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Amateur Radio

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COMMUNICATIONS & TECHNOLOGY

SEPTEMBER 2002

CQ

In This Issue

ntester Chuck Cullian, KØRF,
. Details on page 74.

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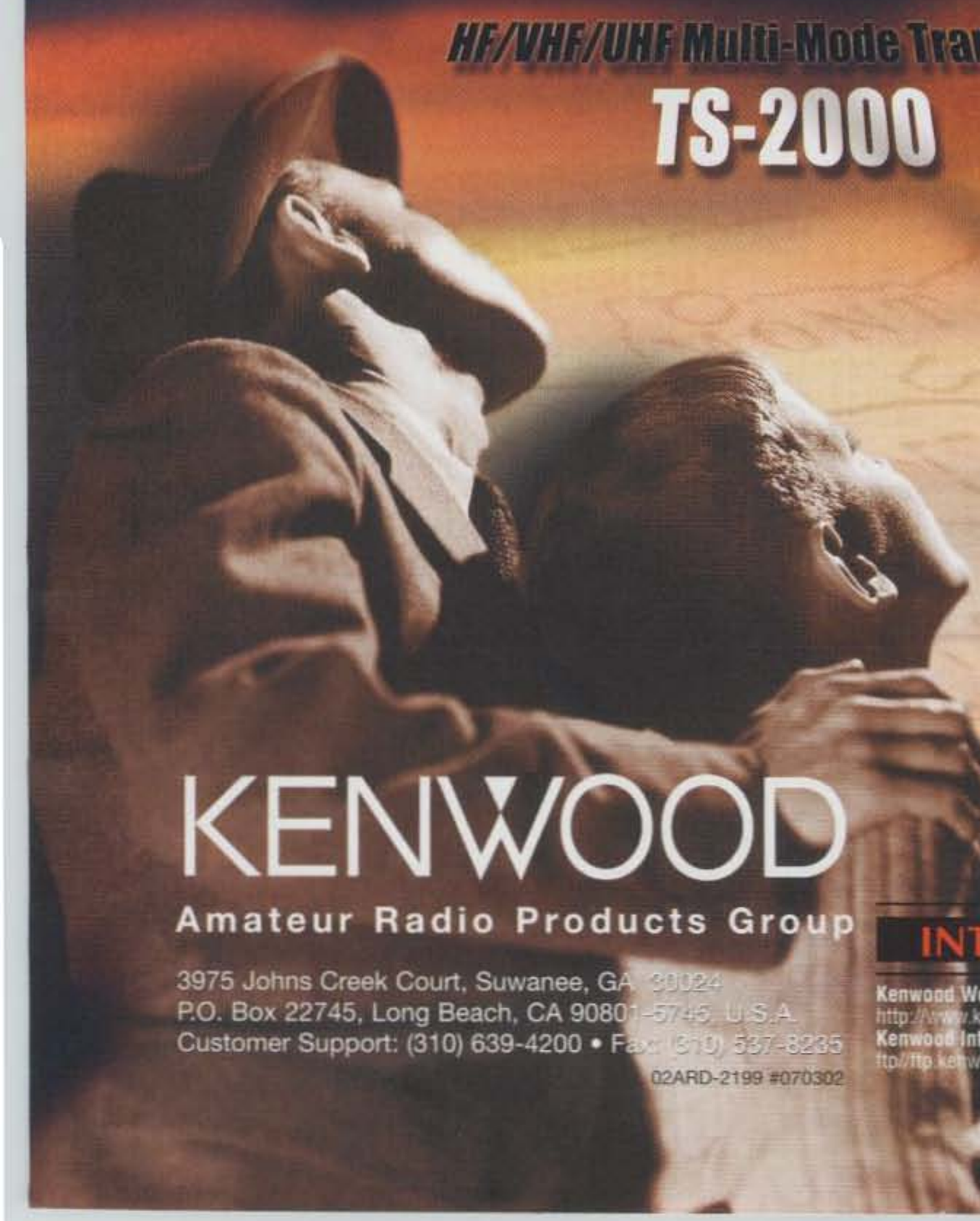

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September 1, 2002

Dear Fellow Ham,

MFJ Enterprises, Inc. humbly started its business in a small downtown Starkville, Mississippi hotel room in October of 1972. The original product, a CW Filter Kit CWF-2, sold for $9.95 plus shipping.

This October, 2002 will mark the 30th Anniversary of our ham radio adventure and I am deeply thankful for the remarkable support we have had from our fellow hams.

Today, MFJ Enterprises, Inc. is a total of five different ham radio companies and manufactures well over 2000 different products.

I wish to extend this heartfelt THANK YOU to all of you who have helped MFJ Enterprises Inc. reach this monumental milestone.

Without the support of our fellow hams, the hard work and dedication of our employees and the tremendous support from our countless friends of MFJ, this 30 Year Anniversary milestone could not have been achieved -- let's celebrate again in another 30 years.

Thank you again for your support!

Sincerely yours,

Martin F. Jue, K5FLU

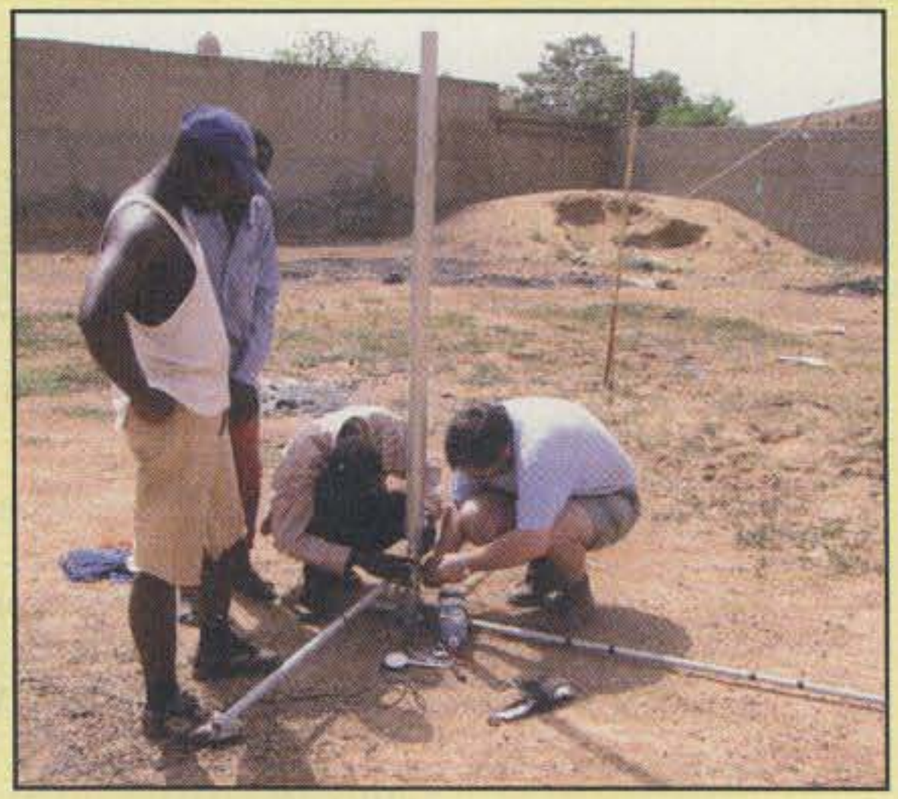
Martin F. Jue
K5FLU
President and Founder
MFJ Enterprises, Inc.

P.S. Please come visit us during our 2nd Annual MFJ/ARRL Day in the Park, October 4 & 5, 2002 to commemorate MFJ's 30th Anniversary.
For more info, visit: http://www.mfjenterprises.com.

CQ Amateur Radio

SEPTEMBER 2002 VOL. 58, NO. 9

FEATURES



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DEPARTMENTS

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Throughout the years, Kenwood has engineered many significant feature and hardware advancements that earned us the nickname "Pacesetter in Amateur Radio". Kenwood continues to show this leadership in advanced design and technology with the TH-D7A(G) handheld and the TM-D700A mobile dual-banders. Not only do our radios perform all the functions of any other radio, but you can also explore the exciting digital world of APRS™, which has become the fastest growing and most dynamic part of the hobby. Most Disaster Communication organizations use APRS™. Identifying someone's location with APRS™ can save a life.

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Ham Radio News

From The CQ Newsroom

A Three-Peat at WRTC

For the third time, the American contest team of Jeff Steinman, N5TJ, and Dan Street, K1TO, took top honors in the World Radiosport Team Competition, better known as WRTC. This year's running of the event was held in Finland. Contesting teams from around the world operate at host stations furnished with essentially similar equipment, allowing the competition to concentrate primarily on operator skills. Steinman and Street also won the event in 2000 and 1996. A Russian team (RA3AUU and RV1AW) finished second, while a German team (DL2CC and DL6FBL) placed third. Final results are on the web at <http://www.wrtc2002.org/results.htm>.

OSCAR-7 Keeps On Keepin' On

AMSAT-OSCAR 7, the amateur satellite launched in 1974 that suddenly came back on the air this summer after two decades of silence, continues to be used by hams around the world. Command operator Mike Seguin, N1JEZ, reports success in sending various commands to the satellite; and slow-scan TV enthusiasts Farrell Winder, W8ZCF, and Don Miller, W9NTP, have been exchanging SSTV pictures via AO-7. Some of their photos are posted on the CQ website.

Emergency Training Grant

The ARRL is one of 43 organizations that will be receiving federal grants to improve homeland security. The League was awarded $181,900 for training amateur radio operators in emergency communications. According to the ARRL, the grant money will be used to provide the ARRL Amateur Radio Emergency Communications Course at no charge to 5200 volunteers around the country, beginning next year. The overall grants announced July 18 by Homeland Security Director Tom Ridge total $10.3 million.

CQ Files Comments on New Band Proposals

CQ magazine publisher CQ Communications, Inc. filed comments with the FCC supporting the creation of two new amateur bands and the elevation of part of the 2.4 GHz band to a primary amateur allocation. However, the company challenged what it views as a shift by the FCC to give unlicensed spectrum users equal standing with licensed services on shared frequencies.

The CQ comments favored creating a new amateur "splinter" band at 135.7–137.8 kHz and encouraged the FCC to open the band to all hams with General Class or higher licenses and to keep technical requirements flexible enough to permit a wide range of experimentation. CQ also supported a new ham band at 5 MHz, calling for no "sub-banding" and giving access to all amateurs with HF operating privileges. Finally, while supporting the FCC's proposal to upgrade the amateur allocation at 2400– 2402 MHz to primary, CQ said it was worried by the Commission's request for comments on how the change might affect unlicensed users of the band and called on the FCC to reaffirm its long-standing policy that the interests of licensed users always take priority over those of unlicensed users. The full text of CQ's comments may be viewed on the FCC website at <http://www.fcc.gov/ e-file/ecfs.html> by selecting "Search for Filed Comments," typing "02-98" in the "Proceeding" box and scrolling through other filed comments.

FCC Panel Recommends 40 Meter Phase-In

An FCC advisory committee has called for a seven-year phase-in of a worldwide 300 kHz wide amateur allocation at 40 meters. Currently, 7.0–7.1 MHz is the only worldwide amateur allocation on the band, with hams in the Americas sharing 7.1–7.3 MHz with broadcasters in other parts of the world. According to the ARRL, the draft recommendation of the FCC's World Radiocommunication Conference 2003 (WRC-03) Advisory Committee included a plan to expand the worldwide amateur allocation to 7.2 MHz by 2007 and to 7.3 MHz by 2010. This would give broadcasters and others affected time to make necessary changes in their equipment and antennas. The FCC noted that this is a recommendation only, and does not represent the final position of the United States government on the issue. The full text of the committee's draft proposals may be viewed at <http://www.fcc.gov/wrc-03>.

ARRL Receives KB3GWY Named 2002 Young Ham of the Year

Josh Abramowicz, KB3GWY, of Reading, Pennsylvania, has been named the Newsline Young Ham of the Year for 2002. *CQ* is a co-sponsor of this award, now in its 17th year, which is administered by the Amateur Radio Newsline. Abramowicz is 17 and entering his senior year at Central Catholic High School in Reading. He was honored for promoting amateur radio to young people through scouting. Josh was a staff member of ham radio station K2BSA at a recent Boy Scout National Jamboree; persuaded his local scout camp to set up a permanent amateur radio station at the camp's science center, and got the Frankford Radio Club to sponsor a ham-radio Venture crew (Venture scouting is a co-ed program for older teens.). He will receive his award at the Huntsville Hamfest in Alabama. *CQ* provides each year's winner with a free trip to SpaceCamp in Huntsville, and Vertex-Standard, another co-sponsor, presents gifts of amateur equipment.

This year's runners-up in a field of some two dozen nominees were Evan Anderson, KCØCWP, of Ashland, Nebraska, and Thomas Tenaglia, K3TAT, of West Chester, Pennsylvania.

New Vanity Fee Effective Sept. 9

A new, slightly higher fee for vanity callsign applications takes effect on September 9, 2002. According to the *ARRL Letter,* applications received on or after that date will be subject to a $14.50 fee for a 10-year term. The current fee is $12. The FCC has been varying the fees nearly every year as it adjusts license fees to meet its budgetary needs. There is still no fee for a basic non-vanity amateur license (other than the exam fee).

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.

CQ Named "Official Journal of 'The Human Race' "

CQ magazine has teamed up with the producers of a planned television series entitled "The Human Race," in which two ham radio operators will participate in a global "road rally," with transportation limited to that provided by ham volunteers along the way. *CQ* will be the "Official Journal of 'The Human Race'," documenting progress on the development and production of the program through a series of articles and updates written by Producer William Desjardins, W1ZY. For more information, see the Announcements section of the CQ website at <http://www.cq-amateur-radio. com>.

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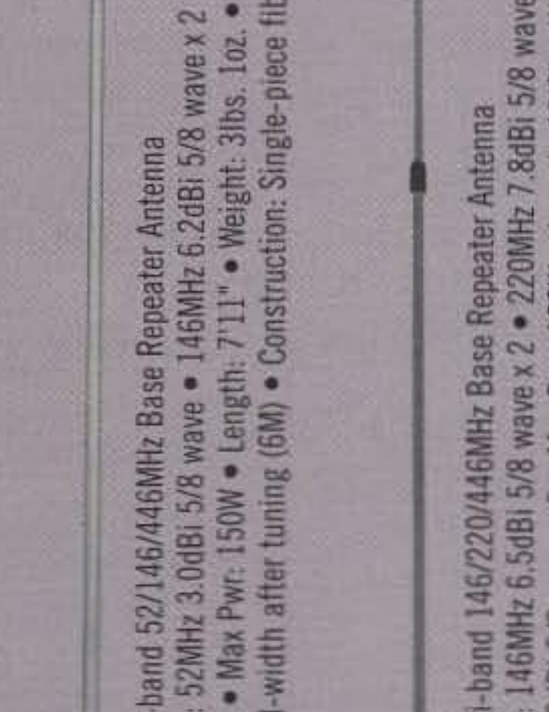
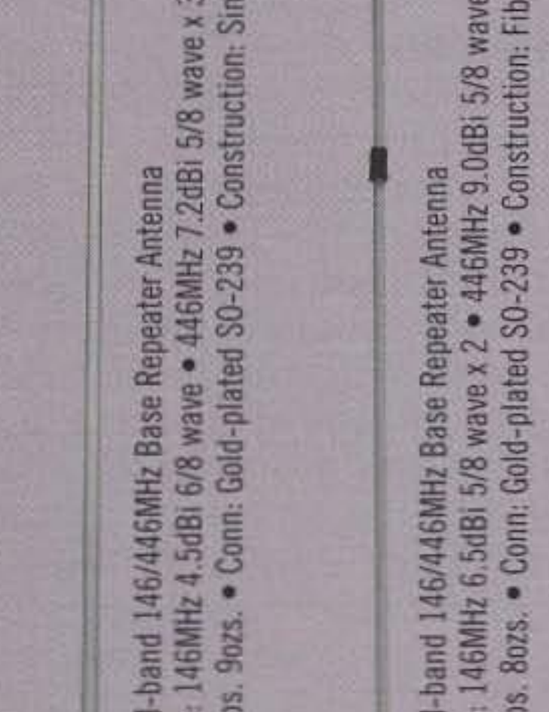


CX-333 • Tri-band 146/220/446MHz Base Repeater Antenna
Gain & Wave: 146MHz 6.5dBi 5/8 wave x 2 • 220MHz 7.8dBi 5/8 wave x 3 • 446MHz 9.0dBi 5/8 wave x 5 • Max Pwr: 120W • Length: 10'2" • Weight: 2lbs. 9ozs. • Conn: Gold-plated SO-239 • Construction: Single-piece fiberglass, 2 Sections



GP-3 • Dual-band 146/446MHz Base Repeater Antenna
Gain & Wave: 146MHz 4.5dBi 6/8 wave • 446MHz 7.2dBi 5/8 wave x 3 • Max Pwr: 200W • Length: 5'11"
• Weight: 2lbs. 8ozs. • Conn: Gold-plated SO-239 • Construction: Single-piece fiberglass

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• Weight: 3lbs. 8ozs. • Conn: Gold-plated SO-239 • Construction: Fiberglass, 2 Sections

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Zero Bias

BY RICH MOSESON, W2VU

An Editorial

Lessons of 9/11

September used to be such a nice month—the heat of the summer begins to ebb, the leaves on the trees begin their annual display of colors, vacations are over, kids are back in school ... a month for returning to "normal" after the slowness of summer. As we all know all too well, September of 2001 was anything but normal, and there is a certain sadness that every peace-loving person alive in September of 2001 will feel when they flip that calendar page in every remaining year of their lives.

Amateur radio played a central role in the nation's response to the attacks of 9/11; not only in New York, Washington, and Pennsylvania, but also in far-removed places such as Newfoundland and British Columbia. In addition, hams from all over the United States served as volunteers with relief agencies helping out at the attack sites.

What have we learned in the year since "9/11" became so much more than another date on the calendar? What have we learned as hams? As people? As Americans? About Americans? Will we be better-prepared—as hams, as humans, as Americans—for "next time"? (There's very little doubt that there *will* be a "next time.")

The first lesson, I think, was learned by the terrorists, who have as much understanding of our way of life as most of us have of theirs. They apparently believed that open, public dissent and debate which we perceive as a sign of a healthy, robust democracy, was actually a sign of a fractious, dissatisfied nation, one which would need just one big push to topple over the edge and fall apart at the seams. After all, they may have reasoned, the Soviet Union fell apart in 1989—with a long war in Afghanistan playing a major role—perhaps they can get us all fighting with each other and break up the United States as well. They did not understand us. They do not understand us. They probably never will understand us. They only hate us. What do they hate? The very freedoms that let us disagree and debate and still come together in a time of crisis and respond with unity and overwhelming force.

The next lesson was about the nature of New York and New Yorkers. To much of the rest of the country, New York City was about as foreign as Afghanistan. Too crowded, too busy, too much crime, too many people who are too busy with themselves to care about others. The response, not only of professional emergency workers but also of just plain people—who endangered or sacrificed their own lives to try to save others—painted a new picture for the nation of the true nature of New York and New Yorkers.

At the same time, New Yorkers learned a lesson about the rest of America and their fellow Americans. Help from all over just poured in, in unprecedented amounts, whether it was money donated to relief organizations, emergency personnel from throughout the country traveling to New York to provide backup and relief, volunteers from across America coming to offer whatever help they could, or, after things had settled down, tourists making a special effort to come to New York and help rebuild the local economy.

Here in the New York area, we gained a new perspective on the fragility of life, discovered we were indeed capable of being friendly, polite, and patient with each other; "road rage" virtually disappeared, unfortunately for only a couple of months, and family matters took on new importance.

As hams, we learned that amateur radio is far from obsolete. In fact, once again, when other communications systems failed—and they failed big-time—ham radio came through and provided vital links during and after the initial emergency. We also learned that we are indeed members of a worldwide brotherhood, as messages of condolence and support came streaming in from our fellow amateurs all over the world.

Taking Responsibility

We also learned that we can't always depend on "someone else" or "the government" to protect us from harm. The passengers on Flight 93 realized that and took responsibility for thwarting a fourth terrorist attack, and who knows how many other lives they saved, even at the expense of their own? Police officers, firefighters, and workers in the World Trade Center and at the Pentagon took responsibility for helping fellow workers get out of the buildings ... even at the expense of their own opportunities to escape safely. On another airplane some time later, when a passenger allegedly tried to ignite a bomb in his shoe, other passengers took the responsibility to stop him and save the lives of everyone on board.

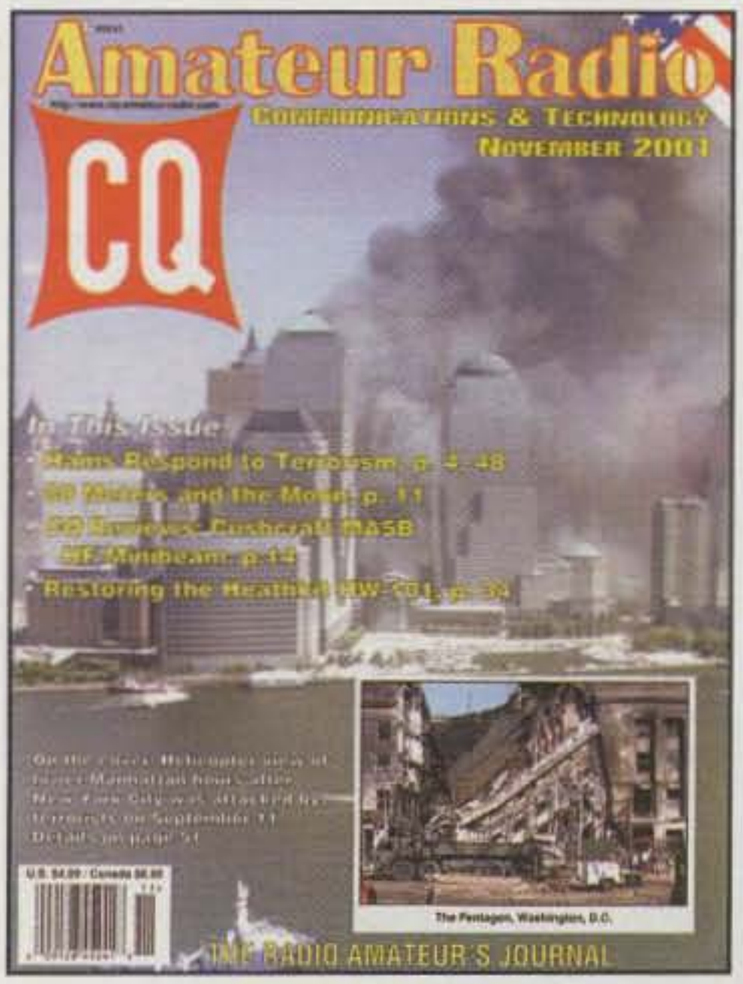
When disaster struck, radio amateurs and others trained in emergency response didn't wait to be asked for help. They knew what needed to be done and took the responsibility for making themselves available ... even at possible risk to their own health and safety. We (and other ham magazines) have chronicled the amateur response, ranging from hams local to the emergency scenes, to those who traveled great distances to help at "Ground Zero," and even those in places like Newfoundland and British Columbia, where thousands of passengers from diverted international flights suddenly found themselves stranded. Around America, everyday people began making note of suspicious activities and reporting them to the authorities.

Looking to the Future

What is our responsibility for the future? We as hams have a responsibility to be equipped and trained at least minimally for responding in an emergency. We need to know how our equipment works and how to stay on the air if the equipment decides not to work. We need to have a "go kit" of essential equipment prepared—or at the very least, a "go list" (other than K1XN's list of QSL managers) so we don't have to waste valuable time thinking about what needs to be packed up and brought with us.

We as Americans have a responsibility to be on our guard and to watch for things that just "don't smell right." We must protect ourselves, our families, our communities, and our country, knowing we have to rely at least as much on ourselves as on "them." But we also have a responsibility to protect the freedoms that make our country and our way of life worth defending.

We must not let our concern for security destroy the very freedoms we are fighting to protect. We must not stifle dissent in the name of security, or use the fear of terrorism as a shield to protect government officials from having to answer to the public for mistakes and mismanagement. In my home



CQ covered various aspects of amateur radio's response to the attacks of 9/11 in nine of the past 11 issues, starting with the November 2001 issue, which was being prepared when the attacks occurred.

state of New Jersey, for example, the state government has just decided that letting the public know the locations of *farms* is a security risk! [There are actually quite a few farms in New Jersey, and (I hope I'm not revealing secrets to terrorists by printing this) they're generally pretty easy to identify by the fact that they're mostly covered with fields instead of buildings! If someone in a crop duster wanted to do damage to the state's farms, he wouldn't need an address list to find them!] We must be on our guard to prevent such silliness from taking hold. If we significantly limit our freedoms by being over-zealous in our pursuit of security, then the terrorists will have won.

Finally, we have a responsibility to ourselves to take care of ourselves and our families, and to take time to enjoy life and pursue hobbies like ham radio. Ham radio builds bridges and forges friendships, without regard to religion, nationality, politics, or most of the other things that divide people and nations. Ham radio provides essential services in times of need. Ham radio is fun, but it is also important, and it will remain important for the foreseeable future.

Looking to the Past

Hams outside of the New York area may not be aware that our hobby has a special link to area known today as "Ground Zero," one which predates the construction there of the World Trade Center. On page 30, *CQ* Publisher Dick Ross, K2MGA, takes us back to 1965 to explain the connection in "A Look Back in Time."

Looking to the more recent past, we have the results of last year's CW weekend of the CQ World-Wide DX Contest, along with the story of one multi-multi team's adventures in activating the rare prefix of XT2 in Burkina Faso, West Africa. And moving into the present, we offer WB6NOA's review of the new RadioShack HTX-420 two-band handheld, plus all of our usual lineup of great columns and other articles. Enjoy ... but remember.

73, Rich, W2VU

Announcements

Collegiate QSO Party – This event will be held 1200Z Sept. 21 to 0400Z Sept. 22 to promote activity at and among collegiate amateur radio clubs and to further the awareness of collegiate amateur radio. Rules: <www.collegiatehams.com/qsoparty.htm>. Non-collegiate stations are encouraged to participate. Logs must be submitted by October 31, 2002.

• These Special Events are slated for Sept.:

RACES 50th Anniversary Operating Event, Lake County, Illinois, 1200–2100 local on 7.283, 14.283, 28.383, 7.037, 14.037, 28.037, PSK31 14,070.15. Contact Lake County RACES/ARES 847-549-5247; details <www.races.org>.

1-land, from Ledge Lighthouse (#USA-542), New London, Connecticut; RAS of Norwich; Sept. 7–8; CW, SSB, RTTY in the General portion of the HF bands. QSL to RASON, P.O. Box 329, Norwich, CT 06360. More info: <www.rason.org>.

K2BR, from Miss America Pageant, Atlantic City, New Jersey; Southern Counties ARA; 1400Z Sept. 16 to 0400Z Sept. 22 on SSB 28.325, 21.325, 14.250, 7.250; CW 28.030, 21.050, 14.050, 7.050 MHz. QSL with #10 SASE to SCARA, P.O. Box 121, Linwood, NJ 08221.

N2UL, "CQ Labor Day," from Great Falls Festival, Paterson, New Jersey; 1200–2300Z Sept. 2 on 28.420, 21.375, 14.260 MHz. QSL to RDGU-LARA, c/o WA2VJA, 112 Prospect St., Nutley, NJ 07110-0716.

K4S, from 250th anniversary of founding of Smithfield, Virginia; Western Tidewater RA; 1500Z Sept. 28 to 2100Z Sept. 29 on 14.250, 21.250, 28.350 MHz. For certificate send QSL and SASE to Erwin Heins, KM4QE, 97 Lumar Rd., Smithfield, VA 23430.

W4UG, from 221st anniversary of Battle of Virginia Capes, Virginia Beach, Virginia; Virginia Beach ARC; 1300–2200Z Sept. 7 on 7.270, 14.270, 21.370, 28.370 MHz. For certificate send QSL and SASE to VBARC, P.O. Box 62003, Virginia Beach, VA 23466.

W5SLA, from Ozone ARC 38th year of community service, Slidell, Louisiana; 1300–2200Z Sept. 14 on 14.250 and 7.250 MHz ±QRM. QSL via Michael White, 404 Holmes Dr., Slidell, LA 70460.

6-land, Route 66 On the Air, sponsored by Citrus Belt ARC, San Bernardino, California; 0400Z Sept. 7 to 1900Z Sept. 15 on 14.266, 21.266, 28.466, 7.266 MHz ±. Certificate available. More info: <qsl.net/w6jbt>.

W7PX, from commemoration of Lewis & Clark expedition on Lolo Trail, Lolo Hot Springs, Montana; 1700Z Sept. 14 to 0200Z Sept. 17, USB on 14.260, 21.360, 28.360 MHz. Certificate ($2.00) and QSL, send SASE: Hellgate ARC, P.O. Box 3811, Missoula, MT 59806. Details at: <www.riversdreams.com/k7vk>.

KB8UUZ, from National POW/MIA Recognition Day, Freedom Township, Ohio; 2000Z Sept. 20 to 2400Z Sept. 22 on 28.375, 21.325, 14.300, 7.240 MHz. For 8½ × 11 certificate send SASE to Tom Parkinson, KB8UUZ, 9992 State Route 700, Mantua, OH 44255.

W8YAF, from YAF Founders Day open house, Yankee Air Museum, Michigan; 1200–2000Z Sept. 22 on 7.270 MHz. For certificate send QSL and 9 × 12 SASE to Frank Nagy, N8BIB, 24315 Waltz Rd., New Boston, MI 48164-9165.

W8B, from Buckwheat Festival, Kingwood, West Virginia; Preston County ops; 1400Z Sept. 26 to 0200Z Sept. 29 on SSB or CW, 40, 20, 10 meters (25 kHz up from bottom of General phone bands or Novice CW bands); 147.000 2 meters; PSK31 on 20 and 10. For certificate send QSL and SASE to KA8UEU, P.O. Box 512, Kingwood, WV 26537.

W9JOZ, from Hosier Valley RR Museum, N. Judson, Indiana; 9 AM to 4 PM local (Chicago time) Sept. 7 on 14.290 and 7.240 MHz. QSL to W9JOZ, Starke County ARC, 504 Jackson St., Knox, IN 46354.

W9D, from Platteville, Wisconsin Dairy Days; Hidden Valleys ARC; 1500–2100Z Sept. 6–8 on 80–6 meters CW and SSB, 2 meters FM. Certificate, QSL on request, HVARC, P.O. Box 112, Platteville, WI 53818-0112.

KØBVC, from Applefest of Western Iowa, Woodbine, Iowa; Boyer Valley ARC; 1500– 2200Z Sept. 28 on 21.256, 14.256, 7.256, CW 7.035, 14.035. Certificate QSL to Karen Stultz, AD4UI, 505 Lincoln Way, Woodbine, IA 51579.

VE3MIS, Halton County Radial Railway Museum, Milton, ON, Canada; Mississauga ARC; 1400–2000Z Sept. 21 & 22 on 7.230, 14.240, 28.340 MHz ±QRM. For certificate send QSL to MARC, c/o Michael Brickell, VE3TKI, 2801 Bucklepost Crescent, Mississauga, ON L5N 1X6 Canada (non-Canadians send green stamp or IRC). Details: <www.marc.on.ca>.

• The following hamfests, etc., are scheduled for Sept.:

Sept. 7, **Clear Lake ARC Hamfest**, Bay Area Community Center, Seabrook, Texas. Details: <www.clarc.org/hamfest.htm>.

Sept. 7, **Southwest Louisiana ARC Swapfest**, 2002, Habibi Temple, Lake Charles, Louisiana. Contact John Leveque, KK5AP, <jjleveque@msn.com>. (Talk-in 146.720)

Sept. 8, **Virginia Beach Hamfest**, Virginia Beach Pavilion, Virginia Beach, Virginia. Info e-mail: <hamfest@exis.net>. (Talk-in 146.970)

Sept. 8, **SEMARA Hamfest**, Southeastern Massachusetts ARA Clubhouse, South Dartmouth, Massachusetts. Contact Tim Smith, N1TI, 508-758-3680, e-mail: <rt_smith@yahoo.com>. (Talk-in 147.00/.60)

Sept. 13–15, **21st Annual Digital Communications Conference**, Denver Marriott Southeast Hotel, Denver, Colorado. Details: <http://www.tapr.org/tapr/dcc/>.

Sept. 14, **RAGS Hamfest**, Pompey Hills Fire Dept., Syracuse, New York. Contact RAGS Hamfest, P.O. Box 88, Liverpool, NY 13088; phone 315-698-4558; e-mail: <ragsonline@hotmail.com>; <www.pagessz.net/~rags>. (Talk-in 147.90/30; exams noon, walk-in)

Sept. 14, **Grand Rapids ARA Hamfest 2002**, Forest Hills Northern High School, Grand Rapids, Michigan. Contact Ed Novakowski, N8UXN, <hamfest@w8dc.org>, 616-458-9029; <http://www.w8dc.org/swap.htm>. (Talk-in 147.26+, 146.52; exams 11 AM, walk-in)

Sept. 15, **LIMARC Hamfest**, Briarcliffe College, Bethpage, Long Island, New York. Details: 516-520-9311; <http://www.limarc.org>.

Sept. 20–22, **RadioFest 2002**, Monte Carlo Inn, Oakville, ON Canada. Contact Harold Sellers, 905-853-3518, e-mail: <listeningin@rogers.com>; or Ontario DX Assn., Box 161, Willowdale Stn. A, Toronto, ON Canada M2N 5S8.

Sept. 21, **All-Arkansas Hamfest & ARRL Arkansas Convention**, Alltel Arena, N. Little Rock, Arkansas. Details: e-mail: <kd5aiv@arrl.net>; phone 501-221-3909; <www.carenclub.com>. (Talk-in 146.940)

Sept. 21, **Hualapi RC Hamfest**, Mohave Community College, Kingman, Arizona. Contact Bill Beaman, KAØIYS, 2652 E. Mary Ave., Bullhead City, AZ 86426 (928-758-6780). (Talk-in 146.76, PL 131.8; exams)

Sept. 21, **W9DXCC DX Convention & Banquet**, Holiday Inn, Rolling Meadows, Illinois. Contact Bill Smith, W9VA, 847-945-1564; e-mail: <w9va@aol.com; <www.w9dxcc.com>.

Sept. 21, **RI Amateur FM Repeater Service Auction/Fleamarket**, VFW Post 6342, Forestdale, Rhode Island. Contact Rick Fairweather, K1KYI, 401-725-7507 (7–8 PM), e-mail: <k1kyi@arrl.net>.

