS-12TK OR SS-18TK
SS-10SM/GTX
SS-10SM/GTX, SS-12SM/GTX, SS-18SM/GTX
SS-10RA
SS-12RA
SS-18RA
SS-10SMU, SS-12SMU, SS-18SMU
SS-10V, SS-12V, SS-18V

*ICS – Intermittent Communication Service

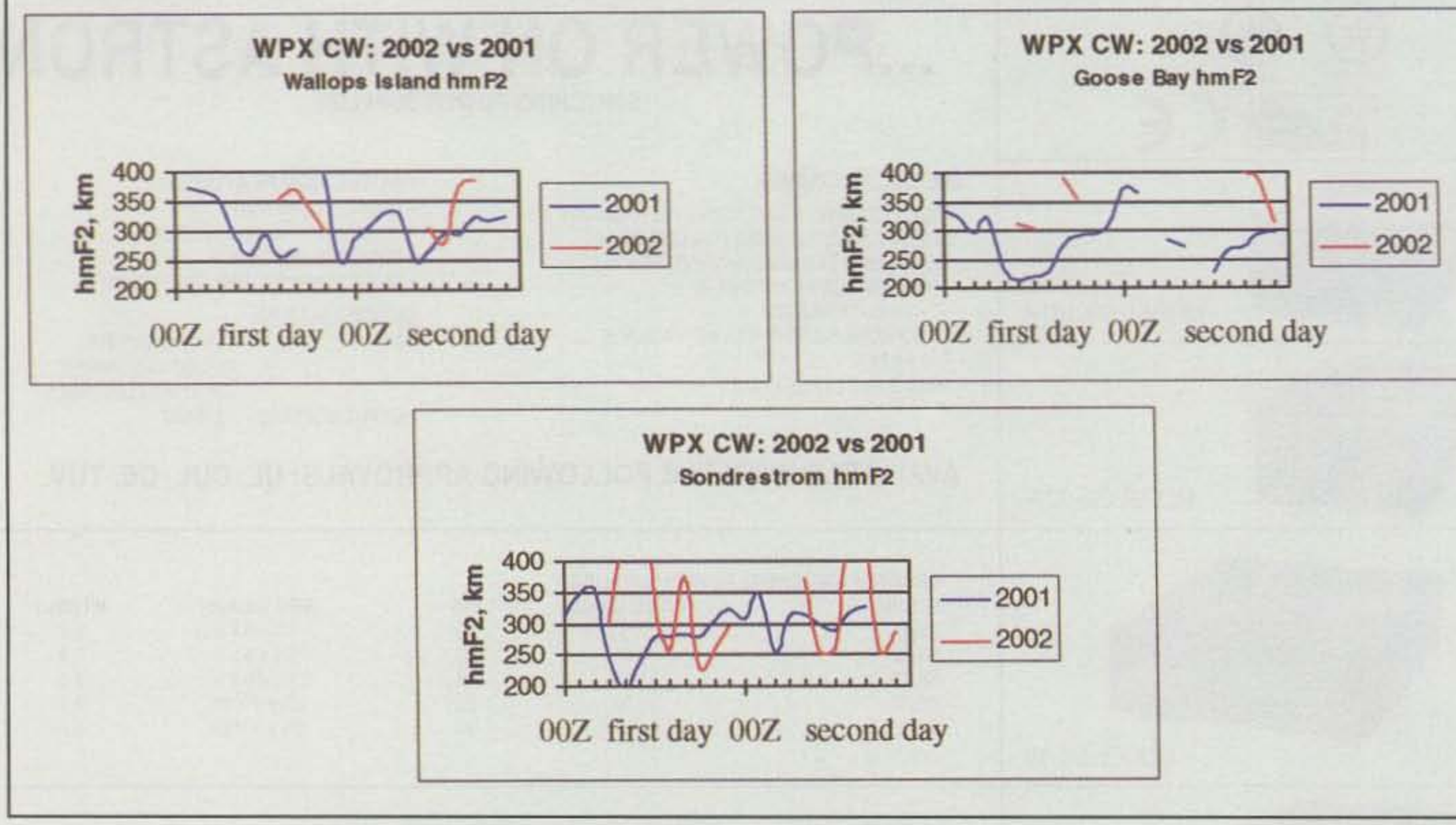

Fig. 4– Wallops Island, Goose Bay, and Sondrestrom hmF2 data.

of large sunspots versus a large group of small sunspots), and

2. The smoothed 10.7 cm solar flux (the 12-month running average) correlates very well with the smoothed sunspot number (the official measurement that defines solar cycles and the parameter for which our propagation prediction programs were set up). This is why our propagation prediction programs allow solar flux to be input – but it is intended to be the smoothed solar flux, not the daily solar flux from WWV. The value of 10.7 cm solar flux on a given day (and the daily value of the sunspot number, for that matter) does not correlate very well with what the ionosphere is doing on that given day.

A-index

The *A*-index is derived from a magnetometer record, which is a measurement of ionospheric currents around the 100 km level. Thus, it provides no direct indication of what's going on in the ionosphere at higher altitudes (the *F* region).

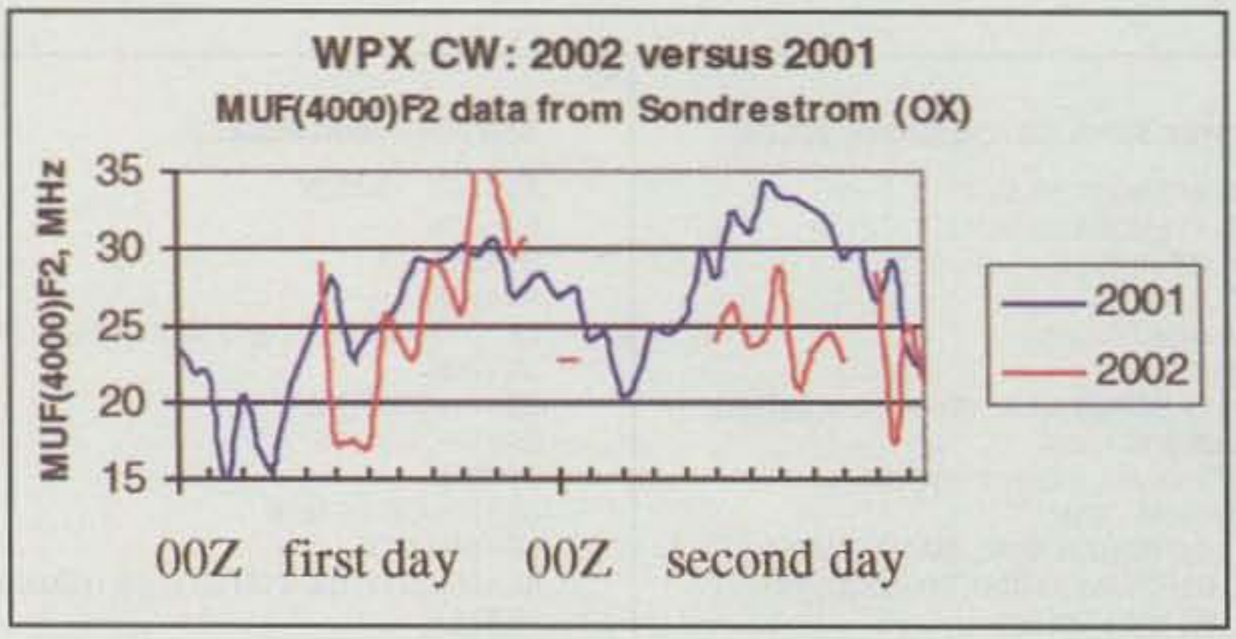

Fig. 5– Sondrestrom MUF(4000)F2.

There are two other issues that can lessen the value of the *A*-index as a propagation indicator.

First, the daily *A*-index is the average of the eight 3-hour *K*-indices, converted to a linear scale. Based on the *K*- indices in fig. 6, Ottawa would have reported an *A*-index of 34 on May 23, 2002. That doesn't tell us if the *A*-index was relatively constant at 34 for the entire day or if it was generally lower and a spike occurred (as what happened on May 23). In other words, a short -duration spike can get smoothed out a bit in the *A*-index calculation, but the impact of the spike on the ionosphere occurs nonetheless.

Second, *A*-indices from a mid-latitude station (such as Boulder) are due to weak return currents out of the high latitudes and may not show in detail all the activity that is going on at the higher latitudes.

Summary

We saw that 10 meters wasn't good in the WPX CW 2002 due to lower maximum usable frequencies caused by a traveling ionospheric disturbance. This was the result of the shock waves from multiple coronal mass ejections a couple of days before the contest. The shock waves did not trigger a full-blown geomagnetic storm, but they did just enough to keep 10 meters closed. The WPX CW 2002 is a good example of a traveling ionospheric disturbance generated in the auroral ionosphere propagating to mid latitudes to temporarily degrade HF propagation.

We also saw that the Boulder numbers didn't reflect this event. That's because 10.7 cm solar flux and the *A*-index are best considered as coarse indicators of HF propagation. They especially have a problem with short-term events, as they don't directly measure any ionospheric processes.

The moral to this story is that the WWV numbers only offer a rough approximation of propagation conditions,

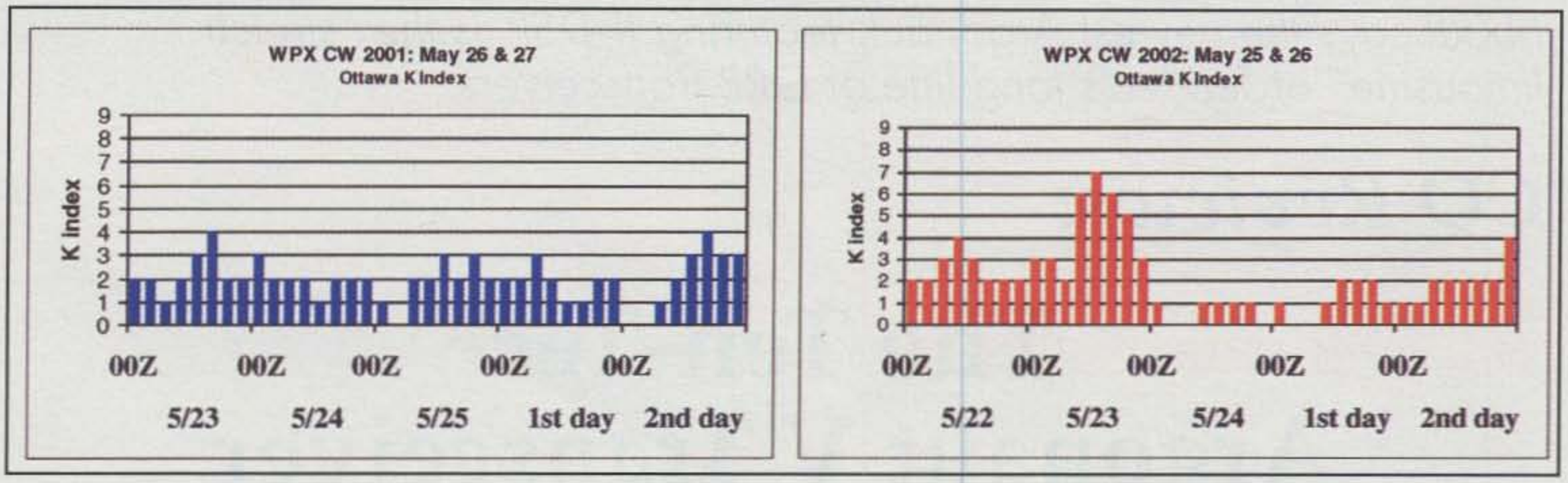

Fig. 6– Ottawa K-index 2001 and 2002.

and there is no substitute for on-air activity to determine actual propagation.

Acknowledgements

I'd like to thank Bill Tippett, W4ZV, for allowing me access to his WPX CW log data, and Bob Hunsucker, AB7VP, for his review of this article.

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N7RR says the newest Argonaut, featuring IF-DSP, is the "stretch limousine" of Ten-Tec's long line of QRP transceivers.

CQ Reviews:

The Ten-Tec Argonaut V Transceiver

BY BRUCE PRIOR,* N7RR

Factory-built multi-band, multi-mode QRP originated with Ten-Tec. The first Argonaut, Model 505, was an innovative honey, offering CW and SSB on five HF bands. The new Argonaut V transceiver features CW, SSB, AM, narrow-band FM, plus the new digital modes on the nine amateur bands from 1.8–29.7 MHz, and the 60 meter band will be added with a flash firmware revision downloaded via the internet whenever that band becomes available to American radio amateurs. For 10 meter NBFM repeater operation, CTCSS tone encoding is included. Oh yes: The receiver can be used for general coverage from 500 kHz to 30 MHz, including high-quality broadcast AM reception.

The Argonaut 505 wasn't exactly a backpacking rig, and neither is this brand-new model, but at only 5 pounds with its rugged steel cabinet, the Argonaut V packs a whole lot of radio into a low-profile enclosure. For most owners, this transceiver will be front-and-center at the main operating position, although it will also serve admirably for mobile, portable, and emergency operation. I'm sure that motel rooms and RV campgrounds will accommodate many an Argonaut V starting this summer and for years to come.

The rig puts out up to 20 watts of RF—way more than traditional QRP levels. Think of the Argonaut V as the Ten-Tec IF-DSP stretch QRP limousine. Power level is front-panel adjustable on the fly between 1 and 20 watts. The very legible LED frequency readout gives a resolution of 10 Hz in green numerals. The final 1 Hertz digit always reads zero; it is absent in AM mode. The tuning resolution is 500 Hz in NBFM mode and 100 Hz in AM mode. The tuning can be fine or coarse. Using coarse tuning in NBFM mode, the entire the entire range from 500 kHz to 30 MHz can be spanned in just over 102 revolutions. A faster method for making major frequency changes is to first use the band switch and then rotate the tuning knob in fast or coarse mode.

The heavy tuning knob feels like one you'd expect to find on a much larger base-station transceiver. The rig is easy to use. The many variable features of the Argonaut V are available from the front panel using 12 buttons and a special multifunctional rotary encoder control. The meter will measure

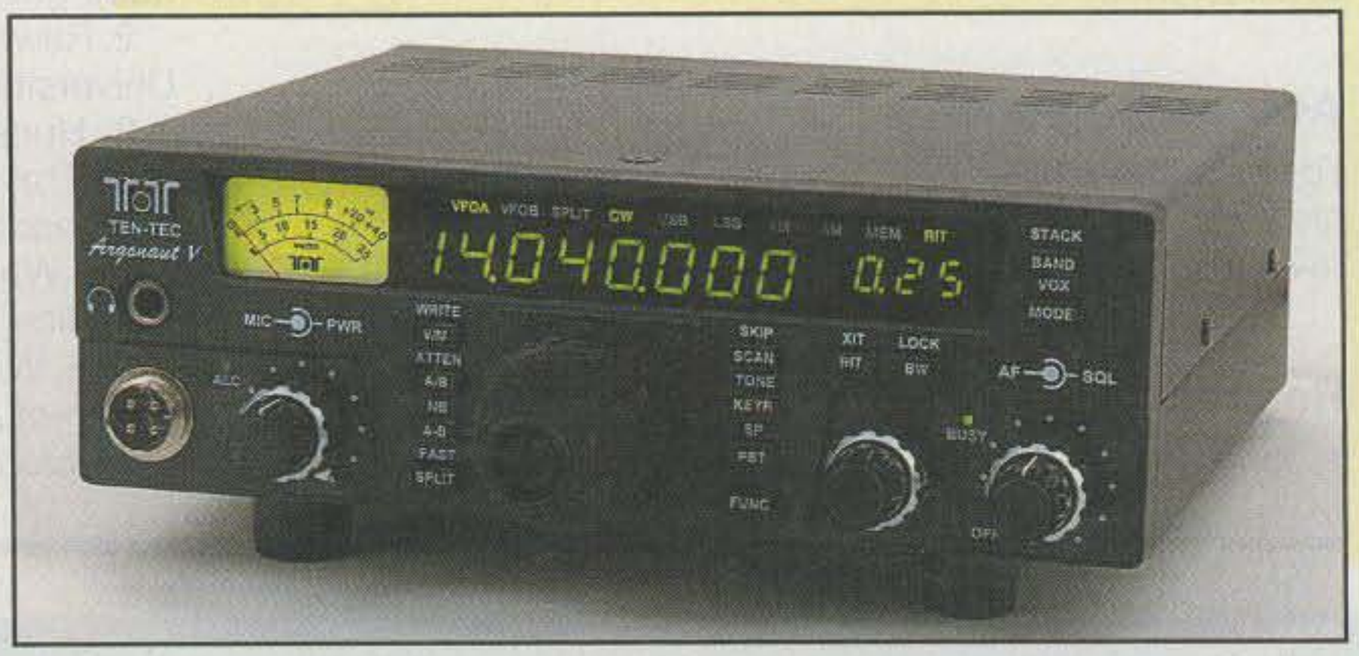

Photo A– The front panel of the Argonaut V consists of 12 buttons, two dual-concentric controls, two rotary encoders (including the main tuning control), a headphone jack, two LED indicator lights, a meter, and a three-part LED display.

receive signal strength, output power, reflected power, standing-wave ratio, and power-amplifier current. The output-power meter can also be scaled for 5 watts at full-scale for more accurate low-power measurement.

Like the Ten-Tec Pegasus and Jupiter transceivers, the Argonaut V is a flash firmware-defined transceiver with IF-stage digital signal processing. Numerous updates have become available for free downloading for the Pegasus and Jupiter (see <http://www.rfsquared.com>). Similar enhancements for the Argonaut V will be posted in the future. The IF-DSP circuitry makes wide-ranging filter settings possible from 200 Hz to 3 kHz on CW and SSB, and 400 Hz to 6 kHz on AM, and a fixed 15 kHz on NBFM. The IF-DSP also allows for an adjustable noise blanker and passband tuning. Two tunable PLL memories, each functioning for the operator like a VFO, can be used for split-frequency operation, including cross-mode and cross-band. Both RIT and XIT can range as widely as ± 9.99 kHz. It is possible to set different offset values simultaneously for RIT and XIT. The automatic loudness control is always in place, and makes for comfortable listening with earphones as well as with the built-in speaker. In any mode the Argonaut V sounds wonderful.

The 100 memory channels store emission mode, transmit and receive frequencies for split operation, bandwidth filter settings, and scanning-skip markers. Channels programmed for NBFM on 10 meters can also hold CTCSS subaudible

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tone frequencies in memory. The storage for these memories is part of the flash firmware system. Non-volatile operating parameters such as passband tuning and RIT, XIT, keyer, and VOX characteristics are stored in a separate EPROM. The *Operator's Manual* includes a detailed technical description and many sheets of circuit diagrams. The Argonaut V uses a 14.850 MHz reference oscillator to produce intermediate frequencies at 45 MHz, 450 kHz, and 14.5 kHz, which are used in both the transmit and receive circuit paths. The transmit/ receive switching is incredibly smooth. You'll never hear a mechanical relay when operating this rig. A combination of solid-state switching and analog-to-digital and digital-to-analog conversions which make the IF digital signal processing possible translate into a radio that is a joy to operate. There must be birdies somewhere in its tuning range, but I haven't found one yet.

The internal speaker on the Argonaut V is situated on the bottom of the enclosure. When the tilt bail is in the elevated position, the sound is directed toward the operator more effectively than with a typical top-firing speaker. The bottom speaker is also well situated for mobile operating, and the optional mobile bracket has a hole to accommodate its sound.

For phone modes, many operators will enjoy the VOX capability of the Argonaut V. Especially with a headset which combines microphone and earphones, VOX is a wonderful way to enjoy a natural conversation on the air. Our Heil Sound headset Ten-Tec adapter also allows Margaret and me to control transmit/receive switching with a footswitch. The same footswitch in CW emission mode makes for convenient, very-swift tuning with an LDG Electronics Z-11 Auto Tuner.

Optimized CW features such as a built-in iambic keyer for speeds from 5 to 50 WPM and smooth QSK have been traditional in Ten-Tec rigs for years. I like to adjust the trans-

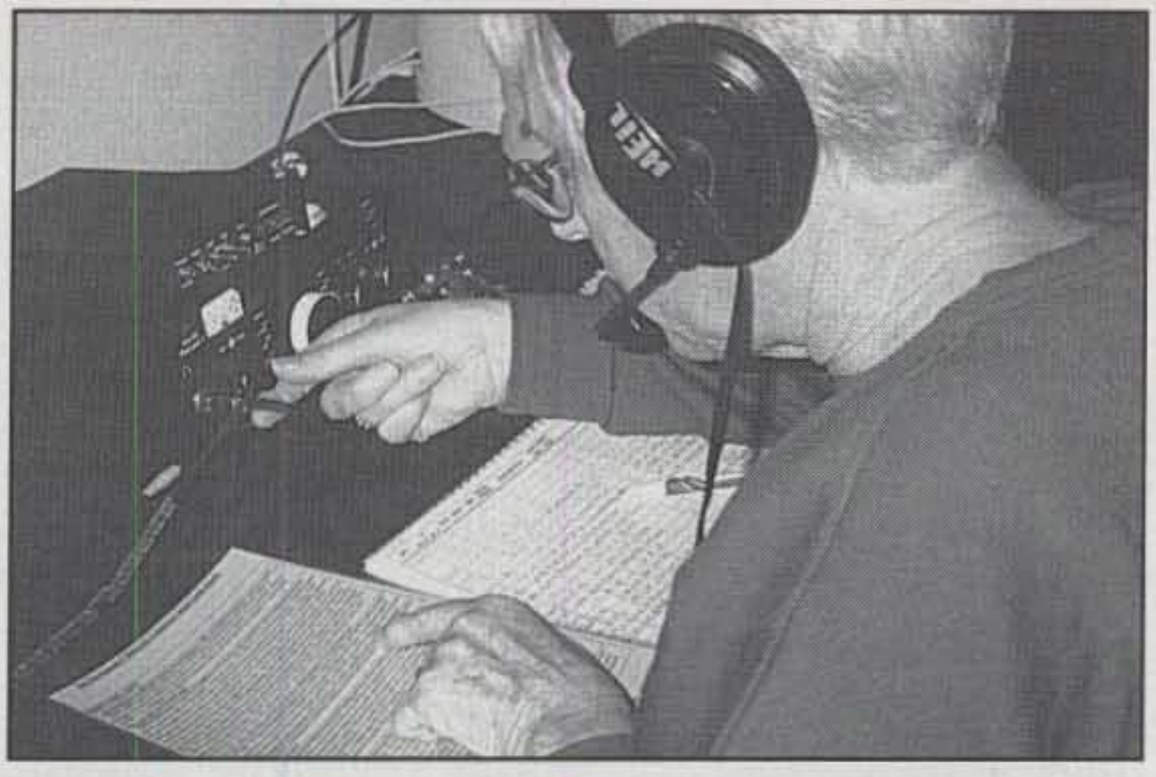

Photo B– Margaret Prior, KD7CEL, wearing a Heil headset, is learning the basics of Argonaut V operation with the Kairos Research Quick Guide.

mit/receive cycle to just a tiny bit of delay so that the receive audio opens up between words, but not letters. Other operators who want to hear what's happening on the band every smidgen of time when they're not transmitting can set the QSK to zero and have their wish come true. The dit-to-dah weighting of the keyer-generated CW can be varied widely. For very slow CW speed, or for difficult operating conditions, shorter dits often communicate better. Longer dits at moderate speeds give the CW a relaxed, mellow flavor suitable for ragchewing.

Not including software-controlled CW via the serial port, the Argonaut V offers three inputs for CW keying. The 3.5

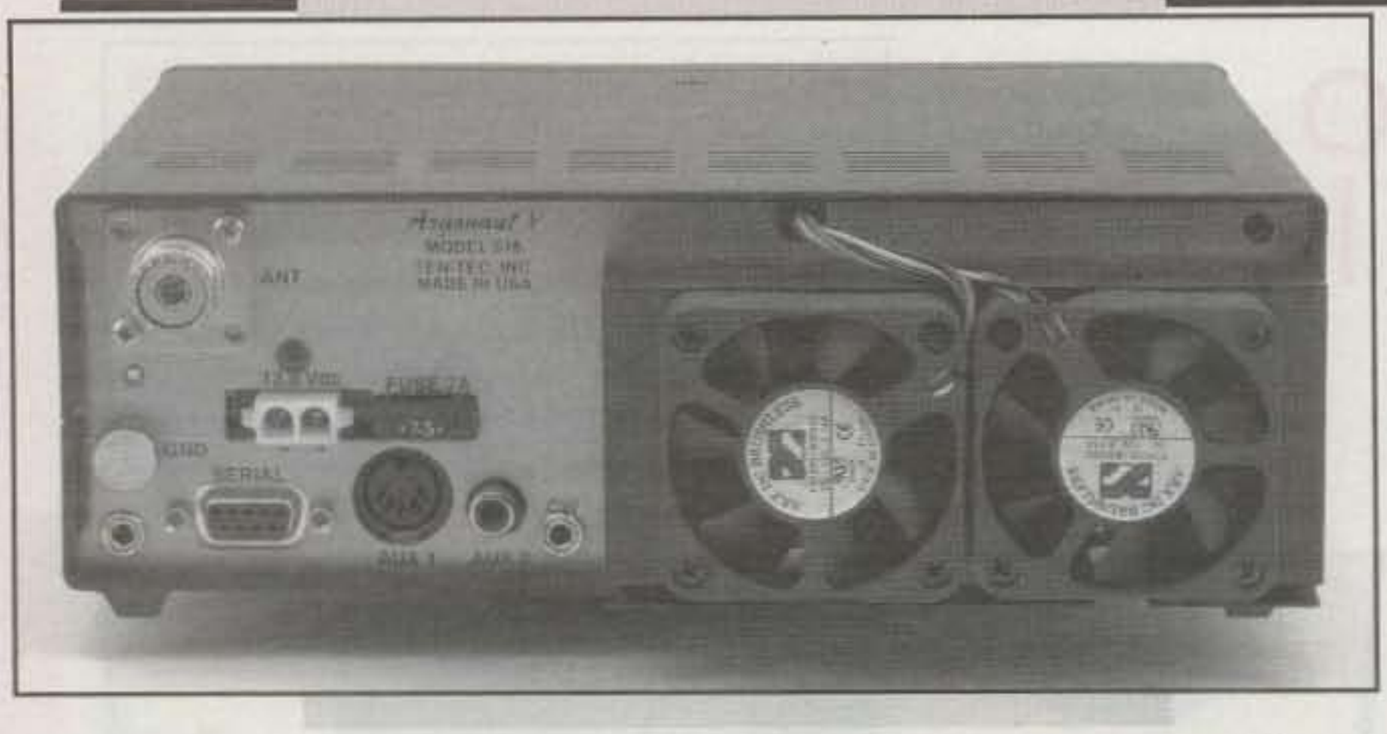

Photo C– The Argonaut V rear panel includes the antenna socket, ground post, DC power input and blade fuse, external speaker socket, serial port, AUX 1 for modem and computer sound-card digital modes, AUX 2 to power an external 12 VDC device, and the CW key or keyer paddle socket. An optional dual fan attaches to the three-part heat sink.

mm CW socket in the rear can be used either for a paddle for controlling the internal keyer, or if the keyer is turned off with the keyer menu, the same socket can also be used for an external key or keyer. In addition, CW can be keyed through the push-to-talk circuit in the front-panel microphone socket. Thus, in a pinch the microphone PTT switch can be used to send CW. For dedicated CW operation, an external key or keyer can be attached to the microphone socket and used even while a paddle is plugged into the rear and the internal keyer is turned on with the keyer menu. Similarly, the five-pin AUX 1 socket has another PTT line which could be used for an external keying source, including a footswitch. Yes, you can practice sending CW QLF style with your Argonaut V, preferably at the lowest power setting when propagation conditions are poor, so only your cross-town friends can hear you sending with your left foot!

For operating any computer sound-card digital mode such as PSK31 or MFSK16 or standard RTTY, an auxiliary socket is available on the rear panel. The audio input on the auxiliary socket is independent from the front-panel microphone socket. Similarly, the audio output on the rear panel has a fixed volume which does not vary with the front-panel AF control. That makes it possible to operate in digital modes with the speaker volume turned down to zero, so no household members will be disturbed. The only extra equipment needed for digital operation with a computer is an optional cable and perhaps a readily available isolation transformer (RadioShack part number 273-1374). An auxiliary DC power socket is included on the rear panel for another station accessory, such as an external keyer or an auto tuner. A serial port can be used both for downloading Argonaut V firmware enhancements and for controlling the transceiver from a computer using third-party software.

The internal flash-ROM allows Ten-Tec engineers to produce future Argonaut V enhancements for free downloading. The open-ended possibilities of downloadable firmware are mind-bending. Nobody now knows just what enhancements will eventually be added to the Argonaut V.

Argonaut V Options

Ten-Tec sells several options for the Argonaut V:

• The temperature-controlled crystal oscillator (**TCXO**) option improves frequency stability and accuracy, specified to three parts per million. It must be installed in the Ten-Tec factory and is best done when the Argonaut is originally ordered. The TCXO option adds $54 to the purchase price.

• The $19.95 **mobile bracket** allows the Argonaut V to be secured for operating in a motor vehicle or a vessel. The tilt bail latches the radio onto the bracket, allowing quick removal of the transceiver.

• For operating at full power with 100% duty-cycle operation, such as with NBFM, AM, or digital emission modes, the $15 **fan kit** helps the transceiver dissipate heat from its final amplifiers. The dual fans are whisper quiet, hardly noticeable unless the audio is turned very low. The fan kit is shipped separately and requires a small Phillips-head screwdriver and about 10 minutes to install. It powers up whenever the rig is turned on.

• The Model 307B **external speaker** is black to match the Argonaut V, the forthcoming HF Orion, the Model 526 "6N2" multimode VHF transceiver, or the RX-350 HF receiver. It is mounted in an enclosure which is optimally tuned for clear communications reception. The 307B costs $98.

• The $10 **accessory cable** is designed to connect the Argonaut V to the audio input and output of a computer sound card for operating a number of digital modes, including PSK31, Hellschrieber, traditional RTTY, and many others.

• A handheld microphone comes standard with the Argonaut V, but a **desk microphone** is also available for $99.95. For superior transmit audio with a wide frequency response, a brand-new product is available which was designed for the high-end Ten-Tec Orion transceiver but is compatible with the Argonaut V—the Ten-Tec/Heil Studio One, a **professional-quality dynamic microphone**. The microphone costs $129.95, and a matching stand or three desk-mounted booms range from $24.95 to $95.95. In addition to the built-in soft-touch push-to-talk switch on the Studio One, it is also equipped with a socket for a second push-to-talk device, such as a foot-switch.

• Model 937 **power supply** costs $89 and is more than ample to power the Argonaut V at full power and 100% duty cycle.

• There is a category of accessories for the Argonaut V that is not so obvious: **transverters** which use any appropriate low-power HF rig to operate on VHF frequencies. Ten-Tec sells the Model 1208 SSB-CW 6 Meter Transverter Kit for $109; it uses the 20 meter transceive functions of the Argonaut V to operate from 50.000 MHz to 50.350 MHz. The similar Model 1210 10 meter to 2 meter transverter will operate in all modes from 144.000 MHz to 145.700 MHz using the 10 meter transceive functions of the Argonaut V. Model 1210 is a kit, selling for $139; the factory-assembled Model 1210A sells for $239.

Simple Mods

The Argonaut V can use a handful of simple modifications:

• The tilt bail will be more stable on a hard surface if it is covered with surgical tubing, available at a medical-supply store. I've made the same change on my Scout and Omni VI+. Unscrew one of the front feet and remove the bail. Lubricate the surgical tubing with a few drops of rubbing alcohol and slip it onto the bail. Then re-install the bail onto the front feet and screw the removed foot back onto the enclosure. The optional matching Model 307B external speaker can also be spruced up with matching surgical tubing on its tilt bail.

• The ground connection will not scratch the surface of the rear panel if a washer is added.

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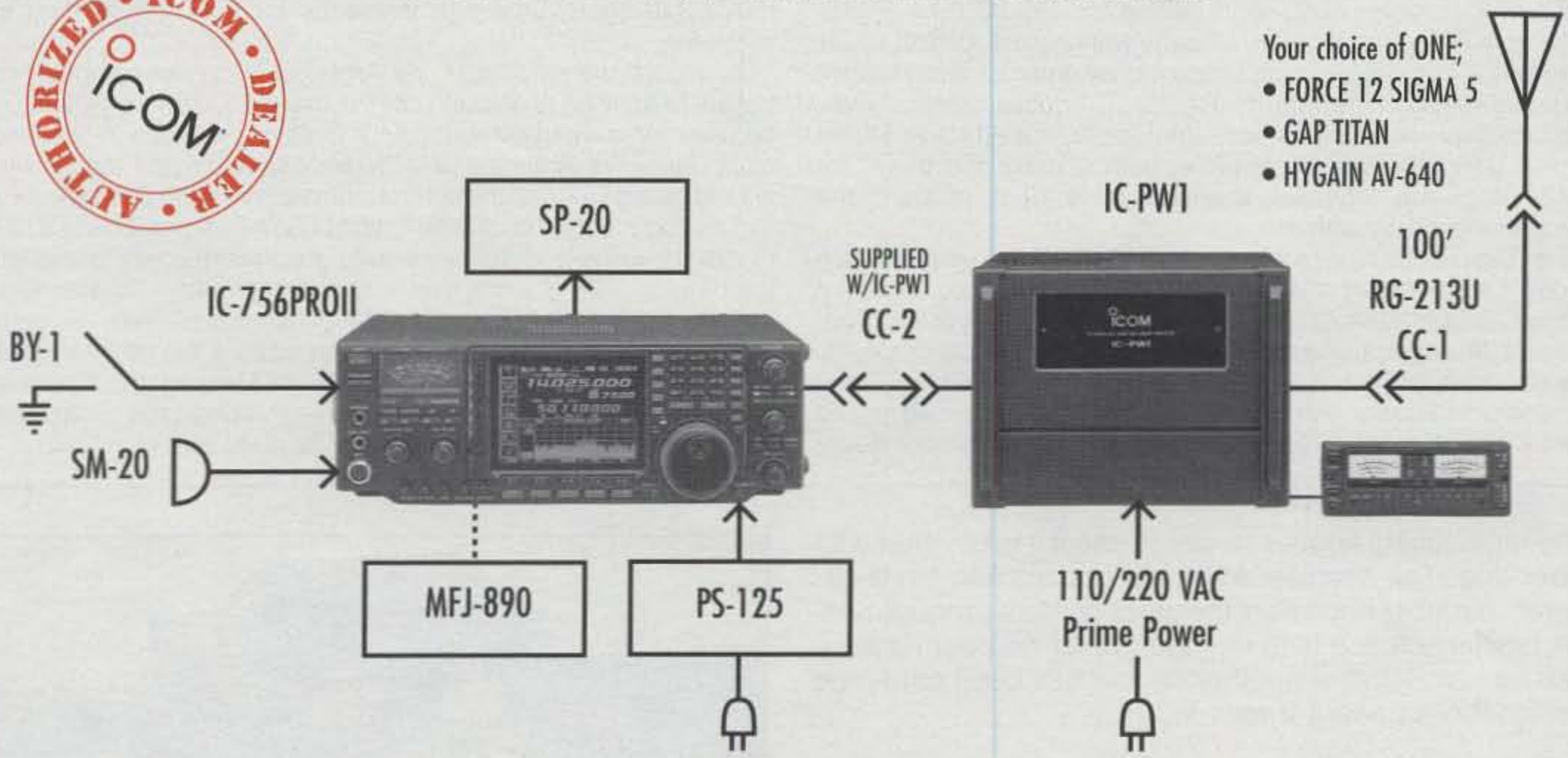

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Third-Party Accessories for the Ten-Tec Argonaut V

Other companies make useful accessories for the Argonaut V:

• Heil Sound <http://www.heilsound.com> manufactures a variety of superior-quality headphone/microphone headsets ranging between $69 and $189 which are used with the $17 AD-1-T4 adapter for any of the current and many of the older Ten-Tec transceivers.

• An detailed two-card laminated Quick Guide to the Argonaut V, including some information not documented in the *Operator's Manual,* is available from Kairos Research (853 Alder Street, Blaine, WA 98230) for $8.00, including shipping, check or money order.

• The marketplace is full of keyer paddles. A convenient one-stop source with a large selection of keys and keyer paddles is Morse Express <http://www.morsex.com>. A fine companion to the Argonaut V is the Code Warrior Jr., which is made by Vibroplex <http://www.vibroplex.com> and selling for $99.95. The Porta-Paddle from American Morse Company works great for $63.95, or $86.90 with a compatible base (<http://www.americanmorse.com/portapaddle.htm>). Amateur Radio Products <http://www.amateurradioproducts.com> sells the simple, but effective Model BD2 K9LU BullDog iambic paddle, with a magnetic base, for $33.45. Since the Argonaut V enclosure is made of steel, the BullDog works nicely with it.

• Until Ten-Tec produces a downloadable firmware update which includes a memory keyer with mode A capability for the Argonaut V, many CW operators who do not own an external keyer will probably want to acquire one. Idiom Press <http://www.idiompress.com> offers the Logikey K-3 keyer for $129.95 including U.S. shipping. Jackson Harbor Press sells the very sophisticated Island Harbor Keyer II. A convenient way to buy the Island Harbor Keyer II is as a complete kit including hardware and enclosure for $49.85 from Morse Express, which also sells the Logikey K-3 keyer.

• Many antenna systems require the use of an antenna tuner or transmatch for optimal operation. A convenient companion to the Argonaut V is the Z-11 Auto Tuner made by LDG Electronics <http://www.ldgelectronics.com>. Assembled and tested, it costs $179; a complete kit including all switches and sockets and the enclosure is $145. SGC, Inc. <http://www.sgcworld.com> sells the 160 to 6 meter SG-237 antenna coupler for $359.95, a weather-resistant automatic tuner designed for indoor or outdoor feedpoint operation, and powered by 12 VDC. The SG-237 adjusts automatically during transmission at power levels ranging from 3 to 100 watts. The SGC Stealth kit includes the SG-237, plus antenna wire and attachment cords, clips, and cable ties for $399.95. The extra investment in a feedpoint antenna coupler adds a noticeable improvement in efficiency for both transmitting and receiving.

• Through the serial port, the Argonaut V can be computer controlled. In addition to actual control of the radio, data from the rig can be used for computerized logging. Callsign Software is planning a comprehensive Argonaut V software controller and logger which should include most of the control indicators missing on the Argonaut V. The current price for similar Callsign Software products is $39.99. Check the website <http://www.callsignsoftware.com> for the latest information. N4PY <http://www.ralabs.com/n4py> is planning to include the Argonaut V in his suite of Windows® Ten-Tec control software, which costs $35. Macintosh owners will be interested in the sophisticated $70 Dog Park Software MacLoggerDX package, to which an Argonaut V driver is being added (see <http://www.dogparksoftware.com/MacLoggerDX.html>).

• The main tuning knob is easier to use if it is covered with a rubber ring. The simplest way is to use a thick, small-circumference rubber band from the grocery-store produce section. A fancier solution is to use the rubber ring from a similarly-size tuning knob of another rig that has been gathering dust since the Argonaut V arrived.

Quibbles

• The IF-DSP system Argonaut V should be programmed to provide a notch filter that is slow enough to allow unimpeded CW copy. Adding this function should be a high priority for Ten-Tec software engineers. Perhaps it could be accessed via the noise-blanker menu.

• There are no CW message memories in the Argonaut V, and the keyer operates in mode B only. Hopefully, at least one CW message memory for CW and optional mode A keying will be incorporated in revised downloadable flash firmware for the Argonaut V. The mode A/mode B selection could be included on the keyer menu.

• There is no panel or display indicator when the attenuator, the tuning lock, the VOX, or the XIT is active. The non-indicated attenuator is a minor problem, since the attenuator defaults to "off" status upon power-up, and turning it on and off affects the S-meter reading. The tuner lock status is obvious if the frequency doesn't change when the main tuning encoder knob is rotated. For XIT, however, only the RIT enunciator is illuminated, and the frequency offset is shown the same way. XIT and RIT functions are operationally separate on the Argonaut V. The transceiver has the advantage of simultaneous independent offset settings for XIT and RIT. Since there is no indicator for XIT that can distinguish it from RIT, however, the resulting confusion effectively nullifies the usefulness of the XIT function. I prefer to carry out the same job, therefore, using split operation between VFO A and VFO B so that I am absolutely certain where I am transmitting. Good candidates for downloadable software modifications would be to add some kind of VOX or XIT indicator. An active VOX could be indicated by a slow-blinking emission mode display:

Photo D– The Argonaut V is shown with black surgical tubing on the tilt-bail and a white rubber band around the tuning knob. The LDG Z-11 automatic tuner fits nicely on top. The magnetic BullDog iambic paddle adheres to the steel cabinet, and the Vibroplex Code Warrior Jr. iambic paddle is on the desk, along with the laminated two-card Kairos Research Quick Guide set. The hand-mic comes standard with the Argonaut V.

<USB>, <LSB>, <FM> or <AM>. A slow-blinking decimal point on the multifunctional display could signal XIT operating mode.

• There is no reversed-sideband CW reception mode. In CW emission mode the Argonaut V listens only on the upper sideband, irrespective of the amateur frequency band. That's no problem for 20 meters and above, but for CW-to-LSB cross-mode communications from 160 to 40 meters the operator must use split operation with the CW transmit frequency set below the LSB receive frequency by the same value as the CW offset. It can be done, but a lot less conveniently than for CW-to-USB cross-mode, where the Argonaut V can be set for CW emission mode and tuned until the USB signal sounds natural. In addition to its value for CW-to-LSB cross-mode operation, reversed-sideband CW reception is a useful QRM-fighter on a busy band. Perhaps reversed-sideband CW reception could be accessed by adding a step to the keyer menu. A reversed-sideband CW mode could be added via a downloadable flash firmware revision. The reversed CW mode could be enunciated on the function display with a slow-blinking <CW>, similar to my proposed blinking phone emission mode enunciator when the VOX is active on phone modes.

• The nine-step noise blanker achieves some atmospheric noise reduction, but it is not the best implementation of this feature on the amateur radio market in the price class of the Argonaut V. Only steps 6 through 9 produce a noticeable degree of atmospheric noise reduction, but with enough distortion to reduce readability of the desired signal. The noise blanker is one part of the IF-DSP system of the Argonaut V which could use some enhancement in a future flash firmware download.

• The BUSY LED seems redundant, dovetailing with an open squelch. It appears to be a remnant echo from the Argonaut V's twin, the Ten-Tec 6N2 transceiver, which shares an almost identical enclosure with the Argonaut V. Perhaps in a later version of the Argonaut V with a redesigned front panel, that LED could serve as one of the missing enunciators, such as for the XIT. Even without a re-labeled front panel, the same LED could be programmed to blink slowly in XIT mode.

That's my quibbles list. Notice, however, that almost my entire list can be remedied with some re-programming of the flash firmware. Ten-Tec can make the changes, and Argonaut V owners can download the improvements. After a few months my quibbles list may disappear almost completely. The Argonaut V is one fine radio today, and the same box will be even better next year.

Bottom Line

Enthusiasm for the Argonaut V is building considerably. Margaret and I like the rig so much that we've decided to buy the review unit. We will be adding a mobile bracket and the Model 307B external speaker. At this writing, Ten-Tec has a waiting list for the Argonaut V with the TCXO option. The company offers a no-questions-asked 30-day return policy, less shipping charges, on the transceiver. I doubt that many hams will take advantage of that offer and send it back. Once they get a chance to operate it, few will want to part with the Argonaut V.

The Ten-Tec Argonaut V Model 516 is priced at $795; the Model 516-TCXO is $849. Contact Ten-Tec, Inc., 1185 Dolly Parton Parkway, Sevierville, TN 37862 (sales: phone 800-833-7373; e-mail: <sales@tentec.com>; on the web: <http://www.tentec.com>). ■

Millennium Profiles

We continue our profiles of CQ Millennium Award "4-Star Winners"—the two dozen hams who qualified for all four award categories in 2001—with stories from SWL Dave Glow, KMA1JL (now AA1VX), and David Langley, W4YDY:

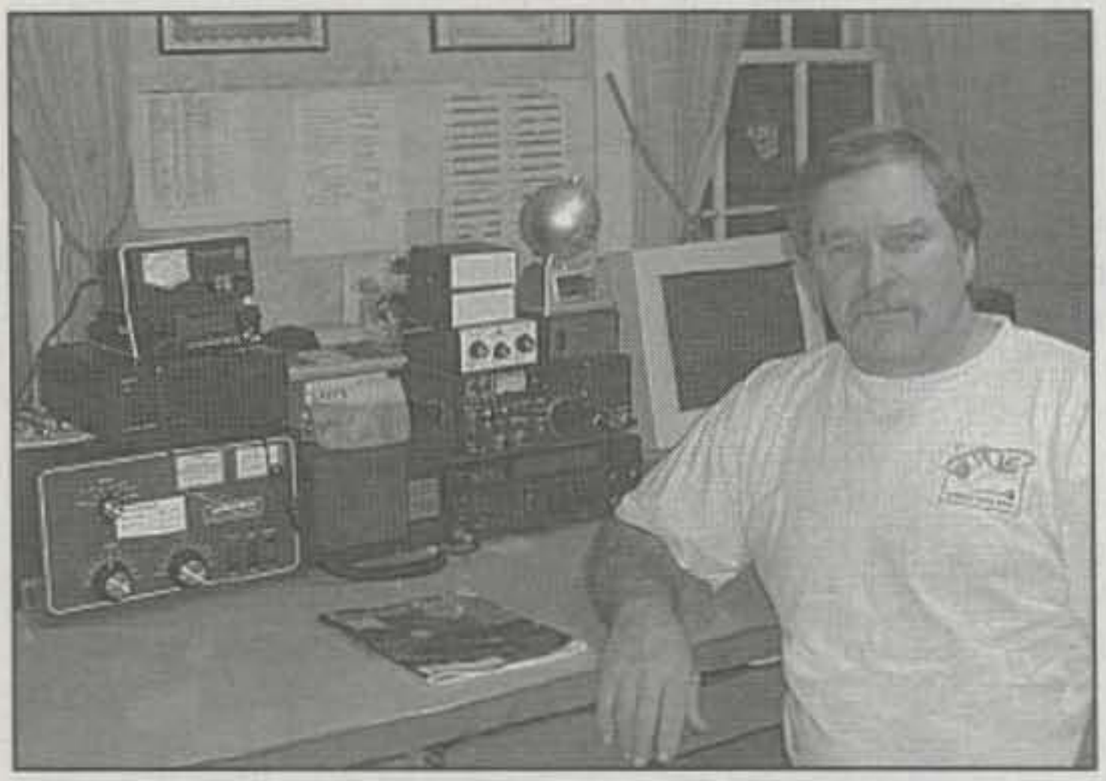
Dave Glow, KMA1JL/AA1VX

I first started listening to shortwave radio in 1963 after stumbling across some foreign broadcasts on an old wooden radio out in the barn. Having purchased a communications receiver the next year, I was quickly amazed at how many countries I could log by listening to amateur radio operators. Soon I was glued to the radio day and night, and spending all my income on postage for QSLs. While I also listened to SWBC and utilities, ham radio monitoring was always my favorite aspect of SWLing.

Eventually, I obtained SWL callsigns WPE1FKZ, KDX1A, and finally KMA1JL. Over the years, I managed to confirm 366 DXCC countries, and I remain extremely grateful to all the hams who answered my requests for cards.

Since there aren't a lot of contest awards involving ham radio that are open to SWLs, I jumped at the opportunity to participate in *CQ*'s 50th Anniversary activity back in 1995, and had a lot of fun earning the "CQ/50 Gold" and "CQ/50 Challenge" awards with all endorsements. When *CQ* announced the Millennium Award, I figured it was a "once-in-my-lifetime" award and decided to go for it. As an additional challenge, I wanted to see how quickly I could achieve all four categories.

While I acknowledge that it's much easier for an SWL to earn an award by not having to jump into a DX pile-up to make a contact, it was still a lot of work to log all the necessary QSOs. More important, however, is that it provided hours of enjoyment. The CQ DX portion was the quickest for me, with all 100 countries logged on New Year's Day. The final category, USA-CA, was finished 20 days later. I



Dave Glow, KMA1JL/AA1VX, operating as an SWL, logged all needed contacts for all four parts of the CQ Millennium Award in just three weeks.

was delighted to receive the Millennium Award on October 10, 2001. A lesson I quickly learned during the contest was that logging 500 QSOs on paper can cause writing cramps, so I finally purchased a logging program for my PC.

Although I had earned my Novice ticket in 1986, I didn't get on the air until 2001 when I inherited some transmitting equipment from a neighbor. As AA1VX, I'm chasing awards all over again, but this time I'm *talking* with hams around the world. I'm looking forward to *CQ*'s next operating activity!

David Langley, W4YDY

When *CQ* magazine announced the CQ Millennium Award for 2001, it caught my attention because I had received the ARRL DXCC Millennium Award after only ten days of operating in 2000. Getting all four in one year was another task, especially the WAZ award. At that time, I was still trying to get QSL cards for that one. Also I was active in the Brightleaf ARC as *Ham Chatter* editor and website <http//:www.qsl.net/w4amc> editor and that took some of my time.

I checked my PDA LOGic computer log (<http//:www.hosenose.com>) to see what I had done in 2000. Surprise! I had accomplished the feat and wished *CQ* had had the award in 2000. The totals for 2000 were 574 counties, CQ DX 225 countries, CQ WPX 1080 mixed prefixes, and CQ WAZ 40 zones. I decided that I would try it again.

The first couple of weeks the DX bands were hot and I was approaching 100. I figured that the 500 counties and the 40 zones would be the hardest to get. On January 30, LA4CM was number 100 for CQ DX. A big bump came in the ARRL RTTY contest in January when I made 230 contacts which included 29 countries, 95 counties, 120 prefixes, and 14 zones.

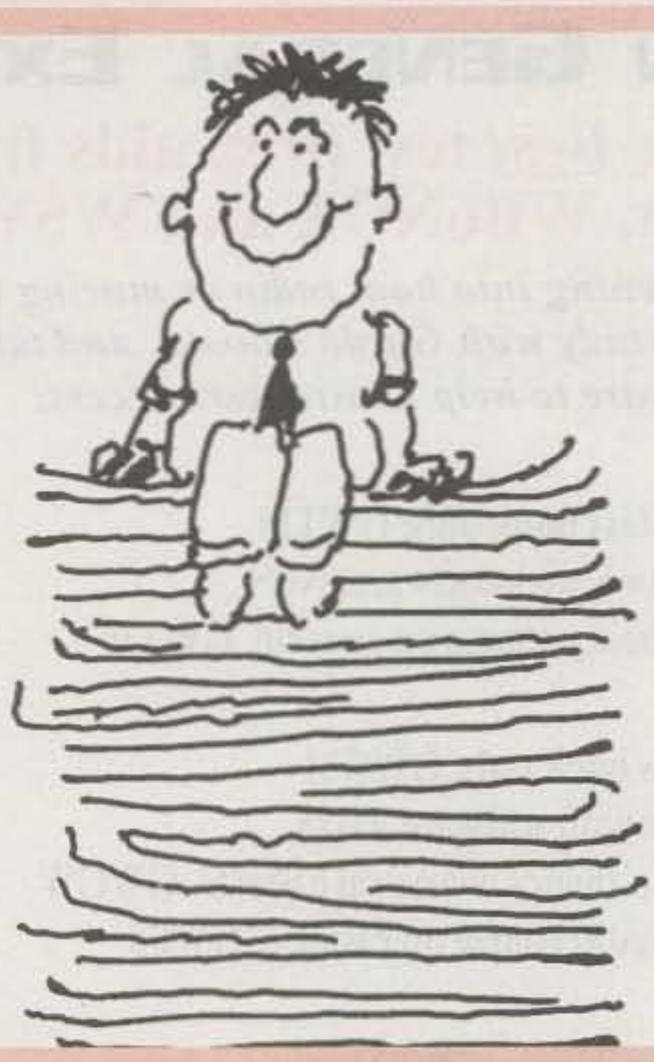
Working toward the CQ Millennium Award inspired David Langley, W4YDY, to get active in county hunting (he received his USA-CA Award with endorsements for 2500 counties last year) and to get back into CW for the first time since getting his Extra back in 1968!

I thought that looking for the 500 counties might be a bigger problem. On January 15, I found the County Hunters Net on 14.336. I jumped in and worked Ralph Wiley, WB4FFV/M, a trucker passing through Scott County, MN. I was on the way. On February 2, I passed the 500 mark and was hooked on county hunting! I have since contacted WB4FFV/M in 16 states and over 250 counties in the Midwest.

The WPX Award was completed in the middle of February. Three down and one to go.

Now to hunt for those last few CQ Zones—19, 24, and 27. By the middle of March, I was down to one zone left, number 27. I saw in a DX bulletin that AH2R was going to be in Guam during the CQ WPX CW Contest on May 26. The last time I was on CW very much was when I was studying for the Amateur Extra Class in 1968. I had to brush up on it and get ready for AH2R to complete the final step in the CQ Millennium Award. On the first night of the contest I found AH2R on 15 meters and made the contact for the last zone. I also contacted AH2R again on 20 meters the next morning just to make sure. If I had sent my contest log to *CQ* magazine, I'm sure I could have held up all the others by being on the bottom of the scores with my two contacts!

The final totals for 2001 were 2508 counties; CQ DX 201 countries; CQ WPX Mixed 1158; and CQ WAZ 40 Zones using SSB, RTTY, CW, and PSK31. Not only did the awards get me interested in county hunting, I also got back on CW in July 2002 and have enjoyed it very much, working counties and DX. I had also completed all four activities for two years straight. Thanks to *CQ* magazine for the CQ Millennium Award.



What You've Told Us...

January's survey asked about advanced technology in ham radio, and we can't remember a topic on which our readers were so evenly divided on so many questions. You were exactly split on the question of whether ham radio currently *is* on the leading edge of communications technology, with 44% saying yes, 44% saying no, and 12% with no opinion. On the other hand 79% of you believe ham radio *should* be on the leading edge of communications technology, with only 9% saying no and 8% having no opinion.

In another relatively evenly split question, 16% of you said you already have a rig that incorporates some sort of advanced technology, such as digital audio, spread spectrum or is a software-defined radio; 23% said you want one as soon as you can, while 26% said you'd wait until the bugs are worked out, 19% prefer to wait until it's well-accepted by most hams, and 13% say they probably will never buy or build an advanced technology radio.

You were pretty clear that any such radio needs to be "backward compatible" with current analog modes (48%) and that one brand of radio must be able to talk to other brands (46%), while 16% of you said a standalone radio was OK and 17% had no specific requirements for an advanced technology radio.

Finally, we asked how widely accepted each of five modes were *when you first started using them.* It'll be easiest to present the answers in a table. All numbers are percentages:

Mode	Brand new	Becoming popular	Already popular	Have never used
CW	1%	1%	82%	13%
AM Phone	1%	4%	14%	17%
SSB Phone	13%	32%	47%	5%
FM Phone	20%	27%	43%	7%
Packet radio	26%	18%	11%	46%

Thank you for your responses. This month's free subscription winner is George Lee, KR5C, of Longview, Texas.

Reader Survey March 2003

We'd like to know more about you—about who you are, where you live, what kind(s) of work you do, and of course, what kinds of amateur radio activities you enjoy. Why? To help us serve you better.

Each time we run one of these surveys, we'll ask a few different questions and ask you to indicate your answers by circling numbers on the Survey Card and returning it to us. As a bit of an incentive, we'll pick one respondent each month and give that person a complimentary one-year subscription (or subscription extension) to *CQ*.

Since W2VU has operating awards on the brain this month, we'd like to hear your views on awards and award-chasing.

Please indicate... Circle Response Card #

1. ... whether you consider yourself to be an award-chaser:
   - Yes 1
   - No 2
   - Don't know / No opinion 3
2. ... whether you consider awards and award-chasing to be an important part of amateur radio:
   - Yes 4
   - No 5
   - No opinion / Don't know 6
3. ... which (if any) of the following major operating awards you have:
   - CQ DX Award (CQDX) 7
   - CQ Prefix Award (WPX) 8
   - DX Century Club (DXCC) 9
   - Islands On The Air (IOTA) 10
   - USA Counties Award (USA-CA) 11
   - VHF/UHF Century Club (VUCC) 12
   - Worked All Continents (WAC) 13
   - Worked All States (WAS) 14
   - Worked All Zones (WAZ) 15
   - Worked 100 Nations (W-100-N) 16
4. ... whether you have reached the top level (honor roll, etc.) of any operating award:
   - Yes 17
   - No 18
   - Don't know / Don't keep track 19
5. ... your *primary* method of finding/making contacts used for awards (select only one):
   - Contests 20
   - DX Cluster (radio) 21
   - DX Cluster (internet) 22
   - DX/Award nets 23
   - DXpeditions 24
   - General operating 25
   - Combination of above 26
   - Other 27
   - None (do not chase awards) 28
6. ... your primary method of finding out about available awards:
   - Magazine award columns 29
   - Other hams, on-air 30
   - Other hams, off-air (e.g., at club meetings) 31
   - World Wide Web 32
   - Other 33
   - None (do not chase awards) 34

Thank you for your responses. We'll be back with more questions next month.

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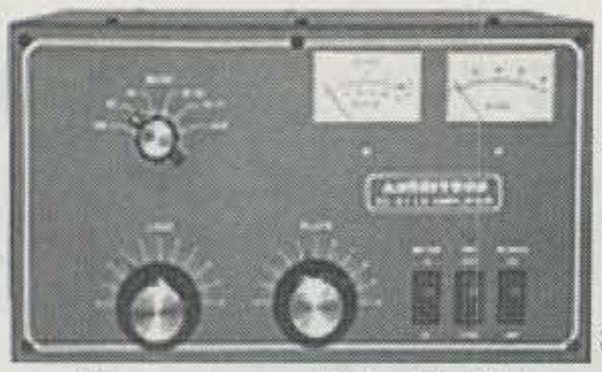
Ameritron gives you four 811A tubes, 800 Watts and far better quality -- for less money than the competitor's 3 tube 600 watt unit . . . Why settle for less power, less quality and pay more money?



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$799
Suggested Retail

AL-811
$649
Suggested Retail

Only the Ameritron AL-811H gives you four *fully neutralized* 811A transmitting tubes. You get absolute stability and superb performance on higher bands that can't be matched by un-neutralized tubes.

Ameritron mounts the 811A tubes vertically -- not horizontally -- to prevent hot tube elements from sagging and shorting out. Others, using *potentially damaging horizontal mounting*, require special 811A tubes to retard sagging and shorting.

A quiet, powerful computer grade blower draws in plenty of cool air. It *pressurizes* the cabinet and efficiently cools your 811A tubes. Our air flow is so quiet, you'll hardly know it's there--unlike noisy, poorly chosen blowers.

You also get efficient full size heavy duty tank coils, full height computer grade capacitors, heavy duty high silicon core power transformer, slug tuned input coils, operate/standby switch, transmit LED, ALC, dual meters, QSK compatibility with QSK-5 plus much more.

AL-811 has three 811A tubes and gives 600 Watts ouptut for only $649.

Near Legal Limit ™ Amplifier

AL-572
$1395
Suggested Retail

New class of *Near Legal Limit*™ amplifier gives you 1300 Watt PEP SSB power output for *65%* of price of a full legal limit amp! Four rugged *Svetlana* Russian 572B tubes. Instant 3-second warm-up, plugs into 120 VAC. Compact 8½Hx 15½Dx14½W in. 160-15 Meters. 1000 Watt CW output. Tuned input, instantaneous RF Bias, dynamic ALC, parasitic killer, inrush protection, two lighted cross-needle meters, multi-voltage transformer.

HF Linears with Eimac 3CX800A7

AL-800H
$2595
Two tubes, 1500 W plus

AL-800
$1775
Single tube, 1250 Watts

These HF linears with *Eimac*® 3CX800A7 tubes cover 160-15 Meters including WARC bands. Adjustable slug tuned input circuit, grid protection, front panel ALC control, vernier reduction drives, heavy duty 32 lb. grain oriented silicone steel core transformer and high capacitance computer grade filter capacitors. Multi-voltage operation, dual illuminated cross-needle meters.

AL-80B . . . Desktop Kilowatt 3-500ZG Amplifier

Ameritron's AL-80B kilowatt output desktop linear amplifier can double your average SSB power output with high level RF processing

AL-80B
$1299
Suggested Retail

using Ameritron's exclusive *Dynamic ALC*™!

You get cooler operation because the AL-80B's exclusive *Instantaneous RF Bias*™ completely turns off the 3-500ZG tube between words and dots and dashes. It saves hundreds of watts wasted as heat for cooler operation and longer component life.

You get a full kilowatt PEP output from a whisper quiet desktop linear. It's a compact 8½Hx14Dx15½ inches and plugs into your nearest 120 VAC outlet. Covers 160 to 15 Meters, including WARC and MARS (user modified for 10/12 Meters with license).

You get 850 Watts output on CW, 500 Watts output on RTTY, an extra heavy duty power supply, genuine *CLASSIC*® 3-500ZG tube, nearly 70% efficiency, tuned input, Pi/Pi-L output, inrush current protection, multi-voltage transformer, dual Cross-Needle meters, QSK compatability, two-year warranty, plus much, much more! **Made in the U.S.A.**

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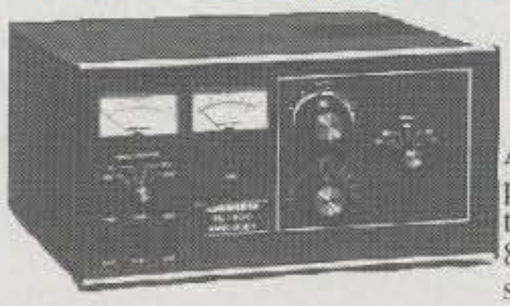
AMERITRON's legal limit amplifiers use a super heavy duty Hypersil® power transformer capable of 2500 Watts!

Ameritron's most powerful Linear



AL-1500
$2995
Suggested Retail

Ameritron's super powerful amplifier uses the herculean *Eimac*® 8877 ceramic tube. It's so powerful that 65 watts drive gives you the full legal output -- and it's just loafing because the power supply is capable of 2500 Watts PEP.

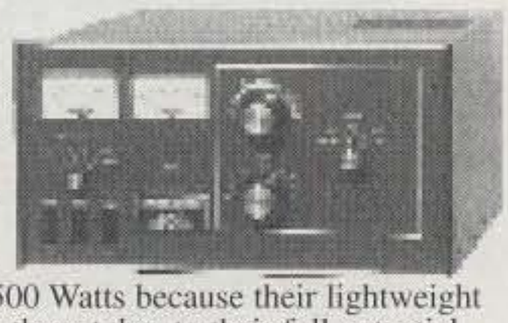
Ameritron's 3CX1200A7 linear Amp

AL-1200
$2545
Suggested Retail

Get ham radio's toughest tube with the Ameritron AL-1200 -- the EimacR 3cx1200A7. It has a 50 Watt control grid dissipation. What makes the Ameritron AL-1200 stand out from other legal limit amplifiers? The answer: A super heavy duty power supply that loafs at full legal power -- it can deliver the power of more than 2500 Watts PEP two tone output for a half hour.

Ameritron's dual 3-500 linear

AL-82
$2445
Suggested Retail



This linear gives you full legal output using a pair of 3-500s. Most competing linears using 3-500s can't give you 1500 Watts because their lightweight power supplies can't use these tubes to their full potential.

AMERITRON no tune Solid State Amplifiers

ALS-500M 500 Watt Mobile Amp

AL-500M
$799
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Ideal Mobile amplifier uses 13.8 VDC mobile electrical system, very compact 31/2x9x15 inches, extremely quiet, 500 Watts output, 1.5-22 MHz coverage, instant bandswitching, no tuning, no warm-up, no tubes, SWR protected.