Sept. 22, **Western CT Hamfest**, Edmond Town Hall, Newtown, Connecticut. Contact John Ahle, W1JMA, 203-438-6782, e-mail: <w1jma@aol.com>. (Talk-in 146.67/.17)

Sept. 28, **Delaware Valley RA**, W2ZQ Hamfest, NJ National Guard Armory, Lawrenceville, New Jersey. Contact Glenn Costello, N2RPM, 609-882-2240; e-mail: <abbott0903@aol.com>; <http://www.w2zq.com/>. (Talk-in 146.67–, 131.8)

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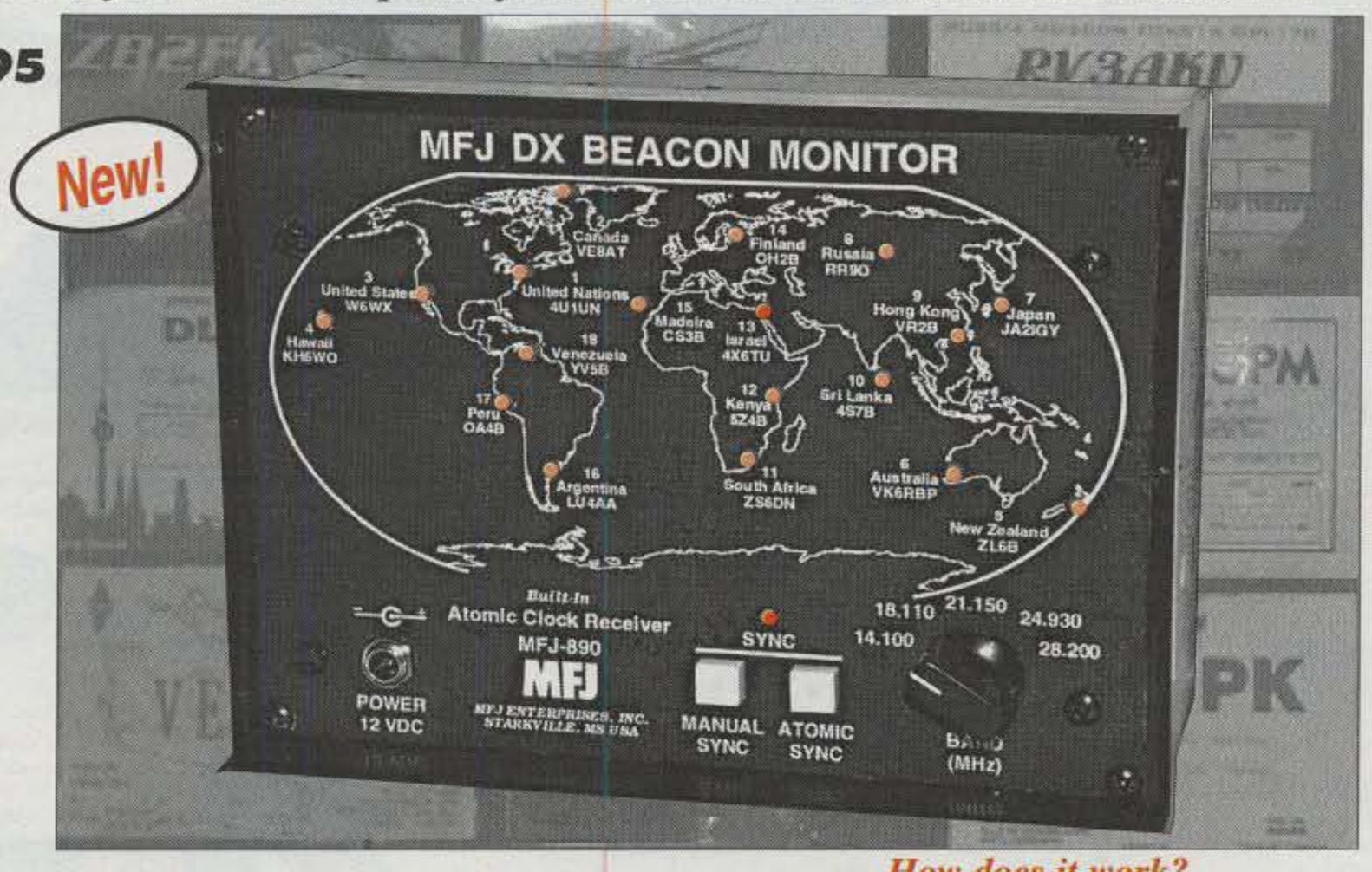

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XT2DX was #2 Multi-Multi in the world from Burkina Faso in last year's CQ WW DX CW Contest. This is the story of VooDoo Contest Group effort as experienced by new group member and rookie DXpeditioner G4IFB.

XT2DX

Multi-Multi in the 2001 CQ WW CW

BY GARY HINSON,* G4IFB

The VooDoo Contest Group specializes in contesting from West Africa in the CW section of the CQ World-Wide DX Contest every November. As we all live in the UK and the USA, we especially welcome the opportunity to leave the cold weather of home for some West African sunshine that time of the year. The goal, of course, is to make many thousands of contacts and collect hundreds of multipliers; "being DX" is the group's primary aim. Over the past decade the "Voodudes" have activated various exotic West African prefixes. Table I lists the group's statistics in the Multi-Operator, Multi-Transmitter category of the CQ WW CW.

Year	Call	# Ops	Result
1994	9G5AA	5	1st place
1995	TY5A	5	1st place
1996	5V7A	10	1st place
1997	5V7A	10	1st place
1998	5V7A	10	2nd place
1999	9G5AA	7	5thplace
2000	9G5AA	4	6th place
2001	XT2DX	6	2nd place

Table I– The CQ WW DX CW Multi-Multi world standings of the VooDoo Contest Group.

The 2001 CQ WW DX CW Contest VooDoo Contest Group team. Left to right, back row: Mike, KC7V; Fred, G4BWP; Andy, G4PIQ; and Don, G3XTT; front row: Roger, G3SXW, and Gary, G4IFB.

The 2001 contest team members were Roger, G3SXW; Don, G3XTT; Fred, G4BWP; Andy, G4PIQ; Mike, KC7V; and myself, G4IFB. Two other Voodudes (Bob, G3PJT, and Vince, K5VT) had planned to join us, but circumstances prevented them from doing so.

The team's combined DXpedition experience is formidable. Apart from the previous trips, most have traveled the globe many times on other DXpeditions. At this point I should admit that I was definitely the rookie of the crew, having only "DXpeditioned" in Europe before this and having had less contesting experience than the others. As you may imagine, XT2DX was a fascinating and somewhat daunting trip for me!

Many characteristics bond the Voodudes into a high-performance team. All are competent CW operators, DXers and contesters who enjoy travelling to exotic locations and are friends as well. Teamwork is an important theme throughout this article.

Pre-trip Planning

Planning for a major DXpedition starts well before the actual event, typically about a year. Selecting an operating location and choosing potential team members are important considerations. As it happened, I was invited to join the XT2 trip just a couple of months before it happened. Lucky for me, I had the finances and holiday time available to commit immediately. It was an easy decision to make, since I already knew four of the team members and was envious of their record scores in previous years. I also had never been to Africa.

About a year earlier Roger, G3SXW, and Fred, G4BWP, had made a reconnaissance visit to Burkina Faso, XT2, met Hugo, XT2HB, and selected a QTH for the contest. With Hugo's invaluable assistance, they obtained the XT2DX license.

The individual group members made their own travel arrangements to and from Ghana, our gathering point in West Africa. Members of the VooDoo group have operated from Ghana many times, encouraging the local amateurs and donating radio equipment and antennas to the Ghana Amateur Radio Society station, 9GØARS. However, since 9G is no longer quite as rare as

*e-mail: <g4ifb@amsat.org>

Burkina Faso

Burkina Faso is a land-locked country in the French part of central West Africa, between the Sahara Desert and the Gulf of Guinea. Although independent, it still shows signs of its colonial past. French is widely spoken in the main towns, but English is rare. There are good French-style restaurants in Ouagadougou. The currency (CFA) was tied to the French franc and is now tied to the Euro.

All of this belies the country's extreme poverty. Burkina Faso is among the poorest countries in the world. It relies heavily on foreign aid (government and private) to supplement meager natural resources. From what we saw, though, its people are resourceful and far from resigned to their fate. Private enterprise is flourishing.

Burkina's main exports are cotton, gold, granite, livestock, peanuts, and products of the shea butter tree (*Butryospermum parkii*). Vegetables such as green beans are increasingly found in British supermarkets.

Tourism is not as well developed as it is in many other parts of Africa. There are a few game preserves, with lions, elephants, hippopotamuses, various monkeys, warthogs, and antelopes.

Andy, G4PIQ, and Gary, G4IFB, work on the amplifiers at 9GØARS, the Ghana Amateur Radio Club station.

it once was, the group likes to travel to other nearby countries to activate exotic prefixes.

Curiously, I discovered that flying to Accra, the capital of Ghana, from Amsterdam on KLM was more expensive than flying from London Stansted to Accra via Amsterdam. However, due to my work commitments I had no choice. We all also had to have the necessary vaccinations (yellow fever is mandatory). Visas are required for 9G and XT, and I had to go to the Ghanaian Embassy and the Burkina Faso consulate in London.

First Stop—Accra

I traveled with Fred, G4BWP, and Andy, G4PIQ, on the leg of the trip from Amsterdam to Accra. The flight was an uneventful six hours, but the arrival was "interesting." After rapidly passing through customs, we descended into the waiting pack of "officially authorized" baggage handlers desperate to relieve us of a dollar to push our luggage carts 50 yards to the taxis. Instead, we waited outside for the hotel courtesy bus. Although it was about 10 PM, it was over 90°F and humid. However, everyone was in good spirits.

For the VooDoo Contest Group, Accra was a convenient place to spend a couple of days before the contest. XT2 can be reached from Accra by road (about 600 miles), which was important for moving our 1.5 tons of equipment! This stopover also allowed the group to meet with long-time friends Ralph, 9G1RQ, and George, 9G1RL. Although I had never met George and Ralph before, I found them to be welcoming and understanding of my first-ever visit to Africa.

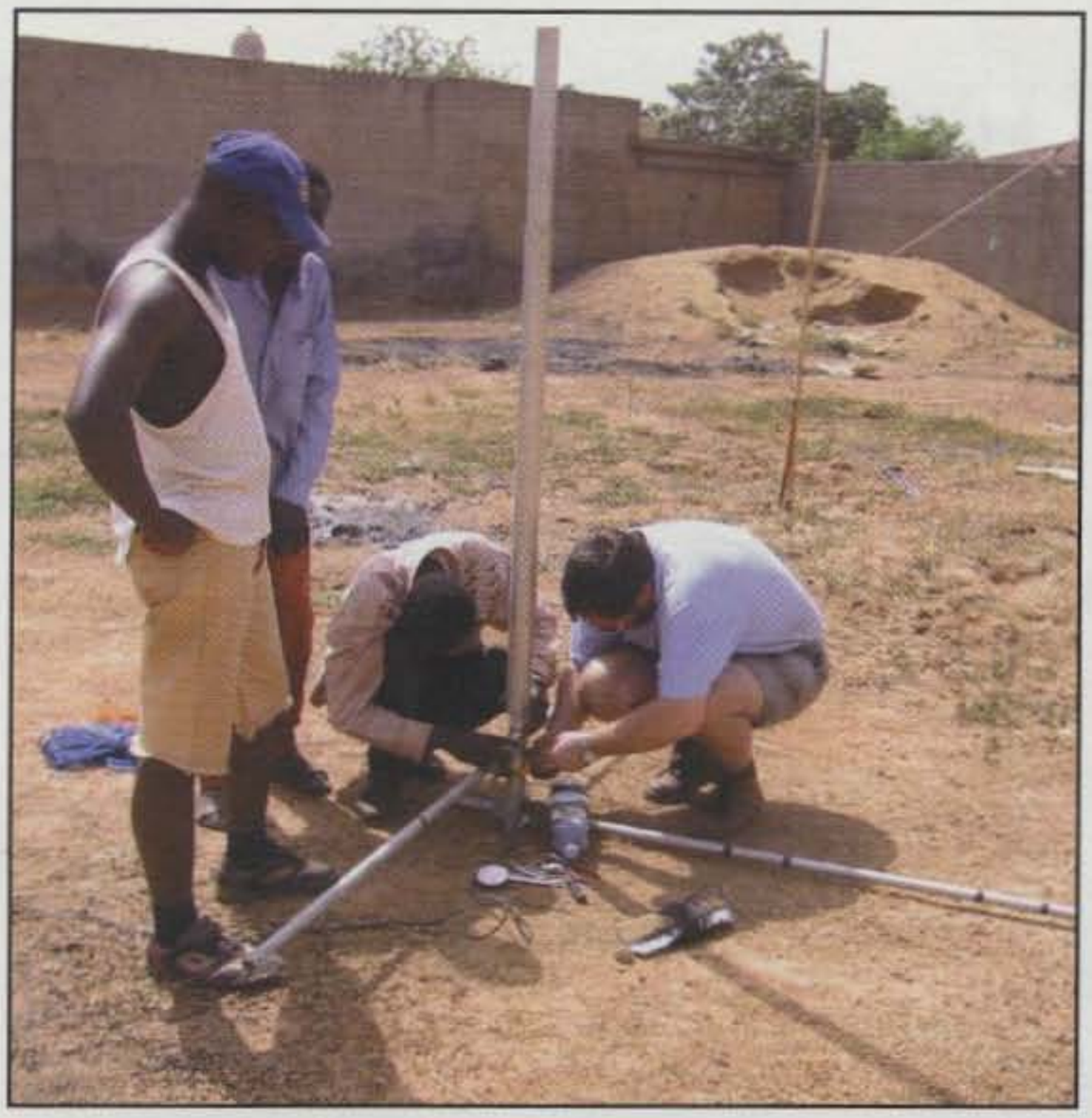
Ralph is a jazz musician who proudly told me he played in Duke Ellington's band a few years ago. Thanks to Ralph, the group has always had local help with organizing things. Perhaps most important, through Ralph's generosity the group had had a safe place to store its equipment between contests. Without that convenience the excess-baggage charges and customs duties to take everything to Africa each time would have made the trips excessively expensive and difficult.

George, 9G1RL, has helped organize the licenses for the group for many years, for which we are most grateful. West African officials are not known for their speed or efficiency, so even a relatively simple license renewal can involve hours of work and numerous visits to the communications ministry. The process takes several months.

Accra was also a good place to adjust to the slower pace of life in Africa before heading to the XT2 contest location. In the fierce sunshine and high daytime temperatures, it made little sense to rush around like we do at home. Some even refer to "GMT" (Ghana Maybe Time) as meaning things happen "sometime—maybe."

Final assembly of the 40 meter beam by Fred, G4BWP, Mike, KC7V, and Mahmud #1.

After a few chilled beers, the heat became more bearable and the group got down to serious last-minute contest preparations: confirming the detailed logistical arrangements and checking the equipment. We also were able to fit in a bit of operating from 9GØARS. While I practiced my pile-up techniques on 10 meters, Mike, KC7V, and Fred, G4BWP, installed an antenna at the sta-



Fred, G4BWP, and the three Mahmuds fine-tune the 80 meter shortened vertical dipole in the field next to the Hotel Splendide in Ouagadougou.

tion and listened to white noise on 6 meters, and Andy, G4PIQ, repaired the club linear.

Onward to XT2

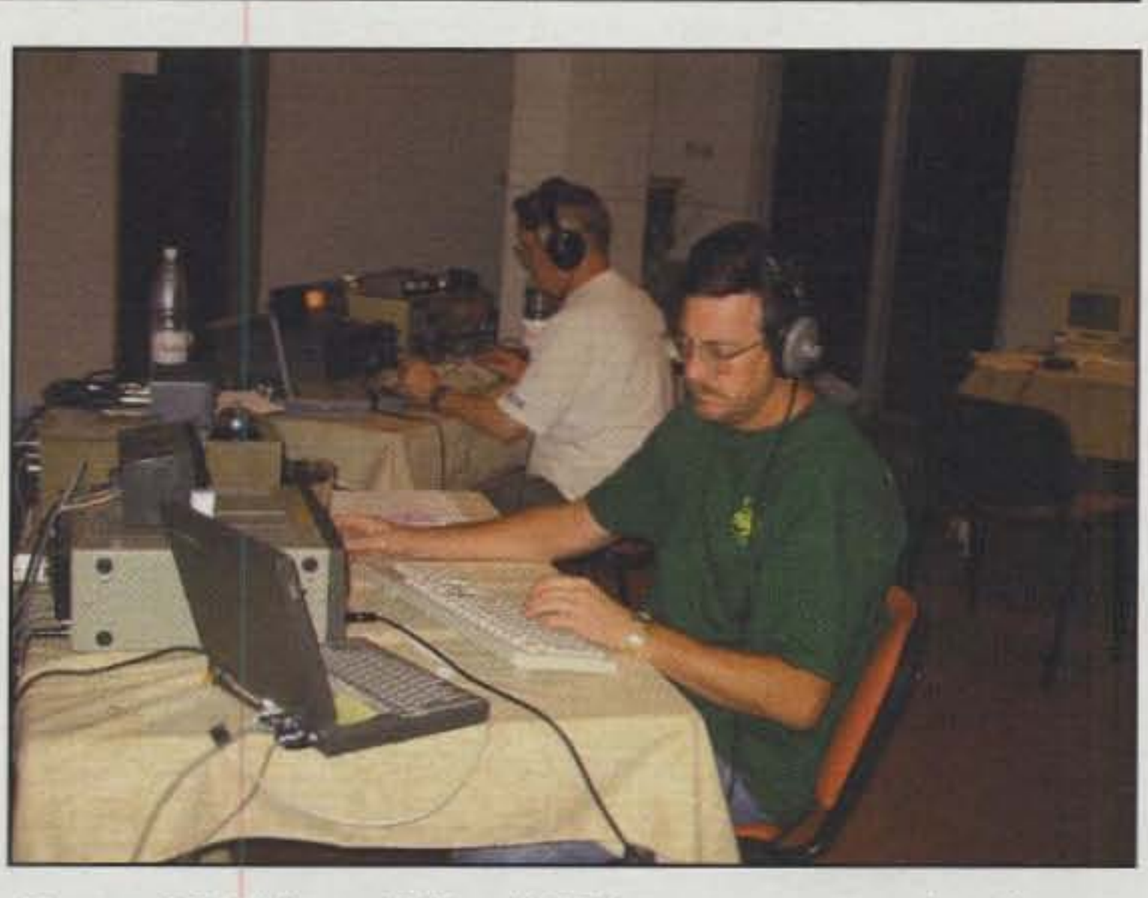
We arranged with Expertravel to collect us for the bus trip to Ouagadougou, the capital of Burkina Faso, well before dawn so that we could load the gear and be on the road at first light. (After the contest we would return to Accra by air. The Voodudes had used Expertravel several times before, so we knew they were reliable.) We had to move the equipment from Ralph's dark shed and into the bus. As Ralph helped us load everything at 4:30 AM and watched us depart, he must have been relieved to have the space back! With all the gear in the bus, there was barely enough room for us. However, soon we were under way, with memories of school rugby trips bus filling my head.

We headed north, watching the countryside become less and less green. As we were travelling only a month after the end of the rainy season, I was surprised how good the roads were. Apparently, the main north-south highway recently had been rebuilt.

As darkness fell, we arrived at Bolgatanga, Ghana for a stopover. Inside its walled compound the hotel may not have been the sort of place you'd see in package holiday brochures, but after a day in the bus, the no-frills rooms and basic restaurant were more than adequate.

The next morning we reached the Burkina border crossing near Po. The first border post (on the Ghanaian side) was a civilized affair. Then we traveled through no-man's land to the Burkina side and another customs post. This was also fairly straightforward, although a large, irate group of colourful Tuareg nomads seemed to be having problems.

At the time, it seemed odd to me that our bus load of gear hadn't been inspected. The reason became apparent a few miles down the highway when we reached the main customs post. It took a couple of hours and over $1000 to clear customs, but we were luckier than another bus that had to completely unload all luggage for inspection (presumably they had argued a little too hard about the customs duties!).



Roger, G3SXW, and Mike, KC7V, concentrate on the pile-ups.

Despite the gloom over the customs bill, the group was looking forward to arrival in Ouagadougou. Just past the airport, on the main road to the city center, we found the Hotel Splendide looking just like its pictures on its website.

Setting Up

The bus was unloaded at the rear of the hotel, and the laborious task of getting all the antenna and tower parts onto the roof began. Even with many local helpers, the next couple of hours in the blazing sun were tough. Bags of cables were hoisted by rope, but most of the boxes (including transformers for the linear amplifiers) had to be hand-carried up four floors to the roof. We all earned our beer that night!

By sunset that first day we had started unpacking, sorting, and laying out the towers and antennas. The L-shape roof provided room for two HF beams on each leg, and the largest (40 meter) beam would go in the middle of the L, on top of the elevator-shaft. There would be wire dipoles sloping down from the roof toward the north. The low-frequency verticals would go into the "field" next to the hotel. This actually was a construction site for a hotel extension. With near-perfect timing, the ground had been cleared and concrete blocks were just being laid out by the time we left!

The group's prior experience paid off during setup. Everyone found something useful to do and shared the workload. Roger enjoyed collecting water and other essential supplies from the local markets. Andy, G4PIQ, was happiest with a soldering iron in hand. Mike, KC7V, just *loves* to climb towers. The rest of us helped put together the antennas and towers in the baking sun. This was the slowest and most laborious part of the station assembly. The fact that our three local helpers spoke no English and all were called Mahmud made the process something of a challenge!

Operating Location

Ouagadougou in central Burkina Faso is a little over 10 degrees north of the equator, 1 degree west. From this location an arc from NW-NE covered the great circle short path to most of the world. The hotel's L-shaped roof meant we sometimes beamed at one another, but distance between antennas and the bandpass filters on every band prevented any intra-station QRM.

The 40 meter beam took the place of pride on top of the elevator shaft. The shaft has a small roof, about 5 meters (16 1/2 feet) square with no edge barriers. Standing up there, looking over the rooftops of central Ouagadougou, is not ideal for those with a fear of heights, and even less so at the top of the tower!

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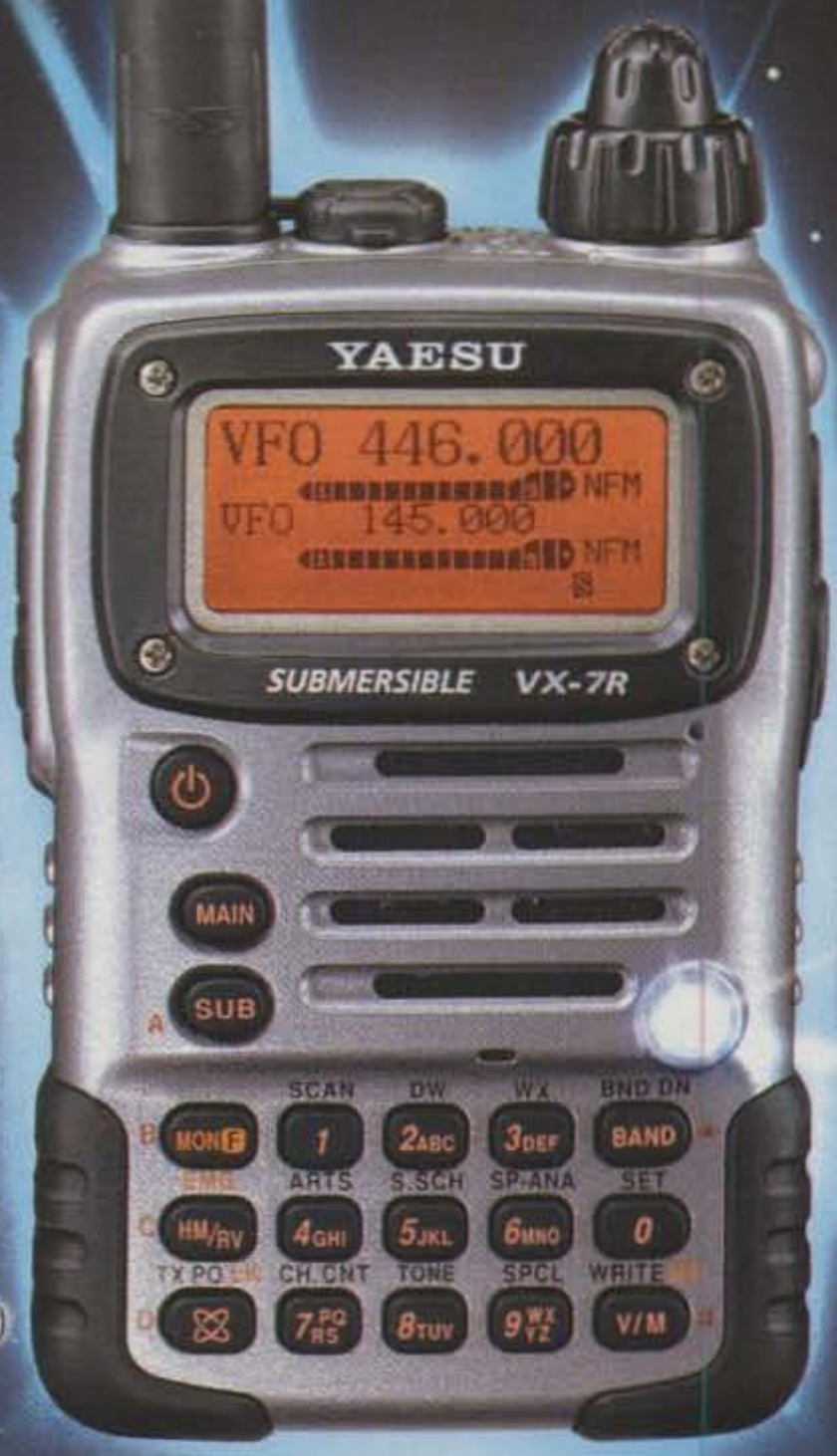

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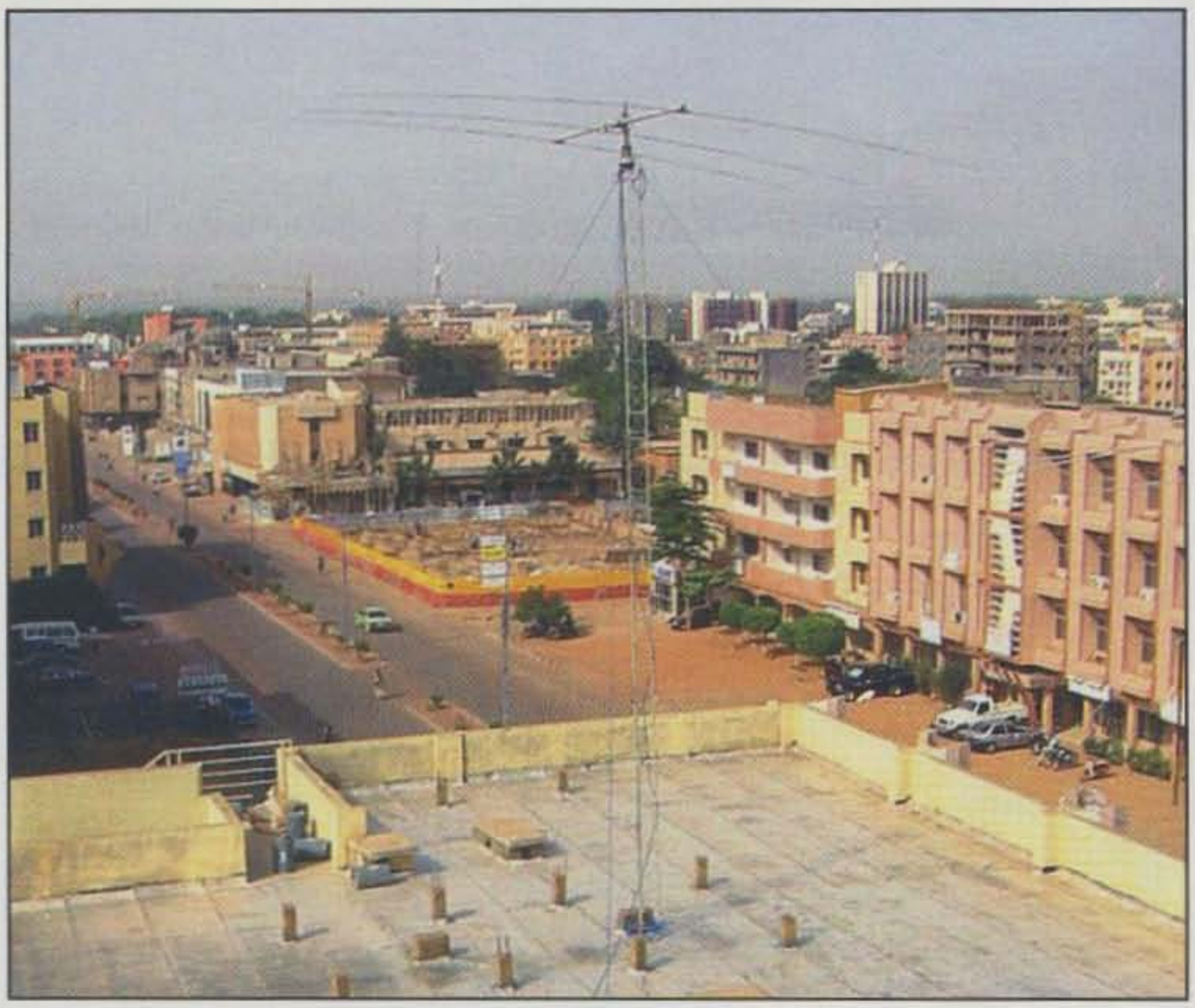

The northerly view across Ouagadougou past the 15 meter beam.

The hotel lift caused us interference problems, especially on 40, the antenna picking up noise from the magnetic and electrical fields. Every few minutes the band was wiped out for 5 seconds by 30-over-9 hash. We were *very* tempted to pull the fuses on the lift during the contest, but decided it was better to stay on good terms with the hotel management and guests!

The main conference room is on the fourth floor of the hotel. It was ideal for our operating purposes, and the hotel kindly lent us sturdy tables and comfortable chairs. We arranged the six monoband stations in band sequence in a U-shape, making it easier to pass multipliers between adjacent bands.

I was relieved to hear that the hotel had a standby generator but needn't have worried, as we experienced no problems with the power. The conference rooms' air conditioners were more than adequate to the task. They also dry the air, so it was even more important to keep drinking bottled water. (We each averaged about three liters a day.)

The Station

All stations were manned during the hours of darkness, with the three HF stations operational in the daylight hours. Our main transceivers were Kenwood TS-930Ss. These venerable rigs had done sterling service for the Voodudes over the years, but were showing the effects of age and storage in less-than-ideal tropical conditions. Two of them failed in testing prior to the contest, although with the help of a service manual from the internet, Andy was able to scavenge parts from one to repair the other.

We used three other rigs: an ICOM IC-756 on Top band (also used on 6 meters outside of the contest), a Yaesu FT-1000MP on 20 meters, and a Kenwood TS-850SAT on 10.

We had five Alpha amplifiers plus one Ameritron. We generally ran less than a kilowatt, because with reasonable antennas in a good location, there was no need to run the amplifiers flat out.

Next to the rare callsign, of course, the antenna farm was our greatest asset. We ran dedicated monoband antennas for each station:

160 meters—sloping dipole, loaded vertical, and Beverage (shared with 80)
80 meters—vertical loaded dipole, sloping dipole, and Beverage (see above)
40 meters—2-element Yagi
20 meters—3-element Yagi
15 meters—3-element Yagi
10 meters—4-element Yagi

The Beverage antenna turned out to be a disappointment. Mike had installed the antenna wire along the back of the hotel on top of a convenient wall. It seemed to work well before the contest, but during the event it proved useless. We never did diagnose the problem.

Logging was with K1EA's CT program. The computers were networked using Ethernet over coax, allowing us to exchange messages and keep track of the overall score progress from any station. We also had a PacketCluster connection, using a modem to access the internet through a Burkinabe ISP. This worked well throughout the contest.

Working Pile-ups—The DX Side

The biggest lesson for me as a rookie DXpeditioner came when I went on the air with such a rare prefix. It only required one CQ before the callers appeared! I operated split (mostly listening 1–3 kHz up the band from my transmit frequency) to make sure callers could hear me. Even during the contest quite often I listened slightly off-frequency because the pile-ups were so huge that I had to move the receiver just to resolve individual calls.

A difference compared to calling DX stations from home was that I rarely used narrow CW filters. This meant I heard a lot of calls all at once, but I found it easier to pick out individual signals by ear, focusing on the tone, speed, timing, and style of the callers. I was surprised to discover that Japanese hams, more than most others, make a real effort to listen in the pile-up. They were highly skilled at calling precisely on my receive frequency just as the previous QSO finished.

As to the DX station's view of those on the other end of the pile-ups, I would split them into three categories:

The Good. These ops matched my speed, timing, and style, and were efficient to the extreme—no continuous repeats, listening intently between each transmission, responding instantly to being called and responding with the bare minimum information, sending perfectly and rhythmically. Working them was a sheer pleasure. Each one meant another solid call in the log with no wasted time, and then straight back to business.

The Bad. The bad ops would call out of turn, repeat information unnecessarily without listening, send superfluous information ("TNX CUL," etc.), and were somewhat clumsy (e.g., slow to respond when called). Working them was more of an effort, but we got there in the end.

The Ugly. These lids and self-appointed pile-up police were either totally deaf, or at best were having "severe trouble" hearing me. They made little or no attempt to follow what I was sending, ignored my pleas to QRX, and continually interfered with everyone else. Some of them may just have been bad operators having a really bad day, while others simply were incompetent operators. I suspect, though, that the rest were plain rude and ignorant. Working the lids was a nightmare.

Just ponder this a moment: Given the choice of working good, bad, or ugly callers, guess which I'd choose first? If you call blindly, your chances are *reduced* of ever working the station compared to lis-

tening! Instead of calling, spend your time listening to the DX operator's style and rhythm, and, most important, listen to the pile-up until you hear someone the DX is actually working.

Don't forget, DXing (and contesting) is supposed to be fun for all of us! If it all gets to be too much, take a break. I did.

The Contest

The week before the contest Roger had figured out an operating roster on the assumption that Bob, G3PJT, would be joining us. When this became impossible, we extended our on-the-air periods to cover the gaps and basically muddled through. In hindsight, we should have taken more care during the Sunday morning contest session. Having operated hard on Saturday, those of us who had stayed up all Saturday night were completely exhausted by dawn Sunday.

With a reasonable sunspot count, propagation during the contest was good on the mid- and high-frequency bands. Fifteen and 20 meters were open day and night, with 10 and 40 meters not far behind. Twenty and 15 closed down for a couple of hours around noon due to solar absorption. Our QSO rates on most bands were limited by contest QRM and (in my case at least) operator fatigue. One-sixty and 80 were hard going. Our low QSO count on 160 meters as compared to the other bands tells its own story, and was certainly not due to lack of effort or experience on that band *(see the Band-By-Band Breakdown box in the contest results elsewhere in this issue—ed.)*.

Our operating techniques during the contest were prioritized according to efficiency, accuracy ,and speed, more or less in that order. We could have sent and received faster code, but that may have reduced the accuracy. Inevitably, however, we made some mistakes. This was the main aspect where I feel I could have done better. Having not been very active for some time before the contest, I took longer than usual to get my ear tuned in.

The realities of being DX really hit me on Sunday morning of the contest. I found myself literally falling asleep at the key once or twice, and my accuracy, speed, and tolerance all suffered.The combination of physical and mental exhaustion, QRM/QRN, and sheer frustration with arrogant lids made me resort to giving up on good pile-ups in order to move and find a clear frequency. I'd start over until the lids found me, and then eventually I'd move again. I want to apologize to all the good operators I deserted each time (and to those who had to struggle to understand my nonsense code at times due to fatigue!), and hope that you worked us later on. Sorry, but it was all I could do to stay awake and keep operating.

Hourly we tracked our actual scores against targets. Our performance was close to the predictions, thanks to the group's prior experience and good conditions, and led to the Voodudes highest ever QSO count and 36.9M points for the number two spot Multi-Multi in the world in the 2001 CQ WW DX CW Contest.

Post Contest

Those who have been involved in Field Day know that dismantling a temporary station takes a fraction of the time it takes to put it together. With the elation of a very successful contest behind us, we ignored our fatigue, and all of the equipment soon was neatly packed and ready to go. A hired truck carried all of the gear to a secure storage place, and we then experienced the trip across central Ouagadougou, watching the hubbub of city life over the truck's side panels. The sight of so many happy faces peering out of the truck caused many bemused looks from the locals!

Pretty soon we had paid our hotel bills and said our goodbyes, and then we departed by Ghana Airways for Accra. By the time we arrived in Accra, the tiredness had started to kick in, and I for one was soon tucked-up in bed for the night.

Conclusion

Looking back on the DXpedition and the contest and totalling up the cost, was it all worth it? From a personal viewpoint, I'd say definitely! We experienced West Africa up close, made thousands of QSOs in the contest, and had a lot of fun. I learned a great deal about DXpeditioning, found out what it's really like to be at the DX end of huge pile-ups—and happily made it home in one piece!

QSL Information

The Voodudes QSL policy remains as it has been in previous years. Rather than just sending QSLs for all QSOs, Roger, G3SXW, replies individually to all requests. The requests are still coming via e-mail (g3sxw@compuserve.com), direct (Roger Western, 7 Field Close, Chessington, Surrey, KT9 2QD, England), and via the bureau. ■

References

Go to <www.voodudes.org> for more details of our trip, along with hyperlinks to other information resources on the World Wide Web, including those we used to prepare for the trip (e.g., <www.state.gov/www.background_notes/burkina_0398_bgn.html>). The internet really is a marvellous source of data if you know how to look (I usually start by searching on <www.Google.com>.). Sources such as the CIA World Fact Book, <http://www.cia.gov/cia/publications/factbook/>, give statistical data about any country in the world and travel safety advice. There is even a site that gives current weather from Ouagadougou (<autobrand.wunderground.com>).

Government websites are good places to look for official information on visas and inoculations, while hotels often have their own websites. Information on the Hotel Splendide in Ouagadougou is at <www.ahrbf.com/pwesplen.htm>; the Paloma Hotel in Accra is at <www.africaonline.com.gh/Paloma/hotel.html>.

Our travel arrangements were made through Expertravel (<www.expertravel.com.gh>) in Accra, Ghana.

For those without internet access, general information books such as the *Rough Guide to West Africa* are ideal.

Results of the 2001 CQ WW DX CW Contest

BY BOB COX,* K3EST

Expanded CQ WW Contest Results on the Web

We've moved a few elements of our contest reporting onto the CQ website this year, including **Station Operators** of Multi-Op stations, **Team Contesting**, **Top Scores in Very Active Zones**, and **Zone Leaders/Single Op**. In addition, we have expanded **QRM** on the web.

To view these additional and expanded elements of this year's CQ WW results, go to <http://www.cq-amateur-radio.com/cqwwhome.html>, then click on "Expanded results, 2001 CQ WW CW" and select the category you want to see. You may also get there by going to our home page at <http://www.cq-amateur-radio.com>, clicking on "Contest Rules & Info," then clicking on "CQ World Wide DX Contest" and selecting "Expanded results, 2001 CQ WW CW."

It was the best of times; it was the worst of times. This famous phrase took on a new meaning, as it aptly described the 2001 CQ WW DX CW Contest. Everyone was looking forward to the race and the setting of personal records. The sun had other plans. A large solar event occurred on late Friday night and made Saturday a challenge for those not operating near the equator. Randy, K5ZD/1, summed it up well: "Two contests in the same weekend! Poor conditions the first day were matched by great conditions the second day." 7S2E was in the midst of the aurora and has a similar comment: "Worst conditions in many years. I had a total blackout on Saturday . . . much better on Sunday."

The number of rare DX stations on the air for the contest made for many new countries for lots of contesters. The effect of the solar flare did not discourage many, and if you persisted there were lots of rewards.

After all the logs were counted, a total of 3400 logs were received: 3111 via e-mail, which equals 92% e-logs! Given the highly variable conditions throughout the world, this number is very FB! But enough QRM. Look in the results for your call and check out the various boxes to see how the top entrants performed.

All Band

Taking time out from his busy medical career in downtown Helsinki, Ville, OH2MM, drove to the airport through the countryside studded with pines and lakes of southern Finland. The daylight was much reduced at this time of the year and the Canary Islands were only a few hours direct flight away. What a difference four hours makes! Emerging into full sunlight at EA8EA, Ville took full advantage of the conditions and his considerable skill to take the world title in the high power category. Several time zones to the east, Hrane, YT1AD, had winning on his mind. Having placed 3V8BB in the contest many times, he flew into Tunis and pushed 3V8BB to new heights by finishing second. Third place went to Robert, S53R, who took off time from his job in Kabul to fly down to Dubai, where he set a new Asian record by putting A61AJ in many a deserving contester's log.

In Europe the changing conditions seemed to favor the eastern and western ends. Taking first place in Europe, and the first Polish #1 in a long time, was Chris, SP7GIQ. The battle for Europe #1 was tough. Second place went to Dave, G4BUO, who finished just behind SP7GIQ. Third place went to RK4FF. There were only two zone 14's in the Europe top ten.

In the U.S. the battle is always tough. After all the dust settled, Randy, K5ZD/1, was the clear winner. Is there ever a time when being in New England is not good? Second place went to John, K1AR, at the K1EA farm, and third went to Andy, N2NT/1, out at the Cape Cod QTH of K1ZM. In the far west state of Indiana, N9RV pushed W9RE into fourth place. Congratulations to W6EEN (N6RT), N6RO, and W7GG, who finished first, second, and third, respectively, in zone 3. N5RZ, K5YA, and K5YAA did a fine job, too.

As you can see, the top ten high power in the world group was dominated by African and Asian stations. A special mention must be made of K4BAI's effort at 8P9Z, and the return of KØDQ to the big leagues as P40Q.

The top scores from each continent were: North America 8P9Z, Africa EA8EA, Asia A61AJ, Europe SP7GIQ, South America P40Q, and Oceania 9M6NA. The top score from Japan was JH5FXP.

Low Power

"A perfect year for low power; disturbed conditions were music to my ears," said John, W2GD, who put P40W into orbit to set a new low power world record by breaking the 10 meg barrier for the first time. With beams pointing south for most of Saturday, John made QSOs while sun was up and down. Second place went to perennial low power champ Joe, AA3B, who put V26K on the map. Third place went to Paul, K9PG, who operated 8P2A.

In Europe Con, DF4SA, decided that southwest Europe was better than central Europe. He was right. Con set a new European low power record at CS7T. Second place in this tough category went to Slawa, ER1LW, operating at ER6A. Third place went to Gedis, LY3BA, operating at LY9A.

The conditions definitely had an effect on the U.S. scores. The clear winner was Jim, W1UK, whose country total made the difference. Second place went to Brooke, N2BA, while third went to Marvin, N5AW, way out in Texas. Bob, K6XV, had the #1 score from the U.S. far west.

The top scores from each continent were North America V26K, Africa FR5FD, Asia

Tack, JE1CKA, of KHØAM fame, put JR1AIB on in the WW CW in the Single Op, 15 meters category.

*c/o CQ magazine
e-mail: <questions@cqww.com>

ZC4DW, Europe CS7T, South America P40W, and Oceania ZK2MO. The top score from Japan was JH2NWP.

QRP

"Who said QRP has to be weak? We had so much fun, we are looking forward to another QRP trip in 2002," said 6Y1A. "QRP is simply the best category to participate in," said DL6RDR. "QRP is really fun!" commented F5PBL. "I am very impressed at the skill of the operators and amazed at the way they could pick up my QRP signals," said GIØGDF.

Those were just a few of the comments from the QRP gang. The #1 score in the world was LY5A operated by LY2PAJ. Second place went to Didier, FY5FY, while third went to TI5X operated by Phil, NØKE. Second in Europe was HG5Z operated by Gyorgy, HA1CW, while third place went to Bosko, YT7TY. In the U.S. the #1 scorer was N3BJ/4, Alan, located in Virginia.

TROPHY WINNERS AND DONORS

SINGLE OPERATOR

World All Band
EA8EA (Opr: Ville Hiilesmaa, OH2MM)
Donor: W9IOP Memorial (Albert Kahn, K4FW)

World Low Power
P40W (Opr: John Crovelli, W2GD)
Donor: Slovenia Contest Club

World QRPp
LY5A (Opr: Jonas Paskauskas, LY2PAJ)
Donor: Gene Walsh, N2AA

World Assisted
CT9M (Opr: Frank Grossmann, DL2CC)
Donor: CTRI Contest Group

USA
Randy Thompson, K5ZD/1
Donor: Frankford Radio Club

USA Low Power
Jim Parise, W1UK
Donor: North Coast Contesters

USA – Zone 3
W6EEN (Opr: Doug Brandon, N6RT)
Donor: Central Arizona DX Association

USA – Zone 4
W9RE (Opr: Pat Barkey, N9RV)
Donor: The Society of Midwest Contesters

Canada
Yuri Onipko, VA3UZ
Donor: Jim Fisher, VE1JF

Carib./C.A.
8P9Z (Opr: John Laney, III, K4BAI)
Donor: Chuck Shinn, W7MAP

Europe
Krzysztof Sobon, SP7GIQ
Donor: Edward Bissell, W3AU

Europe – Low Power
CS7T (Opr: Cornelius Paul, DF4SA)
Donor: Scott Jones, N3RA & Tim Duffy, K3LR

Scandanavia
OG1MM (Opr: Pasi Alanko, OH1MM)
Donor: W3FYS Memorial (Chas Weir, Jr., W6UM)

Russia
Vlad Zaitsev, RK4FF
Donor: Roman Thomas, RZ3AA

Africa
3V8BB (Opr: Hrane Milosevic, YT1AD)
Donor: Gordon Marshall, W6RR

Asia
A61AJ (Opr: Robert Kasca, S53R)
Donor: Chuck Shinn, W7MAP

Japan
Satoshi Hara, JH5FXP
Donor: Japan Crazy Contesters Club

Japan – Low Power
Kenji Saito, JH2NWP
Donor: Western Washington DX Club

Oceania
9M6NA (Opr: Saty Nakamura, JE1JKL)
Donor: Peahi Contest Club

South America
P40Q (Opr: Scott Redd, KØDQ)
Donor: Venezuela DX Club

SINGLE OPERATOR, SINGLE BAND
World – 28 MHz
HO1A (Opr: Stefan Radtke, DL5XX)
Donor: Joel Chalmers, KG6DX

World – 21 MHz
5R8HD (Opr: Bruce Lee, KD6WW)
Donor: N5JJ Memorial (Don Busick, K5AAD)

World – 14 MHz
5X1Z (Opr: Mats Persson, SM7PKK)
Donor: W2JT Memorial (North Jersey DX Assn.)

World – 7 MHz
Jiri Pesta, OK1RF
Donor: Alex M. Kasevich, VP2MM

World – 3.5 MHz
IR4T (Opr: Gabriele Macchi, IK4UPB)
Donor: Fred Capossela, K6SSS

World – 1.8 MHz
4X3A (Opr: Riki Kline, 4X4NJ)
Donor: Kenneth Byers, Jr., K4TEA

USA – 28 MHz
Bill Tippett, W4ZV
Donor: Wireless Institute of the Northeast

USA – 21 MHz
John Reuning, K4OAQ
Donor: Wayne Carroll, W4MPY

USA – 14 MHz
David Franks, K2XR
Donor: Northern Illinois DX Association

USA – 7 MHz
Phillip Allardice, KT3Y
Donor: W6AM Memorial (Jan Perkins, N6AW)

USA – 3.5 MHz
Robye Lahlum, W1MK
Donor: Bill Feidt, NG3K

USA – 1.8 MHz
Ronald McClain, W2VO
Donor: Dave Patton, NT1N & Mark Obermann, AG9A

Canada (7 MHz)
John Currie, VE1ZJ
Donor: Radio Amateurs of Canada

Carib./C.A. (28 MHz)
ZF2AM (Op: John Barcroft, K6AM)
Donor: CQ magazine

Europe – 28 MHz
Greg Morris, 9HØA
Donor: Jay Pryor, K4OGG

Europe – 21 MHz
GIØKOW (Opr: Robert Willamson, GIØNWG)
Donor: Robert Naumann, N5NJ

Europe – 14 MHz
YT9X (Opr: Milan Milovanovic, YU1ZZ)
Donor: G3FXB Memorial (Maud Slater)

Europe – 7 MHz
YT1AD (Opr: Mladen Bogdanov, YU7NU)
Donor: Ivo Pezer, 9A3A/5B4ADA

Europe – 3.5 MHz
9A5Y (Opr: Zvonimir Karnik, 9A3LG)
Donor: K3VW Memorial (Frankford Radio Club)

Europe – 1.8 MHz
Danilo Brelih, S50U
Donor: Pat Barkey, N9RV & Terry Zivney, N4TZ

Japan – 21 MHz
Kenji Koishi, JH3AIU
Donor: DX Family Foundation

Japan – 14 MHz
Yoshiharu Katada, JA9CWJ
Donor: Mitsuhiro Nishimura, JA7WME

MULTI-OPERATOR, SINGLE TRANSMITTER
World
P3A (Oprs: RA9JX, RZ9UA, UA9MA, RW9UP, RK3AD, UT7QF)
Donor: Anthony Susen, W3AOH

U.S.A.
K4XS (Oprs: N2NL, N6MJ, K4XS)
Donor: Douglas Zwiebel, KR2Q

Canada
VE1JF (Oprs: VE1JF, VE1JS, VE1RM, VE9DX, VE9WH)
Donor: Eastern Canadian DX Assn.

Carib./C.A.
WP4NOW (Oprs: WB9ZEZ, W9JOE, N9HZ)
Donor: Lone Star DX Association

Africa
EA8ZS (Oprs: EA8ZS, RA3AUU, RX3ARI)
Donor: Harry Booklan, RA3AUU

Asia
RT9W (Oprs: RU9WX, RX9WR, RW9WA, RV9WB, RW9WW, RW9WY, RA9WR, RV9WA, UA9WFM, RA9WTR, RA9WR)
Donor: Steve Merchant, K6AW

Europe
EA6IB (Oprs: EA3AIR, EA3AJW, EA3ALV, EA3AVV, EA3KU, EA5BM, EA5ZF, EA6ACC, EA6FB, EA6FO, EB6AOK)
Donor: Bob Cox, K3EST

Oceania – Pacific Rim
AH2R (Oprs: JI3ERV, JR7OMD, JK3GAD, JR8VSE, JP1JFG)
Donor: Vienna Int'l Amateur Radio Club – 4U1VIC

South America
PTØF (Oprs: PYØFF, YU1RL, PY5CC, PY7XC, PY7ZY)
Donor: Araucaria DX Group

MULTI-OPERATOR, MULTI-TRANSMITTER
World
HC8N (Oprs: N5KO, K6AW, N6TV, K1KI, KM3T, N4GN, K9NW, K1TO, NØAX)
Donor: K2GL Memorial (Doug Zwiebel, KR2Q)

USA
KC1XX (Oprs: N6HB, W1FV, N2IC K1GQ, N3RD, KC1XX, K1LZ, K1TR, K1XX)
Donor: N6RJ Memorial (Bob Ferrero, W6RJ)

Europe
RW2F (Oprs: RA2FA, RN2FA, RV2FW, RZ3FA, UA2FB, UA2FCC, UA2FF, UA2FM, UA2FP, UA2FX, UA2FZ, UA3DPX)
Donor: Finnish Amateur Radio League

Japan
JA3YBK (Oprs: JH3PRR, JG3KIV, JI3OPA, JM3XKG, JP3PZD, JH4IFF, JH4NMT, JR4ISF, JF4FUF, JL4CVB, JK1JHU)
Donor: Ryozo Goto, JH3JYS

WORLD – SSB/CW COMBINED
KC1XX
Donor: WØID/WØUN ALPHA Award

JAPAN – MULTI-SINGLE SSB/CW COMBINED
JE4VVM
Donor: Vienna Int'l Amateur Radio Club – 4U1VIC

CONTEST EXPEDITIONS
World Single Operator
CN2JS (Opr: Jacques Saget, F6BEE)
Donor: Yankee Clipper Contest Club

World Multi-Single
PJ2T (Oprs: KP2L, WØCG, K6LA, K4WA, K8GT, WI9WI)
Donor: Carl Cook, AI6V

World Multi-Multi
XT2DX (Oprs: G3SXW, G3XTT, G4BWP, G4IFB, G4PIQ, KC7V)
Donor: Bill Schneider, K2TT

SPECIAL – SINGLE OPERATOR AWARD
World SSB/CW Combined
3V8BB (Opr: Hrane Milosevic, YT1AD)
Donor: Hrane Milosevic, YT1AD

World All Band: Under 21 years old
Thomas Andersen, OZ1AA
Donor: Chuck Shinn, W7MAP

CLUB
World SSB/CW
Yankee Clipper Contest Club (431,776,382)
Donor: W1WY Memorial (CQ magazine)

Non-USA SSB/CW
Bavarian Contest Club (194,172,334)
Donor: N6AUV Memorial
(Northern California Contest Club)

Ed, K8EP (now N1UR), the op at C6ARS.

Rosel, DL3KWR, operated Single Op, Low Power, All Band.

Second went to all-around DXer and contester Tom, N4KG. Third was Bill, N8ET.

The top scores from each continent were North America TI5X, Asia JR4DAH, Europe LY5A, South America FY5FY, and Oceania KH6/W8QZA (Africa no entry). The top score from Japan was JR4DAH.

Assisted

Not only can he copy code at over 70 wpm, he also can operate in a contest. Frank, DL2CC, traveled down to CT9M and walked away with the top assisted score in the world. Second place went to another FB contester, Felipe, NP4Z, who keyed KP3Z into a lot of logs. World third place went to Chas, K3WW, who knows a thing or two about the assisted category. The #1 score in Europe was R3CC operated by Jack, RW3QC. Boris, S58A, finished second, while DL4NAC took third. In the U.S. the aforementioned K3WW took top honors. Second place went to Barry, W2UP, and third to Noah, K2NG.

The top scores from each continent were North America KP3Z, Africa CT9M, Asia UA9AM, and Europe R3CC (South America no entry; Oceania no entry). The top score in Japan was JI2KVW.

Multi-Single

Located on the western, central coast of Cyprus on top of a 20 meter cliff, the location of P3A has all the right conditions to allow for a world-class score. Traveling from various locations in Russia, this team once again took first place in the world. Second place in the world was the multi-national effort from the QTH of EA8ZS located on a banana plantation on Las Palmas. Another multi-national team traveled to PTØF to take third place world.

First place in the tough European MS category went to EA6IB. The Spanish team keyed their way to the top of the rankings. Second place went to the fine Hungarian team at HG1S, and third to another central zone 15 team at OM8A.

In the U.S. the top score was taken by K4XS down in Florida. Bill's team and his location sure paid off with top honors. Second place went to another southern team, W4AN, and third place went to constant high finisher N3RS.

The top scores from each continent were North America K4XS, Africa EA8ZS, Asia P3A, Europe EA6IB, South America PTØF, and Oceania AH2R. The top score in Japan was JE4VVM.

Multi-Multi

Putting together a top-contender station in the multi-multi category requires a lot of work. Look at the top scores and you will see evidence of the years of work it takes to create a station which is usually at a remote location. Each year these stations require high maintenance, even if they are permanent installations.

Coming out on top in the MM category was super-station HC8N located on the slopes of a mountain at the equator. The HC8N team worked hard for their victory. Second place went to the Voodoo team, which surprised contesters with XT2DX *(see their story elsewhere in this issue—ed.)*. Ougadougou proved to be very popular. Third place went to J3A, who for the last several years has put J3 on the map. The #1 spot in Europe went to RW2F. This high-quality team finally moved into first place in 2001. Second place went to DFØHQ with their quad antennas, and third went to RU1A, entering their first year as MM. In the U.S. the KC1XX team QSOed its way to first place from their New Hampshire QTH. Second place went to K3LR from their QTH in western Pennsylvania. Third place went to W3LPL located in central Maryland.

The top scores from each continent were North America J3A, Africa XT2DX, Asia JA3YBK, Europe RW2F, and South America HC8N (Oceania no entry). The top score from Japan was JA3YBK.

Clubs

One of the best ways to enjoy ham radio is by joining a club. One of the best ways to enjoy contesting is to talk to your fellow club members about antennas, propagation, station design, and just the fun of socializing with other contesters.

The U.S. clubs always participate strongly in the CQ WW. This year was no exception. The battle for first place in the U.S. and DX was fierce! After all the log checking, it was determined that the Yankee Clipper Contest Club had just edged out the Frankford Radio Club. Third place went to the Potomac Valley Radio Club. In the rest of the world the top honors were taken by the Bavarian Contest Club, who just edged out the Rhein-Ruhr DX Association. Third place went to Contest Club Finland. The competition for a top club spot is heating up!

Special Mention

The CQ WW DX CW Contest was made more interesting by the DXpeditions of the following stations. How many did you work?

V26K, 8P9Z, 8P2A, VP9/W6PH, ZF2AM, ZF1A, HI3/K6CT, HI9/F6AUS, HI3K, TG9AJR, H6C, HO1A, V47KP, J88DR, HKØGU, VP5V, VP5G, KP2/KØDI, KP2E, ZD8Z, EA8EA, EA8AH, EA9LS, SU1ER, 9G5XA, 5R8HD, CT9L, 3B8/LA7MFA, CN2JS, 5NØNHD, 5NØ/G3SVW, 3V8BB, 5X1Z, RIØF, XU7AAV, JY9NX, 9K9X, 9K9Z, A45XR, A45WD, HZ1AB, A61AJ, ZC4BS, 9M2TO, 4U1VIC, OHØR, OHØV, OHØN, ZA/S57AW, J45KLN, J41YM, HA3A, GJ2A, LX4B, 9HØA, ERØND, CT8T, CS7T, VK3FEI, T88JA, 9M6NA, 9M8YY, KH2/KG4PPO, NH7/N6HC, YBØAVK, ZK2MO, DU9/NØNM, H44MA, V63A, 4W1MM, P40Q, P40W, PJ4M, OA4O, TI5X, MUØASP, 6Y1A, 6Y9A, 6Y2A, 6Y4A, 6Y8A, 6YØA, XE2/W6RW, CT3M, 5H1X,

hy-gain Rotators

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Hy-Gain rotators are the first choice of hams around the world!

Hy-Gain's world famous Bell Shaped Rotator™ design is the standard that other rotators are measured against.

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The last thing you want to fall apart is your rotator that's mounted on the top of your tower. You won't make any compromises when you buy and install high quality Hy-Gain rotators.

And we're the only manufacturer to offer a full line of rotators that are completely MADE IN THE USA.

HAM-IV, $559.95. *The heavy duty Ham-IV is the most popular rotator in the world!* It is designed for medium size antenna arrays up to 15 square feet wind load area when mounted in-tower, or 7.5 square feet when mast mounted with an optional lower mast bracket. New alloy ring gear gives extra strength up to 100,000 PSI for maximum reliability. New low temperature grease permits normal operation down to -30 degrees Fahrenheit. New wire-wound potentiometer gives reliable and precision directional indication, new ferrite beads reduce RF susceptibility, new Cinch plug connector plus 8-pin plug at control box (no screwdriver needed). Dual 98 ball bearing race for load bearing strength. Strong electric locking steel wedge brake prevents wind induced antenna movement. Easy-to-use Control Box has illuminated directional meter with North or South center of rotation scale, separate snap-action brake and rotation switches. Uses low voltage control for safe operation. Accepts masts up to 2 1/16 inches diameter. Rotator size is 13 1/2Hx8D inches.

T-2X, $649.95. *Extra heavy duty Tailtwister antenna rotator!* For large antennas up to 20 square feet wind load when mounted in-tower, or 10 square feet when mast mounted with optional support bracket. Triple 138 ball bearing race, strong electric locking steel wedge brake. Control Box has an illuminated directional indicator with North or South center of rotation scale, separate snap-action brake and rotation control switches. Accepts masts up to 2 1/16 inches diameter. Rotator size is 14 1/16Hx9 3/16D in.

CD-45II, $389.95. *Medium duty antenna rotator.* Handles antenna arrays up to 8.5 square feet windload area when mounted in-tower, or 5 square feet when mast mounted with supplied lower support. Dual 48 ball bearing race, disc brake system. Control Box has an illuminated directional indicator with North or South center of rotation scale, separate snap-action brake and rotation control switches with disc brake release. Accepts mast sizes up to 2 1/8 diameter. Includes light duty lower mast support, Rotator size is 17 3/8Hx8 D inches.

AR-40, $289.95. *Lightweight antenna rotator.* Handles smaller ham antennas and large TV/FM antennas up to 3.0 square feet windload area when mounted in-tower, or 1.5 square feet when mast mounted using the supplied lower support bracket. Dual 12 ball bearing race, disc brake system. Silent, automatic control box -- just dial and touch for desired direction. Accepts mast sizes up to 2 1/8 diameter. Includes light duty mast support. Rotator size is 17 3/8Hx8D inches.

Call your dealer for your best price!

Rotator Specifications	T2X	HAM-IV	CD-45II	AR-40
Wind Load capacity (inside tower)	20 sq. ft.	15 sq. ft.	8.5 sq. ft.	3.0 sq. ft.
Wind Load (with mast adapter)	10 sq. ft.	7.5 sq. ft.	5.0 sq. ft.	1.5 sq. ft.
Turning Power (in pounds)	1000	800	600	350
Brake Power (in pounds)	9000	5000	800	450
Brake Construction	Electric wedge	Electric wedge	Disc brake	Disc brake
Bearing Assembly/How many	Tripl race/138	Dual Race/96	Dual race/48	Dual race/12
Mounting Hardware	Clamp plate	Clamp plate	Clamp plate	Clamp plate
Control Cable Conductors	8	8	8	5
Shipping Weight (pounds)	28	24	22	14
Effective Moment (in tower)	3400 ft/lbs.	2800 ft/lbs.	1200 ft/lbs.	300 ft/lbs.

HAM IV

$559.95
Suggested Retail

T-2X

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CD-45II

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Suggested Retail

AR-40

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TOP SCORES

WORLD

High Power
All Band

EA8EA.....12,516,906
3V8BB.....10,812,725
A61AJ.....10,720,332
8P9Z.....10,006,568
P40Q.....9,877,730
ZD8Z.....9,287,860
A45XR.....8,919,400
EA9LS.....8,838,332
JY9NX.....8,745,472
CN2JS.....8,547,798

28 MHz

HO1A.....1,673,777
ZY5A.....1,531,754
CX5BW.....1,466,046
ZS4TX.....1,304,606
ZF2AM.....1,205,246
HZ1AB.....1,145,920

21 MHz

5R8HD.....1,378,533
KH7R.....1,193,592
H2G.....1,168,128
VP5V.....1,054,482
GIØKOW.....879,069
9A5W.....853,216

14 MHz

5X1Z.....1,540,658
LW9DAH.....724,128
YT9X.....709,984
9A6A.....701,575
LY5W.....696,600
HA8FM.....654,974

7 MHz

OK1RF.....721,952
YT1AD.....622,776
YT7A.....599,950
S57DX.....555,012
KT3Y.....434,420
S52O.....398,650

3.5 MHz

IR4T.....309,213
OD5/OK1MU.....261,024
9A5Y.....246,196
W1MK.....236,280
SP8BRQ.....213,760
S59CAB.....207,252

1.8 MHz

4X3A.....109,280
UA9AT.....100,639
S50U.....76,038
EU6EU.....73,644
LZ8T.....66,456
HG3M.....65,875

Low Power
All Band

P40W.....10,198,792
V26K.....7,744,605
8P2A.....6,135,096
ZC4DW.....5,877,190
CS7T.....4,764,272
VP9/W6PH.....4,386,287
VP5G.....4,194,364
C6ARS.....3,875,949
PY2NDX.....3,711,441
ER6A.....3,551,989

28 MHz

LT1F.....1,041,032
EA8AH.....1,010,794
VR2BG.....815,765
TG9AJR.....638,932
KP3CW.....589,917
L40E.....494,000

21 MHz

HI3K.....765,459
EA9EU.....745,745
EA8NN.....703,110
CX5AO.....670,026
LU1FAM.....607,770
DL1LH.....405,309

14 MHz

CX9AU.....598,185
VK6LW.....588,252
LZ4ZP.....488,674
DK3DM.....412,830
CE4U.....405,557
T92D.....378,609

7 MHz

SU1ER.....750,172
CO2JD.....220,524
4X/OK1EE.....178,500
OK1FKM.....164,521
LZ1ABC.....137,352
OK1FCA.....118,992

3.5 MHz

HA8EU.....117,366
YU1KR.....115,515
OQ6NR.....107,355
PA5AT.....105,732
EW8DX.....79,704
HG6V.....76,626

1.8 MHz

TA3D.....101,380
4N1A.....47,854
HA8BE.....46,296
UX5NQ.....45,184
G3WGV.....32,240
S54A.....30,730

QRP, All Band

LY5A.....2,055,896
FY5FY.....1,985,941
TI5X.....1,581,010
HG5Z.....1,293,716
YT7TY.....1,252,100
N3BJ/4.....1,215,200
DL6RDR.....1,178,052
UT9FJ.....1,073,610
N4KG.....949,531
JR4DAH.....817,298

Assisted, All Band

CT9M.....10,263,390
KP3Z.....7,763,460
K3WW.....5,730,417
R3CC.....5,584,144
S58A.....5,500,230
W2UP.....4,914,343
K2NG.....4,768,500
DL4NAC.....4,599,990
UA9AM.....4,453,686
GW3YDX.....4,432,635

Multi-Op., Single Trans.

P3A.....17,928,172
EA8ZS.....12,982,992
PTØF.....11,702,286
EA6IB.....10,584,440
PJ2T.....10,109,968
HG1S.....9,979,570

Multi-Op., Multi-Trans.

HC8N.....47,176,688
XT2DX.....36,947,232
J3A.....23,133,600
RW2F.....18,508,032
DFØHQ.....18,071,850
RU1A.....17,108,421

EUROPE

All Band

SP7GIQ.....5,138,420
G4BUO.....5,129,800
RK4FF.....5,111,302
S50A.....4,622,800
YT7R.....4,546,840
OM5M.....4,540,625
OG1MM.....3,780,421
HA8JV.....3,747,072
EA5FV.....3,703,008
OHØR.....3,664,440

28 MHz

9HØA.....1,025,312
CT8T.....990,250
S56M.....556,341
9A7D.....512,253
S50C.....508,849
YR4A.....465,843

21 MHz

GIØKOW.....879,069
9A5W.....853,216
CT1FJK.....736,610
SP3GEM.....731,634
YZ1AU.....723,536
SP5GRM.....701,811

14 MHz

YT9X.....709,984
9A6A.....701,575
LY5W.....696,600
HA8FM.....654,974
OG4A.....649,800
R73A.....547,792

7 MHz

OK1RF.....721,952
YT1AD.....622,776
YT7A.....599,950
S57DX.....555,012
S52O.....398,650
HA8DU.....370,629

3.5 MHz

IR4T.....309,213
9A5Y.....246,196
SP8BRQ.....213,760
S59CAB.....207,252
OLØE.....174,400
EW1WZ.....167,272

1.8 MHz

S50U.....76,038
EU6EU.....73,644
LZ8T.....66,456
HG3M.....65,875
YL2PQ.....64,800
DJØMDR.....64,206

Low Power
All Band

CS7T.....4,764,272
ER6A.....3,551,989
LY9A.....3,155,273
MU/DL2OBF.....3,110,894
EU1DX.....3,028,248
LY6M.....3,017,946
DL1IAO.....3,013,755
EA7GTF.....2,605,562
OK2PP.....2,507,014
I3JSS.....2,464,176

28 MHz

YU7WW.....414,072
G3KHZ.....371,266
OHØN.....325,500
RZ6FA.....297,206
9A3VM.....287,289
UT4PZ.....260,876

21 MHz

DL1LH.....405,309
OT1H.....403,701
YU1OJ.....383,292
SP4Z.....342,855
Z37A.....335,070
OK2ZV.....293,181

14 MHz

LZ4ZP.....488,674
DK3DM.....412,830
T92D.....378,609
S58AL.....296,063
SV1DPJ.....266,012
US1ITU.....255,024

7 MHz

OK1FKM.....164,521
LZ1ABC.....137,352
OK1FCA.....118,992
SP2FWC.....111,510
YL1ZF.....109,172
G4ODV.....92,232

3.5 MHz

HA8EU.....117,366
YU1KR.....115,515
OQ6NR.....107,355
PA5AT.....105,732
EW8DX.....79,704
HG6V.....76,626

1.8 MHz

4N1A.....47,854
HA8BE.....46,296
UX5NQ.....45,184
G3WGV.....32,240
S54A.....30,730
YU1RA.....15,785

QRP, All Band

LY5A.....2,055,896
HG5Z.....1,293,716
YT7TY.....1,252,100
DL6RDR.....1,178,052
UT9FJ.....1,073,610
DL3NCI.....788,359
SM3C.....691,200
UAØKCL/3.....595,782
DL3KVR.....585,809
UR5SFX.....529,782

Assisted, All Band

R3CC.....5,584,144
S58A.....5,500,230
DL4NAC.....4,599,990
GW3YDX.....4,432,635
DK3GI.....4,054,905
IKØYVV.....3,887,162
OK2FD.....3,837,627
YL8M.....3,746,800
DF3CB.....3,721,947
RM4W.....3,677,352

Multi-Op., Single Trans.

EA6IB.....10,584,440
HG1S.....9,979,570
OM8A.....9,268,980
TM5C.....8,926,542
9A7A.....8,804,340
OM7M.....8,302,320

Multi-Op., Multi-Trans.

RW2F.....18,508,032
DFØHQ.....18,071,850
RU1A.....17,108,421
OH2U.....15,382,160
ES9C.....13,946,796
HG6N.....12,664,938

USA

All Band

K5ZD/1.....7,048,856
K1AR.....6,271,568
N2NT/1.....6,027,840
W9RE.....5,712,255
KQ2M/1.....5,389,614
W1KM.....5,369,000
K3ZO.....4,727,816
K1DG.....4,461,795
KR1G.....3,851,925
N2AN/4.....3,823,896

28 MHz

W4ZV.....692,750
NN4X.....673,140
N4BP.....601,965
K2VV/Ø.....544,320
K5RX.....481,920
N7KU.....370,560

21 MHz

K4OAQ.....586,022
N2MF.....579,439
N9AG/8.....484,292
K4VX/Ø.....481,120
W9OF.....238,392
WA7LT.....148,122

14 MHz

K2XR.....467,425
K2BA.....362,700
K7PI.....178,432
K9CAN.....144,585
K1BV.....113,741
K1QS.....104,720

7 MHz

KT3Y.....434,420
K9AY/4.....352,060
N4PN.....334,170
W4SO.....316,800
KD2RD.....285,625
W5WMU.....144,145

3.5 MHz

W1MK.....236,280
K1IR.....88,815
K8MD.....11,289
K7ON.....2,511

1.8 MHz

W2VO.....1,566
NX5M.....1,000
K6SE.....780
N4UK.....666
N6PE.....154

Low Power
All Band

W1UK.....2,719,830
N2BA.....2,494,682
N5AW.....1,921,000
N4TZ/9.....1,774,584
N4IG.....1,595,086
KM1X.....1,571,948
NY3A.....1,552,896
N4YDU.....1,530,606
K1OA.....1,523,376
KB1EAX.....1,490,370

28 MHz

NO4S.....372,154
K8PO/6.....365,508
NØFW/8.....209,763
WY6DX.....187,636
K2MFY.....186,480
WW3S.....184,080

21 MHz

N4MO.....292,336
KJ9C.....217,986
N2CU.....155,484
W8GOC.....96,896
W6EUF.....81,536
W8IQ.....78,535

14 MHz

N7WA.....113,220
NJ3K.....16,352
K9KJ.....5,940
NZ3O.....5,658
N7VM.....5,635
WD6DX.....4,815

7 MHz

NF6S.....101,136
WØYR/4.....86,496
WA8WV.....51,548
K2CDJ.....47,530
WB2DVU.....37,136
AA8UP.....26,082

3.5 MHz

No Entry

1.8 MHz

W7DRA.....24

QRP, All Band

N3BJ/4.....1,215,200
N4KG.....949,531
N8ET.....755,978
WA3NKO.....628,254
N1TM.....568,320
N5TW.....505,808
W6JTI.....472,166
W3GK.....306,878
AA1CA.....278,460
K8ZT.....250,708
NU4B.....248,589

Assisted, All Band

K3WW.....5,730,417
W2UP.....4,914,343
K2NG.....4,768,500
N2MM.....3,849,480
AA1K/3.....3,794,703
K1PT/4.....3,600,390
N6IG.....3,537,512
N3RR.....3,303,450
K2DM.....3,280,320
K2TW.....3,191,940

Multi-Op., Single Trans.

K4XS.....8,993,439
W4AN.....7,736,256
N3RS.....7,663,500
K4JA.....7,428,048
K8AZ.....6,847,945
N4TO.....6,106,968

Multi-Op., Multi-Trans.

KC1XX.....16,892,980
K3LR.....15,789,074
W3LPL.....15,686,595
N2RM.....14,400,585
K9NS.....11,915,522
NY4A.....10,609,911

M/UT3UA, P3A, 4U1ITU, CU2A, EA6IB, EA8ZS, LX5A, LX/DL4SDX, LX9DIG, 9M6A, AH2R, NHØS, PTØF, PJ2T, J3A, C6AKP, XT2DX, VQ9X, MZ5A, and HC8N.