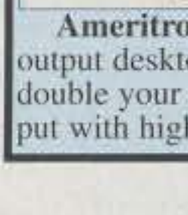
ALS-600 Base 600 Watt Amp

AL-600
$1299
Suggested Retail

No tuning, no fuss, no worries -- just turn it on and operate. Includes AC power supply, 600 Watts output, continuous 1.5 to 22 MHz coverage, instant bandswitching, fully SWR protected, extremely quiet, very compact. Amp is 6x9½x12 inches.

AMERITRON brings you the finest high power accessories!

RCS-8V Remote Coax Switch . . . $149

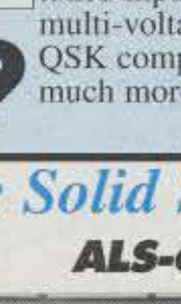


Replace 5 coax feedlines with a single coax. 1.2 SWR at 250 MHz. Useable to 450 MHz. 1 kW at 150 MHz. **RCS-4, $139**. 4 position remote HF switch.

ADL-1500 Dummy Load with oil . . . $69.95

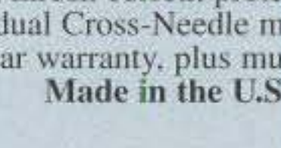
Oil cooled 50 Ohm dummy load handles 1500 Watts for 5 minutes. SWR under 1.2 up to 30 MHz. Low SWR to 400 MHz.

ICP-120/240 Inrush Current Protector . . . $79



Stops power-up inrush current and absorbs momentary high voltage spikes to your amplifier. ICP-120 for 110 to 120V, ICP-240 for 220-240 V.

ATR-20 1.2 kW SSB Antenna Tuner . . . $459



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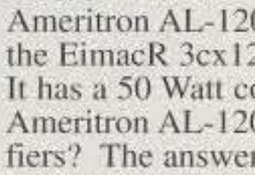
ARB-704 amp-to-radio interface . . . $49.95



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ATP-100 Tuning Pulser lets you safely tune your amplifier . . . $49.95 Pulse tuning lets you safely tune up your amplifier for full power output and best linearity. Keeps average power to low safe level to prevent overheating, tube damage, power supply stress and premature component failure.

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You never know what may happen when you have some sign of your ham radio hobby in a non-ham location. For WB2UDC, it led to the QSO of a lifetime.

In Memoriam
Space Shuttle Columbia

The amateur radio community is deeply saddened by the tragic loss of Columbia and her crew of seven, three of whom were licensed amateurs. Hams have had a long and special relationship with the shuttle program, and with Columbia in particular. This story is about a contact with Columbia, and it was from Columbia, nearly 20 years ago, that Astronaut Owen Garriott, W5LFL, made the first amateur radio contacts from space. On behalf of radio amateurs worldwide, we extend our condolences to the families of the crew members.

This issue was already at the printer when Columbia was lost on February 1. Special thanks to American Press for helping us make this last-minute insertion. Next month we will have full coverage of amateur radio assistance in the search for debris. - *The editors*

The Nine-Minute QSO
Ham Radio Brings Space Down to Earth

BY BOB HOPKINS,* WB2UDC

Apparently, WB2UDC was looking over my shoulder as I wrote my December editorial on "Ham Radio Moments," since that issue hadn't even arrived in the mail when I received his article . . . about a particular "Ham Radio Moment" in his life, and how these moments can lead to much greater things. — *W2VU*

We've all seen it—the stare, the facial expression that develops frequently on those who innocently ask us something about ham radio. You know what I'm talking about, the glassy look, the slagging of the jaw, leading to eyelids at half mast, and often accompanied by the polite "Oh yeah" and the head nod. No doubt about it, ours is a hobby often difficult to explain to the non-believers. However, since most of us get so much enjoyment from hamming, we carry on and share the message—or should I say the passion—anyway.

I've been in that position many times over the years, and I have to admit that talking about ham radio is a part of the hobby I have always enjoyed. My goal is to engage the listener with the sense of adventure and excitement that I have experienced and then answer the questions about the details, concluding with some sort of live demonstration.

My story goes like this:

Patches

Patches . . . we've all seen them. They are symbols of many things—of achievement if you are a Scout or in the military, or perhaps of participation in a particular event or a reminder of a memorable adventure.

In the summer of 1995 I was walking across the small campus of Cooper Union in New York City, where I teach, with my colleague Day Gleeson, a professor in our Art School. I brought up the fact that the Scout Troop with which I was involved as a volunteer leader had a beautiful patch embroidered in many colors and worn proudly by its young members.

"I've got some patches," she replied, "patches from NASA."

"You've got patches from NASA?"

"Oh yeah. Don gave them to me. You know I have a brother-in-law who is an astronaut and I have some of his mission patches."

I was hooked! You have to understand, I am of that age when every young scientist or engineer got some of their inspiration from the space program. My generation knows all about the Right Stuff. Therefore, based on my unbridled enthusiasm, Day gave me a few extra NASA mission patches, and she also told Don Thomas, her brother-in-law, that she works with this nut who is a big fan of the space program.

As luck would have it, Day contacted me a few weeks later and said Don was

*e-mail: <bob@cooper.edu>

Photo 1– Astronaut Don Thomas KC5FVF, returns the Boy Scout patch flown on the STS-70 mission to author Bob Hopkins, WB2UDC. (Photos courtesy of the author)

going on a mission, STS-70, and would like to take one of the troop's patches on the journey. How great was that?! I provided Day with a 6 inch diameter jacket patch and became very interested in STS-70. The summertime mission occurred during the troop's summer camp, so at our Wednesday night campfire, with the stars as clear as can be, I told the boys to look to the stars; somewhere up there is the orbiter Discovery with our patch.

STS-70 returned to Earth, and in September of that year I got another call from my friend Day. She informed me that Don would be visiting and would like to return the patch.

Not only did they take the patch on a multi-million-mile journey, but they're giving it back, I thought, and . . . *I get to meet an astronaut!* I hardly had enough time to prepare, but in the class I had later that afternoon, I mentioned to my students that at lunchtime the next day I was going to be visited by Dr. Don Thomas, NASA Astronaut. If they happened to be in the lab at that time, perhaps they would meet him as well. The next day there was quite a crowd.

Don returned the Scout patch (photo 1), as well as provided some of his own mission patches. In addition, he presented me with a certificate from NASA attesting to the Scout patch's journey. Since so many students were present, he graciously offered to give a short presentation on his mission and life as an astronaut. When we started to take photographs, Don went into my office and changed into his official blue NASA flight suit.

When all was finished and Don was ready to leave, he said, "I saw a telegraph key on your desk." Now my desk is a mess. I do have a Vibroplex bug sitting on top (photo 2), but how he saw it in my "paper full" office I'll never know.

"Are you into ham radio?" he asked.

"Oh yeah. I'm WB2UDC."

"I'm KC5FVF, Foxtrot Victor Foxtrot. I do ham radio from the shuttle. Maybe I'll work you sometime."

I don't have to tell you what kind of reaction he got from me, but needless to say, this added to an already fabulous experience for me.

Photo 2– The "bug" that caught Don Thomas's eye and mission patches for STS-70, STS-83, and STS-94. I moved the bug off my desk for the photo.

A Scheduled Contact

Turn the calendar ahead a year to the summer of 1996. I got another call from Professor Day Gleeson.

"Don is scheduled for another mission, STS-83. He will be doing the SAREX experiment and would like to contact my daughter's school, PS 9, by ham radio. Don suggested that I ask you to help set it up. Are you interested?"

What a question! Of course I was interested. STS-83 was scheduled for the spring of 1997, and even though I'm mostly a QRP CW guy and had hardly a clue as to what I needed to do to make this happen, I did not hesitate to agree to the project.

Day's daughter Asja was in the third grade at the time, and although I have given many ham radio demonstrations to kid groups, third grade was younger than any before. My initial plan was to have three or four meetings with the teachers and students starting six months before the QSO. At these meetings I'd teach a bit about ham radio, how people communicate, and work with the students in developing questions they could ask Don when the contact occurred. There were 120 third graders, four classes of 30 each. The three to four meetings exploded to 12, since I had to meet with each class to make the experience effective. The goal was an educational experience that would be fun and informative regardless of whether we actually would be able to make the QSO.

I have been involved in education for over 30 years. I must say that teaching third graders is a whole lot more challenging and exhausting experience than I'm used to in the "ivory towers" of the university. Those dedicated professionals who teach elementary school will always have my respect. It was pure joy for me to work with the students, but I was pooped at the end of each of my visits.

I covered a variety of topics, including how people communicate, what ham radio is all about, how the study of radio helped me in math and science, and finally the space program and the shuttle. Given the short attention span of this age group, I needed to talk less and interact more. For example, to demonstrate Morse code we played "Stump Professor Bob." This game involved a laptop computer running a CW program. The student would type a line of text, "hit enter," and the text would be beeped out at about 10 words per minute. With nothing up his sleeve, and

Photo 3– Don, KC5FVF, discussing his STS-83 mission with students of PS 9.

certainly not looking at the keyboard or screen, Professor Bob (me) would copy the CW and translate for all to hear. This was a big hit! They were very impressed that I could even copy ahead and even play the censor at times. I distributed copies of Morse code, and some kids actually translated their next day's assignment into dots and dashes. "Secret" codes fascinate kids of any age.

As the big day approached, I was getting excellent support from the AMSAT SAREX team. My mentor, Allan Spitzer, N3TCM, was very supportive and patient. My plans included bringing the students from PS 9 to Cooper Union to use our own multimedia facilities. The actual QSO would be via telebridge (a super phone patch), since the shuttle would not be visible to the New York City area on this mission. At first, the telebridge idea was disappointing, because I had thought I'd like to set up the antennas and rigs, etc., but that would have distracted me from the students. I then thought, a QSO is a QSO no matter how long "the cable to the rig" might be.

We rehearsed with NASA many times, patching the audio into the sound system for the classroom and having clear and "broadcast"-quality audio. The students were ready. One of their assignments was to write a question to submit to their teachers. We got over 100 questions! Now this was going to be a short contact. The shuttle would only be visible for the QSO for about nine minutes. The students had to be coached in advance so as not to use up the whole contact repeating questions. The teachers chose the specific students who were to actually ask the questions, as time did not allow for all 120 to hit the microphone. Buses were chartered to get the kids from PS 9 to Cooper Union. All we needed now was *The Contact*.

STS-83, Columbia, launched on April 4th at 2:20 PM. Our QSO time was about a week into the mission. Over and over I tried to imagine how the event would play out. I even set up backup programs at Cooper if for some reason the QSO didn't work, and was prepared with a "plan B."

Being prepared is a good thing. There was a problem on Columbia. Early into the mission the orbiter developed problems in one of its fuel cells. This was a critical system, and although backup was available, the NASA controllers felt it best to shorten the mission and bring Columbia home. What a disappointment. However, the crew and the orbiter were not in grave danger, and it is easy

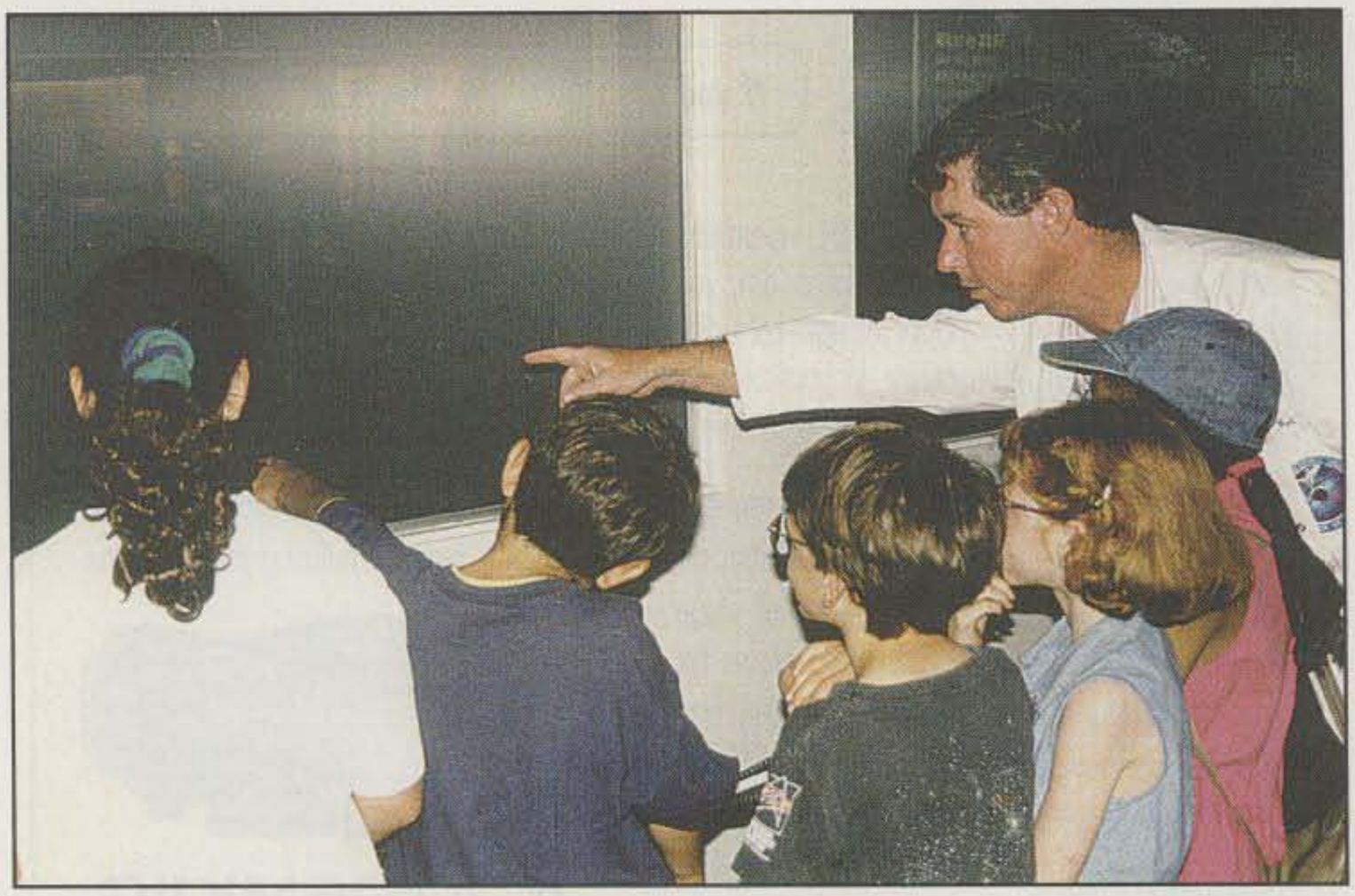

Photo 4– "Professor Bob" discussing the NASA website with the students of PS 9 on the day of the contact.

to understand that NASA puts safety at the top of their priorities.

PS 9 was contacted. The students had to be told the crew was safe, but unfortunately, the contact had been scrubbed.

Plan B

Undaunted, I felt something additional needed to be done. I planned on another visit to PS 9 with one of my students, Mary Alestra, KB2IGG. We would set up and operate 2 meters from each of the classrooms.

Before the planned demonstration, however, I received yet another special phone call. Day informed me that Don would be coming to New York City the next week. One of the things he wanted to do was meet with the students and answer all their questions. He wanted me to sort of be the Master of Ceremonies, since I seemed to get the kids pretty worked up on my visits.

Don showed up, we had a big assembly with all the third graders, and questions were asked and answered (photo 3). Also, I had another eyeball QSO with KC5FVF. No one was disappointed. Towards the end of the assembly, I produced a couple of 2 meter HTs. I gave one to Don up on the stage and took the other outside, and with over 100 students and faculty watching, WB2UDC and KC5FVF made contact. It was no big DX, but an enjoyable ham event nonetheless.

Another Opportunity

This is not the end of the story. At the conclusion of the assembly, as we were leaving PS 9, Don said, "There is a chance we will refly the mission in the summer. If we do, would you like to go to the launch?" You can guess my answer! Sure enough, NASA designated STS-94 a reflight of STS-83 with all the experiments and projects the same—including SAREX! One difference for me: I was going to see the launch.

STS-94 was scheduled for the summer, and school was not going to be in session, so more work needed to be done to ensure participation. The Parents Association of PS 9 plus the classroom-to-classroom 2 meter contacts kept the level of enthusiasm high among the students and teachers (photo 4).

The STS-94 mission began on July 1, 1997 at 2:00 PM. What an incredible experience. To see, to feel, to hear the shuttle launch is truly something difficult to translate into words. A shuttle launch is sort of like "Woodstock for Engineers." It is a celebration of technology, design, and teamwork. All systems go! (My favorite launch photo, featured at the beginning of this article, is also on my QSL card; see photo 5.) Our QSO was scheduled for July 15 at 9:20 AM New York time.

We began our drill again, inviting all the students and their families to Cooper Union. We also invited the press and a variety of official types. The teachers had lined up the students and questions. We rehearsed the use of our multimedia classroom several more times with "SAREX mission control." We used a phone patch to actually connect the telebridge signal to our PA system. The classroom was state of the art, with two large rear-projection displays. One would show the position of Columbia, the other NASA's mission-control website.

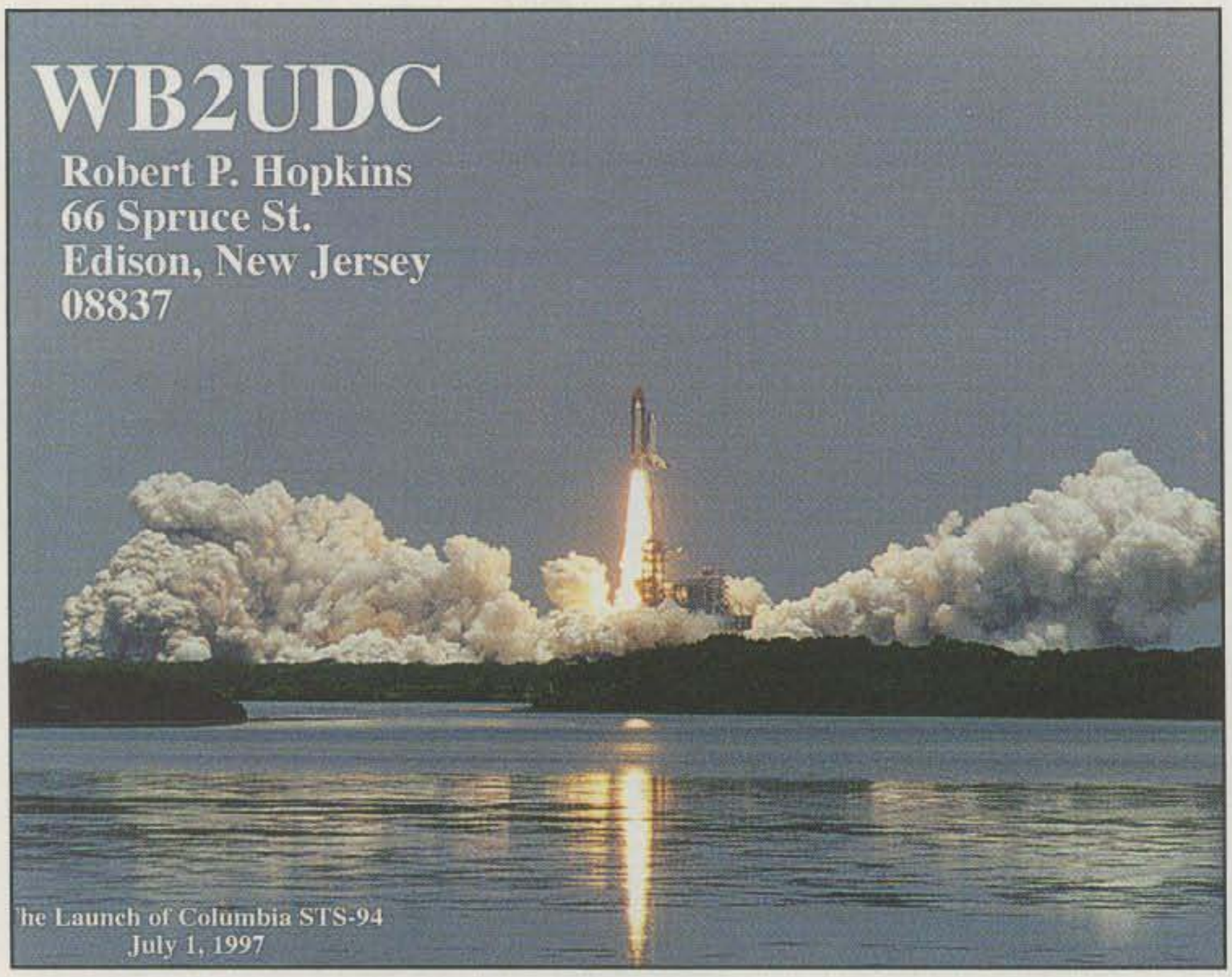

Photo 5– The current QSL of WB2UDC, a photo taken by the author of the launch of Columbia STS-94 on July 1, 1997.

Photo 6– "Can you see the Great Wall of China from the Shuttle?" This was one of the questions asked of the astronauts on STS-94 during PS-9's nine-minute contact.

The moment was approaching. Ten minutes before contact we established a connection with the telebridge conference center. This time, unlike our previous rehearsals, the audio signal was weak—too weak, in fact, to hear over our new, fancy high-powered public-address system. In an effort to adjust the gain on the PA, the system went into audio feedback. This caused the public-address system to shut down!

I had no idea this was going on behind the scenes. Had I known, I might have had a heart attack! However, our ever-resourceful Paul Tummolo, KC2KDA, sprang into action. He pulled the fancy amplifier out of the rack, replaced it with an old standby tube-type amp, and hooked up all the wires at lightning speed, only to discover he was one jumper wire short. Two minutes before the scheduled contact, Paul spotted a discarded twist tie on the floor of the studio. He picked up the tie, stripped off the paper with his teeth, took the resultant piece of wire, and placed the final jumper on the amplifier.

"Thirty Seconds . . . are we go for contact?" At that instant the familiar white noise of 2 meters filled the classroom and . . . "We're go for contact."

I could feel the sweat running down the back of my shirt, and then a signal sounding way too realistic, more like a rare DX station, broke through the noise and the QSO began. Student after student came to the mic and asked questions about life in space (photo 6). The time passed way too quickly, and our nine-minute window began to close. The entire audience shouted out a final 73, and "KC5FVF this is WB2UDC in the Big Apple; thanks for talking to us" ended the contact.

That Familiar Feeling

Those nine minutes gave me back the same feeling I had had 34 years earlier when my first CQ was answered. I became a kid again. What a gift!

For the next hour or so we discussed ham radio, space travel, engineering, and the importance of science in elementary school. We had excellent press coverage. Not all the eyes in the audience were dry. I explained to the kids that our voices were heard on Columbia, and NASA felt education was so important that they committed time and resources to make this happen.

It is almost impossible to repay everyone for this experience. The words *thank you* do not seem to be enough. What I can do, however, is continue to tell the story—an adventure in learning that probably benefited the teacher more than it did the students.

So there you have it. That's my story, made possible through the generosity of a great team of volunteers. Don Thomas—scientist, engineer, space traveler, and amateur radio operator—is an American hero who works very hard at what he does.

Ham radio can make the study of science fun. It is important for young people to experience joy in learning, and what better way than this? What we do cannot just be our secret. We have to share the wealth and tell our story. This one is mine. What's yours? ■

math's notes

BY IRWIN MATH,* WA2NDM

Coax, Connectors, and Some Trivia

While browsing through the various catalogs we have in the technical library at the office I came across some information (and trivia) that I think will be of interest to the experimenters in our midst. While the information given this month is not necessarily "earth shaking" I though it might come in handy, especially if it was all organized in one place.

The first is a chart of specifications for common coaxial cable that should help experimenters know what to expect when using the various types of "bargain" surplus coax available from time to time.

Type	Impedance (ohms)	Operating Voltage	Attenuation @ 1 GHz	Attenuation @ 5 GHz
RG6A/U	75.0	2700	.11 dB/ft	.30 dB/ft
RG8A/U	52.0	5000	.09 dB/ft	.28 dB/ft
RG11A/U	75.0	5000	.09 dB/ft	.28 dB/ft
RG55B/U	53.5	1900	.17 dB/ft	.51 dB/ft
RG58C/U	50.0	1900	.20 dB/ft	.60 dB/ft
RG59B/U	75.0	2300	.12 dB/ft	.41 dB/ft
RG62A/U	93.0	750	.09 B/ft	.30 dB/ft
RG71B/U	93.0	750	.09 dB/ft	.30 dB/ft
RG108A/U	78.0	1000	.26 dB/ft	.80 dB/ft
RG122/U	50.0	1900	.29 dB/ft	.89 dB/ft
RG140/U	75.0	2300	.13 dB/ft	.26 dB/ft
RG141A/U	50.0	1900	.13 dB/ft	.26 dB/ft
RG142B/U	50.0	1900	.13 dB/ft	.26 dB/ft
RG174A/U	50.0	1900	.31 dB/ft	.91 dB/ft
RG178B/U	50.0	1000	.45 dB/ft	1.2 dB/ft
RG179B/U	75.0	1200	.25 dB/ft	.63 dB/ft
RG180B/U	95.0	1500	.17 dB/ft	.50 dB/ft
RG187A/U	75.0	1200	.25 dB/ft	.63 dB/ft
RG188A/U	50.0	1200	.30 dB/ft	.79 dB/ft
RG196A/U	50.0	1000	.45 dB/ft	1.2 dB/ft
RG210/U	93.0	750	.03 dB/ft	.09 dB/ft
RG213/U	50.0	5000	.09 dB/ft	.28 dB/ft
RG214/U	50.0	5000	.09 dB/ft	.28 dB/ft
RG216/U	75.0	5000	.09 dB/ft	.28 dB/ft
RG217/U	50.0	7000	.06 dB/ft	.19 dB/ft
RG218/U	50.0	11000	.04 dB/ft	.14 dB/ft
RG219/U	50.0	11000	.04 dB/ft	.14 dB/ft
RG223/U	50.0	1900	.17 dB/ft	.51 dB/ft
RG225/U	50.0	5000	.08 dB/ft	.21 dB/ft
RG302/U	75.0	2300	.13 dB/ft	.36 dB/ft
RG303/U	50.0	2300	.13 dB/ft	.36 dB/ft
RG316/U	50.0	1200	.30 dB/ft	.79 dB/ft
RG393/U	50.0	5000	.08 dB/ft	.21 dB/ft
RG400/U	50.0	1900	.13 dB/ft	.36 dB/ft
RG401/U	50.0	3000	.08 dB/ft	.21 dB/ft
RG402/U	50.0	2500	.13 dB/ft	.36 dB/ft
RG405/U	50.0	2000	.22 dB/ft	.66 dB/ft

For those of you who are interested, the RGXX/U designation comes from the following:

R = cable that is designed for radio frequency applications

G = government

XX = a government approval number originally issued when the coax was first approved

U = an indication that this cable is designed to meet the same "official" government-approved specifications of all manufacturers.

The "UG" designation that one sometimes comes across is from a government specification that is now obsolete.

Next on the agenda are connectors for the above coaxial cable. The chart below shows pertinent details of these.

Type	Impedance (ohms)	Operating Frequency	Peak Voltage	Notes
BNC	50	0–4 GHz	500	Most common RF connector
BNC	75	0–4 GHz	500	Commonly used for video
C	50	0–10 GHz	1500	Weatherproof bayonet
MHV	—	0–50 MHz	5000	High-voltage use
N	50	0–11 GHz	1500	Weatherproof threaded
SC	50	0–11 GHz	1000	Threaded Cs
SMA	50	0–18 GHz	500	Popular fo microwave
SMB	50/75	0–4 GHz	375/500	Quick connect
SSMA	50	0–40 GHz	500	Microminiature SMA
TNC	50	0–11 GHz	500	Threaded BNCs
TRIAX	—	0–300 MHz	5000	For maximum shielding
TWINAX	95	0–200 MHz	500	For balanced lines
UHF	—	300 MHz	500	Low-cost general-purpose

Many have sleeves and adapters which allow them to be installed on almost all of the cables listed above. These are too numerous to list, and I suggest you check a good connector catalog if you need these details.

The BNC connector, by the way, was named for Neils Councilmen, a designer for Amphenol, who designed the original BNC in the late 1940s. The actual term means "bayonette-neils councilmen." The N connector was named for Paul Neill, another Amphenol designer, who came up with it in the late 1940s. This was the first true microwave connector and is probably where the designation "N" came from. The UHF connector was named for E. Clark Quackenbush, still another Amphenol designer, and this connector made its first appearance in the 1930s. In those days, 300 MHz was considered an "ultra-high frequency," and thus the designation "UHF."

For those who are interested, much of the above "trivia" comes from the Amphenol website at <www.amphenolrf.com>. 73, Irwin, WA2NDM

*c/o CQ magazine

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antennas

BY ARNIE CORO,* CO2KK

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Antenna tuners: They may be manual or fully automatic, balanced or unbalanced, for QRP operation or capable of handling full legal power; may be just a simple series capacitor or L network; may be found in the rather popular T configuration, or the less popular but highly effective PI ; some of the more sophisticated ones may offer full control of all the reactances involved, both capacitive and inductive, and be configured according to the requirements. What I can assure you, however, is that although they are all known as *antenna tuners,* those nowadays essential accessories of our amateur radio stations usually are *not* doing precisely what their name suggests.

From an engineering point of view, antenna tuners are defined as transmission-line sections, be they made from actual physical sections of feeders or from lumped circuits in the form of capacitors or inductors. What is most important of all to make this definition valid is that they must be located right next to the antenna itself. As a matter of fact, any attempts to place the device more than a very short distance away from the antenna in terms of wavelength at the operating frequency will disqualify it as a properly defined *antenna tuner.*

Let's face it: The box, usually with two or three knobs we can tweak, or in more recent times the fully automatic version placed right next to a typical transceiver, in most cases is not working as an antenna tuner as such, and could best be described as a transmission line to transmitter output matching system. However, I doubt that by now we can do anything realistic to change the name of such boxes, so in this column they will continue to be known as antenna tuning units, antenna tuners, or just tuners!

The first conclusion that you should draw from reading this month's "Antennas" Column is that whenever possible, the tuning unit should be located right next to the antenna in use. Doing this certainly will improve the performance of any radiation system, because power transfer from the transmission line to the antenna will be optimized, and the transmission line hopefully will "see" its characteristic impedance at both ends—that is, at the output of the transmitter and at the antenna. I may add, though, that recent careful measurements made to several popular amateur transceivers showed me that their output impedance wasn't the nominal 50 ohms specified by the manufacturers.

Locating the antenna tuning unit, which is the proper name of the accessory, right next to the antenna does bring into the picture one problem: the need to have a remote-control system to operate the system if one needs to change frequencies.

*c/o CQ magazine
e-mail: <co2kk@cq-amateur-radio.com>

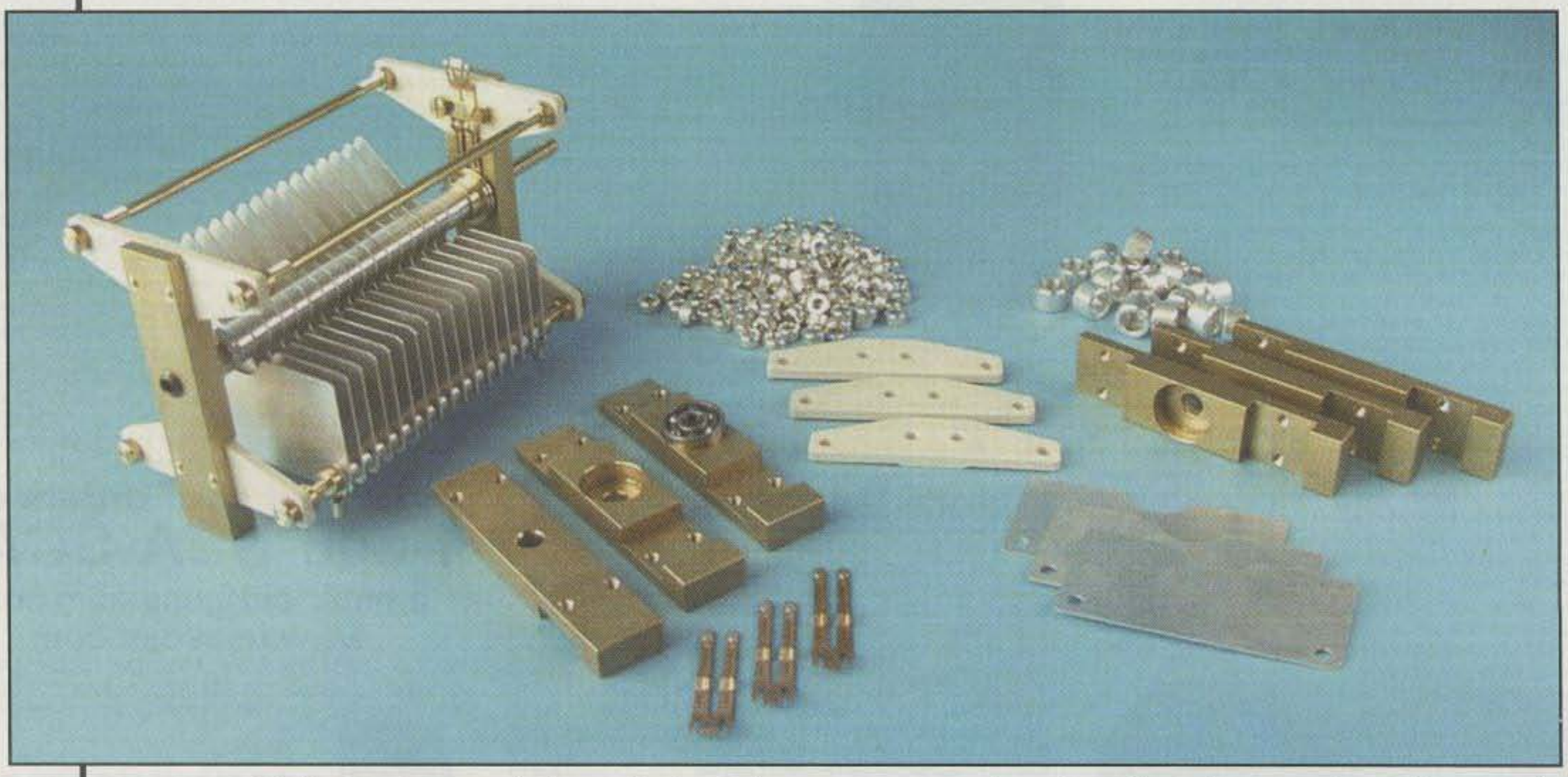

Photo A– Antenna tuning units for high-power use require using either air-spaced variable capacitors such as this one, or the more expensive vacuum variables to prevent flashovers arising from mismatch conditions.

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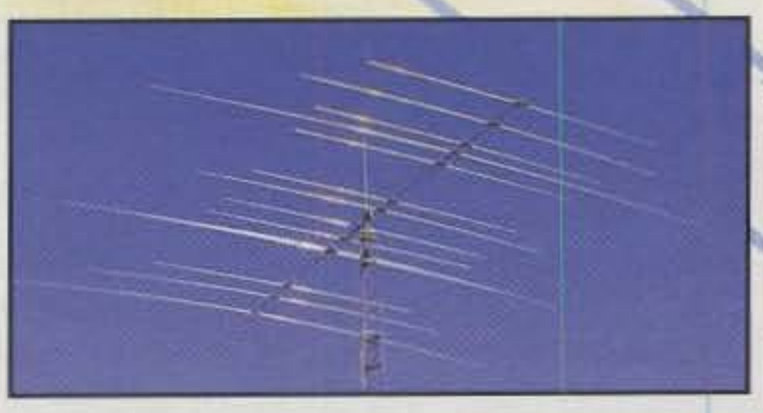

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With recent advances in microprocessor-controlled equipment, remotely tuned antennas are becoming more and more common, especially among professional users of the HF spectrum. Perhaps the best known cases nowadays are the "magnetic loop" antennas that are remotely tuned for resonance and minimum SWR and are helping so many amateurs enjoy the hobby despite having to face severe antenna installation restrictions. I will be presenting several easy-to-homebrew magnetic-loop antennas in an upcoming column.

So far, however, among radio amateurs even the automatically tuned equipment most of the time is located right next to the transmitter, with a variable length of transmission line connecting the antenna to the . . . *transmission-line tuner!*

Length of the Transmission Line

Playing with one of antenna engineers' favorite toys, the Smith Chart, you soon will find that the length of the transmission line between the antenna and the actual location of the antenna tuner, plus the length of line between the tuner and the equipment, have a very significant impact on the matching and efficiency of the system.

Single-band operation on the antenna makes things a lot simpler, because transmission-line theory will tell you that cutting the line to an exact multiple of half wavelengths makes it possible for the complex impedance seen at the antenna terminals to be almost exactly duplicated at the far end of the line, where your box will then attempt to achieve a match.

What to do when multiband operation is required? The answer to this important question will help you do a critical review of your station.

One good choice is to cut the transmission line, typically a coaxial cable run, to an exact number of wavelengths on your favorite band, and then be prepared to match whatever complex impedance is present at the end of the cable on other bands to the radio frequency amplifier output stage, be it a single transistor in a QRP rig, or two big metal-ceramic tetrodes that deliver high power for breaking those pile-ups!

The Right Name for Those Boxes

Let's call them, at least temporarily, by their proper name—*transmission-line matching devices*—and of course, let's also create yet another acronym . . . the *TLMD*.

Now that we have invented a good name for antenna tuners, as they have been known up until now, let's start to learn more about them.

In most cases involving the HF bands, from 80 meters all the way up to the upper edge of our widest band, 10 meters, extremely simple TLMDs will do a very good job indeed. What do I mean by simple? Well, just using the simplest possible matching network, formed by an inductor and a capacitor—the so-called L configuration.

A properly designed L tuning network will have lower losses than other arrangements such as the T or the PI, and it can be easily homebrewed if you can find the proper variable capacitors. Ideally, the L network should have both branches variable, but with antennas that are not resonant to the operating frequency, you can find the required inductance experimentally, then make a final version of the coil required, and only tune the variable capacitor for a proper match which can be approximated by measuring the voltage standing-wave ratio (VSWR).

One of the most prevalent myths, even among some old timers, is that antennas need to be resonant to the operating frequency if you really want them to be efficient. This is absolutely wrong. That's why the L antenna, used with a real antenna tuning unit and not a TLMD, has proven to be so effective.

The combination of an L antenna that starts very close to the station, with an L-network antenna tuning unit *plus* a good counterpoise, is an excellent multiband antenna if you are able to put up at least 0.15 wavelength of wire up in the air.

TLMDs to Avoid and Features to Look For

Transmission-line matching devices that use the T network are the ones you want to avoid using, if you also want good suppression of harmonics and other nonessential radiation. I must warn you, however, that opening up many of those antenna tuners will show that they use precisely the T circuit arrangement, a high-pass network, so it will provide almost no suppression of frequencies above the one on which you are operating.

Avoid the tuners that use very smallsize capacitors and very compact coils. RF watts that are so hard to generate should not be lost as heat.

TLMDs with built-in SWR meters are certainly advantageous, as they save lengths of interconnecting cables and connectors. However, don't think that you will gain a lot by having the SWR meter form part of the TLMD, because losses of the typical coaxial connectors and small lengths of cable are really minimal even all the way up to the VHF region of the spectrum.

TLMDs You Can Make Yourself

First things first: Yes, you can make your own high-performance TLMD or a *real* antenna tuner by following good design and construction practices. By now I am sure that you will avoid the T network for your homebrew TLMD or tuner. That decision will lead you to either the L , the PI, or the PI-L for typical unbalanced networks used with coaxial-cable feedlines.

The L, using high-quality capacitors such as the ones shown in photo A, may be used with the capacitor placed at

Photo B– The variometer was extremely popular among radio pioneers. Nowadays it is still used at high-power VLF stations for precise matching of very large antenna arrays. Variometers offer superior performance because the inductance can be changed without any mechanical contacts.

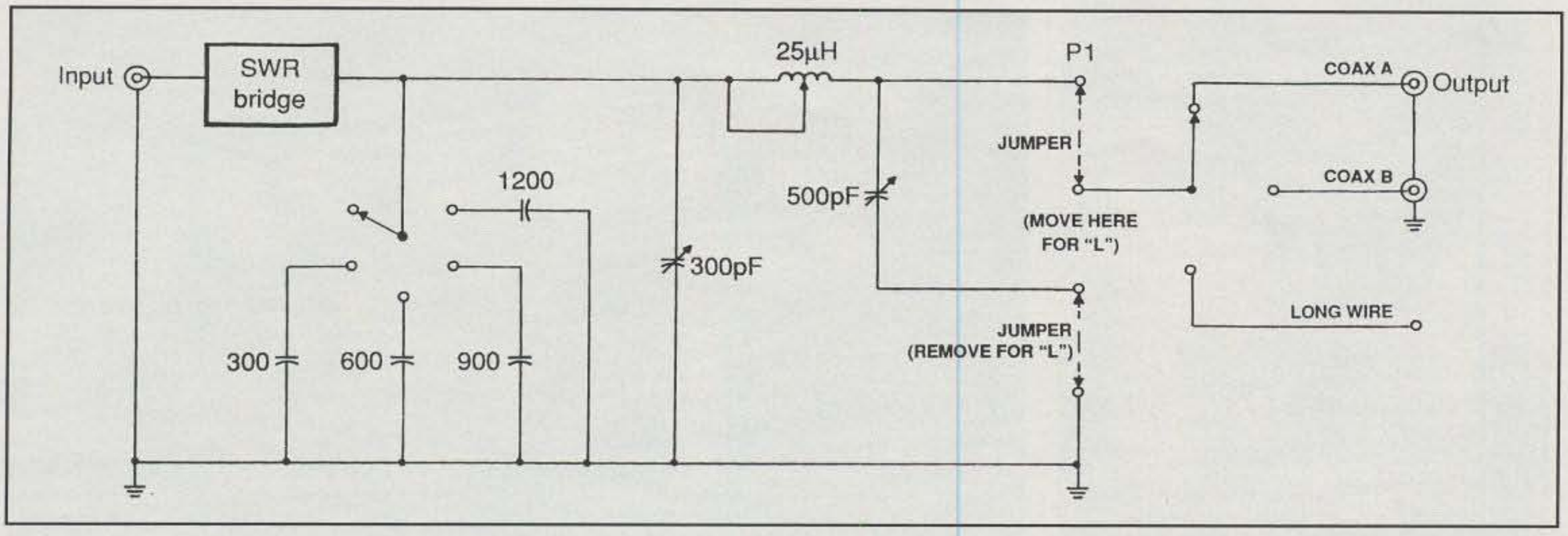

Fig 1– Circuit diagram of PI-L tuner. My favorite antenna tuner or TLMD, depending on where it is located, is the PI-L, which offers both a wide range of impedance matching and excellent low-pass action.

the antenna side or at the rig's output side. On some bands, using the L network to match, for example, an L or a T antenna will require that you have the capacitor connected to the antenna side, while on other bands the network has to be connected all the way around.

You can optimize the L network by making both the inductance and the capacitance variable. In that case, you have three choices for the variable inductance:

1. Use a fixed inductance (coil) with taps and a switch.
2. Use a roller inductor.
3. Use a *variometer* (see photo B).

Of the three above-mentioned options, the most efficient one is the variometer, as you can smoothly change the inductance without having to involve any metal-to-metal contacts. Variometers certainly are not popular in today's radio "art," and this may be due to the relatively high cost of making them, as compared to the simpler coils with switches or the continuously variable roller inductors.

After the ultra-simple L , the next easiest to build TLMD uses a PI network configuration that has the added advantage of much more low-pass filter action as well as providing a very wide range of matching.

Finally, if you really want the optimum, go for the PI-L network (see fig. 1), as this circuit arrangement will provide the widest matching range plus excellent low-pass filtering.

As you may realize by now, once you have the know how, TLMDs and real antenna tuning units are not that difficult to homebrew.

Actual losses due to the coaxial transmission line used at most amateur stations begin to be really significant when the SWR goes above 3 to 1 and the length of the cable is really long. This means that using the antenna tuner as a TLDM with relatively short cable runs —as most of us do—may not be that bad at all. Nevertheless, the highest

Tuners for VHF and UHF?

Sure . . . and I can't understand why they haven't become more popular among VHF and UHF operators. A PI-network 6 meter TLMD used at CO2KK practically eliminates any trace of TVI to local channel 2 , while my simple PI tuner used ahead of the 2 meter FM rig not only makes the rig look at a 1:1 SWR, it also dramatically reduces crossmodulation problems.

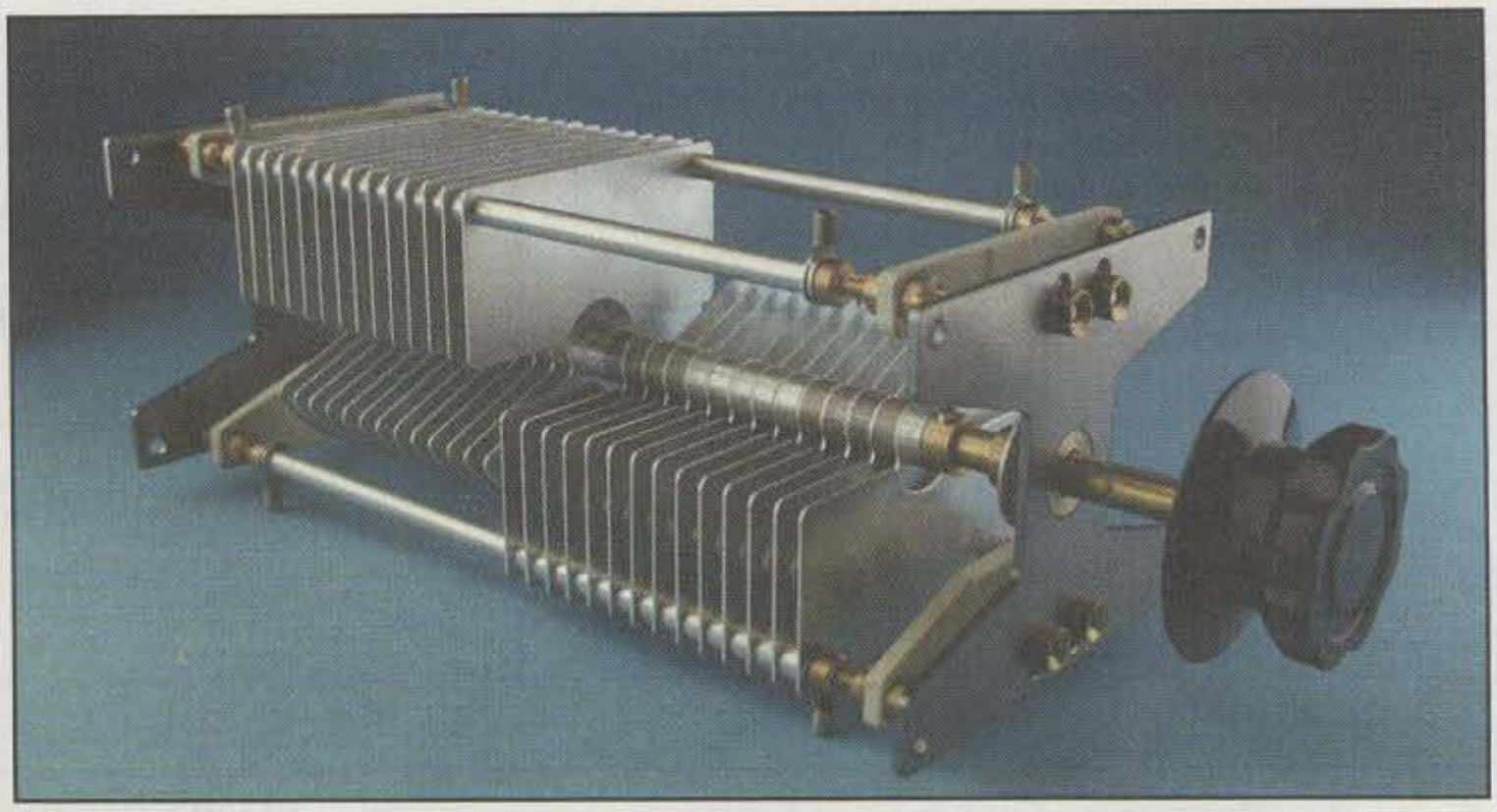

Photo C– Properly designed antenna tuning units will have optimum LC ratios, and the balanced units will use differential or split-stator capacitors such as this one to keep perfect balance between both sides of the transmission line.

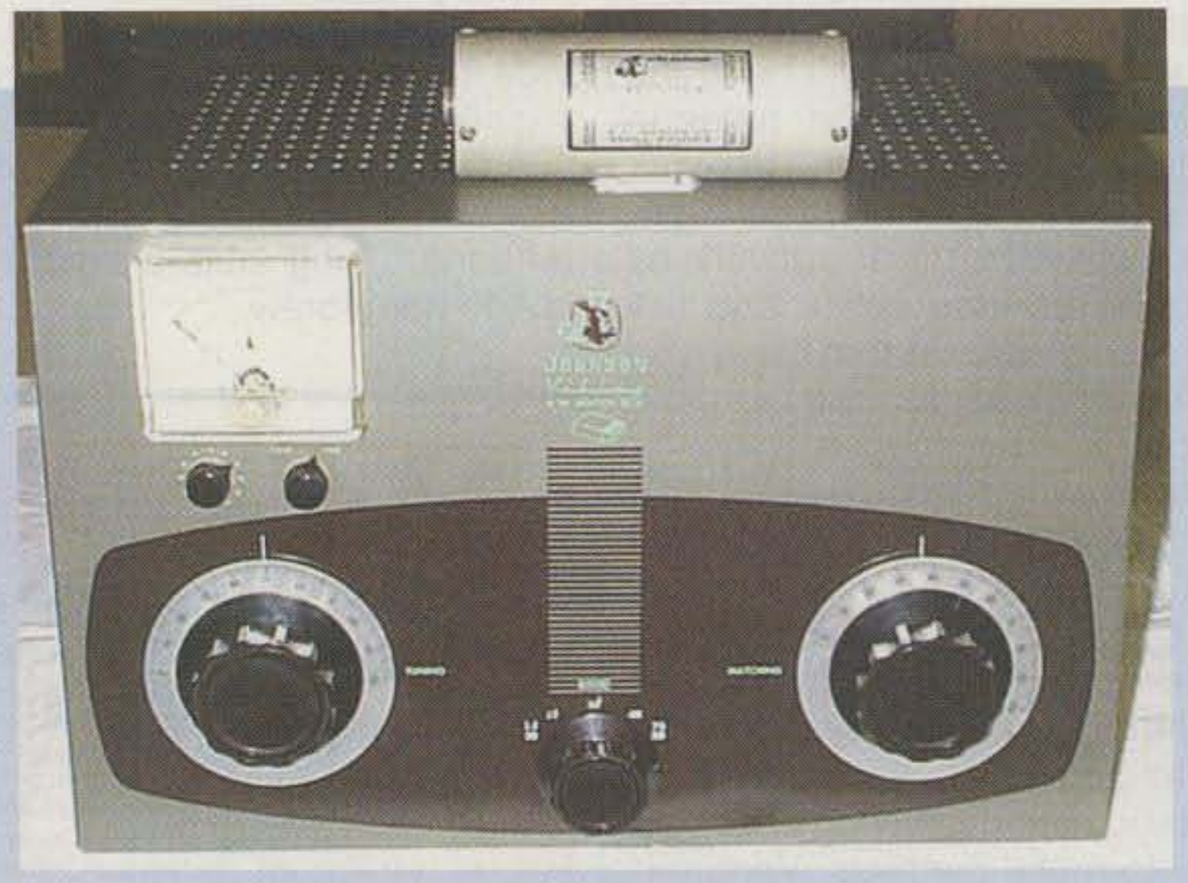

Photo D– Many years ago, the E.F. Johnson Company made the new-classic Kilowatt Matchbox. The engineers who designed it apparently convinced the sales people to use the appropriate name for the accessory, a "Matchbox," not an "antenna tuner."

possible efficiency certainly is achieved only when the matching unit is right next to the antenna to do its one and only job: *Matching* the antenna's complex impedance to the transmission line, *not tuning the antenna at all!*

TLDMs and Real Tuner Scenarios

If your tuner is right next to the antenna, for example at the base of a vertical, then it is a "real" tuner. However, if you simply connect a 50 ohm coaxial line to a half-wave wire dipole (even using a balun) and then trim the SWR to a minimum with the tuner located right next to the rig, you are using it as a TLMD!

Commercial antenna systems intended for wide frequency coverage in the HF spectrum use very sophisticated remotely controlled tuners with great effectiveness, but at very high cost, as extreme care must be taken to protect all the components from exposure to the weather.

My advice is that whenever possible, go for the real tuner function right next to the antenna, and match the antenna to the characteristic impedance of the transmission line right where it must be done! ■

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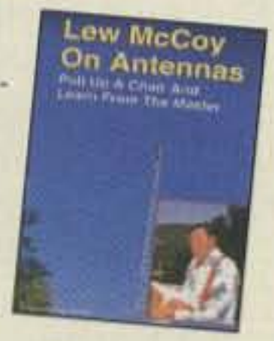

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BY BOB JOSUWEIT,* WA3PZO

Are You Part of a C.O.O.P.?

As the U.S. military received orders in early January to move out for possible action against Iraq, it is important to look at the role of amateur radio in emergency communications. This month we take a step back and look at a bigger picture.

September 11, 2001 is a day few of us will forget. The United States was under attack. The President, who was in Florida, did not return immediately to Washington, D.C., but was diverted to military bases in other parts of the country. In the first few hours that day, President Bush ordered the deployment of a "shadow government" comprised of some 100 senior civilian managers to live and work outside of Washington, D.C. This "shadow government" was the first-ever activation of the Cold War era Continuity of Operation Plan (C.O.O.P.), developed in case there was ever a catastrophic attack on Washington, D.C.

The plan has become a precaution through which high-ranking government officials representing various departments would rotate in and out of the "shadow government" at one of two fortified locations on the east coast. One example had the Veterans Administration Headquarters being evacuated and key management personnel shifted to an undisclosed location.

Amateurs Support Government

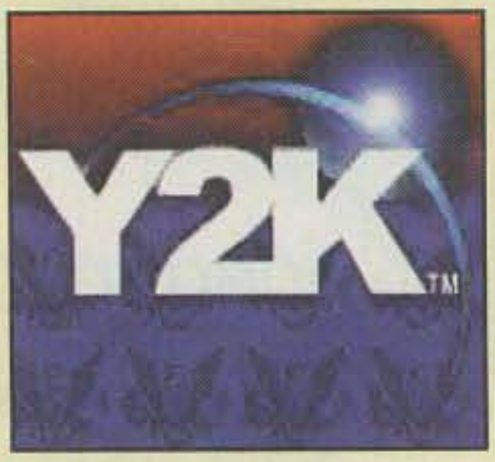
One of the federal government's many concerns was keeping in touch with all its agencies and offices across the nation. The continuity of the federal government had to be maintained.

Within 15 minutes of the first airplane crash into the World Trade Center, the first of many emergency information messages had been transmitted by a Military Affiliated Radio System (MARS) member to the Pentagon. Within an hour, a coast-to-coast backup net was forming. The Army MARS assignment is "Preparing for the Worst."

The initial call for assistance came from the National Communications System in the Department of Commerce. The NCS assists the President, the National Security Council, and others in coordinating and planning for national security and emergency preparedness communications for the federal government under all circumstances, including emergency, attack, and recovery. An e-mail alert just before 10 AM EDT (about one hour after the initial plane crash into the World Trade Center) ordered NCS participating stations to operational level 2, "emergency potential exists." The alert, said the NCS message, "is requested by the FBI, the National Coordinating Center for Telecommunications, and the General Services Administration."

*c/o CQ magazine
e-mail: <wa3pzo@cq-amateur-radio.com>

New Year's Eve 1999 was one of the first large-scale contingency of operations plan uses of amateur radio. (Year 2000 Information and Readiness Disclosure Act graphic)



This activated a national coordination net. By 2 PM more than 200 stations had checked in. Among the participants were FEMA outposts, FAA offices, the American Red Cross, and state emergency operations centers, as well as the MARS members enrolled in SHARES, the HF "Shared Resources" program of the NCS.

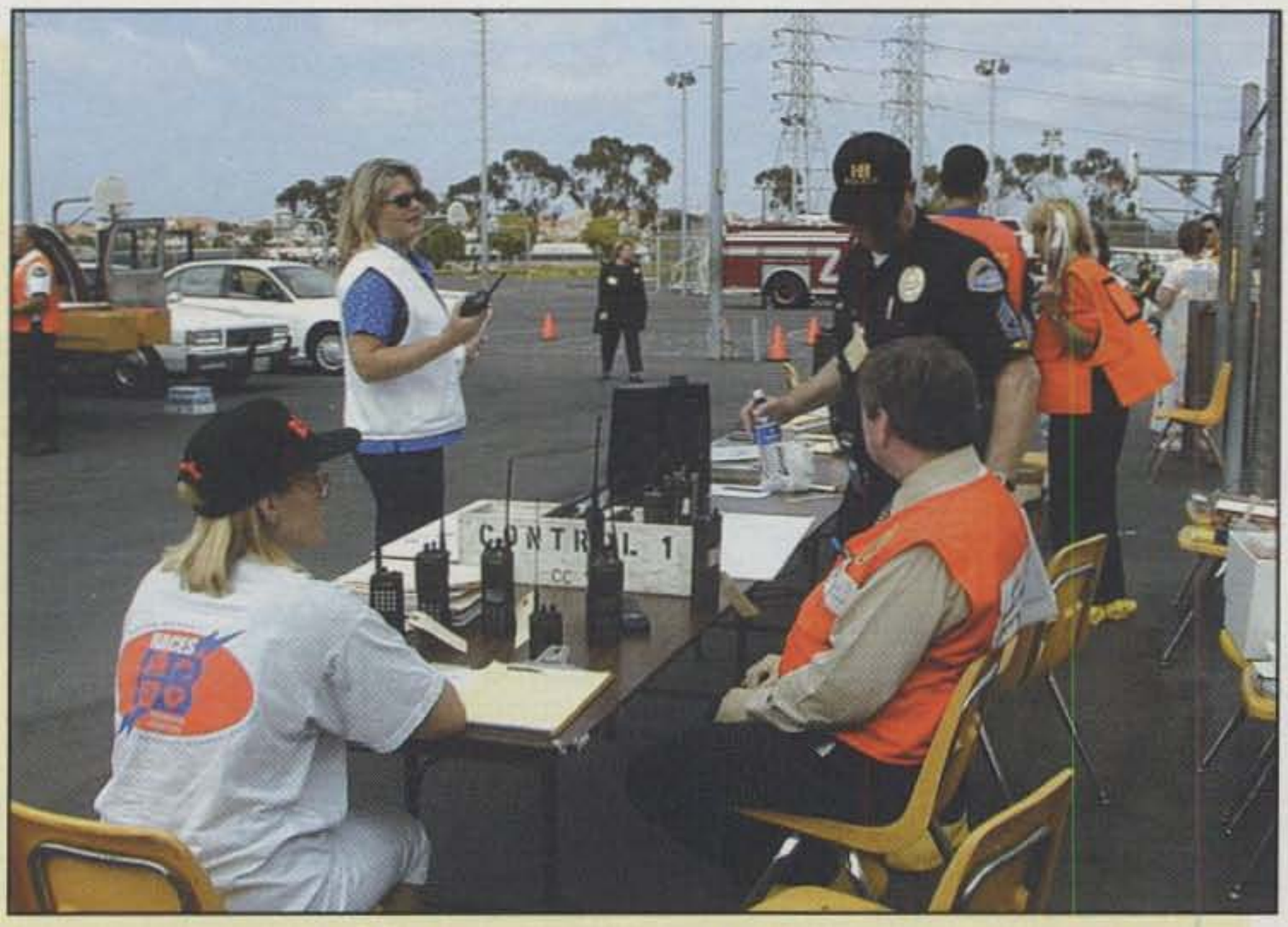
A general alert to all MARS members came soon afterward from Army MARS headquarters at Ft. Huachuca, Arizona, followed by a formal request for assistance from FEMA.

One of the first government agencies to require emergency communications was SHARES itself. Located in an office building near the Pentagon, the SHARES staff was immediately evacuated. Operations chief Ken Carpenter, KD6DBX, a retired Marine Corps communicator, quickly returned to the air with portable equipment at a secure northern Virginia location.

Regional SHARES nets also activated across the country, bringing in many more hams. Among the busiest was the Northeast Coordination Net, which provided links from Arlington, Virginia, near the Pentagon, to Long Island, New York, immediately outside the disaster zone, and to western Pennsylvania. During the first hours 29 stations, the bulk of them hams in the MARS organizations, stood by to handle traffic. (See November and December 2001and January 2002 *CQ* for more information.)

9/11 Was Not the First

Amateur radio operators around the nation and the world had already participated in an informal Continuity of Operations Plan nearly two years prior to the 9/11 attacks. The event was called Y2K, the rollover from December 31, 1999 to January 1, 2000, when it was feared that massive computer system failures might result. Ham radio operators around the world staffed key communication points to report any problems and maintain communication continuity between local, state, and federal agencies as the stroke of midnight went around the world. This communication continuity was maintained at local emergency operations centers, hospitals, and other sites just in case



Huntington Beach (CA) RACES member Margret Cerecedes, KE6OAR (RACES shirt), works at an evacuation center command post along with Public Health, Police, and Fire officials. (Photo courtesy W6GOS)

there was a problem with computers or other devices that might be affected by the year change.

Agencies Review C.O.O.P. Plans

Every government agency is constantly reviewing its continuity of operation plans. Many have formed special committees or working groups to manage a crisis situation.

Last September the Veterans Administration met to discuss their response to the first anniversary of the 9/11 events. The VA has a local presence in many areas of the country and needs to maintain its operations. In fact, a meeting takes place twice a week to discuss how the VA will maintain operations in the event of a future terrorist attack. Speaking in Salt Lake City last year, Claude M. Kicklighter, the Assistant Secretary for Policy and Planning and the Crisis Response Team director, said the VA's facilities are "prepared to support the Department of Defense in treating U.S. military personnel wounded abroad and in providing care for civilians injured in an attack at home."

"The nation is again at war," said Kicklighter, who also is acting director for the Office of Operations, Security and Preparedness. "I firmly believe this new war will be a long one."

Amateur Radio—A Good Fit

At a VA CRT meeting last September, *U.S. Medicine* magazine reported on a discussion about the use of amateur radio operators in an emergency. The magazine reported that Robert F. Elliott, deputy for strategic communications in the VA's emergency management strategic healthcare group in Martinsburg, West Virginia, was identifying the number of ham radio operators affiliated with the VA, either as patients or volunteers, and determining their callsigns and their level of training.

Elliot explained that using amateur radio operators is a good fit for the VA, since a number of veterans have radio experience from the military and have joined amateur clubs that hold meetings at VA facilities. "It's an asset to be used," he said.

Ham radio operators could be of important help to VA officials trying to respond to an emergency if other communications failed. Radio operators have traditionally been able to relay information about supplies, conditions, and casualties. The VA contacted the ARRL for additional information and assistance.

Local Training Updates

The Federal Emergency Management Agency is awarding training grants to various states. In Texas the updated plans will help address a common incident command system, mutual aid agreements, equipment and training standards, interoperability protocols, critical infrastructure protection, and

continuity of operations for state and local governments. As a consequence of the increased demand for amateur radio resources, it is important that amateurs become more professional and knowledgeable in emergency preparedness. The ARRL Volunteer Resources Committee made recommendations that all section leadership officials increase the professionalism of all volunteers "to meet more effectively the needs of served agencies." This includes urging all volunteers involved with either the Amateur Radio Emergency Service (ARES) or the National Traffic System (NTS) to complete at least Level 1 of the ARRL Emergency Communications Course. Others involved in net leadership or management roles should take upper level courses, according to the VRC. For the latest FEMA home study course updates check out: <http://training.fema.gov/EMIWeb/mtp.htm>.