Comments

Staring with the 2002 contest, the CQ WW has a new category: multi-two, abbreviated M2. Please check out this new category in the rules in this issue. The category uses band-changes/hour instead of a time rule. We think that you will find it a lot of fun.

The contest community may not realize the amount of time it takes to create the results you see on these pages. Let's just say that it takes thousands of man-hours. The biggest problem is logs that do not conform to a standard format. The CQ WW is worldwide, and there are always a number of people who believe their program is the best and thus submit a troublesome, time-consuming log which must be decoded separately. For this reason the Cabrillo format was created by N5KO, to allow for a standard submitting format. Please use the Cabrillo format when you submit your 2002

CQ WW log; it is required for electronic logs. All the necessary data to enter your electronic log is in the header summary. It can easily be stripped off and organized. All the contest logging programs create a Cabrillo log for you. All you have to do is submit your log file to either <ssb@cqww.com> or <cw@cqww.com> and we will take care of the rest. When you send your log to one of above addresses, you will receive a robotic response of acknowledgment.

Thanks

First of all, the CQ WW Contest Committee wants to thank you, the entrants, for taking the time to send an electronic log. Your effort to send your log to us via e-mail makes it easier for you and much easier for us. As was mentioned earlier, the percentage of e-logs reached an all-time high of 92% in the CQ WW CW last year! Please continue to send in your log electronically.

The compilation and reporting of these results would not be possible without the efforts of the 40 or so people behind the scenes who make it happen. The CQ WW e-mail robot was set up and is maintained by John, K2MM. Once you send your log and summary to either <ssb@cqww.com> or <cw@cqww.com>, it is processed, decoded, and massaged by Larry, N6TW. Larry has put in many hours to make the log processing efficient and accurate. Dick, N6AA, makes the call database as accurate as is humanly possible. Helping gather data were K1DG, N3ED, K6NA, N6ZZ, N9RV, N2NC, K3WW, and K3LR. Phil, N6ZZ, served as a sanity check at each stage of the creation of the master database.

The CQ WW Committee also has special advisors: K3ZO, N2AA, N8BJQ, G3SXW, S50A, KR2Q, K1AR, N5TJ, W3ZZ, and N5KO. The CQ WW uses the constantly updated log-checking software developed by Tree, N6TR. The CQ WW DX advisors are CT1BOH, DL6RAI, EA3DU, F6BEE, G3SXW, RA3AUU, OK2FD, I2UIY, JE1CKA, OH2KI, OH2MM, ON6TT, PY5EG, S5ØA, UA9BA, and VE3EJ.

Congratulations to all the winners! Join the CQ WW fun in 2002! 73, Bob, K3EST

CLUB SCORES

DX

Bavarian Contest Club	194,172,334
Rhein-Ruhr DX Assn.	178,994,008
Contest Club Finland	146,819,710
Marconi Contest Club (I)	92,836,589
Ural Contest Group (UA9)	73,610,610
Russian Contest Club	60,517,130
Slovenia Contest Club	60,373,215
Tikirikki Contest Club (I)	55,379,803
LNDX (F)	54,700,806
Aphrodite Contest Gang (5B4)	52,488,816
Araucaria DX Group	52,429,990
Kuanas Tech Univ RC (LY)	51,952,841
SP DX Club	44,113,610
YU Contest Club	34,767,292
Croatian Contest Club	32,196,694
Pordenone Gansters	31,368,071
Lithuanian DX Group	29,313,293
Top of Europe Contesters	27,896,588
TuPY DX Group (PY2)	27,615,880
Latvian Contest Club	26,451,689
Chiltern DX Club	25,201,701
HA DX Club (HA)	24,986,873
Czech Contest Club	20,256,198
Low Land Crazy Contesters (PA)	19,583,730
Ukranian Contest Club	18,674,405
Japan Crazy Contesters	17,628,818
Vojvodnia Contest Club (YU7)	14,621,410
Contest Club Slovenia	13,503,354
Crimean Contest Club	12,648,279
LU Contest Group	11,916,301
Sarejevo Contest Gang (T9)	11,636,984
GPDX (CT)	11,368,525
ARM (ER)	10,059,867
Danish DX Group	8,095,292
Kiev Contest Group	7,636,068
Lyon DX Gang (F)	7502825
Belarus Contest Gang	7,054,593
GACW (LU)	6,862,424
British Columbia DX Club	6,832,515
Southern Cross DX Gang (CE)	6,819,952
Moscow Contest Club	5,801,136
LA Contest Club (LA)	5,088,561
Lynx DX Gang (EA)	4,427,789
Guara DX Group (PY7)	3,796,475
Alberta Clippers (VE6)	3,682,755
Vologna Radio Club (UA1)	3,527,045
Banat DX Gang (YU7)	3,394,514
SP Contest Club	3,329,989
Contest Club Cambria (GW)	3,053,404
Northern Patagonia DX Group	3,050,654
Activity Group Belarus	2,968,841
Central Siberia DX Club	2,927,813
Algarve DX Gang (CT)	2,783,043
Jura Swiss Park Team (HB)	2,735,170
Thailand DX Assn..	2,521,579
Kontest Klub Kransnoyarsk (UA6)	2,273,129
Radio Amateur Assn. Western Greece	2,272,426
Koryazhma DX Company (UA1O)	2,114,514
YU1EXY Club	2,077,941
NOL Contest Team (ON)	1,902,759
Beemster Contest Club (PA)	1,838,364
Vrhnika DXERS (S5)	1,770,037
Amsterdam DX Club	1,469,371
Odessa Contest Club	1,375,343
Novosibirsk Contest Club	1,179,843
MNS Contest Team (ON)	1,168,475
Macedonia Contest Team	1,057,705
South German DX Gang	1,015,356
Fox Contest Club (YU)	1,014,589
Globus Club (UR)	982,650
OL7D Club	979,184
Far East Island DX Club	908,996
ALRS (UA1)	890,922
Ivanovo DX Club (UA3)	859,354
SP CW Club	820,984
UA2 Contest Club	794,905
SK6AW Club	622,997
Russian DX Club	580,179
Bashkortostan DX Club (UA9W)	524,935
YVDXPERTS	406,193
BSB DX Gang (PY2)	396,986
Key Contest Team (I)	374,898
Vladimir Radio Club (UA3)	327,134
UN7LT Club	291,239
Belfast-Derry ARS	284,196
UDXC (UR)	273,609
ARPA (CT)	214,009
Tokyo International ARA	171,038
SK7BQ Club	97,154
CG3D QRP Gang (S5)	1,805

USA

Yankee Clipper Contest Club	431,776,382
Frankford Radio Club	425,406,537
Potomac Valley Radio Club	227,507,867
North Texas Contest Club	100,382,575
Florida Contest Group	84,756,594
Southern California Contest Club	69,154,771
Society Midwest Contesters	63,839,223
Northern California Contest Club	57,133,227
North Coast Contesters	54,324,741
Southeast Contest Club	40,925,109
Mad River Radio Club	36,799,777
Central Texas DXCC	35,772,885
Minnesota Wireless Assn..	28,067,230
Willamette Valley DX Club	19,806,776
Tennessee Contest Group	17,058,526
Western Washington DX Club	16,408,305
Carolina DX Assn..	15,813,137
North Florida DX Assn..	15,138,485
Rochester DX Assn. (W2)	12,858,776
Texas DX Society	12,790,929
Grand Mesa Contesterts of CO (WØ)	9,508,904
Central Arizona DX Assn.	6,812,624
Eastern Iowa DX Assn.	6,672,694
Kentucky Contest Group	5,906,655
Southwest Ohio DX Assn..	4,844,524
Oklahoma DX Assn..	3,889,327
Mile-Hi DX Assn..	3,590,131
Kansas City DX Club	3,527,762
UTAH DX Contest Club	2,997,052
West Park Radio Ops (W8)	2,355,506
Hudson Valley Contest &DX Club	2,354,430
American Red Cross EC (W2)	1,856,370
Southern California DX Club	1,773,071
Great Lakes DXCC (W8)	1,578,233
South New Jersey Radio Assn.	1,555,994
Western New York DX Assn.	1,391,436
Cherryland ARC (W8)	1,201,516
Sterling Park ARC (W4)	1,195,439
Northern Arizona DX Assn..	1,180,799
Athens County ARC	1,111,530
Salt City DX Assn. (W2)	1,109,804
Schenectady ARA (W2)	1,064,160
Bergen County ARA (W2)	507,288
Heartland DX Assn..	436,074
Northrop-Grumman RC (W6)	369,681
Great South Bay ARC (W2)	363,592
Michigan DX Assn..	285,248
Metro DX Club (W9)	263,170
Hickory Withe DX Club (W4)	138,850
Jersey Coast (W2)	132,857
Fresno ARC (W6)	13,132

DX QRM

Terrible condx first day plus high level of noise on low bands. It was a big fun anyway...**4U1ITU (OM8AW)**. Major screw-up. CQ MSG was 6Y2A and TU message was 6Y5A. Treat other logs lightly if reported call is 6Y5A. Treat my log harshly. Contest was fun from DX location and QRP only ... **6Y2A**. VY HPI that I could QSO with HZ, PYs, my new entities! This year's result is the best score of my past participations. Only 10W output! MNI TKS 4 UR works ... **7K2PBB**. Worst condx in many years. Had a total black out—nothing heard on any band on Saturday afternoon. Much better on Sunday ... **7S2E**. Thanks to 8P6SH for all of his help! ... **8P2A**. Poor propagation to USA ... **9G5XA**. Since A61AJ is a fully equipped multi-multi setup, I had to rewire the station in a way that only three operating positions were available—SO3R, hi! Though, except for simple logging network, no connections were available between the stations. Had to jump a lot around the spacious shack when moving mults! ... **A61AJ (S53R)**. First SO2R attempt with some teething problems. Many thanks to Ivo (ADA) for his help, 5B4AFM for his SO2R box, and 5B4ES for hosting again. Hope to C U next year! ... **C4W**. Never trust just one alarm clock ... **CT9M**. After a long time of being QRT it was my first try in the CW part. My K2 with 5 watt into a multiband dipole did a great job ... **DF9JZ**. A big "thank you" to the hams of the Guernsey ARS, especially to Ed, GU3SQX, and Phil, GUØSUP, for their help and hospitality. Guernsey is a place that is much too beautiful to go there only from Thursday to Monday with two days of radio in between. I'll be back, but next time for a real holiday—well maybe with a little pile-up every now and then ... **DL2OBF**. FB contest! ... **ES1TM**. Just a brief operation from France. Outside these times I was also active as G3VQO (checklog attached). Hope it doesn't cause too much confusion ... **F/G3VQO**. 1st entry QRP with my K1, band-limited: 80/40/20/15m only. QRP is really fun!! Not sure I will enter anymore a contest running more than 5W!! VY 72/73 and waiting for the next edition! ... **F5PBL**. Things were going well until I lost my main amp after abt 12 hours. Changed to my 2nd radio amp for back-up only to lose that after a further 6 hours. Decided to pull out after that and had the rest of the weekend off! See you next year ... **GØIVZ**. More countries/ zones/contacts than last year, less 3 point contacts so lower score!! Aurora on Saturday morning didn't help. Elecraft K2 really superb RX ... **G3VPW**. Great fun to enter my first CQWW log from a modest station. The PU's were not as big as D68C but had great fun. Hope to CU next year ... **GU4YOX**. Highlight: Being called by HI8 for a 7 MHz mult at 2358Z on Sunday. Lowlight: Failing to move the TF double mult ... **GW7X**. The 500W was not enough to break the QRM from Jakarta, but in CW was much more better ... **YBØAVK (HA7VK)**. First time that HB9A, the callsign of the Union of Swiss Radio Amateurs (USKA) has been used in a CQWW contest MS. All operators liked this contest very much and would like to do again next year ... **HB9A**.

BAND-BY-BAND BREAKDOWN—TOP ALL BAND SCORES

Number groups indicate: QSOs/Zones/Countries on each band

WORLD TOP SINGLE OPERATOR ALL BAND

Station	160	80	40	20	15	10
EA8EA	141/14/48	421/17/55	802/27/73	1618/35/103	1569/34/104	2060/34/110
3V8BB	171/8/49	611/19/72	1160/28/90	1307/37/105	1047/32/108	1565/35/102
A61AJ	198/12/45	201/17/53	1032/30/92	1237/36/111	1372/34/110	1916/32/112
8P9Z	84/7/11	670/22/73	1334/22/78	1113/26/80	1589/28/90	2024/31/104
P40Q	119/9/31	288/16/61	832/23/78	1213/31/96	1738/34/102	1767/32/97
ZD8Z	33/10/27	195/17/59	366/24/62	783/31/85	1511/35/108	2606/32/120
A45XR	73/10/32	337/17/57	939/31/88	1229/35/100	1057/31/106	1495/31/106
EA9LS	80/4/33	263/13/57	969/25/82	1084/34/96	893/29/98	1810/33/101
JY9NX	66/7/36	501/12/58	1116/25/81	916/29/94	1187/29/103	1484/31/103
CN2JS	4/2/4	331/13/60	939/25/79	861/33/98	1454/35/117	1353/29/107

USA TOP SINGLE OPERATOR ALL BAND

Station	160	80	40	20	15	10
K5ZD/1	27/9/18	181/15/59	928/32/106	1074/37/120	860/32/104	720/32/103
K1AR	23/9/16	184/17/61	762/32/99	822/40/112	858/32/102	732/31/110
N2NT/1	23/11/15	196/15/66	796/28/90	831/39/116	723/30/102	842/30/102
W9RE	16/8/11	151/21/59	578/35/94	983/39/115	679/33/107	779/36/97
KQ2M/1	12/4/6	86/12/45	568/27/81	881/38/104	714/31/110	1053/33/112
W1KM	39/10/24	304/16/61	727/35/100	650/35/100	571/28/93	942/27/90
K3ZO	5/4/3	117/12/44	630/26/84	704/35/104	709/26/93	852/31/95
K1DG	15/5/6	111/15/48	675/29/92	676/35/100	578/29/97	720/29/100
KR1G	11/4/6	141/13/57	730/26/81	469/29/84	704/26/91	650/25/83
N2AN/4	17/8/14	101/12/46	346/27/79	606/31/93	771/35/101	740/29/91

WORLD MULTI-OPERATOR SINGLE TRANSMITTER

P3A	193/11/55	682/22/81	1145/30/113	1979/39/131	1974/38/138	2139/37/143
EA8ZS	84/11/46	205/18/73	1301/35/112	1155/40/127	1514/37/129	1479/38/138
PTØF	20/10/19	187/16/56	728/27/86	1975/33/105	1612/34/126	2312/33/121
EA6IB	51/8/51	200/20/86	1310/34/120	1530/40/141	1584/39/137	1675/38/142
PJ2T	111/9/18	314/18/63	916/28/98	1578/35/115	1128/33/115	1459/32/118
HG1S	90/11/61	510/24/93	1385/39/124	1144/40/131	1157/40/141	1332/39/146

USA MULTI-OPERATOR SINGLE TRANSMITTER

K4XS	12/7/10	115/24/86	922/36/116	852/40/140	1022/39/142	1108/38/140
W4AN	22/10/16	99/23/78	1030/37/116	990/39/132	670/37/136	957/35/133
N3RS	23/11/22	130/20/75	992/34/115	773/39/133	834/35/133	875/34/129
K4JA	35/11/33	286/22/84	504/32/117	994/40/138	904/35/130	601/36/137
K8AZ	18/8/17	88/22/71	833/34/116	1041/40/138	599/34/128	813/34/126
N4TO	19/9/17	90/22/76	493/32/109	936/40/129	561/34/123	910/35/130

WORLD MULTI-OPERATOR MULTI-TRANSMITTER

HC8N	344/18/34	1563/33/110	3372/39/143	3800/40/155	4266/40/151	4157/40/152
XT2DX	165/12/44	569/23/75	2010/35/119	4221/40/145	4490/38/148	4104/39/146
J3A	150/13/28	908/24/84	2398/34/113	2916/40/140	3440/37/135	2751/36/116
RW2F	906/15/72	1546/25/98	2111/39/128	2778/40/144	2007/39/145	1653/37/146
DFØHQ	793/14/70	1461/31/114	2341/39/138	2223/40/138	1943/40/141	1819/38/146
RU1A	759/16/67	1137/29/102	2242/40/139	2651/40/141	1839/40/145	1487/37/136

USA MULTI-OPERATOR MULTI-TRANSMITTER

KC1XX	67/12/30	703/26/99	1498/36/125	2058/40/142	1615/37/141	1327/36/135
K3LR	89/14/35	310/23/81	1486/37/131	1817/40/151	1455/39/147	1504/37/142
W3LPL	193/14/40	579/28/97	1430/37/123	1899/40/146	1494/40/147	1369/36/138
N2RM	92/12/34	552/25/93	1532/35/124	1762/40/142	1439/35/133	1172/36/128
K9NS	126/14/26	272/26/86	951/34/123	1570/40/146	1439/40/143	1293/36/127
NY4A	25/9/15	340/19/82	1149/34/117	1343/40/130	1551/35/128	1023/35/123

Left to right, some zone 19 personalities: RAØFU, N6ZZ, UAØFAI, and UAØFZ. N6ZZ operated from RIØF on Sakhalin Island in the CQ WW CW.

Propagation was very poor on Saturday and only a little better on Sunday. Only the great help of two friends like DL6RAI and DL2NBU helped us to reach a good score. We worked zone 3 on 10 only on Sunday afternoon; that gives an idea of the bad propagation ... **IQ4A**. The 10 meter band had the best openings ... **JA1AZS**. Not so great condx and having a cold, I had a nice sleep! A shortest sleep (40 minutes) on SSB and a longest sleep (10 hours) on CW, so 2001 WW was over and now thinking abt 2002. Life's too short. Sleep and excuse should have been short or zero! ... **JA8RWU**. Three weeks ago I got a tower at my backyard. I worked to built this contest is a debut of my new antennas. The performance is I achieved approximately double score by last year ... **JH2NWP**. Never try a new logging program one day before the contest! ... **KP3Z**. Very strong aurora first day!! Thanks for nice contest ...**LY2BBF**. Wow great conditions for QRP, but no US on Saturday. 20 meters opened up to the USA on the Sunday evening. Until then I had not worked many USA stations. It made a big difference to the final score. Fantastic contest. See you next year ... **M4T**. My first ever go at a CW contest and what a way to dive in at the deep end. Enjoyed giving a few points away. 100% S&P. Next year perhaps a proper effort ... **MW5EPA**. I enjoyed the contest and QSOs with excellent operators. Thanks! Must improve our antennas and skill for next year. Thanks to all for contacts ... **NHØS**. Great experience from zone 10! ... **OA4O**. Amazing what 100W to a 2nd hand trap-GP indoor downtown can work with the help of sunspots. Great ops at PTØF and XT2DX who heard me sneaking by the pile-up—QRQing instead of going QRS! Also made some contacts QRO and with real antennas ... **OE5OHO**. Thanks for QSOs everybody! CU in 2002! Saturday was a disappointment in conditions, but Sunday was fun ... **OHØV**. This year I had to cancel IH9P operation because of QRL so I tried 15m with tribander. I was surprised how it worked well! ... **OL5Y**. First time ever I made over 1000 QSOs during a single weekend, no CQing only S&P. Happy to give out the special OQ4 prefix. Commemorative QSLs will be sent via the bureau to all those worked ... PSE don't forget to send your QSL ... **OQ4CAS**. A perfect year for low power; disturbed conditions were music to my ears ... **P40W**. First CQWW CW from small home station due to the unavailability of PI4COM club station. I was very surprised working 38 US station with 100 watts and simple L-antenna: 11m vertical and 14m horizontal part series fed with 300 pF. Happy to work XT2DX also. Until next time ... **PA5AT**. I thank for they have organized this beautiful contest of high level ... **PY3CQ**. Grace and peace! ... **RK3BY**. After the SSB CQWW M/M from IG9A, I was sorry I did not stay there for the CW portion. After the fantastic set-up of stations there and nobody was QRV on CW. Anyway, nice contest as always and extremely bad conditions first day! ... **S50R**. Ham radio is fun, isn't it? ... **S51JM**. First contest with keyboard keying—wonderful!! ... **SM3EAE**. The CQWW is my favorite contest ... **SP8JHM**. Limited operation on 160 meters only, testing new antenna. It was the first experience on 160 for all three of us and we enjoyed it a lot ... **SW1R**. My thanks to Juan, TG9AJR, and Jocelyn, my wonderful hosts! This was a last-minute, no-preparation DXpedition. All I brought to TG was a paddle and keying interface. Juan supplied the antenna (vertical), XCVR (Yaesu 767GX), and computer. Thanks to XE1KK and N5KO for installing the antenna in September ... **TG9AJR**. Some new operators in the team tasted the thrill of big M/S station. Sure they will try again! ... **TM2Y**. Very very like the WW contest ... **UAØBA**. The excitement before and during the contest, the drive that keeps one alert 48 hrs straight, the highlights like continuos high rates or openings to high density mult areas that were not missed, then the end of it all and instant feeling of deep satisfaction and then joy. I'll be there next time for sure! ... **UN1LT (UA9BA)**. We have bad time here—big wind and snow. Over 7 hours it was no electricity and my "quad" on 10/15m was broken. Sorry, maybe next year will be better ... **UR6F**. First day of contesting was a disaster thanks to aurora, but the conditions improved a lot on Sunday. Being the only station active from zone 2 resulted in huge pile-ups on Sunday ... **VA3NA**. Great way to clean out the cobwebs after 10 years away from CW contesting! Was even more of a blast with 10 watts and a dipole! I'm hooked again! ... **VE3RSA (ex-VE3HTT)**. The flare wiped US out 1st day, second much better. Burned out one radio and blew a tube out in one amplifier but we still had fun ... **VE7GL**. Part-time operation; introduced another ham to the joys of CW contesting. Conditions sounded not so good on Sat. ... **VK5GN**. Jet lagged from long overseas trip to discover my friendly power company changed street distribution to 23k KV with an S9+20 dB noise level. It was still fun. Perhaps they will change their insulators in time for next year's test ... **XE1V**. Propagations were good all across the bands for the whole two days plus new radio made contest time a lot of fun! ... **YBØUNC**. Propagation within Indonesia and South and North America is very good. This contest was hard work ... **YE1A**. Starting with the contest from small city near Yugoslavian (Kosovo) border. After two hours contest was over because of electricity problems and huge snow storm. I decided for "safe escape" to YU8 land. I hope for more luck next time. All the best for the committee ... **ZA/S57AW**. Very pleased with score considering I don't have a beam. Horizontal loop performed really great. I became an expert in retuning the ATU for a quick QSY ... **ZC4DW**. Answer it it was of excellent level. Many difficult stations were very well heard here by the south of Brazil. We thanked for the organization and we were in the wait of the accountancy of the points. As every scout says: "be prepared" ... **ZX3S (PY3UEB)**.

USA QRM

Lost about one hour Friday night due to local lightning storm. Very rough day Saturday, with high bands all but dead until sunset. Sunday was pretty good but rates were not as

EUROPE TOP SINGLE OPERATOR ALL BAND

Station	160	80	40	20	15	10
SP7GIQ	168/7/38	487/23/62	748/23/76	942/27/69	1030/36/98	891/34/85
G4BUO	63/9/37	564/18/68	561/25/84	841/35/98	1008/34/106	649/31/105
RK4FF	101/10/34	331/11/54	870/29/90	857/37/101	985/33/115	1322/34/113
S5ØA	71/7/45	493/19/65	965/33/92	773/30/91	681/33/97	852/34/104
YT7R	113/12/57	343/16/62	715/30/101	874/33/103	776/36/109	547/34/117
OM5M	45/5/22	333/15/60	776/25/82	1046/37/98	640/30/103	919/37/111
OG1MM	67/6/36	430/12/61	580/25/91	795/33/97	558/31/105	765/35/115
HA8JV	145/10/47	521/19/70	691/31/95	636/34/95	531/32/99	593/35/105
EA5FV	8/3/7	181/14/53	557/17/68	849/29/90	1079/33/118	903/27/85
OHØR	281/7/42	525/20/75	524/26/89	756/35/92	485/29/94	490/35/104
LY7Z	249/10/47	382/15/61	281/23/82	858/36/119	1030/33/121	898/34/122
ERØND	124/9/44	247/14/51	500/26/79	632/32/107	1101/32/101	1359/35/112
SQ6Z	68/5/31	295/9/50	288/25/80	740/35/106	1063/34/108	1238/34/108

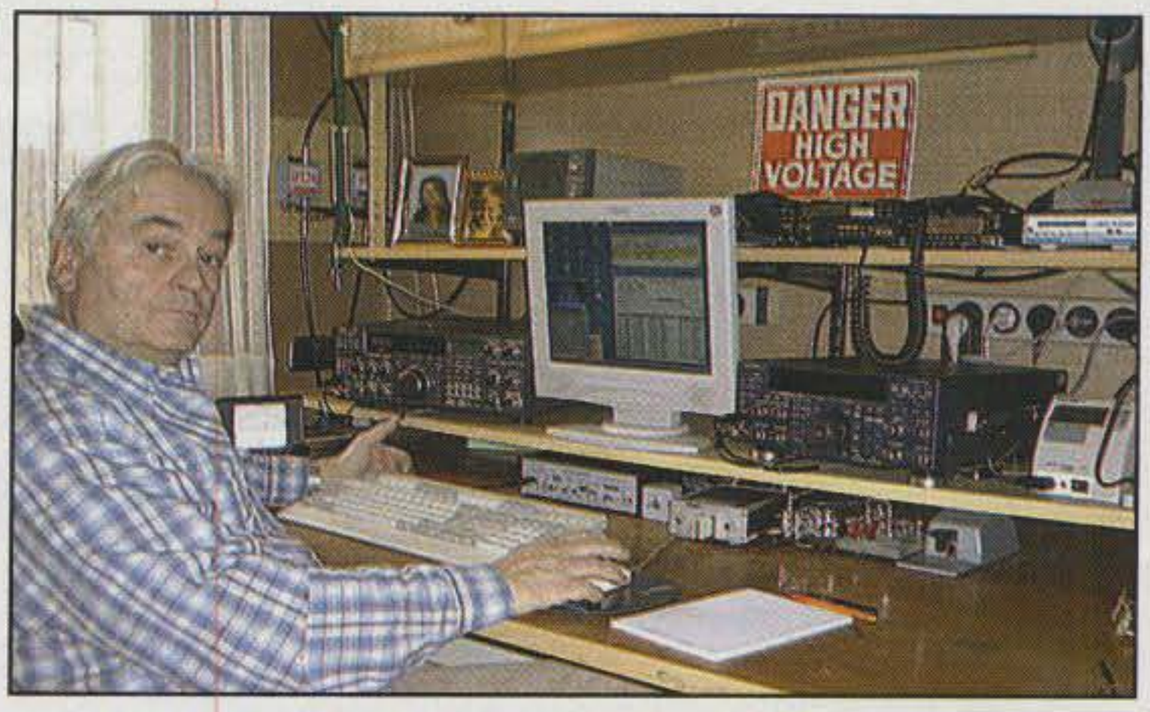
EUROPE MULTI-OPERATOR SINGLE TRANSMITTER

EA6IB	51/8/51	200/20/86	1310/34/120	1530/40/141	1584/39/137	1675/38/142
HG1S	90/11/61	510/24/93	1385/39/124	1144/40/131	1157/40/141	1332/39/146
OM8A	59/10/58	304/19/88	1127/37/122	1360/40/137	1101/40/138	1264/38/143
TM5C	54/10/53	700/22/85	1157/33/111	1066/38/125	1332/38/134	1047/35/133
9A7A	191/9/55	638/17/83	1079/29/102	1173/37/138	1694/40/140	726/39/141
OM7M	289/14/66	512/24/195	1063/37/120	1026/40/129	843/39/140	1054/39/144

EUROPE MULTI-OPERATOR MULTI-TRANSMITTER

RW2F	906/15/72	1546/25/98	2111/39/128	2778/40/144	2007/39/145	1653/37/146
DFØHQ	793/14/70	1461/31/114	2341/39/138	2223/40/138	1943/40/141	1819/38/146
RU1A	759/16/67	1137/29/102	2242/40/139	2651/40/141	1839/40/145	1487/37/136
OH2U	803/17/72	1004/26/101	1782/37/132	2387/40/145	1799/40/142	1244/38/149
ES9C	877/12/64	1305/25/90	1974/38/123	2544/40/137	1741/40/141	1177/35/130
HG6N	581/14/64	1053/19/80	1750/36/118	2225/39/132	1815/40/139	1535/38/139

good as we had hoped. First CW Multi-Single from AA5NT ... **AA5NT**. Family commitments limited me to playing only one day. Unfortunately it was the first day!! ... **KØEJ**. For my first single-band effort I tried 80m. Highly recommended. You really learn the band when it's all you do for the whole contest! This score represents only the first night. Unfortunately, a family event took top priority for the second night ... **K1IR**. Conditions were so bad, I let my wife talk me into quitting the contest and working on projects around the house. I woke up Sunday morning early, turned on the radio, and started running. Wow, conditions back! When I got the tap on the shoulder: "I thought you were gonna work on the house today!" Coldly, I switched off the radio. Next time I will keep my mouth shut. Contest weekend is contest weekend, no matter how bad condx seem ... **K2NJ**. Indoor antennas in apartment makes it interesting! ... **K2UR**. No low band antennas this year, but just wait until next year. I sure miss Caribbean conditions having been V26JT this time last year ... **K3JT**. Many DX ops have great ears! ... **K4RV**. Saturday was a complete bust with severe weather and horrible propagation. Sunday was somewhat better. Thanks everyone! ... **K4WI**. I am not a competent CW operator, but I did have a good time ... **K5RA**. Two contests in the same weekend! Poor conditions first day were matched by great conditions the second day ... **K5ZD/1**. 10, 15 dead to Europe Sat. morning! Bad for the left coast! Conditions generally poor for most of the test for us "little pistols." Oh for a beam—and power! ... **K6CEO**. Lousy noisy conditions, 25-year-old gear that was tempermental, antenna work that never worked, blew the band switch up on 15m in the amp, a rain storm, poor sleep, and only had time to make about 113 contacts on 4 bands. Damn, what fun! I can't wait til next year! ... **K7DD**. Was lots of fun, but it just ain't the Caribbeans! Also, you know Saturday was bad when you start working new "mults" and they turn out to be common countries such as France, Italy, Germany, etc.! ... **K7ZUM**. Saturday was like the bottom of the sunspot cycle on 10. Highest hourly rate was 9. Luckily the ionosphere recovered and conditions were good to excellent on Sunday, especially strong signals from the Pacific towards the end ... **K8IR**. Into every contester's life a few protons must fall ... **K9MA**. I wait all year long for the CQWW. QRP contesting doesn't get any better than this! ... **KA6SGT**. Sure had fun this year! Ran the contest from the lake QTH. Too bad about the solar flare on Saturday. Not many signals made it thru. Hope to have the tower and beam up for next year. See you all next year ... **KB9KEG**. The solar flare Saturday made me check to see if antenna still standing ... **KC7UP**. Worked 4W6MM but failed to work A52R ... **KE1F**. First big contest; had a blast. Used an attic antenna ... **KG4HTT**. Wow—non-contester types just don't know the study in propagation they are missing out on! This was unbelievable: The arctic flutter on 20 was so bad I could almost see ice on the signals! Yet still working many EU. Glad 10 recovered from the proton event on Sunday! ... **KS7T**. Great runs w/JA! ... **NØKV**. Like two different contests! Boy, how conditions changed on day 2. Glad I didn't give up ... **N1DG**. 700 mw for all except XT2DX with 2 watts! ... **N2JNZ**. Fantastic contest. Didn't do as well as I would have liked to but there's always the next time. Still had a great weekend. Thanks ... **N3FR**. Solar activity sure made for some strange propagation. Worked 9V1YC from the east which is 90 degrees from either long or short path ... **N4IG**. Saturday conditions made me ponder retirement from the sport. Sunday was the most fun I've ever had in a DX contest. It was neat to have more than enough people to work on Sunday. It was a mad dash to the finish line. I'm finally getting used to using two radios at once. What's next, SO3R? ... **N4YDU**. This was my third time out in the QRP category and managed to beat last year's score despite challenging conditions the second day. This is my favorite contest of the year and my thanks to CQ for sponsoring it! Thanks also for all the QSOs! ... **N5TW**. Working SU1ER long path on 40 was great! ... **N6IC**. The sun god must hate radio contests! Thank God for JAs! ... **N7DF**. Saturday was a struggle! Sunday was a lot of fun! ... **N8ET**. Bands lousy on Sunday morning so worked



OE3ZK—a winning score Single Op, 14 MHz, High Power.

HC8N on 6 with 5 watts! ... **N9IJ**. Thanks to all the great ops who copied my 5 watt signal and thanks to the gang at XT! ... **NU4B**. Interesting conditions; log represents four merged stations ... **NY4A**. I know why they call it the black hole ... **WØSLW**. Patience is still a virtue!! Again? ... **W1AMF**. Sure wish stations would ID more often! Can you imagine number of "worked b4's" that would be eliminated and time saved waiting to log a given QSO? ... **W3HDH**. The worst of times (Saturday) and the best of times (Sunday)! ... **W4ZV**. Bad thunder storms on Friday night. Murphy hit me late Friday night and I lost the amp. Conditions poor to fair and the Oklahoma Sooners lost on Saturday. Thank goodness that the Cowboys didn't play Sunday. I still enjoyed the contest. There were a lot of good operators ... **W5FO**. Murphy never lets me down. When I tried to use my amplifier on 10 meters it would lock up my computer. Wound up having to run barefoot low power 100 watts throughout the contest on 10. Conditions were great at times but total blackout occurred too ... **W6NKR**. Those VooDoo ops at XT2DX have amazing ears ... **W7BX**. It's always nice to greet old friends from around the world ... **W8GOC**. The extensive record list that Bob (K3EST) has developed for this contest at the <cqww.com> website makes it the best contest in the world. Pick the record, and try to beat it! ... **W8QZA**. Two contests rolled into one 48 hour period. Whether you like prosperity or adversity, this contest had it! ... **W9RE (N9RV)**. My first contest using electronic logging. Sure helps the score and relieves the chore of dupe checking. As always, lots of fun ... **WBØTRA**. My first CQWW CW. Enjoyed all the fun and frustration! ... **WD9DZV**.

(Continued on page 104)

As we observe the first anniversary of the September 2001 terrorist attacks on the United States, CQ Publisher Dick Ross, K2MGA, looks back at ham radio's special connection to the World Trade Center site in New York City.

A Look Back in Time

BY DICK ROSS,* K2MGA

It's hard to believe that 37 years have passed. I was the recently-appointed Editor of CQ back in the Spring of 1965, with one whole year under my belt in the magazine's top spot, after spending the previous four years as Assistant and then Associate Editor.

Al Dorhoffer, K2EEK, my assistant and long-time ham radio buddy, had grown up in the surplus electronics business courtesy of his father, Murray, one of the most brilliant wheeler-dealers of his time in the radio parts business.

Al and I were stunned by the news: Our beloved Radio Row, Cortlandt Street in lower Manhattan, was being condemned to make way for two enormous office skyscrapers that would dwarf any other in the world.

Skyscrapers be damned! This was Radio Row! This was sacred ground. How prophetic.

As far as we knew, no one had gone out of their way to document Radio Row in photos. With time running out, Al and I planned one last expedition to this special place of our youth, and soon, armed with camera and a few rolls of Tri-X film, we hit the rails (the NYC subway) for one last visit before the wrecking ball began to swing.

I wasn't much of a photographer, but a few rolls of film successfully captured some of the flavor of the place. Al wrote an interesting essay on the past and future of the 16 to 18 acre hub of the radio parts world, and together with a few Bettman Archive photos and a few of mine, the piece appeared the July 1965 issue of CQ.