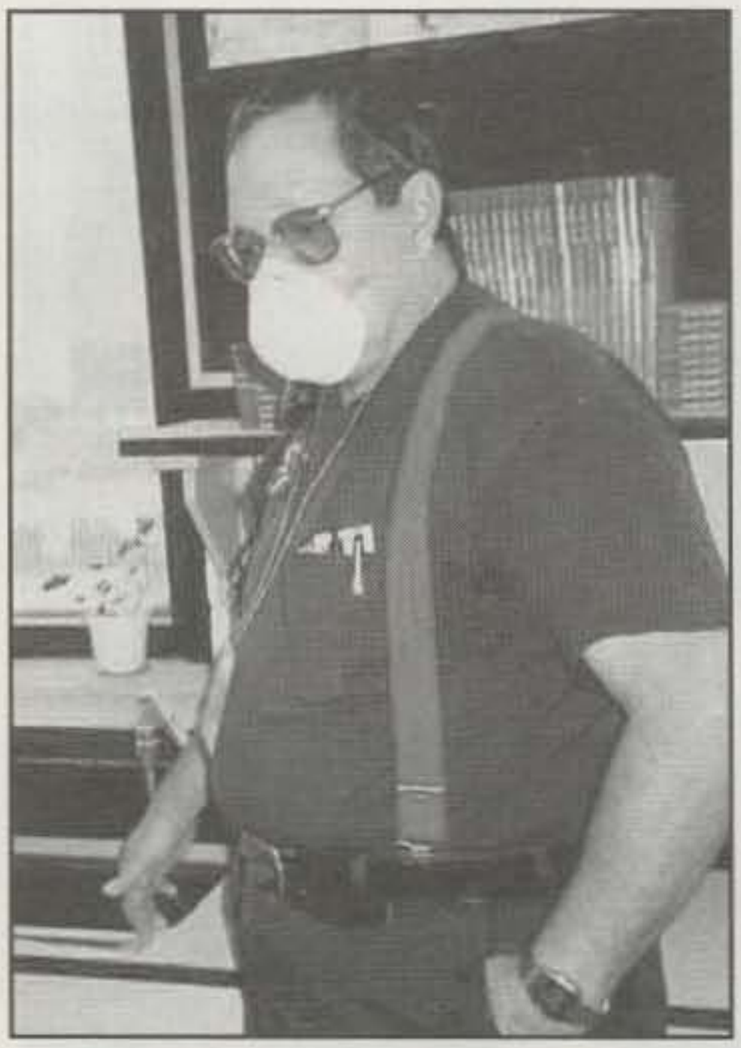
You haven't made up your mind if you are part of a C.O.O.P.? From this reporter's perspective, if amateur radio operators are activated to provide communications and you are part of the response, then you *are* helping to keep the continuity of government in operation.

RACES CERT Working Together

On Wednesday, December 11, Glorria Morrison, KE6ATG, Huntington Beach, California's Fire Department Emergency Services Coordinator, was in the process of briefing the new Police Chief, Kenneth Small, on routine procedures. The briefing was interrupted by a natural gas leak in the city. Nine fire companies were assigned to the incident, including a unit from another nearby fire department. Public works and police department personnel also responded. A 55-unit apartment complex was evacuated. Huntington Beach Fire Battalion Chief Jacques Pelletier requested that a Care and Reception Center be set up for displaced residents due to the evacuation.

The Huntington Beach Radio Amateur Civil Emergency Service (HB RACES) was placed into standby mode by Fire Department Emergency Services. HB RACES established a directed net and began logging-in availability for response. The RACES Incident Command System (RICS) was initiated, and 20 RACES members responded with full availability.

Using RICS, RACES communicators were deployed to the Emergency Operations Center (EOC) and the Fire



Barry Vogt, N3NVA, wears a protective mask to help protect him from the dust while assisting with communications near the World Trade Center site. (Photo courtesy N3NVA)

Incident Command post at the scene of the gas leak. All other available RACES members maintained radio watch on the net and prepared for possible 12-hour deployments. RACES communications were exclusively utilized throughout this event, since the city cell phone system was not functioning.

Meanwhile, a call was made to the Community Emergency Response Team (CERT) Shelter Leader to activate five CERT volunteers to the Care and Reception Center location.

Tim Sawyer, WD6AWP, acted as net control operator. HB RACES Chief Radio Officer Steven Graboff, MD, W6GOS, responded to the Care and Reception Center and provided cell phone, amateur radio, American Red Cross, and HB Fire radio communications. There were no other forms of communication at that location. Within two hours the Fire Department advised RACES that the emergency was over and the net was deactivated. The shelter was closed down and the residents went home.

"Between the RACES communicators and CERT Shelter Team, no additional city or Red Cross personnel were needed and the incident was handled very well. There was no cost for the incident, since all volunteers and volunteer communications equipment were utilized and I was on my regular workday," said Morrison. "This is an example of how volunteers can be utilized to provide emergency services to the City of Huntington Beach at no cost and no drain to city resources."

Huntington Beach CERT was formed in 1991 following a tornado that struck two of the city's 133 half-mile-square districts. The city police and fire departments were heavily impacted and would have been severely stretched had damage been more widespread. It was concluded that if every neighborhood, school, and business were to become self-sufficient and able to properly respond to a disaster, the overall public-safety response would be faster and more efficient.

Environmental/Biological Health Risks

In our earlier coverage of the amateur radio response to the World Trade Center Disaster we raised the question of long-term health issues to ham radio operators and others who assisted in the rescue and recovery effort. We posed questions about ham radio operators going into an area without protective clothing alongside of other emergency responders who were wearing protective clothing and breathing apparatus, and whether we could effectively use a radio if we were wearing protective clothing.

Many emergency workers threw out clothing and in some cases their equipment rather than bring it back to their homes or workplaces. At the same time hundreds of ham radio operators brought their radios, antennas, go-kits, etc., into the area to provide a valuable service. Most of those radios and kits are now back in the shack, ready to be taken to the next emergency. (Your local emergency management agency may be a good source of information for cleaning your equipment.) Is this healthy? We still don't know

This spring the New York City Health Department is launching a study which will follow as many as 200,000 people who may have been exposed to smoke, dust, and airborne substances from the collapse and cleanup of the WTC site. The WTC Registry will enable the health department to evaluate long-term health effects from the WTC disaster as objectively and comprehensively as possible. The Registry will monitor the mental health of registrants as well.

The Registry will collect information such as your name, address, and age. You may be asked where you were on September 11 and how long were you at the WTC site. You may also be asked

about health or mental problems you may have experienced since September 11, and any follow-up treatment you may have received since then.

All information collected will be confidential and maintained securely at the NYC Department of Health and Mental Hygiene (DOHMH). Information from individuals will be entered into a database, then combined, sorted, and analyzed so that we can look at how the events of September 11 affected different groups of people. This will generate both a broad overview of the health effects from the WTC disaster, as well as more a detailed picture of health effects experienced by specific demographic groups. This information should be helpful in understanding the effects on ham radio operators and others who responded to this disaster.

According to the NYC Health Department officials, participants "will be kept informed of any medical or public health information as it becomes available, including relevant studies, medical interventions, and public health recommendations." Health care will continue to be provided by each individual's personal physician.

The Federal Emergency Management Agency provided $20 million to the U.S. Department of Health and Human Services (HHS) to establish the WTC Registry. For further information, check out the Registry web page at <http://www.nyc.gov/html/doh/>. You may also contact the Agency for Toxic Substances and Disease Registry Information Center at 1-888-42-ATSDR (1-888-422-8737) and NYC Health and Mental Hygiene at 1-877-NYC-DOH7 (1-877-692-3647).

This information is being provided because so many hams traveled from outside of the New York area to assist in the response and to raise the awareness for future responses.

Recap

This month we dug into our files a bit and offered a different perspective on the events of the past few years. Understanding the role of amateur radio operators and the Amateur Radio Service may help focus our attention on deployments yet unknown. It is clear that our role as trained communicators helps our communities and our nation provide a continuity of government in the best and the worst of times. It is also clear that many agencies are requesting help from local amateur radio operators. Some of those requests are coming in so quickly that amateur radio public-service leaders have to effectively manage their existing resources so as not to be spread too thin between too many agencies.

We often receive comments on our stories. While there are many ham radio emergency communication related list servers, there is a place you can ask or make comments on the stories we cover each month. Check out the Public Service and Emergency Communications forum on the CQ website. Go to <http://www.cq-amateur-radio.com>, select "Q&A" and then "Public Service."

This month I want to thank Wayne, KB6HZ, and Steve, W6GOS, for providing information from California. Are you doing something interesting in public-service and emergency communications? Drop us a note and let us know about it. Until next time . . .

73, Bob, WA3PZO

BY FREDERICK O. MAIA,* W5YI

Two More Hams Petitions for Rulemaking Filed with FCC

The FCC has received and put out for comment two more amateur radio petitions. In a recent Public Notice, the Commission invited comments on the proposals, designated RM-10620 and RM-10621. They join seven other petitions that have been languishing at the FCC, some for nearly two years.

RM-10620

RM-10620 was submitted by Dale E. Reich, K8AD, of Seville, Ohio, on November 9, 2002.

Dale says that while the reduction in amateur radio license classes to three in 2000 "...was long overdue," the FCC did not address the number of Novice or Advanced licensees who would be renewing in the future. He asks that the FCC issue "merit" and "service" credit to allow some of the remaining Novice and Advanced class licensees to automatically advance to the next class without taking an exam since (he believes) they previously passed a tougher exam.

According to K8AD, only Novices and Advanced class license holders who have been licensed 20 or more years would be eligible for the special "Conditional Merit and Service" upgrade to the Technician and Extra class. The upgrade would be authorized by the VE/VEC System, but no Certificate of Successful Completion of Examination (CSCE) would be issued. Instead, no upgrade would be issued until reviewed and approved at local FCC field offices.

Reich also requests that Novices who do not have 20 years of operating be allowed to operate on the VHF phone frequencies that were available to Novices "...from the era of the 1950s to 1970s." He adds, "In real emergencies, ...Novices need real voice communications on VHF at 2 meters and 6 meters like in the past."

The original Novice license, begun in 1951, was a one-year, non-renewable license which authorized 75 watt, crystal-controlled, limited HF CW and 2 meter phone privileges at 145 to 147 MHz. The phone privileges were abolished in 1968 as part of Incentive Licensing, but the license term was doubled to two years.

The petitioner said the new Novice 2 meter power level should be "...an RF power limit of 40 watts output or an ERP (effective radiated power) not to exceed 75 watts." Also proposed is an additional CW segment from 28.5 to 28.8 MHz for Novices and Technicians with code credit. The current 10 meter authorization for these licensees is from 28.1 to 28.5 MHz (with phone permitted between 28.3 and 28.5).

Reich also states that "All Novices would also regain the use of the 6 meter band between 51 and 52 MHz." *[Editor's note: We are not aware that Novices were ever authorized to use 6 meters.]*

The Advanced class, says Reich, "...merit conversion to Extra would allow all normal Extra privileges, however, the FCC could revert the license back to Advanced..." for serious FCC violations.

Another feature suggested is that license lapses due to non-renewal during military service would be forgiven. "The time must be accounted for and proved by letters and documents submitted to the VEC/VE [which would be] relayed to the FCC licensing bureau." Reich adds that additional "...input from the public as to additional restrictions or limitations is requested."

Comments on RM-10620

As a general rule, the amateur community is opposed to K8AD's proposal. Here is a sample of the nearly 150 comments the FCC has received so far:

"To offer the current Novice and Advanced amateurs the ability to upgrade without testing will further undermine goal-setting spirit of the hobby. We need to cease giving away licenses to hams unwilling to put any effort into our hobby otherwise it will become just another citizens band or family radio service." —*Tim Hagfors, N4XSQ, Taylor Mill, KY*

"While the basic idea may be the instant upgrading of holders of the Novice and Advanced licenses, the rest of the 'request' appears to be a 'Christmas' wish list that the petitioner should have sent to Santa Claus. This petition has many contradictory points and contains significant historical errors that display the petitioner's serious lack of knowledge and understanding of the Amateur Radio Service, not to mention the legal processes by which the Commission operates."—*William Houlne, WB6BNQ, National City, CA*

"The system Mr. Reich proposes is based on the fundamental premise that time passage is a substitute for knowledge ...a flawed premise."—*Steven E. Matda, KE4MOB, Bristol, VA*

"The petition requests a restoration of 145 to 147 MHz that was removed from the Novice class through previous rulemaking proceedings. By allocating just this amount of spectrum, the Novice class licensee only has access to those repeaters with input/output frequencies located between 145.000 MHz and 147.000 MHz as well as the recognized simplex channels in this range."—*Nathan Bargmann, NØNB, Bremen, KS*

National Volunteer Examiner Coordinator, P.O. Box 565101, Dallas, TX 75356-5101 (telephone 817-461-6443) e-mail: <w5yi@cq-amateur-radio.com>

"Providing upgrades solely on the basis of merit for public service or for some public service need completely ignores the requirement that amateurs must be technically proficient as well." *—Thomas H. Busch, WB8WOR, Bloomington, IN*

"While this proposal represents a natural extension of the restructuring efforts of April 15, 2000, it seems to me to be overly complicated and burdensome. I recommend that this proposal be modified to simply automatically upgrade *all* Novices to Technician with HF privileges to upgrade *all* Advanced class licensees to Extra class at the next license renewal."*—Randy Perkinson, AG4TN, Hixson, TN*

"I support the upgrade of Advanced class licenses in the Amateur Service to the next level under the current license restructuring. Now that the code portion at 20 wpm is no longer required, is seems fair that the upgrade be made. Additionally, upgrading Advanced licenses would expedite moving to a three license structure."*—Bill Goff, KI6DJ, Sutter Creek, CA (Advanced class)*

"Certification of 20 years of operation by the FCC is a concept that is fraught with opportunities for abuse. The FCC has already demonstrated that it is extremely difficult, if not impossible, to document the licensing history of all amateur radio operators."*—Bill Strickland, Athens, GA*

"I feel if a Novice can't pass a Tech test, or has been inactive for 10–20 years, then it's time to study and get active. These petitions sound like poor attempts for unmotivated people to get something for nothing."*—James T. Ferrell, N8QOQ, Utica, MI*

"I believe RM-10620 has a lot of merit for amateur radio operators who have over 20 years of operating experience and without any citations."*—Richard P. Sullivan, WØRPS, Des Moines, IA (Advanced Class)*

"I support this proposal not only because it's fair and it makes sense, but also because it would reduce the burden on the FCC of maintaining Novice and Advanced class licenses in the FCC database. It appears that the only opposition to the proposal is from existing higher-level hams who do not want to make things any easier for other hams. This is similar to much of the opposition to lowering the code barrier." *—Steven Karty, N5SK, Vienna, VA*

"Having held an amateur radio operator's license for well over 43 years, I am in favor of this proposal, not to gain additional privileges, but as a first step in returning those privileges that were lost in 1967."*—Glen E. Zook, K9STH, Richardson, TX (Advanced class)*

"I feel, especially, that Novice class operators have more than fulfilled the requirements of the Tech class, and former Tech Plus class, amateur radio licenses. I feel that it is absurd that Novices, regardless of how long they have been licensed, do not have access to the 2 meter band that every other license class can operate on."*—David Crusan, KX8N, Jackson, OH*

"Earn the upgrade to the higher class of amateur radio license. No test, no upgrade. This gimme (Give Me) society has got to halt, once and for all. I personally do not want to be upgraded to Extra, 5 wpm Morse Code, not me. I earned my class Advanced at the required 13 wpm. The entire amateur radio license class structure is a complete downgrade. Lower standards for quantity and no quality."*—Raymond J. Yakesh, K7PIG, Sierra Vista, AZ (Advanced class)*

"A Novice should be tested on the VHF and UHF privileges that a Technician license will give him/her. If an individual has been a Novice for 20+ years and has not upgraded to Technician during that time, I would have grave doubts as to their knowledge (surely not expertise) about the additional privileges that a Technician license will grant."*—Scotty W. Neustadter, W4WW, Huntsville, AL*

"If amateur radio is to provide our nation with needed communications expertise in time of war or major disasters, a trained knowledgeable pool of communicators is desirable, not just license holders who have 'put in their time'"*—Jose Berrios, WB2BWU, Forest Hills, NY*

"If they can't upgrade after 20 years with study, they probably aren't qualified to be at the next level anyway."*—Gary Steinbeck, WØSDI, Primghar, IA*

RM-10621

RM-10621 was submitted on December 2, 2002 by Dr. Perry I. Klein, W3PK, V.P. Government Liaison, Radio Amateur Satellite Corporation (AMSAT), Washington, DC., on behalf of AMSAT-NA.

AMSAT-NA asked the FCC to drop its presently required 27-month pre-space notification to the FCC's International Bureau for Amateur Satellite launches and substitute a pre-space notification within 30 days of a launch commitment.

Klein said "As a practical matter, the 27-month deadline requirement has proven to be an unnecessary burden both for amateurs and the Commission. Secondary payload launch commitments rarely become available as far as 27 months in advance. Thus, the Commission inevitably received a request to waiver all or part of Section 97.207(g). Moreover, specific frequency plans may be finalized as little as 30 days in advance of launch." Klein added that "The ITU Radiocommunications Bureau must be informed of space stations in the Amateur-Satellite Service when these satellite operate in bands shared with other services. However, no filing time requirements apply."

AMSAT asks that the Part 97 rules be replaced with the following:

Section 97.207 Space Station.

(g) The license grantee of each space station must file a written pre-space information document with the International Bureau, FCC, Washington, DC 20554 within 30 days after receiving a launch commitment. This document shall give all information relevant to the space station's identification and interference potential of the types described in Appendix 4 to the Radio Regulations. If any material item described in the original information document changes before launch, a replacement written pre-space information document shall be filed with the International Bureau. The replacement filing shall be made no later than 30 days after such changes are made and, in any case, before launch.

Comments on RM-10621

The amateur community was overwhelmingly in favor of reducing the 27-month pre-launch notification to thirty days. Here are sample comments:

"As this proposal made by the Radio Amateur Satellite Corporation is deregulatory in nature and is narrowly defined, I suggest that the Commission issue an order on its own motion granting the request as presented. If it is not seen fit to grant an order, I support the issuance of a Notice of Proposed Rulemaking."*—Stephen M. Kellat, KC8BFI, Ashtabula, OH*

"I agree the 27-month waiting period is too long. With changing technology shorter time periods must be considered."*—Mark Ryan, KM5WV, Northglenn, CO*

"Given that the Commission would no longer be required to process waivers of the 27-month notification, it is also in the Commission's own interest to approve this proposal."*—James E. Whedbee, N0ECN, Kansas City, MO*

"A 27-month pre-launch notification is excessive given that it is now possible to prepare payloads much faster than when the original rule was formulated. The proposed 30-day notification appears to be adequate; however the commission may find that 60–90 days notification best serves the public interest."—*Joseph B. Edmonds, Jr., N4NQY, Mechanicsville, VA*

"Amateur satellites are all built and launched by volunteer and not-for-profit entities for the sole purpose of expanding scientific knowledge and education. Launch opportunities that are available and affordable to these groups most often occur on an ad-hoc basis. The FCC has routinely granted waivers to accommodate the requestor. By modifying the extended pre-launch notification period to 30 days, the commission has the opportunity to stimulate participation in this area and make better use of their own assets."—*Howard DeFelice, AB2S, Bayport, NY*

"I find the 27-month period of time exorbitant for a non-orbital space attempt. The wording should be changed to 'orbital' operations not just space operations."—*Harold C. Bacon, KA1ILH, Plantsville, CT*

"Requiring a 27-month advanced notice could in some cases hamper satellite launch or at worst scuttle a mission. A revised 30-day period seems to be more than adequate to meet the intent of the required advanced notice." —*Randy Bynum, NR6CA, Reno, NV*

"With today's rapid forms of communications, 27 months pre-space notification seems unnecessary. Since the amateur satellite frequencies are accepted pretty much worldwide, 30-day notification should be more appropriate."—*Paul T. Mason, WA6EUZ, Richmond, CA*

"Thirty days is too short. The process should be between 90–120 days so that all authorities and agencies will be notified."—*Michael D. Price, WA5ZWQ, Bossier City, LA*

"The proposed modification developed by AMSAT is reasonable and will make the administrative burden less on the FCC and the satellite operators."— *Stephen J. Horan, AC5RI, Las Cruces, NM*

"Thirty days is acceptable given the difficulty of securing an affordable launch for amateur payloads. Unlike commercial interests, amateur satellites are designed, constructed, delivered to the launch facility, and launched by a non-profit corporation, with donations. Under these circumstances, finding an affordable launch opportunity is difficult. This is largely due to last-minute decisions made at the launch site."—*Kyle A. Yoksh, KØKN, Olathe, KS*

These comments and others may be found on the FCC's Electronic Comment Filing System on the web at: <www.fcc.gov/e-file/ecfs.html>. Once there, click on the "Search for Filed Comments" link located on the right side of the page under "ECFS Main Links." Then enter the Rulemaking number, RM-10620 or RM-10621, and you will be taken to the electronically filed comments. The petitions themselves are located at the end of the list of comments.

The 30-day preliminary comment period closed on January 17, 2003. If the FCC decides to go forward with these proposals, another round of comments will be solicited from the public at the Notice of Proposed Rulemaking (NPRM) stage.

Other Amateur Radio Petitions

The FCC has several other Petitions for Rulemaking that are awaiting Commission action. They include:

RM-10413: *Filed March 22, 2002 by the American Radio Relay League (Newington, CT),* seeks to "refarm" (eliminate) the 80, 40, and 15 meter Novice/Technician Plus CW subbands and reuse the spectrum in part to expand the 80 and 40 meter phone allocations for higher class licensees. Novice and Technician Plus licensees would operate on the 80, 40, 15, and 10 meter General class CW allocations at up to 200 watts output.

ARRL also asks that (1) Spread-spectrum emission be permitted on the 222–225 MHz band, (2) the special event callsign program be expanded to provide for prefixes that do not have a mailing address, (3) the rules be clarified to indicate that modulated CW (MCW) is permitted for repeater station identification, and (4) incorporate into the rules a 1990 FCC waiver authorizing amateurs in certain areas of Colorado and Wyoming to operate on certain segments of the 33 cm band.

RM-10412: *Filed February 11, 2002, by Nicholas E. Leggett, N3NL (Reston VA),* asks that commercially made amateur radio transmitters and transceivers to be manufactured in such as way so that they can be easily repaired in the field.

Leggett believes that most amateur radio systems are not easy to repair in the field, which is important "...because it enhances emergency communications preparedness and the growth of technical knowledge."

He wants amateur radio equipment manufacturers to be compelled by rule to include capabilities such as field-replaceable modules or circuit boards; minimum spacing between components, test points, and jacks for taking measurements; chassis with doors and removable shielding; service manuals containing schematic diagrams with specified voltages, currents, and waveforms; etc.

Leggett concedes that this might cause some manufacturers to drop out of the amateur market, but they would be replaced by others.

RM-10355: *Filed December 27, 2001, by Glenn L. Williams AF8C, (Bay Village, OH) secretary of the NASA John H. Glenn Research Center Amateur Radio Club of Cleveland,* wants the rules to additionally permit retransmission of manned spacecraft communications from the International Space Station in addition to the Space Shuttle. Current rules permits only amateur retransmission of NASA manned shuttle communications.

RM-10354: *Filed by Novice licensee John S. Rippey W3ULS, (Montross, VA) on December 27, 2001,* wants increased frequency privileges for entry-level licensees who have demonstrated proficiency in telegraphy.

Rippey, first licensed in the 1950s, let his General class license lapse for 45 years. He regained his previous W3ULS callsign under the Vanity callsign program after retesting in 1999. He maintains "...the HF operating privileges authorized today for a Novice or Technician Plus license fall far short of providing adequate value." He argues that "a basic license allowing significant HF operating privileges on phone and CW is a good way of encouraging new entrants into the Amateur Radio Service."

He proposes additional CW spectrum for Novices at 80, 40, 30, 17, 15, 12, and 10 meters and new phone privileges at 17 and 12 meters which he feels "...will add significant value to the Novice license."

RM-10353: *Filed by Gary R. Harrison, KØBC (Bolivar, MO), president of The Quarter Century Wireless Association (QCWA) on December 17, 2001, on behalf of the organization,* wants to change the Vanity callsign system rules to permit amateurs to designate a specific ham radio club to receive their station callsign after their death.

The QCWA says current Vanity rules "excludes current licensees from speaking for themselves" while they're still alive. Instead, club trustees must request a written statement from a close

relative "...attesting to the person's association with the club and showing consent of the relative to the request."

RM-10352: *Filed on September 17, 2001 by William R. Tippett, W4ZV (New London, NC), and Jeffrey T. Briggs, K1ZM (Hopewell Junction, NY),* seeks to separate wideband and narrowband activity in the 160 meter band.

They ask that the 160 meter frequencies from 1.843 to 2.000 MHz be FCC allocated to wideband emissions such as SSB, AM, and SSTV with 1.800 to1.843 MHz being reserved for narrowband modes such as CW and digital. The petitioners chose 1843 kHz to ensure that the lower edge of a LSB signal would not extend below 1840.

They say that an FCC-mandated subband "...is essential to supplement the newly revised ARRL 160M bandplan which we believe will prove ineffective in maintaining a separation of wideband and narrowband modes." The ARRL Board approved a voluntary 160 meter bandplan in July 2001 which excludes wideband operation below 1840 kHz.

RM-10313: *Filed May 1, 2001 by Thomas C. Wineland (Suwanee, GA), president of Kenwood Communications Corp.,* requests that the FCC relax the frequency restrictions on auxiliary operation, which Kenwood contends is "poorly defined" in the rules and "significantly over-regulated." Now limited to frequencies above 222.15 MHz, Kenwood wants to extend auxiliary operation to 2 meter frequencies above 144.5 MHz, except on the satellite subband of 145.8 to 146.0 MHz.

The petition actually is another effort by Kenwood to make its "Sky Command" remote station control system legal in the U.S. The device allows a fixed HF station to be controlled using a pair of dual-band (2 meter/70 cm) transceivers. In July 2000 the FCC ruled that use of Sky Command did not comply with rule Sec. 97.201(b) and refused to grant a waiver allowing use. The ARRL agreed and has refused Sky Command advertisements in QST.

The following three petitions filed by the American Radio Relay League have successfully reached the Notice of Proposed Rulemaking stage. All three were combined into OET Docket No. 02-98 released May 15, 2002.

RM-10209: *Filed July 24, 2001,* requests a new ham band near 5 MHz. The domestic secondary HF allocation of 150 kHz between 5250 and 5400 kHz would improve emergency and disaster relief communications between the U.S. and the Caribbean.

RM-9949: *Filed July 17, 2000,* seeks to upgrade the existing secondary Amateur Radio Service allocation in the 2400–2402 MHz band to primary status and to add a primary allocation for the Amateur-Satellite Service in this band. Hams already are primary at 2390 to 2400 and from 2402 to 2417 MHz.

RM-9404: *Filed October 22, 1998,* seeks a low-frequency allocation for the Amateur Radio Service at 135.7 to 137.8 kHz and 160 to 190 kHz. Use will focus on advanced techniques to communicate during adverse conditions with limited facilities. In the NPRM the FCC declined to include 160–190 kHz, proposing only the "sliver band" at 135.7–137.8 kHz.

The comment and reply period on OET Docked 02-98 has closed. It is awaiting final action by the Commission.

FCC officials in Washington have indicated to *CQ* that the Commission is planning to combine many, if not all, of the pending petitions into an "omnibus" rulemaking proposal to be released this spring. 73, Fred, W5YI

what's new

BY KARL T. THURBER, JR.,* W8FX

New Super Spring Goodies

Once again the ever-welcome, sweet scent of spring soon will be in the air, after a seemingly long winter. This month we'll focus on noteworthy ham shack radio gear, accessories, software, net news, books, and some "genuinely useful stuff" we believe will be of great interest to you. Let's begin!

Radio Gear

Alinco DR-620T Twin Band Mobile Transceiver. Alinco has developed the new DR-620T Twin Band Mobile Transceiver (photo A) which operates on the 2 meter and 70 cm bands. The radio has transmit coverage of 144.00–147.995 and 430.00–449.995 MHz. Receive coverage is 108.00–173.995 and 335.00–480.00 MHz; there's also wideband FM coverage of 87.5–108 MHz. Standard features include 200 memory channels and various remote-control capabilities, including parameter setting and direct frequency entry through the microphone. Additional optional features include front control unit separation, advanced 10F3 digital mode with speech compression technology, and an advanced TNC and connector that supports digipeat mode for APRS tracking and 9600 bps packet.

Photo A– The new DR-620T Alinco Twin Band Mobile Transceiver for the 2 meter and 70 cm bands has transmit coverage of 144.00–147.995 and 430.00–449.995 MHz. See the text for many additional features, including 200 memory channels and various remote-control capabilities. (Photo courtesy Alinco)

The DR-620T's manufacturer's suggested retail price (MSRP) is $481.95. Contact Alinco through its North American distributor, ATOC Amateur Distributing, LLC, 23 S. High St., Covington, OH 45318 (937-473-2840; e-mail: <alinco@alinco.com>; web: <http://www.alinco.com>).

Accessories for the Shack

MFJ-1279 Deluxe Sound Card Radio Interface. The "accessory kings" at MFJ have come up with another impressive add-on that lets you use your PC's sound card and rig for all digital modes. It's the MFJ-1279 Deluxe Sound Card Radio Interface (photo B). The new interface boasts all the many advanced features of the popular MFJ-1275 Sound Card-to-Rig Interface, but the MFJ1279 also includes four handy jacks: a direct keying jack to allow direct keying of your radio in CW or FSK operation; an auxiliary input jack to let you connect various external devices such as an audio-tape player, VCR audio, or camcorder through the unit without swapping out cables; a headphone jack for use with stereo headphones; and a footswitch jack for PTT operation when VOX isn't used. The "plug and play" MFJ-1279, at $129.95, comes complete with a CD, RS-232 cable, AC supply, and audio cables.

Photo B– The new MFJ-1279 Deluxe Sound Card Radio Interface boasts all the features of the popular MFJ-1275 Sound Card-to-Rig Interface, but sports several new interfacing jacks, including support for footswitch control. (Photo courtesy MFJ)

Photo C– MFJ also offers the new MFJ-1273B Digital Modes Sound Card Interface. This basic sound card interface is for those who operate mostly digital modes and who don't need a micro phone input. (Photo courtesy MFJ)

Also available is the new MFJ-1273B Digital Modes Sound Card Interface (photo C). This basic sound card interface is for those who operate mostly digital modes and who don't need a microphone input. The MFJ-1273B has sound card, radio, speaker, and RS-232 interface jacks; it's $59.95 and includes all accessories.

*289 Poplar Drive, Millbrook, AL 35054-1674
e-mail: <w8fx@cq-amateur-radio.com>

For more info, contact MFJ Enterprises, Inc., 300 Industrial Park Road, Starkville, MS 39759 (1-800-647-1800; e-mail: <mfj@mfjenterprises. com>; <http://www.mfjenterprises. com>).

AOR™ TV-5000 Scanner Video Converter. Are you looking to expand your "video horizons"? AOR U.S.A. has released the new TV5000 Scanner Video Converter (photo D), a handy accessory that lets you monitor standard NTSC video when using wide-range receivers (such as the AOR AR5000 or AR5000+3) that have wide-bandwidth 10.7 MHz IF outputs. The TV-5000 is compact, easy to connect, and operates on just two AA batteries or 12 VDC.

Photo D– AOR U.S.A. has released the TV-5000 Scanner Video Converter which lets you monitor standard NTSC video when using wide-range receivers with wide-bandwidth 10.7 MHz IF outputs. The unit also lets you observe video outside the tuning range of most broadcast reception units, including amateur radio FSTV. (Photo courtesy AOR U.S.A)

The $199.95 MSRP unit adds the ability for you to observe video outside the tuning range of most broadcast reception units. You may, for example, be able to view video used in amateur radio fast-scan TV communications, public safety, news media feeds, satellite links, wireless video monitors, and more, according to AOR's Takashi "Taka" Nakayama, KW6I.

For more information, contact AOR U.S.A., Inc., 20655 S. Western Ave., Suite 112, Torrance, CA 90501 (310-787-8615; e-mail: <info@aorusa.com>; on the web: <http://www.aorusa.com>).

Heil Classic Microphone and More. As part of the 20th year celebration of the amateur radio division at Heil Sound, Ltd., proprietor Bob Heil, K9EID, has proudly announced the Heil Classic Dual Element Studio Microphone (photo E). An exact copy of a 1930 broadcast microphone, the beautiful Classic design is available for use with amateur radio transceivers.

Photo E– An exact copy of a 1930 broadcast microphone, the Heil Classic is for use with transceivers. It contains two dynamic mic elements, a wide-frequency-range broadcast element, and a choice of communications element. (Photo from the Heil Sound website)

The new microphone contains two dynamic mic elements, a wide-frequency-range broadcast element, and your choice of the HC-4 or HC-5 full-range communications element. A small switch located on the back panel alongside the PTT switch lets you select the type of audio response you need. The Classic also is available with the new Heil "iC" electret element, which is used to drive the low-gain front ends of early ICOM transceivers. A high-impedance model also is available to match the impedance inputs of older tube transmitters. The Classic microphone is $229; the CC-1 set of connecting cables to match most popular transceivers is $30.

The new "iC" mic element for early ICOM radios also is available in an attractive, platinum-finish body microphone. It's designated the "iCM," which is designed both for hand use and for mounting on a desk stand or microphone boom; the price is $89. Bob also offers a new special-purpose connecting audio cable called "Heilwire," of interest to amateurs to carry balanced audio lines and DC control lines from a PTT circuit or computer keying system. The cable minimizes coupling between the two signals and shields the sensitive audio lines from RF interference. The cable is available in 20, 50, and 100 ft. packaged lengths, priced at $20, $47.50, and $95, respectively.

For details contact Heil Sound, Ltd., 5800 North Illinois, Fairview Heights, IL 62208 (618-257-3000; e-mail: <info@heilsound.com>; web: <http://www.heilsound.com>).

ZeroSurge® Series Mode Surge Removal Filters. ZeroSurge, Inc., is a leading manufacturer of patented series-mode technology surge removal filters. The new Models 2R8 and 2R8IEC (photo F) are two-receptacle, 8 amp standalone models that will protect a typical computer system.

The latter model comes with an IEC connector (the type on the back of a PC) and a cord with a standard 120 VAC plug. This versatility allows the protector to be plugged into a standard outlet or used directly with the IEC-type connectors supplied with computers, computer accessories, and even audio equipment. The Model 2R8IEC protector also is available with Spectrum WVR™ wide-voltage-range technology. ZeroSurge's patent-pending WVR technology is

Photo F– The ZeroSurge® Models 2R8 and 2R8IEC are standalone surge-removal filters. The latter model allows the protector to be plugged into a standard outlet or used directly with the IEC-type connectors supplied with computers, computer accessories, and even audio equipment. (Photo courtesy ZeroSurge, Inc.)

said to operate effectively over the range 85–265 volts, dynamically stopping surge current as well as surge voltage—reportedly a necessity where voltage variations such as brownouts exist.

Contact ZeroSurge, Inc., 944 State Rt. 12, Frenchtown, NJ 08825 (1-800-996-6696; e-mail: <info@ZeroSurge.com>; on the web: <http://www.ZeroSurge.com>).

Nemal Digital Audio Snake Cables. Recently Nemal Electronics International introduced a new series of high-end digital audio snake cables (photo G). The 110 ohm cables are available containing two to 24 wire pairs; for example, Nemal part number SND2424 consists of 24 individually shielded and jacketed pairs with an overall foil shield and jacket. The new cables facilitate rapid, neat installation of systems requiring multiple pairs, and the discrete color-coded individual jackets provide for easy and positive identification. Outer jackets are available in standard black or various colors.

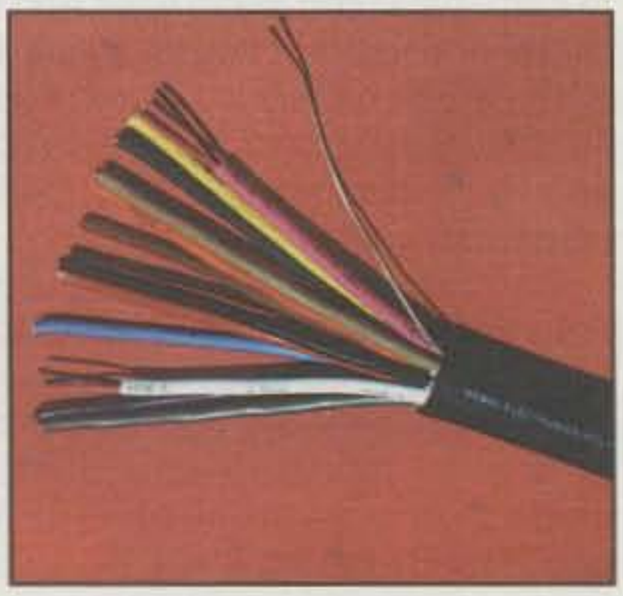


Photo G– Nemal has introduced a new series of digital audio snake cables. The 110 ohm cables, available containing two to 24 pair, facilitate rapid, neat installation of systems requiring multiple audio pairs. (Photo courtesy Nemal Electronics International)

Contact Nemal Electronics International, 12240 N.E. 14th Ave., North Miami, FL 33161 (1-800-522-2253; e-mail: <info@nemal.com>; web: <http://www.nemal.com>). You'll find the entire Nemal catalog online at their website.

Software and Computers

DeLorme Street Atlas USA® 2003. The spring and summer travel season is close at hand, and so we mention DeLorme's recently introduced Street Atlas USA® 2003 (see fig. 1), the very newest version of DeLorme's high-performance travel-planning software. The new product has been extensively updated using a variety of new techniques and data sources, including street data from the most recent U.S. Census data. DeLorme also has updated highway interchanges by matching them to recent aerial imagery to greatly improve routing accuracy.

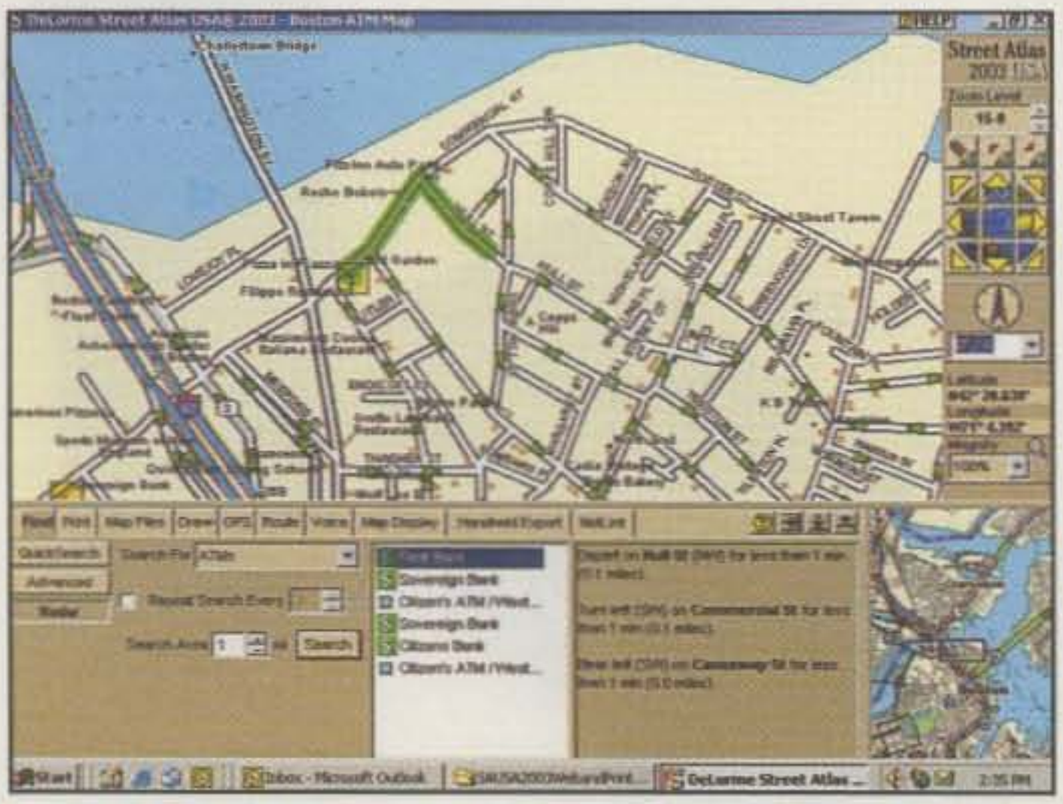


Fig. 1– DeLorme's Street Atlas USA® 2003 travel planning software sports a handy "Radar" feature that locates nearby services with information and directions included. In this sample screen the user has searched for and found conveniently located ATMs in a small area of Boston, along with detailed directions to them. (From the DeLorme website)

Some of the program's features include 6.2 million streets across the country; more than 4.2 million updated places of interest, with phone numbers, including hotels, fuel stops, banks, colleges, attractions, and restaurants; new and detailed truck/RV service-stop listings; split-screen GPS tracking displays; enhanced GPS voice commands for receiving spoken responses from multimedia laptops; the ability to instantly add new routable streets as they're developed; a handy "Radar" feature that locates nearby services with information and directions included; and more. Suggested price is $49.95.

For more info, contact DeLorme, Two DeLorme Drive, P.O. Box 298, Yarmouth, ME 04096 (1-800-561-5095; e-mail: <info@delorme.com>; web: <http://www.delorme.com>).

New Versions of the Copernic Search Tool. In several columns we have noted various Copernic programs, especially the Copernic search tools. These extremely capable programs help you find what you're looking for on the web by simultaneously using several user-selected search engines. The programs rank results by relevance, provide summaries, store the results, organize them, and remove duplicates, among many other things.

Fig. 2– Check out the recently updated, redesigned, and renamed "Copernic® Agent" product line. The new programs in the series have plenty of innovative features. Go to <http://www.copernic.com>.

Recently, Copernic launched its sixth-generation search software, renaming its impressive product line "Copernic Agent" (fig. 2). Copernic® Agent Basic is a free download, while Copernic® Personal is $29.95 USD and the upscale Copernic® Professional is $79.95 USD. The updated programs, with their completely new architecture and redesigned user interfaces, have plenty of innovative features to make your searches faster, more powerful, and much easier.

All three versions, even the free Copernic Agent Basic (used by millions of searchers worldwide), are indeed impressive searchers. However, the new Copernic Agent Professional (fig. 3) goes far beyond simple web search engines. The integrated search software combines powerful and innovative tools to find, manage, analyze, and track relevant information on the web.

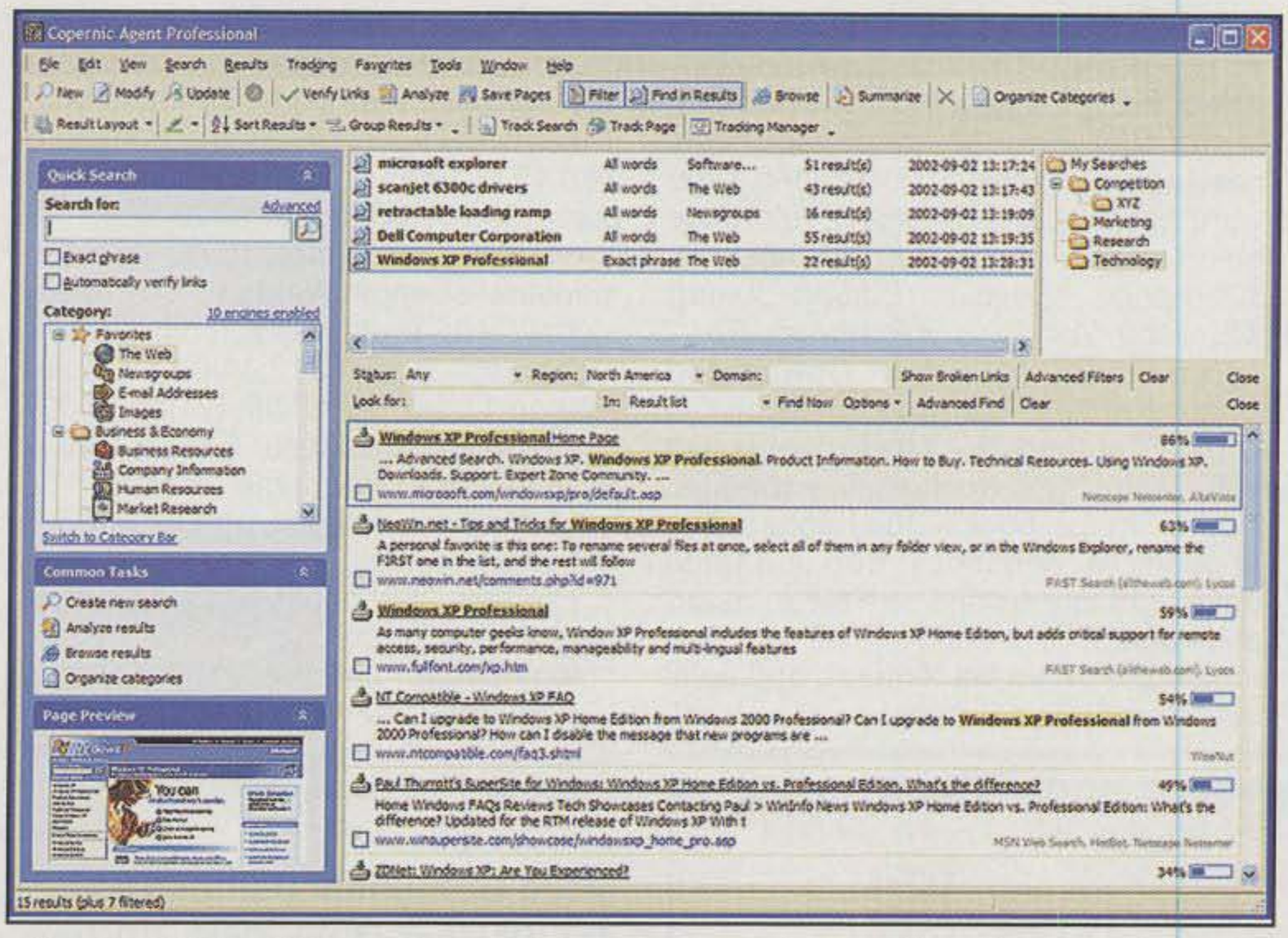


Fig. 3– While all three Copernic® versions are impressive, the new Copernic Agent Professional goes far beyond simple web search engines by letting you find, manage, analyze, and track information. A typical Copernic Agent Pro screen is shown here. (From the <Copernic.com> website)

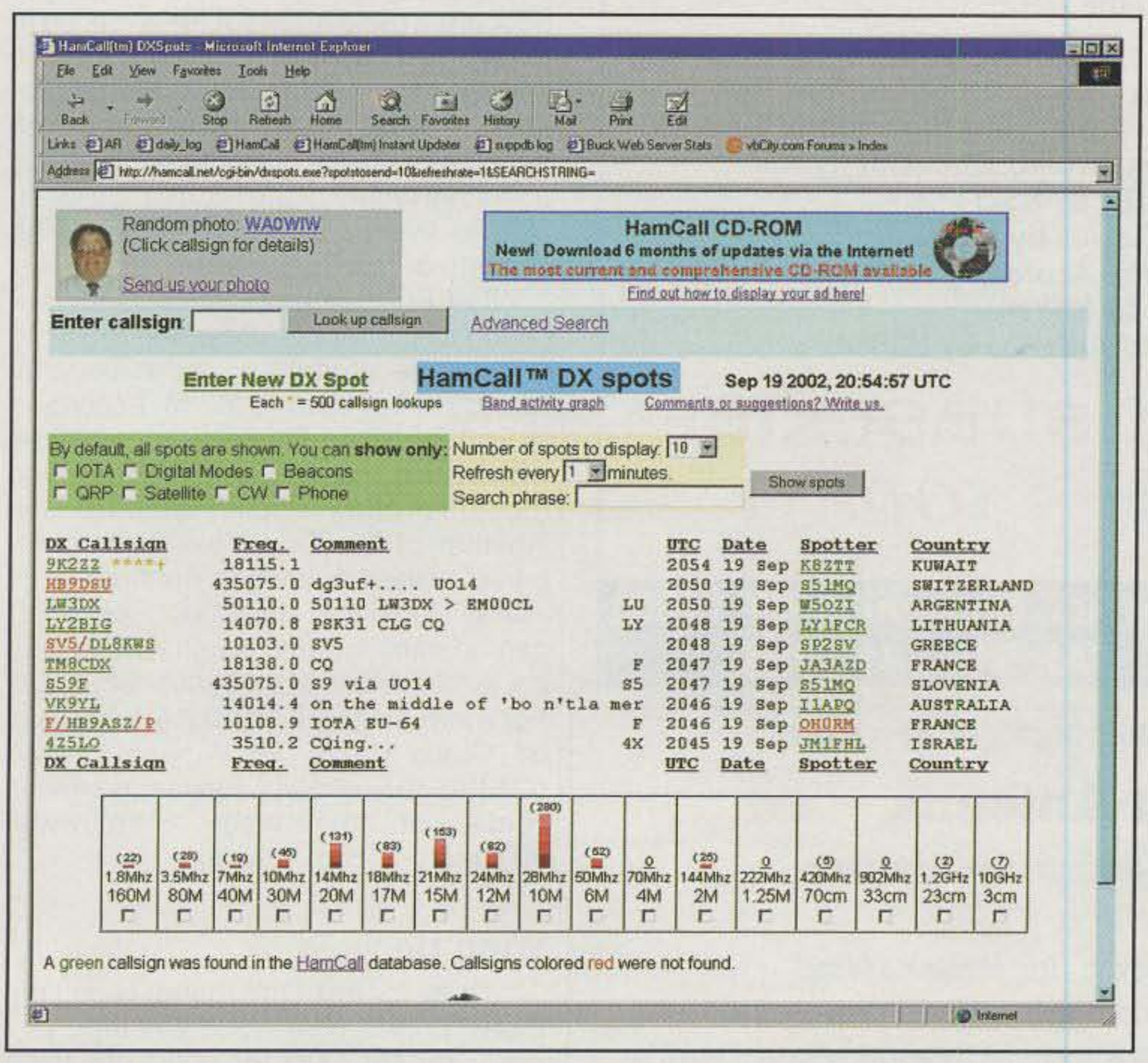


Fig. 4– DXers should check out the HamCall™ DX Spots Web Page, at <http://hamcall.net/dxspots>; it gives special insight to the active DXer. The page collects current DX spots from DX Summit and a variety of sources. (Graphic courtesy Buckmaster Publishing)

Contact Copernic, 360 Franquet St., Suite 60, Sainte-Foy, Quebec, Canada G1P 4N3 (418-527-0528; e-mail: <sales@copernic.com>; web: <http://www.copernic.com>).

New on the Net

Buckmaster DX Spots Web Page. Jack Speer, N1BIC, let us know about a new web product offering from Buckmaster Publishing. The HamCall™ DX Spots Web Page, at <http://hamcall.net/dxspots>, is a real convenience that gives special insight to the active DXer (fig. 4). The page collects current DX spots from DX Summit and a variety of sources and presents them on one page with many filters and controls, as well as a search capability.

A main feature of the DX Spots page is that every spotted call and spotter call is automatically looked up in the HamCall database. If the callsign is in the database, the color of the call is green; if not found, then the color is red. Each callsign is marked by a number of asterisks indicating the previous lookup activity for that callsign.

This feature helps identify spots that are mistyped or that are not callsigns at all, and it also makes the callsign holder listing immediately available by just clicking on a link to a new information window. Users may enter new DX spots directly on the page to share with others. A band activity graph is displayed so you can quickly know which bands are open and active.

The page is available to registered HamCall CD-ROM users on an unrestricted basis, and to others without the special features, such as live links. Support of this service is encouraged by purchase of the frequently updated HamCall CD-ROM from the publisher at <http://buck.com/haminfo.html>.

For more information, contact Buckmaster Publishing, 6196 Jefferson Highway, Mineral, VA 23117 (1-800-282-5628; e-mail: <info@buck.com>; web: <http://hamcall.net> or <http://www.buck.com>).

From the Bookshelf

New from Newnes. Newnes offers many popular book titles in computing, electronics and electrical engineering, broadcasting, film and TV, video and audio, and other technology, billing themselves as "publishers for the electronics industry."

Not long ago, I was the welcome recipient of a near-boatload of fresh Newnes titles in these fields—more titles than I could ever hope to read or report on. Nevertheless, many titles are

of considerable interest to radio amateurs and other hobbyists. Just a small sampling of the many new and interesting books I received includes *Electromagnetics Explained,* by Ron Schmitt, 359 pages, $34.99; *Optoelectronics and Fiber Optic Technology,* by Ray Tricker, 320 pages, $29.99; and *Fabricating Printed Circuit Boards,* by Jon Varteresian, 192 pages, $29.99;

Contact Newnes, an imprint of Elsevier Science, 200 Wheeler Road, Burlington, MA 01803 (1-800-545-2522; e-mail: <custserv.bh@elsevier.com>; web: <http://www.newnespress.com>). The Newnes online catalog is available on the website, and you can request a paper copy of the catalog be sent to you.

New XP Books from Que®. Have you upgraded to Microsoft® Windows® XP, or bought a new PC equipped with Microsoft's newest (and reportedly best) operating system? If so, and if you want a really comprehensive reference guide to XP, check out the massive, 1028-page *Special Edition Using Microsoft Windows XP Home, Bestseller Edition,* by Robert Cowart and Brian Knittel. The $44.99 book/CD combo's authors don't try to overwhelm you with their technical expertise. Rather, in the book's 30 chapters, two appendices, and index, Bob and Brian drive right to the point with clear, natural language. The don't just tell you how to use the Windows features and point you elsewhere for networking or hardware advice; rather, they help you choose, install, and configure hardware and software that work in concert with Windows. The book comes complete with 45 minutes of how-to video on CD, presented by the authors.

What if you elected to go with the industrial-strength Windows XP Professional? No problem. A comparable, 1272-page book/CD combo, *Special Edition Using Microsoft Windows XP Professional, Bestseller Edition,* also is available from the same authors. The book includes a video on CD and it's $49.99.

The new Que books are available in bookstores, or contact Pearson Technology Group, 201 West 103rd Street, Indianapolis, IN 46290-1097 (1-800-858-7674; on the web: <http://www.quepublishing.com>).

More Genuinely Useful Stuff

The Rhythm of the Code CD from KAWA Music. The Rhythm of the Code™, a very popular Morse code learning tool, now is available with revisions on CD. KAWA Music™ proprietor Phil Kawa, KA1WJQ, an accomplished musician, discovered that in studying to become a radio amateur, he excelled in the Morse code and believed his music abilities were a factor in his Morse proficiency. After obtaining his license, he decided to create a method of learning code that would make his method available to everyone. The result was The Rhythm of the Code.

What Phil came up with was a combining of the Morse code with music to enable the student to learn code at speeds of from 5 to 13 WPM. According to Phil, because the code is combined with music, conventional code timing methods don't apply, although his Rhythm of the Code has been compared to the Farnsworth method.

The Rhythm of the Code PAK 1 CD can be sampled and purchased online; it's available for $19.95 plus $4.00 s/h. For more details, contact KAWA Music, 61 Curtis Circle, E. Weymouth, MA 02189-3067 (e-mail: <kawamusic@aol.com>; on the web: <http://www.edisongreen.com/kawa>).

Wrap-Up

That's all for this time, gang. Next time more "What's New." See you then.

Overheard: Over the years one thing I've learned is that every "yes" I utter leads to far more work than I ever expected!

73, Karl, W8FX

Is It Really Broken?

BY WAYNE YOSHIDA,* KH6WZ

The story you are about to read is true. The names and callsigns have been changed to protect the guilty and the innocent. For certain events, even *my* name and callsign have been deleted to avoid embarrassment.

I know this has happened to you, because at one time or another "it" happens to all of us. "It" is the frustrating and sinking, panicky and blood-pressure-rising feeling you experience when your radio is dead. The feeling is worse when the radio is on, but seems not to be working quite right—or it is just working differently than it used to. This is especially bad when you are operating in a high-pressure or even relatively low-key event such as a contest, demonstration, public-service event, or communications drill.

The focus here is on the VHF and/or UHF mobile and/or HT, but the concepts apply to any radio and pretty much anything else that plugs into a wall outlet or runs off batteries.

The Multiple Modes of Failure

Along with the myriad of operations and functions today's radios possess, there are several "failure modes" that a radio, and any other piece of electronic equipment, may eventually go through. Here are the main problems and suggested solutions, and I am sure there are many more.

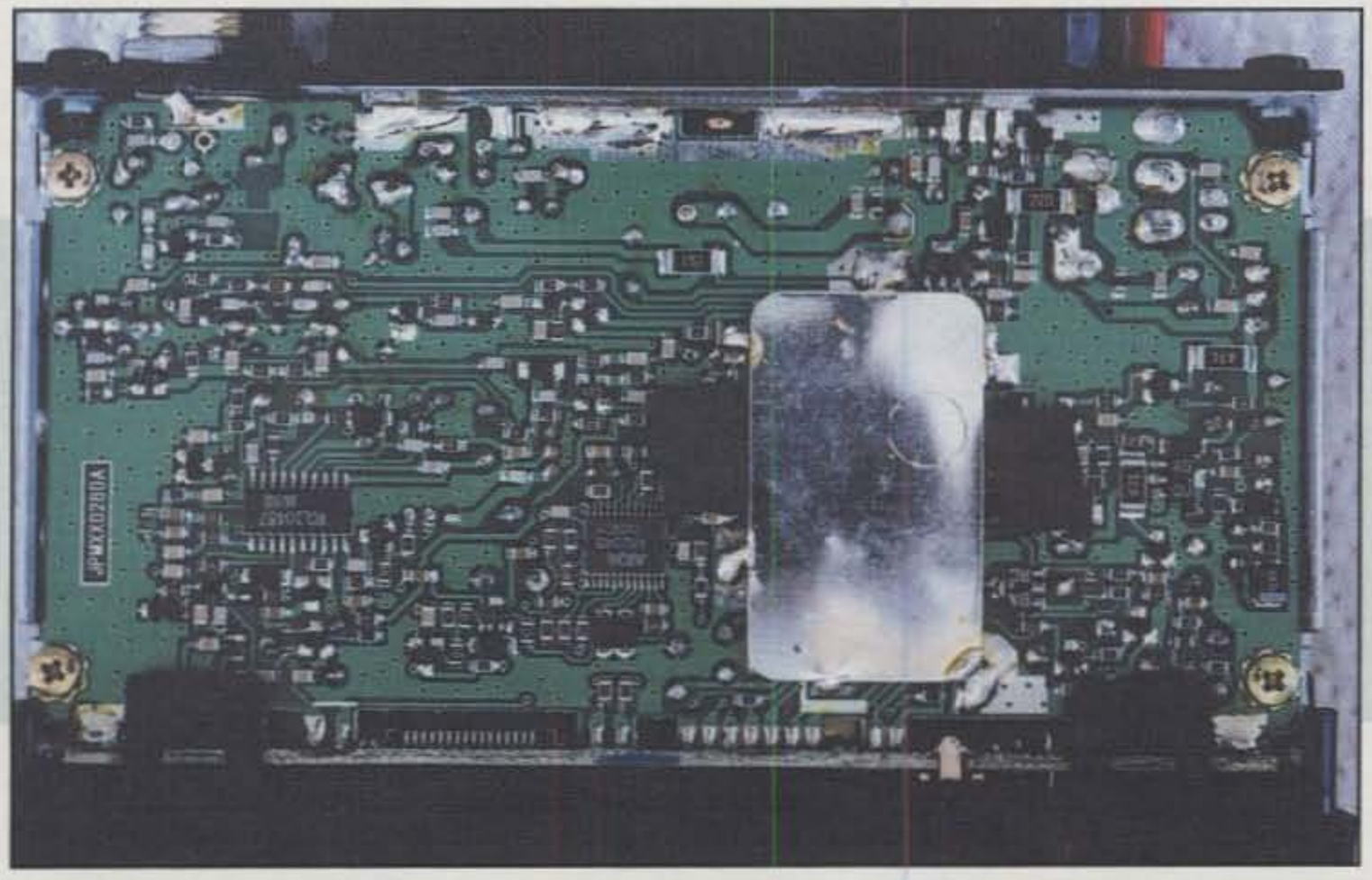
The first one is the scariest, but is actually the easiest to figure out. It's the **Completely Dead Mode.** Completely dead means nothing turns on, nothing gets warm, and nothing lights up. This indicates a problem in the power-supply "chain" from the power source—AC outlet, power-supply unit, power cable, and fuses or the battery pack.

First, wiggle all the connecting wires to and from the power source, whether it is a battery pack or AC mains. If the unit is running on AC, check to see if it is still plugged in. I know this sounds stupid, but it actually happened to a close friend of mine. Yes, the rig was plugged in when he first turned on the unit. It was working fine until the radio just "kicked off," in his words. It turns out that a loose AC outlet, combined with a playful and mischievous puppy, made the wire come unplugged. By the way, the AC outlet has been replaced, and the dog went through obedience training. Problem solved so far. Is there a timer function on the radio? Make sure the timer is off.

OK, so it's plugged in. Check the fuse or fuses. Refer to the manual: Remember that fuses can be "hidden" in almost any location, and you may have to open the cabinet to check. It's easiest to follow the electrical path starting from the mains fuse or circuit breaker at the house, to the circuit breaker in the power strip, to the AC line fuse in the power supply, to the fuse in the radio power cable.

Speaking of power, I heard about this phenomenon on the RACES repeater one night. Seems that some of the RACES/Red Cross portable radio sets in the equipment pool were not working quite right. Signal strength was way down, but should not have been a problem with the short distances (a few city blocks) involved. Magnet-mount antennas were being used for portable non-car operation (with AC-operated power supplies), so the team thought that a better ground plane was necessary. The mag-mount antennas were "glomped" to metal garbage-can lids, which improved the signals, but

*16428 Camino Canada Lane, Huntington Beach, CA 92649
e-mail: <kh6wz@cq-amateur-radio.com>



A peek inside a typical modern VHF mobile radio. This is the "foil side" of the circuit board. See all the little blobs in there? Many of them are surface-mount components—very tiny resistors, capacitors, diodes, and other stuff. Before heating up your soldering iron, it may be best if you check for the "operational failure modes" first. (Photo by the author)

not by much. After some head-scratching, someone made a comment about the power supply. Ah ha! This is the **Something Wrong with the Power Supply Mode**.

Swapping the small 10 amp units for beefier 20 and 30 amp power supplies fixed the problem. Plugging the smaller power supplies back in made the problem come back. Upon closer inspection, someone noticed that the power-supply cabinet screws were loose, causing an intermittent ground situation, and RF was getting into the DC supply. A few quick turns with a No. 2 Phillips screwdriver fixed the problem.

The **Operator Error Mode** is easy to get into, especially with the huge assortment of features and buttons in most all of today's radios. Some radios have a longer "learning curve" than others, and it is important to check the operational and programming aspects of the rig you buy. One thing that helps me learn to operate a radio is to use lots of Post-It® flags and margin notes in the operator's manual. Sometimes I actually rewrite sections of a manual for a particularly strange function description or programming step.

Get out the manual and follow the steps exactly for what you want the radio to do. I find that it helps to read through the entire section that applies to the particular function you want, and then read it again. Next, with the radio in front of you, go through the steps one at a time, exactly as the book says. If the unit is a mobile rig, power it up with a power supply. You cannot pretend to operate the radio with just the manual.

Microprocessors are a blessing and a curse. As a blessing, today's rigs have dozens, if not hundreds, of functions in a smaller amount of space. As a curse, the **Microprocessor Glitch Mode** is a mysterious "thing" that happens to confuse the radio's brain, and usually it needs to get "cleaned out" and reset—sort of like the electronic equivalent of whacking it on the side of its head. This is very similar to the glitches that happen to computers all the time: You know, you are working away at the keyboard, and all of a sudden you see some strange message on the monitor, or the keyboard locks up and nothing goes in. What do you do? You hit CTRL + ALT + DELETE, right? (Well, sometimes I reach for the AC cord and pull it out of the wall outlet. . . .)

The microprocessor reset function for radios varies from rig to rig, and each manufacturer has its own way of doing "The Big Reset." Usually it involves a bit of manual dexterity as you press several buttons at once, or in the case of some HTs, pressing button X and button Y as you remove and then replace the battery pack. In any case, you will most likely lose all memory information, and restoring it could cost you several dozens or even hundreds of frequency, tone, offset, and channel designation key strokes. This is a great reason to purchase or borrow the programming software interface and "cloning cable" for your rig. If you are like me, you'll just grunt and bear it, and key-in all the data by hand. . . .

Then there's the **Improper Interface Mode.** Just recently I ran into this one. This is when you plug something into a port on your radio that doesn't belong there. The microprocessor gets confused (for example, it's looking for a TNC for packet radio, and you've plugged in that SSTV demodulator instead), and your radio doesn't know how to handle the strange electrical signals coming into the radio. It's sort of like a cartoon I saw several years back, with a guy sitting at the bus stop who wants to share his music from his new portable walk-around stereo. He unplugs a connector from a little box being worn by the man sitting next to him and plugs it into his stereo player. However, the other fellow's unit is a heart pacemaker. . . . Again, a microprocessor reset usually sets the radio straight.

The **Frontal Knob Change Mode** sometimes happens when someone borrows or operates your rig (like at Field Day) and changes a setting or sets a function switch differently than you prefer or enables some feature you normally don't use. This is similar to Operator Error Mode, but is more sneaky and harder to diagnose without discussing the problem with the previous user. If multiple users are involved, as at a club station, it may be impossible to tell who did what.

Carefully observing how the radio is behaving (or misbehaving) should provide you with clues as to what is "broken." For example, a good friend was kind enough to lend his brand-new ICOM IC-706 to the group for Field Day. When he got it back after the long weekend, he said something was wrong with either the microphone or the radio. It kept going into transmit when the radio or the microphone was bumped or moved. He did a microprocessor reset and all that. Yep, the voice-activated relay, or VOX, something my friend never uses, was turned on. (He prefers—correctly—push-to-talk operation while mobile, the primary operating application of his IC-706.)

Ever hear a strange-sounding FM signal on the repeater or on simplex? This could be the **It's Not You, It's Me** and its converse, **It's You, Not Me** mode. Let's call this the **You/Me** mode for short. It's a friend of yours and you should recognize his or her voice, but something just "sounds wrong." It's probably because one of you is off frequency, usually by 5 kHz, or "one click" on the VFO knob. Being off frequency can affect your communications range, so this is another important reason to be on frequency—and it's just darned inconsiderate to be "off." Yes, it is possible to store an incorrect frequency into a memory channel, so each and every time you go to "Simplex Channel 3" you sound funny. Each of you must double-check the frequency display to make sure you are truly "on channel." On some rigs the 5 kHz is a small switch that is set to one position or another.

Another manifestation of the You/Me mode is the position or the selection of "narrow FM." Some of the newer VHF/UHF rigs have a setting for narrow FM. However, most all operations on the FM and repeater portions of the bands is "wide band" FM. Narrow FM will sound garbled on a wide-band receiver.

Then there's the **Bad Test Instrument Mode**. This is sometimes embarrassing, since it could mean that a piece of station equipment makes you think your radio is broken when it's not. I once had to make a "house call" to a radio dealer who was convinced that all the brand-new radios he had in his inventory were defective and not putting out the rated power. As we looked at his test setup everything looked okay, but I had a "funny" feeling that something about his test bench wasn't right. I watched as he carefully attached a wattmeter to the antenna port, applied DC power to the unit, and keyed the microphone. We watched the power meter read no more than two watts. We took out another unit —same thing, one or two watts output.

We then pulled out a rather awesome Hewlett-Packard digital-readout, built-in VHF dummy load, RF power instrument, hooked it up to the radio, and the meter said 25 watts—right on the nose, the unit's rated power. Thus, something was wrong with the test setup and not the radios. Remember that funny feeling I had? It turns out that the cable connecting the wattmeter to the units under test was about 25 feet long, with an assortment of adapters and right-angle connectors. This turned out to be a very eye-opening lesson about line loss at VHF. We removed all the adapters, replaced the RG-58 with a much short-

er and much newer piece of 9913, and magically all the radios tested as being good using the original test setup.

One more mode, and the most frustrating, is **Intermittent Mode.** This is the most dastardly thing electro-mechanical devices will do to their owners at one time or another. It's exactly like when your car makes this funny noise, and when you take it to the shop the sound disappears. You go away, you know the mechanic thinks you're crazy, and sooner rather than later the same noise comes back again.

What to do? Try the big reset, and see if it clears the problem. Since the unit is not working, you have nothing to lose. It then either works as it supposed to (or used to) and you are all set (Hooray!), or it doesn't. What now?

It's time to send it in for service. However, before you wrap it up, check the manufacturer's website for Frequently Asked Questions (FAQ), service bulletins, or additional technical assistance that may have been posted. Also check for the manufacturer's repair policies and procedures.

ICOM America (website <http://www.icomamerica.com>) has one of the most useful ham radio equipment sites I've ever seen. Service information is easily accessible from the home page under "Support." They have an excellent FAQ, preventative maintenance section, and trouble-shooting hints for the company's gear. Kenwood <http://www.kenwood.net> includes a listing of service centers. Yaesu <http://www.yaesu.com/amateur/amateur.html> includes contact information for its technical support staff. Ten-Tec <http://www.tentec.com/Amateur.htm> has information sorted by product category. Check the *CQ* Advertiser's Index for other manufacturers and their websites.

Another resource is your favorite radio dealer. It's possible that a dealer is aware of a certain problem and may have access to information on a solution. Some dealers even have technicians on staff who can do factory-authorized service for you right there, without your needing to ship the rig anywhere.

Remember, the service technician is like a detective: He must observe the behavior, examine clues, and deduce probable causes, and then proceed to fix the problem. We must provide all the hints and clues to help him correct the problem efficiently.

Here's where all your steps and observations pay off. You are now much better able to describe the misbehaving radio to the service center, and completely avoid the description of the trouble that service personnel must really, really hate: "It's broken." Other similar and useless descriptions such as "Does not work" or "Nothing happens" will not appear on your trouble card.

You will be able to describe your rig's problem with specific details such as "Low power output on 2 meter band, 70 cm OK." An even better description of this problem will be something like "Low power output (about 3 watts on internal power/SWR meter) on 2 meters (146.55 MHz). Power-output control is fully clockwise. Power out seems to be OK on 70 cm, across the entire tuning range. Microphone is the unit supplied with the rig. Power supply is rated at 30 amps and is putting out 14 volts under load. Antenna is a dual-band magnet-mount antenna, on the vehicle roof. SWR on both bands varies from 1.0 to 1.8 to 1 across the radio tuning range."

Sure sounds like a lot of words to say rather than "Radio not working," eh? However, this description will help save the technician valuable time by his not having to go over parts of the radio that are working correctly. You've at least narrowed down the problem.

The final step is to prepare the rig for shipping. You want to avoid additional damage to your rig by packing it carefully. You did keep the box and foam buffers that came with the rig, right? If not, you'll have to re-box it. For proper packing procedures, go to the UPS website: <http://www.ups.com/using/services/packaging/guideline.html> Shipping stations such as Mailboxes Etc. and others surely will help you (for a fee, but compare it to the value of your radio). Don't forget to get insurance for the package. If the shipping people damage the box, then you can replace your broken radio with a brand-new one, and you might actually be much better off.

Summary

I hope this information will be useful to you when rig troubles happen. Have you experienced one or more of these "failure modes"? Have you observed a failure mode I missed? If so, tell me about it and how you solved the problem. I am sure the readers of this column would enjoy hearing about it.

73, Wayne, KH6WZ

Homebrew Your Own Weather Radar? Sure!

BY DAVE INGRAM,* K4TWJ

While experimenting with a 10 GHz Gunnplexer obtained from Microwave Associates/Advanced Receiver Research a few years ago, I devised a simple yet effective amateur radar setup with some interesting applications. Basically, the small microwave setup bounced signals off various objects and cloud masses to function as an intruder alarm and personal weather radar.

The amateur weather radar part of this setup started as a quick-brew workbench project. It was not fancy or elaborate, but it worked surprisingly well for immediate-area use. I wanted to fine tune the setup, but between working, writing, hamming, and moving QTH, I ran out of spare time (An obstacle I am still trying to overcome. These 24-hour days are just too short!). I dismantled the system and never wrangled time to reassemble it, but the idea or concept of operation is too attractive to simply fade into the annals of time. I am thus sharing my notes and diagrams via this month's column so you can devise or expand on your own intruder alarm or weather radar system. Understand that this is a project outline to spark your own homebrewing ingenuity, and each completed setup will surely differ from my examples. You might opt for combining a 24 GHz radio with a computer running special software, or use microprocessor control with digital readout, 5-speed scanning, and add a rocket launcher to seed weak clouds—and that's fine. Radio amateurs are widely known as pioneers of new communications frontiers. I am just encouraging everyone to exercise that creative ability. Now let's get started!

*4941 Scenic View Drive, Birmingham, AL 35210
e-mail: <k4twj@cq-amateur-radio.com>

A Unique "Starter Project"

A simple, yet effective way to become familiar with microwave concepts and idiosyncrasies is by assembling a basic motion/intruder detector as illustrated in fig. 1. Here a pair of 9 volt alkaline batteries is connected in parallel to double their current rating and power the Gunn diode/oscillator-transmitter in a 10 GHz Gunnplexer. The oscil-

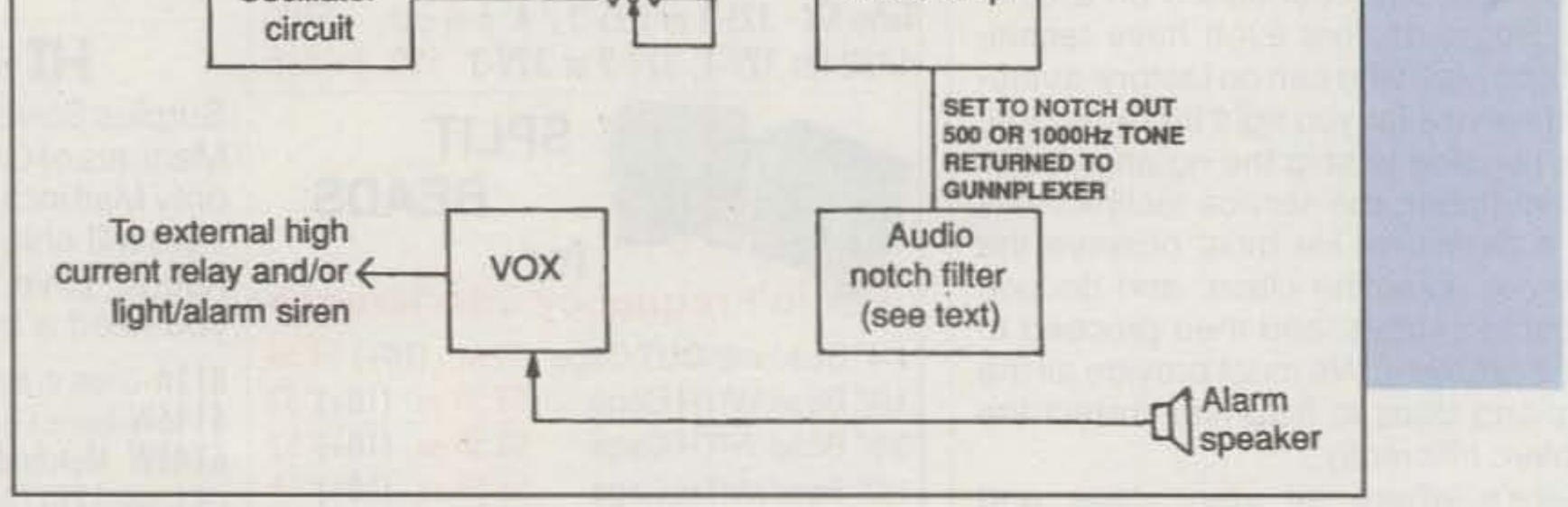


Fig. 1– Block diagram of the basic 10 GHz motion/intruder detector discussed in text. System works on the principle of nulling out normally reflected echoes so any expected movement produces an audible tone or triggers a VOX. Layout of components and mounting of Gunnplexer is left to your creative ingenuity.

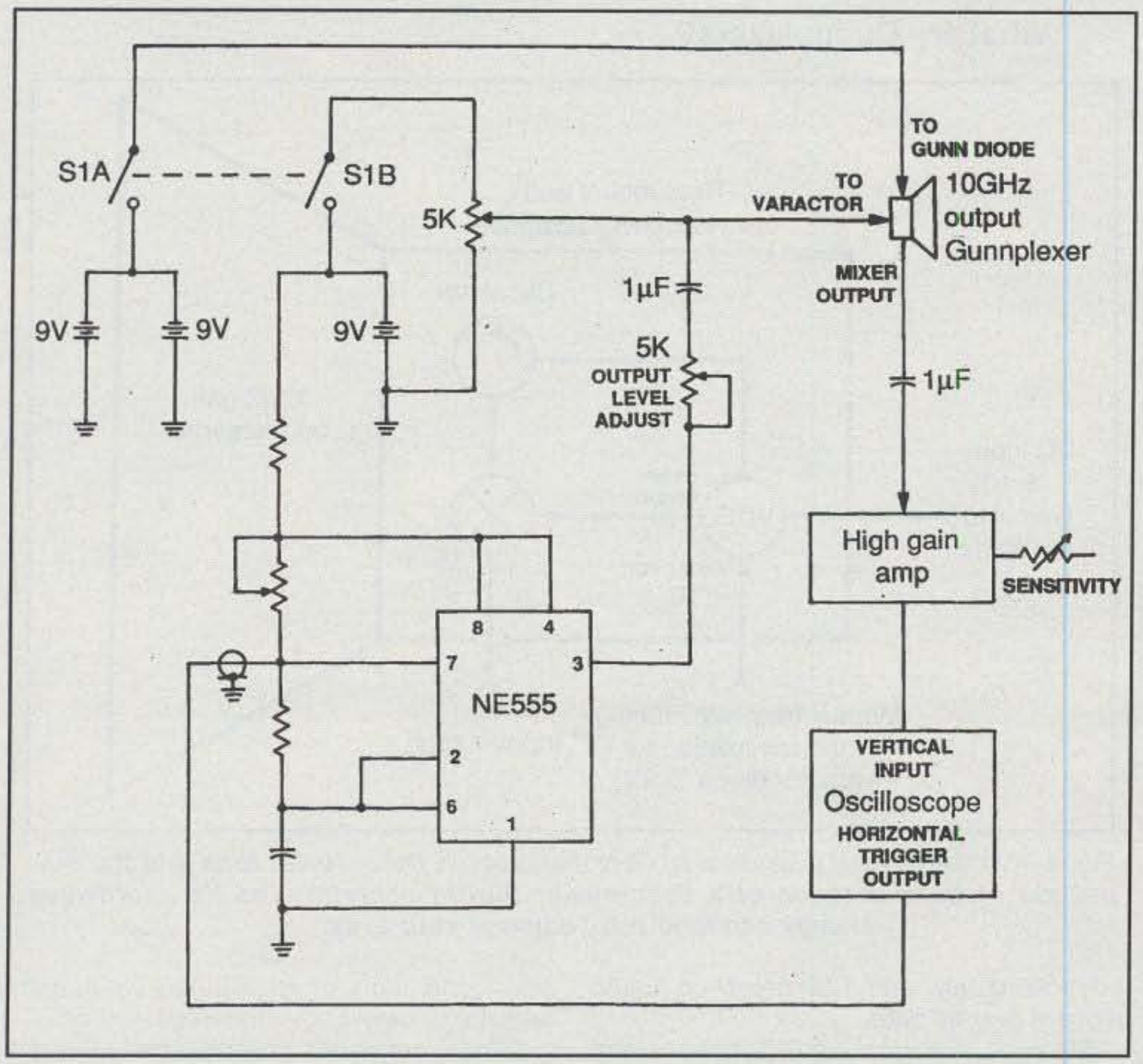


Fig. 2– Our MARK I version weather radar setup. The Gunnplexer functions as a 10 GHz transceiver modulated by a 200 kHz to 1 MHz signal from the NE555, while the oscilloscope generates sync/timing pulses and displays echoes according to range. (Discussion in text.)

lator's exact 10 GHz frequency is set by 1 to 9 volts applied to its varactor from a separate 9 volt battery. Simultaneously, a 500 or a 1000 Hz tone generated by an NE555 IC is superimposed on the varactor's DC control voltage to modulate the Gunnplexer. Power for the NE555 (5 volts) is tapped from the varactor's 9 volt battery for convenience.

The NE555's output level is set with a 5K ohm potentiometer, while a non-polarized 1 mFd capacitor couples the audio signal to the varactor's input line. Suitable NE555 oscillator circuits and suggested values for capacitors and resistors for various operating frequencies, incidentally, are available in technical application sheets from man-

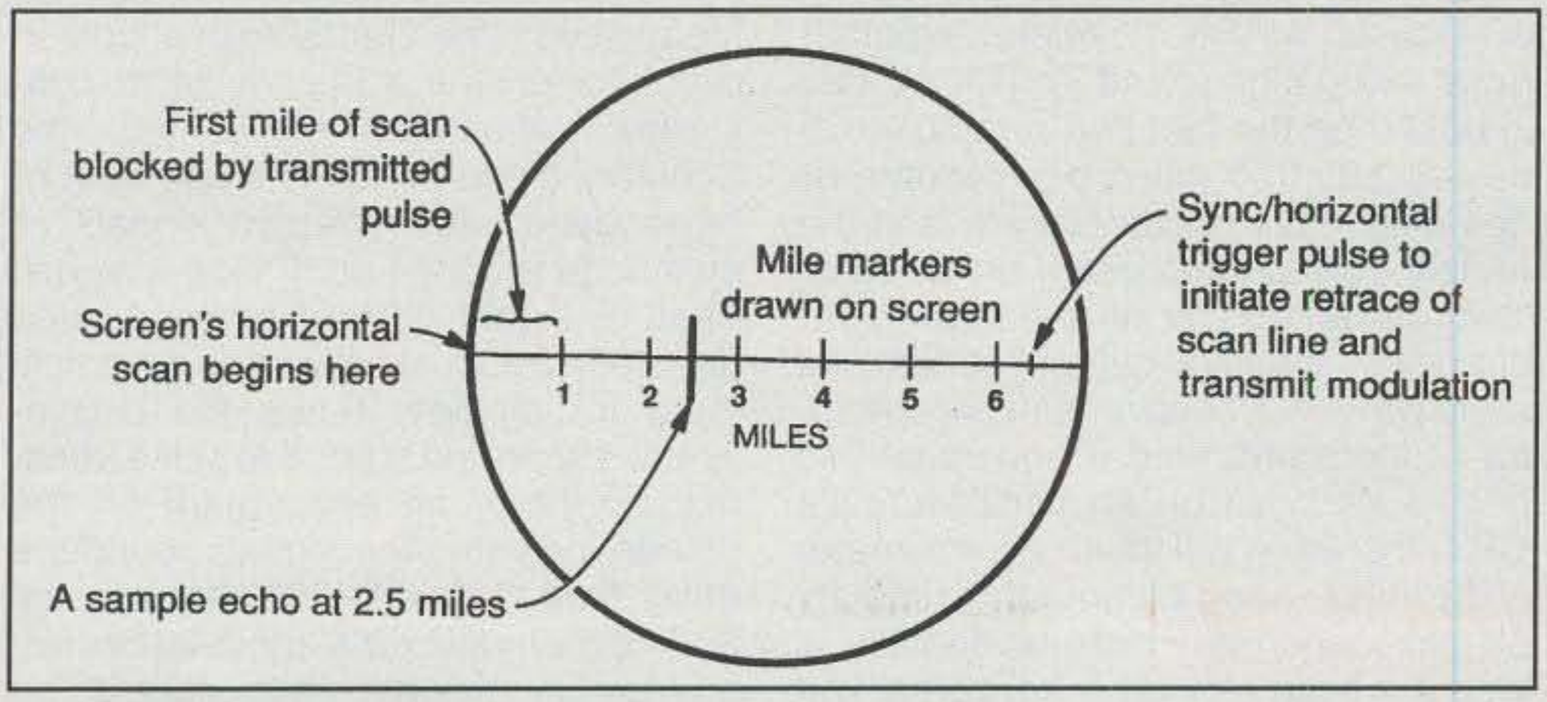


Fig. 3– Outline of the display on oscilloscope in fig. 2. The scan line begins on the CRT's left side, and at the same time a modulating pulse from the NE555 circuit is applied to the Gunnplexer's varactor input. Time marks shown correspond to an approximate 6 mile range. (Discussion in text.)

What are Gunnplexers?

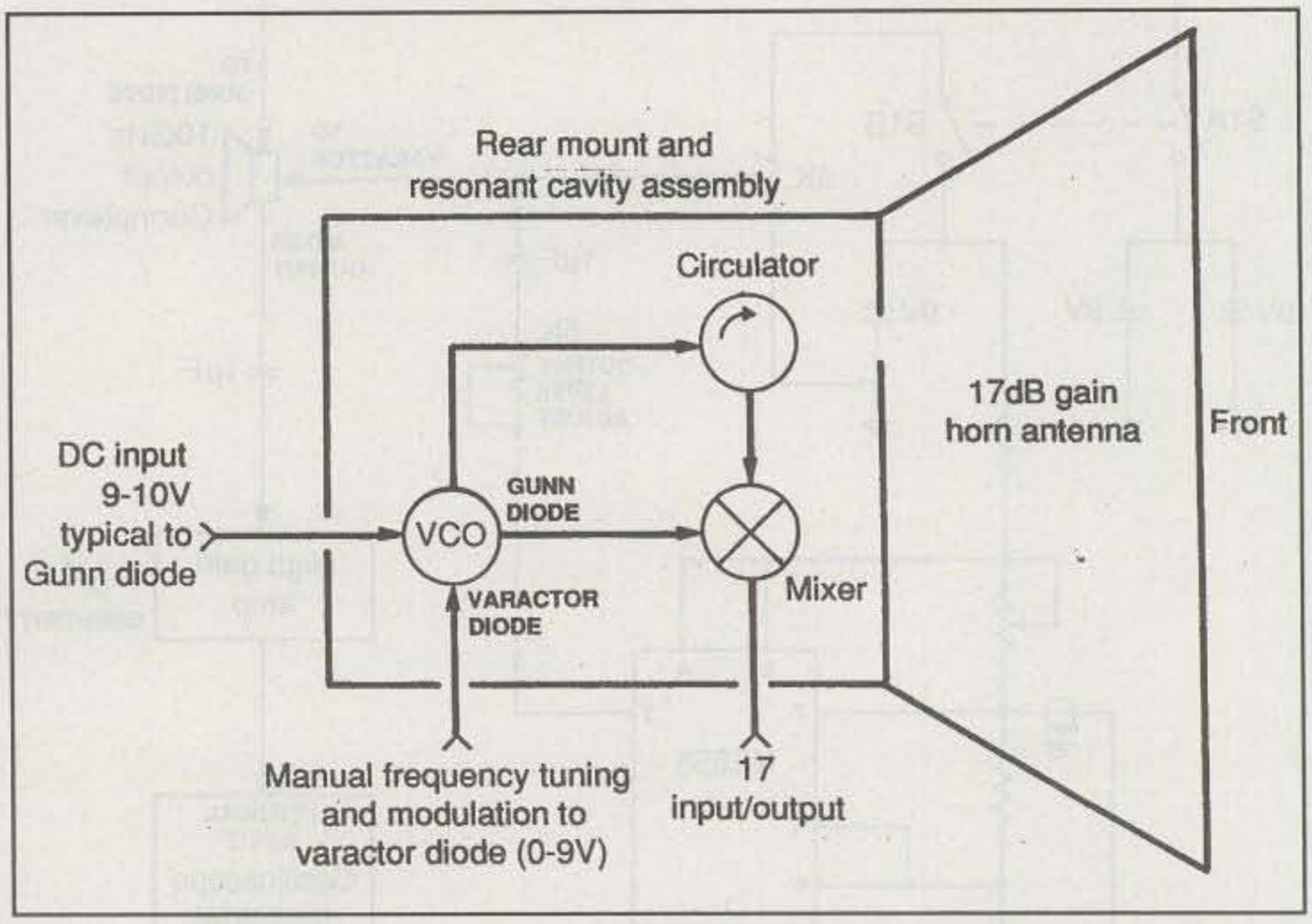


Fig. A– Outline of what's inside a 10 GHz Gunnplexer. ***Note: Never look into the output slit or horn antenna of a Gunnplexer during operation, as its microwave energy can (and will!) damage your eyes.***

Simply explained, a 10 GHz Gunnplexer is a small 10 GHz transmitter, receive down-converter, waveguide, and horn-type antenna system in an approximately 4 inch square package or unit (fig. A). It consists of a tiny Gunn microwave diode mounted in a resonant cavity, a varactor diode, a pair of Shottky diodes for mixers, a ferrite rod circulator, and a 17 dB gain horn antenna. When voltage is applied to the Gunn diode, it becomes an oscillator/transmitter with its frequency controlled by DC voltage applied to the varactor diode. An input/modulating signal can also be superimposed on that DC control voltage. The ferrite-rod circulator diverts approximately 10 percent of the Gunnplexer's output power to the Shottky diodes, thus producing a local oscillator/injection signal for the mixer. The difference between an incoming/received signal and transmitted signal produces the IF output signal. The Gunnplexer transmits and receives simultaneously (with its circulator preventing receiver desensing), so T/R switching is eliminated.

During typical two-way use, two Gunnplexers are frequency-offset by an amount equal to their desired IF output. As an example, one Gunnplexer would be set on 10.250 GHz and the other Gunnplexer set on 10.395 GHz to yield a 145 MHz difference/IF. If two Gunnplexers are offset by 1000 Hz, their IF output would be 1000 Hz. If the signal from either Gunnplexer bounced off a reflective object or cloud, its 1000 Hz IF output level would increase. If the object moved or vibrated, the output signal would be Doppler-shifted accordingly and FM detection could retrieve desired data.

My original microwave experiments and amateur weather radar system were built around a 10 GHz Gunnplexer obtained from Microwave Associates/Advanced Receiver Research/AR Communications products, P.O. Box 1242, Burlington, CT 06013. Their telephone number is 860-485-0310 and website is <www.advancedreceiver.com>.

Other companies may also carry Gunnplexers and substitute types such as "pull-outs" from police radar guns may be available through surplus outlets. Your challenge is finding such units. Good luck and good hunting! —*K4TWJ*

ufacturers and parts suppliers. If you plan to experiment with microwaves to any extent, these technical data sheets are vital.

The Gunnplexer's output signal is aimed in a specific direction, and reflections or echoes return to the Gunnplexer's mixer. The mixer's output is connected to a 1 or 2 watt audio amplifier which is connected to a tunable audio notch filter capable of at least 50 dB of attenuation. Several years ago, a suitable filter was the MFJ-751; an upgraded or homebrewed version should work fine today. Just be sure the notch filter will null out the Gunnplexer's modulation tone, and you're set to go.

When an unfamiliar movement occurs in the watched area, the modulating tone changes in frequency and/or amplitude. Rather than staying notched out, it becomes an audible alarm. A high-power audio amplifier can be connected to the notch filter's output for an extra-loud alarm, or a VOX circuit operating an outdoor light or siren can be added for security and flexibility. This system can be battery operated, used anywhere, and works quite well. You can even use it handheld style like a police radar gun, if desired.

A Weather Radar System, Version 1

After experimenting with the previously discussed motion detector, I put together a basic "MARK 1" version weather radar setup (figs. 2 and 3). This system is based on the fact that a radio wave travels 186,000 miles per second, or one mile in 5.1 microseconds, and the horizontal scanning beam on an oscilloscope can also be set to a specific frequency or speed (in microseconds). If a radio wave leaves a transmitting antenna at the same time a horizontal line begins its scan on an oscilloscope's CRT, the wave will travel approximately 12 miles round trip in approximately 63 microseconds (which, incidentally, is also the scan rate for a horizontal line on a regular TV set). In my case, an oscilloscope with a horizontal trigger output was used in conjunction with a 10 GHz Gunnplexer and an NE555 in a pulse-modulating circuit plus a high-gain receive amplifier to produce a direction-and-distance form of radar.

The horizontal-line-triggering output from the oscilloscope keys the NE555 circuit, which in turn produces a modulating signal to superimpose on the Gunnplexer's output. That signal is then transmitted in the direction of interest. Meanwhile, the Gunnplexer's built-in circulator diverts a fraction of its constantly transmitted signal into the Schottky diode mixer so it can beat or heterodyne with reflected signals or echoes to produce an IF output signal. That IF signal is then amplified and directed to the oscilloscope's vertical input for display. Since the oscilloscope's scan line started at pulse transmission time, an echo mark on the screen indicates the signals round-trip delay time. This effect is shown in fig. 3. The Gunnplexer's modulation frequency is flexible, but should be between 200 kHz and 1 MHz, as it will determine pulse (and echo) signal width. A pulse frequency of 200 kHz will be approximately 5 microseconds (T =

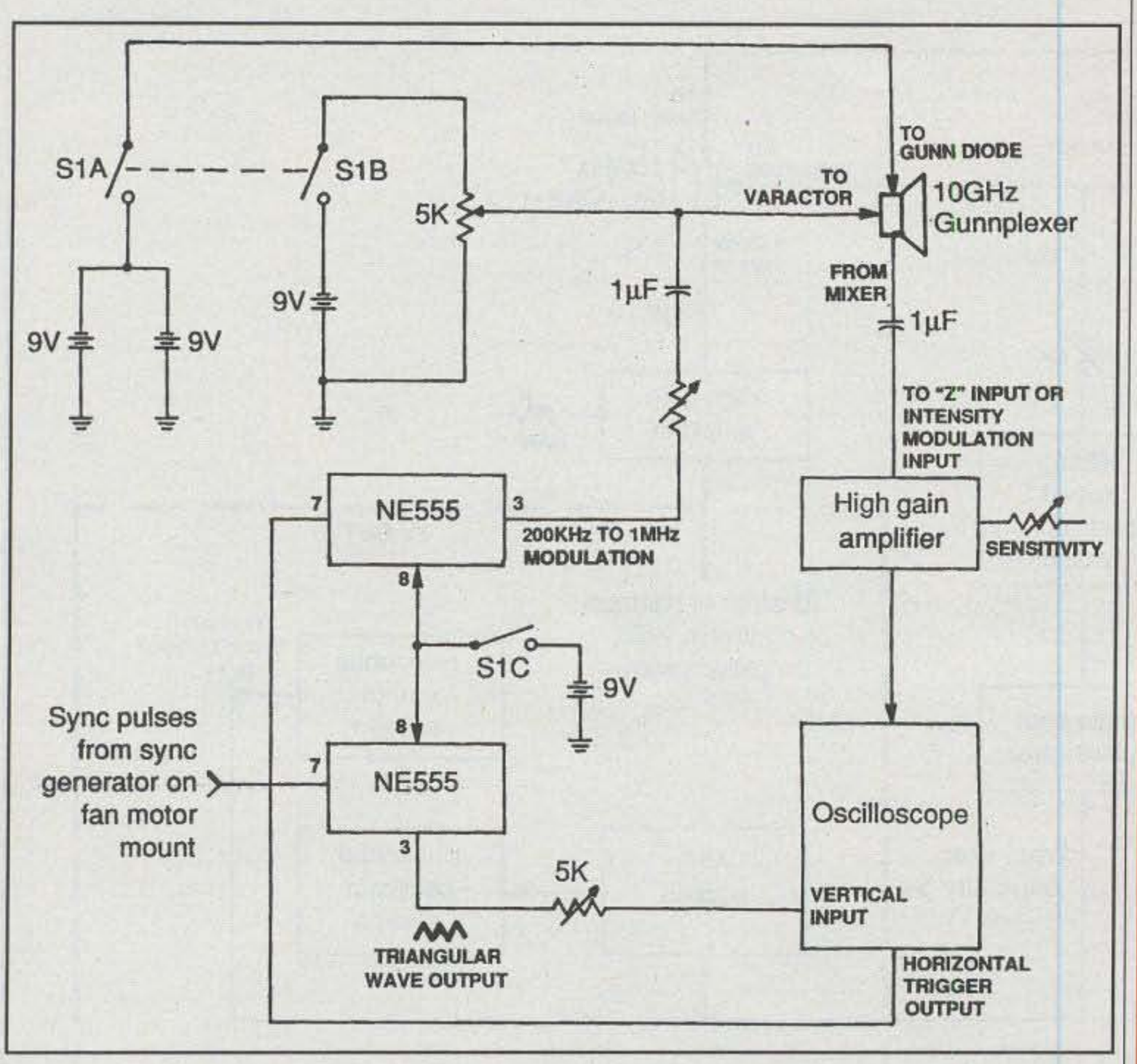


Fig. 4– Our Mark II version weather radar incorporates a second NE555 circuit synced to the Gunnplexer's slow-moving mount on an oscillating fan base. Its triangular-wave output connects to the DC vertical input of an oscilloscope so the scan line moves down the screen in sync with Gunnplexer movements.

1/F), which corresponds to one mile on the oscilloscope's CRT. In comparison, a pulse frequency of 1 MHz will be approximately 1 microsecond or 0.2 mile. The 200 kHz pulse will block the first mile of screen display; a 1 MHz pulse will block the first 0.2 mile of display, but since this corresponds to a close-in area, no problems result.

This system is quite attractive for monitoring rain-cloud density in a single and specific direction, but since the Gunnplexer does not move, only one direction can be checked at a time. That is not a problem in my case, as our storms usually approach from the same direction and the Gunnplexer can be repositioned by hand. Most folks like to know what is happening in all directions, however, so a second version of a weather radar system was devised.

An Expanded (Mark II) System

My "Mark II" setup is similar to the first version, except the mechanism from a small oscillating kitchen fan is used to move the Gunnplexer over an approximate 120 degree "sweep area." Another NE555 circuit configured as a triangular wave generator is also added for vertical deflection of the CRT beam in sync with the slow-moving Gunnplexer. Scan-line-initiating sync pulses for the NE555 can be acquired from microswitches mounted on each end of the fan/Gunnplexer's moving platform. Again, I remind you this is a "concept project," and you are encouraged to use your creative ingenuity in designing a suitable sync pulser. The NE555's (triangular wave) output is then directed to the oscilloscope's (DC) vertical input and the receive/echo amplifier's output is moved to the oscilloscope's intensity input (usually it's CRT's cathode). Meanwhile, the oscilloscope's horizontal scan (and Gunnplexer's modulation) runs at 200 kHz to 1 MHz as previously discussed.

Now by carefully readjusting echo amplifier gain and oscilloscope CRT intensity, the screen should remain dark until an echo is received. Range markers can then be added to the display. For quick results, they can be drawn on clear plastic and placed over the screen. As an alternative, another NE555 circuit can generate the range markers. As you probably surmised,

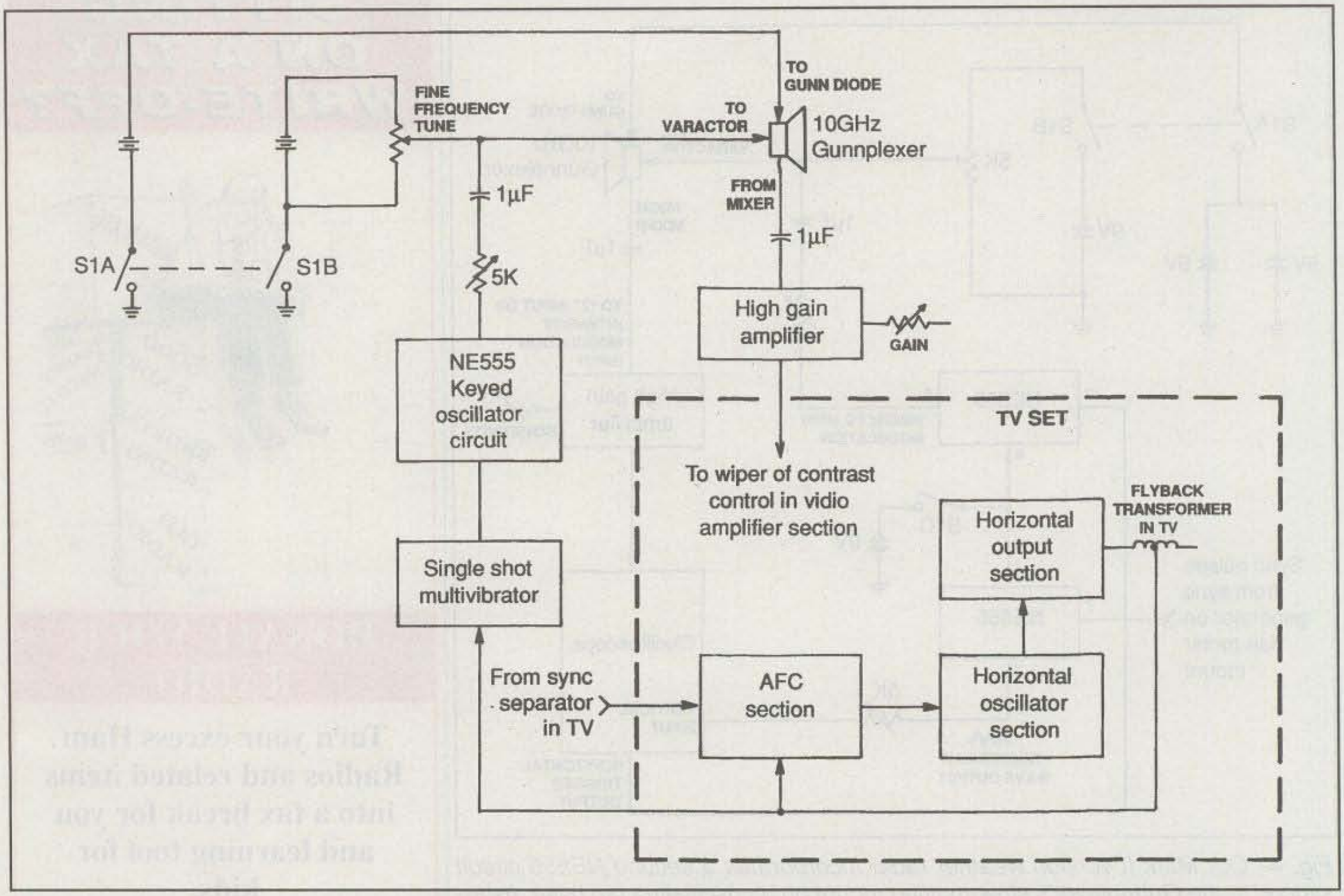


Fig. 5– Outline of a "Mark III Version" mini-weather radar using a modified TV receiver for pulse timing and scan display.

other oscilloscope sweep rates may be used for monitoring various distances. That is your choice. I also suggest replacing the oscilloscope's P1 phosphor CRT with a long persistence P7 phosphor CRT for a good radar-type display.

Now briefly recapping and clarifying, the completed system (shown in fig. 4) works as follows. Sync pulses from the oscilloscope trigger the NE555 modulation circuit, causing the Gunnplexer to transmit a 10 GHz signal in 200 kHz pulses. As the scan line moves across the oscilloscope's CRT, the Gunnplexer's signal travels out and reflects off rain clouds, etc. Resultant echoes are received, downconverted, amplified, and applied to the oscilloscope's intensity modulation input. Additional expansions such as using different modulation setups, microprocessor timing concepts, and more power for longer range are also possible here, so feel free to experiment.

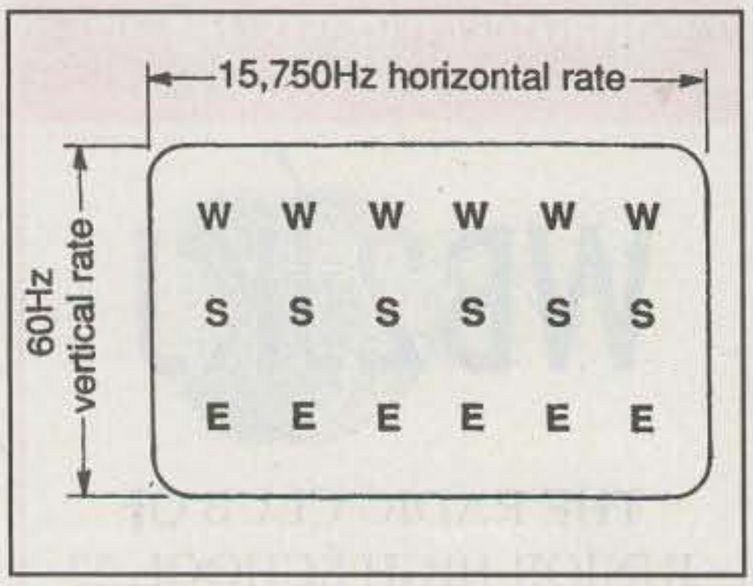


Fig. 6– Example of how weather data would be displayed on the screen of a modified TV receiver. (See the discussion in the text.)

A Mark III Version?

One interesting and low-cost way to expand the mini-weather radar is substituting a (modified) TV set for the oscilloscope. A TV with an RF or IF problem is a good candidate here, as the radar system will be connected to the TV's video amplifier section and prior stages will not be used. An outline of this concept is shown in fig. 5. Horizontal AFC pulses sampled from a low-voltage winding on the TV's flyback transformer can be amplitude-limited and used to trigger/sync the Gunnplexer's modulator. A single-shot multivibrator should work fine here. Reflected 10 GHz signals will be downconverted in the Gunnplexer, then amplified to the 1 or 2 volt level and applied to the TV's video amplifier (between the contrast control's wiper and ground, just like the old audio amplifier trick). Echoes should then appear as intensity variations on the screen with timing and/or distance marks similar to our version II system.

Finally, electronically "sweeping" three directions with the 10 GHz signal at a 60 Hz rate to match the TV's vertical scan rate as shown in fig. 6 can be added. Beyond this point, expansions and spin-off ideas/projects are endless and limited only by your imagination. Go for it, and show everyone that famous amateur radio tradition of visualizing and developing new ideas and pioneering new frontiers is still alive, well, and thriving! Good luck and . . .

73, Dave, K4TWJ

E-Mail Note

As this column is being written, our *CQ* e-mail is still out of control and overloaded, with some e-mails mysteriously getting deleted. No messages are being ignored; they are just not getting through the system. Brief postal mailed notes with SASEs still get through and are answered as time permits. *—Dave, K4TWJ*

BY JOE LYNCH,* N6CL

IEEE 802.11b: Friend or Foe?

Wireless network protocol IEEE 802.11b has become a handle for ultra high-speed wireless local area network (LAN) or wide area network (WAN) systems. While a slower version of wireless networking has been around since the *early* 1990s, this particular protocol has been around since the *late* 1990s. Given a boost by Apple Computers in 1999 (which incorporated it into their equipment under their AirPort name), it has been experiencing a steady growth since then.

Glen Fleishman, writing in a February 22, 2001 *New York Times* article entitled "The Web, Without Wires, Wherever," predicted huge growth in wireless networks by the end of 2001. In spite of his optimistic forecasting, such growth has not been at the exponential rate he foretold. Even so, the growth has been sufficient to begin to become problematic for amateur radio operators, particular those who live in high-population areas where many wireless LANs have been installed.

Notwithstanding the problems these wireless devices are beginning to cause, some hams have benefited from them by employing them in creative amateur radio applications. Consider the following quote posted by Frank Kibbish, WB6MRQ, of the High Sierras Field Day Group, WN6I, to the ARRL's 2002 Field Day Contest Soapbox website (http://www.arrl.org/contests/soapbox/index.html?con_id=13&ofst=10):

> Thanks to Alan, WB6ZQZ, our logging computers went wireless. Alan put together a new logging program (using Python) that not only logged the contacts for each station, but sent every contact to every other station as well. The program interfaced with each laptop's 802.11b network card, and shared data with the other stations in quasi-real-time over a peer-to-peer network. This enabled any station to work any band and mode because they already had the logs. And the program's GUI interface showed the logger at one station what bands and modes the other stations were using, so there was never any risk of ending up with two stations on the same band at the same time. Oh, and by the way, this program is compatible with Windows, MAC, and even Linux!
>
> But I know what you're thinking: What good is a networked logging program if the stations don't have synchronized clocks? (Yeah, right.) Well, Brad, N6BDE, was ready for just such an occasion! He hooked up a time reference (after some amount of arguing with the unit to get it to see the GPS satellites) and managed to provide time sync for all the laptops. After all, having logging computers with clocks that aren't in sync would be gauche!

Frank gives is a very good example of amateur radio operators using existing technology in an amateur radio application. Not lost on your editor, and no doubt on the designer of the LAN described above, the wireless equipment may be operating on a frequency within a ham band, 2.4 GHz, albeit under the FCC's Part 15 regulations, which govern non-licensed low-power transmitters, as opposed to Part 97, which governs our operation on the same frequency spectrum.

Using the spread-spectrum mode, the 802.11b wireless devices operate on a series of channels between 2400 and 2483.5 MHz (see Table I). From the table, one can see that nearly all of the 11 channels listed fall within the 2400–2450 MHz ham band. Hence, it is highly likely that the WN6I Field Day LAN operation was taking place within the ham bands. Curiously, an unasked question of the story's reporter is whether or not these various wireless transceivers should have been declared in their total transmitter count. This editor will leave that loaded question to the League's contest branch for them to deal with.

Again looking at Table I, it is also worth noting that the low edge of Channel 1 falls within a critical frequency portion of the band, 2400–2402 MHz, for which, in response to a petition from the ARRL, the FCC recently announced (by way of a Notice of Proposed Rulemaking) its intention to make the amateur radio service the primary user.

Keeping Up with the Technology

In an effort to keep abreast of the fast-developing technology, in January 2001 the ARRL Board of Directors voted unanimously that the League should proceed with the development of High

VHF Plus Calendar

March 2	Poor EME conditions.
March 3	New Moon.
March 7	Moon Apogee.
March 9	Poor EME conditions.
March 11	First Quarter Moon.
March 12	Highest Moon declination.
March 16	Moderate EME conditions.
March 18	Full Moon.
March 20	Moon Perigee.
March 21	Vernal Equinox.
March 23	Poor EME conditions.
March 25	Last Quarter Moon and highest Moon declination.
March 30	Moderate EME conditions.

—EME conditions courtesy W5LUU

Channel	Low Freq.	Center Freq.	High Freq.
1	2.401	2.412	2.423
2	2.406	2.417	2.428
3	2.411	2.422	2.433
4	2.416	2.427	2.438
5	2.421	2.432	2.443
6	2.426	2.437	2.448
7	2.431	2.442	2.453
8	2.436	2.447	2.458
9	2.441	2.452	2.463
10	2.446	2.457	2.468
11	2.451	2.462	2.473

Table I– IEEE 802.11b channels (freqs. in GHz).

e-mail: <n6cl@fuller.edu>

Speed Digital Networks for the Amateur Radio Service. The outcome of this vote was that the League's president, Jim Haynie, W5JPB, appointed amateurs to the High Speed Multimedia Working Group (HSMM) which reports to the League's Technology Task Force. Chaired by Dr. John Champa, K8OCL, this subcommittee has recently posted a web page on the ARRL's website: <http://www.arrl.org/hsmm>. This web page is an excellent source for what to do and where to go to get started in amateur radio application of 802.11b.

Part 15: Protection or Peril?

Amateur radio operators need to know what Part 15 does and does not regulate. Ignorance is not bliss! A comprehensive examination of the protection and perils of Part 15 can be found on the ARRL website at <http://www.arrl.org/tis/info/part15.html>. A few of the highlights are worth noting:

Part 15 covers devices and systems that can cause intentional, unintentional, and incidental interference to other services authorized on a particular frequency spectrum. For example, using Part 15 regulations, hams have been successful in a few incidents in getting local public utility companies to clean up their high-voltage transmission lines, which were causing incidental interference on amateur radio frequencies.

Even being armed with these regulations is not enough, however, because as the above example indicates, the onus is on the amateur radio operator to complain about the interference. Furthermore, the perils of Part 15 include the following problems: First, such devices are no longer type-accepted by the FCC. They now are subject to Certification, or a Declaration of Conformity, or simply Validation. Second, most owners of consumer-electronic-oriented devices are completely ignorant of the responsibilities accompanying their ownership.

While consumer-electronics-product instruction manuals usually contain the obligatory warning that the product may cause harmful interference to other devices, must accept interference from other services, and the owner must cease its use if it is determined that the device is causing such interference, rare is the individual owner who has bothered to read this warning, let alone understand its implications.

Nevertheless, for us in the amateur radio service, this warning paragraph is problematic, to say the least. How many of us are willing to advise our next-door neighbor that the product for which he just shelled out several hundred dollars is illegally interfering with our ham radio station, and according to the FCC he is to immediately cease using the product? It's safe to say that very few of us would be so bold as to take on this task.

While many Part 15 devices operate in the milliwatt and microwatt levels, the 802.11b Part 15 (to be more precise regulation number Part 15.247) exemption allows for transmission power levels to one watt and high-gain (directional) antennas. For amateur radio operators operating on 2.4 GHz in the boresight of one of these directional antennas, they can receive major interference. Even sidelobe radiation from some of the types of antennas used on several devices operating all across the spectrum can cause the noise floor on the band to rise by several dB. Even more so, amateur television (ATV) repeaters, because of their high-gain antennas and sensitive receivers, have been experiencing an increase in interference from such devices.

By way of emphasizing the problems with 802.11b Part 15 authorized devices, the ARRL notes in Attachment I of their Ad-Hoc Spectrum Strategy Committee Report to the ARRL Board of Directors 2001 Second Meeting (see <http://www.arrl.org/announce/reports-0107/spectrum-strat.html>) in Footnote 12 to Table 2.1-2 US Unlicensed Device Usage in Amateur Bands, By Service/Use, the following very telling comment:

> These [WAN and LAN devices] represent a major threat to the 2.4 GHz band. At their permitted 1 W levels, the interference from these devices may extend for miles. Although, as Part 15 devices, the operator of the device must correct interference, in practice, it may be difficult to identify a particular operator. In at least one case reported to ARRL, a WAN operator ceased operation upon reports of interference, but resumed operation once it was determined that the interference was to the Amateur Radio Service. Some amateur receiving sites are experiencing tens of dB increase in noise in the Part-15 portion of the 2.4 GHz band, presumably from the aggregate of many Part 15 or ISM [industrial, scientific, and medical] devices "visible" from a good RF location.

They further observed in a concluding footnote:

> At this time [2001], the 2400–2450 MHz Amateur band is the most vulnerable to interference from Part 15 devices. Keep in mind, however, the emergence of Ultra Wide Band (UWB) wherein each emitter may cover more than one band. It should also be noted that Table 2.1-2 was derived from US regulations in Region 2. It is possible that additional interference to Amateurs under the jurisdiction of the FCC in Region 2 or Region 3 could occur from devices operated under the jurisdiction of other nations. This possibility has not been investigated thus far, but is a suitable subject for later study.

Not covered in their footnoting is that these devices are also authorized within the U.S. 5650–5925 MHz ham band. While not nearly as populated with amateur radio activity as the 2400–2450 MHz band, it is another amateur radio frequency spectrum under increasing threat by expanding development of 802.11b Part 15 authorized devices.

An additional problem is the illegal use of higher power levels at access points (APs) for such devices. In a white paper authored by Paul Rinaldo, W4RI, and John Champa, K8OCL, entitled "On Amateur Radio Use of IEEE 802.11b Radio Local Area Networks" (slated for reprint in the spring 2003 issue of *CQ VHF*), which was written for the ARRL's High Speed Multimedia Working Group, they state, "there are an increasing number of APs operating outside the Rules. The FCC is aware of some of these high-power APs and is considering enforcement action."

Wringing Applications From Adversity

As problematic as these 802.11b devices are, there are also opportunities, as the WN6I Field Day operation demonstrated. These opportunities are not limited to employing the off-the-shelf devices as manufactured. Rather, as is often the case in our hobby, the only limitation is our ingenuity.

Speaking of opportunities, Rinaldo and Champa comment, "802.11b presents the Amateur Radio community with an opportunity to use the inexpensive RLAN [radio local area network] cards for high-speed multimedia applications including streaming television. While most prices presently hover around $100, some are available at about half that price."

While Part 15 regulations stipulate the one-watt limitation, amateur radio regulations under Part 97 that cover spread-spectrum emissions stipulate a maximum output of 100 watts if automatic power control (APC) is used. (For more information on spread-spectrum and amateur radio applications, see the reprint of the "Digital Communications" column by Harold E. Price, NK6K, from *QEX,* 1995, as posted at <http://www.tapr.org/tapr/html/ssf.html>.)

Obviously, this higher power level permits transmissions of multimedia signals over much greater distances. Indeed, using the right dish antenna and under the right conditions, several EME operators have made it to the Moon with less power than is permitted under these regulations. However, that is another can of worms, which is beyond the scope of this particular column to contend with. Perhaps in a future column we will address the issues related to bouncing a spread-spectrum signal off the Moon that can be received in countries that do not permit their amateur radio operators such a mode of communications.

Even so, by way of illustrating one such opportunity, Rinaldo and Champa reported the following proposed application:

> Amateurs in Livingston County (MI) are in the process of planning what might be the first amateur 802.11b network. They are coordinating their experiments with the ARRL High Speed Multimedia Working Group (HSMM) and the Michigan Area Repeater Council (MARC).
>
> Current plans call for using 802.11b Channel 6 with a center frequency of 2437 MHz. This approach will place the 22 MHz spread spectrum signal in what appears to be the most logical frequency for such testing. Approximately half of the signal is in the experimental portion of the [existing (1991) ARRL band plan for the 13-cm band] (2438-2450 MHz) already designated for spread spectrum use. The other half of the signal is in the currently un-used satellite sub-band (AMSAT-OSCAR 40 downlinks around 2401 MHz) and the 2.4 GHz fast-scan ATV sub-band.
>
> If effective APC techniques can be developed, the experimenters plan to use RF output power in the range of 2–4 watts. With small dish antennas and helical beams, the experimenters hope to achieve throughputs in the range of 1-3 Mbit/s over a range of 10 miles or more.

Updating Rinaldo and Champa, in an ARRL article posted on the web at <http://www.arrl.org/news/stories/2003/01/10/3/?nc=1> entitled "High Speed Multimedia Hamming Could Be the Next Big Thing" and datelined January 10, 2003, the writer reports, "In Michigan, the Livingston County HSMM Experimenters Team already has three HSMM access points—called 'APs' in the commercial world—and about a dozen stations on the air centered on 2437 MHz."

Problematic Opportunities?

The opportunities described above are not without their problems. Take, for instance, the FCC's frowning on the Amateur Radio Service operators communicating with users of Part 15 devices. I remember an unauthorized QSO I had with a fellow ham who was using an old CB 100 mW walkie-talkie on 27 MHz. While I worked him, I listened to his transmissions on the 27 MHz CB band and transmitted my ham radio station on AM on the 10 meter ham band. In order to give an appearance of some legitimacy to my QSO (In those days we had to identify the station with whom we were communicating as well as our own), I identified my QSO by signing my friend's amateur radio callsign and mine.

Because of the propagation at the time of our QSO, we reasoned that no one could possibly determine if I was working my friend crossband on CW (He was a Novice class licensee at the time), or if I was illegally talking to him via his Part 15 device. Even so, our QSO lasted all of about 30 seconds. We were too worried that somehow the local FCC examiner in San Diego was on to our clandestine activities for us to continue them for very much longer than that short period of time. (If only old John Cruz knew how much trouble we young hams got ourselves into from time to time—yet maybe he did!)

My youthful vignette illustrates, however, the problems of amateurs communicating with non-amateurs who are operating within the Part 15 regulations. As it was in my youth, it continues to today that such communications fall within a prohibited area of FCC regulations.

One solution to the problem of communicating with users of non-licensed

of 802.11b protocol devices is to convert them to us—that is, to encourage these serious non-licensed users to become licensed hams. That solves one problem but still leaves open another: the content of the transmissions.

As with any amateur radio communications, we amateurs have the permitted content of our communications regulations to contend with. What travels on a non-licensed LAN may be illegal, or at best, in poor taste per our regulations.

There is also the problem of station identification. Part 97 stipulates that amateur radio transmissions must periodically identify the originating station. In an effort to satisfy this requirement, Rinaldo and Champa point out that some 802.11b amateur radio operator users have considered modification of the 802.11b protocol so as to map station callsigns into the frames similar to that used in AX.25. Presently, identifying is by way of rather conventional means, as they point out: "In the Livingston County amateur experimental high-speed network mentioned previously, identification will be callsigns typed in normal 802.11b text. Normal voice identification will use streaming audio. Normal ATV identification will be used for streaming video."

The Future

From the above referenced article "High Speed Multimedia Hamming Could Be the Next Big Thing" the following quote:

'The development of the ARRL 802.11b protocol will significantly enhance Amateur Radio, especially with respect to emergency communication and support of public service activities,' Champa predicted. He and his HSMM Working Group colleagues also expect that it will attract many technically oriented users of the Internet and wireless LANs to get their amateur tickets.

In addition to emergency communication, Hinternet [a hybrid word combining *ham* and *internet* coined by HSMM subcommittee member Alex Fraiser, N3DER] applications could include two-way streaming video, full-duplex streaming audio, Voice over Internet Protocol (VoIP) applications such as eQSO, EchoLink, iLink and IRLP, and digital voice. As on the wired Internet, communication can be point-to-point, point-to-multipoint, and multicast at high bandwidth.

'An emergency volunteer equipped with a laptop or a wireless PDA (personal digital assistant) with a microphone and a small video camera now has the tools to be a mobile set of eyes and ears in the midst of a communications emergency,' says Working Group member Kris Mraz, N5KM.

Speaking of 802.11b amateur radio applications, we here in Oklahoma are in the midst of tornado alley. What better way for a Skywarn member to accurately show a wall cloud than to transmit actual pictures of it via video-streaming amateur radio signal. As indicated above, the limit to the applications is in the visions for them.

And Finally

The title for this month's column asks a legitimate question: Is IEEE 802.11b protocol a friend or foe for amateur radio? While we discussed some of the problems with the protocol, hopefully we gave a relatively positive answer to the question. Even so, this piece is far from comprehensive. It is, however, an overview of a growing use of our microwave spectrum. It is your columnist's hope and plea that before commercial development runs away with our spectrum, we develop applications appropriate to our interests in amateur radio as a major effort to further proffer a major justification for our retaining our valuable frequency spectrum.

You can look forward to future coverage of this developing mode of communications in this column and feature articles in future issues of *CQ VHF* magazine. In a continuing effort to be comprehensive in our coverage, I look forward to hearing about your unique applications of this and other modes of communications within our hobby on the VHF Plus ham bands.

Until next month... 73, Joe, N6CL

Calls for Papers

Calls for papers are issued in advance of forthcoming conferences either for presenters to be speakers, or for papers to be published in the conferences' *Proceedings*, or both. For more information, questions about format, media, hardcopy, e-mail, etc., contact the person listed with the announcement. To date this year the following organizations or conference organizers have announced calls for papers:

Southeast VHF Society Conference (April 25–26). Contact Dick Hanson, K4AND, e-mail: <k5and@adelphia.net>. Deadline for submitting papers is March 11.

Central States VHF Society Conference (July 25–27). Contact Joe Lynch, N6CL, e-mail: <n6cl@utulsa.edu>. Deadline for submitting papers is May 15.

Microwave Update (Sept. 25–28). Contact Jim Christiansen, K7ND, e-mail: <k7nd@att.net>. Deadline for papers is July 1.

Basic Electronic Components Simplified

BY DAVE INGRAM,* K4TWJ

At the suggestion of editor Rich Moseson, W2VU, we are including a condensed study of basic electronic components in this column's featured topics, and the first installment in the series begins this month—right now. We are highlighting some strictly ground-floor information on resistors, capacitors, coils, and transformers, and our discussion is especially written for newer members of our great amateur radio world. This is prime information seldom featured in magazines, but information useful for a lifetime, because these components are the main building blocks of all electronic circuits. Additional components such as tubes, transistors, ICs, and microprocessors will be discussed in future columns. Any part of the upcoming discussion can be expanded into a full-blown and quite extensive study of its own. I am just hitting the high points in this crash course. We thus will move fast, so hold on and read carefully!

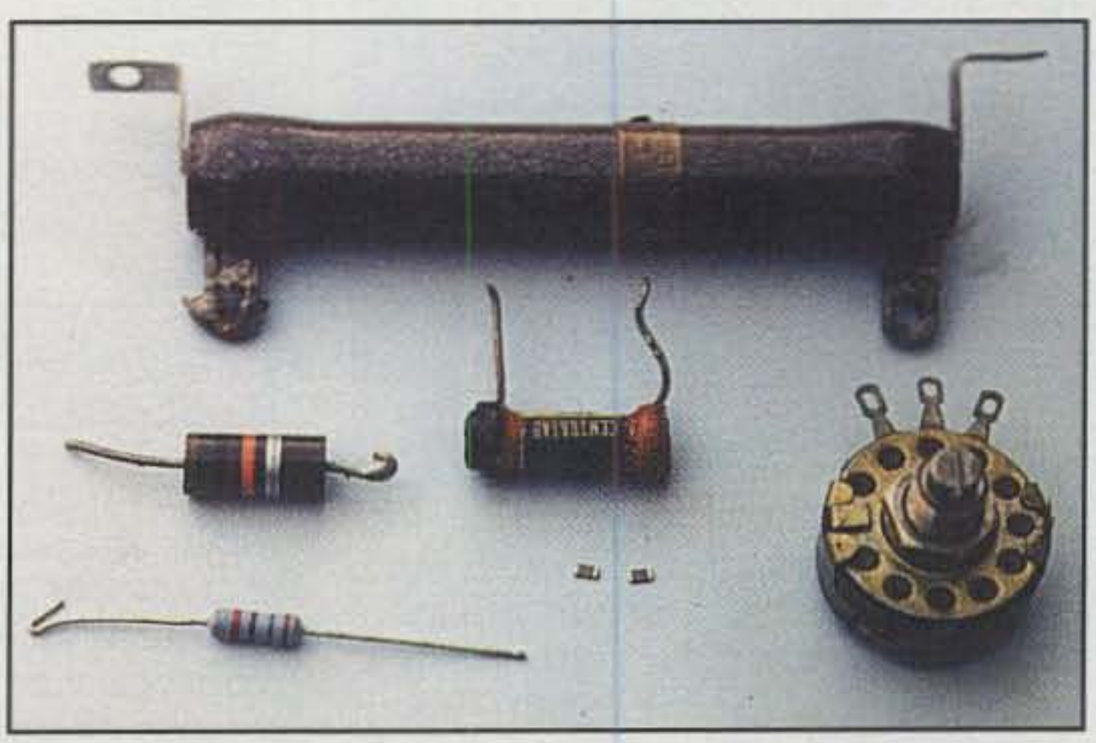


Photo A– A general sampling of resistors used in various types of electronic gear both past and present. Items shown include familiar the 1 and 2 watt leaded-type resistors (left), wire-wound 50 watt resistor (top), potentiometer (right), and classic Body-End-Dot resistor (middle). The two tiny specks appraeing below the B.E.D. resistor are surface-mount "chip" resistors. Most general-purpose resistors are made of compressed carbon granules.

Resistors

Surely the oldest and most widely used components in all types of electronic equipment are resistors—items specifically designed to oppose current flow and produce a voltage drop (plus dissipate heat) in the process. Over the years, both fixed and variable resistors have been made in a wide variety of shapes and styles. Carbon-granule-encapsulated types, however, traditionally have served for handling power levels up to two watts, and nichrome wire-wound types have handled power levels up to 200 watts. Bifilar-wound or non-inductive resistors have even been (and still are) made for VHF applications and high-power dummy loads.