September 11th

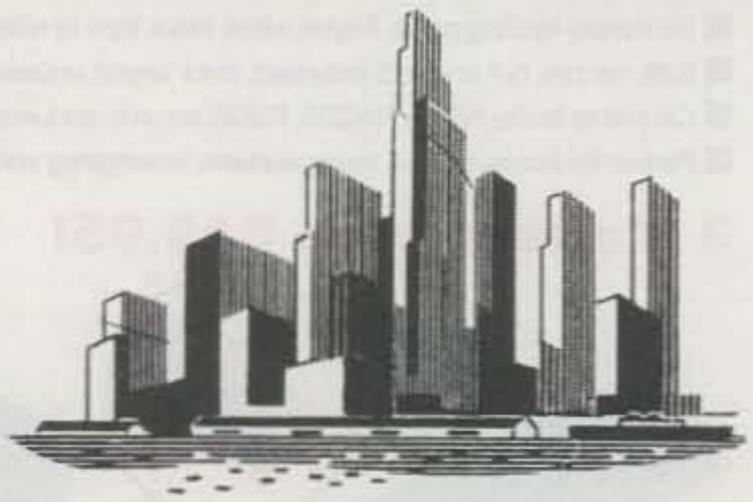
September 11, 2001 brought all the memories flooding back, and sent me to my now-huge photo file in search of the 1965 originals. The prints were gone, but the negatives survived.

As we observe the first anniversary of one of the saddest and most heart-wrenching days in American history, we reprint here K2EEK's original article, with a selection of representative photos showing what we now call Ground Zero as it appeared in the Spring of 1965. Please excuse the slight exaggeration in his description of the height of the Twin Towers. Some of the NY tabloids took glee on hyperbole, and both Al and I believed what we read. Life was so simple then...

Take special note of the chilling familiarity of the 1965 map of lower Manhattan. It was, and is, sacred ground indeed.

—K2MGA

The Cortlandt Street Story



"N.Y. Radio Row"

The last really great land transaction in New York took place when, in that historic moment, Manhattan Island was sold for a memorable twenty four dollars. Today in Manhattan, that figure might possibly buy a potted plant at a local florist, but at least it would be New York soil.

Land in New York—or more precisely, land in the borough of Manhattan—is perhaps the most valuable property in the world. One single acre may easily be worth a million dollars or more, depending upon where on the island it's located. It is little wonder, then, that the city has grown upward when it can't grow outward. That single acre must produce thousands upon thousands of square feet of office space.

The land situation in lower Manhattan has been critical for a long time. For over one hundred years, vacant land has been non-existent, and any new structure built was at the expense of some older, less economical building. That fate now faces the area popularly known as Radio Row.

For the historical buff, Radio Row or Cortlandt Street, was opened and named in 1736. The street was named after an early Dutch settler, Olaf Stevenson Cortlandt. It is not true

**Publisher, CQ magazine*

MFJ *Apartment* Antenna

Covers 40 thru 2 Meters . . . Mounts outdoor to windows, balconies, railings . . . works great indoors mounted to desks, tables, bookshelves

MFJ-1622
$99.95
New!

New MFJ-1622 Apartment Antenna lets you operate 40 thru 10 Meters on HF and 6 and 2 Meters on VHF with a single antenna!

Its universal mount/clamp lets you easily attach it to window frames, balconies and railings. It also works great indoors mounted to a bookshelf, desk, or table. It's not a 5 element yagi, but you'll work your share of exciting DX!

Highly efficient air wound "bug catcher" loading coil and telescoping 5½ foot radiator lets you really get out! Radiator collapses to 2½ feet for easy storage and carrying.

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

Operating frequency is adjusted by moving the "wander lead" on coil and adjusting counterpoise for best SWR.

MFJ Ground-Coupled Portable Antenna Base

Provides effective RF ground and stable mount for vertical antennas . . . Antennas radiate well with low SWR

MFJ-1904
$99.95
New!

MFJ *Ground-Coupled Portable Antenna Base*™ provides an *effective* RF ground 160 through 2 Meters and a stable mount for vertical antennas.

Capacitive coupling to ground is a *time-proven* principle. It needs no tuning and antenna radiates well and gives good SWR on all bands. Performance is similar to mobile stations when using a mobile antenna but is far better with longer antennas.

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.

33 Feet Telescoping fiberglass Mast . . .

Collapses to 3.8 feet, weighs 3.3 lbs.

MFJ-1910
$79.95

Super strong fiberglass mast has huge 1¾ inch bottom section. Flexes to resist breaking. Resists UV. Put up *full size* inverted Vee dipole/vertical antenna in minutes and get *full size performance!*

MFJ Vertical

for Antenna Restricted Areas

40, 20, 15, 10 Meters, Automatic Band Switching

MFJ-1795
$149.95
New!

Perfect for permanent or portable operation in antenna restricted areas. Hide behind trees, fences, buildings, *in* bushes -- only 7 to 10 feet tall (adjustable).

Low angle of radiation for DXing, omni-directional, handles 1500 watts PEP, low SWR.

Highly efficient end-loading. Entire length radiates.

Ground mounts with suitable ground such as MFJ-1904 *Ground-Coupled Antenna Base*, radials or ground rods. Or roof mount with radials.

HF mini-Bugcatcher

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

MFJ-1624
$79.95
New!

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.

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.

MFJ Portable Antenna

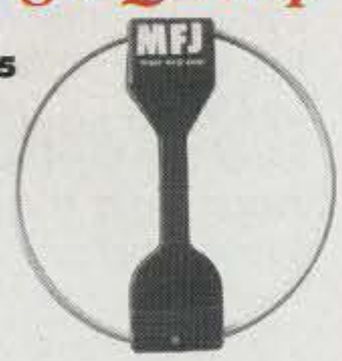
MFJ-1621
$89.95

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

MFJ-1786
$379.95



MFJ's *tiny* 36 inch diameter *high-efficiency* loop antenna performs like a *full-size* dipole! Operate 10 thru 30 MHz *continuously* -- including WARC bands!

Ideal for limited space -- apartments, small lots, motor homes, attics or mobile homes.

Mounts vertically or horizontally. Low angle radiation gives you excellent DX.

Super easy-to-use! Remote control autotunes to desired band, then beeps. No control cable needed. Handles 150 watts.

Fast/slow tune buttons and built-in two range Cross-Needle SWR/Wattmeter lets you quickly tune to your exact frequency.

All welded construction, no mechanical joints, welded butterfly capacitor with no rotating contacts, large 1.050 inch diameter round radiator -- *gives you highest possible efficiency*. Heavy duty thick ABS plastic housing has ultraviolet inhibitor protection.

Free MFJ Catalog

Visit: http://www.mfjenterprises.com or call toll-free 800-647-1800

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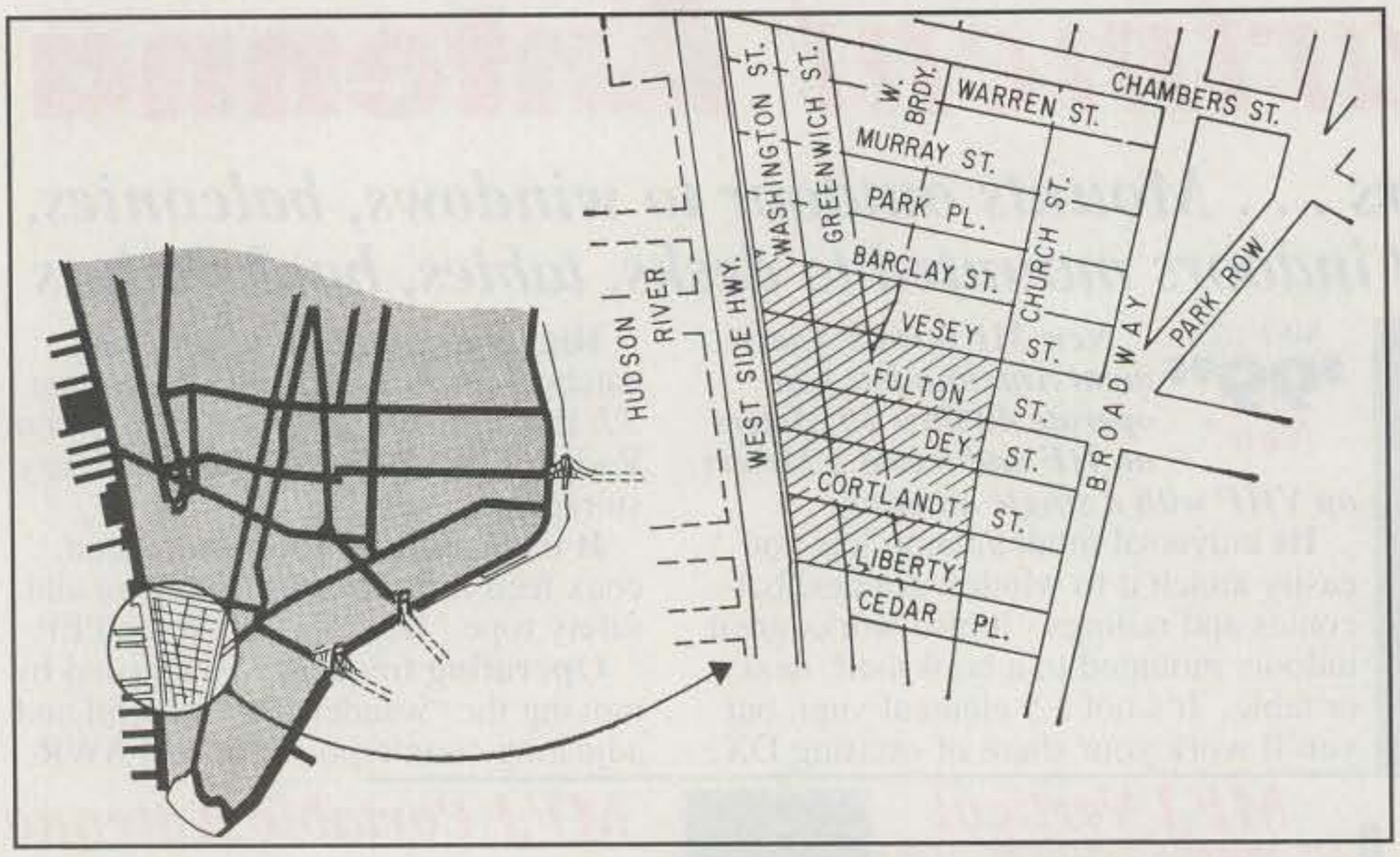


The affected area of lower Manhattan containing famed Radio Row. The shaded area at the right is to be cleared for the new World Trade Center. (Original 1965 map and caption.)

that Murray Baum of G&G Radio was there to sell him the property.

A few years ago it was decided (by people who decide things) that a single center for world commerce would be built in New York City. It would be called the World Trade Center. Architects' proposals were submitted and plans were finally adopted (by the same people) which called for two identical skyscrapers—one mile high—to be built on the fifteen square block area bounded by Liberty Street on the South, Church Street on the East, Vesey Street on the North, and the Hudson River on the West. This is Radio Row. At this writing, test borings have been made, court litigations evolved, and all that remains is a definite date of eviction to pull the shrouds over the forty-year history of an industry.

Just what is this legendary little area that has attracted ham and experimenter for forty years or more? Basically, Radio Row is a small area of several square blocks, centered on Cortlandt Street, that contains store after store catering to every phase of radio and electronics. The lofts and offices above these stores contain wholesalers and storage space for other dealers in electronics. There are surplus outlets, tube specialists, diodes specialists, transformer dealers, Hi Fi stores, tinkerer's bargain stores, and several legitimate wholesale and retail parts distributors. Nowhere else on earth does such a diversification of radio stores exist.

Cortlandt Street is generally considered the heart of Radio Row, with the great majority of old surplus, parts, and equipment stores either located there or having been located there at one time or another. The street is not particularly big, extending only four city blocks, East from New York's Hudson River to Broadway. Of these four blocks, only two are taken up by radio parts stores. From this nucleus, stores branch out South to Liberty Street, North to Vesey Street, and still farther North as far as Canal Street.

In the past ten years, there has been a gradual change in the quality and flavor of the Cortlandt Street area. Some of the past landmarks have disappeared and some stores have moved out; others have moved uptown. The great throngs that congregated there on Saturday afternoons are almost gone. The little childish hand that reached over the counter with a labouriously handwritten parts list containing 187 individual items, each indispensable, and the squeaky voice saying, "Stop when you reach $6.15; that's all I have," is a thing of the past.

Replacing the long trek to the city, the standing in line, the shifting through trays and boxes of indescribable merchandise, of breathing in that certain scent all radio stores seem to have (especially

A 1965 view of Cortlandt Street looking west from Washington Street. The elevated West Side Highway is in the background, and part of one of the vintage Hudson River ship piers can be seen beyond the highway. Radio stores were side-by-side along much of the street even at this late date.This is the spot where Tower 2 of the World Trade Center stood.

Looking south on Greenwich Street near Fulton Street. It wasn't pretty, but there was more "great stuff" behind those shabby store fronts than any ham could even dream about.

It's hard to believe that the shop owner could have any idea what he had in his inventory, but amazingly, these guys could put their hands on just about anything on demand. We haven't got a clue what store this is!

stored surplus and waxed wrappings) is the mail order catalog, the ad in the magazine, direct mailings to the home, and massed club purchasing.

For the metropolitan area ham who has his ticket at least eight or nine years, Radio Row means the place he got his start and bought all his parts. Today, he travels only a short distance to a local distributor or uses the mail, but somehow, it's not the same.

During these same ten years the amateur ranks have grown into entirely new markets, new demands, and represent the largest number of potential customers in the industry's history. There is business available, customers available and waiting; it's just that the old familiar store has changed or is no longer available.

Where To?

In a short while, possibly within the year, Radio Row will cease to exist. The signs are there already; a few old timers hold out but the end is inevitable. Where they will go is already written on the wall. Many have in the last several years gone out of business, some have diversified into the mail-order businesses, and others have given up the retail trade entirely. Some are now in the industrial end of the business with exotic test equipment and specialized components.

Those who remain on Radio Row represent the minority. The once familiar names are no longer here except on some faded sign or in someone's memory. The exodus has started to mid-Manhattan, New Jersey, Nassau County, and other divergent points. Canal Street now supports more surplus stores than Cortlandt Street, although they are being displaced by an increasing number of surplus hardware and discount stores. The question "Where To?" no longer seems correct, for it now seems very unlikely that any resurrection of a Radio Row is about to take place in any other location. It is truly the end of an era and the beginning of a legend.

The Business Itself

What of the people who own or run these businesses? Generally speaking, the old-timers in the business represent a clannish group having a common beginning in the Brownsville section of Brooklyn around 1920. Originally, many of them worked from their garages, before being attracted to the Cortlandt Street area by low rents, and a good source of customers from the Cortlandt Street ferry, docking at the foot of the street, on the Hudson. The thousands of commuters passing by each day provided a brisk trade.

Most of the current crop of businessmen on Radio Row don't date back to that early era, but instead represent the second generation of the old Brownsville group, in addition to a large number of "graduates" from the old Radio Wire Co. (now Lafayette Radio Electronics) at 100 Sixth Ave. A few of the current owners found their way into the business by accident, but generally the trade is a tight, closed affair with very little new outside blood.

The old-timers prospered in an industry devoted to component sales and customer contact. If the customer had a problem in some construction project, the salesman or owner was able to answer his need with the correct part and/or engineering involved. The entire business was founded upon the fact that people *built* because there was no great quantity of commercial equipment available. For the most part the sales help fostered building and were instrumental in bringing many newcomers into the hobby. Many amateurs today can recall the salesman who sold them their first set of parts and offered suggestions and who was available for counseling when it didn't work.

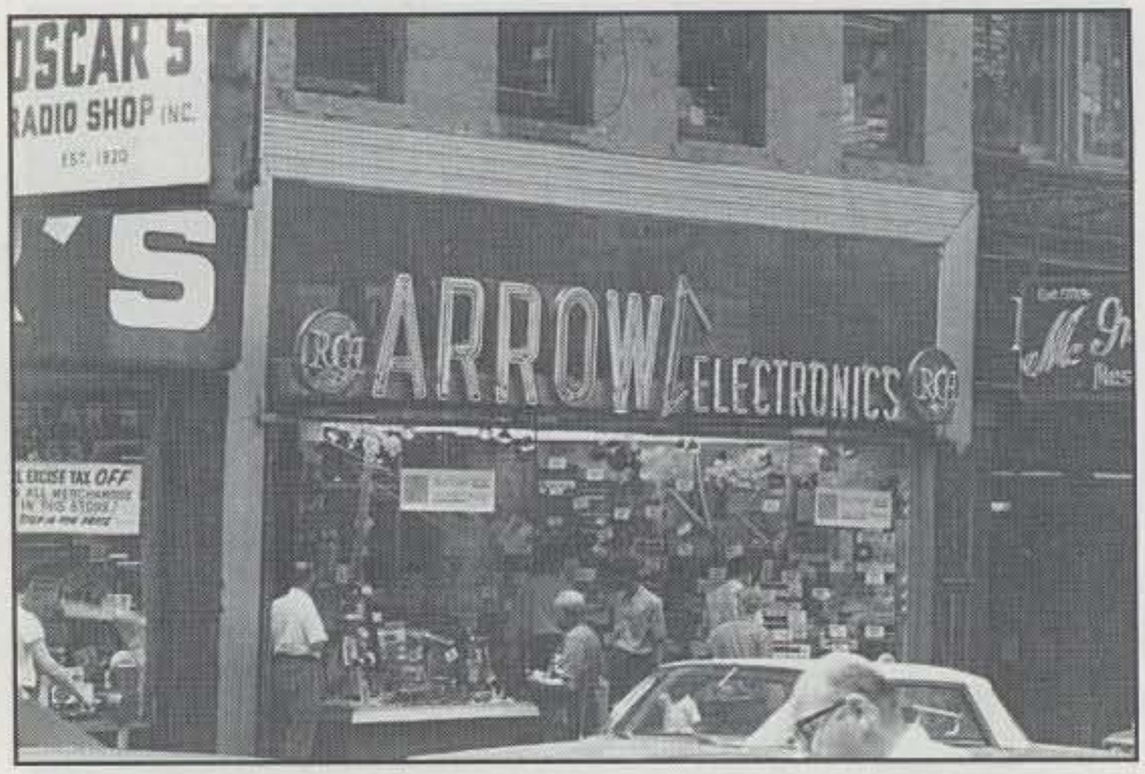
Today, people consider a kit as home-brew, and commercially made equipment is prevalent.

As the state of the art grew and matured, the equipment became increasingly difficult to construct without elaborate test equipment, and so, building began to subside in favor of buying. As increased buying took hold and building slackened, the old-time sales help changed with the times and most stores now employ a younger sales staff oriented towards selling equipment rather than developing builders. It's a sad fact of life.

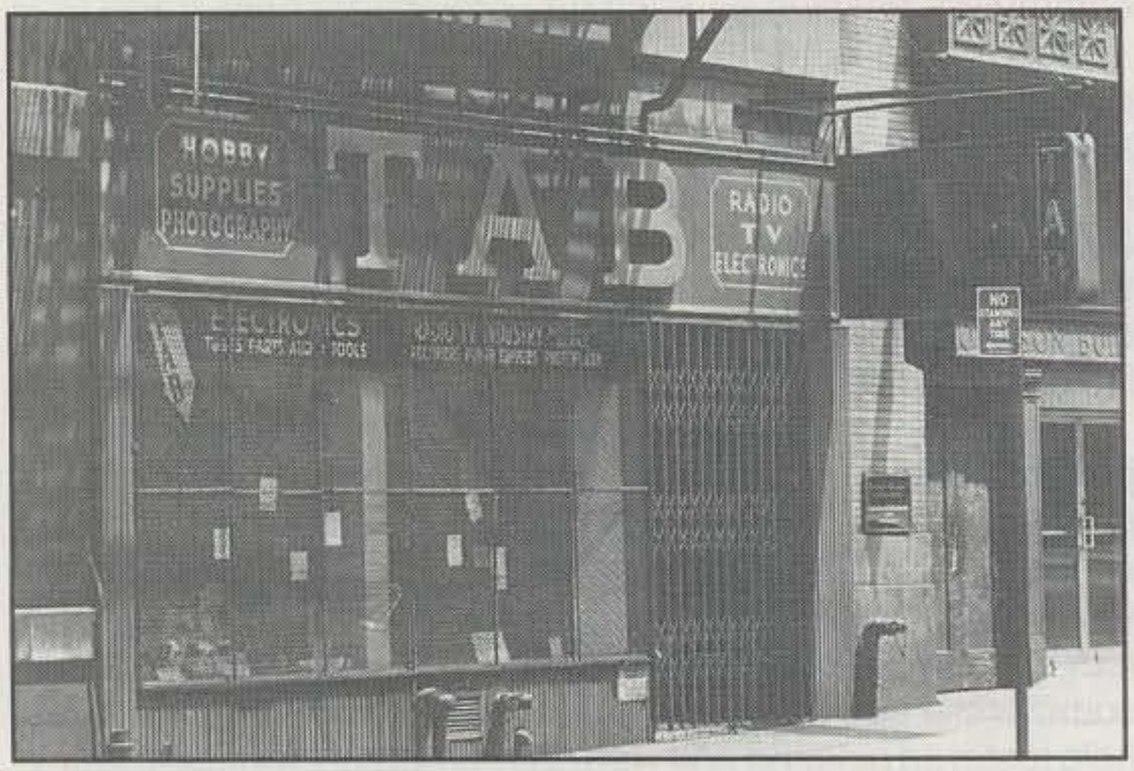
Surplus

What is commonly referred to as "surplus" had its roots in amateur radio from about 1917. A huge distinction should be brought up at this point that not all surplus is military surplus. Surplus constitutes any manufacturer's excess, or material remaining after a business failure. The great upsurge of military surplus came shortly after World War II when enormous quantities of material became available to the public. Amateurs in the service had had the opportunity to work with the most sophisticated and versatile communications equipment available. With typical American planning, enough equipment

Rex Radio, one of my favorite surplus stores, at 84 Cortlandt Street. At the age of 15, I bought a complete—and I really mean "complete"—BC-375 transmitter, including all the tuning units, the LF tuner, and the huge alternator that powered it all in its native B-17 bomber. I had to spend my last $3.00 on taxi fare to haul it all home some 20 miles away.



Among the surplus stores and junk stores there were a few legitimate electronics parts retailers such as Arrow Electronics. Arrow grew to be among the largest commercial electronics component suppliers in the world with sales in the billions of dollars. This is where you went when you had graduated from dismembering old junk TV's for resistors and capacitors, and decided to go "upscale" with all new parts.



TAB at 111 Liberty Street off Broadway was one of those places where you had a chance of finding almost anything, or nothing of value. One thing it did have was a great inventory of the kinds of tubes any ham would want such as 1625's (the cheap [25 cent] 12-volt-filament cousin to the 807), 832's ,and big-brother 829's for the VHF crowd. But despite the uncertainty of finding really good stuff at TAB, it was one of those "must-visit" places. TAB stood for That's A Buy. How's that for marketing?

The original Harrison Radio store. Owner Bil (with one "L") Harrison was a ham's ham, and stocked his store from stem to stern with every conceivable component and piece of ham equipment you could ever want. Although the sign suggested that they also catered to all areas of electronics, I hardly remember anything there that wasn't ham radio specific. One of my old friends was a Harrison salesman from this era, Mark Grossman, who's still active and involved in the hobby in New York City.

was stockpiled to outfit several other armies and this gear was snapped up by the waiting amateur just as fast as it could be released.

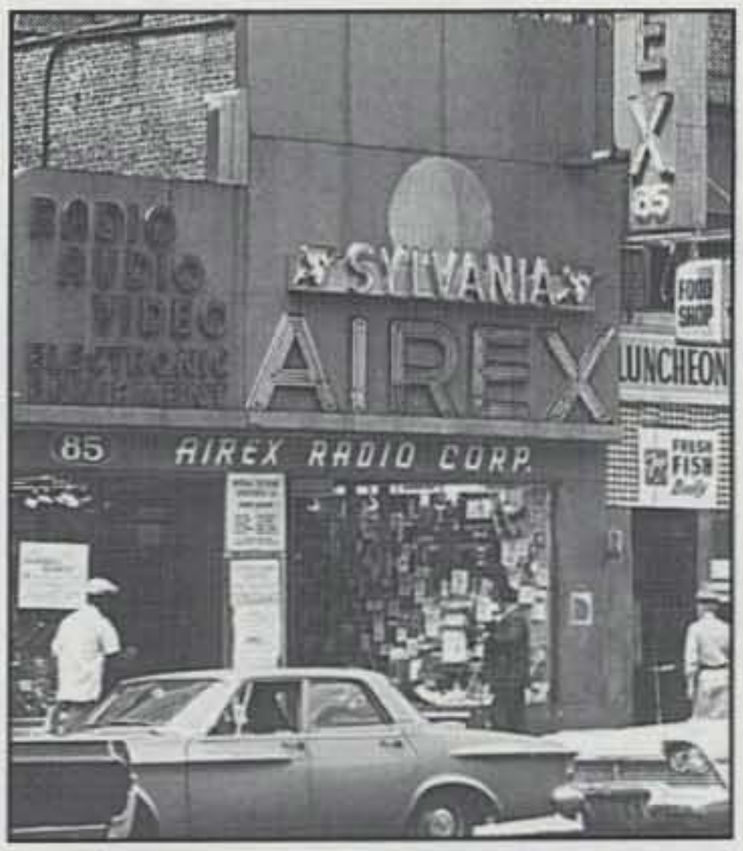
Conversion articles abounded in the ham magazines and surplus ads frequently outnumbered ads for commercial parts and gear in the magazines. Prices were low, profits were high, dealers made a lot of money.

Then came Korea and the market temporarily dried up with the government initially buying back surplus equipment and spare parts at original and sometimes *over* original acquisition cost. The dealers made still more money.

After Korea the surplus market was flooded again with even more exotic surplus equipment, old surplus, and the residue of factories geared to wartime production.

Factories going out of business, plus a rapid cut back on the number of TV set manufacturers deposited vast quantities of goods on the market. Dealers made money, builders saved money, people built more, and surplus was king.

Times were good then, but soon the bottom started to slip away gradually. The war ended over twenty years ago; companies now have tighter inventory control and tend to re-organize instead of go out of business. The avalanche of goods has dwindled down to a trickle. So-called "good" surplus is in short supply and relatively new military surplus equipment is high priced and frequently too sophisticated for amateur use. Parts that once would have filtered down to the surplus market now reach a cost conscious industrial market in a highly competitive economy. Suitable World War II surplus has been depleted by twenty years of picking, and the large number of dealers has dwindled proportionately. Through foresight, some of the dealers have stockpiled equipment and parts during the prosperous years and that is what is being offered



Each of the legitimate shops had an advertising tie-in with one of the major tube manufacturers who supplied classy signage in return for the exclusive on tubes sold in that store. It lent credibility to the place, and elevated it above the run-of-the-mill "schlock shop." Airex was one of those up-scale, legitimate distributors. Often the larger distributors were connected to their warehouses in buildings on the same block through a rabbit warren of connecting passages. Did you say "fire code?"

today. There is still surplus available from the government but in relatively small quantities. This is doled out year by year.

A new and more profitable market for surplus equipment and parts is the newly forming countries around the world and the various South American and European governments. What would have been sold domestically is more and more frequently being exported, further diminishing the U.S. market.

What Lies Ahead?

What lies ahead is the first lesson in Economics I. It is the Law of Supply and Demand. Dealers can only sell what they have been asked for, or what they can create a demand for. A dwindling Cortlandt Street cannot be blamed entirely on a new building labeled progress, but rather the guilt (if it is guilt) should lie with progress itself. The amateur, like everyone else, grows with changing times. He learns through example and perpetuates the art. He creates a demand that those who earn a living from him must satisfy. It is just that progress is sometimes a painful thing. Most of the stores will relocate and business will go on as usual, but somehow it won't be the same. ■

Washington Readout

BY FREDERICK O. MAIA, W5YI

Regulatory News In The World Of Amateur Radio

Amateur Radio—What You Need to Know, Part I

What is the Amateur Service?

This is the first of several columns dealing with the regulatory side of ham radio. This month we cover an overview of the Amateur Radio Service and the history of radio regulation. Future columns will discuss topics such as operator responsibilities, qualifying for a license, amateur callsign systems, permitted and prohibited communications, third-party and international communications, safety and RF exposure rules, technical and equipment standards, and emergency communications. —W5YI

The Amateur Radio Service is known all over the world as "ham radio." By current international definition, amateur radio is public, two-way, non-professional radio service which exists to further education, experimentation, and unimportant personal communications.

According to the international Radio Regulations, only technical subjects may be discussed, and amateur radio may not be used as a messaging service for the public when the transmissions cross national borders. This regulation exists to protect commercial telecommunications revenue in foreign countries. Both of these provisions can be overlooked if the countries involved agree.

The U.S. definition of amateur radio is that it is a voluntary, non-commercial, personal communications service where participants may learn about radio, assist during emergencies, and contribute by improving radio science and international friendship. There is no ban whatsoever on personal communications via amateur radio, even some with a personal business component. Amateur stations may not, however, be used to broadcast to the public or to carry messages for a fee.

In a nutshell, the purpose of U.S. amateur radio is simply to foster developmental, recreational "hobby-type" and personal communications, with public-service communications being an important aspect of ham radio. Although certain segments are set aside for certain types of communications, no particular mode or emission is advanced in the rules.

The "hobby" component can be any one of a myriad of activities, including experimentation, traffic handling, home brewing, emergency preparedness, DXing, rag-chewing, satellite operation, CW, FM repeaters, moonbounce, RTTY . . . you name it! More than a million "hams" are authorized to communicate with other radio amateurs around the word.

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

The U.S. Licensing Scheme

In the United States anyone except representatives of foreign governments may become a ham. There are no age restrictions. If you can pass the examination, you can be a licensed ham radio operator. There have even been six-year-old hams.

Exams include questions on an applicant's understanding of the technical and practical side of the radio hobby. Our licensing scheme rewards technical and Morse code proficiency with additional frequency privileges. The higher the license class, the harder the exam and the greater the privileges of the license.

Morse code knowledge continues as a U.S. prerequisite for high-frequency voice operation but not for the beginning Technician Class license. In amateur radio telegraphy is the key to accessing the HF bands, even if no CW operation is planned. This questionable concept is based on international regulations. It is anticipated, though, that the upcoming World Radiocommunication Conference to be held during the summer of 2003 (WRC-03) will abolish the mandatory Morse proficiency requirement.

Amateur radio operators in all areas of the world communicate with each other directly or through repeater relay systems or amateur satellites. Twenty-seven small frequency bands throughout the spectrum are allocated to the Amateur and Amateur-Satellite Services internationally. Some 1300 digital, analog, pulse, and spread-spectrum emission types may be transmitted.

Hams exchange messages by voice, teleprinting, telegraphy, facsimile, and television. In areas where the FCC regulates the services, an amateur operator must have either an FCC license or one issued by a country with which the U.S. has signed a reciprocal licensing agreement. Amateurs from those countries do not need any special permission to operate in the U.S. Amateurs from other countries must qualify for an FCC license before operating here.

All frequencies are shared. No frequency is assigned for the exclusive use of any amateur station. Station control operators cooperate in selecting transmitting channels to make the most effective use of the frequencies. Unlike virtually all other personal radio services, radio amateurs may design, construct, modify, and repair their own radio station equipment. The FCC equipment authorization program generally does not apply to amateur station transmitters.

Operator Class and Examinations

The FCC has six levels of license operator class, each authorizing increased privileges. They are Novice, Technician, Technician Plus Code, General, Advanced, and the Amateur Extra Class. Even though there are six license classes, only three classes are now issued: Technician, General, and Extra. This is because the FCC stopped issuing new Novice, Tech Plus, and Advanced Class when it restructured the Amateur Service in April 2000.

The class for which each licensee is qualified is determined by the degree of skill and knowledge in operating a station that the licensee demonstrates during an examination administered by volunteer examiners (VEs) in his or her area. Volunteer examiners are General and higher class radio amateurs who have been authorized to conduct license examinations.

Most new amateur operators start at the Technician Class and then advance to the General Class or Amateur Extra Class operator license. The VEs give examination credit for the license class currently held so that examinations required for that license need not be

repeated. The VEs construct the written examinations from question pools that have been made public. Helpful study guides and training courses are widely available.

History and Regulation of Electrical Communication

The earliest method of distance communication was by runners—and later by riders—who carried oral or written messages, since electrical transmission had not yet been invented. Signal fires, reflected sunlight, smoke signals, flag waving, and jungle drums are other primitive forms of communication.

Communication over electric wires arrived in 1835 when Samuel F. B. Morse, an art professor at New York University, employed a chemical battery and a lever to send currents through a wire circuit. The discovery of the "ground return" circuit meant that only one wire would be needed.

In 1844 members of Congress witnessed the sending and receiving of messages over an experimental telegraph line between Washington and Baltimore. "What hath God wrought?" sent by Morse from the old Supreme Court chamber in the U.S. Capitol to his partner in Baltimore officially opened the completed line on May 24, 1844. In an instant, distances were covered that took stage coaches, Pony Express riders, or locomotives days. or even weeks, to span.

Small telegraph companies sprang up everywhere. Western Union began business in 1851. Together with the railroad, the telegraph built up communities, opened markets, and promoted commerce. In the 1860s cables were laid under the Atlantic Ocean that linked America with Europe, and the tentacles of wireline communication spread all over Europe.

Wireline telegraph networks, however, stopped at the various national borders, since most countries had different systems, security concerns, and conflicting procedures. It was not unusual, therefore, for radio operators to physically hand over telegraphed messages to their counterparts in neighboring countries.

The International Telegraph Union was formed in Paris in 1865 by 20 European countries to facilitate the exchange of wireline telegraph messages across international borders. The members decided on common rules to standardize equipment, adopted uniform operating instructions, and laid down common international tariff and

accounting rules to interconnect their national networks.

The Invention of Radio

In the 1860s James Clerk Maxwell, a Scottish physicist, predicted the existence of radio waves, and in 1886 Heinrich Rudolph Hertz, a German physicist, demonstrated that rapid variations of electric current could be projected into space in the form of radio waves similar to those of light and heat. A patent of a wireless system was issued in the U.S. as early as 1872.

Amateur radio has been around for more than a century. It is generally agreed that ham radio began in 1895 when Guglielmo Marconi, an Italian inventor, sent and received the first radio signal locally in Italy. Although he never had a license or a callsign, Marconi considered himself an amateur.

On December 12, 1901 Marconi and his assistants transmitted and received the first international radio signals—the letter "S"—flashed across the Atlantic Ocean from England to Newfoundland. Marconi inspired hundreds of others to experiment with radio communications, and the era of the amateur radio operator had begun.

For the first decade of its existence amateur radio flourished without regulation. In 1909 amateur stations accounted for more than 80 percent of all stations on the air. In the early years wireless telegraphy remained primarily confined to the sea. Ships talked to each other in their dot-dash language on a frequency of 500 kHz.

During the early days of radio the low ground-wave frequencies were believed to be the best. Frequencies higher than 1.5 MHz were thought to have very little value and eventually were allotted to amateurs for experimentation.

The ITU

The regulation of radio came about in 1906, when the International Telegraph Union (ITU) extended its reach over wireline telegraphy to include wireless radio communication.

The first legislation dealing with marine radio was approved by Congress in 1910. Known as the Wireless Ship Act, it required installation of wireless apparatus and operators on large sea-going passenger vessels. Large cargo ships were added in 1912, but few ships staffed their radio equipment around the clock. On April 14, 1912 the ill-fated *Titanic* resorted to wireless telegraphy to call for help. The disaster pointed out the need for wireless regulation.

Part 97: Amateur Radio Service Rules and Regulations

Subpart "A" – General Provisions: covers the purpose of the Amateur Service, station licensing, and callsign systems.

Subpart "B" – Station Operation Standards: covers the routine operation of an amateur radio station.

Subpart "C" – Special Operations: covers other amateur radio communication methods such as auxiliary, beacon, repeater, Earth and Space, telemetry, telecommand, and message-forwarding systems.

Subpart "D" – Technical Standards: lists the authorized frequency bands, operating modes, and transmitter power levels.

Subpart "E" – Providing Emergency Communications: includes operating a public-service station during an emergency or disaster.