Some of the most continuously popular types of resistors used in all types of electronics are shown in photo A. The classic "Body-End-Dot" type was popular during the 1930s and 1940s, and is still highly sought after today for making restored classic gear look fully authentic. Regular or "leaded type" 1/2, 1, and 2 watt carbon resistors (so named because wire leads extend from their ends) are now declining in availability as micro-miniature "chip" or surface-mount equivalents take their place—especially in new robotically produced gear. Yes, times are changing, and working with new very tiny parts requires a steady hand and a large magnifier—or simply replacing complete PC boards for a "quick fix."

A resistor is usually marked with its ohmic value in one of two ways: with color-coded rings or with a straight-stamped value. As an eternally helpful aid for working with these components, their classic color code (with a ridiculous phrase to help you remember them for many years hence) is shown in fig. 1. The ring, or band, closest to one end of a resistor is its first digit, the next ring is its second digit, and the third ring (closest to the gold or silver "tolerance band") is its multiplier or "number of zeros" digit. As an example, bands of yellow, violet, yellow, and silver equal 4, 7, and four-zeros at 10 percent tolerance, or 470K ohms ±47K ohms. Remember our previously mentioned "B.E.D." resistors? Their color code is read as resistor Body color = first digit, the End's color = second digit, and the small color Dot on the body is its multiplier digit. What about surface-mount or "chip" resistors? Most are stamped with their value; check them with your ohmmeter if you are unsure (A high-power magnifier definitely helps here!). As an example, a stamped number of 4K7 usually indicates 4.7K ohms. Practice reading and checking values, and you will get the knack of it.

Typically, the ohmic value of resistors wired in series adds, while the value of resistors in parallel divides (fig. 2). Knowing that fact can prove quite advantageous when you are caught in a bind, as you can use two or three on-hand resistors to "make" an unavailable resistor. You can also connect a fixed resistor in parallel with a variable resistor for limiting range and performing many more

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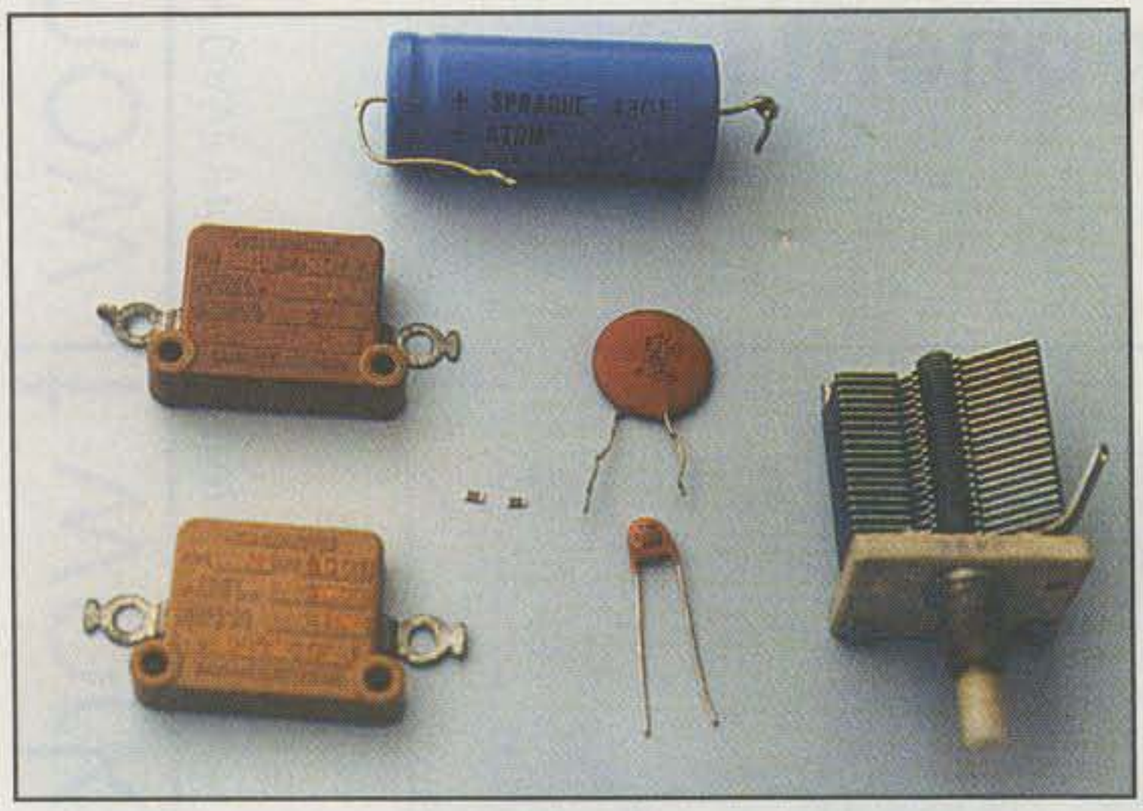

Photo B– This quickly assembled variety of capacitors includes 2-MICA "block" capacitors rated at 2500 volts (left), an electrolytic capacitor (top), a small variable capacitor (right), and two disc capacitors plus two tiny surface-mount "chip" capacitors in the middle. Most general-purpose tubular capacitors are comprised of metallic foil and waxed-paper-type strips wound in a spiral. (Discussion in text.)

"tricks." We can discuss this in future "How It Works" columns if interest warrants.

Capacitors

Equally familiar components used in all types of electronic gear are capacitors—items designed to block direct current (DC) and pass alternating current (AC). How well a particular capacitor passes or opposes the flow of AC, however, depends on its capacitive value and the applied AC signal's frequency. Generally speaking, a small-value capacitor (one in the "pFd range") will pass an RF signal but exhibit high opposition or *reactance* (the electronic term for AC resistance) to audio frequencies. Conversely, a large-value capacitor (one in the "mFd range") typically passes both RF and audio frequencies. The exact amount of resistance or reactance a particular value capacitor exhibits to a specific frequency, incidentally, can be calculated with the formula: Xc (capacitive reactance in ohms) = 1/6.28 × F (Hz) × C (in parts of a Farad).

Small "tubular-type" capacitors typically are comprised of a strip of metallic foil and an insulating dielectric similar to a strip of wax paper rolled into a cylinder and fitted with wire leads. Larger "electrolytic" capacitors, as used for filters in power supplies, employ two metallic electrodes separated by a chemical-type electrolyte material. Some of the most familiar types of capacitors found in various forms of electronic gear are shown in photo B. "Block" capacitors were made during the 1930s and 1940s, and are now sought for accurately homebrewing or rebuilding classic gear. They are especially adapted to handling high RF currents in transmitters. Most capacitors are marked with their values. Color codes for older types are found in handbooks of the particular eras. The tiny "dots" are surface-mount or "chip" capacitors that are rapidly becoming a new-era standard as we move into the age of robotically produced gear. Unlike chip resistors, "SMT" capacitors are seldom marked with their value. Storing them in value-marked shipper bags (if purchased) or interpreting their value from related circuit diagrams is usually necessary. Unlike resistors, the value of capacitors wired in series divides, while the value of capacitors wired in parallel adds. This fact can also be used to "make" a specific value capacitor from on-hand items, and many folks have even combined fixed-value and variable capacitors to yield a desired value or to tune a desired frequency range.

Color	Key Slogan Word	Related Number (In first and second band, and number of zeroes in multiplier band)
Black	Bad	Zero
Brown	Beer	1
Red	Rots	2
Orange	Our	3
Yellow	Young	4
Green	Guts	5
Blue	But	6
Violet	Vodka	7
Gray	Goes	8
White	Well	9

Fig. 1– The color code for resistors with a dumb, but effective slogan to help you remember colors versus numbers.

Inductors

Coils of wire or inductors are also very interesting items to study—so much so, in fact, one could easily devote a lifetime to developing better, more efficient, and more unique-style inductors for special needs. Like capacitors, coils can also be separated into two broad categories: air-core types which exhibit less than one Henry of inductance and work at radio frequencies, and iron-core types with more than one Henry of inductance which work at audio frequencies. The exception here is powdered-iron or ferrite-core toroids that can be used for both RF and AF applications.

Generally speaking, coils work on the principle of releasing energy in the form of a magnetic field which results when direct current is applied to the coil. The oldest and most familiar example of this effect occurs when a coil is wound on a nail or horseshoe and connected to a battery to make an electromagnet. The resultant fixed magnetic field produced by applying DC to a coil is of miniscule benefit in radio, but the *changing,* or constantly expanding and collapsing, magnetic field produced by applying AC to the coil opens endless capabilities. The coil's opposition to initial current flow plus self-induced counter-voltage opposing current flow causes it

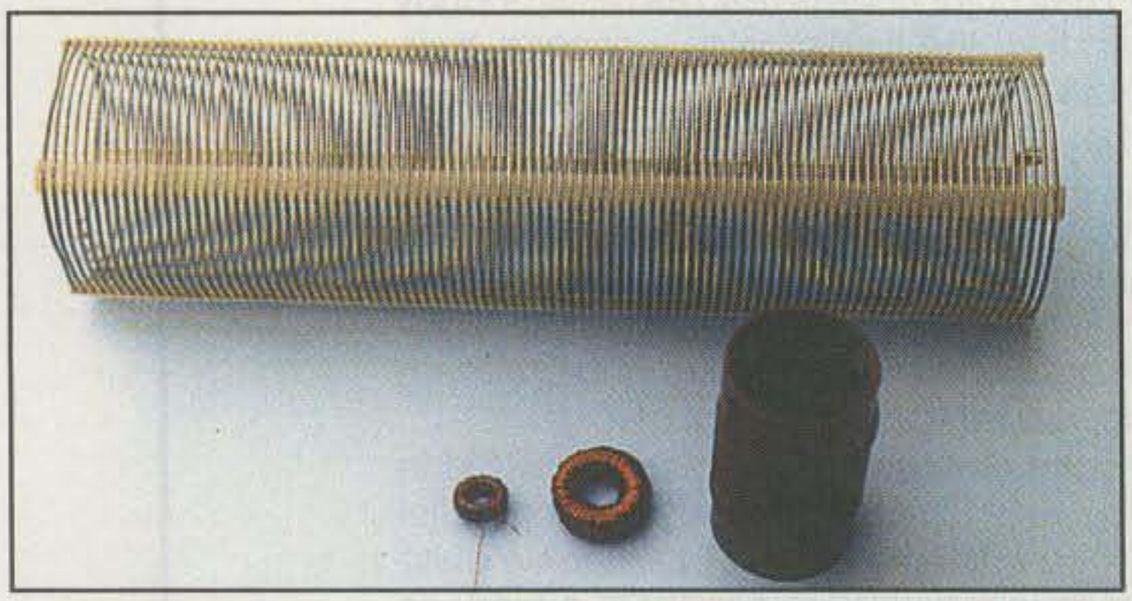

Photo C– This mini-collection of inductors includes an air-core coil (top), a phenolic-form coil (right), and two small toroidal-core coils (left). Iron-core coils are generally used in AF applications and power supplies.

Photo D– Power transformers like the one shown here usually consist of two or three windings on a laminated iron core covered with a metal case.

to resist, or "choke out," AC or RF energy while passing DC. The coil's changing (AC) field can also be used to couple signals or RF energy from one stage to another (in a receiver, transmitter, or antenna tuner).

Yet another application for coils is applying a rapidly changing AC signal to them and then stabilizing, rectifying, and regulating resultant inductive kicks to produce a modern "switching-type" DC power supply. That's right, friends, the heartbeat of lightweight 12 volt DC power supplies is inductive kicks tamed down to yield smooth DC voltage for powering a transceiver.

Some familiar types of coils used in both receivers and transmitters (plus power supplies) are shown in photo C. The traditional open-air, or "air core," coil is slowly giving way to large toroidal core-wound coils in high-power transmitting applications, but a full changeover is probably several years down the line. With regard to "chip" or surface mount components, only low-value inductances are available at the present.

Like resistors, the inductance of coils connected in series adds while the inductance of parallel-connected coils divides. One of the most interesting applications of that fact is Terlin's world-famous Outbacker mobile HF antenna. Its helically wound element utilizes series-connected loading coils for various bands, while its outer "wander lead" jumps or shunts coils with a lower inductance coil. The classic mathematical formula for calculating a coil's inductive reactance or opposition to AC/RF energy, incidentally, is included in fig. 2.

Transformers

When one coil or inductor with AC applied to its winding is brought in proximity to another coil, its changing magnetic field will cause, or induce, voltage and current into the second coil. The ratio of energy induced or coupled from one winding to the other is proportional to the turns in each winding.

This concept of changing one level of electrical energy to another with minimum losses forms the basis of transformers. If a transformer is used in a power supply and its primary-to-secondary turns ratio is 10:1 and 120 VAC is applied to its primary winding, resultant secondary/output voltage will be 12 VAC. If (after rectification and filtering) a connected transceiver draws 20 amps peak current or 240 watts (12V × 20A), primary current will be inversely proportional at 2 amps (240W/120V) peak. If another transformer has a 1:20 ratio and 120 VAC is applied to its primary, resultant output will be 2400 volts (120 × 20)—assuming negligible eddy current and hysteresis losses if you are hunting for technical nits to pick. If a connected linear amplifier draws 500 mA, primary current will be 10 amps (2400V × .5A = 1200W/120V). Get the idea?

Generally speaking, transformers can be categorized in two types: air core used for RF and IF applications, and iron core used in AF and power-supply applications (the "core" relates to the form or support for the windings). The exception here once again is toroidal core transformers that, through selection of material permeability and coil turns, can work for RF or AF applications.

A familiar example of an iron-core-type transformer is shown in photo D. This particular style is used in small linear amplifiers. It too is also becoming a rather scarce item, because large, legal-limit-type amplifiers are using custom-made transformers with open-frame designs, and 12 volt suppliers are using "switching" circuits in increasing numbers.

An air-core transformer was not included in photo D, incidentally, as RF or IF transformers are usually enclosed/shielded in a metal case and must be "ripped open" for viewing. As an alternate, shift your thoughts and visualize this scenario: Assume you install a dipole antenna several feet away from but parallel to a power line, telephone line, or TV lead in and then experience

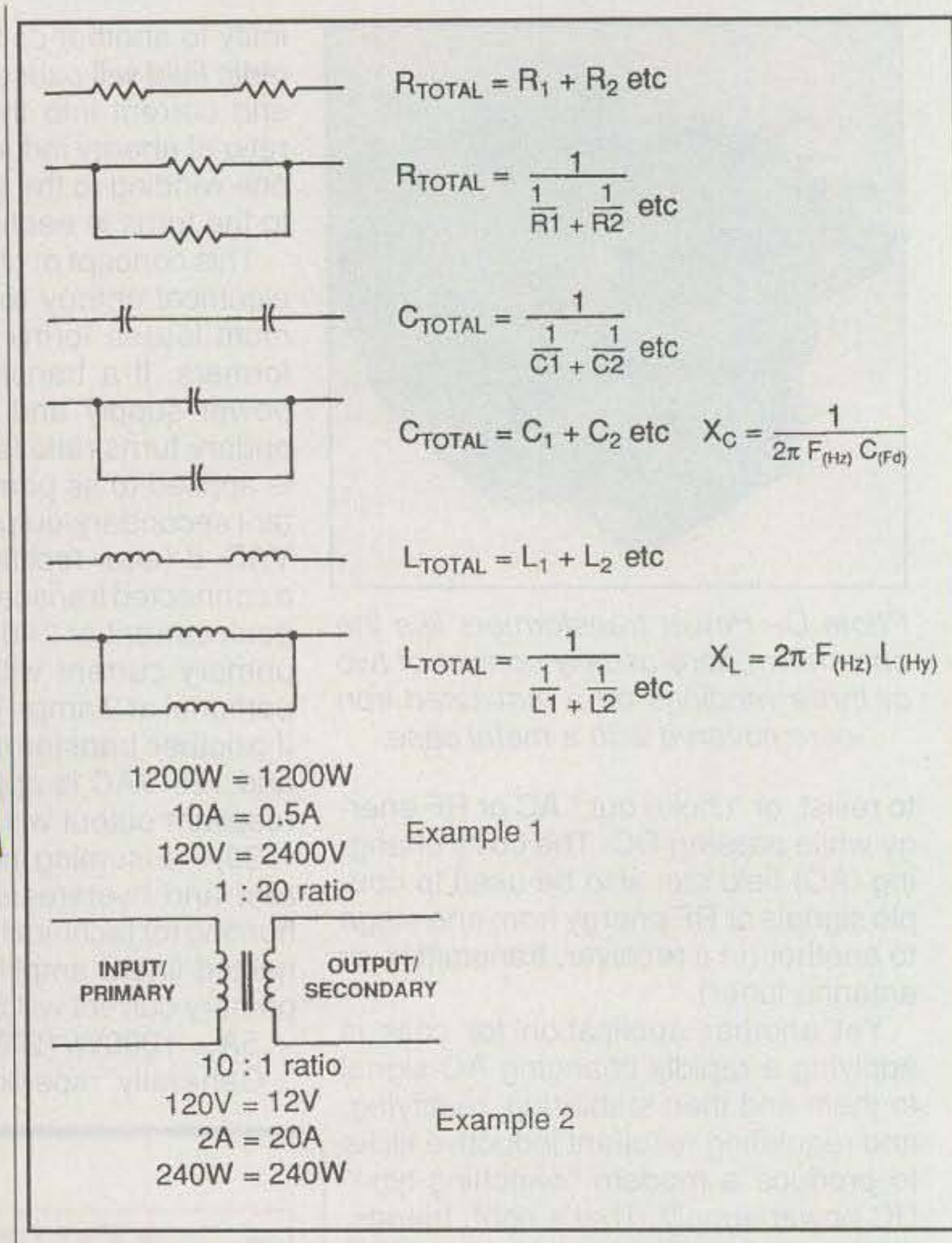

Fig. 2– Circuit symbols and mathematical formulas related to the discussion in the text of resistors, capacitors, coils, and transformers.

RF feedback, telephone RFI, or TVI. What's the problem? The parallel wires can act like an open-air RF transformer with (unfortunately) one inducing into the other. Remounting the dipole at right angles to the utility lines minimizes coupling. Remember that fact if you ever experience a similar problem. Remember also that power lines and antennas can be a deadly combination if one falls on the other.

Conclusion

That wraps up the views for this time, friends, and we hope we gave you some useful insight into a few of those strange little components inside your favorite rig. As we mentioned earlier, only a limited amount of information can be squeezed into each column, and starting at the "ground floor" is simply good logic. Now let's hear your thoughts. Shall we continue with a quick overview of a few components per column like we did here, present a more in-depth study of only one component per column, or should our "How It Works" discussions focus primarily on full circuits and gear overall? If circuits and gear are preferred, what would you like to see discussed?

Simply mailing us a postcard with your opinion/preference is the best bet here, as our e-mail continuously overflows and gives error messages. If you wish a brief reply, just send a short (!) letter with an SASE. Postal mail may be slow, but it is still reliable. Meanwhile, remember to enjoy a few good on-the-air QSOs every day, and never stop learning!

73, Dave, K4TWJ

BY CARL SMITH,* N4AA

Where the Action Is

I was somewhat surprised at the response to the pictures of my own station and antenna system in the January issue. One ham in Hawaii wanted all kinds of details on how I put the wood pole up, what rotor managed to hold it all without some kind of thrust bearing, etc. Gee, I don't know. I put all of it up about ten years ago, and it's still there with no sign of damage from the wind and weather that exist on top of the hill.

I was also somewhat surprised at the comments I received on the "Free-Banding" business, also in the January issue. My purpose in making it "public" was to spur discussion, and it certainly did that. I can only hope that some positive results come from all the discussion now that the activity has been made known to DXers worldwide.

The Most Wanted

2003 is starting off with announcements of DXpeditions to some of those Most Wanted countries. I hear of no less than *two* different groups going to Ducie Island (VP6/D) in the March/April time period. With those operations, Ducie is sure to drop from its # 30 ranking in *The DX Magazine*'s 2002 Most Wanted list. Others are in the planning stages, so we'll have to wait to see if those plans evolve into actual operations. Remember that some of these things take years to work out—all the little details, including permission, transportation, and financing, take work and time.

Speaking of *The DX Magazine*'s Most Wanted list, the overall world rankings are available on the website <www.dxpub.com>. The January/February issue of the magazine carried the continental breakdowns, and the March/April issue will have the breakdown by mode. Many DXpeditioners use this listing as their guide to where to direct their efforts over the next year or two.

Where the Action Is

Tens of thousands of QSL cards were processed last year by the DXCC Desk, and many of those applications resulted in DXers reaching, or at least getting very close to, Honor Roll status. I have noticed over the past year that more and more activity is swinging to the WARC bands—30, 17, and 12 meters—as well as the low bands—160 and 80 meters. Many DXpedition announcements now emphasize those particular bands.

I also have noted a dramatic drop in reports of DX in general on the all-time favorite band for DXing—20 meters. In years past 20 was where you went if you wanted to work those needed countries. With awards now being offered for DXCC on 30 meters, etc,. more interest has developed in the WARC bands. Well, we have to have some challenge when we reach the 300-plus confirmed level, so this is probably a good thing.

The Top QSL Managers

Relative to QSL cards, John Shelton, K1XN, who furnishes the QSL information in this column, conducted an informal survey around the first of the year asking for nominations for the Top QSL Managers. He got a pretty good response, and I am pleased to list the top 25 "vote getters" here, in order by the number of votes each received: KU9C, W3HNK, G3SWH, KK5DO, WA3HUP, AKØA, EA5KB, EA4URE, WF5E, K2FF, N4CQQ, KQ1F, VE3XN, NØJT, WA4JTK, G3SXW, N3SL, DL7DF, AA5BT, IK2QPR, DL5EBE, DL1NHK, VK1AA, KB2MS, and K1ER. Congratulations to these QSL Managers. Obviously their time and effort to get those QSL cards into "our" hands is appreciated by a majority of DXers. *Thank you, ladies and gentlemen.*

At a Western Kentucky DX Association meeting John Reasoner, WA4QMQ, was presented with a plaque for Outstanding QSL Manager services over the period 1977 to 2002 (see text). Shown left to right: Steve, K4EU; Don, N4THE; Larry, WB4KLI; Gary, WD4MDY; Jack, KF4OTG; Jim, K4TXJ; Ed, N4HID; and John, WA4QMQ. (Photo courtesy Steve, K4EU)

Recently, one such QSL Manager was recognized by his fellow DXers. Dr. John Reasoner, WA4QMQ, was honored for 25 years of QSL Manager services at a meeting of the Western Kentucky DX Association meeting in Bowling Green. John was presented with a plaque for Outstanding QSL Manager services over the period 1977 to 2002 by Steve Hawley, K4EU. John served as QSL Manager for Steve's DX operations as WA4UAZ/HC1, HD1A, VS6JR, F6IKG, and CN8FC, beginning in 1977. It is conservatively estimated that John handled over 30,000 QSL requests for these operations over those 25

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The WPX Program

Mixed

1910 .....KF8PD 1911 .....IX1FXD

CW: 450 K3JHT. 950 KX1A. 1400 AA1KS. 1550 WA2EYA. 2200 S51NR. 4300 N6JV.

SSB: 350 KT2C, N5PU. 850 KX1A. 900 N9DI.

MIXED: 450 KF8PD. 750 IX1FYD. 1150 W2FKF. 1450 KX1A. 2450 ON4CAS. 2500 OZ1ACB. 3750 WB2YQH.

20 meters: IX1FYD

Asia: IX1FYD
Europe: IX1FYD

Award of Excellence Holders: N4MM, W4CRW, K5UR, K2VV, VE3XN, DL1MD, DJ7CX, DL3RK, WB4SIJ, DL7AA, ON4QX, 9A2AA, OK3EA, OK1MP, N4NO, ZL3GQ, W4BQY, IØJX, WA1JMP, KØJN, W4VQ, KF2O, W8CNL, W1JR, F9RM, W5UR, CT1FL, WA4QMQ, W8ILC, VE7DP, K9BG, W1CU, G4BUE, N3ED, LU3YL/W4, NN4Q, KA3A, VE7WJ, VE7IG, N2AC, W9NUF, N4NX, SMØDJZ, DK5AD, WD9IIC, W3ARK, LA7JO, VK4SS, I8YRK, SMØAJU, N5TV, W6OUL, WB8ZRL, WA8YM, SM6DHU, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, DK4SY, UR2QD, ABØP, FM5WD, I2DMK, SM6CST, VE1NG, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, HA8XX, K7LJ, SM3EVR, K2SHZ, UP1BZZ, EA7OH, K2POF, DJ4XA, IT9TQH, K2POA, N6JV, W2HG, ONL-4003, W5AWT, KBØG, HB9CSA, F6BVB, YU7SF, DF1SD, K7CU, I1PO, K9LNJ, YBØTK, K9QFR, 9A2NA, W4UW, NXØI, WB4RUA, I6DQE, I1EEW, I8RFD, I3CRW, VE3MC, NE4F, KC8PG, F1HWB, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, KC7EM, YU1AB, IK2ILH, DEØDAQ, I1WXY, LU1DOW, N1IR, IV4GME, VE9RJ, WX3N, HB9AUT, KC6X, N6IBP, W5ODD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, WØULU, K9XR, JAØSU, I5ZJK, I2EOW, IK2MRZ, KS4S, KA1CLV, KZ1R, CT4UW, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, OE1EMN, W9IL, S53EO, DF7GK, I7PXV, S57J, EA8BM, DL1EY, KØDEQ, KUØA, DJ1YH, OE6CLD, VR2UW, 9A9R, UAØFZ, DJ3JSW, HB9BIN, N1KC, SM5DAC, RW9SG, WA3GNW, S51U, W4MS, I2EAY, RAØFU, CT4NH, EA7TV, W9IAL, LY3BA, K1NU, W1TE, UA3AP, EA5AT, OK1DWC, KX1A, IZ5BAM, W4GP, K4LQ.

160 Meter Endorsement: N4MM, W4CRW, K5UR, VE3XN, DL3RK, OK1MP, N4NO, W4BQY, W4VQ, KF2O, W8CNL, W1JR, W5UR, W8RSW, W8ILC, G4BUE, LU3YL/W4, NN4Q, VE7WJ, VE7IG, W9NUF N4NX, SMØDJZ, DK3AD, W3ARK, LA7JO, SMØAJU, N5TV, W6OUL, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, UR1QD, AB9O, FM5WD, SM6CST, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, K7LJ, SM3EVR, UP1BZZ, K2POF, IT9TQH, N8JV, ONL-4003, W5AWT, KBØG, F6BVB, YU7SF, DF1SD, K7CU, I1POR, YBØTK, K9QFR, W4UW, NXØI, WB4RUA, I1EEW ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, YU1AB, IK4GME, WX3N, WBØDD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, K9XR, JAØSU, I5ZJK, I2EOW, KS4S, KA5CLV, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, S53EO, S57J, DL1EY, KØDEQ, DJ1YH, OE6CLE, HB9BIN, N1KC, SM5DAC, S51U, RAØFU, UAØFZ, CT4NH, W1CU, EA7TV, LY3BA, RW9SG, K1NU, W1TE, UA3AP, OK1DWC, KX1A, IZ5BAM, W4GP.

Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage if airmail desired) to "CQ WPX Awards," P.O. Box 593, Clovis, NM 88101 USA. ***NOTE:*** *WPX will not accept prefixes/calls which have been confirmed by computer-generated electronic means.*

YO4RIU is 24 years old and a student at the Sports Faculty in the Lower Danube, University of Galati. He has been licensed for ten years. With his FT-840 and triband Yagi, long wire for 40, and a dipole for 80, he has worked well over 100 countries on 80 through 10 meters. He only needs a handful of cards to reach 5 Band DXCC. (Photo courtesy John, KDØJL)

years. K4EU expressed his gratitude and thanks to WA4QMA for his excellent QSL Manager service for deserving DXers.

Words of Wisdom from "Uncle DX"

I have offered "words of wisdom" from my friend Uncle DX in this column before. He offered me one of his writings recently, and I just have to share it with you. It is so fitting in these days of "high tech" stuff.

Uncle DX on Habits, Dependencies, Changes, and Memory

Several years ago, with the advent of computers into our everyday life, I concluded (and declared) they would never become the center of my Amateur Radio life . . . or life period. And they haven't. However, the dependency is ever in the bushes. Let's examine and see if it rings a chime in your shack.

First something else has to be said from my perspective, which I *know* comes close to home for some of my mature ham buddies, who will remain call-less. We wake up earlier, but by going to bed with the chickens we do get our rest so we can be vigilant on the bands. After all, we are always in training for DX and at the ready for the QRPer down the hill.

It's 20 degrees F and dark, with no one up in the house but this DXer. What is the first thing I turn on in this silly hour prior to sunrise? OOPS, the computer. Now maybe it's because mine is not the screamer many of you have, and it takes awhile to do all the things it does with the smoke and mirrors. And, we all know these new rigs without the beautiful lights of the "valves" are instant on, so to speak, and don't need time to warm up anymore. Do they ever drift?

So while the computer is booting up (love this term, *booting up*), I turn on the rig, fumble with the switches and other things to finally hear the "noise" on 80 or one of the sunrise bands. In the summer it may not be 80 or 160, but we also must screw all the cables back on the equipment since we *all* unscrew the cables from these unforgiving rigs at bedtime—*right*?

5 Band WAZ

As of Jnauary 15, 2003, 610 stations have attained the 200 zone level and 1305 stations have attained the 150 zone level.

New recipients of 5 Band WAZ with all 200 zones confirmed:
K3ZO

The top contenders for 5 Band WAZ (zones needed, 80 meters):

N4WW, 199 (26)
W4LI, 199 (26)
K7UR, 199 (34)
WØPGI, 199 (26)
W2YY, 199 (26)
VE7AHA, 199 (34)
IK8BQE, 199 (31)
JA2IVK, 199 (34 on 40m)
KL7Y, 199 (34)
NN7X, 199 (34)
IK1AOD, 199 (1)
DF3CB, 199 (1)
F6CPO, 199 (1)
KC7V, 199 (34)
GM3YOR, 199 (31)
VO1FB, 199 (19)
KZ4V, 199 (26)
W6DN, 199 (17)
W6SR, 199 (37)
W3NO, 199 (26)
K4UTE, 199 (18)
HB9DDZ, 199 (31)
RU3FM, 199 (1)
HB9BGV, 199 (31)
N3UN, 199 (18)
OH2VZ, 199 (31)
K5MC, 199 (22)
W1JZ, 199 (24)
K2UU, 199 (26)
W1WAI, 199 (24)
W1FZ, 199 (26)
UT4UZ, 199 (6)
SM7BIP, 199 (31)
PY5EG, 199 (23)
SP5DVP, 199 (31 on 40)
KY7M, 199 (34)
W8AEF, 199 (40)
W9NGA, 199 (26)
K8RR, 199 (26)
UU5JR, 199 (4)
EA5BCX, 198 (27, 39)
G3KDB, 198 (1, 12)
KG9N, 198 (18, 22)
KØSR, 198 (22, 23)
UA4PO, 198 (1, 2)
JA1DM, 198 (2, 40)
9A5I, 198 (1, 16)
LA7FD, 198 (3, 4)
K5PC, 198 (18, 23)
K4CN, 198 (23, 26)
KF2O, 198 (24, 26)
G3KMQ, 198 (1, 27)
N2QT, 198 (23, 24)
OK1DWC, 198 (6, 31)
W4UM, 198 (18, 23)
US7MM,198 (2, 6)
K2TK, 198 (23, 24)
K3JGJ, 198 (24, 26)
W4DC, 198 (24, 26)
N4XR, 198 (22, 27)
OE2BZL, 198 (1, 27)
N4PQX, 198 (24, 26)
RU3DX, 198 (1, 6)

The following have qualified for the basic 5 Band WAZ Award:

K1JE (150 zones)
IK5FTV (173 zones)
HL1XP (190 zones)

****Please note: Cost of the 5 Band WAZ Plaque is $80 ($100 if airmail shipping is requested).**

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award Manager, Paul Blumhardt, K5RT, 2805 Toler Road, Rowlett, TX 75089. The processing fee for the 5BWAZ award is $10.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $15.00 for nonsubscribers. An endorsement fee of $2.00 for subscribers and $5.00 for nonsubscribers is charged for each additional 10 zones confirmed. Please make all checks payable to Paul Blumhardt. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. K5RT may also be reached via e-mail: <k5rt@cq-amateur-radio.com>.

Okay, I now have my great radio station on with the computer screen lighting up the shack. Often I light up the table/desk with this wonderful invention. The coffee is brewing. . . . I'm ready, *right*? What's next?

Hark . . . the DX cluster, of course. It's just a tool to DX you understand, not the center of it, hi. So we connect, or if on the cable, we wave our trained fingers over the keyboard to find out where W8JI is on 160 (and the DX) or the pile-ups on 80 and 40. It seems as magic. Have we even turned up the gain on the receiver yet?

Well, let me tell you, there is more to the story if that little connect can't be made. The reason I write this morning before sunrise is I'm already in the early stages of withdrawal, and it's only been 10 or 15 minutes without the cable. No connect, no cluster, and perhaps *no* DX—egad! Does somehow this magic computer business take away the sunspots or cause high absorption? Must be, because today I hear nothing. Then, in my fog, I finally discover I have to tune the rig all by myself and find the DX. Would you believe I even have to get the call over the "air"? Can't confirm it on the computer. . . . This is awful. Has it, this wonder of progress, become the center of the station when I said it wouldn't?

As I look at the screen I realize this darn one-eyed ruler-in-waiting of the world is directly in the center of the desk, just above the rig. For years it was off to the side. . . . I wasn't gonna put that thing too close to my HF love, no sir. Well, without thinking in that context, the last time the shack was moved/redecorated, which is an excuse for a good cleaning, the monitor came to the "center." Didn't realize the dependency was that great, and I actually said recently it was because of the crick in my neck from looking at that angle so much. Shucks, now it's within 3 inches of the rig. And this morning it wouldn't work because the wires wouldn't let it connect.

Remember, wireless is the center of this DXer's ham life. . . . Oh yeah, some DXer. Some day I'm going to be like Andy Rooney and examine my priorities! One way would be not to turn on my "desk light" and get back to the basics. Can I handle it, can you, say for a week? Can we still tune by ourselves, find the DX, and have that feeling of great accomplishment? Or is it like that slide rule in high school or the calculator today being

The WAZ Program

10 Meter SSB
546 .....K6FG

17 Meter SSB
31 .....RA4CC

20 Meter SSB
1106.....SM5BRK

17 Meter CW
45 .....K6FG

160 Meters
182 .....K4CIA (32 zones)

All Band WAZ
SSB
4836.....KT4HN
4837.....9A3LD
4838 .....K3VY

Mixed
8201 .....KC5KJE
8202 .....DL3ZAI
8203 .....IK1WGX
8204.....N3DD

All CW
344 .....N5ORT
345 .....JHØALB
346.....WD8AHR

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award Manager, Paul Blumhardt, K5RT, 2805 Toler Road, Rowlett, TX 75089. The processing fee for all *CQ* awards is $6.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $12.00 for nonsubscribers. Please make all checks payable to Paul Blumhardt. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. K5RT may also be reached via e-mail: <k5rt@cq-amateur-radio.com>.

Laszlo, HA3NU, is an old timer, licensed since 1972. He favors CW on whatever band has the best propagation at the time. He has 200 zones toward the 5B WAZ; 5B DXCC, and CW Honor Roll with 340 confirmed. He likes contests, DXing, and high-speed CW. He is also president of the Hungarian CW Group. (Photo courtesy John, KDØJL)

a shorter way to the final end? Is it really bad to be dependent on this tool called the computer, or is it just progress we are fortunate to be part of?

I can't check the e-mail this morning, can't check the temperature or the WX in lower Slobovia. W1MK is lonely calling CQ on the bottom of 80. Mike, VK6HD, just might be able to have a chat with a friend via the huge piles spawned by his output and the masses nagging at him (and a QRPer now and then) for a "quick fix" each sunrise. OH . . . lost it again; we have to turn up the gain and tune the rig to work DX today.

Of course, Uncle DX jests, as you obviously know. Hopefully, by looking at this with humor, while pointing out that times have changed, we change. That's all OK *if* we have the memories, which is one of our great gifts.

For the most part, computers are wonderful additions to our stations. They have their moments, as we all know, when their minds go their own way and don't cooperate with us. However, they are nice to have around. I do become concerned that some of the skill we worked and lived for may be sliding away. I believe mine is, and when the cable is down, and when I find a station "all by myself," it feels just plain good. It's a reminder of how it was—like looking at an old piece of gear we polished and preserved just to keep in touch with our past. HF is always with us . . . the true and deserving DXers we old duffers are. Enjoy it, folks, as I will to the last with my hand around the paddle, with my feet just sticking out of the headphones listening to that weak one with my wireless and logging by the light of this tool called a computer.Happy DX on you . . .

—Uncle DX

I hope you enjoyed the above. I got quite a chuckle from it as I remembered

CQ DX Honor Roll

The CQ DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more ACTIVE countries. With few exceptions, the ARRL DXCC Countries List is used as the country standard. The CQ DX Award currently recognizes 335 countries. Honor Roll listing is automatic when an application is received and approved for 275 or more active countries. Deleted countries do not count and all totals are adjusted as deletions occur. To remain on the CQ DX Honor Roll, annual updates are required. All updates must be accompanied by an SASE if confirmation of total is required. The fee for endorsement stickers is $1.00 each plus SASE. Please make checks payable to the awards manager, Billy F. Williams. All updates should be mailed to P.O. Box 9673, Jacksonville, FL 32208.

CW

K2TQC 334	N4JF 334	N7RO 332	K3JGJ 331	KZ4V 329	NC9T 326	KE5PO 322	N1HN 313	KH6CF 301
K2FL 334	K2ENT 333	K6GJ 332	N4AH 331	N5HB 329	K4JLD 326	W7IIT 322	CT1YH 313	KØHQW 299
K9BWQ 334	K3UA 333	K4CN 332	W2VJN 331	K1HDO 328	OK1MP 325	K6CU 321	K9OW 313	WG7A 295
K9MM 334	WB5MTV 333	KA7T 332	W2UE 330	K7JS 328	W4LI 325	N4OT 321	PY4WS 313	KE3A 295
W7OM 334	EA2IA 333	W8XD 332	N4CH 330	K8PV 327	WA8DXA 325	HA5DA 321	N7WO 312	W9IL 294
K2JLA 334	W7CNL 333	WØJLC 332	W6DN 330	W4QB 327	I5XIM 325	VE7DX 320	K9DDO 312	KD8IW 288
N7FU 334	YU1HA 333	K8LJG 332	W2UE 330	W4UW 327	K5UO 325	IKØADY 320	W3II 312	EA3BHK 282
K2OWE 334	PA5PQ 333	YU1AB 332	I4LCK 330	I1JQJ 327	IK2ILH 325	WG5G/QRPp 320	W6YQ 310	YC2OK 282
N4MM 334	DL3DXX 333	K5RT 332	VE7CNE 330	YU1TR 327	N5FW 325	HA5NK 319	YT1AT 310	DJ1YH 281
F3TH 334	IT9QDS 333	NØFW 331	4N7ZZ 330	I4EAT 327	9A2AA 325	K1FK 319	KF8UN 308	UA9SG 279
F3AT 334	G4BWP 333	PT2TF 331	W6DN 330	DL8CM 327	LA7JO 324	F6HMJ 319	IKØADY 307	XE1MD 278
DJ2PJ 334	K4CEB 333	K6LEB 331	K7LAY 330	SM6CST 327	SM5HV/HK7 324	OZ5UR 317	YU7FW 306	EA2CIN 278
WA4IUM 334	K4IQJ 333	VE3XN 331	WB4UBD 330	N4KG 327	W6SR 323	F5OIU 317	LU3DSI 302	I3ZSX 276
W4OEL 334	N5FG 333	W1WAI 331	K9IW 329	IT9TQH 326	9A2AJ 323	K8JJC 315	F5OIU 302	G3DPX 275
W2FXA 334	K4MQG 333	K2JF 331	G3KMQ 329	I2EOW 326	KUØS 322	HB9DDZ 314		

SSB

K6YRA 335	PY4OY 335	PA5PQ 333	N2VW 331	W2FKF 329	W6SR 326	XE1CI 321	LU3HBO 310	KØOZ 291
K2TQC 335	VE3XN 335	K8LJG 333	YZ7AA 331	KE4VU 328	N4KG 326	CT1ESO 321	SV3AQR 310	I3ZSX 290
W6EUF 335	4Z4DX 335	K3UA 333	YV1JV 331	K1HDO 328	K7TCL 326	YT1AT 321	HA6NF 310	AC6WO 290
K2JLA 335	WDØBNC 334	K4JLD 333	WA4WTG 331	K5UO 328	W5LLU 326	EA8TE 321	HB9DDZ 310	W4PGC 288
K4MQG 335	DU9RG 334	VE4ACY 333	EA1JG 331	KF8UN 328	W9HRQ 326	W6MFC 321	WA5MLT 310	YV5NWG 287
IK1GPG 335	N7RO 334	KØKG 333	W8KS 331	EA3EQT 328	W4QB 326	K3LC 320	EA3BHK 307	RW9SG 286
K5OVC 335	K2FL 334	W4WX 333	YV5IVB 331	WØULU 328	K8PV 326	N4CSF 320	N1ALR 306	VE7HAM 285
NØFW 335	WØYDB 334	VE2WY 333	KX5V 331	K1EY 328	DL6KG 326	N4HK 320	XE1MDX 305	KKØDX 285
K9MM 335	W4UW 334	WB3DNA 333	I8LEL 331	KZ4V 328	W4LI 326	DL3DXX 320	EA5OL 305	VE7SMP 284
W6BCQ 335	K9BWQ 334	K6GJ 333	K9OW 331	XE1D 328	WR5Y 326	KØFP 320	WB2AQC 305	F5RRS 284
XE1AE 335	W4NKI 334	W9SS 333	K3JGJ 331	KD8IW 328	IKØIOL 325	EA1JG 320	N1KC 305	CT1CFH 284
W7OM 335	WB4UBD 334	K9PP 333	N5ORT 331	ZL1BOQ 328	K9IW 325	EA7TV 320	KE4SCY 304	WØIKD 283
KZ2P 335	W4UNP 334	W2CC 333	PT2TF 331	I1EEW 327	WA4JTI 325	SV1RK 320	KC4FW 304	EA3CYM 283
IK8CNT 335	W8AXI 334	VE7WJ 333	W3AZD 331	SV1ADG 327	NI5D 325	WA4DAN 319	K3BYV 303	W9ACE 283
VK4LC 335	VE2GHZ 334	VE2PJ 332	W6DN 330	DL8CM 327	KC4MJ 325	CE1YI 318	YC2OK 303	KBØRNC 282
OE7SEL 335	OE2EGL 334	YV1KZ 332	K8CSG 330	I1JQJ 327	K7HG 324	W5OXA 317	WB2NQT 303	F5JSK 281
VE3MR 335	WA4IUM 334	YV1AJ 332	EA3KB 330	F9RM 327	AC7DX 324	YV4VN 317	VK3IR 303	WN6J 281
VE3MRS 335	K5RT 334	KSØZ 332	YV1CLM 330	XE1MD 327	KØHQW 324	WN9NBT 317	W2GZI 302	IK8TMI 281
K4MZU 335	W2FXA 334	N5ZM 332	LA7JO 330	I4EAT 327	W9IL 324	EA5GMB 317	N5QDE 302	YU1TR 280
OZ5EV 335	N4JF 334	W6SHY 332	AB4IQ 330	W3GG 327	EA3BKI 323	K6RO 316	KD4YT 302	KK5UY 280
N7BK 335	K2ENT 333	I8KCI 332	AE5DX 330	AA6BB 327	K4JDJ 323	CT1AHU 316	KK4TR 301	KA5OER 280
K7LAY 335	N4CH 333	LU4DXU 332	KB2MY 330	SM6CST 327	EA3BMT 323	N5HSF 316	SV2CWY 300	F5INJ 279
ZL3NS 335	IØZV 333	W5RUK 332	WS9V 329	WD8MGQ 327	WW1N 322	CP2DL 314	4X6DK 300	EA3CWT 278
N4MM 335	EA2IA 333	VE4ROY 332	K2JF 329	CX4HS 327	F6BFI 322	WZ3E 314	YT7TY 300	VE2DRN 277
OZ3SK 335	4N7ZZ 333	W7FP 332	ZL1AGO 329	IØSGF 327	K6CF 322	K9YY 313	K6GFJ 299	9A9R 277
K7JS 335	KE5PO 333	K9HQM 332	N5FG 329	IT9TQH 327	LU7HJM 322	NØMI 313	XE2NLD 299	W6UPI 276
XE1L 335	VE1YX 333	CT1EEB 332	W9OKL 329	IT9TGO 327	K5NP 322	KD5ZD 313	WA1ECF 295	VE2AJT 275
YU1AB 335	XE1VIC 333	K4CN 332	DU1KT 329	DK5WQ 327	PY2DBU 322	W5GZI 311	N5WYR 293	Z31JA 275
OE3WWB 335	IN3DEI 333	W8ZET 332	I2EOW 329	UY5XE 327	LU5DV 322	VE3CKP 311	K7ZM 292	G4URW 275
K5TVC 335	I4LCK 333	K1UO 332	VE7DX 329	KW7J 327	WA4ZZ 322	CT1YH 311	OA4EI 292	VE2AJT 275
N5FG 335	W2JZK 333	EA3BMT 332	W2FGY 329	KE5K 327	N3RX 321	YV5NWG 311	N8SHZ 291	4Z5FL/M 275
DJ9ZB 335	EA4DO 333	DL9OH 331	CT1EEN 329					

RTTY

K2ENT 331	NI4H 321	K3UA 318	G4BWP 312	W4EEU 291	I2EOW 291	W4QB 280	YC2OK 280	PA5PQ 272
WB4UBD 329	EA5FKI 320	W2JGR 316	N5FG 305	KE5PO 297	I1JQJ 289			

CQ DX Awards Program

CW

1036 ..... K4MQG 1037 ..... WA1RGS

SSB Endorsements

320 ..... N5FG/335
320 ..... PY4OY/335
320 ..... VE3XN/335
320 ..... W2FXA/334
320 ..... N4JF/334
320 ..... K1UO/332
320 ..... KB2MY/330
320 ..... KE3A/328
300 ..... K3BYV/305
300 ..... I3ZSX/300
275 ..... VE6ZT/282
275 ..... 4Z5FL/M/275

CW Endorsements

320 ..... N4JF/334
320 ..... W2FXA/334
320 ..... K4MQG/333
320 ..... N5FG/333
320 ..... W7CNL/333
275 ..... KE3A/295
250 ..... VE6ZT/260

RTTY Endorsements

320 ..... EA5FKI/320
300 ..... N5FG/305

The basic award fee for subscribers to *CQ* is $6. For non-subscribers, it is $12. In order to qualify for the reduced subscriber rate, please enclose your latest *CQ* mailing label with your application. Endorsement stickers are $1.00 each plus SASE. Updates not involving the issuance of a sticker are free. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business-size, No. 10, self-addressed, stamped envelope to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. Currently we recognize 335 active countries. Please make all checks payable to the award manager.

a power failure on a recent Saturday morning that lasted for nearly three hours. It's amazing the things you try to do without thinking—like reaching for a light switch, or trying to use some appli-

Jose, YS2MRL, is a newcomer to DXing,having just started in 2000. He now has an FT-767GX and Mosley Mini-33A and a Cushcraft D3W, so he is active on the bands. He hopes to get on 6 meters soon, too. (Photo courtesy of John, KDØJL)

ance that "won't work." Makes one feel rather foolish afterward, but it's what we have become so accustomed to doing, we do it without ever thinking about it. Try doing without your radio computer for even a few hours. It could be very enlightening.

Until next month . . . have fun on the bands. There are still several contests for us to jump into a for a score or "new ones." Make the most of it.

73, Carl, N4AA

QSL Information

K2G via JA1OZK
K2KW/6Y5 via WA4WTG
K3TEJ/KP4 via K3TEJ
K4E via KU4BT
K4FFF via N4GM
K6ACZ/DU via K6ACZ
K7AR/C6A via K7AR
K8MFO/6Y5 via K8MFO
K8MFO/C6A via K8MFO
KA1I/NH2 via JH7BZR
KC4/N2TA via N2TA
KC4/NK3T via NK3T
KE7X/6Y5 via WA4WTG
KHØ/JF2VAX via JF2VAX
KHØ/JK2VOC via JK2VOC
KH2S/KP1 via N5VL
KH2TX via JA2KTX
KH5/AH6OZ via AH6OZ
KH5/NH6UY via NH6UY
KH5/WH6GS via WH6GS
KH6/DJ6OI via DJ6OI
KH6GMP/KH3 via KH6GMP
KH6ND/KH5 via N4XP
KH6ND/KH5 via N4XP
KH7R via KH7R
KH8/KM9D via OM2SA
KH9/AL7EL via N4XP
KH9/N4BQW via KB6NAN
KL4A via WA2GO
KM9D/KH8 via OM2SA
KP2/AB2E via AB2E
KP2/K3EJ via K3EJ
KP2/K3TEJ via K3TEJ
KP2/K8MJZ via K8MJZ
KP2/KT8O via KT8O
KP2/OK1TN via OK1TN
KP3Z via WC4E
KP4/NE8Z via NE8Z
KW4CW via N4GM
L53EA via LW3EA
L59EOC via EA7JX
LA1LGN via LA1B
LN4C via LA4C
LTØH via EA7FTR
LU/3A2MY via 3A2MY
LU1ZV via LU4DXU
LX1KC via LX1KC
LX7I via LX2AJ
LX8DL via LX1DA
LY7Z via LY2TA
MØ/UT5SI via UT5SI
M2D via G3LZQ
MD4K via G3NKC
MD6V via G3NKC
MJØAWR via K2WR
MU5X via G3KKQ
MW5A via G3TXF
N3FW/KH2 via JA2VFW
N4BQW/KH9 via N4BQW
N4RP/C6A via N4RP
N4XP/KH5 via N4XP
N6MZ/KH9 via N4XP
N6XG/6Y5 via N6XG
N6XG/6Y5 via WA4WTG
N7MQ/C6A via N7MQ
N7NU/C6A via N7NU
NF6S/KP1 via N5VL
NH7A via F5VHJ
OA4/DL2JRM via DL2JRM
OD5/IK3AGP via IK3AGP
OD5/N4ISV via N4ISV
OHØ/K8MFO via K8MFO
OHØJV via DL7RV
OHØV via OH6LI
OH1TX via OH1TX
OH2NC via OH2NC
OH4A via OH6LI
OMØM via OMØWR
OM3PC via OM3PC
ON4VP via ON4VP
ON9CXP via N4XP
OY3QN via OZ1ACB
OY4TN via ON5UR
OZØXX via OZØXX
P4/DF8AN via DF8AN
P40A via WD9DZV
P40AV via K4AVQ
P40N via DF8AN
P5/4L4FN via KK5DO
PJ2/DL1EFD via DL1EFD
PJ2/W4PA via W4PA
PJ2MI via W2CQ
PJ4/OH1VR via OH1VR
PJ4W via DL1EFD
PJ5/K1NA via K1NA
PJ7/KM3T via K2PF
PTØF via W3HC
PV2DAE via PY2LDJ
PYØFT via JA1ELY
PY5EG via W3HC
PZ5DK via PAØDKA

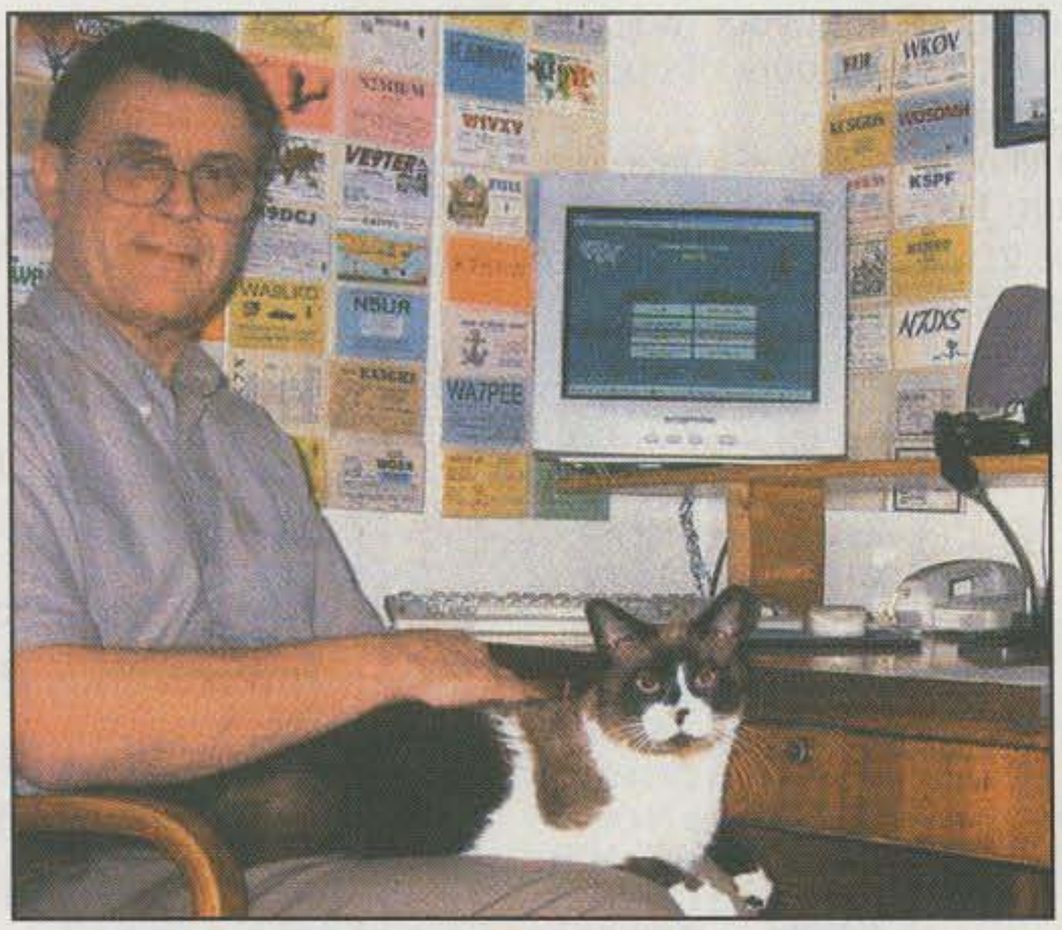
(The table of QSL Managers is courtesy of John Shelton, K1XN, editor of "The Go List," P.O. Box 3071, Paris, TN 38242; phone 731-641-4354; e-mail: <golist@golist.net>.)

awards

BY TED MELINOSKY,* K1BV

Do County Contacts from Club Stations or Expeditions Count?

Can I count county contacts made from club stations or expeditions? This question was posed recently by Makoto Iseki, 7N2UTO, on behalf of a JA friend who had done considerable operating from a club station. This is often the case overseas. The USA-CA rules state that the award is available to individuals "regardless of calls held." While it might be argued that the person did not actually permanently "hold" the call, my interpretation is that even for temporary operations the person making the contacts controlled the station and made the contacts, so counties worked and confirmed in this manner are valid for USA-CA. In such cases, the counties should be marked as having been made with another call you have used. This applies to other multi-operator situations, such as DXpeditions, as well as club stations.



Dean DeVries, N9VRZ, USA-CA All Counties #1044.

Dean DeVries, N9VRZ
USA-CA All Counties #1044

This month we hear from Dean, N9VRZ, who attained USA-CA All Counties on May 10, 2002:

It all started back in the mid-'60s. I saw a couple of kids running around with walkie-talkies. Well, of course I had to have a couple. We could only talk over a short distance. There were some older guys a few blocks away experimenting with antennas and ways to communicate farther. It wasn't long before we were building Knight kits and small Heath kits that were able to communicate over several blocks . . . cool!

Then Dad got interested, a good thing, as he was the guy with the money! First we started with a small single-channel mobile that we modified to have several channels. Then the interest went to a base station with large antennas. We had some good times talking to people up to 10 miles away. Well, that lasted for about a year or two. Then I got involved with other things (girls) and Dad got involved in ham radio as WA8WTT. I eventually got married, and raising a family took up most of my time. Dad went on to work many U.S. and foreign stations.

At a gathering at my friend Calvin Sherk's house back in 1994 I noticed a guy with a handheld radio on his belt. Curiosity got the best of me, and I wandered over to ask him what it was all about. He introduced himself—Russ Duckwall, N9VFO. He explained to me that it was a 2 meter 440 unit and showed me many of its features, including how he was able to access repeaters to speak with other hams as well as make phone calls. I thought to myself that this was way cool and I had to have one.

I asked Russ what I had to do. He explained the licensing procedure and informed me that he was a Volunteer Examiner and could give me the test when I was ready. He also offered to let me use some practice tapes and a study manual.

After a couple of months of studying I passed the Technician Plus exam and I was ready to get a radio. One Saturday Russ suggested taking a ride to ComDac, a ham radio and computer store in St. Joseph, Michigan. He introduced me to Jim Dooley, N8LXQ, who showed me some of the available radios. It wasn't too difficult a decision as to which radio to purchase—a Yaesu FT-530 like Russ's. Jim also showed me the base station in the store and told me about his interest in county hunting. County hunting sounded very interesting to me. However, being a Tech Plus, I didn't have the privileges to hang out on the County Hunter's Net, so I worked some of the local hams from the store's station.

Russ introduced me to a ham who was on 2 meters, Larry Hickman, KA9ZRW. After talking to Larry, I found out he too was a long-time county hunter. It was plain to see I needed to get on the HF bands. Larry was about to upgrade his station and offered to sell me his Yaesu FT-747. I purchased it and was able to get a taste of HF on 10 meters as well as listen to the County Hunter's Net on 14.336. It was great, and I knew I had to upgrade my license. It was back to studying and getting some good coaching from Larry.

In September 1995 I received my General license and was finally able to do some county hunting. My very first county contact was with Bob Demchak, KC1NA, a big rig in Kit Carson, Colorado, and I was on my way to meeting and working some of the nicest and most helpful people on the amateur bands. Many have made special trips or gone many miles out of their way to put out needed counties for county hunters.

In the first six months of hunting I racked up well over 2000 counties worked mobile with no relays. The closer I got to the magic number 3076 county, the more difficult it was to find counties I actually needed. Thus, I worked toward the Bingo, YL, OM YL Team, All One Band, and the Big Rig awards. These are only a few of the many awards you can work toward in county hunting.

Finally in April 2002 I was able to finish up the last few counties I needed. I got the contacts confirmed, and Jim and Larry helped with the confirmations and tying up the

*12 Wells Woods Rd., Columbia, CT 06237
e-mail: <k1bv@cq-amateur-radio.com>

USA-CA Honor Roll

500

AB4YZ.....3220
F8GB.....3221
VE1OP.....3222

1000

AB4YZ.....1616
VE1OP.....1617

1500

AB4YZ.....1351
VE1OP.....1352

2000

AB4YZ.....1248
VE1OP.....1249

2500

AB4YZ.....1168
VE1OP.....1169

3000

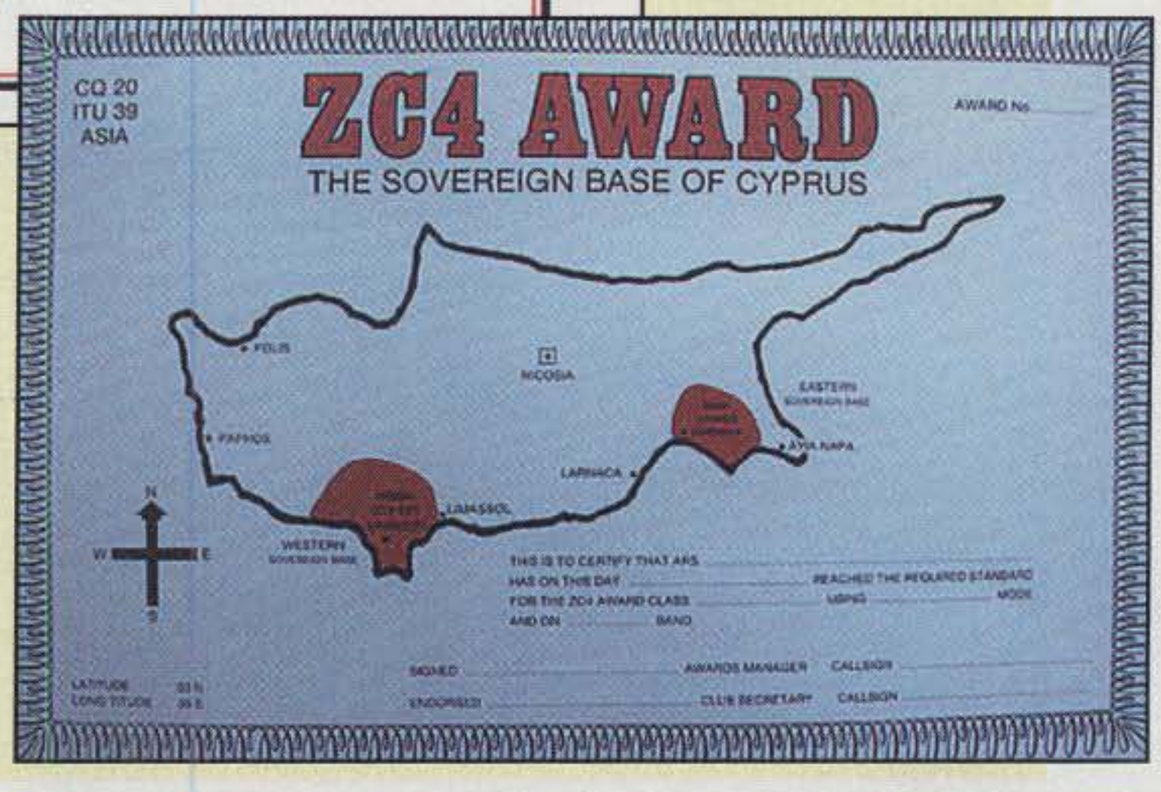
AB4YZ.....1077
W8OP.....1078

The total number of counties for credit for the United States of America Counties Award is 3077. The basic award fee for subscribers is $6.00. For nonsubscribers it is $12.00. To qualify for the special subscriber rate, please send a recent CQ mailing label with your application. Initial application may be submitted in the USA-CA Record Book, which may be obtained from CQ Magazine, 25 Newbridge Road, Hicksville, NY 11801 USA for $2.50, or by a PC-printed computer listing which is in alphabetical order by state and county within the state. To be eligible for the USA-CA Award, applicants must comply with the rules of the program as set forth in the revised USA-CA Rules and Program dated June 1, 2000. A complete copy of the rules may be obtained by sending an SASE to Ted Melinosky, K1BV, 12 Wells Woods Road, Columbia, CT 06237 USA. DX stations must include extra postage for airmail reply.

USA-CA Special Honor Roll

Raymond Crampton, AB4YZ
USA-CA All Counties #1057
December 2, 2002

The UBA SWL Champion award is available to both SWLs and amateur radio operators.



The ZC4 Award is sponsored by Steve Bowden, G4KIV, who held the call ZC4BX while living in Cyprus.

loose ends. On May 10, 2002 I was issued USA-CA #1044. While I found great satisfaction in completing all 3076 counties of the U.S., I found real pleasure in the 6 1/2 year journey—the people I have met and the stories that go with the chase. Of course, I would like to acknowledge every single one in this column if I could!. Thank you, and 73 to all.—*Dean, N9VRZ*

DX Awards

Belgium's UBA SWL Champion. Many amateurs get their start as shortwave listeners. SWLs have their own organizations, and many of them sponsor awards that parallel the amateur experience. The Belgian national amateur organization UBA sponsors the following very challenging award for SWLs. Note that amateur radio licensed stations have a different requirement. Belgian SWLs are very active, and many QSL collections contain some of the "ONL-" prefix cards. You *do* reply to SWL cards, don't you?

The award is available to any SWL or amateur radio operator. *Requirements:* Provide proof of having received SWL reports from 100 DXCC countries, all continents, and one station from each Belgian province plus an 20 additional ON stations. GCR list accepted. If you have already have DXCC or the Heard All Continents award, a photocopy of the award will be sufficient proof. Licensed amateurs may apply for the award if they have received 20 SWL reports of UBA SWLs and answered them, or have met the same requirements as for SWLs. Amateurs applying under these conditions must declare upon their honor that they have received and answered the cards. Fee is $US10 or 10 Euros to: Brenda Casteleyn, ON1AKU, Ferd. Coosemansstraat 32, B-2600 Berchem, Belgium.

Cyprus ZC4 Award. Steve Bowden, ZC4BX, recently returned to the UK after three years in Cyprus, where he initiated and managed the ZC4 award. He admits that his present callsign, G4KIV, doesn't attract the pile-ups that ZC4BX did, but he's brought the certificates back and offers them under the following set of rules:

The ZC4 Award is available for amateurs and SWLs in three classes:

Class 1—contact 10 ZC4 stations (same call on different band okay).

Class 2—contact 5 ZC4 stations (same call on different band okay).

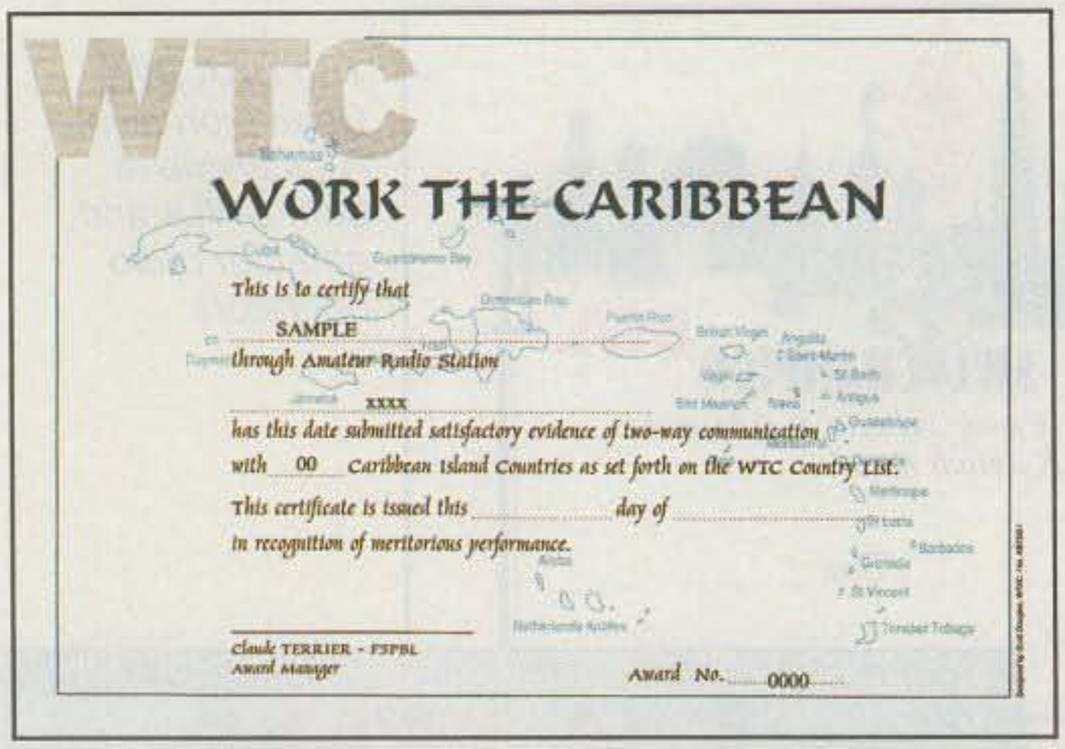
Class 3—contact 3 ZC4 stations (same call on different band okay).

Band/mode endorsements available on request. Send GCR list and fee of $US6 or 10 IRCs to: Stephen Bowden, G4KIV, 36 Aspin Drive, Knaresborough, North Yorkshire, HG5 8HQ, UK (<http://www.stevebb.com/ham.htm>).

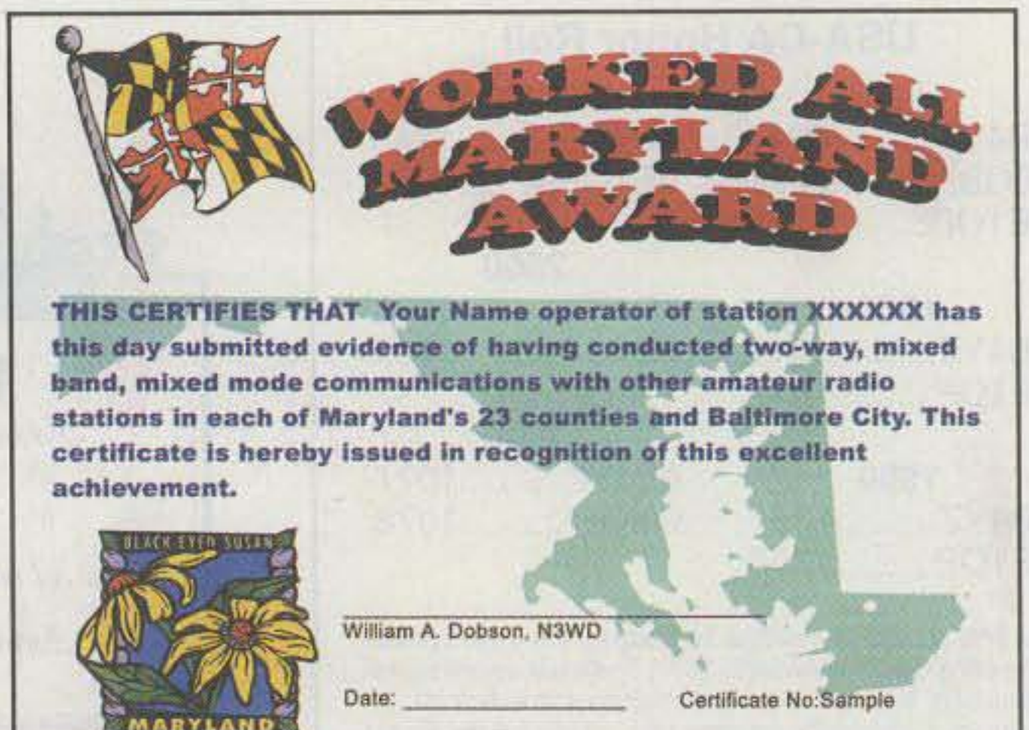
France's Work The Caribbean (WTC) Award. About the only remnant of the famed Certificate Hunters Club that exists today is a small series of awards available for contacting countries found within the ocean areas of the world. Claude Terrier, F5PBL, has revised the older awards program and makes it available once again. The series includes Indian Ocean, Work the Pacific, Work the Caribbean, and Islands of the World. Rules for the United Nations award are shown below. Rules for the others are available for SASE/IRC to F5PBL at the address below.

The Work The Caribbean award is issued for confirmed contact with at least 20 Caribbean countries on the country list. A similar award, but somewhat more difficult, is The Caribbean, issued for confirmed contact with at least 40 countries on the TC (The Caribbean) Country List. Provide GCR list of contacts and fee of $US10 or 10 Euros to Claude Terrier, F5BPL, 8 allée du Mail, F-92360 Meudon-la-Foret, France (e-mail: <f5pbl@jqsl.net>).

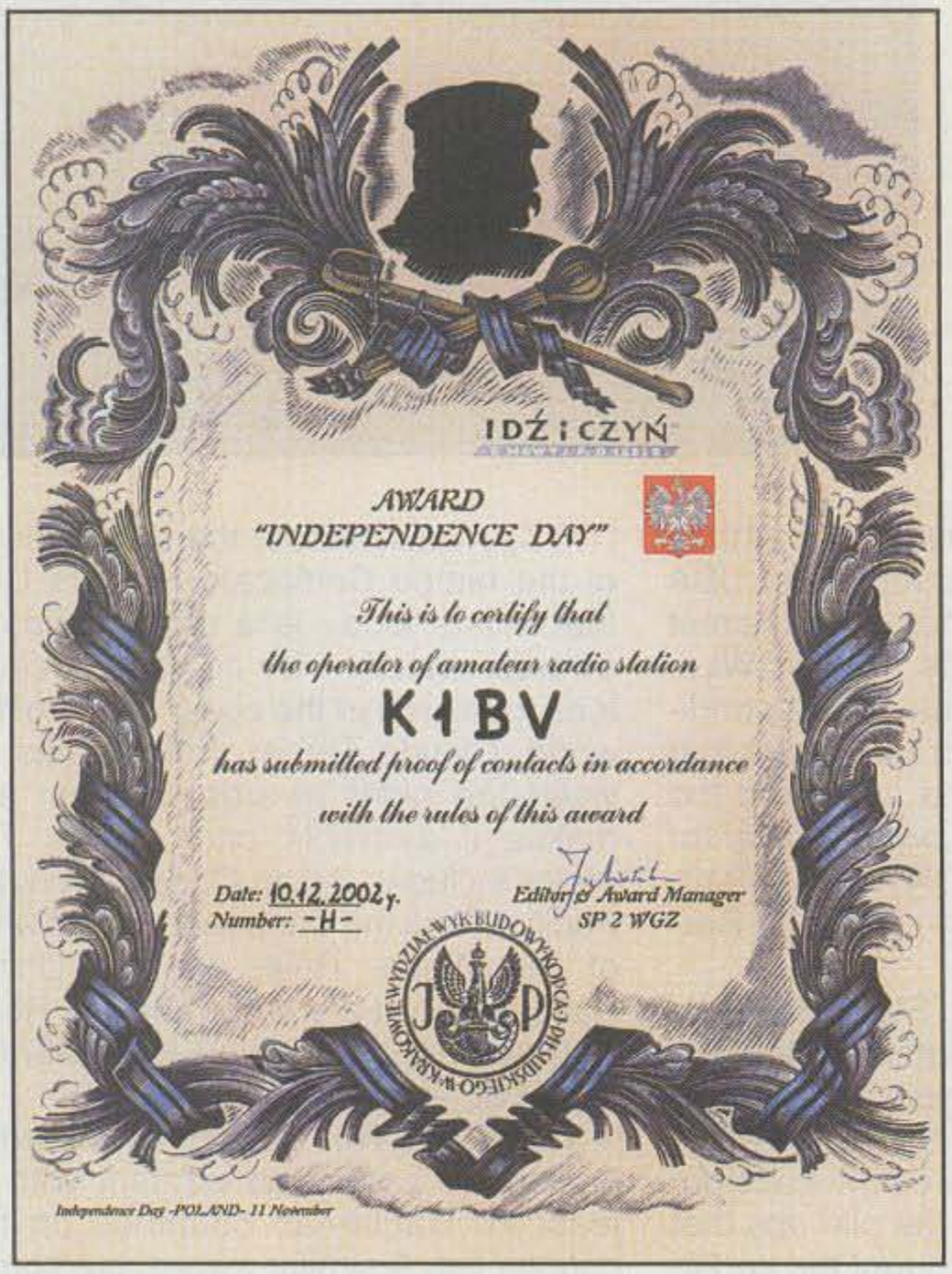
The following Caribbean country prefixes may be used towards completion of this award: C6, CO, CO4, FG, FS, FM, FY, HH, HI, HK, HKØ Bajo Nuevo, HKØ San Andres, HKØ Serrana Bank, HKØ Roncador Cay, HP, HR, HRØ Swan, J3, J6, J7, J8, KG4, KP1 Navassa, KP2, KP4, KP4/D Desecheo, PJ2, PJ3, PJ4, PJ5, PJ6, PJ7, PY, PZ,



The Work The Caribbean award is issued for contacts with at least 20 Caribbean countries.



To receive the Worked All Maryland Award confirm contact with all 23 Maryland counties plus Baltimore City.



The Independence Day Award is issued in memory of those who fought and died for freedom in Poland.

TI, V2 Barbuda, V2 Antigua, VP2E, VP2K St. Kitts, VP2K Nevis, VP2M, VP2V, VP5 Turks, VP5 Caicos, VP9, W/K USA Florida only, XE3, YN, YV, YVØ Margarita, YVØ Aves, ZF, 6Y, 8P, 8R, 9Y Trinidad, 9Y Tobago.

Poland's Independence Day Award. On November 11, 1918, following the end of World War I, the Independent Republic of Poland was proclaimed. There would be many more conflicts and more tragedy in the ensuing years, including the beginning of World War II, and many years under Communist control, but that date is celebrated in Poland as the National Holiday of Independence, the anniversary of the regaining of independence of the Polish nation.

Jerzy Mielnik, SP2WGZ, calls our attention to a brand-new certificate honoring the struggles of the Polish people. The award is available for contacting Polish stations since November 2001. This is a permanent award in memory of those who fought and died for freedom, and it is available to all radio amateurs and SWLs. Contact SP and SQ stations on or after November 1, 2001. Europeans need 5 contacts; all others need 3. No band or mode restrictions. Send GCR list and fee of 7 IRCs or equivalent to: Jerzy Milnik, SP2WGZ, P.O. Box 2, 84-232 Rumia 4, Poland.

Worked All Maryland Award

The Baltimore Amateur Radio Club sponsors an interesting series of awards and certificates. Within that group is the Worked All Maryland certificate individually sponsored by one of the club's members, Bill Dobson, N3WD. Bill generously provides the award at no cost, but he does require that you send an SASE.

Since Maryland has relatively few counties, the award is available only after confirming all 23 counties plus Baltimore City (total 24 contacts). Note that Washington, DC counts for either Montgomery or Prince Georges county. There are no steps within the award. No date restrictions. *No repeater contacts allowed.*

Submit application with GCR list, QSLs, and 9 × 12 SASE. Endorsements are available for band and mode. For endorsements, submit application and 9 × 12 SASE. Mail applications to Bill Dobson, N3WD, P.O. Box 922, Reisterstown, MD 21136 (internet: <http://www.qsl.net/n3wd>).

Maryland counties are Allegany, Anne Arundel, Baltimore, Baltimore City, Calvert, Caroline, Carroll, Cecil, Charles, Dorchester, Frederick, Garrett, Harford, Howard, Kent, Montgomery, Prince Georges, Queen Annes, St. Mary's, Somerset, Talbot, Washington, Wicomoco, and Worcester.

URL of the Month

Kalawao County, Hawaii. Is it real or not? Acknowledged as probably the toughest county to contact (or operate from) out of all the 3077, some have referred to it as the mythical fifth county of Hawaii. Larry Cahoon, WD3P, has researched the fascinating history of Kalawao, its connection with the famed Leper Colony founded in the 1880s and its subsequent administration by the Hawaiian Department of Health. Read about it for yourself at <http://www.wd3p.net/ch/hi/kal.htm>.

I'm still looking for your club or group's award program. Publicity is available; just contact me. 73, Ted, K1BV

our readers say

The Code

Editor, *CQ:*

Thank you for W6BNB's fascinating telegraphy article in the December 2002 *CQ* ("Telegraphy and the Double-Speed Key," by Bob Shrader, W6BNB, page 16). Bob erred, however, in stating that the American Morse and Continental Code are the same. In fact, the Continental Code is the same as the International Morse Code, the opposite of what Bob wrote. This can be verified in several publications and is even indicated on my own 40-plus-year-old Code Proficiency Certificate from the ARRL.

The slip-up in no way detracted from an otherwise excellent article. Here's hoping for many more like this from Bob.

Dale Holloway, K4EQ

Hamfests—and Dayton

To Jeff, AA6JR:

You hit a hot button with your comments on hamfests ("Magic in the Sky" column, October 2002 *CQ*). Dayton, sadly, has become a shadow of what it was just a few years ago. When I first started attending, there was a lottery for flea market spaces. If you didn't get your request in early, you probably wouldn't get a space, let alone the same space you had the year before. That changed a few years ago. Now they not only offer the same spaces, but they beg you to take them, offering a "discount" (They let you have them at the previous year's rate.) if you book early.

As the cost has increased, contrary to what DARA claims, attendance has fallen off significantly. To use the analogy of radio, the cost per spot has increased dramatically as the ratings shrink. Couple that with area restaurants and hotels milking the hams for all they're worth. I've experienced the same room change from a business rate to a hamfest rate (20% higher) from Wednesday to Thursday. I've experienced poor service in restaurants. The bottom line is that it has become more expensive to be there every year, yet sales are down. Even major vendor participation isn't what it once was.

Is DARA aware of the problem? If they are, they're doing a good job of ignoring it. While I'm sure their costs, like rent and insurance, have increased, they have never offered an explanation to justify the annual price increases. Customer care has *never* been their forte. They have the attitude of the old Bell System, "We're DARA, we don't care... we don't have to." HARA Arena is inadequate as a venue, at best, yet they charge a premium for space, because they can, or at least they could.

I wasn't able to attend last year. My mother was ill and I couldn't, in good conscience, leave her. My associates took my spaces. The last straw was despite an increased ticket (and flea-market) price, they had the (gall) to charge for the program. I have no plans to return to Dayton any time soon.

The only way the big guys will get the message is if we "vote" with our feet and our wallets. 73, Ben Bass, N2YDM

2 Meters Where Has Everyone Gone?

Editor, *CQ:*

Just read the October 2002 editorial entltled "Nobody Goes There Anymore; It's too Crowded,." Well, if it is any consolation, here in the UK much the same thing is happening on 2 metres FM, both simplex and repeater operation—silence most of the time. And again, just as in the USA, "drive time" is thebusiest time, relatively speaking!

There was a time when I used to take a rig with me when on vacation to your neck of the woods. However, I decided to leave it at home for the simple reason that I rarely heard anyone! Another reason is the strange proliferation of those "Super-Private" 70 cm repeaters. Why do they do that?! It was always my understanding that amateur radio is about *communication!*

73, Ray J. Howes, G4OWY
Weymouth, Dorset, England

Editor, *CQ:*

Regarding your question about 2 meters and where everyone has gone, all the comments I've heard are just about word-for-word. I'm sure you've heard the same.

Down here it seems to be a matter of new 3×3 radio procedure, or lack of, particularly the jargon identified as "CB Chatter," the practice of ending every transmission with "QSL?", not to mention "kick-it-back" and "what's yoaarrr personal?" This is coupled with the unwillingness to consider changing the way they talk. ("When in Rome...") I exceeded my ration of hearing that several years ago and joined the mobile exodus to 70 cm. Since this malpractice has spread to HF, that could be the answer to your question.

I enjoy reading your magazine. Keep up the good work...and I'll venture down to 2 meters on the way home tonight to see if anything has changed. BCNU.

73, John, W5HX
Atlanta, GA

contesting

BY JOHN DORR,* K1AR

Turbo-Charged Contesting—PJ2T Style

March's Contest Tip of the Month

If, like me, you're into keeping cars for a long time, you perform regular preventative maintenance, right? As you might expect, a well-oiled contest station is no different. When was the last time you considered a "100K mile checkup" for some of your older equipment? Well-used radios are no different than cars; they need to be adjusted and maintained from time to time. Also, if you're like most hams, your laboratory instrumentation is limited. So take some good advice and have another ham or local repair shop give some of that equipment of yours a quick tune-up. It's cheap money when you consider the total investment you have in your hobby, and the returns may be dramatic!

Calendar of Events

Feb. 15–16	ARRL CW DX Contest
Feb. 21–23	**CQ WW 160M SSB Contest**
Feb. 22–23	REF SSB Contest
Feb. 22–23	UBA CW Contest
Feb. 22–23	RSGB 7 MHz CW Contest
Mar. 1–2	ARRL SSB DX Contest
Mar. 9	North American Sprint RTTY Contest
Mar. 9	UBA Spring Contest
Mar. 9–10	Wisconsin QSO Party
Mar. 15–16	Russian DX Contest
Mar. 15—17	BARTG Spring RTTY Contest
Mar. 22–23	Oklahoma QSO Party
Mar. 29–30	**CQ WW WPX SSB Contest**
Apr. 5–6	MARAC County Hunters SSB Contest
Apr. 5–6	SP DX Contest
Apr. 11–13	Japan International CW DX Contest
Apr. 19–20	YU DX Contest
Apr. 19–20	Michigan QSO Party
Apr. 19–20	Ontario QSO Party

I don't think it's too much of an exaggeration to say that the majority of contest operators have a strong desire to experience contesting from "the other side." In fact, many hams often speak of that lifelong dream of going on a DXpedition and experiencing the excitement of hundreds of stations calling them from around the world.

In my case, until my trip to PJ2T for last year's CQ WW, it had been over ten years since I'd had the thrill of being DX in a contest. While there are literally dozens of guys who do it every contest season, it's still a unique experience for me and probably for the vast majority of you as well.

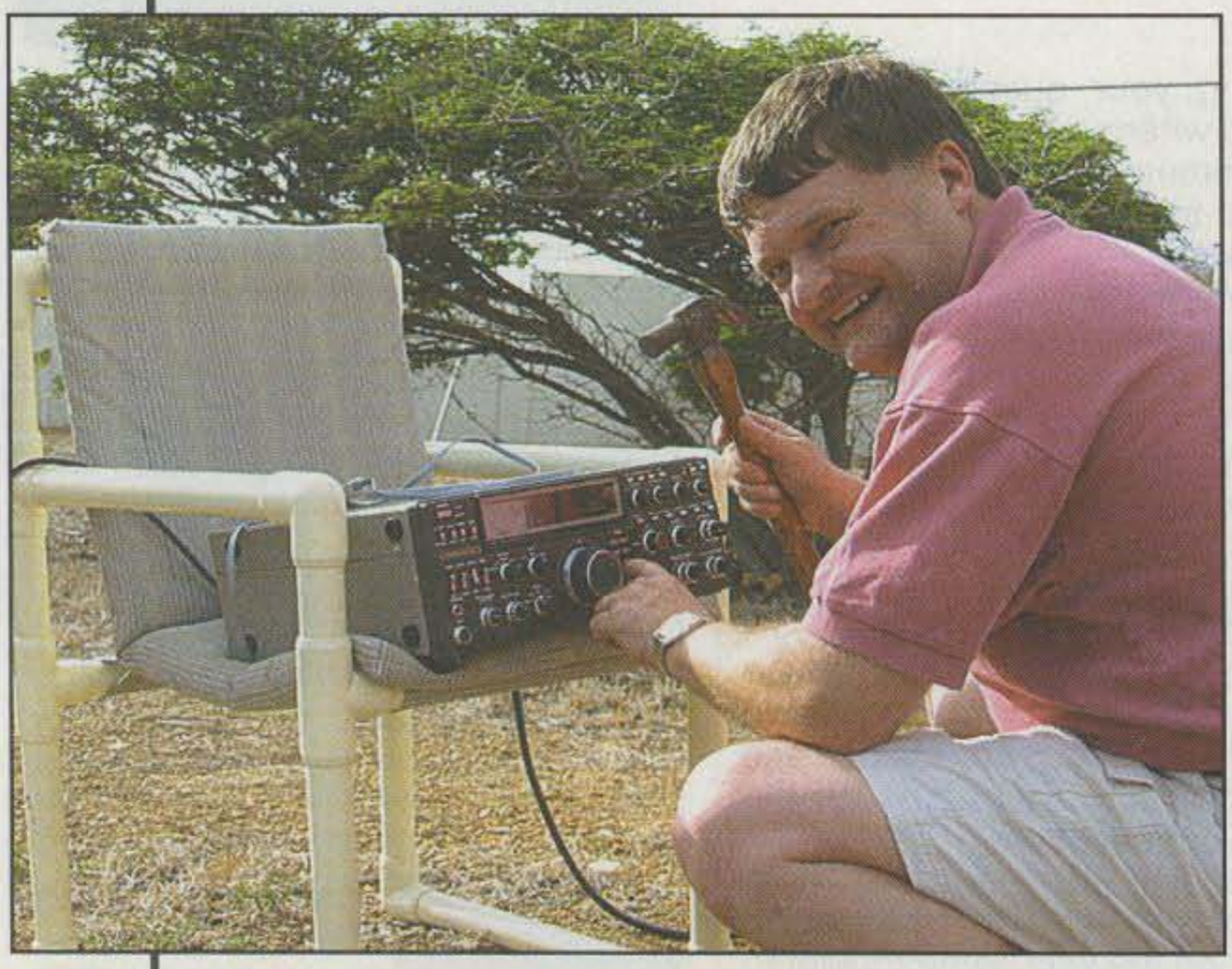
As it turned out, my trip to Curacao resulted mostly out of an odd combination of unplanned events. This past fall, K1EA decided that he would take the big plunge into home building by starting a new construction project in front of his current house. Unfortunately, that necessitated shutting down his station until the project is completed. Thus, now being a homeless contester, I began looking into other alternatives. Fortunately, there are many opportunities for an experienced contester living in New England. We have the luxury of multi-ops spread out all over the region, and there are always several good stations looking for contesters who want to give single-operating a try. Ironically, on nearly the same day as Ken and I discussed his station's future, I read an e-mail message from Ron, K8NZ, looking for one or two more ops to come to PJ2T for the 2002 CQ WW DX SSB Contest. After a few e-mails back and forth the trip was on!

For those of you who don't know, the PJ2T location is owned by Geoff Howard, WØCG, along with the support of the members of the Caribbean Contest Consortium (CCC), who have pulled together financial and logistical resources to build a world-class contest station at Geoff's Curacao QTH. The station is actually located at the old QTH of John Thompson, W1BIH. Perhaps some of you remember the days of PJ9JT, where John—along with others, including his good friend, W1WEF—worked thousands of QSOs over the years. If you're interested, you can find out more information about the QTH by checking out <http://asgard.kent.edu/ccc/>.

As it turns out, heading to the Caribbean, especially Curacao, is extremely easy. It's really not much different from going to Atlanta or any other "normal" airline destination. The weather is warmer and there is more water nearby, but other than that, it's just another plane ride. Last year we were fortunate to pull together a terrific crew of guys that included K8NZ, WC4E, N8BJQ, W1MD, and myself. We knew that we would have a great time regardless of our final score!

The 2002 CQ WW offered a new twist with the addition of the Multi-2 category, much like what exists for the ARRL DX Contest. As it turned out, this category was the perfect complement to our team. We looked at the situation and concluded almost immediately that it would be much more fun

*2 Mitchell Pond Road, Windham, NH 03087
e-mail: <K1AR@contesting.com>



Sometimes it takes a little extra "AR" urging to ensure everything is properly tuned on 15 meters. (Photo courtesy WC4E)

Nothing like a few beams to keep the rate up at PJ2T! (Photo via K8NZ)

for the second station operator to actually work guys as a run station rather than being limited to searching for multipliers as a multi-single, which is tedious even in the Caribbean. Therefore, with an operating crew and strategy in hand, the fun was about to begin.

Fortunately, the CCC has done a tremendous amount of work in building the PJ2T station—inside and out. I think the pictures in this month's column speak for themselves. However, there's always something to do at a contest station to get ready, and we did a bit of antenna work, including putting up a 5-element 15 meter Yagi at 30 feet (yes, 30 feet) that was fixed to the U.S. Amazingly, the antenna turned out to be a "rock crusher," which is a true testament to the magic of operating around salt water.

Inside the shack there was the usual configuration work to get the station ready for Multi-2 operation. In reality, we had three stations ready to go, with the third available for spotting multipliers and back-up operation (if needed). Geoff and the CCC team have done a tremendous job of putting together this station. The house itself has been completely remodeled, with two bedrooms and full baths. Although there's no air conditioning, the breeze off the water helps keep temperatures manageable. No, it's not "dry heat," as they often say in the desert Southwest.

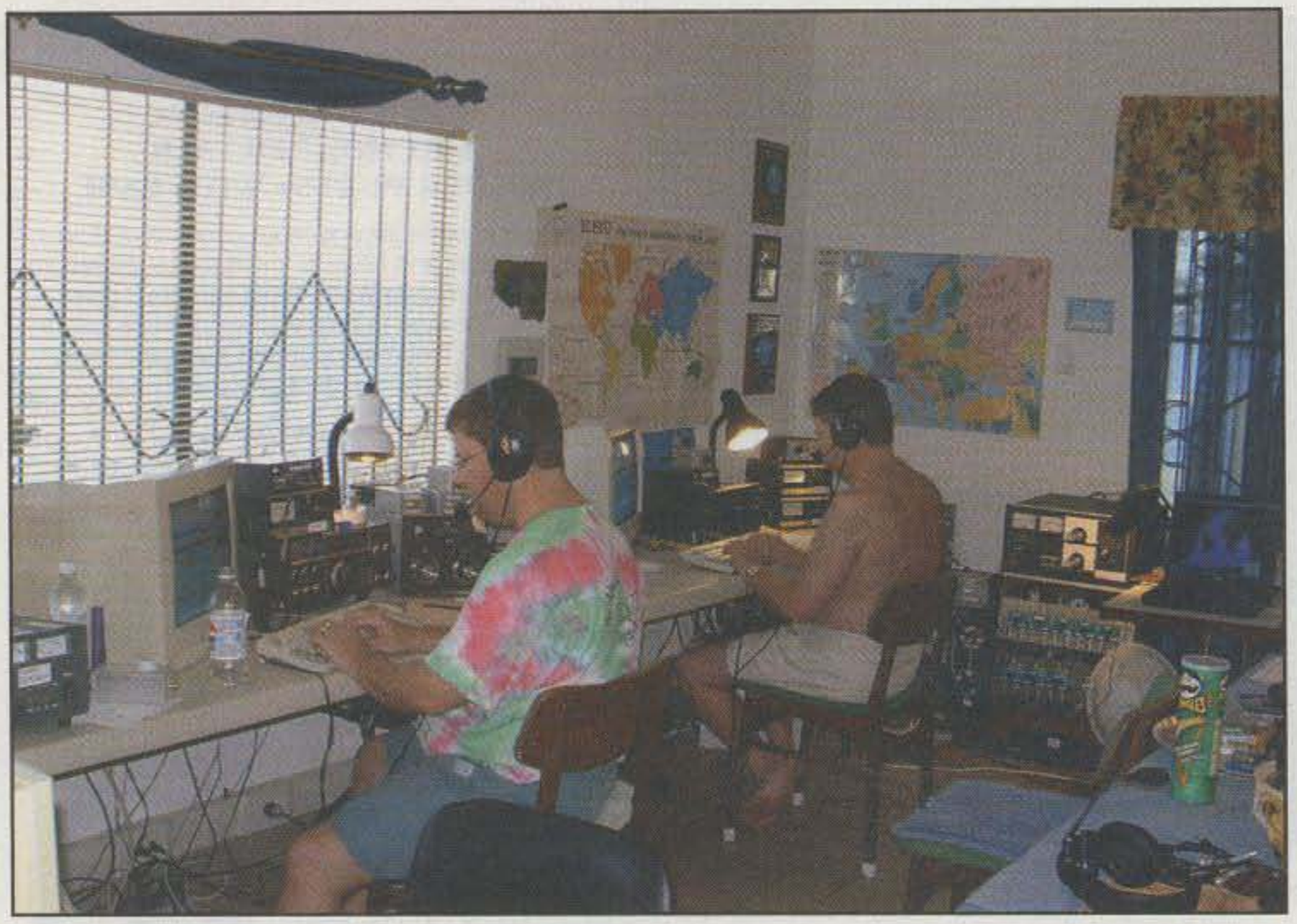
By the time Friday morning arrived we were essentially ready to operate. We had one equipment failure—an amplifier—that resulted in our using an old Alpha that only ran about 500 watts , but that really didn't seem to matter. Most of us played radio during the week ahead of the contest—in between other tasks—as PJ2/xxxx. I experienced one of the largest CW pile-ups to Europe I've ever heard during an afternoon run on 20 meters. With all of the operations from PJ2/9 you would think the level of interest in working Curacao would be fairly low. However, everyone still enjoys working a loud station in the Caribbean, if for no other reason than just to say, "Hello and good luck in the contest."

As we neared the beginning of the contest, we had set some pretty lofty goals for ourselves. The previous year's multi-single operation had yielded 8000+ QSOs, so as a Multi-2, it seemed reasonable that we would be well ahead of that total, especially with the antenna improvements that had been implemented by the CCC team over the year.

The Contest Begins

It's 2359Z and the stations are sitting on 10 and 15 meters (I'm on 15) with huge pile-ups calling. We're ready to go. The anticipation of what's to come is one of ham radio's greatest moments and a big thrill for any contester.

As the bell went off we were rocking with 13 QSOs in the log in the first minute between the two stations. It appeared that all of our preparation paid off as we rocketed out of the starting gate. Then disaster struck! After about 5 minutes of operating, we noticed that the two computers were not synchro-



The hands never left the keyboards at the PJ2T operating positions. On the left is W1MD; on the right none other than K1AR. (Photo courtesy K8NZ)

Band	QSOs	Zones	Countries
160	38	7	21
80	520	18	67
40	1650	30	111
20	2820	36	142
15	4432	38	154
10	3707	32	140
Total	**13167**	**161**	**635**
Total Score = 30,983,504			

Table I– Claimed score from PJ2T for 2002 CQ WW DX SSB Contest.

nizing. The QSOs from the 15 meter station were not making it into the other computer and vice versa. Although not particularly amusing at the time, you can just imagine what it's like for me to be running guys at a rate of 400 QSOs/hour while simultaneously asking questions about the computers and the network.

Jeff, WC4E, took the liberty of tape-recording "station 1," which has some of contesting's more comedic moments, as you listen to me running guys and pausing to ask, "Did his computer get that one?" As it turned out, we were getting RF into the Ethernet connection between the computers. Yet again, computers became the focus (You may recall my column on that subject a few months ago). After a bit of "floor bonding" by the guys not operating, we successfully swapped out network routers, moved cables around, and engaged in other RF-preventive measures until things finally started to work. Somehow when all was said and done, I had worked 374 guys in the first hour, and Jeff wasn't far behind on the other station.

For the next 10 hours or so it was pretty much standard fare as Caribbean contest operations go. We worked the high bands until they ran out of gas and slowly moved down to the grind of 160–40 for most of the night. It may surprise you, but operating from a station such as PJ2T is not an environment where there are wall-to-wall 300 hours. In fact, those rates are relatively rare, being limited to the beginning of the contest and peak times with North America in the afternoons. European runs are reasonable, but usually rank only in the mid-200's at their peak. Such was our experience as well.

During the evening operating times, 20 meters becomes a swing band. At times, especially from the equator, you can get some interesting band openings to Asia and other parts of the world. This year was no exception. In fact, it was rare not to find one of our stations operating on 20 meters. However, we did enjoy the popularity of being a unique multiplier on the low bands. At times the pile-up on 40 meters (ah, the beauty of working Europeans transceive) was something at which to marvel, and I can only imagine what rare multipliers we missed in deep Asia and other parts of the world throughout the weekend by not being able to hear as well as we should have. It was both humorous and disconcerting to operate on 80 and 40 meters while having very loud North Americans yell "listen up" into their microphones. (Of course, none of us have ever done that; I'm referring to the other group not reading this article.) Everything you hear and experience from home—the good, the bad, and the ugly—is magnified while operating as we did.

The Opening Morning

While I had prepared myself emotionally for what followed, it was still surprising to me how slow the rate can get from the Caribbean. In the early morning before the band opens to Europe there is little to work. Our combined two-station rates were well below 100/hour. Also, I can assure you that when you get used to running at 200–300 QSOs/hour, a 50/hour is like operating on the internet or on packet at 1200 baud.

Finally the high bands (10 and 15 meters) came to life, and it was apparent that our strategic operating plan of operating below the U.S. band was going to pay off. Although we didn't operate below 28300 kHz until later in the morning, even that move improved our rate for a while. Some of my seasoned Caribbean traveling friends advised me to consider this operating technique. Their view is that you can work North America later in the day. Take advantage of quieter frequencies by operating around 21150. Boy, were those frequencies quiet. I could hear a pin drop on my frequency, and the rates rose as a result. For hours on end we worked European after European. And while nearly everything counts as a 3-point QSO in Curacao, our multiplier and non-USA totals certainly were well served by the strategy. It also was amazing how well we could maintain decent rates while signing our callsigns nearly every time *and* passing QSOs from one station to the other. Literally hundreds of QSOs were made by announcing the transmit frequency of our other transmitter and working the same station on two bands within minutes of one another. Again, being at PJ2T didn't hurt, although I've seen great success with this operating technique at USA multi-op stations as well.

Here Comes the Rate Again

As the European runs retreated by early afternoon on Saturday, nature's signal told us to crank up the rate to North America. Short of the beginning of the contest, this is the next best thing, as the 300+ QSOs/hour rates re-emerge.

Okay, so the location is "Pretty" good! (Photo via WC4E)

The rates were actually neck and neck between 10 and 15 meters with combined rates exceeding 1000 QSOs/hour on the computer screen. Operating in that mode almost becomes mechanical. The signals are loud, with the interesting result of being in a sort of robotic state that resembles a contesting pendulum. You simply work one guy, say your call, work another, and the next thing you know an hour has passed and you've done it 350 times.

Late Afternoon Brings More Change

While there seemed to be an endless supply of stations calling, we eventually had to do other things, and that included swinging our beams toward JA/Asia and checking out Europe on 20 meters. This is one aspect of Caribbean contesting where bigger antennas do indeed matter.

I'm sure many of you have heard that often said plea from Asia, "CQ Caribbean Sea, CQ Caribbean Sea." It's a propagation path that is rather difficult for most stations, and when we fired up our big mono-banders in the direction of Japan, we certainly got their attention. The challenge, of course, was that signals were not particularly loud in most cases, and I was constantly considering the trade-offs of working JA's versus doing other more productive things. In the end, you have to resist the temptation to be a DXer and focus on maximizing your score. For the JA's we missed, there will be another day!

Day 2 Begins

As it turned out, Day 2 was much like the first day. We were blessed with good conditions in the Caribbean (although they were hardly acceptable in more northern latitudes, but better than Saturday) and the rates just continued. As we operated, we began doing more and more "forecasting" of our final score, thinking that 25 million points would perhaps be within reach, or perhaps 11,000 QSOs. It seemed that during the day on Sunday we spent a good deal of time revising our targets upward, much like what a good day on Wall Street might have done a few years ago.

Although the rates were slower on the second day (as they are for everyone), we still managed to work well over 5000 QSOs, or 200+ QSOs/hour between the two stations. There was no let-up on passing QSOs, multipliers, and anything else that was breathing on the bands. Even in the last 15 minutes of the contest, we were feverishly working needed multipliers and sending them to needed bands. At the very end of the contest on 20 meters, I still vividly remember a pile-up 10 or 20 deep calling me. In fact, immediately after the contest ended, I had one station begging me for a QSO, as he needed PJ2 for a new country. PJ2/K1AR made it into his log!

The Final Results

When all the dust had settled, our crew at PJ2T managed to produce a claimed score of nearly 31M and an apparent world victory (see Table I). To say that it was nothing short of an amazing experience would be one of life's great understatements. The job of putting together one of contesting's great world-class stations that the crew of CCC and Geoff, WØCG, in particular, have done is incredible. To pull it off on a tiny Caribbean island is even more impressive. I know that there are really only two words that adequately express our gratitude for the 2002 WW SSB experience we all enjoyed. Thus, on behalf of all the operating team, I simply say, "Thank you!"

Final Comments

Although it wasn't nearly as exciting as the real event, recalling and writing about my experiences from PJ2T was well worth the time. Operating a contest from "the other side" is not as hard as it may seem, nor as expensive. Hopefully you've been motivated to check it out after reading about my experience. A quick tune around the bands before a DX contest certainly will show that the appeal of being DX is high and lots of guys are taking action. Why don't you consider joining the action this fall?

73, John, K1AR

Corrections

Correcting the corrections listed in the November 2002 column, in the CQ WW DX CW 2001, ZK1CG operated from the North Cooks (not the South Cooks) in the Multi-Multi category.

In the results of the 2002 CQ 160 Meter CW Contest, published in the December 2002 issue of *CQ*, the list of ops for Multi-Multi station W2GD was incomplete. The ops were K2TW, N2NC, N2NU, N2OO, W1GD, W2CG, W2GD, W2NO, and W2RQ.

In the 2002 WPX SSB Contest results, published in the January 2003 issue, K5ZD should have been listed in the U.S. 1st call area.

propagation

BY TOMAS HOOD,* NW7US

WinCAP Wizard 3 Review

I downloaded the latest version of Jim Tabor's (KU5S) propagation software WinCAP Wizard 3 and ran the setup program. There are two versions offered at Jim's website: <http:// www.taborsoft.com/wwizard3/>. The first is a complete package that contains VOACAP, as well as the WinCAP Wizard 3 (WW3) software. The other download is just the WW3 software, for those who might already have the latest version of VOACAP installed. WinCAP Wizard 3 is built to utilize the powerful VOACAP software (see my review of Ace-HF, another program built to use VOACAP, which appeared in the January 2003 column).

After completing the installation, a menu panel appeared, offering seven choices. A window also popped up telling me to press the F1 "Help" key to continue with a Quick Start session. One of the most obvious startup tasks was the need to configure the program with details of where I am located, antenna type, and so forth. By clicking on the "Circuits" button, I got to a multi-page Configuration Manager. I quickly discovered a powerful feature—the ability to enter many profiles for both the transmitter site and the receiver site. For instance, let's say that I have a summer home in Alaska and a winter home in Florida. I can enter both locations as individual "records" complete with all the details of each site. In the same way, I can create "groups" which contain profiles of receiving sites. This creates a lot of flexibility later, when choosing circuits that you wish to analyze. The Configuration Manager also allows you to set System settings such as Required Signal to Noise Ration (SNR), and so on.

The next Main Panel button is "Analyze," which presents three options. I selected the "Beacons" option, which proved to be quite a surprise. After the computer worked for a few moments, I was presented with the Beacon Chart (see fig. 1). This was very interesting! On this window are navigational buttons that allow you to select a different beacon. As you move from beacon to beacon, a corresponding chart showing a 24-hour period of information such as the SNR and Reliability is shown. Under each chart is a table of the results of the analysis of the circuit between you and the beacon station, on that frequency.

Once I finished browsing all of this data and viewing the Beacon Chart, I clicked on "Activate." Another surprise: If your computer is synchronized to the atomic clock, you will see the beacon that is currently transmitting on the frequency in question (say, on 14.10 MHz, at the current moment). The chart automatically changes to the right beacon at the right time. Thus, not only can you monitor the signal, you can see in front of you on the chart when you should hear the signal during the course of the day—nice feature!

*P.O. Box 213, Brinnon, WA 98320-0213
e-mail: <cq-prop-man@hfradio.org>

LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for March 2003

	Expected Signal Quality			
Propagation Index.....	(4)	(3)	(2)	(1)
Above Normal: 2, 4-5, 9-10, 25 29, 31	A	A	B	C
High Normal: 1, 3, 6-8, 14, 17-18, 21-24, 26-28, 30	A	B	C	C-D
Low Normal: 12-13, 16, 20	B	C-B	C-D	D-E
Below Normal: 11, 15	C	C-D	D-E	E
Disturbed: 19	C-D	D	E	E

Where expected signal quality is:

A—Excellent opening, exceptionally strong, steady signals greater than S9.

B—Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S6, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S3, with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find the *propagation index* associated with the particular path opening from the Propagation Charts appearing on the following pages.
2. With the *propagation index*, use the above table to find the expected signal quality associated with the path opening for any given day of the month. For example, an opening shown in the Propagation Charts with a *propagation index* of 3 will be good (B) on March 1st, excellent (A) on the 2nd, good (B) again on the 3rd, etc.

Can I do this for an individual station? Sure. From the "Analyze" menu, I chose "Point-to-Point" and was presented with a table of locations with amateur callsign prefixes. Selecting one by clicking on the row of the location, then pressing the "Analysis" button, I was presented with a Summary of Best Usable Frequencies (see fig. 2), and also the Best Usable Frequency Point-to-Point Chart (see fig. 3).

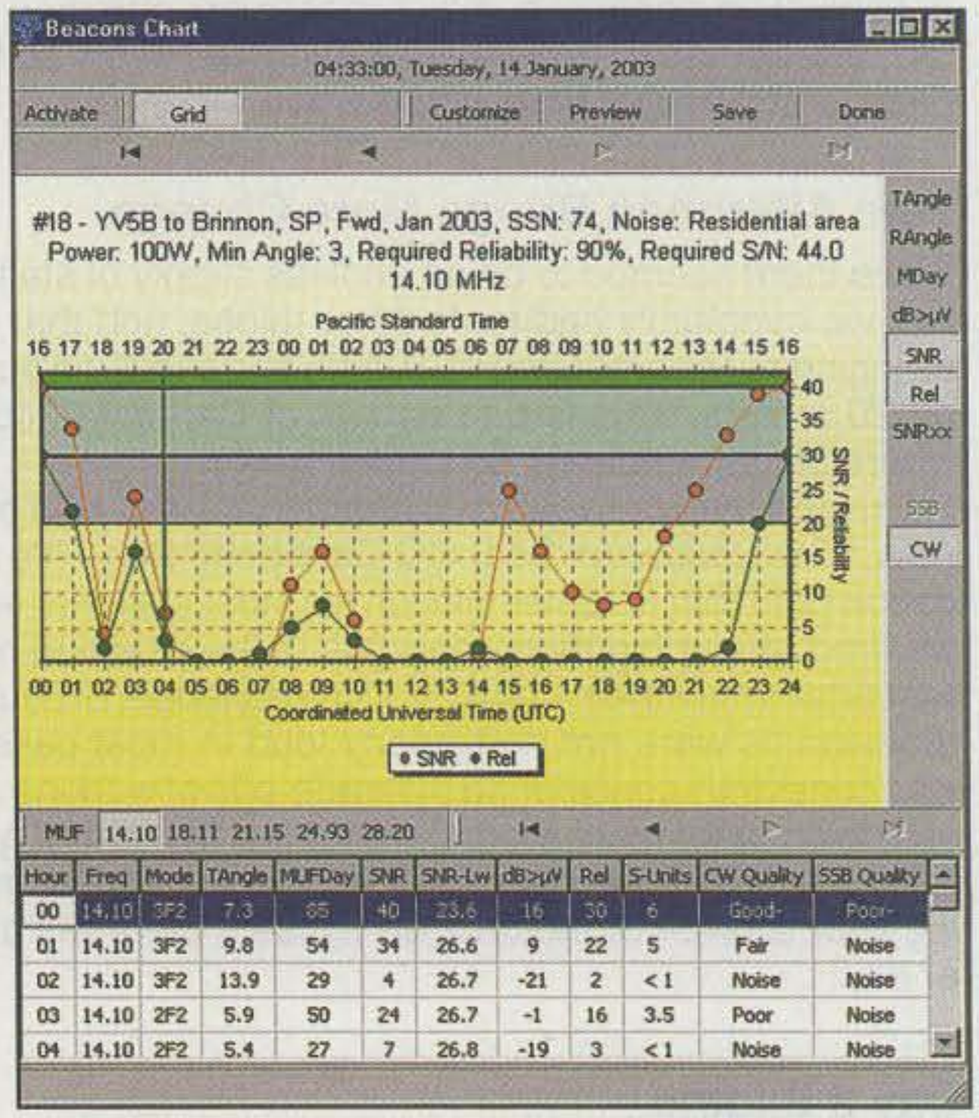


Fig. 1– Beacon Chart from KU5S's propagation software program WinCAP Wizard 3.

Done

Target: Ljubljana, Slovenia S5
Day: 0 Month: 1 SSN: 74 Noise: Residential area
Circuit: Req Rel: 90% Req SNR: 44.0 Min Angle: 3
Power: 100W LP: F Rev: F

========== Jan 2003 ==========
SSN: 74, Pwr: 100W

Xmtr: Brinnon, USA----------
Rcvr: S5, Ljubljana, Slovenia----------

Time UTC		Band	Signal CW	Quality SSB	Alternate SSB	
0000Z		40M	P-	N	20M	N
0100Z		40M	P-	N	20M	N
0200Z		40M	P+	N	80M	N
0300Z		40M	P+	N	80M	N
0400Z		40M	P+	N	80M	N
0500Z		40M	P-	N	80M	N
0600Z		40M	N	N	80M	N
0700Z		40M	P+	N	80M	N
0800Z	*	30M	P+	N/A	40M	N
0900Z	*	30M	P+	N/A	20M	N
1000Z	*	30M	P-	N/A	40M	N
1100Z	*	30M	N	N/A	40M	N

1:1

Fig. 2– WinCAP Wizard 3's Summary of Best Usable Frequencies to Slovenia from Washington State.

I decided to explore a bit, and clicked on the "Customize" button. I was then allowed to change colors and other attributes of the graph. That is another nice feature. I can save the results, and also "Preview" them for printing. In addition, along the right side of the chart window I found that I could select different data to chart (like Transmit Angle, and so forth).

I noticed on the table of locations that there is a "Batch" button. Using this I was able to create another "receive" group, adding locations to a list of receiving sites. Then, from the "Analyze" menu I selected "User Batch." This was much like the Beacons feature, but used the set of locations that I defined, rather than the beacon list.

I then selected the "Map" option from the Main Panel. The resulting window allows selection of Beacon Predictions, User Predictions, and options to modify what style of map, and many other attributes and data. Fig. 4 shows one map I made of the Best Usable Frequency between my location and Australia. On the map, at the receiving site, the Best Usable Frequency for the time is shown (15 MHz in this example), as well as the mode (F2F2), the SNR (15), and the Reliability (8). It shows the great-circle path between the two locations, and you can add additional data to the map. You can create maps with many locations (the Batch or Beacons) and see at a glance the best frequencies to work each location. This is another great feature. For those who are planning a DXpedition or a Field Day event and need to find the right time to use each band for optimal results, this program can really help (see fig. 5, a sample stateside map).

With an amazing set of choices, the ability to save all results, and the fact that it is built on top of the very powerful VOACAP software, WinCAP Wizard 3 is quite the HF

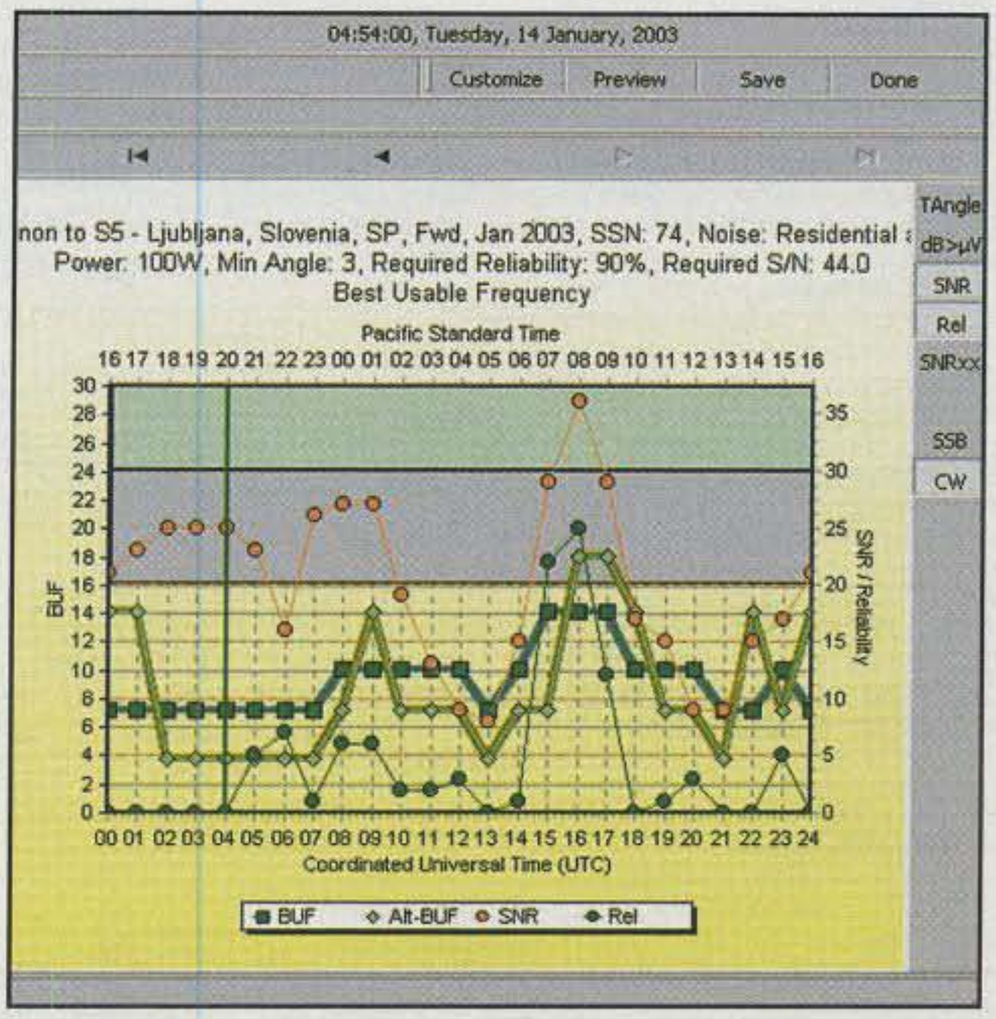


Fig. 3– Best Usable Frequency Point-to-Point Chart from WinCAP Wizard 3.

user's tool. The database of predicted smoothed sunspot numbers, locations, and more makes it usable right away without a lot of fuss.

Check it out for yourself. You can try out the software for a period of time for free. Jim Tabor has additional software that you will find interesting, as well.

I want to compare WinCAP Wizard 3 with Ace-HF. Next month I will present an overview of how these stack up against each other.

Sunspot Cycle 23 Progress

Cycle 23 continues its slow but steady decline. The Royal Observatory of Belgium reports a monthly mean sunspot number of 82 for December 2002, down 13 points from the 95 reported for November 2002. The low for the month was 25 on December 30, and the high was 140 on December 17. This results in a smoothed sunspot number of 106 centered on June 2002, just slightly down from the 109 of May 2002. A smoothed sunspot level of 66 is expected for March 2003, plus or minus 14 points.

During December there was a corresponding decrease in the 10.7 cm solar flux level. Canada's Dominion Radio Astrophysical Observatory at Penticton, British Columbia reports a 10.7 cm observed monthly mean solar flux of 158 for December, down from November's 168. The 12-month smoothed 10.7 cm flux centered on June 2002 is 183, down from May's 188. A smoothed 10.7 cm solar flux of about 118 is predicted for March 2003, plus or minus about 20 points.

The observed monthly mean planetary *A*-index (*Ap*) for December 2002 is 13, considerably quieter than the previous two months. The 12-month smoothed *Ap*-index centered on June 2002 is 13.5, remaining about the same as for March and April.

March Conditions

March is a great month for DXing. Spring and autumn may be considered the optimal months for DX propagation. As the Vernal Equinox approaches, the gray line begins to run straight north and south and the sun is most nearly overhead at the equator, making night and day of almost equal length

HOW TO USE THE SHORT-SKIP CHARTS

1. In the Short-Skip Chart, the predicted times of openings can be found under the appropriate distance column of a particular meter band (10 through 160 meters) as shown in the left-hand column of the chart. For the Alaska and Hawaii Charts the predicted times of openings are found under the appropriate meter band column (15 through 80 meters) for a particular geographical region of the continental USA as shown in the left-hand column of the charts. An * indicates the best time to listen for 80 meter openings.

2. The propagation index is the number that appears in ( ) after the time of each predicted opening. On the Short-Skip Chart, where two numerals are shown within a single set of parentheses, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. The index indicates the number of days during the month on which the opening is expected to take place, as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual dates on which an opening with a specific propagation index is likely to occur, and the signal quality that can be expected.

3. Times shown in the charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 AM; 13 is 1 PM, etc. In the Short-Skip Chart appropriate *standard* time is used at the path midpoint. For example on a circuit between Maine and Florida, the time shown would be EST, on a circuit between New York and Texas, the time at the midpoint would be CST, etc. Times shown in the Hawaii Chart are in HST. To convert to standard time in other USA time zones add 2 hours in the PST zone; 3 hours in the MST zone; 4 hours in the CST zone; and 5 hours in the EST zone. Add 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 14 or 2 PM in Los Angeles; 17 or 5 PM in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *standard* time in other areas of the USA subtract 8 hours in the PST zone; 7 hours in the MST zone; 6 hours in the CST zone; and 5 hours in the EST zone. For example, at 20 GMT it is 15 or 3 PM in New York City.

4. The Short-Skip Chart is based upon a transmitted power of 75 watts CW or 300 watts PEP on sideband; the Alaska and Hawaii Charts are based upon a transmitter power of 250 watts CW or 1 KW PEP on sideband. A dipole antenna a quarter-wavelength above ground is assumed for 160 and 80 meters, a half-wave above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 dB gain above these reference levels, the *propagation index* will increase by one level; for each 10 dB loss, it will lower by one level.

5. Propagation data contained in the charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado 80302.

CQ Short-Skip Propagation Chart
March & April 2003
Band Openings Given In Local Standard Time At Path Mid-Point (24-Hour Time System)

Band (Meters)	*Distance From Transmitter (Miles)*			
	50-250	*250-750*	*750-1300*	*1300-230*
10	Nil	Nil	08-09 (0-1) 09-12 (0-2) 12-14 (0-3) 14-16 (0-2)	08-09 (1-0) 09-12 (2-1) 12-14 (3-2) 14-16 (2-3) 17-18 (1) 18-20 (0-1)
15	Nil	08-09 (1) 09-15 (0-2) 15-17 (0-1)	07-08 (0-1) 08-09 (1) 09-10 (2) 10-15 (2-4) 15-17 (1-3) 17-18 (0-2) 18-20 (0-1)	07-08 (1-0) 08-09 (1) 09-10 (2-3) 10-15 (4) 15-17 (3) 17-18 (2-3) 18-20 (1-2) 20-21 (0-1)
20	11-13 (0-1) 13-15 (0-2) 15-16 (0-1)	07-10 (0-1) 10-11 (0-2) 11-13 (1-3) 13-15 (2-4) 15-16 (1-3) 16-18 (0-3) 18-20 (0-2) 20-07 (0-1)	06-08 (1-2) 08-10 (1-3) 10-13 (3-4) 13-15 (4) 15-18 (3-4) 18-20 (2-3) 20-22 (1-2) 22-06 (1)	06-07 (2-1) 07-08 (2) 08-10 (3) 10-15 (4-3) 15-18 (4) 18-20 (3-4) 20-22 (2-3) 22-02 (1-2) 02-06 (1)
40	06-07 (1-2) 07-09 (2-3) 09-18 (3-4) 18-19 (2-3) 19-21 (1-2) 21-00 (0-1)	06-07 (2-3) 07-09 (3-4) 09-11 (4-3) 11-13 (4-2) 13-15 (4-3) 15-18 (4) 18-19 (3-4) 19-20 (2-4) 20-21 (2-3) 21-00 (1-2) 00-06 (0-1)	06-07 (3-2) 07-08 (4-2) 08-09 (4-1) 09-11 (3-1) 11-13 (2-1) 13-15 (3-1) 15-17 (4-2) 17-19 (4-3) 19-20 (4) 20-21 (3-4) 21-00 (2-3) 00-02 (1-3) 02-06 (1-2)	06-08 (2-1) 08-15 (1-0) 15-16 (2-0) 16-17 (2-1) 17-19 (3-2) 19-21 (4-3) 21-22 (4) 22-00 (3-4) 00-02 (3) 02-05 (2-3) 05-06 (2)
80	07-08 (2-3) 08-11 (3-4) 11-18 (4-3) 18-20 (3-4) 20-22 (2-3) 22-02 (1-2) 02-05 (1) 05-07 (1-2)	07-08 (3-2) 08-11 (4-1) 11-16 (3-0) 16-18 (3-2) 18-20 (4-3) 20-22 (3-4) 22-02 (2-4) 02-05 (1-2) 05-07 (2)	07-08 (2-1) 08-11 (1-0) 11-16 (0) 16-18 (2-1) 18-20 (3-2) 20-02 (4) 02-05 (2-3) 05-07 (2)	07-08 (1-0) 08-16 (0) 16-18 (1-0) 18-20 (2-1) 20-22 (4-2) 22-02 (4-3) 02-05 (3-2) 05-07 (2-1)
160	05-07 (4-2) 07-09 (3-1) 09-17 (2-0) 17-19 (3-1) 19-20 (4-2) 20-05 (4)	05-06 (2-1) 06-07 (2-0) 07-09 (1-0) 09-17 (0) 17-19 (1-0) 19-20 (2) 20-22 (4-3) 22-03 (4) 03-05 (4-3)	05-06 (1) 06-19 (0) 19-20 (2-1) 20-22 (3-2) 22-03 (4-2) 03-05 (3-2)	05-06 (1) 06-19 (0) 19-20 (1-0) 20-22 (2-1) 22-03 (2) 03-05 (2-1)

ALASKA
March & April 2003
Openings Given in GMT

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern USA	21-23 (1)	20-21 (1) 21-23 (2) 23-01 (1)	20-23 (1) 23-02 (2) 02-05 (1)	06-13 (1) 07-12 (1)*
Central USA	21-00 (1)	20-22 (1) 22-00 (2) 00-02 (1)	20-00 (1) 00-02 (2) 02-04 (3) 04-05 (2) 05-06 (1)	07-09 (1) 09-12 (2) 12-14 (1) 08-12 (1)*
Western USA	21-01 (1)	20-22 (1) 22-00 (2) 00-02 (3) 02-03 (2) 03-04 (1)	18-21 (1) 21-00 (2) 00-03 (3) 03-05 (2) 05-07 (1)	06-08 (1) 08-09 (2) 09-12 (3) 12-13 (2) 13-15 (1) 09-10 (1)* 10-12 (2)* 12-13 (1)*

HAWAII
March & April 2003
Openings Given in Hawaiian Standard Time

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern USA	10-12 (1) 12-14 (2) 14-15 (1)	08-11 (1) 11-13 (2) 13-15 (3) 15-16 (2) 16-17 (1)	07-13 (1) 13-15 (2) 15-19 (3) 19-21 (2) 21-05 (1) 05-07 (2)	18-20 (1) 20-22 (2) 22-00 (3) 00-02 (2) 02-03 (1) 20-22 (1)* 22-01 (2) 01-02 (1)*
Central USA	10-11 (1) 11-14 (2) 14-16 (1)	06-08 (1) 08-13 (2) 13-16 (3) 16-17 (2) 17-18 (1)	08-13 (1) 13-15 (2) 15-17 (3) 17-19 (4) 19-21 (3) 21-23 (2) 23-05 (1) 05-08 (2)	18-19 (1) 19-22 (2) 22-01 (3) 01-04 (2) 04-05 (1) 19-21 (1)* 21-02 (2)* 02-04 (1)*
Western USA	09-11 (1) 11-12 (2) 12-14 (3) 14-15 (2) 15-16 (1)	07-08 (1) 08-09 (2) 09-11 (3) 11-15 (4) 15-17 (3) 17-18 (2) 18-20 (1)	15-18 (4) 18-20 (3) 20-00 (2) 00-04 (1) 04-06 (2) 06-09 (4) 09-11 (3) 11-13 (2) 13-15 (3)	17-19 (1) 19-20 (2) 20-21 (3) 21-23 (4) 23-05 (3) 05-06 (2) 06-07 (1) 19-20 (1)* 20-22 (2)* 22-04 (3)* 04-05 (2)* 05-06 (1)*

**Indicates best times to listen for 80 meter openings. Openings on 160 meters are also likely to occur during those times when 80 meter openings are shown with a propagation index of (2) or higher.*

For 12 meter openings interpolate between 10 and 15 meter openings.

For 17 meter openings interpolate between 15 and 20 meter openings.

For 30 meter openings interpolate between 40 and 20 meter openings.

Propagation charts prepared by George Jacobs, W3ASK.

in all parts of the world. On March 21 and September 22 of each year the sun is directly over the equator, and the length of night and day is exactly the same everywhere. This creates an ionosphere of similar characteristics throughout more of the world than is possible during other times when it is summer in one hemisphere and winter in the other, and there are extreme differences in the ionosphere. This "ionospheric equalization" which takes place during the equinoctial periods is responsible for optimum DX conditions. The effects of the Spring Equinox start late in February and last through late April.