Subpart "F" – Qualifying Examination Systems: covers how to qualify for a license to operate an amateur station.

There are also two appendices which list the places where the Amateur Service is regulated by the FCC and the various amateur radio geographical regions.

Table I– The parts within Part 97.

Regulations for further wireless uniformity were adopted at the 1912 London ITU conference. To carry out its obligations under that treaty, the United States enacted the Radio Act of 1912. This was the first law for the domestic control of general radio communication.

The Radio Act regulated the character of emissions, transmission of distress calls, set aside certain frequencies for government use, and placed licensing of wireless stations and operators under the Secretary of Commerce and Labor. Licensing of all radio stations, including amateur radio stations, began that year. Before government licensing, amateurs could operate on any wavelength they chose and could even select their own callsigns.

The Radio Act of 1912 also limited the operation of "private stations" (meaning radio amateurs) to 200 meters, the "useless" shortwave frequencies above 1500 kHz. The new regulation had a devastating impact on the number of radio amateurs, reducing their numbers by more than 80 percent!

The first ITU frequency allocations were made in 1927. That same year, the alphabet was apportioned among the nations of the world for basic use in the assignment of radio callsign prefixes. The United States was assigned the prefix letters N, K, W, and AA through AL. As an aid to the enforcement of radio laws, radio stations were required to identify themselves at regular intervals using a unique callsign.

In 1932 the name International Telecommunication Union was adopted to reflect the expanded responsibilities of the organization. The ITU is composed of delegations from its member nations and meets every few years to agree on changes to the international Radio Regulations. The organization became an arm of the United Nations in 1947, and its headquarters moved from Berne to Geneva, Switzerland the following year.

The primary objective of the ITU is the furtherance of effective and efficient telecommunications and the regulation of the radio spectrum on a worldwide basis. The ITU accomplishes this by dividing up the radio spectrum for allocation to the various competing services.

The ITU allocation plan divides the world into three geographical regions. Frequency allocations in North, Central, and South America generally conform to those for Region 2; ITU Region 1 generally includes Africa, Europe, and parts of northern Asia; Region 3, includes the Middle East, parts of southern Asia, and the South Pacific, including Australia.

The Radio Act of 1927 created a five-member Federal Radio Commission with regulatory powers over radio, including the issuance of licenses, the allocation of frequency bands to various services, assignment of specified frequencies to individual stations, and control of station power. The Secretary of Commerce was granted authority to inspect radio stations, to examine and license radio operators, and to assign station callsigns.

Seven years later Congress passed the Communications Act of 1934, which, along with numerous amendments, remains the basic document controlling telecommunications in the United States and its possessions.

The FCC

The Communications Act of 1934 replaced the Federal Radio Commission with the Federal Communications Commission, establishing it as an independent government agency responsible for the regulation of all non-government interstate and foreign wire and radio communication which originates or is

received within the United States. The FCC is required to administer U.S. telecommunications policy within the basic international spectrum framework agreed to by the ITU member nations.

Among its duties, the FCC allocates frequency bands for the various radio services, determines frequencies to be used by individual stations, licenses and regulates stations, and determines operator qualifications. The Amateur Radio Service is only one of many different radio services administered by the FCC.

Radio operations of the federal government are not regulated by the FCC, however. This is handled by another government agency, the National Telecommunication and Information Administration (NTIA).

Operation of the FCC is directed by five commissioners who are appointed by the President, one of whom is designated the chairman. The appointments must be approved by the Senate, and not more than three of the commissioners may be members of the same political party. Appointments are made for five-year terms, except those made to fill an unexpired term.

Certain commission activities are delegated to various bureaus, divisions, branches, and staff offices. The FCC's Wireless Telecommunications Bureau oversees nearly all FCC domestic wireless telecommunications services, including the Citizen's Radio Service, the Family Radio Service, and the Amateur Radio Service.

Rules and Regulations

The U.S. Code of Federal Regulations is a listing of all government rules. The CFR is divided into 50 titles which represent broad areas that are subject to federal oversight. FCC regulations, including those of the Amateur Radio Service, are covered in "Title 47, Telecommunications." Each title is divided into chapters and subdivided into parts covering specific regulatory areas. Large parts may be further subdivided into subparts. All parts are organized into sections which contain the part and paragraph number.

All FCC rules are initially published in the *Federal Register*, the daily journal of government proceedings. They are updated annually and published in paper-bound volumes once a year in October.

Title 47 is further broken down into several parts. Part 97 specifically applies to the Amateur Radio Service. The Part 97 Amateur Radio Service Rules and Regulations are then broken down into six subparts (see Table I).

When quoting a specific rule, it is proper to refer to it by its title, part, subpart, and section. For example: 47 CFR Part 97, Subpart A, Section 97.1 refers to the Basis and purpose of the Amateur Radio Service. Within the ham radio community, however, it is common to refer to the rules simply by section number, such as "In Section 97.1 of the rules..."

Next Month

In Part II of this series we'll look at the administrative side of amateur licensing —how the amateur exams are developed and what actually goes on between the time you take your test and the time your license is issued or upgraded. We'll also examine the important responsibilities of each amateur station's control operator. In most cases, that's *you*, and the FCC has certain expectations that you need to understand (and it's better to have them explained by us than in a personal letter from FCC amateur enforcement chief Riley Hollingsworth!). Stay tuned.

73, Fred, W5YI

Gordo unveils a full-featured, two-band HT which offers everything from weather channel alerts to a built-in fluxgate compass, 100 channels of memory, AO-27 satellite capabilities, and some other undocumented features that emergency communicators will love...

CQ Reviews:

The RadioShack HTX-420 2 meter/440 MHz Handheld

BY GORDON WEST,* WB6NOA

Thousands of amateur radio operators have discovered ham radio and found the resources for earning their licenses at their local RadioShack store. I am told that 95 percent of our country's population lives within five minutes of a RadioShack. It is no wonder their amateur radio products and training materials have attracted to our hobby many newcomers who maybe were just stopping in for parts and shortwave sets or scanners.

Many new ham operators first made it on the airwaves with the entry-level, 2 meter HTX-202 handheld. RadioShack has brought in new models of HTs, but its latest two-band, "big radio" handheld, the HTX-420, really caught me by surprise. It was uncomplicated, with *all* of the big-league features, including some discovered capabilities (not in the manual) that will certainly appeal to hams involved in emergency communications.

In the Box

For $269.99 plus your local sales tax, you get the following in the HTX-420 package:

- 2 meter/440 MHz, 5 watt capable handheld
- 7.2 volt, 1200 mAh lithium-ion battery with wall charger
- AA 4-cell battery holder
- 2 meter/440 MHz SMA rubber-duck antenna
- Belt clip and lanyard

**CQ Contributing Editor, 2414 College Dr., Costa Mesa, CA 92626*
e-mail: <wb6noa@cq-amateur-radio.com>

- Intelligently written, 48-page instruction manual

"We designed this radio with the beginner as well as the well-seasoned amateur radio operator enthusiast in mind," comments RadioShack buyer Wayne Wilson, WR5S. Wayne is active in amateur radio and product design, all the way back to the early Heathkit days. "We designed this radio after our ham radio engineers worked with over 15 *other* amateur radio products, and no one can say that this radio is just a 'beginner model,' " adds Wilson.

Nope, definitely not a beginner two-band handheld!

- 100 erase-safe memory channels
- CTCSS encode/decode *easily set* (no complicated menus to fret over)
- Pre-programmed weather channels plus S.A.M.E. weather alert (more on this later)
- Dual-conversion intermod-free receiver
- Full-size feel, major-size LCD frequency readout (of course, back-lit keys and readout at night)
- 16-key DTMF with six autopatch speed -dial locations, *easily set*
- Lithium-ion battery pack with dry-cell holder included (or plug into your mobile 12 volt source and pump up the power output)
- Built-in fluxgate compass (in case you get lost)
- Speaker-mic common jack (other than a Kenwood mic)
- Scanning options (way too many for me to figure out right now)
- Packet radio hook-up diagram

The big LCD readout on the RadioShack HTX-420 shows that the radio is tuned to 147.060 MHz, using tone and a positive shift, on low power, in memory position 2, and that the battery is in good shape. (Photos by the author)

- Power save
- Loud audio (that you can hear on your belt)
- Timeout timer and automatic power off (so you don't go hoarse)
- Crossband for working the FM "easySATs"

The HTX-420 comes standard with a 7.2 volt, 1200 mAh lithium ion battery pack (with wall charger), plus a holder for four AA batteries of your choice. Using an optional power cord, you may also plug into a 12 volt DC supply.

Satellite Operating with the HTX-420

Working the FM satellites was no problem with this two-band radio. You can select a transmit frequency in the VHF band and a receive frequency in UHF, or vice versa. When you press the "XBO," the main frequency is duplicated at the sub-frequency display. "XB" appears to the right of the main frequency display. I then entered the transmit frequency on the main frequency display. I can push the reverse key to exchange the main frequency display and the sub-frequency display. Pressing the push-to-talk button on the side of the new RadioShack transceiver cycles to the other band for transmit. Here is how I loaded crossband FM satellite frequencies:

AO27	UO14
436.805 RX, 145.850 TX	435.080 RX, 145.975 TX
436.800 RX, 145.850 TX	435.075 RX, 145.975 TX
436.795 RX, 145.850 TX	435.070 RX, 145.975 TX
436.790 RX, 145.850 TX	435.065 RX, 145.975 TX
436.785 RX, 145.855 TX	435.060 RX, 145.980 TX

Now you have the five channels plus five more channels for each FM satellite. Your crossband transmit remains relatively set, but as the satellite approaches and then descends into loss of signal, you simply rotate the top knob on the RadioShack HT to optimize the receive frequency, which may shift as much as a total of 15 kHz because of Doppler shift. Not having simultaneous receive in the crossband mode won't slow you down a bit when working the FM easySATs. In fact, on other handhelds with simultaneous receive of the other band, I usually turn it down all the way so I don't get feedback if I'm not using a separate earphone.

- Airband reception, AM mode
- Out-of-band VHF reception, plus MARS and Coast Guard Auxiliary keypad TX mods
- UHF out-of-band reception, including FRS, GMRS, public safety, and air/wind profiler
- Emergency-only *full* UHF operation
- "T" band public-safety reception

Almost Everything

Before I get started with some interesting discoveries on the new he-man RadioShack HT, let me point out some obvious things that a $270 handie would not include.

The first thing is what you might not expect when you look at the outside box containing the equipment: While it shows *both* 2 meters and 440 MHz in the window, it receives *either* band but *not* both at once. The dual-band display indicates one band for receive and the other band for transmit. This would allow you to set FM satellite uplink and downlink frequencies to compensate for ascending, overhead, and descending passes (see "Satellite Operating with the HTX-420"). The only thing you would not get would be *simultaneous* reception of your own uplink signal—no big deal with the FM easySATs.

You don't get the optional speaker microphone or DC power cord. The DC power cord is a whopping couple of bucks. For the speaker mic, several I had from other pieces of equipment, other than Kenwood, worked well in the twin-hole socket.

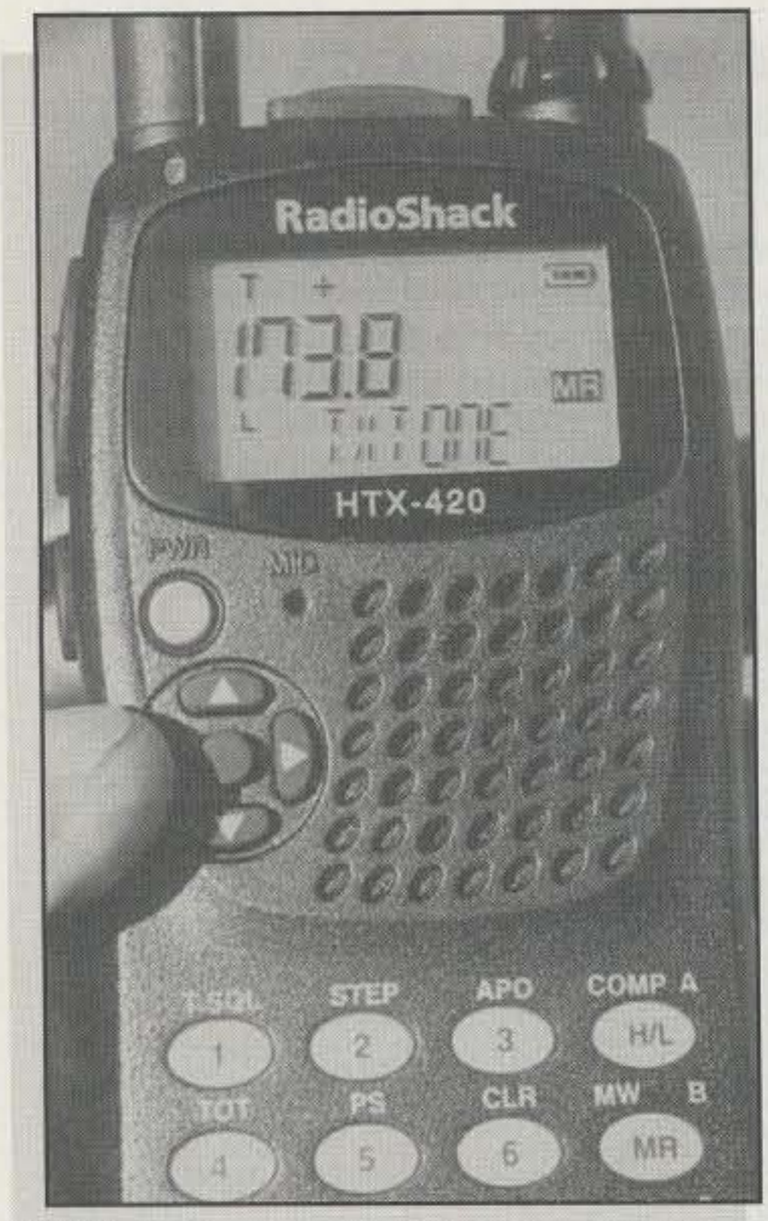
Boaters, you won't get emergency marine VHF boat-to-Coast-Guard transmit. On the VHF side, out-of-band transmit starts at 142 and ends at 149.8. On UHF, the out-of-band transmit keystroke modification unbelievably goes wide open from 420 MHz to 470 MHz! ***Warning:*** *If you are caught using this equipment transmitting on any frequency outside of the amateur radio band (other than MARS or Coast Guard personnel), even running low power on Family Radio Service and GMRS frequencies, you would be in violation of the rules that prescribe* ***only*** *type-approved radio transmitters in this region.* Keep this in mind when you find the two-key TX unlock steps for this very wide-open-capable handheld with an unbelievably sensitive receiver at bandedge extremes.

There were no automatic repeater splits, and no documentation about cloning or computer control. I have been told that cloning and computer-control data requirements are in the technical specs of the equipment, but it probably will be organizations such as RT Systems that will figure out how to clone and how to computer-enter all of those 100 channels. The software protocol and construction for a PC interface cable is available in the 19-1108 service manual. You can order a service manual through your local RadioShack store. Hopefully, the unit will clone from one HT to another, but this equipment is so new even the factory does not know if this is possible without the use of a computer.

Finally, no alphanumerics. Therefore, with 100 possible channels of memory, keep a black book on all of those channels previously stored.

And How It Operates!

With most RadioShack handhelds you need to really scour the instruction manual for subtle things such as setting CTCSS encode and decode. This radio is different: Pressing the left



Setting CTCSS tones on the HTX-420 is easy, and the display lets you know if you are setting a transmit (TX) or receive (RX) tone.

A belt clip and lanyard strap are standard with the HTX-420. Be careful not to lose the two tiny screws for the belt clip. They are not *packed in a separate plastic bag.*

or right arrow "bull's eye" lets you step through repeater offsets, receive CTCSS tone, transmit CTCSS tone, DTMF slots, weather warning settings, and finally, a simple automatic squelch adjustment. The up/down arrows select the individual parameters of each of these functions.

I was delighted to see a straight-forward approach to calling out CTCSS functions. With *other* handhelds a statement such as "repeater tone" doesn't give much clue as to whether or not this is Transmit CTCSS or Receive CTCSS. With this unit they simply say "TX" and "RX." Good for RadioShack!

The bull's-eye center button toggles among AM airband reception, preset weather-channel reception, 2 meter band, 70 cm band, and back to airband.

When you get to the weather channels, this new RadioShack handheld follows a convention that I have seen in some new FRS weather-channel receive circuits: Instead of weather channel 1 being 162.550 MHz, WX-1 is the lowest weather-channel frequency of 162.400, and WX-7 is the highest weather-channel frequency, 162.550. This differs from what the National Weather Service calls its weather channels 1, 2, and 3. No big deal. This little RadioShack handheld also offers Specific Area Message Encoding weather alert, and this SAME code identifies a specific geographic area so your handheld will sound an alert only when a weather emergency is declared in your own area. You can look up your six-digit SAME code at <http://www.nws.noaa.gov/nwr/indexnw.htm>. I see this as a handy feature, particularly for SkyWarn operators in the Midwest and elsewhere.

A function key on the right side of the radio allows you to bring up secondary keyboard functions. These sub-functions give you the works, from power save to keyboard beep, automatic power off to keyboard lock, and all sorts of relatively fast memory and frequency scan and search functions.

The big LCD display shows a battery-level icon, power level, CTCSS settings, big numbers for the frequency or channel you are on, and a blinking "S" illustrating the power-save mode. With power save ON, the unit goes into the power-save sampling mode after 8 seconds of monitoring a squelched channel. The book says it samples every 8 seconds for activity, but what they really mean is it automatically turns on after 8 seconds of frequency *inactivity*. The sampling rate is extremely fast, so no syllables are lost when someone comes up on channel when in the power-save mode.

What a feel! Take the battery off the radio and it still feels relatively heavy—because it is! No plastic case here! The radio is all die-cast aluminum, and this keeps it almost stone cold during long periods of transmit.

When you first turn on the equipment or rotate or push any one of the dials or keys, backlighting comes up, including the keyboard. Backlighting goes off approximately 5 seconds later. I haven't figured out how to keep backlighting on for continuous illumination, and they probably have no way of doing this in order to prevent accidental battery drain. The top knob changes frequency or memory channels, and at the base of the knob is a concentric volume control. Volume output was judged refreshingly loud at full tilt—another great feature when you wear this equipment on your belt with the supplied belt clip.

Direction Finding

I went hiking with the radio, and after a few electronic compass calibration maneuvers I could sort of get the built-in fluxgate compass to work. A fluxgate is an electronic sensor that is able to detect a magnetic field—in this case, the Earth's magnetic field. You must hold the radio absolutely flat, and it takes the electronic compass a couple of seconds to lock in on which magnetic direction the rubber-duck antenna is pointed. The bearings were relatively accurate, but I suggest you bring along your Boy Scout compass as a back-up!

Final Impressions

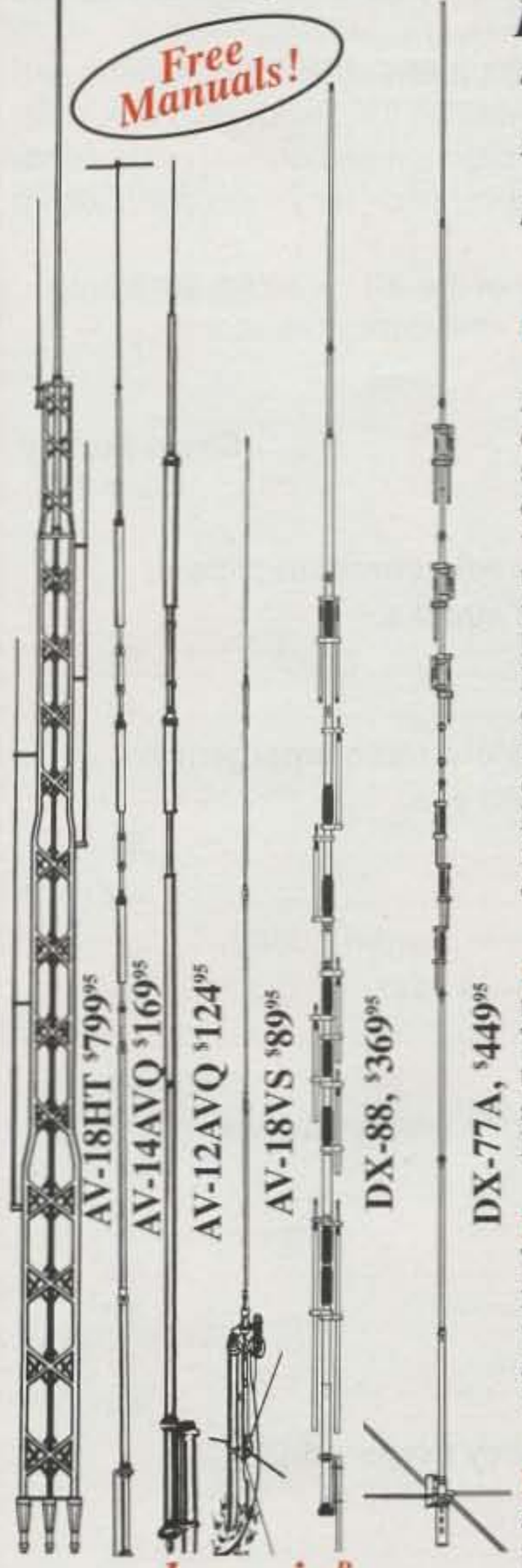
During the test I was interrupted and accidentally left the handheld facing straight up into some very hot southern California sunshine. The radio was so warm that I could barely pick it up, yet the huge LCD display did *not* turn black. This is good news; an LCD display that can be seen at all angles is truly a quality LCD panel that can take the harsh environment.

Finally, the receiver is right up there with twice as expensive handhelds when it comes to sensitivity and intermod rejection. I have a big commercial VHF antenna with which I test handhelds, and any handheld that shows me less than two signal-strength units of background hash independent of where I am dialed is considered good rejection for a handheld. With all of its out-of-band capabilities, I was impressed. The HTX-420 is priced at $269.99.

It's certainly a keeper! Congratulations, RadioShack.

hy-gain HF VERTICALS...

Self-supporting -- no guys required . . . Remarkable DX performance -- low angle radiation, omnidirectional . . . Handles 1500 Watts . . . Low SWR . . . Automatic band switching . . . Aircraft quality aluminum tubing . . . Stainless steel hardware . . . Recessed SO-239 connector . . . Two year limited Warranty . . .



hy-gain[R]
Classics

All hy-gain multi-band vertical antennas are entirely self supporting -- no guys required.

They offer remarkable DX performance with their extremely low angle of radiation and omnidirectional pattern.

All handle 1500 Watts PEP SSB, have low SWR, automatic bandswitching (except AV-18VS) and include a 12-inch heavy duty mast support bracket (except AV-18HT).

Heavy duty, slotted, tapered swaged, aircraft quality aluminum tubing with full circumference compression clamps is used for radiators. Includes all stainless steel hardware. Recessed SO-239 prevents moisture damage. Hy-gain verticals go up easily with just hand tools and their cost is surprisingly low. Two year limited warranty.

AV-18HT, $799.95. (10,12,15,20,40,80 M, 160, 17 Meters optional). 53 ft., 114 lbs.

Standing 53 feet tall, the famous *Hy-Gain HyTower* is the world's best performing vertical! The AV-18HT features automatic band selection achieved through a unique stub-decoupling system which effectively isolates various sections of the antenna so that an electrical 1/4 wavelength (or odd multiple of a 1/4 wavelength) exists on all bands. Approximately 250 kHz bandwidth at 2:1 VSWR on 80 Meters. The addition of a base loading coil (**LC-160Q, $109.95**), provides exceptional 160 Meter performance. **MK-17, $89.95**. Add-on 17 Meter kit. 24 foot tower is all rugged, hot-dip galvanized steel and all hardware is iridited for corrosion resistance. Special tilt-over hinged base for easy raising & lowering.

AV-14AVQ, $169.95. (10,15,20,40 Meters). 18 ft., 9 lbs. The Hy-Gain AV-14AVQ uses the same trap design as the famous Hy-Gain Thunderbird beams. Three separate air dielectric Hy-Q traps with oversize coils give superb stability and 1/4 wave resonance on all bands. Roof mount with Hy-Gain AV-14RMQ kit, $89.95.

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.

AV-18VS, $89.95. (10,12,15,17,20,30,40,80 Meters). 18 ft., 4 lbs. High quality construction and low cost make the AV-18VS an exceptional value. Easily tuned to any band by adjusting feed point at the base loading coil. Roof mount with Hy-Gain AV-14RMQ kit, $89.95.

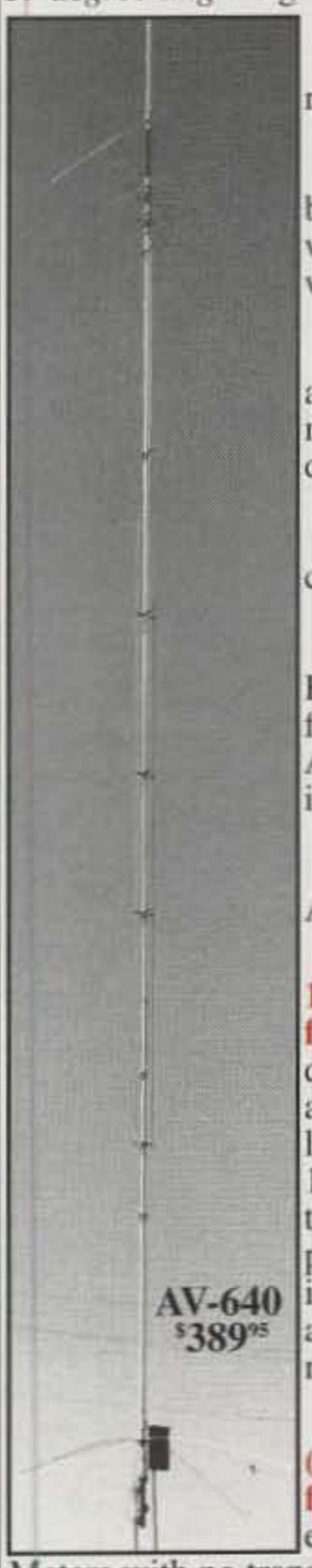
DX-88, $369.95. (10, 12, 15,17,20,30,40,80 Meters, 160 Meters optional). 25 ft., 18 lbs. All bands are *easily* tuned with the DX-88's *exclusive* adjustable capacitors. 80 and 40 Meters can even be tuned from the ground without having to lower the antenna. Super heavy-duty construction. DX-88 OPTIONS: 160 Meter add-on kit, KIT-160-88, $189.95. Ground Radial System, GRK-88, $99.95. Roof Radial System, RRK-88, $99.95.

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
AV-18HT	$799.95	10,15,20,40,80	1500 W PEP	53 feet	114 pounds	75 MPH	------
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 no guy	1.5-1.625"
DX-77A	**$449.95**	**10 - 80 M**	**1500 W PEP**	**29 feet**	**25 pounds**	**60 mph no guy**	**1.5-1.625"**

hy-gain[R]
PATRIOT

Hy-Gain's new **PATRIOT** HF verticals are the best built, best performing and best priced multiband verticals available today. For exciting DX make full use of your sunspot cycle with the **PATRIOT's** *low 17 degree angle* signal.



No ground or radials needed

Effective counterpoise replaces radials and ground.

Automatic bandswitching

Single coax cable feed. Each band is individually tunable. Extra wide VSWR bandwidth. End fed with broadband matching unit.

Sleek and low-profile

Low 2.5 sq. ft. wind surface area. Small area required for mounting. Mounts easily on decks, roofs and patios.

Full legal limit

Handles 1500 Watts key down continuous for two minutes.

Built-to-last

High wind survival of 80 mph. Broadband matching unit made from all *Teflon*[R] insulated wire. Aircraft quality aluminum tubing, stainless steel hardware.

hy-gain*[R] *warranty

Two year limited warranty. All replacement parts in stock.

AV-640, $359.95. (6,10,12, 15,17,20,30,40 Meters). 25.5 ft., 17.5 lbs. The AV-640 uses quarter wave stubs on 6, 10, 12 and 17 meters and efficient end loading coil and capacity hats on 15, 20, 30 and 40 meters -- no traps. Resonators are placed in parallel not in series. End loading of the lower HF bands allows efficient operation with a manageable antenna height.

AV-620, $289.95. (6,10,12,15,17,20 Meters). 22.5 ft., 10.5 lbs. The AV-620 covers all bands 6 through 20 Meters with no traps, no coils, no radials yielding an uncompromised signal across all bands.

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Call your dealer for your best price!

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What You've Told Us...

Our July survey asked about the antenna(s) you use at your station, and it drew a larger-than-usual response. First of all, an incredible 98% of you have a station/antenna on the air; 90% of you are set up for HF/MF, 87% have an antenna for VHF/UHF, 6% have satellite antennas, 2% have microwave antennas, and 4% have "other" antennas, perhaps for scanning. Nearly everyone who responded (96%) has some sort of antenna set up at home for fixed station use; 80% have a mobile antenna in their car, truck, or van; 68% have at least one antenna for a handheld; 8% have an antenna on their bike, boat, or plane; and 5% have an antenna someplace else.

Who makes your antennas? A whopping 87% of you use at least one commercially-built antenna, while 41% have at least one antenna built from your own design and 34% of you have an antenna built from a published design. Antenna installation remains very much a do-it-yourself activity for hams, as 72% of you have installed at least one antenna on your own, working alone; 50% have installed an antenna with help, and only 5% have ever had an antenna professionally installed. Where are your antennas? While 86% of you have some sort of outdoor antenna, 30% have one or more antennas installed indoors, perhaps a reflection of the growing problem with CC&Rs.

Your preferences for antenna types are pretty clear: 79% of you have at least one vertical antenna, 65% have a dipole, 53% have a Yagi, only 8% use a quad, and 32% have some other type of antenna (obviously, most of you have more than one antenna!).

Finally, we asked how you support your antenna(s). Half of you (50%) have a tower, 43% of you use trees, 42% use wall or roof mounts, 9% use a deck or balcony mount, and 36% use something else to keep your antenna(s) in the air.

Thank you for your responses. This month's winner of a free one-year subscription to *CQ* is Gordon Terry, KCØMMC, of Manhattan, Kansas.

Reader Survey September 2002

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 Reader Service 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*.

This month, as we observe the first anniversary of the 9/11 attacks, we want to see how the past year has affected your personal emergency preparedness.

Please indicate... **Circle Survey Card #**

1. ... whether you participated in any amateur radio communications directly connected to the September 11th attacks.
- Yes....39
- No....40

2. ... whether you have participated in any amateur radio emergency or disaster communications within the past year.
- Yes....41
- No....42

3. ... whether you have participated in any amateur radio public service events (parades, etc.) within the past year.
- Yes....43
- No....44

4. ... how you would rate your level of emergency preparedness today.
- Excellent....45
- Good....46
- Marginal....47
- Poor....48
- Unprepared....49

5. ... how you would rate your level of emergency preparedness today *compared to a year ago.*
- Much better prepared....50
- Better prepared....51
- About the same (well-prepared)....52
- About the same (poorly-prepared)....53
- Not as well-prepared....54

6. ... your feelings about amateur radio's continued importance today vs. a year ago.
- Much more positive....55
- Somewhat more positive....56
- About the same (positive)....57
- About the same (negative)....58
- Somewhat more negative....59
- Much more negative....60

Thank you for your responses. We'll have more questions for you in our next reader survey.

Alinco Unleashes the Power in Hand-held Communications!

Try the DJ-596 dual bander that can communicate in analog or optional digital modes! Check out the powerful DJ-196/296/496 monoband units. Pick up the "Gen2" DJ-S40 pocket HT. No matter which you choose, you'll get a transceiver that's rugged, easy to program and built for years of dependable operation. You expect more value from Alinco and we deliver!

DJ-596T VHF/UHF Dual-band HT with Digital Voice Option*

Loaded with features! The breakthrough design supports optional digital voice communications and you can easily switch the unit between analog and digital modes!

- Full 4.5 watts output VHF/4w UHF
- Powerful NiMH battery
- 100 memories in any combination of VHF or UHF channels
- Direct frequency input from keypad
- Each memory capable of "odd split" operation.
- Alphanumeric channel labels
- CTCSS and DCS encode+decode plus tone bursts
- Full 2m and 440 band coverage
- Accepts 6 ~ 16 VDC direct input
- Three scan modes
- Illuminated keys and display
- Wide and narrow FM modes
- 10 autodial memories
- Theft alarm feature
- Optional EJ-43U Digital Voice Board!*

DJ-196T (2m), DJ-296T (222 MHz), DJ-496T (440 MHz)

These sturdy, full-featured monobanders are priced low and ready to go!

- 5 watts DJ-196 / 4 watts DJ-296 and DJ-496
- Long-lasting NiMH battery
- 40 memory channels
- Keypad frequency input
- CTCSS and DCS encode+decode
- Alphanumeric display
- 13.8 VDC direct input
- Wide and narrow FM modes
- Illuminated keys and display
- Autodial memories
- S-meter

DJ-S40T 440 MHz Pocket HT

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Math's Notes

What's New And How To Use It

BY IRWIN MATH, WA2NDM

Operational Amplifiers Revisited

We have received several requests to repeat the explanation we gave in the past regarding the use and operation of op-amps, so this month I thought we'd give it another go-around. Also, as requested, we will not bore you with a lot of math. We will only provide the very basic details of what you should know to get started.

The operational amplifier is one of the most useful devices and has applications from DC well into the hundreds of MHz. It may be used as a simple amplifier, a voltage follower, an arithmetic element, and a host of other unusual circuit elements. Fig. 1 is the basic circuit of the so-called inverting configuration. As you can see, the op-amp is supplied with both positive and negative power-supply voltages. (Later we will see how to use a single supply.) The output of the circuit is expressed by the formula Eout = Ein × Rf/Ri, which simply means that the output voltage is the negative value of the input voltage multiplied by the value of the feedback resistor (Rf) divided by the value of the input resistor (Ri). In this example, therefore, the gain is 2, which means that if you applied +2 volts to the input of fig. 1, you would obtain –4 volts at the output of the op-amp. Similarly, applying –3 volts to the input will provide +6 volts at the output. The only limitation in output voltage (+ or –) depends on the value of the power supply. You cannot get more than you put in. Also note that the input impedance for this circuit is equal to the value of Rin, or 5K. The output drive capability, frequency response, and DC drift of the op-amp will depend on the particular device used. So much for the inverting circuit.

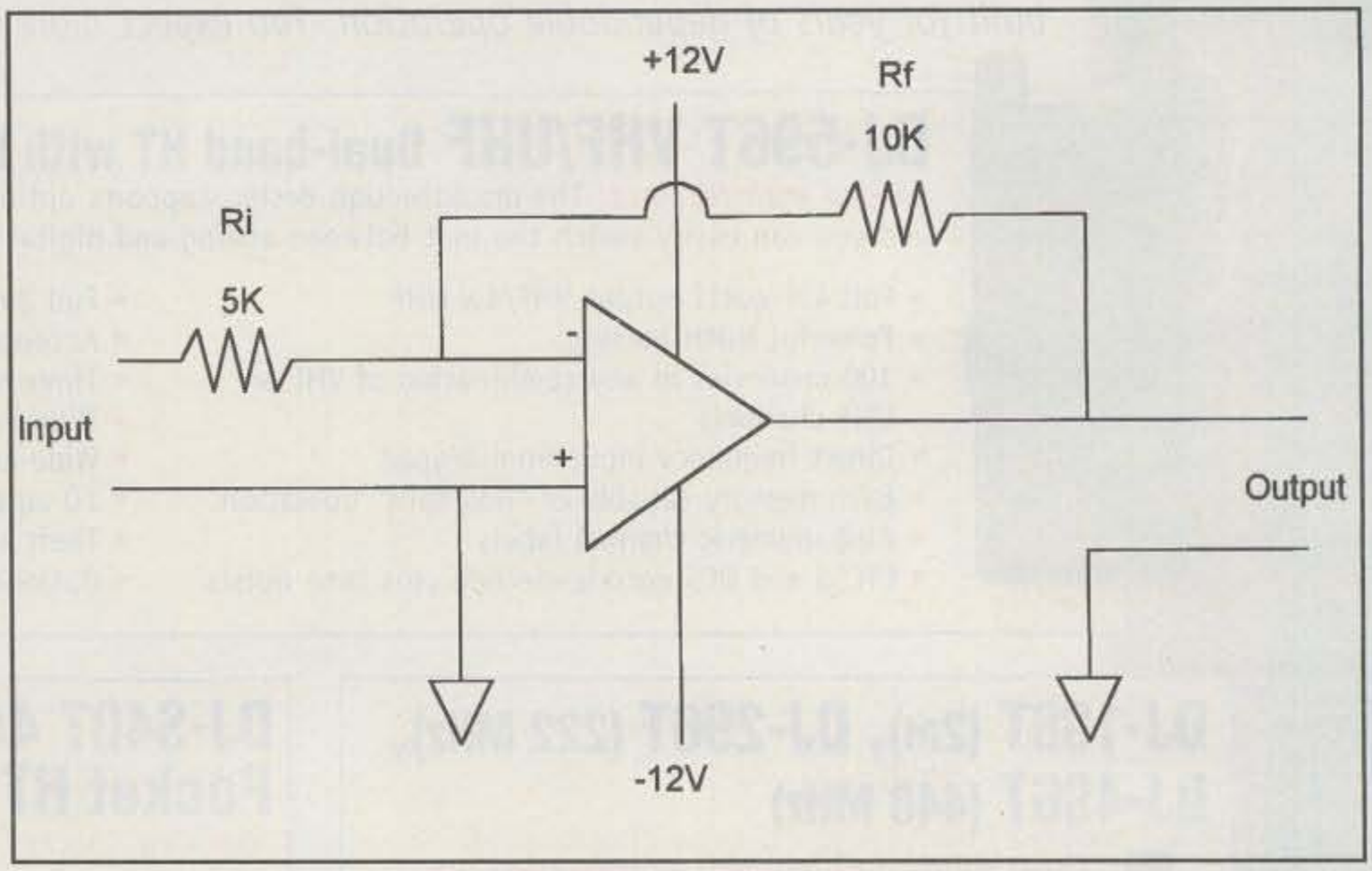

Fig. 1– Basic inverting op-amp circuit.

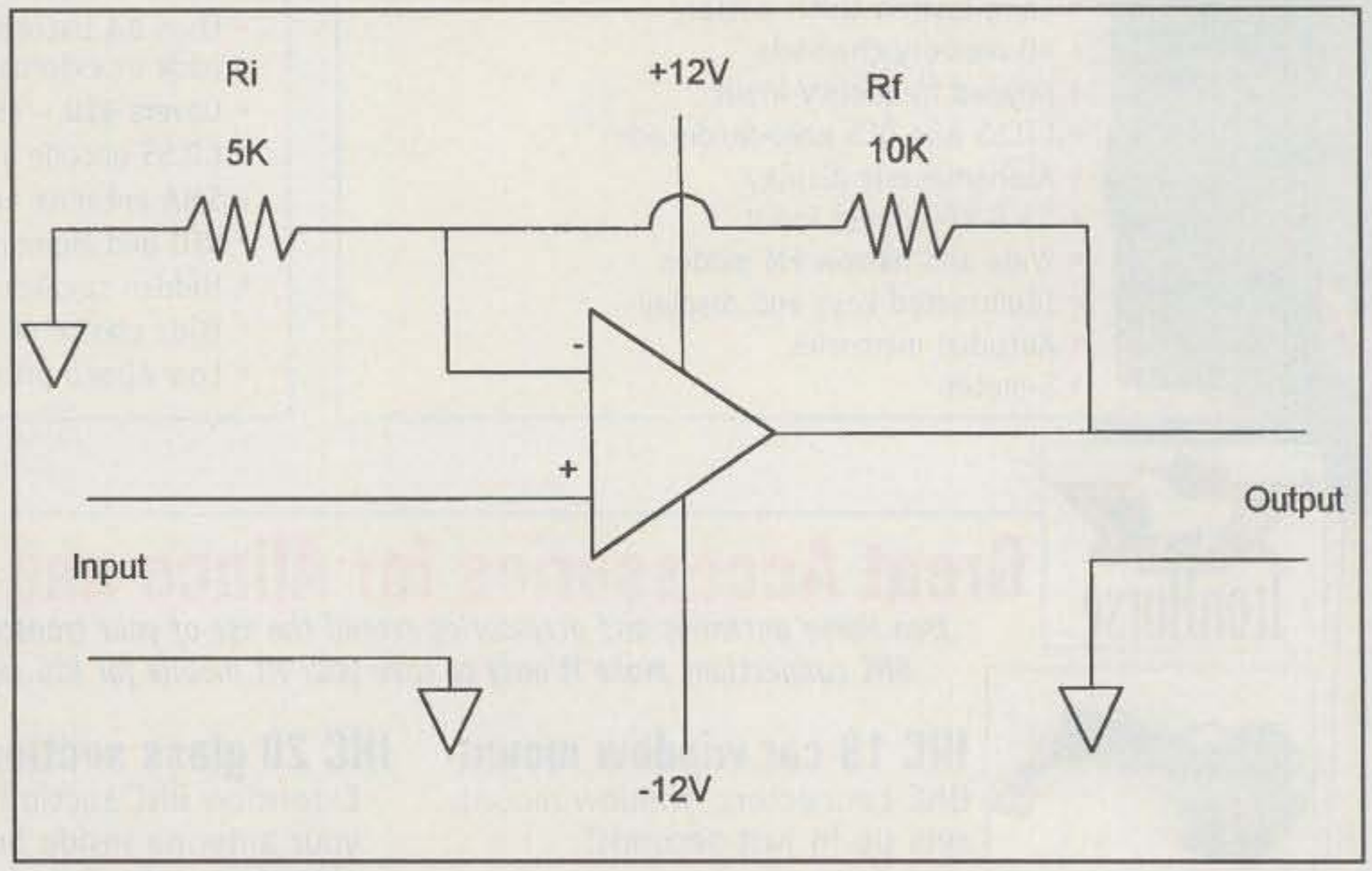

Fig. 2– Basic non-inverting op-amp circuit.

Fig. 2 is the classic non-inverting op-amp circuit configuration. In this case the formula changes to Eout = Ein (1 + Rf/Ri). This means that if you apply +2 volts to the input, the output will be 2(1 + 2), or +6 volts. The input impedance of this circuit is very high and is determined by the amplifier used. In many cases, a physical resistor is connected between the positive input and ground to achieve some desired value (which is very close to the value of the resistor). Keep in mind that for small gain values the "1+" added to the ratio of feedback and input resistor will be a significant factor. For large gain the "1+" is usually insignificant. In the case of a gain of 100, for example, the 1+ will only result in an "error" of 1% from the Rf/Ri ratio, while for a gain of 10 the 1+ will result in a 10% variation from the actual ratio.

Fig. 3 is the classic op-amp follower-circuit configuration. In this circuit the formula becomes Eout = Ein. This means that if you apply +2 volts to the input, the output will also be +2 volts. The input impedance of this circuit, like

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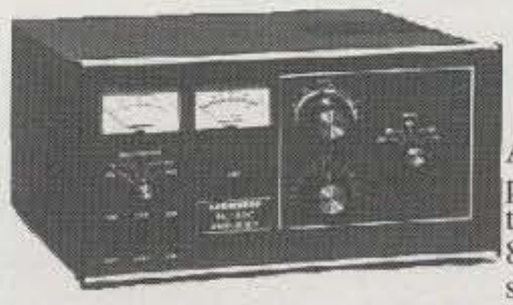

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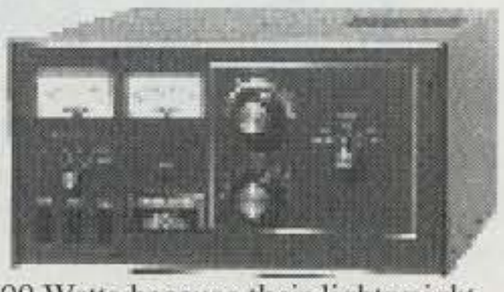

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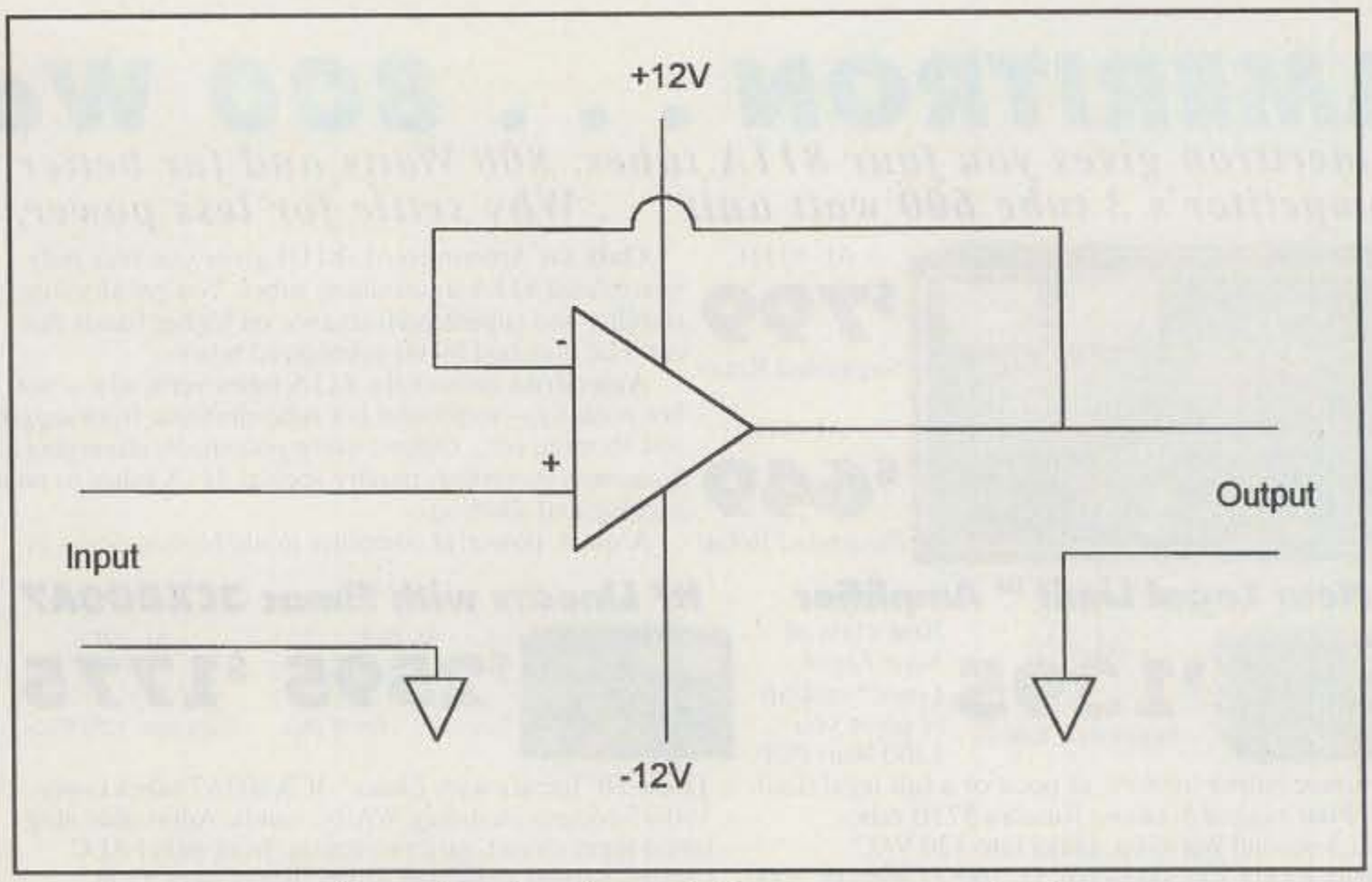

Fig. 3– Basic voltage-follower op-amp circuit.

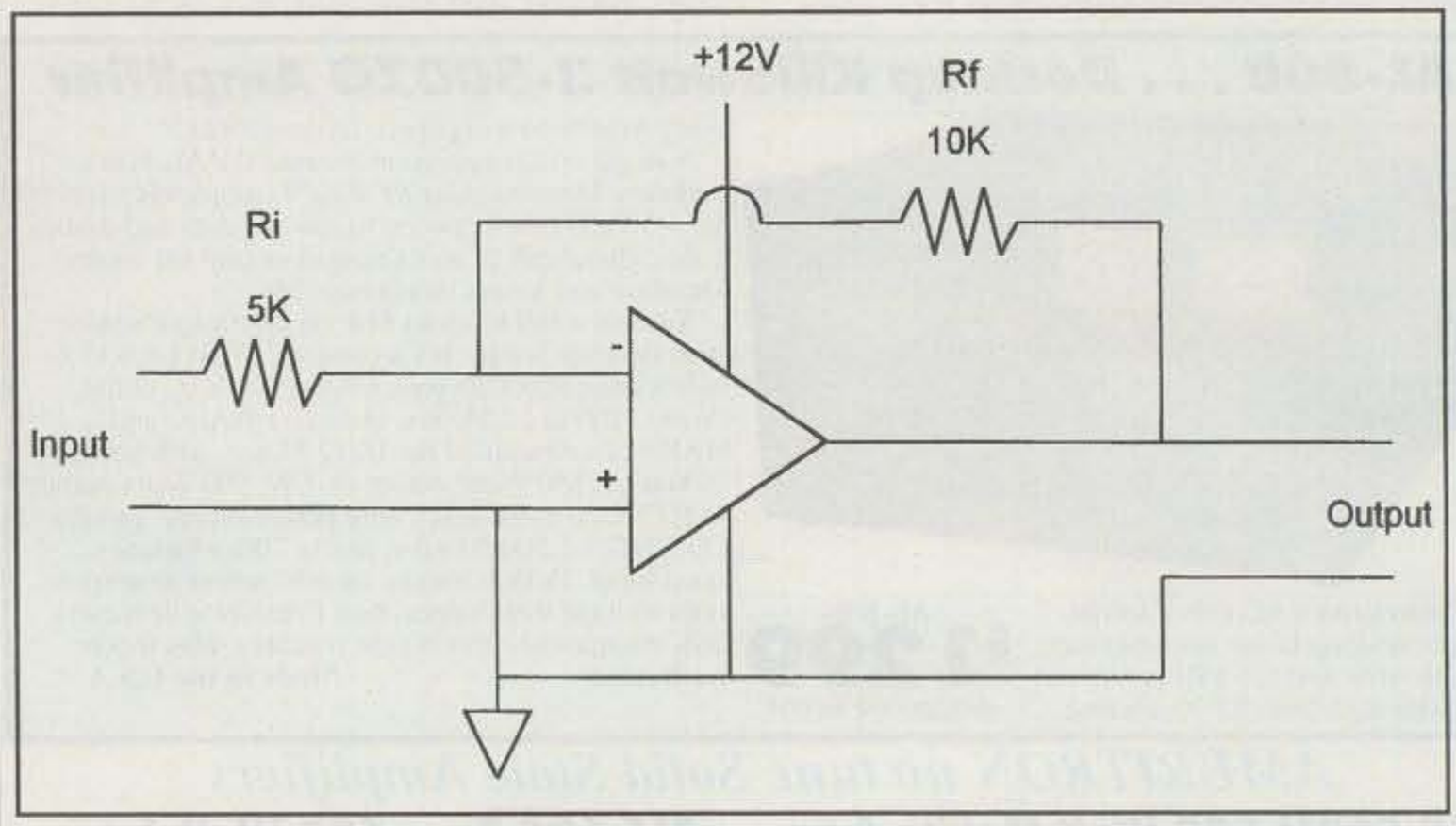

Fig. 4– Single-supply inverting op-amp circuit.

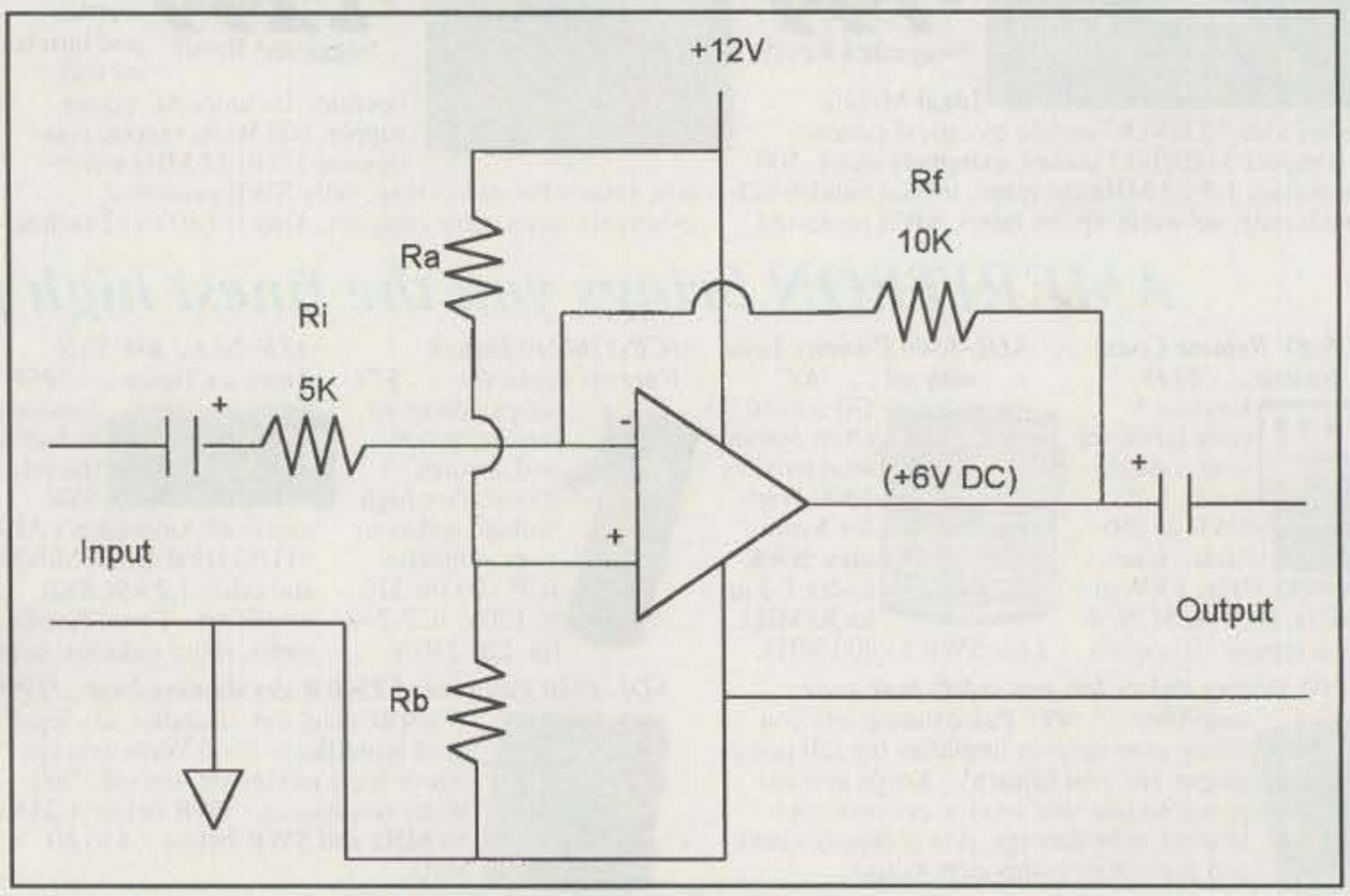

Fig. 5– AC-coupled, single-supply inverting op-amp circuit.

the non-inverting configuration, is also very high and is determined by the amplifier used. Such a circuit is usually used to convert a high-impedance input to a low-impedance output.

The frequency response of figs. 1, 2, and 3, as we mentioned, are primarily dependent on the op-amp used. For the common 741 variety this will only be a MHz or so. For other op-amps the frequency response can extend well into the hundreds of MHz. If you plan to use a high-frequency op-amp for low-frequency applications, you may have to add a capacitor in parallel with Rf to prevent self-oscillation. The gain of an op-amp without feedback is very high—sometimes so high that the device self-oscillates. Capacitor values used to reduce self-oscillation usually range from 1–2 pF up to 100 pF and function by reducing the bandwidth of the circuit until oscillation ceases. You will have to experiment with the exact value if you require this type of compensation, as it will change the AC characteristics of the circuit. The smaller the value, the wider the frequency response. Keep in mind that the op-amp circuits shown so far are truly DC coupled, so they will work as simple adders, subtractors, multipliers, and dividers by varying the voltages and resistances used. In fact, the original application for the op-amp was in analog computers.

Figs. 1, 2, and 3 operate from both positive and negative supplies. This is required for handling positive and negative DC output signals. If operation from a single supply is desired, the op-amp can be reconfigured as shown in figs. 4 and 5. In fig. 4 the negative power supply has been eliminated and the negative power supply input pin grounded. Any signal input to the op-amp must now be negative, since the output can only be positive. If a positive input signal were to be applied to this circuit, the output would be zero, since there is no negative power supply. Note that some op-amps cannot operate in the single-supply mode, so if you need to work from one supply, be sure to choose a device that is rated for single-supply use.

In fig. 5 the op-amp has been AC coupled and biased. Resistors Ra and Rb are chosen to obtain a DC output voltage (before the output capacitor) of about half the supply. Signals now applied to the input will be amplified (by a factor of 2) and applied to the output. Note that response to DC is lost, however. We should mention that while ±12 volt supplies are shown in our examples, op-amps are available that will

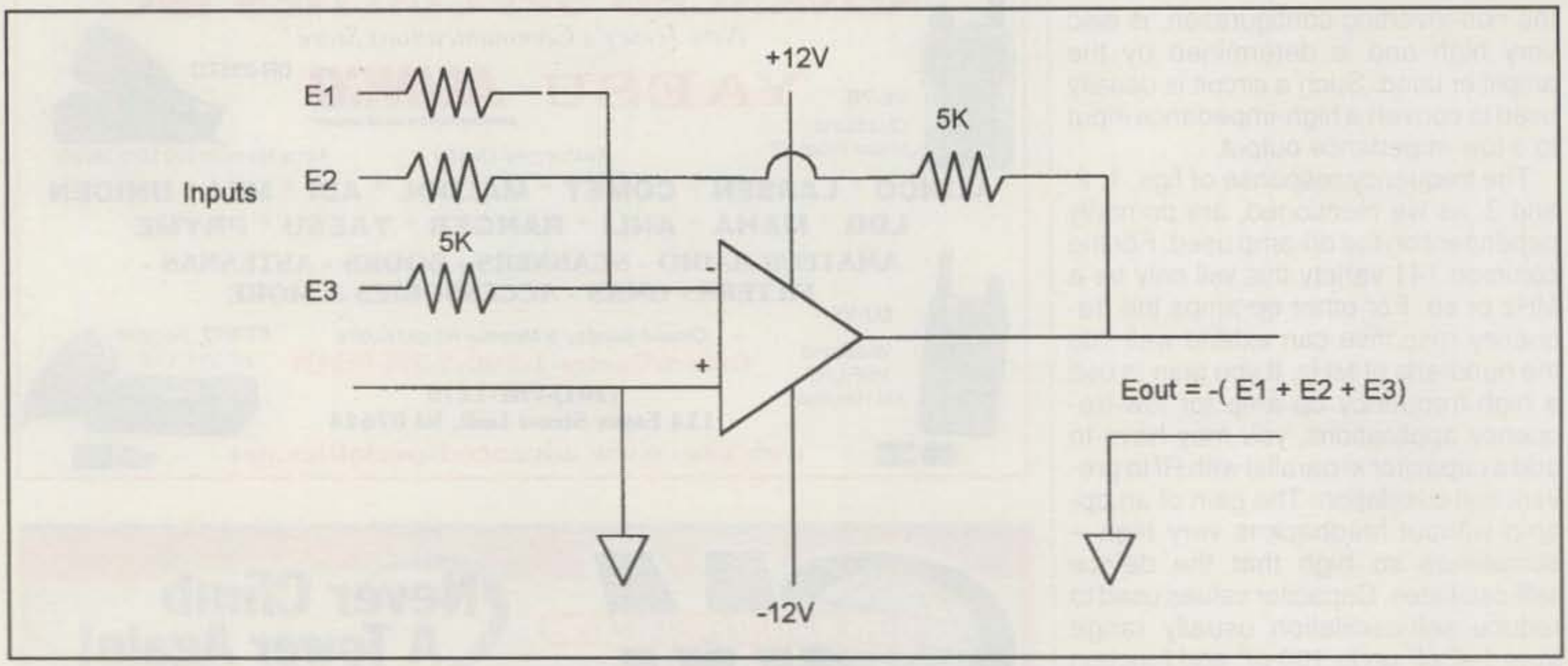

Fig. 6– Op-amp summing circuit.

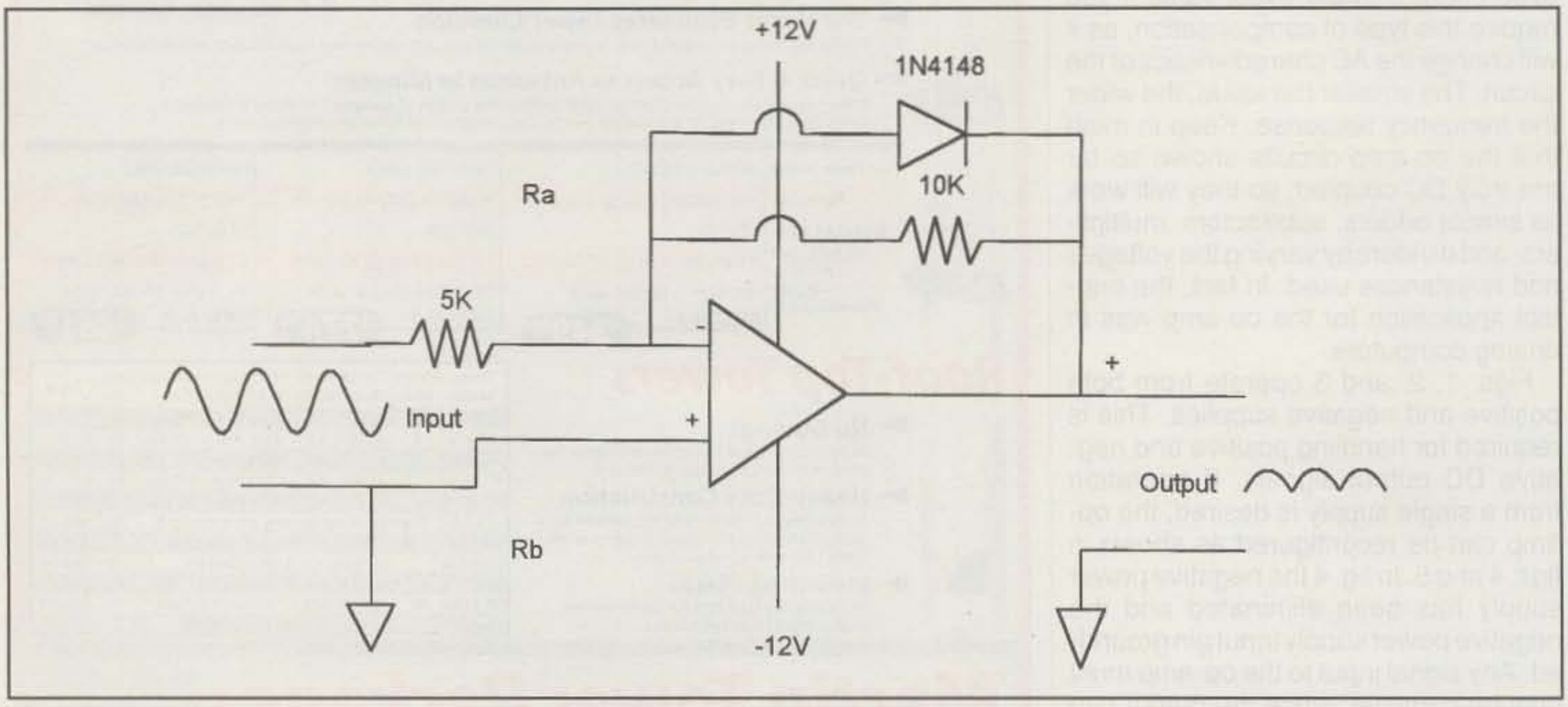

Fig. 7– Op-amp "half-wave rectifier" circuit.

operate with a wide variety of voltages from less than ±5 volts to well in excess of ±24 volts.

With these basics in mind we now will look at some of the various configurations that are possible with op-amps. Remember that all of these circuits are given simply to illustrate how versatile these devices are. For practical circuits you will have to experiment, but that is what this column is really about anyway, isn't it?

Fig. 6 is basically the same as fig. 1 but shows how the op-amp was (and still is) used as an arithmetic voltage summer. By using various input voltages and a digital voltmeter connected to the output, you can produce a simple analog computer. Use a precision pot for Rf and you can even make an analog multiplier or divider. Note that this circuit may be used to add and subtract AC voltages as well.

Fig. 7 shows a half-wave rectifier, or so-called "ideal diode" op-amp configuration. In this circuit negative voltages are "shorted out" by the diode, and only positive signals are allowed to pass. Since the op-amp will adjust its gain to compensate for the diode's 0.7 volt drop, the output will be a "perfectly" rectified signal. In the AC-coupled mode such a circuit probably would make a good AM detector. Reversing the diode will result in negative-output half-cycles.

Fig. 8 is a current-to-voltage converter. Any current applied to the input will produce a voltage output that is a function of the feedback resistor. Such a circuit usually is used to convert the output of a photodiode or other current-generating device to a voltage. By the way, this circuit is the basis of many fiber-optic receivers.

Fig. 9 is an op-amp comparator circuit that uses the high gain of an op-amp without a feedback resistor. In this circuit the output of the op-amp will be high (at the +12 V level) as long as the input voltage is below the voltage at the arm of the 10 K pot. As soon as it rises

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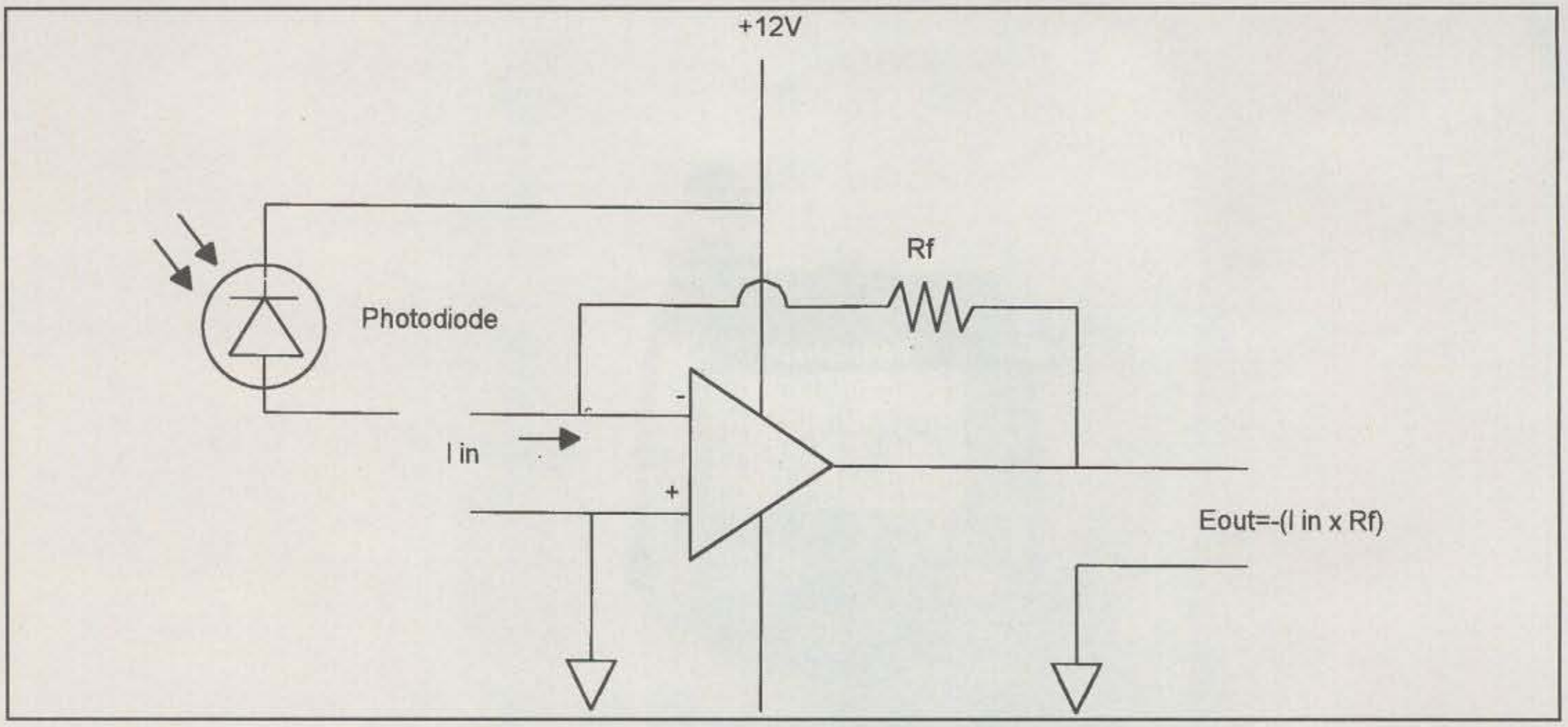

Fig. 8– Basic current-to-voltage op-amp circuit.

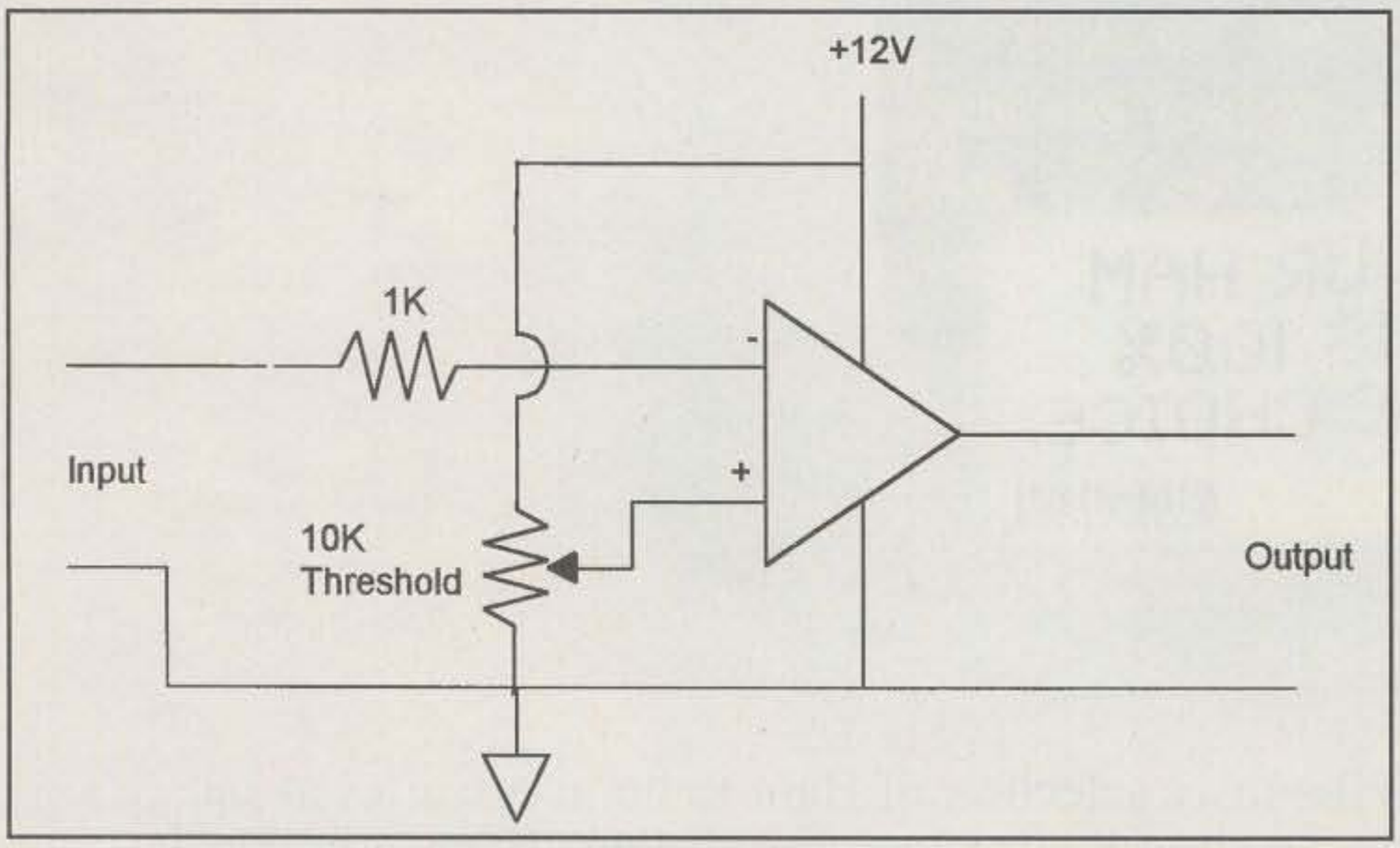

Fig. 9– Op-amp comparator circuit.

above this "threshold," the output immediately will drop low. Such a circuit is used to detect various input levels, such as the degree of charge of a battery or the loss of a critical voltage.