This improvement is most noticeable on long circuits between the northern and southern hemispheres—for example, from the United States to Australia, to South America, to southern Africa, to southern Asia, to Antarctica, and so on.

During these seasons conditions are also optimum for long-path as well as short-path openings, and during grayline twilight periods associated with sunrise and sunset.

During March it should be a toss-up among 10, 12, and 15 meters for the best DX band during the daylight hours from sunrise to sunset, with 20 and 17 meters not far behind. Due to the decrease in solar activity in this cycle, fewer 6 meter openings will occur than in the past few years. Ten meters will close down more quickly than the lower bands, but will continue to offer great DX openings into Asia and Europe, and especially in north to south paths. These paths will gradually grow weaker as we move through April. We will find 15 meters staying open long into the evenings. Fifteen is the band of choice as we move through the month and into April, when you occasionally will find 15 meters open all night long. Daytime paths will not degrade

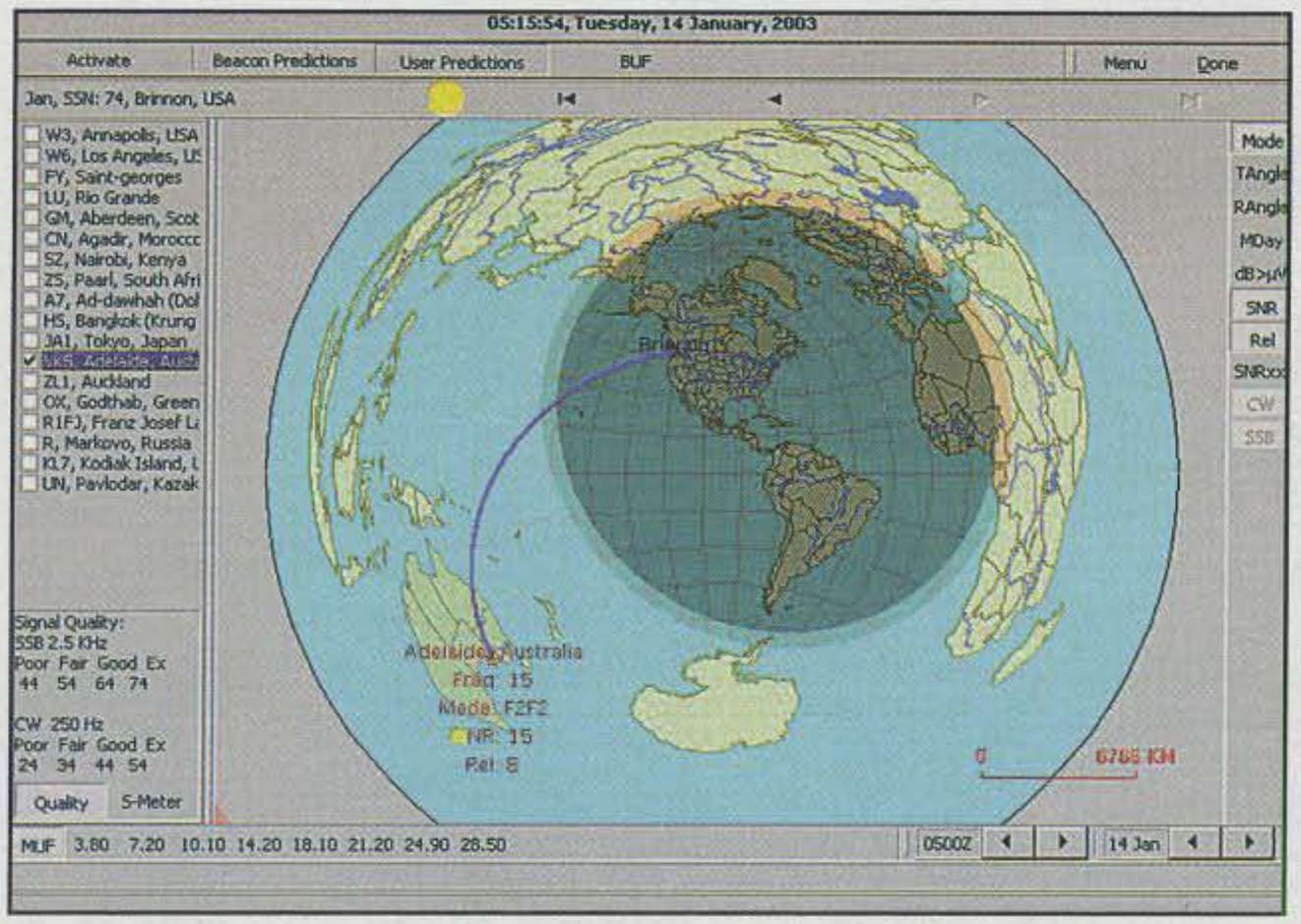


Fig. 4– Great Circle Map of the Best Usable Frequency between the author's location and Australia.

Fig. 5– Best Usable Frequency map of N. America..

much until midsummer. You will see more early closures if you live closer to the North Pole. Seventeen and 20 meters will remain in excellent shape. Both short- and long-path circuits are reliable and solid. Many nighttime paths are open during March. Prime-time evening hours in the United States are sunrise hours across Russia, Africa, and both the Near and Far East. Expect a lot of short- and long-path DX into these areas of the world.

From sundown to midnight look to 20, 30, and 40 meters for great DX openings, with some good openings towards the west and south also possible on 17 and 15 meters. On days when conditions are High Normal or better, even the 12 and 10 meter bands may remain open for DX towards the west and south into the late evening hours. Also check both 80 and 160 meters during this time period for some good DX possibilities. It may be possible to work DX openings from sundown and midnight on all bands during March.

Between midnight and sunrise the best DX bands should be 30, 40, and 80 meters, with openings to many areas of the world also possible on 20 meters. The 160 meter band should also open to DX to many paths of the world during this period.

March looks like a great month for worldwide DX propagation conditions on all of the amateur radio shortwave bands. For more detailed information concerning band openings, refer to the DX Propagation Charts for March which appeared in last month's column. This month's column contains Short-Skip Charts that are valid for both March and April 2003. These charts, which include data for Hawaii and Alaska, contain band predictions for predominantly one-hop paths, ranging in distance from 50 to 2300 miles. For day-to-day changes in shortwave propagation conditions expected in March, see the Last-Minute Forecast at the beginning of this column.

VHF Ionospheric Openings

The possibilities for ionospheric openings on the VHF bands usually improve during March and the spring months. Many of the solar-ionospheric relationships that can produce ionospheric openings on the VHF bands tend to maximize during equinoctial periods.

A seasonal increase in short-skip openings due to sporadic-*E* propagation generally takes place during March, and an occasional 6 meter opening may be possible during this month. Sporadic-*E* openings most often occur during the daylight hours over distances between about 1000 and 1400 miles. There is also a good chance for an increase in widespread auroral activity during March, accompanied by auroral-scatter-type openings on 6 and 2 meters. Check the Last-Minute Forecast for those days in March that are expected to be Below Normal or Disturbed. These are days on which auroral activity is most likely to occur.

Conditions should be optimal during March for trans-equatorial scatter propagation between the southern tier states and countries deep in South America. The best time for TE openings should be between 8 and 11 PM local time.

I would like to hear from you. Please share your observations about the current solar cycle, or ask questions that you would like me to explore in this column. My propagation page is available as a resource at <http://prop.hfradio.org/>, or using a WAP device (for example, a WAP cell phone), go to <http://wap.hfradio.org>. You might also wish to have my automated e-mail reports. You may sign up at <http://prop.hfradio.org/ealert/>.

Until next month, I wish you great DX. Look for me on the bands!

73, Tomas, NW7US

WPX Results *(from page 24)*

Number groups after call letters denote following: Band (A = all), Final Score, Number of QSOs, and Prefixes. An asterisk (*) before a call indicates low power. Certificate winners are listed in boldface. (Note that the country names and groupings reflect the DXCC list at the time of the contest.)

CW RESULTS

QRP/p

ZC4BS	**A**	**2,515,388**	**1506**	**521**
UN4L	**A**	**2,291,625**	**1287**	**525**
HG5Z	**A**	**1,916,967**	**1523**	**597**
			(Op: HA1CW)	
LY9A	**A**	**1,861,034**	**1482**	**614**
			(Op: LY3BA)	
JA6GCE	**A**	**1,264,300**	**949**	**470**
YT7TY	**A**	**1,247,688**	**1177**	**516**
KG1D	**A**	**1,214,667**	**851**	**467**
			(Op: K1KI)	
SM3C	**A**	**1,038,510**	**1086**	**495**
OT2A	**A**	**920,710**	**885**	**490**
			(Op: JK3GAD)	
WQ1RP	*	869,372	822	427
			(Op: K1RC)	
UY2UF	**A**	**832,397**	**939**	**443**
WJ9B	**A**	**717,876**	**750**	**391**
N7IR	**A**	**698,904**	**718**	**408**
G3KKQ	**A**	**498,190**	**717**	**385**
OK2VWB	**A**	**491,321**	**609**	**361**
AA1CA	*	442,890	570	333
CX2AQ	*	**403,312**	**492**	**277**
DF3AX	**A**	**382,047**	**605**	**367**
RA4HW	**A**	**369,591**	**553**	**353**
W4DEC	**A**	**272,568**	**482**	**277**
MØO	*	271,458	517	297
			(Op: G4JZO)	
DL1LAW	*	221,520	488	284
W8VE	**A**	**197,250**	**359**	**250**
DF1DX	*	181,560	365	255
W5KDJ	**A**	**164,800**	**286**	**200**
LZ4AE	**A**	**157,990**	**340**	**259**
ON7CC	*	154,800	383	240
VE3RSA	**A**	**125,488**	**237**	**184**
K6SE	**A**	**111,936**	**268**	**192**
SP9MRQ	**A**	**110,352**	**300**	**209**
PAØADT	**A**	**110,025**	**294**	**225**
K8ZT	*	108,153	239	183
JA7MJ	*	107,236	221	166
UR7EQ	*	104,922	262	201
K9MMS	**A**	**89,265**	**207**	**165**
DL1ARJ	*	84,376	257	199
NQ4U	*	77,190	224	166
HB9AYZ	**A**	**67,437**	**221**	**177**
SP8AQA	*	67,068	204	162
DF5RF/P	*	66,417	238	169
WD4GBW	*	52,393	149	121
US3QW	*	40,513	150	127
RV9COI	**A**	**39,216**	**134**	**114**
USØYA	*	34,917	130	103
N1TM	*	32,648	122	106
EA7EZQ	**A**	**29,512**	**136**	**119**
WC7S	*	29,500	156	118
K9FOH	*	29,070	108	102
N2JNZ	**A**	**21,375**	**114**	**95**
UA4ARL	*	21,068	106	92
AGØT	**A**	**20,090**	**124**	**98**
AE4JF	*	17,296	120	92
KCØW	*	17,199	101	91
AA8IV	*	14,536	94	79
DJ5QK	*	14,514	93	82
HB9DOZ	*	12,580	87	74
F5IQJ	**A**	**8,769**	**108**	**37**
VE3IGJ	*	8,493	65	57
NQ7X	*	5,148	46	44
W2BVH	*	4,512	53	47
N9AVG	*	4,085	47	43
ZW2Q	**A**	**4,017**	**47**	**39**
DL3BVA	*	3,432	46	44
W2JEK	*	2,904	35	33
AA3WI	**A**	**2,278**	**35**	**34**
KØCO	*	1,881	38	33
KRØU	*	1,475	27	25
WØIFL	*	903	22	21
SP6AYP	*	492	14	12
UU2JQ	*	264	11	11
JR3RWB	**28**	**139,105**	**257**	**215**
DF9ZP	**28**	**48,900**	**178**	**150**
NE5D	**28**	**5,474**	**49**	**46**
SP8MI	**28**	**640**	**20**	**20**
JA1GTF	*	555	15	15
RZ6HX	**21**	**512,601**	**641**	**437**
YU1LM	**21**	**365,760**	**500**	**360**
GØDCK	**21**	**255,024**	**412**	**322**
SMØGNS	**21**	**220,281**	**395**	**303**
UT2UZ	**21**	**218,964**	**347**	**284**
T94OM	**21**	**176,988**	**386**	**258**
SP4GFG	**21**	**172,250**	**338**	**265**
ES1CR	**21**	**156,938**	**325**	**262**
WA6FGV	**21**	**116,856**	**281**	**216**
JR9NVB	**21**	**90,528**	**202**	**164**
JR1NKN	*	71,302	197	154
VE3HG	**21**	**22,440**	**92**	**88**
OK1AIJ	**21**	**14,742**	**88**	**81**
EA2CR	**21**	**11,004**	**90**	**84**
SP4TBM	*	2,508	34	33
RV3DBK	**21**	**1,998**	**40**	**37**
JF3WNO/3	*	40	4	4
LY5G	**14**	**617,100**	**775**	**484**
			(Op: LY2FE)	
PA3ELD	**14**	**232,883**	**509**	**323**
OK1DSA	**14**	**220,286**	**436**	**323**
G3LHJ	**14**	**166,704**	**368**	**276**
W6YJ	**14**	**156,845**	**296**	**247**
IZ1DFI	**14**	**147,968**	**356**	**272**
HB9DAX	**14**	**77,616**	**230**	**196**
RWØAR	**14**	**42,240**	**138**	**128**
OM2ZZ	**14**	**36,784**	**168**	**152**
NU4B	**14**	**35,453**	**127**	**121**
EA4BWR	**14**	**30,858**	**160**	**139**
NZ5A	**14**	**25,584**	**145**	**104**
SM6AHU	**14**	**19,610**	**115**	**106**
RA3XEV	**14**	**19,600**	**120**	**100**
UAØSBQ	*	14,089	77	73
OR4CCP	**14**	**8,400**	**87**	**80**
			(Op: ON4CCP)	
RV3GM	*	1,768	34	34
WB9MII	*	143	13	11
US5QQF	**7**	**101,652**	**240**	**172**
PA3FSC	*	336	12	12
NE6M	*	182	7	7
OL4W	**3.5**	**190,452**	**414**	**236**
			(Op: OK1IF)	
EW6CU	**3.5**	**131,200**	**288**	**200**
RW3VZ	**3.5**	**120,761**	**287**	**197**
OK1IR	*	119,997	291	201
OM4K	**3.5**	**84,796**	**237**	**172**
			(Op: OM4AA)	
YT1R	**1.8**	**12,282**	**89**	**69**
			(Op: YU1RA)	
USØQG	**1.8**	**1,000**	**23**	**20**
N6WG	*	180	15	10

NORTH AMERICA

UNITED STATES

WC1M	**A**	**5,720,197**	**2524**	**779**
NR1DX	**A**	**4,631,235**	**2243**	**735**
NU1P	**A**	**3,502,692**	**1932**	**653**
			(Op: K1MK)	
AG1C	*	3,371,200	1859	688
			(Op: N2GC)	
K5ZD	*	1,561,904	1106	536
K5MA	*	1,127,720	812	440
KN1T	*	548,680	599	319
			(Op: K1NU)	
WZ1R	**21**	**2,069,382**	**1308**	**609**
			(Op: N1RR)	
K1VW	**1.8**	**7,930**	**90**	**65**
***N1UR**	**A**	**2,059,200**	**1337**	**572**
***WA1Z**	**A**	**1,147,240**	**930**	**460**
***K1HT**	**A**	**1,095,028**	**816**	**451**
*KQ1F	*	1,089,880	867	440
			(Op: K1XM)	
*N4CW/1	*	1,003,730	832	455
*W1TO	*	619,866	627	351
*KE1F	*	372,084	502	307
*K1TH	*	254,014	355	241
*N1LW	*	139,784	269	202
*AE1D	*	99,588	242	172
*K1SWG	*	99,288	210	168
*KG1V	*	81,738	217	171
*AB1BX	*	46,740	158	123
*W1QA	*	33,372	124	103
*AE1X	*	2,325	33	31
***WE1USA**	**7**	**1,010,225**	**810**	**425**
			(Op: WA1LNP)	
W6XR	**A**	**5,151,357**	**2409**	**731**
			(Op: N2YX)	
K2FU	**A**	**1,569,205**	**1105**	**515**
KA2MGE	**A**	**692,437**	**703**	**409**
WA2FGK	*	474,890	546	338
WA4ATJ	*	319,872	405	272
W2FUI	*	195,624	316	228
NA2X	**3.5**	**4,508**	**47**	**46**
***WK2G**	**A**	**1,460,592**	**1112**	**504**
***W2TZ**	**A**	**1,026,368**	**901**	**448**
***WA2EYA**	**A**	**346,256**	**483**	**304**
*WV2LI	*	318,681	414	261
			(Op: N2GA)	
*WA2VQV	*	275,417	400	289
*W2SWL	*	157,325	306	217
*KF2U	*	64,079	170	139
*WW2DDM	*	34,515	130	117
			(Op: K4UK)	
*WA2IAU	*	29,997	114	99
*N2CU	*	12,880	76	70
*NS2P	*	84	7	7
***N2GM**	**21**	**80,012**	**193**	**166**
*WA2NXK	*	105	7	7
K3WW	**A**	**6,168,000**	**2706**	**750**
KF3B	**A**	**5,574,096**	**2522**	**759**
			(Op: N3RS)	
K3CR	**A**	**5,508,408**	**2461**	**782**
			(Op: LZ4AX)	
AA3B	*	5,024,883	2325	761
N3UM	*	1,995,840	1298	576
K3MD	*	1,164,999	920	473
N3ZZ	*	735,597	815	423
W3AZ	*	612,018	580	363
N3RD	*	267,734	374	263
K3ZO	*	223,465	342	239
W3GN	*	174,876	306	228
WT3P	*	118,552	255	203
AA3VA	*	65,860	171	148
W3AP	*	36,700	118	100
K3VA	**14**	**161,007**	**280**	**231**
W3BGN	**7**	**1,683,990**	**887**	**462**
***WO3Z**	**A**	**1,135,443**	**936**	**461**
***WF3M**	**A**	**807,775**	**779**	**409**
***N1WR**	**A**	**738,549**	**672**	**399**
*W3CP	*	396,900	423	294
*N3KCJ	*	373,511	485	311
*WA3AAN	*	238,656	379	264
*N3KR	*	174,528	309	216
*K3DSP	*	129,168	270	207
*WX3M	*	89,612	230	172
*N3NZ	*	58,636	170	137
*K3FH	*	38,416	137	112
*W3FQE	*	11,151	65	59
***K3GW**	**21**	**138,390**	**242**	**210**
***NJ3K**	**14**	**176,605**	**373**	**247**
*W3BYX	*	53,568	155	144
*KF3CV	*	675	15	15
KN1DX	**A**	**6,152,718**	**2782**	**781**
			(Op: K4ZW)	
KT3Y	**A**	**5,609,940**	**2572**	**777**
K4RO	**A**	**3,771,690**	**2122**	**741**
WW4RR	*	2,463,455	1634	655
			(Op: N4ZZ)	
W4SAA	*	1,660,828	1160	533
KO7X	*	1,144,780	909	481
K4LTA	*	951,216	945	456
KY4AA	*	768,222	802	441
			(Op: N4GN)	
W4YE	*	603,504	583	396
K4LQ	*	359,466	413	331
K4XG	*	235,000	352	250
KØCOP	*	202,725	311	225
N4UH	*	138,367	230	179
AD4L	*	121,968	254	176
NG4Z	*	79,913	219	157
			(Op: K2UFT)	
W7QF	*	78,524	165	134
AF4RK	*	56,160	168	135
N4TL	*	49,323	153	123
KW4CW	**28**	**1,034,346**	**945**	**498**
			(Op: N4BP)	
WW4M	*	80,150	220	175
			(Op: W4ZV)	
NJ4U	*	60,140	190	155
			(Op: K4EA)	
KC4D	**21**	**2,916,244**	**1614**	**698**
			(Op: K4OAQ)	
***NF4A**	**A**	**4,160,208**	**2104**	**767**
			(Op: N4PN)	
***N4IG**	**A**	**1,529,088**	**1123**	**528**
***WD4AHZ**	**A**	**1,363,348**	**1092**	**511**
*NA4K	*	1,353,037	1053	521
*NK4A	*	1,196,279	999	497
			(Op: NF4A)	
*NR4X	*	1,099,791	913	483
			(Op: K4SB)	
*K4EU	*	1,036,164	805	474
*N4YDU	*	727,500	704	388
*N4KW	*	500,772	542	348
*K4QPL	*	318,339	417	279
*WO4O	*	304,425	400	275
*K4IE	*	166,804	293	223
*W4IDX	*	163,072	304	208
*KB4N	*	134,400	267	200
*W4TYU	*	130,065	277	195
*AA4KD	*	112,320	252	192
*KW4DA	*	103,722	206	177
*KU3O	*	99,176	233	184
*K6ETM	*	88,230	218	170
*NS4CG	*	75,348	196	156
			(Op: W4EBA)	
*N4JED	*	72,080	202	170
*W4BCG	*	36,519	132	111
*NA4CW	*	33,411	126	111
*AE4EC	*	20,116	101	94
*KA1DWX	*	10,388	67	53
*W4DGG	*	5,265	50	45
*K3MZ	*	3,959	38	37
*K4RFK	*	3,108	39	37
***KN4Y**	**28**	**102,816**	**302**	**204**
***N4MM**	**21**	**752**	**16**	**16**
***WK4Y**	**7**	**176,421**	**306**	**217**
***WS4NC**	**7**	**54,489**	**150**	**123**
			(Op: N4VHK)	
***AI4AA**	**1.8**	**1,472**	**34**	**32**
			(Op: K4WI)	
NT5C	**A**	**5,119,260**	**2594**	**820**
			(Op: N3BB)	
N5RZ	**A**	**5,111,653**	**2622**	**823**
K5YA	**A**	**4,285,229**	**2186**	**767**
W5KFT	*	4,100,092	2185	772
			(Op: K5PI)	
KZ5D	*	2,777,456	1718	688
N5PO	*	1,358,073	1075	537
W5VX	*	909,030	935	471
N6ZZ	*	483,028	603	364
K5YAA	*	279,888	379	272
K5WAF	*	54,340	167	143
W5BBR	*	30,324	114	114
KM5TY	*	18,450	91	82
W5TM	**21**	**2,103,121**	**1363**	**641**
			(Op: W5AO)	
KM5G	**21**	**1,418,450**	**1073**	**550**
KC5FU	**21**	**1,284,023**	**1010**	**559**
			(Op: N5QQ)	
W5MX	*	317,205	442	285
WZ5V	**14**	**2,259,423**	**1446**	**657**
W5FO	**14**	**1,688,580**	**1161**	**636**
NU5A	**7**	**655,690**	**564**	**323**
			(Op: K5GN)	
N5DO	**7**	**383,090**	**441**	**290**
***WD5K**	**A**	**1,819,179**	**1328**	**607**
***W5GAI**	**A**	**701,807**	**693**	**421**
***WA5SOG**	**A**	**500,940**	**525**	**345**
*KØCIE	*	389,730	567	330
*NO5W	*	382,824	621	312
*AD5GS	*	305,020	496	302
*KC5JSO	*	109,368	257	196
*AF5Z	*	24,644	124	101
*KB5NJD	*	8,192	69	64
KU6W	**A**	**6,051,277**	**2810**	**857**
			(Op: N6MJ)	
KR7O	**A**	**4,153,296**	**2160**	**752**
			(Op: N6TV)	
N6CW	**A**	**2,259,965**	**1489**	**635**
N6NF	*	1,274,905	1089	535
WJ6O	*	1,177,574	986	514
			(Op: K6XX)	
WY6K	*	1,004,488	987	482
			(Op: K6RB)	
KF6RIP	*	1,003,352	1008	437
W6TK	*	786,463	759	419
N6HC	*	679,199	779	419
K6GT	*	465,716	648	345
AJ6V	*	391,578	538	349
W6CUS	*	317,745	504	307
NW6P	*	316,575	603	315
			(Op: K6RIM)	
K6AUC	*	312,522	443	294
K6III	*	229,908	357	276
N6ZFO	*	173,972	371	244
WO6M	*	161,397	331	227
W7CB	*	102,120	217	185
KE6ZSN	*	94,622	275	187
NI6T	*	90,534	269	191
AA6W	*	59,444	202	154
K6OWL	*	40,446	180	126
W6VNR	**28**	**27,354**	**121**	**97**
***NX6T**	**A**	**1,734,866**	**1326**	**581**
			(Op: K6AM)	
***AA6PW**	**A**	**1,723,700**	**1334**	**550**
***N6NG**	**A**	**283,668**	**406**	**308**
*AK7G	*	218,400	422	260
*N6EM	*	214,200	410	255
*WA6OGO	*	208,820	419	265
*AA6EE	*	161,460	347	230
*N6GL	*	105,480	296	180
*WA6BOB	*	102,249	309	189
*K6UM	*	85,635	237	173
*KA6R	*	63,042	188	158
*K6CSL	*	62,604	193	141
*W6NKR	*	50,094	146	121
*AD6G	*	38,478	164	121
*NA6E	*	7,656	69	58
*AE6AX	*	7,056	66	56
*KE6QR	*	6,625	63	53
***WD6DX**	**28**	**16,380**	**95**	**84**
***N6MU**	**21**	**1,176,136**	**915**	**559**
*NP4IW/NN6	*	61,462	228	158
*WT6TT	*	13,446	84	81
			(Op: N6NZ)	
*W6ISO	*	1,288	28	28
***KU6T**	**7**	**13,908**	**92**	**76**
KC7V	**A**	**3,612,525**	**2048**	**735**
WR7HE	**A**	**2,421,721**	**1531**	**647**
			(Op: K7QQ)	
K7ZZ	**A**	**2,009,280**	**1497**	**624**
N7TT	*	1,530,650	1250	575
K7XN	*	495,580	604	355
W7QN	*	473,797	614	367
KS7T	*	451,386	492	351
K7UAZ	**21**	**1,916,430**	**1328**	**635**
			(Op: N4OGW)	
W7AYY	*	23,529	95	93
K7RI	**14**	**1,902,840**	**1307**	**628**
			(Op: W7/LU9AY)	
K7OX	**7**	**19,201**	**105**	**91**
W7DRA	**3.5**	**6,837**	**77**	**53**
***N7WA**	**A**	**544,104**	**701**	**396**
***N7IF**	**A**	**462,090**	**599**	**365**
***AC7LX**	**A**	**377,508**	**558**	**326**
*NC7M	*	347,272	510	332
*K7VI	*	323,628	522	298
*KA7T	*	285,984	453	288
*W7HS	*	212,267	353	253
*NG7Z	*	145,130	388	230
*NR7DX	*	118,400	247	200
			(Op: K7ABV)	
*N7ZN	*	110,330	285	187
*AB7RW	*	106,191	225	207
*K7TR	*	96,768	260	189
*W7ZMD	*	93,060	240	188
*W7GTO	*	56,980	212	148
*K7JWD	*	55,870	186	151
*NY4I	*	43,434	210	127
*WW7Q	*	40,260	128	110
*W7GT	*	40,016	160	122
***K7ON**	**21**	**430,360**	**603**	**371**
N8EA	**A**	**974,810**	**834**	**430**
K2UOP	**A**	**635,748**	**614**	**372**
WO8CC	**28**	**228,739**	**405**	**287**
			(Op: N9AG)	
N8BJQ	**21**	**1,618,050**	**1105**	**575**
WS8O	*	220,110	351	253
			(Op: W8GN)	
***NZ8O**	**A**	**2,489,200**	**1594**	**635**
			(Op: W8MJ)	
***W8IQ**	**A**	**1,260,438**	**1023**	**498**
***KV8Q**	**A**	**803,574**	**830**	**414**
*K8IR	*	626,232	643	388
*K5IID	*	540,540	588	364
*W8PN	*	508,715	597	355
*K8GL	*	362,141	456	313
*K8DD	*	330,616	445	286
*WB8TLI	*	288,248	390	274
*K8CV	*	179,515	293	223
*N8NX	*	102,856	230	184
*KB8PGW	*	41,064	132	116
*K8KHZ	*	34,430	138	110
*K8MR	*	14,766	77	69
*AF8C	*	756	21	21
***KT8X**	**7**	**11,952**	**50**	**48**
N9RV	**A**	**4,190,700**	**2256**	**687**
			(Op: W8LVN)	
WI9WI	**A**	**2,447,550**	**1614**	**630**
W9OP	**A**	**1,212,219**	**949**	**513**
W9RE	*	870,825	787	425
WT9U	*	424,081	590	329
NN9G	*	191,970	314	237
			(Op: N9GG)	
W9VA	**21**	**128,544**	**253**	**208**
K9NW	**14**	**2,916,960**	**1639**	**708**
***KK9A**	**A**	**3,271,524**	**1827**	**681**
***KS9K**	**A**	**2,886,102**	**1668**	**654**
			(Op: N4TZ)	
***K9ZO**	**A**	**485,438**	**600**	**346**
*W9WI	*	444,429	534	339
*W9CC	*	67,392	192	156
*W9LYA	*	26,800	117	100
*K9OSH	*	18,568	97	88
*N9KO	*	8,515	72	65
***KX9DX**	**28**	**18,972**	**102**	**93**
***K9WA**	**21**	**124,120**	**250**	**214**
***K9QVB**	**14**	**1,488,616**	**1085**	**584**
***K9BG**	**14**	**748,512**	**690**	**452**
*K9QH	*	184	8	8
***W9SE**	**7**	**153,573**	**315**	**213**
KØØU	**A**	**2,419,260**	**1626**	**661**
KU1CW/Ø	**A**	**2,254,275**	**1405**	**645**
NRØX	**A**	**2,104,494**	**1350**	**623**
KAØGGI	*	1,585,366	1224	566
KGØUA	*	509,379	543	353
WØZP	*	411,796	622	382
AE9B	*	207,808	369	272
WAØMHJ	*	174,496	300	224
WØHW	*	152,325	273	225
K4IU	*	69,900	194	150
WØTY	*	11,492	76	68
K2VV	**21**	**3,032,421**	**1665**	**733**
KØRF	**7**	**762,196**	**638**	**356**
NØTT	**1.8**	**1,995**	**40**	**35**
***KEØUI**	**A**	**561,024**	**654**	**384**
***KSØM**	**A**	**107,694**	**236**	**193**
*KØRY	*	82,641	205	163
*ADØH	*	50,120	164	140
*NØAC	*	21,952	114	98
*AEØQ	*	14,952	113	84
*KØUK	*	4,116	45	42
***WØETT**	**14**	**136,654**	**265**	**227**
*WØIE	*	3,212	45	44

MARTINIQUE

FM5BH	**A**	**8,270,112**	**3435**	**831**
FM5GU	**14**	**3,117,520**	**1778**	**665**

PANAMA

***HP1AC**	**28**	**115,746**	**257**	**191**

HONDURAS

***HR3J**	**A**	**2,177,883**	**1432**	**549**
			(Op: JA6WFM)	

ALASKA

***KL7FAP**	**A**	**4,860**	**50**	**45**

PUERTO RICO

***WP3C**	**A**	**3,815,643**	**2036**	**681**
***WP4LNY**	**A**	**2,675**	**27**	**25**

COSTA RICA

W5AA/TI8	**A**	**85,500**	**203**	**171**
TI3M	**14**	**2,709,360**	**1555**	**639**

CANADA

XM3AT	**A**	**5,447,955**	**2562**	**753**
XM3EJ	*	2,673,818	1473	577
VA3UA	*	2,611,785	1498	605
VE3NE	*	2,362,238	1355	577
XM4YU	**A**	**580,116**	**606**	**348**
VE7VR	**A**	**523,973**	**606**	**331**
VO1MP	**28**	**165,568**	**291**	**199**
XM3ANX	**21**	**2,397,408**	**1415**	**624**
XM7SZ	**14**	**2,917,995**	**1639**	**705**
			(Op: VA7RR)	
VE4IM	**14**	**259,840**	**355**	**290**
VE3XAX	**7**	**986,446**	**654**	**346**
VY2ZM	**1.8**	**35,880**	**104**	**78**
***XL3NA**	**A**	**3,735,212**	**1770**	**659**
*VE3XB	*	1,988,560	1221	530
***XM2AWR**	**A**	**1,652,176**	**1114**	**496**

*VE3YDX	*	1,368,046	963	458
		(Op: RW4MM)		
*VE3KP	*	1,214,955	896	441
*VE3IAY	*	968,448	791	384
***VE7XF**	**A**	**518,520**	**439**	**435**
*VA3TEE	*	513,570	539	323
*VE7NI	*	219,112	344	244
***XM6ZT**	**A**	**211,650**	**306**	**249**
*VA3XRZ	*	196,344	325	216
***XM5SF**	**A**	**119,259**	**248**	**189**
*VE3AGC	*	18,018	80	78
*VA3IX	*	94,880	225	160
*VA7LC	*	74,752	240	146
*VE7ASK	*	9,000	63	45
*VE2FFE	*	5,250	49	42
***VE3OIL**	**28**	**6,650**	**52**	**50**
*XM3STT	*	1,288	23	23
*VE3MQW	*	490,091	497	371
***VE3UKR**	**14**	**135,648**	**247**	**216**
*XL3WN	*	130,221	288	189
***VE3OSZ**	**1.8**	**13,923**	**73**	**51**

BERMUDA

***N6NO/VP9**	**A**	**394,128**	**496**	**306**

MEXICO

XE1ZOI	**A**	**2,001,270**	**1488**	**570**
XE2MX	*	123,394	223	206
***XE2AC**	**A**	**848,540**	**932**	**380**
***XE1NW**	**14**	**44,109**	**160**	**117**

NICARAGUA

***HT4T**	**A**	**1,233,622**	**1064**	**465**
		(Op: YN4SU)		

CAYMAN IS.

ZF1A	**21**	**4,852,224**	**2401**	**768**
		(Op: W5ASP)		

AFRICA

ALGERIA

***7XØDX**	**A**	**1,024,500**	**845**	**375**
		(Op: VK3DXI)		

MOROCCO

***CN8YR**	**A**	**410,697**	**463**	**287**
*CN2PM	*	44,520	139	106

MADEIRA IS.

CT3BD	**A**	**117,290**	**214**	**185**
***CT3KN**	**14**	**1,763,310**	**1113**	**530**

ANGOLA

***D2CR**	**A**	**319,019**	**394**	**263**

CANARY IS.

EA8AVK	**A**	**86,496**	**182**	**159**
***EA8EY**	**28**	**27,348**	**100**	**94**
***EA8FT**	**21**	**1,581,235**	**1013**	**521**
***EA8NQ**	**14**	**610,144**	**556**	**368**

CEUTA AND MELILLA

***EA9AZ**	**28**	**1,551,560**	**1058**	**491**
***EA9AI**	**21**	**141,888**	**247**	**192**

TRISTAN DA CUNHA

ZD9IR	**A**	**519,415**	**552**	**305**

SOUTH AFRICA

ZS4TX	**3.5**	**43,758**	**95**	**78**
***ZSØE**	**A**	**136,590**	**241**	**174**
		(Op: ZS6AJS)		
***ZS5RON**	**28**	**169,050**	**269**	**210**
***ZS6EGB**	**21**	**27,876**	**101**	**92**

ASIA

VIETNAM

***XV9SW**	**21**	**1,407,536**	**1064**	**536**
		(Op: SM5MX)		

ISRAEL

***4X1VF**	**28**	**441,639**	**560**	**297**
***4Z8EE**	**7**	**343,408**	**295**	**208**
		(Op: OK1EE)		
*4Z5AX	*	176,400	217	150

CYPRUS

P3F	**A**	**10,127,064**	**3486**	**829**
		(Op: 5B4AGN)		

KUWAIT

9K2ZZ	**A**	**539,712**	**648**	**288**
9K9O	**21**	**4,297,504**	**2105**	**736**
		(Op: 9K2RR)		

WEST MALAYSIA

***9M2TO**	**A**	**1,545,264**	**1223**	**504**
		(Op: JAØDMV)		

TAIWAN

***BW3 /UA3VCS**	**A**	**1,930,159**	**1423**	**539**

KYRGYZSTAN

EX2A	**A**	**1,390,800**	**1051**	**456**
EX8O	*	502,789	552	331
EX2M	**28**	**1,510,340**	**1190**	**481**

TAJIKISTAN

EY7AF	**A**	**4,091,451**	**2032**	**637**
*EY8WW	A	341	11	11

SOUTH KOREA

HL5UOG	**A**	**436,545**	**531**	**327**

THAILAND

HSØ/G3NOM	**A**	**2,328,144**	**1475**	**574**
E21EIC	**A**	**1,102,794**	**957**	**462**
HSØ/SM3DYU	*	125,786	273	218
***E2ØNTS/8**	**7**	**20,646**	**63**	**62**

SAUDI ARABIA

HZ1HZ	**A**	**1,498,873**	**722**	**692**
HZ1AB	**28**	**3,667,994**	**2272**	**659**
		(Op: SMØCXU)		

JAPAN

JAØQWO	**A**	**1,773,632**	**1247**	**518**
JF2QNM	**A**	**1,068,300**	**878**	**450**
JA5APU	**A**	**949,922**	**819**	**422**
JA1HP	*	587,520	592	360
JA1BNW	*	499,905	519	345
JA1QOW	*	293,886	411	261
JA6ZWA	*	258,856	373	262
		(Op: 7M4CLF)		
JA2FSM	*	192,360	306	229
JA2QVP	*	123,532	255	178
7J1ABD	*	83,390	194	155
JA9CWJ	*	83,130	186	163
JQ2EHD	*	69,296	182	142
JR7MZC/1	*	65,552	173	136
JR3WXA	*	55,022	162	122
JA2BQX	*	38,528	134	112
JA6BGA	*	12,288	70	64
JA1HHU	*	5,928	43	39
JH1AEP	**28**	**7,007**	**51**	**49**
JH7XGN	**21**	**2,819,342**	**1525**	**674**
JR1AIB	**21**	**1,623,280**	**1136**	**515**
		(Op: JE1CKA)		
JA5MAJ	*	404,492	484	319
JO1QZI	*	60,624	159	144
JA5IP	**7**	**63,280**	**119**	**112**
7N4AHT	*	25,254	79	69
***7M1MCT**	**A**	**1,645,686**	**1131**	**518**
***JO3JYE**	**A**	**1,402,200**	**1054**	**492**
***JH2NWP**	**A**	**1,100,440**	**868**	**440**
*JM2RUV	*	676,384	607	368
*JA2CUS	*	546,798	587	329
*JA3MVI/1	*	533,000	550	328
*JA7DNO	*	346,480	444	305
*7M1MCU	*	317,240	433	280
*JA5ATN	*	297,920	389	245
*JA1XUY	*	246,159	354	243
*JA1CP	*	188,370	308	210
*JF7PHE	*	175,168	309	224
*JA6AKW	*	166,400	196	260
*JJ6WYS	*	155,929	299	211
*JA1BPN	*	154,470	271	190
*JA2VZL	*	127,095	251	185
*JA7CPW	*	122,745	232	167
*JG1OWV	*	114,582	224	169
*JJ4PPK	*	100,280	210	184
*JE1TSD	*	100,206	213	171
*JM2FCJ/9	*	86,122	199	149
*JA7ARW	*	74,844	196	154
*JH7QNG	*	65,888	172	142
*JR7OMD	*	59,928	164	132
*JA3DAY	*	55,510	155	130
*JA2CXF	*	52,736	145	128
*JA4BAA	*	47,196	143	114
*JH6WBN	*	46,720	151	128
*JA1XRH	*	42,158	132	107
*JF3KQA/1	*	40,916	139	106
*JA1RRA	*	39,648	134	112
*JA1XPU	*	37,293	122	93
*JA1IZ	*	35,432	122	103
*JA1WHG	*	31,208	113	94
*JA6YAI	*	20,898	100	81
		(Op: JQ6PNK)		
*JE8KKX	*	13,192	74	68
*JGØAXT	*	12,512	72	68
*7K2GMJ	*	10,602	68	62
*JH1NXU	*	9,680	66	55
*JA6SRB	*	3,936	39	32
*JK1REJ	*	2,730	26	35
*JG1FGL	*	2,044	29	28
*JR3NDM	*	2,001	31	29
***JH9VSF**	**28**	**677,943**	**697**	**357**
***JE2HCJ**	**28**	**84,168**	**200**	**167**
*JA1PS	*	26,772	106	97
*JF7GDF	*	25,761	103	93
*JI1HFJ	*	23,051	99	89
*JA7KM	*	13,912	78	74
*JA1GS	*	12,596	70	67
*JA1BUI	*	7,124	55	52
*7K2PBB	*	1,736	28	28
*JA1AAT	*	325	13	13
***JI3BFC**	**21**	**395,787**	**473**	**329**
***JJ6TWQ**	**21**	**135,884**	**242**	**211**
*JGØOXL	*	113,004	243	172
*JA4AQR	*	105,248	208	184
*JH1FNU	*	96,720	214	186
*JI7NUF	*	82,680	198	159
*JH2XTV	*	28,413	103	99
*JL8AQH	*	22,790	92	86
*JE1CKA	*	19,558	96	77
*JE1JAC	*	15,836	80	74
*JA6QDU	*	12,420	73	60
*JR3VFU	*	2,700	32	30
*JH1OLB	*	1,650	29	22
***JR4GPA**	**14**	**524,650**	**561**	**350**
***JHØEPI**	**14**	**452,592**	**493**	**336**
*JHØNVX/1	*	358,065	423	327
*JF3EBO	*	229,755	347	255
*JA2KKA	*	125,450	227	193
***JH1APZ**	**7**	**41,847**	**93**	**87**
***JR4ISF**	**7**	**39,950**	**103**	**94**
*JL6IPK	*	32,271	106	93
*JH7XMO	*	20,703	77	67
*JE1SPY	1.8	1	1	1

JORDAN

JY9NX	**A**	**9,942,384**	**3798**	**824**
		(Op: JM1CAX)		

LEBANON

OD5/OK1MU	**28**	**2,160,328**	**1510**	**562**

TURKEY

TA3DD	**28**	**121,527**	**261**	**189**
TA2/Z36W	**21**	**311,375**	**453**	**265**
***TA3BN**	**A**	**39,516**	**132**	**111**

ASIATIC RUSSIA

RZ9CO	**A**	**5,450,338**	**2315**	**718**
UA9CDV	**A**	**5,308,653**	**2228**	**667**
UA9CLB	**A**	**4,511,130**	**2034**	**645**
RA9SG	*	2,834,520	1442	598
UA9MC	*	2,203,032	1158	552
RZ9AE	*	1,850,136	1102	508
RA9ST	*	1,228,927	902	419
UA9FM	*	921,644	770	412
UA9BS	*	756,525	681	393
UA9CKS	*	715,875	580	345
RX9TX	*	602,280	625	360
UA9FEG	*	239,112	331	246
UA9KM	*	49,450	154	115
RK9CYA	*	13,800	72	69
			(Op: RK9CR)	
RJ9J	**14**	**2,593,764**	**1454**	**661**
			(Op: RA9JR)	
UA9CI	**7**	**1,965,529**	**849**	**419**
RK9AY	**3.5**	**137,522**	**187**	**133**
UA9OS	*	2,508	22	22
***RU9CI**	**A**	**2,097,120**	**1265**	**544**
***UA9OA**	**A**	**1,272,922**	**938**	**434**
***RA9DZ**	**A**	**571,296**	**561**	**352**
*RZ9UWZ	*	525,584	562	307
*UA9APA	*	395,604	433	297
*UA9XAB	*	301,648	393	272
*UA9CR	*	150,282	272	207
*RV9CLF	*	100,264	197	151
*RX9JM	*	74,676	186	147
*UA9OSV	*	72,816	182	148
*UA9AX	*	67,134	161	134
*UA9QFF	*	23,577	99	87
*RV9WZ	*	8,601	65	61
***UA9LAC**	**28**	**110,160**	**270**	**170**
*UA9LAO	*	11,907	71	63
***UA9WQK**	**21**	**695,959**	**603**	**419**
*UA9OAL	*	204,470	339	254
*UA9LGL	*	197,470	316	245
***UA9JLL**	**14**	**1,103,706**	**811**	**486**
*RA9XF	*	869,031	731	433
*UA9FGJ	*	665,133	601	399
***RW9QA**	**3.5**	**68,000**	**133**	**100**
RAØFU	**A**	**2,718,348**	**1677**	**631**
UAØANW	**A**	**853,798**	**730**	**394**
UAØLS	*	651,570	673	370
UAØAZ	*	37,288	120	118
RAØBA	**21**	**1,378,045**	**997**	**521**
***UAØACG**	**A**	**1,780,922**	**1314**	**479**
***UAØQBR**	**A**	**1,319,634**	**1007**	**501**
*RAØJX	*	331,100	478	301
*RUØAE	*	67,014	167	146
*RAØFLP	*	2,142	41	34
***UAØQJO**	**21**	**1,735,396**	**1186**	**598**
*RXØQA	*	700,146	726	401
*RUØAT	*	74,936	185	152
***RAØJM**	**14**	**20,416**	**102**	**88**

KAZAKHSTAN

UN5J	**A**	**91,360**	**205**	**160**
***UP6P**	**A**	**3,756,202**	**1903**	**674**
*UN7CZ	*	739,540	647	359
*UN8FZ	*	191,404	295	218
***UN7GM**	**28**	**574,632**	**622**	**347**
*UN7EX	*	25,056	103	96
***UN8FM**	**21**	**23,387**	**105**	**91**
***UN9LN**	**14**	**1,181,500**	**859**	**500**
*UN4PD	*	207,713	297	253

HONG KONG

VR2BG	**A**	**117,000**	**261**	**200**

INDIA

***VU2UR**	**A**	**110,032**	**224**	**184**

BRITISH BASES ON CYPRUS

***ZC4DW**	**A**	**4,359,910**	**2153**	**635**

EUROPE

CROATIA

9A5Y	**28**	**1,486,327**	**1253**	**629**
		(Op: 9A3NM)		
9A5W	**14**	**2,522,058**	**1714**	**721**
9A5E	**7**	**2,535,820**	**1334**	**590**
9A4X	**7**	**1,485,190**	**1022**	**490**
9A3MA	**3.5**	**137,610**	**315**	**198**
***9AØDX**	**A**	**3,124,730**	**2010**	**686**
		(Op: 9A3PA)		
*9A3CY	*	118,584	298	216
***9A3RE**	**1.8**	**84,747**	**263**	**159**

MALTA

9HØA	**21**	**5,389,008**	**2896**	**933**
		(Op: 9H1EL)		

PORTUGAL

***CT1CJJ**	**A**	**1,916,812**	**1544**	**626**
***CT1FNT**	**14**	**35,280**	**172**	**147**

GERMANY

DF3CB	**A**	**6,463,926**	**3136**	**854**
		(Op: LY1DS)		
DL1IAO	**A**	**5,601,468**	**2732**	**804**
DL3YBM	**A**	**2,081,184**	**1599**	**608**
DFØFS	*	1,803,800	1546	580
		(Op: DL1EKC)		
DL8UAT/P	*	1,659,042	1309	567
DL4CF	*	1,296,042	1187	538
DJ6QT	*	1,263,352	1057	536
DL1JF	*	867,390	788	435
DL7JV	*	553,112	647	392
DL4HRM	*	541,268	676	364
DL6KVA	*	293,020	415	260
DK2BJ	*	57,000	201	150
DL4DRA	*	10,540	70	62
DL6DVU	*	4,539	52	51
DK2GZ	**28**	**476,346**	**668**	**403**
DK8LV	**21**	**2,476,249**	**1599**	**713**
DK3KD	**21**	**1,020,780**	**1002**	**477**
DN1MA	*	1,175	30	25
DJ1CW	**14**	**826,896**	**872**	**483**
DL4WA	*	285,714	518	351
***DL4SDW**	**A**	**1,707,607**	**1386**	**583**
***DL2HQ**	**A**	**1,100,458**	**1019**	**509**
***DL4JYT**	**A**	**895,104**	**1010**	**448**
*DJ1OJ	*	679,779	738	459
*DJ5GG	*	679,724	797	436
*DL8MUG	*	599,132	703	404
*DM3PKK	*	490,599	610	361
*DJ8UV	*	441,045	605	363
*DL1HCM	*	440,220	557	348
*DK3GI	*	350,778	500	323
*DL7JAK	*	328,016	489	304
*DL1DQW	*	280,488	483	312
*DJ9AO	*	278,640	507	324
*DL6KO	*	236,662	366	241
*DL2ANM	*	200,904	379	264
*DJ6TK	*	158,130	329	251
*DL2RTJ	*	129,444	275	201
*DL7IZ	*	103,824	229	168
*DK7AN	*	82,251	223	171
*DL3BZZ	*	75,240	194	165
*DL7UXG	*	73,744	213	176
*DL6UAM	*	48,032	191	152
*DL1SAN	*	40,120	161	136
*DL3JRA	*	31,828	122	109
*DF5AU	*	20,412	110	84
*DL2ZAV	*	10,318	89	77
*DL2AL	*	8,195	60	55
*DL5KUA	*	4,092	31	31
***DL2MIH**	**28**	**3,956**	**46**	**46**
***DK5IM**	**21**	**393,888**	**526**	**373**
*DH6JL	*	150,552	304	246
*DL6EDD	*	30,831	151	129
***DL1TH**	**14**	**230,256**	**424**	**328**
*DJ3PP	*	74,464	240	208
*DL4AAE	*	54,538	163	134

SPAIN

AN5FV	**A**	**3,893,192**	**2397**	**776**
AN5YU	**A**	**1,651,692**	**1474**	**588**
EA3NR	*	174,000	345	250
AM1AEH	*	89,052	256	181
EA1FBJ	*	64,400	211	175
EA1EQ	*	56,730	215	155
EA1VM	*	44,888	141	124
EA1JO	**21**	**325,076**	**464**	**362**
EA3ALV	*	280	11	10
***AN7GTF**	**A**	**3,250,755**	**2135**	**705**
***EA4NP**	**A**	**1,779,718**	**1540**	**626**
***AM4DRV**	**A**	**1,770,306**	**1725**	**586**
*EA7WA	*	1,734,603	1313	563
*EA2BNU	*	740,328	807	436
*AN7AJR	*	616,196	939	413
*EA1CS	*	502,653	624	411
*AN7NW	*	477,102	632	393
*AM5AVC	*	416,060	657	355
*EA3GIP	*	411,680	543	332
*EA1WX	*	177,859	345	253
*AN2BDS	*	131,906	268	202
*EA7CWA	*	113,160	242	205
*EA5EOH	*	85,085	215	143
*EA3AXM	*	27,965	136	119
*EA5BKV	*	27,612	140	118
*EA7CA	*	23,584	95	88
*EA7FZ	*	20,470	124	115
*EA5ABE	*	19,364	107	94
*EA4BNQ	*	13,432	100	92
*EA5AL	*	8,151	64	57
*EA3RE	*	340	18	17
***EA1BRB**	**28**	**11,189**	**69**	**67**
*EA1BYA	*	2,496	32	32
***EA2AZ**	**21**	**738,655**	**843**	**485**
*AN7KJ	*	404,352	647	384
*EA4EFJ	*	158,613	323	249
***EA1FEQ**	**14**	**113,544**	**300**	**249**
*EA1ND	*	24,395	133	119

BALEARIC IS.

***EA6NB**	**A**	**331,982**	**689**	**322**
*ED6DD	*	254,898	477	306

IRELAND

***EI4DW**	**A**	**765,994**	**862**	**449**
***EI4CF**	**21**	**218,868**	**368**	**299**

ESTONIA

ES1AJ	**A**	**2,516,721**	**1926**	**659**
ES4RD	**7**	**648,648**	**696**	**364**
ES6CO	**3.5**	**28,800**	**123**	**100**
***ES2U**	**A**	**1,438,110**	**1250**	**551**
				(Op: ES2DJ)
***ES5GI**	**28**	**20,009**	**121**	**107**
***ES1TM**	**21**	**155,433**	**363**	**263**
***ES2EZ**	**14**	**237,144**	**505**	**328**

BELARUS

EW/NP3D	**14**	**2,268,735**	**1627**	**697**
EW6MM	**7**	**586,530**	**575**	**343**
***EW1CQ**	**A**	**999,186**	**1072**	**482**
***EU1MM**	**A**	**916,272**	**986**	**504**
*EW3LN	*	166,391	355	227
*EU1CC	*	364	14	14
***EV6Z**	**21**	**114,848**	**258**	**194**
***EU2MM**	**14**	**826,827**	**927**	**521**
*EV6M	*	135,675	311	225
***EW1MN**	**7**	**235,144**	**342**	**247**
***EW6AL**	**3.5**	**29,715**	**123**	**105**
***EU6DX**	**1.8**	**28,886**	**131**	**101**

FRANCE

TM9C	**A**	**4,273,126**	**2572**	**737**
				(Op: F5IN)
TM5B	**A**	**1,233,424**	**1497**	**508**
F5TNI	*	604,506	663	389
TM7XX	**21**	**3,274,796**	**2016**	**763**
				(Op: F5MUX)
***F5JBR**	**A**	**1,126,476**	**1092**	**498**
***F3GJ**	**A**	**973,557**	**1023**	**477**
***F5ICC**	**A**	**787,968**	**801**	**432**
*F6IRF	*	712,236	794	427
*F6GQO	*	307,040	512	304
*F6AUS	*	271,986	417	317
*F5SGI	*	218,396	390	284
*F5LMJ	*	185,565	369	267
*F/G3VQO/P	*	114,525	323	225
*F5NEV	*	41,019	146	121
*F5JDG	*	12,936	86	77
*F5JQG	*	3,689	59	31
*F2FX	*	3,564	53	44
***F6FTB**	**21**	**268,467**	**405**	**327**
*F5JY	*	225,903	389	293
***F5NLY**	**14**	**838,924**	**859**	**524**
*F8BPN	*	432,768	636	392

ENGLAND

G4BJM	**A**	**967,434**	**1106**	**474**
G4ZVJ	**A**	**483,257**	**600**	**353**
G3UFY	*	103,716	233	172
MØTTT	**7**	**1,829,284**	**1175**	**524**
GØCKP	**3.5**	**279,549**	**415**	**267**
***G5X**	**A**	**1,982,091**	**1563**	**599**
				(Op: MØBRK)
***M7W**	**A**	**1,929,501**	**1685**	**567**
				(Op: G4IIY)
***G5LP**	**A**	**1,543,746**	**1393**	**563**
*G3KKP	*	857,789	919	457
*G4OGB	*	733,044	896	444
*G3OOU	*	508,352	693	376
*G4KFT	*	442,911	606	393
*G4DDX	*	362,232	593	344
*G4WFQ	*	346,320	518	312
*GØ/N9LYE	*	183,521	406	247
*GØUKX	*	122,982	297	206
***G3RSD**	**21**	**238,084**	**397**	**308**
***M4T**	**14**	**361,185**	**673**	**363**
				(Op: GØVQR)
*G3TJE	7	798,183	640	393

SCOTLAND

GM4SID	**A**	**1,629,650**	**1520**	**550**
***GM4UYZ**	**A**	**4,845**	**59**	**57**

GUERNSEY

MU/DL7ET	**A**	**321,708**	**658**	**323**
***MUØFAL**	**A**	**394,605**	**627**	**333**

WALES

GW7X	**7**	**2,045,520**	**1248**	**540**
		(Op: GW3NJW)		

HUNGARY

HA8JV	**A**	**4,456,756**	**2504**	**772**
HGSØRT	**A**	**2,561,064**	**1809**	**654**
				(Op: HA6NL)
HA3LI	**A**	**1,548,396**	**1459**	**531**
HA9PP	*	1,116,808	962	518
HA6PQ	*	882,797	970	479
HA1A	**28**	**517,244**	**700**	**406**
				(Op: HA1YA)
HA5PT	*	80,224	204	184
HA9RU	**21**	**1,938,578**	**1402**	**629**
HA8DU	**7**	**1,838,200**	**1106**	**520**

HG1R	7	1,257,648	996	456
		(Op: HA1XO)		
*HG9M	A	300,348	485	309
		(Op: HA5MY)		
*HA3OU	"	189,527	327	239
*HA8EU	28	254,881	459	319
*HA8MD	21	1,564,998	1229	582
*HG4F	14	1,652,708	1317	596
*HA4FV	3.5	283,008	491	264

SWITZERLAND

HB9CZF	A	976,885	867	455
HB9KC	"	128,700	266	225
*HB9ARF	A	1,656,633	1480	561

LIECHTENSTEIN

*HBØ /HB9HAW	7	363,550	459	275

ITALY

IK2AHB	A	241,434	487	306
I2AZ/1	"	53,655	207	147
IK1QBT	28	349,536	579	352
IQ3X	21	2,790,612	1748	729
		(Op: IV3SKB)		
IKØYVV	14	3,000,831	1883	787
II1H	"	595,980	766	430
I2SVA	"	11,390	74	67
I1NVU	3.5	248,880	428	255
IK4AUY	1.8	19,720	116	85
*IK3SCB	A	143,389	375	223
*IK2WYI	A	108,138	284	201
*I6FDJ	"	67,704	220	168
*IN3FHE	"	56,088	166	164
*IZØAIS	"	41,785	211	137
*IK2NCF	"	25,500	116	100
*IKØXEZ	"	17,544	91	86
*IV3YDD	"	13,158	97	86
*IK2REA	"	475	19	19
*IK2AIT	21	30,008	138	121
*IR2V	14	391,210	550	355
		(Op: I2WIJ)		

SARDINIA

ISØIGV	A	750,690	839	439
*ISØHQJ	A	591,072	817	393
*ISØOMH	"	421,473	589	321

SICILY

*IT9ORA	A	147,840	297	231

NORWAY

LA7MFA	A	3,227,794	2064	694
LA6FJA	A	361,566	505	318
*LA3BO	"	2,060,064	1639	622
*LA5UF	A	1,594,979	1491	563
*LA9HFA	A	1,124,745	1323	501
*LA8OM	"	259,251	496	309
*LA1YE	21	20,907	111	101
*LA7AK	14	485,181	665	423

LITHUANIA

LY7Z	A	5,561,731	2735	839
		(Op: LY2TA)		
LY2MW	A	4,560,936	1646	1416
LY2CY	A	3,532,035	2009	767
LY1CX	"	1,160,016	1081	507
LY2MM	"	1,156,467	1012	507
LY3IW	"	359,121	519	343
LY2OO	"	331,248	539	309
LY2KM	"	146,685	277	231
LY2OX	"	127,104	272	192
LY3BH	"	28,500	135	125
LY2GV	28	155,400	390	259
LY2LF	14	31,000	146	124
LY2BW	1.8	176,820	374	210
*LY2FN	A	1,406,556	1288	534
*LY2DX	A	591,240	724	379
*LY3BX	A	498,490	622	395
*LY3ID	A	416,944	571	368
*LY2BBF	"	95,645	245	185
*LY3CY	"	32,412	135	111
*LY2AT	28	35,209	155	137
*LY2OU	"	4,042	46	43
*LY2TE	"	76,804	232	182
*LY5A	14	1,478,880	1252	632
		(Op: LY2PAJ)		
*LY6A	14	1,428,480	1230	620
		(Op: LY2BM)		
*LY1CT	"	178,464	384	286
*LY3NT	3.5	219,020	432	233
		(Op: LY1DI)		
*LY3CW	"	144,628	313	209
*LY2GW	1.8	26,622	130	102

BULGARIA

LZ2PL	A	1,611,462	1406	547
LZ1QZ	A	392,368	574	358
LZ2DL	"	322,127	734	349
LZ6C	14	391,230	734	378
LZØ2JP	3.5	15,478	94	71
*LZ1AQ	A	336,472	489	307
*LZ5ZI	A	191,525	329	235
*LZ2BE	"	133,352	279	211
*LZ1NJ	"	12,312	118	54
*LZ1XL	28	170,775	340	253
*LZ2NB	"	14,640	81	80
*LZ1EP	"	11,830	72	65
*LZ1KP	21	160,292	308	246
*LZ2ITU	"	5,720	64	55
*LZ7H	14	269,912	456	332
*LZ2L	3.5	383,526	547	298
		(Op: LZ2LDS)		
*LZ1DQ	1.8	50,952	183	132
*LZ2RF	"	15,488	75	64

AUSTRIA

OE1A	A	4,120,290	2293	765
		(Op: OE1EMS)		
OE5CWL/5	A	1,600,655	1329	551
OE9SLH	"	157,165	290	215
OE3I	21	1,607,001	1193	627
		(Op: OE1JNB)		
*OE5T	14	6,633	73	67
		(Op: OE5OHO)		

FINLAND

OH2VZ	A	336,501	495	309
OH6NJ	28	101,835	345	219
OH8VJ	"	37,240	194	140
OH7M	21	2,037,863	1473	661
		(Op: OH4XX)		
OH3WW	21	1,995,568	1416	653
OH4A	14	3,152,848	1974	772
		(Op: OH6QU)		
OH8L	14	1,634,779	1355	619
		(Op: OH8LQ)		
OH7KD	"	1,443,514	1323	614
OH3BU	7	517,140	589	340
OH2BCI	3.5	340,101	522	279
OH3XR	"	236,379	424	247
*OI6AY	A	1,048,840	1143	520
		(Op: OH4II)		
*OH2FS	A	405,916	448	436
*OH2BLI	"	264,435	498	305
*OH6RC	"	198,596	375	262
*OH2LU	"	127,801	296	227
*OH2BNX	"	9,490	66	65
*OH3RB	28	220,158	549	302
*OH3WS	21	108,650	232	205
*OH3IR	14	18,432	102	96

ALAND IS.

OHØR	A	6,104,280	3140	845
		(Op: OH2PM)		

CZECH REPUBLIC

OK1RI	A	5,455,317	2617	833
OL5Y	A	3,350,520	2001	738
		(Op: OK1FUA)		
OL4M	A	1,359,780	1278	524
OK1AOV	"	1,175,004	1007	514
OK1OX	"	859,328	904	464
OK1ZF	"	538,650	634	378
OK1DOS	"	215,160	389	264
OK1DVK	"	129,584	272	182
OK1AUC	28	96,408	250	206
OK2ABU	"	93,262	248	211
OL7D	"	9,315	75	69
		(Op: OK1DTP)		
OK2ZC	21	1,603,126	1237	602
OL3E	"	543,400	630	418
		(Op: OK1MBZ)		
OK5W	14	2,591,276	1698	719
		(Op: OK2ZW)		
OK2BVG	7	1,224,636	894	478
OK1XC	"	908,028	752	396
OK1RR	3.5	395,632	551	313
OK1WF	"	312,950	516	275
*OK2PP	A	3,489,237	2155	747
*OK1BA	A	1,853,052	1304	614
*OK1HX	A	1,602,328	1266	568
*OK2DU	"	1,513,264	1334	542
*OK1ZP	"	1,232,175	1103	525
*OK2WH	"	1,134,084	1097	483
*OK2PDT	"	1,041,929	1023	511
*OK1VD	"	962,336	910	493
*OK1MKI	"	856,625	920	445
*OK2KLD	"	854,733	979	439
		(Op: OK2BU)		
*OK1FCA	"	784,938	814	462
*OK7AZ	"	772,885	825	467
		(Op: OK2ON)		
*OK2SGY	"	587,301	659	407
*OK2BND	"	573,804	736	396
*OK1DXD	"	536,042	626	389
*OK2BMT	"	458,150	544	374
*OK2TBC	"	408,483	561	369
*OK1HGM	"	406,587	589	313
*OK2BDF	"	297,616	427	304
*OK2FB	"	281,610	504	298
*OK1TFH	"	252,192	393	284
*OK1DSX	"	245,479	380	299
*OK2SWD	"	227,420	398	274
*OK2PEF	"	221,709	413	281
*OK2PBG	"	193,018	332	238
*OK1AXB	"	181,545	325	245
*OK1AYY	"	181,536	341	244
*OK2BGK	"	146,331	279	213
*OK2BWC	"	137,940	278	209
*OK2BNC	"	126,260	289	214
*OK2TCW	"	125,460	265	204
*OL4OU	"	108,800	294	170
		(Op: OK1HCG)		
*OK1AUP	"	79,248	192	156
*OK1MZO	"	67,184	171	152
*OK1FFH	"	49,594	160	137
*OK6CW	"	41,100	197	150
		(Op: OK1HCG)		
*OK1SRD	"	40,392	145	132
*OK5SWL	"	15,484	99	79
*OK1AOU	"	4,284	44	42
*OK1RV	"	1,271	33	31
*OK2GG	28	116,840	302	230
*OK1FPS	21	688,827	723	447
*OK2NN	"	554,193	627	443
*OK2QX	"	434,910	542	399
*OK1MMN	"	104,345	249	205
*OK1XGL	"	24,056	114	97
*OK1JDJ	14	20,952	114	108
*OK2KJ	7	271,440	365	261
*OK1TGI	"	261,159	396	263
*OK1CZ	"	182,484	289	222
*OK2BPL	"	175,336	275	217
*OK1SI	"	100,464	221	182
*OK2ZV	3.5	322,640	529	296
*OK2SNX	1.8	45,312	202	118

SLOVAKIA

OM3OM	A	1,515,150	1269	546
OM2RA	A	496,172	610	326
OM3DX	"	1,045	21	19
OM3NA	21	2,481,656	1574	716
OM7PY	"	258,633	403	309
OMØWR	7	1,341,424	933	472
OM3ZWA	3.5	343,621	537	289
*OM4DN	A	987,816	1039	474
*OM6RM	A	936,684	995	441
*OM4TX	A	915,348	950	476
*OM3GB	"	582,144	577	384
*OMØTT	"	538,475	481	425
*OM1II	"	522,264	622	376
*OM7AG	"	514,483	661	401
*OM3PQ	"	484,584	585	366
*OM7AT	"	205,164	441	278
*OM4DA	"	193,765	401	271
*OM7YC	"	114,276	254	214
*OM7CA	14	621,452	762	481
*OM7VF	14	237,652	402	311
*OM3TB	"	204,462	392	307
*OM1AW	"	131,327	305	257
*OM3CDN	"	59,094	200	178

BELGIUM

*OR6NR	A	1,508,715	1322	585
		(Op: ON4RU)		
*ON/OM1KWA		1,042,548	1032	489
*ON4KJ	"	218,816	406	263
*ON5HY	"	79,104	240	192
*ON4KVA	"	9,100	70	65
ON5JD	"	14,620	90	86
*OT2H	21	1,305,034	1166	563
		(Op: ON4IT)		
*OR6UQ	"	240,864	400	312
*OS5ZO	14	134,932	335	244
		(Op: ON5ZO)		
*OR6TJ	1.8	2,160	36	30

FAROE IS.

*OY1CT	A	591,360	989	420

DENMARK

OZ7YL	7	101,913	203	161
OZ4OC	"	3,150	39	35
*OZ8AE	A	1,325,643	1126	561
*OZØRS	A	472,188	703	361
*OZ5UR	"	377,880	547	335
*OZ8SW	"	65,670	202	165
*OZ4FF	"	49,226	180	151
*OZ4RT	"	30,774	138	138
*OZ1BMA	14	163,300	333	284
*OZ1ETA	"	103,840	308	220

THE NETHERLANDS

PAØJNH	A	295,274	413	322
PA5TT	"	118,374	296	218
PA5WT	21	297,990	497	330
PB7CW	"	102,109	301	203
*PA3BFH	A	491,022	625	378
*PA/DJ2YE	A	150,960	266	204
*PA5FN	"	120,600	336	225
*PA2ALF	"	69,174	225	183
*PAØLSK	"	16,653	99	91
*PAØADP	"	14,151	93	89
*PAØLRK	"	11,040	69	69
*PAØRRS	21	293,328	445	336
*PAØJED	14	204,756	364	302

MALYJ VYSOTSKIJ IS.

R1MVI	1.8	158,760	387	196
		(Op: RA1ACJ)		

SLOVENIA

S58A	A	5,899,009	2824	839
S53FO	"	532,602	666	378
S59ABC	14	2,668,284	1696	747
		(Op: S51DS)		
S52LW	7	821,332	742	404
S57M	1.8	195,776	401	224
*S58MU	A	461,104	570	368
*S58RU	A	122,112	299	212
*S51NZ	"	100,746	244	193
*S51JM	"	34,770	131	114
*S57Z	14	1,132,716	1089	548
*S53F	7	1,060,605	906	441
*S54A	"	944,350	783	425

SWEDEN

8S5A	A	4,165,412	2571	778
		(Op: SM5AJV)		
SM6WQB	A	517,228	692	382
SM3R	"	116,017	277	199
		(Op: SM3CBR)		
SM3AF	"	49,725	214	153
SM6CDG	14	3,942	59	54
SM2T	7	827,407	697	409
		(Op: SM2EZT)		
7S3J	"	209,960	338	232
*SM5G	A	2,129,026	1644	626
		(Op: SM5JBM)		
*SM2KAL	A	687,650	1122	425
*7S5Q	A	608,192	755	416
		(Op: SM5COP)		
*SM7EH	"	481,768	650	392
*SM3AVW	"	346,880	587	320
*SM6NET	"	324,064	545	328
*SM6BSK	"	228,550	350	350
*SM7BVO	"	116,480	296	224
*SM5RE	"	98,107	270	199
*8SØW	"	65,943	218	153
		(Op: SMØNJO)		
*7S4A	"	50,386	140	118
		(Op: SM4ATJ)		
*SM7BQX	"	38,500	144	125
*SM6C	"	36,630	129	110
		(Op: SM6CTQ)		
*SM6DUA	"	15,921	92	87
*SM3EAE	"	1,431	27	27
*7S2E	21	9,918	104	87
		(Op: SM2DMU)		
*SMØKV	"	3,828	91	87
*SM7VZX	14	1,093,453	1031	547
*8SØF	"	488,684	744	434
		(Op: SMØOGO)		
*SM6CRM	"	270,063	423	333
*8S6A	7	256,425	402	263
		(Op: SM6DPF)		

POLAND

SN7Q	A	6,634,037	3040	857
		(Op: SP7GIQ)		
SP4AVG	A	194,307	368	239
SP3XR	"	115,746	273	202
SP2HPM	"	74,025	257	175
SP2AYC	"	16,571	87	73
SN8V	28	365,258	583	362
		(Op: SP8LBK)		
SN3A	21	2,631,200	1616	715
		(Op: SP8NR)		
SP8GWI/8	14	484,575	605	325
SP2JGK	"	60,230	245	190
SP6AZT	3.5	212,949	398	239
*SP6LV	A	1,114,000	1029	500
*SP2DNI	A	872,818	995	466
*SP9GFI	A	771,486	848	426
*SP2OG	"	499,720	670	310
*SP9GKM	"	454,425	646	365
*SP3HC	"	432,000	590	375
*SP3DIK	"	389,572	586	337
*SP8FHJ	"	299,495	472	301
*SP5HNK	"	259,794	438	283
*SP5UAF	"	205,592	358	248
*SP2HMT	"	203,310	411	251
*SP3OL	"	196,300	368	260
*SQ9FMU	"	180,594	318	237
*SP5CGN	"	179,816	341	266
*SP6IHE	"	127,517	285	221
*SP9IBJ	"	99,640	260	212
*SP2AVE	"	95,387	250	181
*SP4GHL	"	85,590	305	135
*SO1RON	"	85,056	235	192
*SP7FBQ	"	81,069	233	183
*SP6BEN	"	80,990	200	178
*3ZØCDP	"	50,386	159	122
*SP8GNF	"	41,844	159	132
*SP9EMI	"	38,142	136	117
*SP4JTJ	"	27,359	123	109
*SP9NFB	"	19,339	97	83
*SP5JSZ	"	17,177	101	89
*SP6FJ	"	14,560	72	65
*SQ9MZ	"	3,672	41	34
*SP6RGC	"	1,898	27	26
*SP6GNJ	"	1,625	25	25
*SP5LCC	28	82,703	223	191
*SP9NSV	28	70,520	198	172
*SP2BLC	"	30,500	133	122
*SP4DC	"	17,670	100	95
*SP3LWP	"	10,281	72	69
*SQ8GHJ	"	2,460	32	30
*SP4DEU	21	768,900	742	466
*SQ9PM	"	83,993	219	169
*SP9MCU	"	34,650	139	126
*SP8BAB	14	434,676	580	407
*SP2EXE	14	333,776	555	368
*SP5ICS	"	146,880	334	270
*SP9EWO	"	26,880	145	128
*SP2FWC	"	13,992	97	88
*SP9DUX	3.5	93,740	254	172
*SQ2HEB	1.8	149,129	354	197
*SN5Z	1.8	810	19	18
		(Op: SP5MBQ)		

GREECE

J41YM	A	4,258,600	2691	796
		(Op: OK1YM)		
*J48LZ	A	806,589	1059	441
		(Op: LZ1QN)		
*SV1DKL	21	538,479	743	423
*SV1XV	3.5	1,998	31	27

DODECANESE

SV5/DJ5AA/P	A	584,064	872	384
*J45KLN	A	623,238	995	426
		(Op: SMØCMH)		

TURKEY (EUROPE)

TAØ/Z37M	14	2,770,304	2092	736
		(Op: Z31GX)		
TAØ/YU7AV	7	2,187,068	1349	548
TAØ/Z33F	3.5	577,408	727	347

BOSNIA-HERZEGOVINA

*T94YT	A	603,313	740	391
*T94NO	28	473,480	746	380
*T97Y	21	200,109	383	273
*T91GJK	"	260	10	10
		(Op: T92T)		
*T94FC	14	1,075,870	1065	542
*T97J	7	180,042	328	222

ICELAND

*TF3GB	A	811,899	969	417
*TF3IRA	14	14,080	98	88

EUROPEAN RUSSIA

RK4FF	A	4,143,007	2457	817
RZ3AZ	A	3,245,508	2101	756
RN6AL	A	2,778,844	2057	661
RM3C	"	2,577,960	1852	682
		(Op: RA3CW)		
RW4PL	"	2,008,208	1582	626
UA4WA	"	2,003,440	1709	634
RN4WA	"	1,975,180	1701	610
RA3NN	"	1,593,592	1456	572
UA4RF	"	1,079,456	1062	553
UA3AGW	"	705,120	741	390
RA3XO	"	519,786	618	402
RK3AD	"	383,560	551	344
RU6LWT	"	361,350	505	330
		(Op: R6L-551)		
RX3AEX	"	245,280	457	292
UA3UJE	"	161,250	292	215
RV1CC	"	139,378	333	227
UA3MDX	"	126,876	346	218
RK6BZ	"	87,576	241	178
RU3DX	"	74,520	200	180
UA6JY	"	67,014	179	146
RA3ANL	28	40,552	158	137
RF4R	21	1,301,960	1112	605
		(Op: UA4RC)		
RV6LSS	21	984,632	969	536
RA3TT	14	1,335,498	1237	618
RN3CT	14	758,784	916	512
UA3DNR	"	718,704	890	504
RW4LC	"	437,660	616	395
RA1OZ	"	367,680	634	383
RT3A	"	18	3	3
RW3GB	3.5	294,848	484	271
UA4CCG	3.5	275,355	465	261
*RG9O	A	1,719,130	1768	574
		(Op: RZ9OU)		
*UA3ABJ	A	1,676,160	1355	576
*RU3FF	A	1,457,192	1251	571
*RN6CF	"	1,308,619	1194	559
*UA3PW	"	1,078,896	1130	494
*RN4SS	"	988,428	1118	492
*RK3BX	"	972,076	1050	466
*UA1ZZ	"	841,750	924	481
*UA6JD	"	773,415	786	459
*RA6HR	"	720,838	852	439
*RA3UAG	"	709,344	781	432
*RZ4AG	"	707,105	746	445
*RX3RZ	"	612,465	790	399
*UA4WLI	"	548,328	841	372
*RW6BN	"	545,259	755	403
*UA4FEN	"	499,484	679	386
*RX3AGQ	"	316,848	525	336
*RZ3VA	"	303,264	451	351
*RW3AX	"	295,785	475	313
*RU4CO	"	281,170	495	310
*RA6LAE	"	198,170	407	266
*RN1AO	"	117,152	281	224
*UA3UNP	"	113,296	243	194
*RA3WDK	"	88,894	208	169
*UA3XAC	"	80,850	199	154
*UA3VLO	"	80,712	208	171
*RU3WR	"	73,871	238	173
*RA6AR	"	65,849	207	161
*RN3AY	"	57,888	182	144
*RA3FH	"	51,246	171	146
*UA1ANA	"	35,520	121	96
*RA1AR	"	23,030	123	94
*RU3DM	"	21,432	108	94
*UA3UBT	"	9,796	66	62
*RU3XB	28	6,032	60	58
*RN3AX	"	300	10	10
*UA3DPX	21	930,510	869	490
*UA1ANX	"	243,960	408	285
*UA4UBW	"	22,152	118	71
*RV3ACA	14	936,330	1052	529
*RA1OK	14	523,712	705	448
*RA3AN	"	458,080	676	409
*RW3XZ	"	429,128	668	388
*UA1ONG	"	304,300	500	358
*UA4NF	"	268,332	492	354
*UA3SAQ	"	61,254	199	166
*UA4PAY	"	23,546	135	122
*UA3XGW	"	19,899	105	99
*RN3AQ	"	5,564	57	52
*RA6FV	7	302,918	434	281

*RX6LDK	"	131,904	304	192
*RV6LFE	"	1,850	28	25
***RU6FA**	**3.5**	**201,865**	**387**	**235**
***UA6AKD**	**3.5**	**84,150**	**245**	**165**
*RW6AH	"	49,920	170	128
*RN6AI	"	41,697	158	123

KALININGRADSK

UA2FM	**28**	**590,499**	**811**	**441**
UA2FB	**7**	**2,481,124**	**1339**	**586**
RV2FW	**3.5**	**760,886**	**800**	**391**
RN2FA	**1.8**	**242,000**	**458**	**242**

UKRAINE

UY3QW	**A**	**2,906,288**	**1992**	**674**
EOØIDX	**A**	**1,930,850**	**1834**	**575**
		(Op: UX7IA)		
UR5E	**A**	**473,496**	**625**	**327**
		(Op: UR5EDX)		
UY5ZZ	"	449,985	663	393
UR7EU	"	324,800	488	320
UT4EO	"	20,460	108	93
UR5IOK	**28**	**295,805**	**479**	**335**
UR6F	**21**	**2,817,612**	**1697**	**756**
		(Op: UXØFF)		
UXØIB	**21**	**1,035,112**	**1002**	**538**
UYØZG	"	638,910	690	465
UT7UJ	"	38,735	145	127
UZ8M	**14**	**1,830,400**	**1480**	**650**
		(Op: USØMR)		
UT5PX	"	379,822	574	359
UT5HP	"	297,270	424	405
UR8QX	**7**	**1,819,593**	**1075**	**543**
UX5I	**3.5**	**305,982**	**499**	**267**
		(Op: UT5IZ)		
UX1IL	"	35,828	150	106
***UW8M**	**A**	**2,126,632**	**1692**	**646**
***UT1QW**	**A**	**1,650,968**	**1342**	**584**
***UY5TE**	**A**	**1,037,456**	**1081**	**472**
*UR6QS	"	1,035,870	1027	473
*US3IZ	"	1,018,098	1014	489
*UT8IT	"	864,416	935	454
*UY1U	"	824,140	896	445
*UT2QQ	"	592,620	739	415
*UY5ZI	"	505,586	634	379
*UR5FIS	"	375,410	535	346
*UT5ECZ	"	245,630	466	290
*UR5FCM	"	153,360	319	213
*UY1M	"	141,912	299	216
		(Op: UR9MM)		
*UR5XCW	"	118,190	275	165
*UT1EJ	"	63,360	182	144
*US8IBS	"	45,885	166	133
*UTØRM	"	16,324	86	77
		(Op: UTØRM)		
*UT5UGQ	"	403	15	13
***EO1I**	**28**	**73,211**	**225**	**179**
		(Op: UT1IA)		
*UU2JA	"	5,520	48	46
***US7IGF**	**21**	**375,920**	**534**	**370**
*UX3HA	"	58,190	257	110
***UR6IJ**	**14**	**803,760**	**888**	**510**
***US8IM**	**14**	**342,360**	**559**	**360**
		(Op: US8IZM)		
*UX8IX	"	332,288	606	352
*UY2ZA	"	316,680	514	364
*UT2AU	"	248,847	443	327
*UX7QD	"	116,325	325	235
*UR5NX	"	92,288	262	206
*UY5YA	"	74,052	214	187
*UT3EK	"	62,336	215	182
***UW2F**	**7**	**551,088**	**632**	**344**
		(Op: UTØFT)		
***UT8AS**	**7**	**378,000**	**476**	**300**
*USØHZ	"	377,487	498	297
*UT4PZ	"	145,668	269	199
*UW7Q	"	85,162	196	158
		(Op: UR7QM)		
*UY3AW	"	64,974	182	147
***UR3HC**	**3.5**	**300,810**	**505**	**271**
***UT1FA**	**1.8**	**91,410**	**247**	**165**

LATVIA

YL2KO	**A**	**3,201,050**	**1899**	**730**
YL6W	**14**	**2,342,340**	**1714**	**715**
YL2PQ	**1.8**	**143,613**	**333**	**197**
***YL/RZ3BY**	**A**	**3,020,820**	**2169**	**690**
***YL5W**	**A**	**1,559,444**	**1276**	**578**
*YL2PA	"	337,932	499	324
*YL2TW	"	88,060	241	170
*YL2NK	"	38,252	140	131
*YL2PN	"	17,640	96	84
***YL5M**	**14**	**292,922**	**530**	**343**

ROMANIA

YO9HP	**A**	**1,881,152**	**1465**	**608**
YP8A	"	244,512	439	288
YP3A	**21**	**2,097,225**	**1595**	**675**
		(Op: YO3GRE)		
YO4NF	**14**	**2,640,410**	**1815**	**730**
***YO2NAA**	**A**	**768,948**	**814**	**417**
***YO4ATW**	**A**	**427,614**	**549**	**363**
*YO3APJ	"	374,213	490	343
*YO2CJX	"	233,298	398	234
*YO8RFS	"	226,486	409	281
*YO4CSL	"	90,304	316	136
*YO4GDP	"	89,240	239	184
*YO4RLP	"	35,258	150	122
***YO3KYO**	**28**	**2,409**	**33**	**33**
***YO2AQB**	**21**	**104,310**	**211**	**190**
***YO9FYP**	**14**	**162,624**	**424**	**264**
*YO2GL	"	82,812	234	201
*YO3FN	"	52,323	111	107
***YO2BEH**	**1.8**	**5,220**	**58**	**45**

YUGOSLAVIA

YU8/LZ1BJ	**A**	**1,537,250**	**1413**	**550**
YU8/OK1CRM	**A**	**717,402**	**853**	**399**
YZ1AU	**28**	**1,293,666**	**1230**	**561**
4N1A	"	42,944	152	122
		(Op: YU1UA)		
YU1ATA	**14**	**896,940**	**983**	**540**
YU1KX	**3.5**	**402,435**	**582**	**297**
YZ1W	**1.8**	**161,616**	**359**	**208**
		(Op: YU1YV)		
YU1UA	"	66	6	6
YZ1MA	"	60	6	6
***YZ9A**	**A**	**3,455,848**	**2157**	**692**
		(Op: YU1NW)		
***YT1LT**	**A**	**1,325,092**	**1155**	**514**
***YZ1KA**	**A**	**707,272**	**832**	**419**
*YU1KT	"	558,453	697	393
*YU1EQ	"	361,820	448	316
*YU7RN	"	268,481	427	289
*YU1AB	"	245,644	385	283
*YU1INO	"	166,124	352	238
*4N7A	"	20,740	119	85
*YTØT	"	16,464	99	84
***YU1AU**	**28**	**630,924**	**757**	**444**
*4N1N	"	338,613	543	331
		(Op: 4N1JA)		
*YU7W	"	284,256	464	329
		(Op: YU7WW)		
***YU7KWX**	**21**	**1,083,316**	**1022**	**502**
		(Op: YU7CF)		
*YU7KS	"	428,352	535	388
***YT7A**	**14**	**2,114,460**	**1430**	**691**
*YU7KM	"	222,789	419	309
***YZ1U**	**7**	**1,051,090**	**851**	**445**
		(Op: YT1UR)		
*YZ1V	"	785,242	776	394
		(Op: YZ1ZV)		
*YU7IAB	"	275,098	392	263
*YT1LD	"	32,548	134	103
***YU7DP**	**3.5**	**34,730**	**140**	**115**
*YU1GFG	"	15,450	97	75
		(Op: 4N1JA)		
***YU1EA**	**1.8**	**71,550**	**234**	**150**

MACEDONIA

Z39Z	**3.5**	**630,360**	**750**	**360**
		(Op: Z32AF)		
***Z33A**	**28**	**163,440**	**309**	**240**
***Z37A**	**21**	**671,885**	**777**	**415**
		(Op: Z35G)		

OCEANIA

SAIPAN

WHØV	**A**	**1,027,325**	**843**	**377**

HAWAII

KH6ND	**A**	**7,996,774**	**2952**	**862**
***KH7CD**	**A**	**2,677,476**	**1482**	**534**

AUSTRALIA

VK8AV	**A**	**660,297**	**540**	**363**
VK4WPX	**A**	**12,626**	**76**	**59**
VK5GN	**A**	**8,836**	**64**	**47**
***VK8JAC**	**A**	**86,265**	**186**	**135**
***VK3DBQ**	**A**	**50,568**	**139**	**129**
***VK4TT**	**28**	**409,165**	**469**	**295**
***VK4DX**	**14**	**1,623,804**	**1002**	**546**

INDONESIA

***YBØGJS**	**A**	**2,407,439**	**1407**	**569**
***YC1VBH**	**7**	**39,156**	**85**	**78**

NEW ZEALAND

ZL1BYZ	**A**	**286,596**	**425**	**228**
ZL1ALZ	"	62,244	167	126
***ZL1AIH**	**A**	**480,320**	**518**	**316**

SOUTH AMERICA

CHILE

3G1X	**A**	**4,844,310**	**2079**	**678**
		(Op: XQ1IDM)		
CC6E	"	115,656	250	158
		(Op: AD6TF)		
***XQ1ZW**	**A**	**1,522,384**	**1019**	**493**
***CB4A**	**7**	**28,296**	**75**	**66**
		(Op: CE4USW)		

URUGUAY

***CX7BY**	**21**	**726,516**	**650**	**378**

FRENCH GUIANA

***FY5FY**	**A**	**4,918,300**	**2235**	**685**

ARGENTINA

AY7EE	**A**	**2,064,387**	**1151**	**559**
LO7H	**A**	**1,179,264**	**825**	**444**
		(Op: LU7HN)		
AY1DZ	"	157,731	268	203
***LT1F**	**28**	**2,344,895**	**1335**	**595**
		(Op: LU1FAM)		
***L51EXU**	**28**	**2,118,168**	**1282**	**558**
		(Op: LW1EXU)		
***LP5F**	**28**	**1,357,979**	**993**	**463**
***LU5FB**	**21**	**813,780**	**674**	**411**
		(Op: LU1AEE)		
***L73F**	**A**	**4,616,608**	**2188**	**712**
		(Op: LU5FF)		
***LU1EWL**	**A**	**2,011,368**	**1284**	**516**

PERU

OC4WW	**A**	**11,058,312**	**3439**	**881**
		(Op: OHØXX)		

ARUBA

P41P	**A**	**12,230,052**	**3827**	**919**
		(Op: KØDQ)		
P4ØY	**A**	**10,700,004**	**3508**	**889**
		(Op: AE6Y)		
P43JB	**21**	**119,598**	**219**	**186**

NETHERLANDS ANTILLES

PJ2U	**A**	**9,053,040**	**2986**	**804**
		(Op: K6LA)		
PJ4M	**A**	**5,017,584**	**2049**	**663**
		(Op: K2QM)		

BRAZIL

ZX5J	**28**	**6,787,440**	**2664**	**857**
		(Op: IV3NVN)		
PU3A	**21**	**5,746,284**	**2376**	**813**
		(Op: PY3DX)		
PY2NY	**14**	**2,282,160**	**1305**	**592**
PY2NDX	**7**	**1,971,172**	**761**	**452**
PV8DX	**3.5**	**5,568**	**32**	**32**
***PX2W**	**A**	**7,814,556**	**2936**	**813**
		(Op: PY2YU)		
***PY2NA**	**A**	**1,017,288**	**845**	**398**
***PY4FQ**	**A**	**701,337**	**635**	**367**
*PU7EEL	"	432,141	440	283
*PP7CW	"	227,424	294	206
*PY2ZI	"	196,100	315	212
*PP2RON	"	127,386	236	189
*PY7OJ	"	91,608	178	132
*PY3AU	"	90,576	197	153
*PR7AB	"	47,718	127	99
*PY2APQ	"	6,864	46	44
*PT2AW	"	4,797	43	39
*PY2DEZ	"	1,440	24	24
***PY7IQ**	**28**	**1,033,900**	**832**	**422**
*PR7FN	"	2,079	27	27
***PY2RH**	**21**	**457,996**	**503**	**308**
*PY8AZT	"	329,708	400	278
***PY4CEL**	**14**	**23,318**	**92**	**89**
***PY2EMC**	**7**	**136,308**	**168**	**148**
*PR7AR	"	3,770	29	26
***PY7ZY**	**3.5**	**152,581**	**182**	**143**

VENEZUELA

YW1D	**7**	**2,860,110**	**983**	**495**
		(Op: YV1DIG)		
***YV7QP**	**21**	**94,400**	**200**	**160**

TRIBANDER/ SINGLE ELEMENT

UNITED STATES

NR1DX	**A**	**4,631,235**	**2243**	**735**
AG1C	"	3,371,200	1859	688
			(Op: N2GC)	
KZ5D	**A**	**2,777,456**	**1718**	**688**
N6CW	**A**	**2,259,965**	**1489**	**635**
N3UM	**A**	**1,995,840**	**1298**	**576**
W4SAA	**A**	**1,660,828**	**1160**	**533**
KAØGGI	**A**	**1,585,366**	**1224**	**566**
K3MD	**A**	**1,164,999**	**920**	**473**
W6TK	"	786,463	759	419
KA2MGE	**A**	**692,437**	**703**	**409**
N6HC	"	679,199	779	419
KGØUA	"	509,379	543	353
K7XN	**A**	**495,580**	**604**	**355**
W7QN	"	473,797	614	367
KS7T	"	451,386	492	351
WT9U	**A**	**424,081**	**590**	**329**
K4XG	"	235,000	352	250
K6III	"	229,908	357	276
KØCOP	"	202,725	311	225
WAØMHJ	"	174,496	300	224
AA6W	"	59,444	202	154
AF4RK	"	56,160	168	135
K6OWL	"	40,446	180	126
W7AYY	**21**	**23,529**	**95**	**93**
***WD5K**	**A**	**1,819,179**	**1328**	**607**
***NX6T**	**A**	**1,734,866**	**1326**	**581**
			(Op: K6AM)	
***WD4AHZ**	**A**	**1,363,348**	**1092**	**511**
*NA4K	"	1,353,037	1053	521
***W8IQ**	**A**	**1,260,438**	**1023**	**498**
***W2TZ**	**A**	**1,026,368**	**901**	**448**
*KV8Q	"	803,574	830	414
*N4YDU	"	727,500	704	388
*W5GAI	"	701,807	693	421
*K8IR	"	626,232	643	388
*W8PN	"	508,715	597	355
***W9WI**	**A**	**444,429**	**534**	**339**
*NO5W	"	382,824	621	312
***N3KCJ**	**A**	**373,511**	**485**	**311**
*NC7M	"	347,272	510	332
*K4QPL	"	318,339	417	279
*WB8TLI	"	288,248	390	274
*WA3AAN	"	238,656	379	264

***W7HS**	**A**	**212,267**	**353**	**253**
*W2SWL	"	157,325	306	217
*W4TYU	"	130,065	277	195
*N7ZN	"	110,330	285	187
*N6GL	"	105,480	296	180
*KW4DA	"	103,722	206	177
*KU3O	"	99,176	233	184
*K7TR	"	96,768	260	189
*K6UM	"	85,635	237	173
*NS4CG	"	75,348	196	156
		(Op: W4EBA)		
*K6CSL	"	62,604	193	141
*W6NKR	"	50,094	146	121
*NA4CW	"	33,411	126	111
*W9LYA	"	26,800	117	100
*NØAC	"	21,952	114	98
*AEØQ	"	14,952	113	84
*N2CU	"	12,880	76	70
*W3FQE	"	11,151	65	59
*NA6E	"	7,656	69	58
*AE6AX	"	7,056	66	56
*NS2P	"	84	7	7
***KX9DX**	**28**	**18,972**	**102**	**93**
***K9WA**	**21**	**124,120**	**250**	**214**

DX

JY9NX	**A**	**9,942,384**	**3798**	**824**
		(Op: JM1CAX)		
PJ4M	**A**	**5,017,584**	**2049**	**663**
		(Op: K2QM)		
HA8JV	**A**	**4,456,756**	**2504**	**772**
8S5A	**A**	**4,165,412**	**2571**	**778**
		(Op: SM5AJV)		
EY7AF	**A**	**4,091,451**	**2032**	**637**
		(Op: EY8AF)		
AN5FV	**A**	**3,893,192**	**2397**	**776**
		(Op: EA5FV)		
OL5Y	**A**	**3,350,520**	**2001**	**738**
		(Op: OK1FUA)		
RZ3AZ	**A**	**3,245,508**	**2101**	**756**
RA9SG	**A**	**2,834,520**	**1442**	**598**
RN6AL	"	2,778,844	2057	661
VA3UA	**A**	**2,611,785**	**1498**	**605**
RM3C	"	2,577,960	1852	682
		(Op: RA3CW)		
DFØFS	**A**	**1,803,800**	**1546**	**580**
		(Op: DL1EKC)		
JAØQWO	**A**	**1,773,632**	**1247**	**518**
DL8UAT/P	"	1,659,042	1309	567
GM4SID	**A**	**1,629,650**	**1520**	**550**
OE5CWL/5	**A**	**1,600,655**	**1329**	**551**
		(Op: OE6CWL)		
YU8/LZ1BJ	**A**	**1,537,250**	**1413**	**550**
HB9CZF	"	976,885	867	455
G4BJM	**A**	**967,434**	**1106**	**474**
ISØIGV	**A**	**750,690**	**839**	**439**
UA3AGW	"	705,120	741	390
XM4YU	**A**	**580,116**	**606**	**348**
		(Op: VE4YU)		
DL7JV	"	553,112	647	392
DL4HRM	"	541,268	676	364
ZD9IR	**A**	**519,415**	**552**	**305**
EX8O	**A**	**502,789**	**552**	**331**
RK3AD	"	383,560	551	344
RU6LWT	"	361,350	505	330
		(Op: R6L-551)		
OH2VZ	**A**	**336,501**	**495**	**309**
PAØJNH	**A**	**295,274**	**413**	**322**
JA1QOW	"	293,886	411	261
SP4AVG	**A**	**194,307**	**368**	**239**
RV1CC	"	139,378	333	227
LY2OX	**A**	**127,104**	**272**	**192**
UA3MDX	"	126,876	346	218
G3UFY	"	103,716	233	172
JR7MZC/1	"	65,552	173	136
I2AZ/1	"	53,655	207	147
DK2GZ	**28**	**476,346**	**668**	**403**
OH6NJ	**28**	**101,835**	**345**	**219**
XM3ANX	**21**	**2,397,408**	**1415**	**624**
		(Op: VE3ANX)		
RN3CT	**14**	**758,784**	**916**	**512**
MØTTT	**7**	**1,829,284**	**1175**	**524**
VE3XAX	**7**	**986,446**	**654**	**346**
OH3BU	**7**	**517,140**	**589**	**340**
UA4CCG	**3.5**	**275,355**	**465**	**261**
OH3XR	**3.5**	**236,379**	**424**	**247**
***L73F**	**A**	**4,616,608**	**2188**	**712**
		(Op: LU5FF)		
***ZC4DW**	**A**	**4,359,910**	**2153**	**635**
***AN7GTF**	**A**	**3,250,755**	**2135**	**705**
***9AØDX**	**A**	**3,124,730**	**2010**	**686**
		(Op: 9A3PA)		
***HR3J**	**A**	**2,177,883**	**1432**	**549**
		(Op: JA6WFM)		
***VE3XB**	**A**	**1,988,560**	**1221**	**530**
***G5X**	**A**	**1,982,091**	**1563**	**599**
		(Op: MØBRK)		
***BW3 /UA3VCS**	**A**	**1,930,159**	**1423**	**539**
*M7W	"	1,929,501	1685	567
		(Op: G4IIY)		
*EA4NP	"	1,779,718	1540	626
*EA7WA	"	1,734,603	1313	563
***RG9O**	**A**	**1,719,130**	**1768**	**574**
		(Op: RZ9OU)		
***UA3ABJ**	**A**	**1,676,160**	**1355**	**576**
***7M1MCT**	**A**	**1,645,686**	**1131**	**518**
***OK1HX**	**A**	**1,602,328**	**1266**	**568**
***9M2TO**	**A**	**1,545,264**	**1223**	**504**
		(Op: JAØDMV)		
*RN6CF	"	1,308,619	1194	559
*VE3KP	"	1,214,955	896	441
*JH2NWP	"	1,100,440	868	440
*UA3PW	"	1,078,896	1130	494
***OI6AY**	**A**	**1,048,840**	**1143**	**520**
		(Op: OH4II)		
***7XØDX**	**A**	**1,024,500**	**845**	**375**
		(Op: VK3DXI)		
***OM6RM**	**A**	**936,684**	**995**	**441**
***EU1MM**	**A**	**916,272**	**986**	**504**
*OM4TX	"	915,348	950	476
*G3KKP	"	857,789	919	457
***YO2NAA**	**A**	**768,948**	**814**	**417**
***EI4DW**	**A**	**765,994**	**852**	**449**
*G4OGB	"	733,044	896	444
*VE7XF	"	518,520	439	435
***SP2QG**	**A**	**499,720**	**670**	**310**
***PA3BFH**	**A**	**491,022**	**625**	**378**
***DM3PKK**	**A**	**490,599**	**610**	**361**
*AN7NW	"	477,102	632	393
***N6NO/VP9**	**A**	**394,128**	**496**	**306**
*G4DDX	"	362,232	593	344
*RX3AGQ	"	316,848	525	336
***HG9M**	**A**	**300,348**	**485**	**309**
		(Op: HA5MY)		
***LA8OM**	**A**	**259,251**	**496**	**309**
*ED6DD	"	254,898	477	306
		(Op: EA6DD)		
***VE7NI**	**A**	**219,112**	**344**	**244**
***XM6ZT**	**A**	**211,650**	**306**	**249**
		(Op: VE6ZT)		
***PY2ZI**	**A**	**196,100**	**315**	**212**
***OK1AXB**	**A**	**181,545**	**325**	**245**
*SO9FMU	"	180,594	318	237
*JJ6WYS	"	155,929	299	211
***UY1M**	**A**	**141,912**	**299**	**216**
		(Op: UR9MM)		
***LZ2BE**	**A**	**133,352**	**279**	**211**
*AN2BDS	"	131,906	268	202
*PP2RON	"	127,386	236	189
*JA2VZL	"	127,095	251	185
*JG1OWV	"	114,582	224	169
***F/G3VQO/P**	**A**	**114,525**	**323**	**225**
*JE1TSD	"	100,206	213	171
*SP9IBJ	"	99,640	260	212
*JM2FCJ/9	"	86,122	199	149
*SP7FBQ	"	81,069	233	183
***ON5HY**	**A**	**79,104**	**240**	**192**
*PA2ALF	"	69,174	225	183
*RA6AR	"	65,849	207	161
***OZ4FF**	**A**	**49,226**	**180**	**151**
*JA1XRH	"	42,158	132	107
*JF3KQA/1	"	40,916	139	106
*OK1SRD	"	40,392	145	132
***TA3BN**	**A**	**39,516**	**132**	**111**
*SP9EMI	"	38,142	136	117
*OZ4RT	"	30,774	138	138
*SP4JTJ	"	27,359	123	109
*DF5AU	"	20,412	110	84
*SP5JSZ	"	17,177	101	89
*DL2ZAV	"	10,318	89	77
*VE7ASK	"	9,000	63	45
***PY7IQ**	**28**	**1,033,900**	**832**	**422**
***VK4TT**	**28**	**409,165**	**469**	**295**
***HP1AC**	**28**	**115,746**	**257**	**191**
***VE3MQW**	**21**	**490,091**	**497**	**371**
***PY2RH**	**21**	**457,996**	**503**	**308**
***EA4EFJ**	**21**	**158,613**	**323**	**249**
***JJ6TWQ**	**21**	**135,884**	**242**	**211**
***IK2AIT**	**21**	**30,008**	**138**	**121**
***IR2V**	**14**	**391,210**	**550**	**355**
		(Op: I2WIJ)		
***PAØJED**	**14**	**204,756**	**364**	**302**
***OM3CDN**	**14**	**59,094**	**200**	**178**
***OH3IR**	**14**	**18,432**	**102**	**96**
***G3TJE**	**7**	**798,183**	**640**	**393**
***UW2F**	**7**	**551,088**	**632**	**344**

ROOKIE

YU8/OK1CRM	**A**	**717,402**	**853**	**399**
***YT1LT**	**A**	**1,325,092**	**1155**	**514**
***RN6CF**	**A**	**1,308,619**	**1194**	**559**
***YZ1KA**	**A**	**707,272**	**832**	**419**
***DJ9AO**	**A**	**278,640**	**507**	**324**
***SP5HNK**	**A**	**259,794**	**438**	**283**
***SP9IBJ**	**A**	**99,640**	**260**	**212**
***VK8JAC**	**A**	**86,265**	**186**	**135**
***K8KHZ**	**A**	**34,430**	**138**	**110**
***UA9QFF**	**A**	**23,577**	**99**	**87**
***VE3AGC**	**A**	**18,018**	**80**	**78**
***AE6AX**	**A**	**7,056**	**56**	**56**
***AE1X**	**A**	**2,325**	**33**	**31**
***RAØFLP**	**A**	**2,142**	**41**	**34**
***PY2DEZ**	**A**	**1,440**	**24**	**24**
***4N1N**	**28**	**338,613**	**543**	**331**
		(Op: 4N1JA)		
***YO3KYO**	**28**	**2,409**	**33**	**33**
***EA4EFJ**	**21**	**158,613**	**323**	**249**
***OS5ZO**	**14**	**134,932**	**335**	**244**
		(Op: ON5ZO)		
***K9QH**	**14**	**184**	**8**	**8**
***RX6LDK**	**7**	**131,904**	**304**	**192**
***UR3HC**	**3.5**	**300,810**	**505**	**271**
***YU1GFG**	**3.5**	**15,450**	**97**	**75**
		(Op: 4N1JA)		

BAND RESTRICTED

***RN6CF**	**A**	**1,308,619**	**1194**	**559**
***UR5FCM**	**A**	**153,360**	**319**	**213**
***JG1OWV**	**A**	**114,582**	**224**	**169**
***SP9IBJ**	**A**	**99,640**	**260**	**212**
*RA3WDK	"	88,894	208	169
***ON4KVA**	**A**	**9,100**	**70**	**65**
***7K2PBB**	**28**	**1,736**	**28**	**28**
***OK2QX**	**21**	**434,910**	**542**	**399**
***UA1ANX**	**21**	**243,960**	**408**	**285**
***M4T**	**14**	**361,185**	**673**	**363**
		(Op: GØVQR)		
***UA4PAY**	**14**	**23,546**	**135**	**122**

ASSISTED

UNITED STATES

K5KG	**A**	**4,671,753**	**2179**	**799**
AF1Z	**A**	**3,523,566**	**1873**	**678**
			(Op: K1PT)	
K2PLF	**A**	**3,014,610**	**1573**	**690**
K3KO	"	2,219,700	1245	604
K9NR	**A**	**2,215,080**	**1519**	**586**
WN9O	"	2,004,792	1409	618
			(Op: W9IU)	
WM6A	**A**	**1,274,115**	**1068**	**505**
			(Op: K6TA)	
N4GG	"	1,176,436	890	491
N2BJ	"	901,075	749	475
K9UQN	"	799,800	773	430
KG1F	"	744,657	685	401
K1HI	"	648,048	616	368
W3HVQ	"	555,024	554	373
K3WA	"	503,616	538	344
KD2HE	**A**	**391,856**	**522**	**304**
K8OQL	**A**	**379,731**	**510**	**311**
W3IQ	"	284,556	380	276
W5GN	**A**	**277,816**	**398**	**287**
NF9V	"	273,470	394	290
AI9T	"	234,520	354	260
KR5DX	"	204,864	382	264
			(Op: K5NZ)	
KØZM	**A**	**125,008**	**276**	**208**
W4TE	"	73,931	172	143
WØTM	"	37,968	127	113
W1US	**21**	**1,928,609**	**1199**	**601**
			(Op: K1LZ)	
WY3T	**14**	**320,226**	**394**	**318**
***AB2E**	**A**	**641,124**	**676**	**396**
***K3DI**	**A**	**614,148**	**602**	**366**
***NEØP**	**A**	**436,293**	**616**	**351**
*W2WB	"	433,755	504	315
*N2NI	"	430,803	551	317
*W2GG	"	202,653	369	253
***W7BX**	**A**	**149,850**	**299**	**225**
***K9PG**	**A**	**43,292**	**137**	**137**
***N7XY**	**A**	**6,912**	**57**	**54**

DX

OR2T	**A**	**6,917,885**	**2925**	**923**
			(Op: DL2CC)	
UA9AM	**A**	**5,574,464**	**2331**	**736**
OE2S	**A**	**4,800,902**	**2405**	**838**
			(Op: OE2VEL)	
OH6NIO	**A**	**3,588,508**	**2158**	**764**
VE1OP	**A**	**3,105,968**	**1653**	**646**
SN7N	**A**	**2,788,801**	**1758**	**703**
DF3IAL	**A**	**2,725,800**	**1640**	**708**
OK1FDY	**A**	**2,228,928**	**1596**	**611**
G3TXF	**A**	**1,870,272**	**1490**	**612**
RD4M	**A**	**1,824,968**	**1473**	**628**
			(Op: UA4LU)	
HB9FBS	**A**	**1,741,888**	**1445**	**544**
TM9R	**A**	**1,653,120**	**1624**	**630**
			(Op: F6IRA)	
HB9DDO	"	1,493,076	1164	563
EM3J	**A**	**1,304,217**	**1317**	**551**
			(Op: UU2JZ)	
DL1DTC	"	1,276,794	1126	534
DJ9RR	"	1,121,256	1123	522
DL5YM	"	1,087,824	1068	519
DJ9MH	"	897,050	871	466
YL8M	**A**	**690,736**	**701**	**368**
UAØAGI	**A**	**603,424**	**578**	**346**
SP5AKG	"	561,267	699	413
JA2YKA	**A**	**501,456**	**548**	**337**
			(Op: JN2FMH)	
JI1EFP	"	200,200	315	200
DF5ZV	"	131,784	264	204
JK3GWT	"	115,134	245	186
XM6LB	**A**	**108,160**	**223**	**169**
			(Op: VE6LB)	
PA3GRM	**A**	**67,620**	**196**	**161**
OE1TKW	"	57,510	170	142
TF3MM	**A**	**48,988**	**200**	**148**
VE7FO	**A**	**33,812**	**118**	**107**
UA2FF	**21**	**3,001,544**	**1827**	**728**
DK3DM	**21**	**2,478,472**	**1531**	**712**
UZ7U	**21**	**2,090,832**	**1391**	**688**
			(Op: UT3UA)	
EY8MM	**21**	**1,952,640**	**1276**	**565**
T94MZ	**21**	**1,717,248**	**1368**	**624**
OR4ATW	**21**	**901,336**	**923**	**488**
			(Op: ON4ATW)	
EW2AA	**14**	**1,990,632**	**1492**	**697**
OM7CW	**7**	**825,693**	**815**	**393**
RZ9HG	**7**	**603,307**	**446**	**281**
YLØA	**3.5**	**593,892**	**726**	**351**
			(Op: YL2KA)	
UT5UGR	**3.5**	**535,954**	**690**	**346**
RW3XX	**1.8**	**102,087**	**279**	**171**
***UW5U**	**A**	**1,899,456**	**1473**	**624**
			(Op: UY2UA)	
***YL4U**	**A**	**1,793,520**	**1380**	**636**
***LZ9R**	**A**	**1,786,752**	**1467**	**576**
			(Op: LZ3YY)	
***S57UN**	**A**	**1,403,688**	**1119**	**572**
***DL2RMC**	**A**	**927,462**	**951**	**467**
***OK2ZJ**	**A**	**860,405**	**888**	**455**
***JA3YPL**	**A**	**835,978**	**776**	**407**
			(Op: JJ3TBB)	
***PY1NX**	**A**	**601,315**	**496**	**319**
***VE3BUC**	**A**	**584,850**	**590**	**350**
*DL2OBF	"	496,551	675	367
*OR4APU	"	475,137	672	403
			(Op: ON4APU)	
*JH5OXF	"	473,538	529	338
***SM7BHM**	**A**	**466,116**	**642**	**358**
*T93Y	"	259,116	386	286
***M6T**	**A**	**177,000**	**331**	**236**
			(Op: G4PIQ)	
*7L4IOU	"	173,673	294	207
*S53AU	"	138,250	301	175
*7N2DAB	"	95,166	205	153
*JK2VOC	"	71,550	199	150
***F5AKL**	**A**	**64,375**	**163**	**125**
***LR7E**	**A**	**64,152**	**161**	**132**
			(Op: LW8DLB)	
*DJ2QV	"	59,696	193	164
***OE5OHO**	**A**	**53,106**	**196**	**167**
***EA4UB**	**A**	**37,632**	**129**	**112**
*RU3AT	"	19,040	93	80
*JA1PYP	"	7,238	51	47
*L99D	"	7,050	55	47
			(Op: LU7DW)	
***RWØBG**	**21**	**168,720**	**290**	**222**
*RA9AC	"	159,328	276	208
***JG3NKP**	**21**	**118,800**	**218**	**198**
***IC8COF**	**1.8**	**5,750**	**62**	**50**

MULTI-OPERATOR SINGLE TRANSMITTER

UNITED STATES

KT1V	**10,527,680**	**3601**	**985**
WW4T	**10,316,890**	**3726**	**985**
KQ2M	**8,219,792**	**3147**	**929**
NO2R	7,923,032	3133	923
KM4M	7,579,332	2995	894
KZ4DX	7,345,092	3084	932
NØNI	**6,857,766**	**2884**	**921**
NM5O	**5,405,036**	**2618**	**868**
NC7J	**2,656,636**	**1767**	**668**
WX6V	**2,496,695**	**1563**	**641**
W2YE	2,467,281	1554	599
N2ED	2,450,584	1432	629
KI7Y	2,213,937	1536	627
NZ1U	1,910,741	1195	623
NT2W	1,242,870	981	510
KJØG	834,470	879	455
W4NJK	31,742	170	118
W6YRA	26,928	118	102
NJ2BB	56,232	164	142

NORTH AMERICA

8P4A	**18,516,960**	**5622**	**1056**
NP4Z	**11,575,710**	**4044**	**930**
XM7SV	**5,424,382**	**2341**	**797**
VE7GL	4,292,112	1971	739
XM6AO	**545,870**	**625**	**338**

AFRICA

3V8BB	**19,041,135**	**5152**	**1065**
ET3PMW	**1,251,234**	**890**	**423**

ASIA

P3A	**18,176,342**	**5235**	**1046**
YM3LZ	**10,122,690**	**3398**	**881**
RW9C	**6,814,160**	**2523**	**760**
8J7C	**4,424,310**	**2337**	**738**
YI9OM	**3,871,058**	**2157**	**617**
RK9JWV	2,092,523	1246	523
RK9CZO	780,030	694	405
RZ8VWA	442,382	687	326
RN9WWW	117,852	215	161
RW9HZZ	73,432	192	134
RK9WZZ	180	12	9

EUROPE

AM6IB	**9,164,650**	**4146**	**1045**
YT6A	**9,143,420**	**3750**	**1012**
CS8W	**8,675,405**	**4393**	**995**
HG1S	**8,184,912**	**3514**	**984**
F9IE	**8,011,038**	**3353**	**966**
OM7M	**7,670,604**	**3377**	**969**
RM6A	**7,440,610**	**3423**	**995**
9A9D	**7,259,630**	**3468**	**959**
OL8M	**7,016,323**	**3140**	**947**
OL7W	6,563,610	2960	939
DJ6TF	**6,339,464**	**2823**	**932**
YT9X	6,330,539	3177	911
9A5D	5,979,020	2968	890
EN9F	**5,538,813**	**3039**	**861**
RI4M	5,357,178	2977	906
RF3A	5,293,392	2876	884
GX6YB	**5,165,600**	**3162**	**800**
OL7R	5,048,541	2491	867
LY1YK	**4,953,264**	**2495**	**888**
PI4DEC	**4,814,144**	**2554**	**856**
YL7C	**3,927,090**	**2396**	**790**
RZ1QZZ	3,906,400	2476	760
OT2U	**3,881,066**	**2251**	**782**
OM3RKA	3,544,704	2064	724
CT7T	3,461,220	2333	738
DFØLI	3,190,528	1967	704
4N7N	3,045,042	2091	693
DLØDX	3,018,177	2007	683
RD3R	2,573,284	1900	691
YZ7A	2,458,946	1788	658
OM3KHO	2,148,750	1594	625
SI9AM	**2,085,249**	**1768**	**643**
UX4E	2,026,944	1623	621
SM2LIY	2,004,406	1666	647
EA2AAZ	**1,827,696**	**1460**	**605**
9A7T	1,820,740	1414	590
YO8KGA	**1,699,034**	**1426**	**569**
OL2U	1,491,971	1281	559
RZ4PZL	1,343,016	1308	552
EMØU	1,254,396	1131	516
SP9KRT	**1,212,606**	**1114**	**522**
DLØMZ	983,580	995	485
RK3NWC	913,444	1068	476
ED2JJ	683,550	851	441
YU1AAT	560,175	687	385
GM2T	**264,000**	**387**	**250**
UR4PWC	171,788	367	268
RK1NWA	81,576	306	206
USØQ	55,110	202	165
YO2KJW	11,088	75	63
LA1K	1,484	28	28
UR4UWZ	325	13	13
HG6N	175	8	7
UT4UYA	128	9	8

OCEANIA

4D1Q	**666,328**	**760**	**298**

SOUTH AMERICA

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NR6O	7,963,584	3550	944
WX5S	**7,611,400**	**3445**	**950**
WR3L	**5,823,280**	**2675**	**830**
NT6K	1,956,544	1597	608
AK3Z	418,528	482	319

NORTH AMERICA

6Y2A	**38,821,328**	**10106**	**1274**
WL7E	**15,799,925**	**4950**	**1073**
AL7NJ	**11,913,135**	**4288**	**995**
VC6X	**10,878,621**	**3937**	**1007**

ASIA

A61AJ	**42,766,232**	**10620**	**1244**
RT9W	**17,731,000**	**5245**	**1000**
JA1YPA	**2,157,096**	**1317**	**578**
JF2SKV	226,404	378	228

EUROPE

ES9C	**17,464,886**	**6969**	**1138**
LY7A	**13,889,116**	**5753**	**1109**
9A7A	**13,449,240**	**5304**	**1080**
HG3DX	**12,524,434**	**5219**	**1066**
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ZL6QH	**4,057,432**	**1785**	**668**

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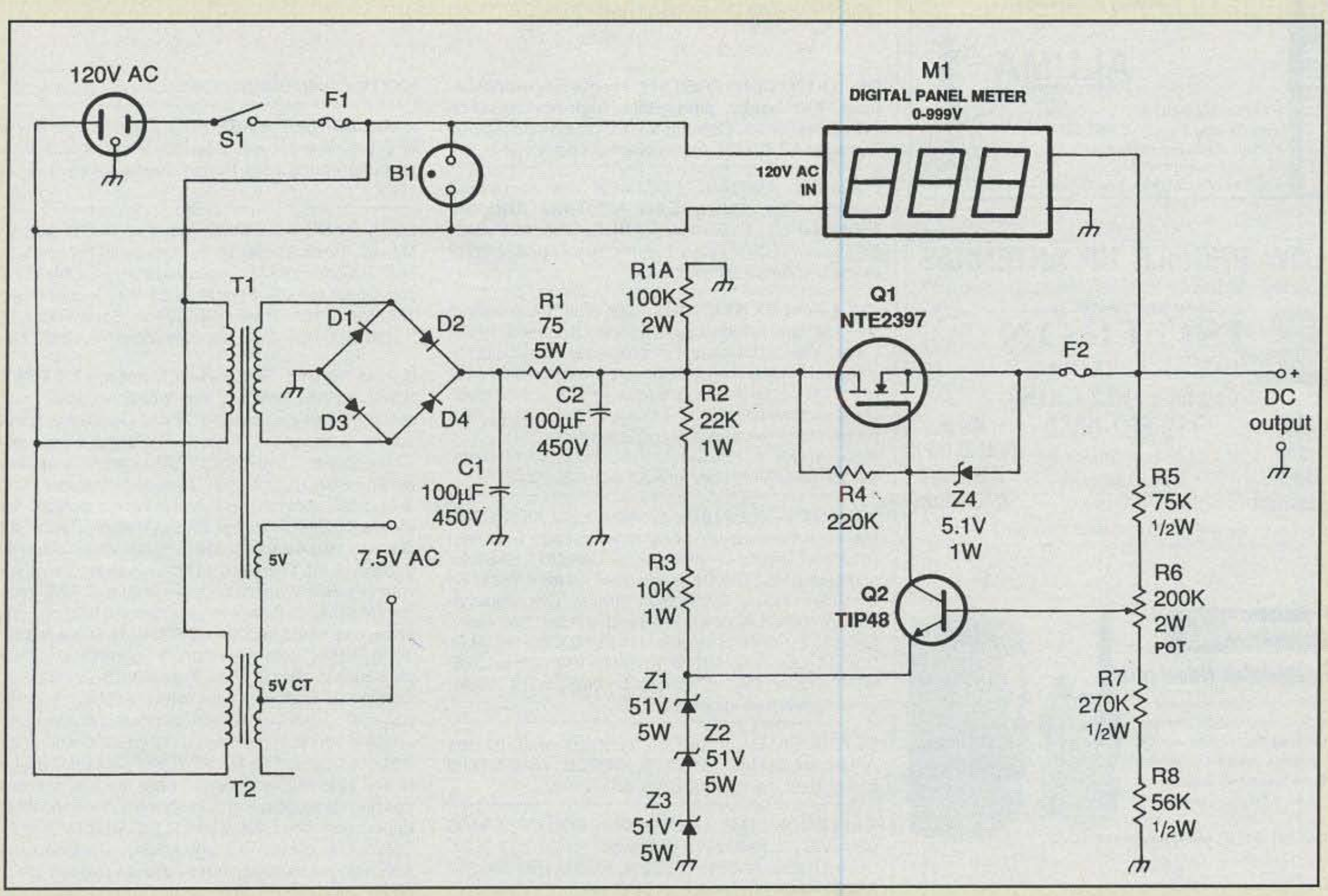

"Build a Regulated Solid-State Power Supply for Vintage Transmitter" (December 2002 issue), the corrected schematic (fig. 1).

Oops...

In our December 2002 issue, in WB2GMY's article, "Build a Regulated Solid-State Power Supply for Vintage Transmitter," the schematic (fig. 1) incorrectly showed the digital panel meter wired into the AC line in series rather than in parallel, and some of the transformer connections are incorrect. A corrected drawing of the 120 VAC portion of the circuit is shown here. Thank you to the many readers who realized the circuit wouldn't work too well as shown and brought it to our attention, and our apologies to anyone inconvenienced by the error.

Looks like jet lag got the best of us in "Travels With CQ" in the January issue. The new U.S. headquarters of Vertex Standard (Yaesu) is in Cypress, California, not Long Beach. The city officials in the ribbon-cutting photo are also from Cypress, not Long Beach (at least we didn't say it was Long Beach, New York!), and Vertex Standard's annual worldwide sales are closer to $200 million than the $100 million we said in the article.

Also in the January issue, we got Herb Schoenbohm's former callsign wrong in the headline but right in the text. His former call was KV4FZ, not FX.

Finally, the March 2003 photo in the 2003/2004 CQ Amateur Radio Calendar was inadvertently misidentified as three 18-element, 6-meter-long john antennas. Owner Chuck O'Neal, K1KW, informs us that the lower two antennas comprise a 36-element stacked Log Periodic Dipole Array, covering 14 to 30 MHz (each LPDA has 18 elements), perhaps the largest such amateur radio installation in the world. Each antenna weighs 400 pounds and has a boom length of 62 feet. The lower LPDA is mounted 55 feet up the tower and the upper one is at 110 feet. At the very top (125') is an 11-element, 6-meter beam. Our apologies for the error.

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Built to the exacting requirements of both the commercial radio industry, as well as the U.S. military's MIL-STD 810, the FT-2800M is constructed using an aluminum diecast chassis/heatsink assembly, providing outstanding mechanical and thermal stability for the internal components.

With superb ergonomics to go along with its stout RF design, the FT-2800M is ready for action, at home or away!

New Ultra-High-Dissipation Heat Sink Design

The all-new heat sink of the FT-2800M provides more effective cooling than any other design, allowing long transmission periods without dangerous heat build-up or power reduction due to thermal protection.

HEAVY-DUTY VHF FM TRANSCEIVER

FT-2800M

ACTUAL SIZE

For the latest Yaesu news, visit us on the Internet:
http://www.vxstdusa.com

Specifications subject to change without notice. Some accessories and/or options may be standard in certain areas. Frequency coverage may differ in some countries. Check with your local Yaesu Dealer for specific details. Specifications guaranteed only in 2-meter Amateur band.

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HF EXCITEMENT

INTRODUCING YAESU'S ALL NEW HF MOBILE

Blending leading-edge technologies developed on the FT-897 and MARK-V FT-1000MP transceivers, the FT-857 is the world's smallest* HF/VHF/UHF Multimode Transceiver, and it's available now!

*Jan. 2003

FT-857 DESIGN HIGHLIGHTS

The FT-857 is a high-performance, ultra-compact transceiver operating on the 160-10 meter HF bands, plus the 50, 144, and 430 MHz VHF/UHF bands. Providing 100 Watts of power on HF/6 meters, 50 Watts on 2 meters, and 20 Watts on 70 cm, the FT-857 is ideal for mobile, vacation, DX-pedition, or home use when space is at a premium.

Utilizing the renowned receiver performance of the FT-897 and MARK-V FT-1000MP, the FT-857 features wide dynamic range, optional Digital Signal Processing, and outstanding audio.

The wide array of convenience features includes a 32-color display; Spectrum Scope; built-in keyer with memory and beacon mode; U.S. Weather Band reception; 200 memories with Alpha-Numeric labels; AM Aircraft reception; detachable front panel (optional YSK-857 required); and much, much more.

You've asked for it, and it's here today: the FT-857 New Mobile. . .from the engineers at Yaesu!

New Remote Control DTMF Microphone MH-59A8J (Option)

The optional MH-59A8J Remote Microphone provides control of the major functions of the FT-857 from the microphone's keypad. The MH-59A8J includes a rotary control knob for adjusting the operating frequency and the receiver volume level.

UP/DWN keys
LOCK Switch
PTT Switch
Keypad
1(DSP) key
2(MHz) key
3(CLAR) key
4(HOME) key
5(◄ MODE) key
6(MODE ►) key
7(V/M) key
8(BAND DWN) key
SEL/DIAL key and Indicator
SEL knob
9(BAND UP) key
***** key
0(CNTL) key
ENT(#) key
A key
B key
C key
F(D) key
ACC key
PWR(FAST) key
P1 key
P2 key

Actual Size

HF EXCITEMENT

FT-857

ULTRA-COMPACT HF/VHF/UHF 100 W* ALL-MODE TRANSCEIVER
(HF/6 m 100 W, 2 m 50 W, 70 cm 20 W)

For the latest Yaesu news, visit us on the Internet: http://www.vxstdusa.com

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Buy a IC-746PRO. Save $200!
(AND get a FREE PS-125 Power Supply)*

Supercharged Performance!

Purchase an IC-746PRO and SAVE $200, *PLUS* receive a FREE PS-125 power supply. With 25 amps continuous, quieter RF operation, and a look matching the latest ICOM rigs, the PS-125 is the perfect companion to the '746PRO. Better hurry though, a deal this good won't last too long. See your participating ICOM dealer for more details.

IC-746PRO Features

- **32 BIT FLOATING POINT DSP & 24 BIT AD/DA CONVERTER.** At the heart of the '746PRO, the DSP is an incredible tool for handling the QRM found on the bands.
- **SELECTABLE DIGITAL IF FILTER SHAPES FOR SSB & CW.** Tailor the filter shape & bandwidth to your personal operating preferences or band conditions. Sharp for selectivity and signal fidelity or soft for readability.
- **AGC LOOP MANAGEMENT.** Multiple AGC loops, controlled by the 32 bit DSP, filter out unwanted interfering signals, eliminating pumping of the AGC.
- **AUTOMATIC NOTCH FILTER.** Perfect for SSB operation to eliminate annoying heterodynes and "tune up", without effecting the receive audio.
- **MANUAL NOTCH FILTER.** Perfect for CW or digital operations, the 70db manual notch filter eliminates unwanted signal without effecting the actual passband of your filters.
- **DIGITAL TWIN PASSBAND TUNING.** Great for crowded bands, or contests, eliminates interfering signals by narrowing or or shifting the IF passband.
- **BUILT-IN RTTY DEMODULATOR & DECODER.** External units or PCs are no longer required for RTTY decoding. Twin peak audio filter, using the DSP unit, significantly reduces interfereing signals overlapping the tones.
- **TWIN PEAK AUDIO FILTERS.** Peak the signal audio used in the digital modes.
- **DIGITAL RF SPEECH COMPRESSOR.** Utilizes the 32 Bit DSP to provide the maximum punch without the fuzzy sound.
- **MICROPHONE EQUALIZER.** A total of 121 varieties of equalized audio can be set with the built-in microphone audio equalizer, tailored to operating style & microphone characteristics.

IC-746PRO. Leave the competition in the dust.

HF/6M/2M • 100W • All Mode • Enhanced Rx • 9600 Baud Ready • 32 Bit IF-DSP & 24 Bit AD/DA Converter • Independently Selectable IF Filter Shapes For SSB & CW • SSB/CW Synchronous Tuning • Built-in RTTY Decoder • Variable Level Noise Blanker • Auto & Manual Notch Filter • Digital Twin Passband Tuning • Mic Equalizer • CW Memory Keyer • VOX • Auto Antenna Tuner

FAST AND EASY FILTER SHAPING!

CHANGE FILTER SHAPES WITH THE PUSH OF A BUTTON AND THE TURN OF A KNOB - IT'S THAT EASY!

- **TX AUDIO PASSBAND.** Great for the "Perfect Audio" you are looking for by selecting from 2.2, 2.4, & 2.8 kHz bandwidths.
- **RECEIVE AUDIO EQUALIZER.** Allows you to set the audio style to ease listening fatigue during long hours of operation.
- **SSB/CW SYNCHRONOUS TUNING.** You no longer have to worry about changing from SSB to CW, the radio automatically shifts the VFO without losing the CW station you were copying.
- **ADJUSTABLE NOISE BLANKER.** Adjustable in 101 steps, this gives you control of the level of the noise blanker, to eliminate distortion of the desired signal.

FREE PS-125!

BUY A '746PRO & GET A FREE PS-125 POWER SUPPLY*

*Limited time offer. See your participating authorized Icom dealer for details. **$400 MSRP (Manufacturer Suggested Retail Price)

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