Finally, fig. 10 shows the pin assignments for most common operational amplifiers supplied in 8-pin DIP housings. Note that pins 1, 5, and 8 usually are reserved for trimming or other types of compensation, depending on the op-amp being used.

This short explanation is, as they say, "only the tip of the iceberg." If you delve further, you will find a multitude of uses for this unique device. I hope at least some of you will use the above to spark your imagination and then share your pet circuits with us.

73, Irwin, WA2NDM

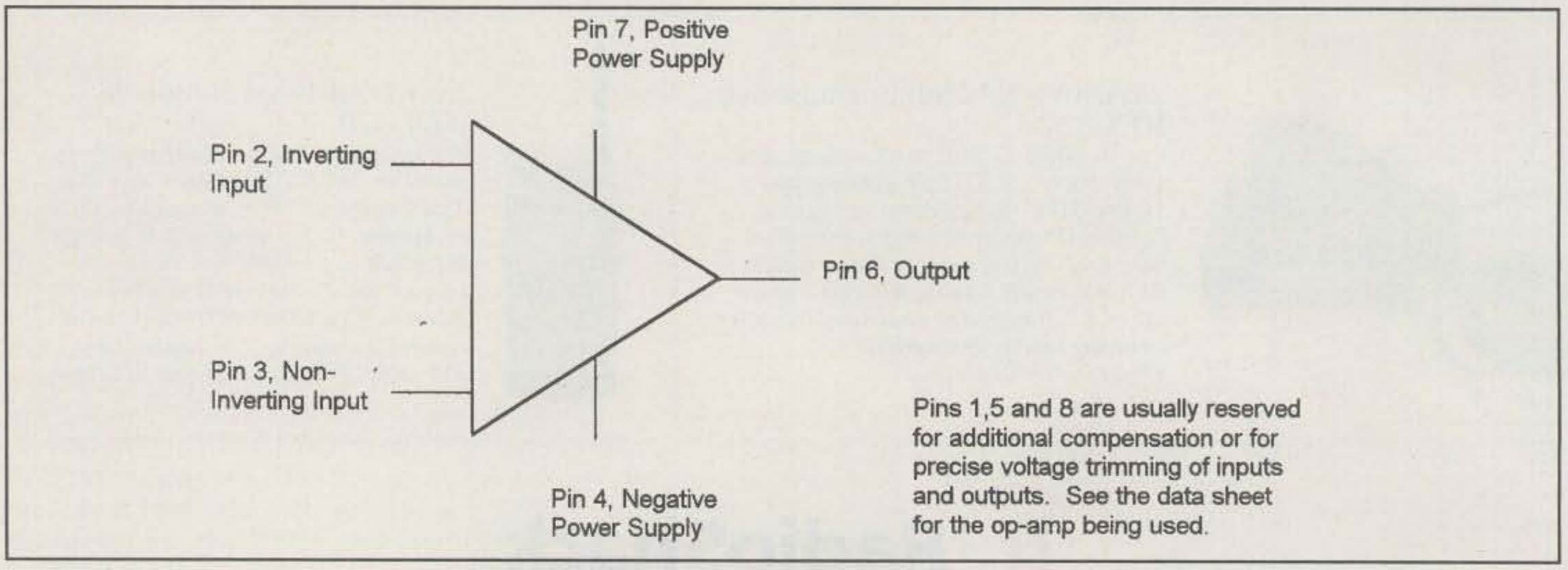

Fig. 10– Pin connections for most common 8-pin DIP op-amps.

Public Service

BY BOB JOSUWEIT, WA3PZO

Public Service and Emergency Communications

Being Ready When the Call Comes

The summer season had barely started, yet amateurs across the country were pressed into service, providing communications for fires in many states, preparations for hurricane season, and a search for a missing girl.

Initial search efforts for 14-year-old Elizabeth Smart were linked via amateur radio.

Kidnapped!

In the early morning hours of June 5, Elizabeth Smart, age 14, was kidnapped from her home in an upscale neighborhood of Salt Lake City, Utah. Within hours a large ten-day search effort began. On the second day of the search Joel Neal, KC7UBP, Salt Lake County A.R.E.S., Inc. Emergency Coordinator, was contacted by the search organizers (Abby/Jennifer Foundations) and asked to assist with communications. Neal activated the A.R.E.S. group in the early morning hours of June 7.

The initial call activated four additional operators. Cindy Neal, KC7UUW; Eugene, N7OVT, and Carol McWherter, KC7LLW; and Russ Scholz, K7MRS, began setting up at the Shriners' Hospital command post. The station included two dual-band radios and portable antennas. By the time the search began, the station was in full operation.

As word of the search spread, over 135 amateur radio operators reported in requesting assignments. In addition, over 8500 non-hams participated in the search. The hams worked over 110 hours as net control operators, at field stations, and at other assigned locations as needed.

Volunteers were sent out into the field as the hub of communications. According to Carol, KC7LLW, they set up a base station and the searchers spread out around them, coming back to report what they had found.

"This made it so one ham radio operator could work with several teams and keep everyone informed. The ham then relayed this information back to net control. We started when the searchers started, between 7:00–8:00 AM, and went until they quit, at about 8:00 PM, sometimes even longer. We covered all kinds of areas, including canyons, lakes, desert terrain, mountain peaks, and valleys along the Wasatch Front."

With such a large group of searchers many forms of communications were used. Besides ham radio, cell phones, 900 MHz trunked radios, and FRS (Family Radio Service) radios were utilized. Depending on the terrain, some systems did not have any coverage or could not reach a base station. Using the hams' communications knowledge, McWherter said they were able to use all forms of communications. The terrain also called for a change in standard operating frequencies. The A.R.E.S. volunteers were not able to use their normal 2 meter repeater, but with support of the Utah Amateur Radio Club, the Utah VHF Society, the Utah Repeater Coordinator, as well as hams and clubs in neighboring states, they were able to cover the necessary areas.

As the week wore on, it was determined that the command post had to move out of the Shriners' Hospital and into a nearby LDS (Church of Jesus Christ of Latter Day Saints) Church. This move was done seamlessly. One team moved and set up a new command post at the site, while the other team continued to function as net control. Once the LDS site was established, the Shriners' Hospital command post was closed.

After ten days of searching, Elizabeth was not found. The A.R.E.S. group logged many hours of operations, and learned about their radio equipment and how prepared they were for diverse communications tasks. McWherter said, "We were disappointed about not finding Elizabeth, but knew we had done our best." As of early July the search for Elizabeth continues.

The National Hurricane Center in Miami. (WD4JR photo)

Hurricanes: Planning, Preparing, and Responding

Each year scientists, weather forecasters, emergency management officials, and amateur radio operators make sure they are prepared for the five months known as the hurricane season. As we enter the prime weeks of hurricane season from late August through September, we stop to take a look at amateur radio operations at the National Hurricane Center.

Since 1980 amateur radio has provided a valuable service to residents and marine interests whenever a hurricane is within 300 miles of land fall in the areas of the western Atlantic, the Caribbean, and the eastern Pacific.

In 1980 Julio Ripoll, WD4JR, then an architecture student at the University of Miami, would borrow the university club station transceiver or bring his own radio from his dormitory room in a cardboard box and hand carry it a couple of blocks down US-1 to the old NHC building. He would set the equipment on one of the Hurricane Forecasters' desks and connect it to a rooftop wire antenna.

During the first year amateur radio proved to be a valuable asset, as then

c/o CQ magazine
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Julio Ripoll, WD4JR, participates in June test at W4EHW. (N4EVB photo)

NHC Director Dr. Neil Frank used amateur radio to communicate with the Brownsville Weather Center in Texas after they had lost all of their conventional communications links. NHC and Brownsville discussed the strange behavior of the eye of Hurricane Allen while it stalled just off the Texas coast for nearly two hours. W4EHW also provided very important radio relays and coordination among the American Red Cross, the British Hospital Ship *HMS Glasgow*, and the Government of St. Lucia just after the hurricane severely damaged the island and caused fatalities and injuries to its people. Since no other means of communications from St. Lucia were operating at the time, the *HMS Glasgow* sought and received permission via amateur radio to land on the island to render medical aid. Following Hurricane Allen, Dr. Frank sent a message to all amateur radio operators: "Thanks for a great job. Without your help many people in the islands would not have received our warnings."

A Complete Network

Today there is a pool of about 40 volunteers who can be called upon to staff W4EHW—the permanent amateur station at the National Hurricane Center—in three hour shifts for as long as they are needed. This past June the entire station at NHC was tested. All radio equipment, computers, and antennas were found to be in good operating order. Contacts were made from 3.5 MHz to 440 MHz using SSB, FM, CW, PSK31, and APRS. Eight operators kept the station on the air while five new operators received training on all of the equipment.

These operators, in conjunction with net control operators of the Hurricane Watch Net, collect real-time hurricane reports for the Center's Hurricane Forecasters from amateur radio operators in the affected area using voice and APRS. In addition, weather reports are collected from members of the volunteer Observer Network in the affected area via either e-mail or fax. These reports provide the forecasters with supplemental data that is not available from other sources, and it is incorporated into their forecasts.

Net Operations

The W4EHW operators receive live hurricane reports from members of the Hurricane Watch Net on 14.325 MHz. This information is placed on standard forms and posted at the Hurricane Center's main operating desk. Assistant Coordinator Julio Ripoll, WD4JR, told *CQ* that this form is posted on W4EHW's website: <www.fiu.edu/orgs/w4ehw>. He recommends using it as a check list and standard format for operators submitting reports. In addition, they also receive surface reports from the Water Way Net, various 40 and 80 meter emergency nets, and Spanish nets. They monitor APRS Automated Weather Stations, Local VHF and UHF frequencies, an internet on-line form, e-mail, and even fax.

The on-line Observer Network for non-amateurs has about 200 volunteers. Ripoll says they also receive reports using NOAA's Citizen's Weather Observer Program website and stations from the CARMEN Project. The Caribbean Amateur Radio Meteorological Emergency Network is a group of amateur radio operators in different countries who have been provided with weather equipment. Each station is required to have 20 meter SSB capability in addition to suitable standby power.

W4EHW members have been working with NOAA (National Oceanic and Atmospheric Administration, parent agency of the National Hurricane Center and the National Weather Service) on the idea of making the reporting stations automatic using APRS. The weather data from several locations on and around a larger island would be sent on 2 meter VHF to a collection point, and then when a storm is imminent, the data would be "gatewayed" onto HF for transmission to NHC in Miami.

Ripoll says W4EHW collected over 300 surface reports last year and operated 31 shifts for more than 93 hours of on-the-air time. Surface reports are visual and instrument observations that are submitted in real time as events happen. These reports are a very important tool in forecasting,

John McHugh, KU4GY, checks all the lightning arrestors and connectors while Nick Pikarsky, N4EVB, makes antenna adjustments. (WD4JR photos)

as they reflect what is actually happening at ground level during a hurricane. This helps hurricane forecasters by verifying the intensity of the hurricane at ground level, wind-field areas, location and movement of the eye, storm surge, flooding, and accuracy of warning areas and types. All of this volunteer time doesn't include the time off the air used for coordination, equipment maintenance, and other W4EHW projects.

Lock Down

The state-of-the-art National Hurricane Center building was completed in 1995 and is built of 10 inch thick, steel-reinforced concrete exterior walls with two tornado-proof rooms made of 20 inch thick, steel-reinforced concrete walls. A full uninterruptible power supply (UPS) system is backed up by three 100 KW generators which can power NHC for up to three weeks after a direct hit. W4EHW is equipped with state-of-the-art equipment on HF, VHF, and UHF, running up to 500 watts, eight antennas, two computers, APRS, and the internet.

WD4JR prepares his home for Hurricane Irene before leaving for NHC. (WD4JR photo)

Unfortunately, some hurricanes aim right for Miami, and when that happens, it forces the National Hurricane Center to go into a "Lock Down" mode. Ripoll says a Lock Down is usually declared by the NHC director after review of pending severe weather conditions, rate of increase in wind speed, and other factors that make driving to and from NHC hazardous. The Lock Down is usually declared when tropical storm conditions are pending and there have been several hours of forewarning. The steel hurricane shutters usually are up the day before any tropical storm conditions start. All operators make sure their families are safe and their homes are prepared for the hurricane before they report for duty.

August marked the tenth anniversary of Hurricane Andrew, the most expensive storm ever to hit the United States. During that storm more than 2 million people were evacuated, hundreds of thousands of homes were damaged or destroyed, and families were in shelters for months *(and the old NHC, which the new building replaced, was heavily damaged—ed.)*. It was also a storm that caused a Lock Down. Others came close. During Hurricane Floyd, Ripoll said, "We were just hours from Lock Down and then the storm made its famous turn to the north, just before affecting south Florida. Floyd was a Cat 4 and coming right at us. We were on pins and needles waiting for the slow-moving front to push Floyd away from us. Too bad for the folks in the Bahamas. They got clobbered bad."

Jerry Jarrell, a past director of the National Hurricane Center, has said: "Despite satellites, hurricane-hunter aircraft, and radar, there are large areas where surface weather reports are not available. Often amateur radio is the only link to remote storm locations."

Michelle

Hurricanes don't always pay attention to the calendar, and last year was no exception. Hurricane Michelle tracked through the Caribbean Sea and Atlantic "out of season" in early November, dropping torrential rains in Nicaragua and Honduras and causing flooding and mud slides as it moved very slowly into the Caribbean. It eventually became a powerful category 4 hurricane with winds of 135 MPH. For three days in early November W4EHW collected and distributed valuable information.

As Michelle started to track northward toward Cuba and began to intensify, W4EHW activated early Saturday morning and started coordination with the Hurricane Watch Net on 20 meters and the Cuban Emergency Net on 40 meters for what was to be a very long weekend.

In anticipation of possible interruptions in normal communications with Havana, NHC Director Max Mayfield asked W4EHW to establish a backup amateur radio link with Cuba in order to maintain the flow of hurricane information and warnings. Michelle was forecast to track between the densely populated

Hurricane Michelle hit Cayo Largo, Cuba with winds of 130 MPH and an 18 foot tidal surge. (CL4RP photo)

cities of Havana and Matanzas and was expected to produce major damage and communications blackouts.

One of the initial problems was the fact that the Cuban Emergency Net is located in the CW portion of the U.S. 40 meter band. Ripoll contacted the FCC and received special permission to allow W4EHW to operate on that frequency using single sideband. This was vital to W4EHW's operations, as it allowed the operators to communicate directly with Cuban hams and the Havana Civil Defense to relay the hurricane advisories and collect surface reports.

Operations in Full Gear

W4EHW set up two simultaneous and continuously manned radio stations at NHC for this operation. One was on 20 meters on the Hurricane Watch Net and the other was on 40 meters for the Cuban Emergency Net. Lionel Remigio, KC4CLD, of Miami, Florida, volunteered to man a third off-site monitoring station for 40 meters to collect information from Cuba. His very detailed reports were sent directly to W4EHW via e-mail and fax and were considered a true asset to increasing the effectiveness of the W4EHW operations.

Cuba

Alexis Digon, CL4RP, on Cayo Largo, a small island off the southern coast of Cuba, was the first to report landfall of the eye of Hurricane Michelle with winds of 210 KMH (130 MPH). He had lost his antenna during the height of the hurricane winds, but was able to repair it and get on the air shortly after the strong winds subsided to report that all 142 people on the island had survived.

Reports also came in from the southern central coast of Cuba (Playa El Cajio), where the ocean had retreated from the shoreline some 300 meters (1000 feet) due to the strong northerly winds pushing the water away from the beach. Warnings were broadcast to keep curious people from venturing out to look at the dry ocean bottom, as the waters return quickly and without warning.

As Michelle moved over the mainland of central Cuba, most of the electrical power, telephones, and other communications were completely out. Ham radio was the only form of communications left open to and from Cuba and within the center part of the island nation. Some of the Cuban stations were in blackout areas and had advisories that were more than four hours old. Civil Defense in Havana had also lost its HF antenna. W4EHW on 40 meters was the only source of the current hurricane advisories.

Many people depend on the operators at W4EHW and the staff of the National Hurricane Center to provide information. Max Mayfield summed it up best: "We at NHC in Miami appreciate your participation in relaying weather surface reports from hurricane affected areas, as well as distributing the Hurricane Advisories to those with no other means of receiving these vital warnings. ... We extend our thanks to all ham radio operators."

With Thanks...

Each month we report on amateur radio operators serving in the public interest. In many cases we rely on you, our readers, to help tell the story of how your group responded to an emergency. This month we want to thank Carol McWherter, KC7LLW, and Julio Ripoll, WD4JR, for their assistance.

73, Bob, WA3PZO

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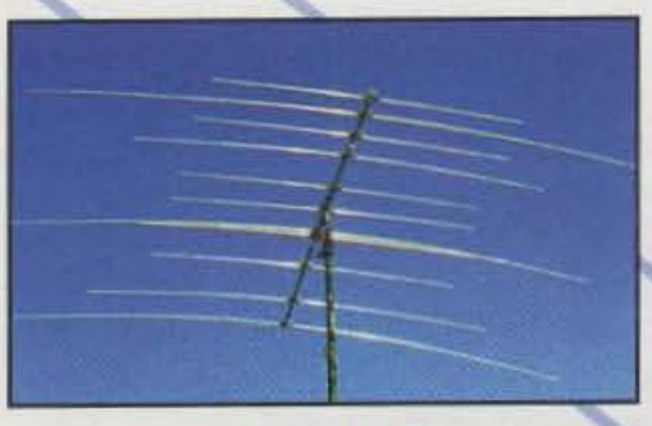

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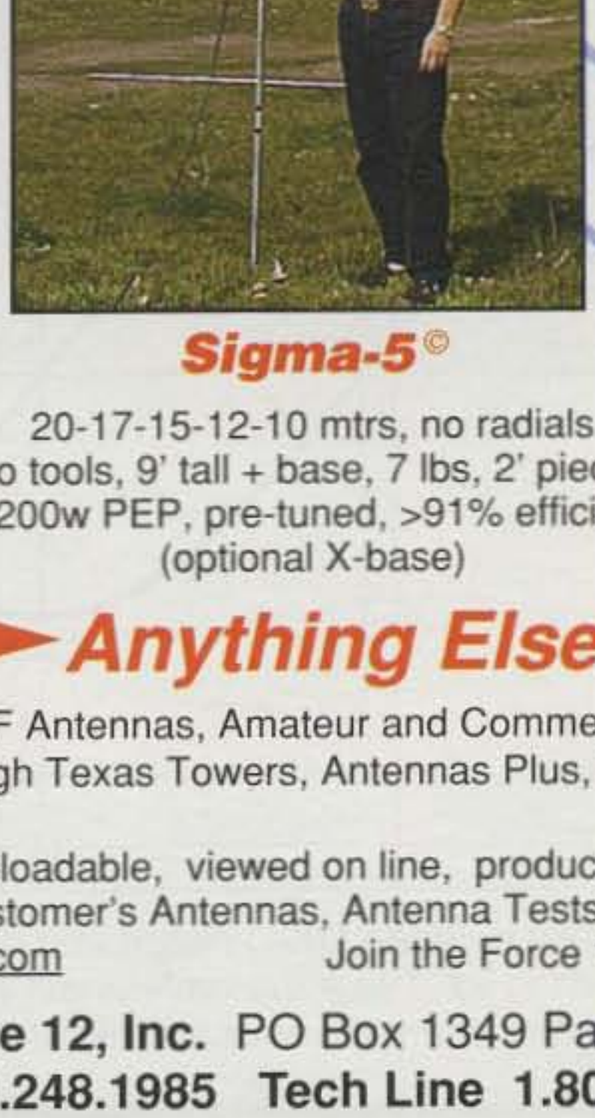

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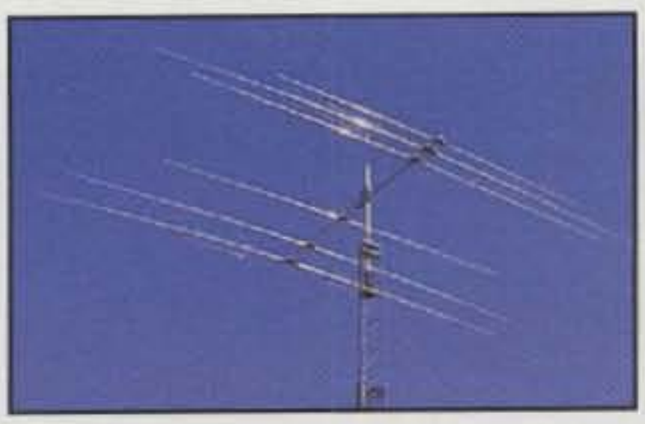

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How It Works

BY DAVE INGRAM, K4TWJ

Theory 'n Practice

Basic Antenna Theory Simplified

At the suggestion of editor Rich Moseson, July's "How It Works" and "World of Ideas" columns swapped topics, so portable antennas for emergency preparedness were featured here. Continuing along in that direction this month, we present a more detailed yet "basic facts" study of antenna theory. As you will recall, such "theory light" discussions were (and still are!) the main purpose of this column. I just include a few fun diversions along the way to keep things interesting and upbeat.

This time we will consider why and how antennas are different impedances, how a mismatch of impedance affects SWR, and the roles transmission lines and tuners play in matching impedances. I am sure you will find this information quite useful for understanding the general concepts of antennas, for interpreting details you read about various antennas in the literature, and for clarifying license-exam-related questions on antennas.

As an opening point, I wish to state I am not an authority on antennas. That is other amateurs' claim to technical fame, and I do not wish to challenge or compete in such perpetual "who knows best" arguments. I am simply interested in sharing my college-taught knowledge with newer amateurs, and I will strive to keep the discussion as simple as possible.

E, I, and Z and How They are Related

Have you ever noticed some amateurs or magazine articles referring to particular antennas as 50 ohms, 75 ohms, 300 ohms, or higher impedance and wondered how such factors are determined? Possibly you have also questioned how feedpoint impedances can vary so widely and how such variations relate to those strange-looking antenna waveforms included in license exam questions. There are really no technical secrets involved here. Some folks just look at similar facts from different angles and/or describe the same

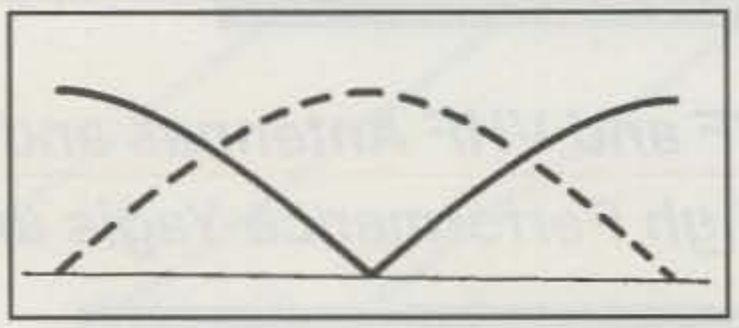

Fig. 1– Unlabeled graph of voltage and current distribution along a 1/2-wave wire or antenna as typically included in FCC license-exam questions. Without peeking at the text or fig. 3, can you spot which line represents voltage and which line represents current?

actions in different words—and those differences can make life confusing.

Consider, for example, the waveforms (sample from an FCC test question) shown in fig. 1. Are they a mushroom growing at ground level, a sunrise on a distant horizon, or a bird flying off into the sunset? Actually, they are graphs of voltage and current distribution on a wire or antenna one-half wave in length. Such waveforms initially are easier to visualize and understand if we extend them to a full wavelength, then reverse the polarity of the voltage curve so it looks more like a sine wave than a bird (fig. 2). We can then label the waveforms as voltage and current, insert some hypothetical values and lengths, and calculate associated impedance along the wire or antenna.

What is the main point here? The ratios of voltage and current along any wire or antenna are similar. The only variations are feedpoint impedance (which depends on where the transmission line is connected) and amplitude (which depends on applied power). The values of voltage and current along a wire or antenna also vary from minimum to maximum over a half-wave length, then change polarity and repeat every half wave thereafter. Let's clarify that fact by applying some random figures to our graph of voltage and current, then noting impedances.

Since waveforms repeat in levels and ratios every half wave and since many folks tend to visualize only positive polarities or alternations, let's focus on the waveforms illustrated in fig. 3. Notice current is minimum and voltage is maximum at the ends of this hypothetical half-wave radiator, while current is maximum and voltage is minimum at its middle (the usual feedpoint for a dipole). Now assume minimum current is 0.2 amp, maximum current is 2.0 amps, maximum voltage is 1000

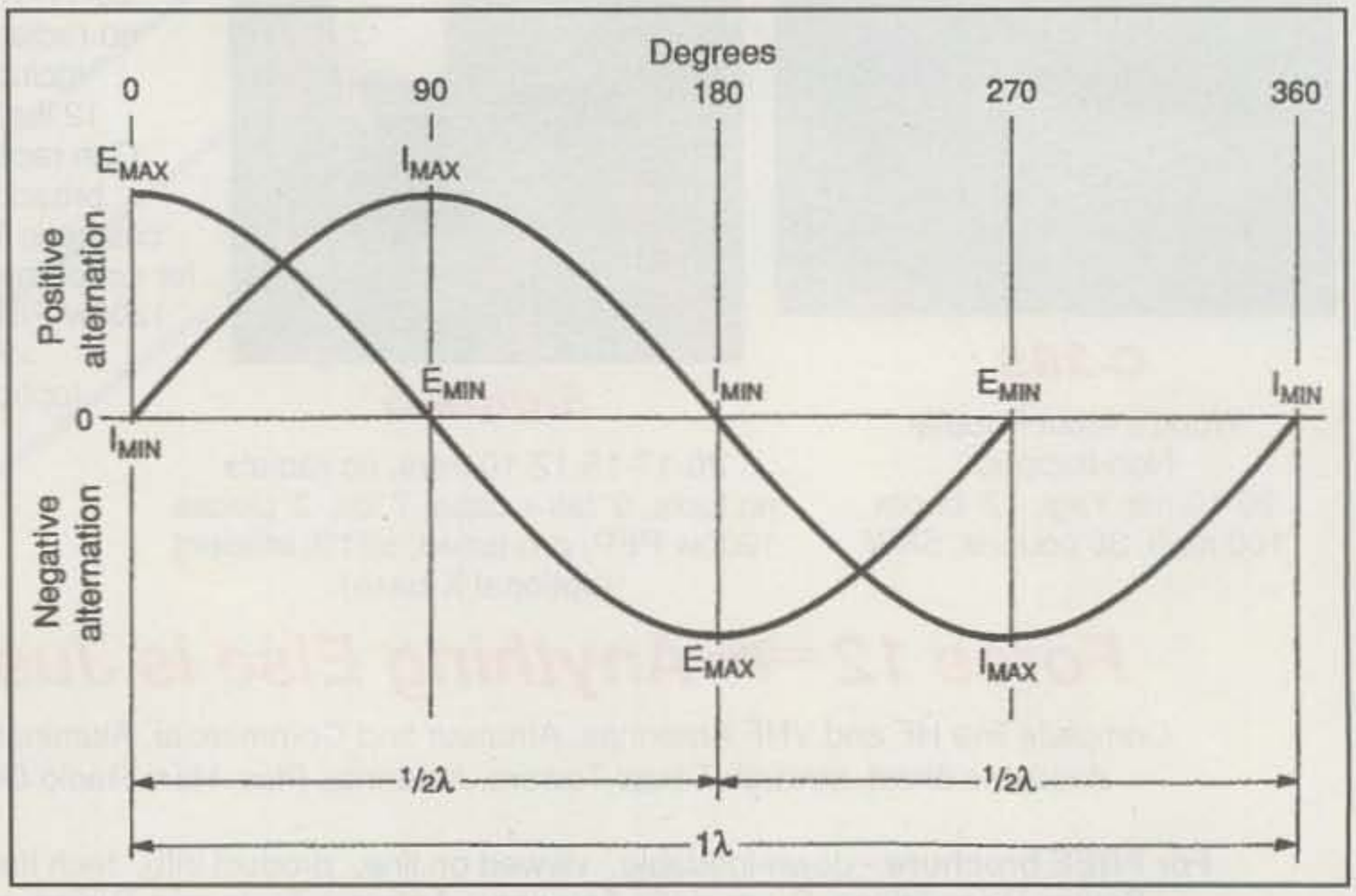

Fig. 2– Here we extended the voltage and current waveforms and wire/antenna lengths shown in fig. 1 to a full wavelength and included both positive and negative alternations of waves for easier understanding.

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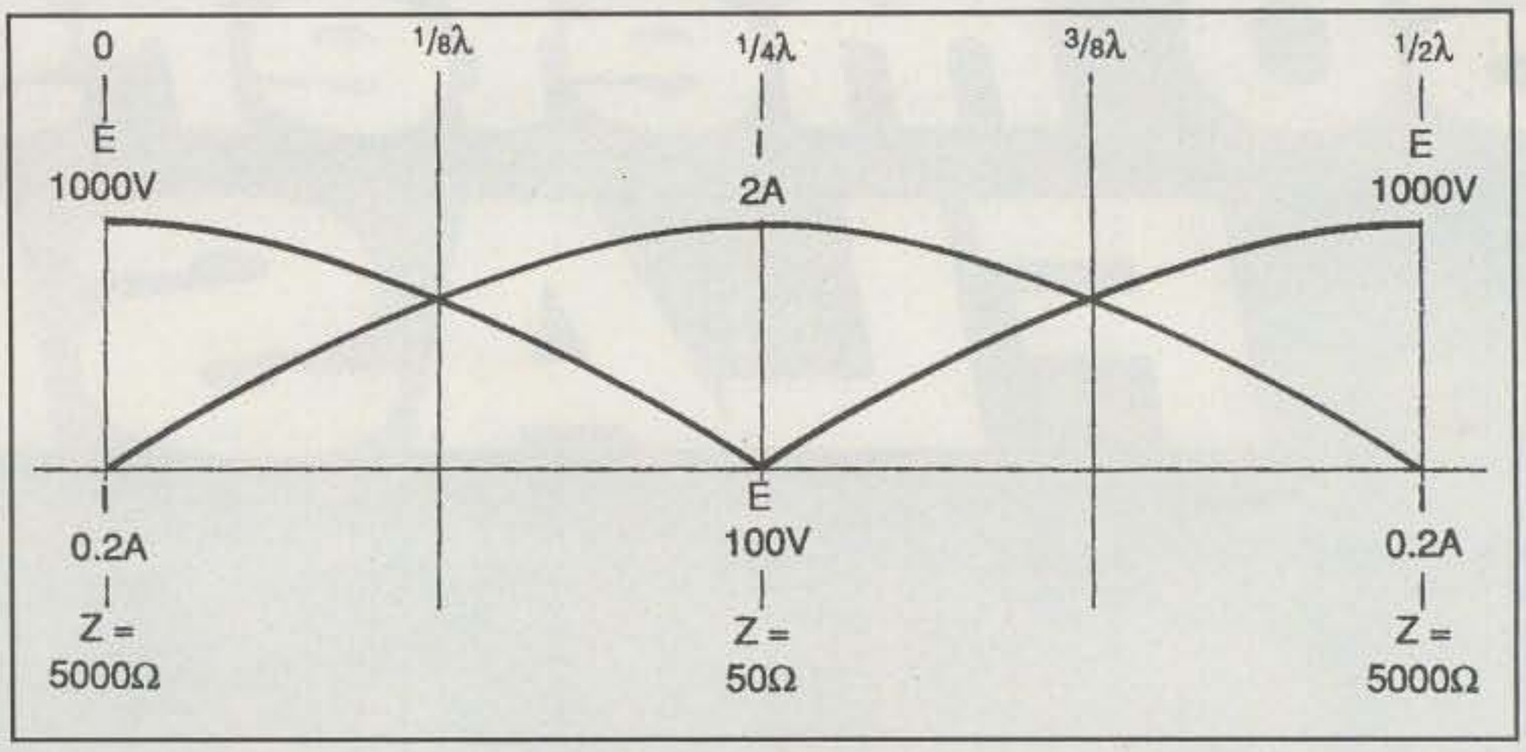

Fig. 3– A more in-depth study of voltage and current distribution along a half-wavelength wire. Hypothetical high and low values of voltage and current plus fractions of wavelength have been included for calculating impedance along the length. (Discussion in text.)

volts, and minimum voltage is 100 volts (a convenient 10:1 ratio for both voltage and current). Applying Ohm's Law (with Impedance/Z for Resistance/R), the half-wave or end-feedpoint impedance will be E/I = Z, or 1000/.2 = 5000 ohms. Again, I point out the exact values of E and I will vary according to power levels, but their impedance-determining ratios will stay the same. That is why a center-fed half-wave antenna is low impedance, an end-fed half-wave antenna is high impedance, and the impedance of a "between half-wave and full-wave" antenna is between low and high impedance.

Look again at fig. 3 and notice the vertical lines—1/8-wave, 1/4-wave, 3/8-wave, and 1/2-wave points. Now think logically. If the 1/4-wave (middle) feedpoint impedance is 50 ohms and the end, or 1/2-wave, impedance is 5000 ohms, what would you say is the impedance midway between those points (or at 3/8 wave)? If you guessed 1800 to 2400 ohms, you are right on track, and you are also starting to visualize an antenna's impedance changing according to its length and feedpoint. Good show!

Bear in mind that we have been considering pure theory, or an antenna installed over a perfectly-conductive ground and without any obstructions in its near vicinity or induction field. In reality, ground conductivity is poor and buildings, vehicles, and trees can also affect feedpoint impedance. That is why the impedance of both homebrewed and commercially made antennas varies slightly from "specs" and from one location to another.

Most amateurs are familiar with the classic 1/4-wave vertical antenna, which exhibits a good match to 50 ohm coax and requires several 1/4-wave radials for good operation. By comparison, newer-style 3/8-wave verticals such as the Hy-Gain AV640 shown in photo A have a longer element to radiate a stronger signal, and they can also use shorter radial rods to simulate ground.

How do we match its medium-high feedpoint impedance to 50 ohm coax and a 50 ohm transceiver? We could install an antenna tuner at its feedpoint (the idea works for longwires, right?), but we would need to readjust it every time we shifted frequency 50 or 100 kHz—and it would only work one band. How do multiband 3/8-wave antennas such as the Hy-Gain AV640 handle this task? Notice the black box at its feedpoint (photo B). It contains a high-power and broadband impedance-matching transformer. It converts the vertical's approximately 2000 ohm impedance to 50 ohms and covers 40 through 6 meters without adjustment. The idea sure beats running outside to reset a tuner every time you change frequencies and also changing element length when changing bands, right? Why not use an in-shack tuner? Because the impedance mismatch is outside between the antenna and feedline, not inside between the feedline and transceiver. Is the fog surrounding antennas now starting to clear?

Impedance and SWR

Effectively transferring RF energy from a transceiver to a transmission line and on to an antenna requires all three items be matched in their impedance. The impedance of modern transceivers is relatively fixed at 40 to 60 ohms. Trans-

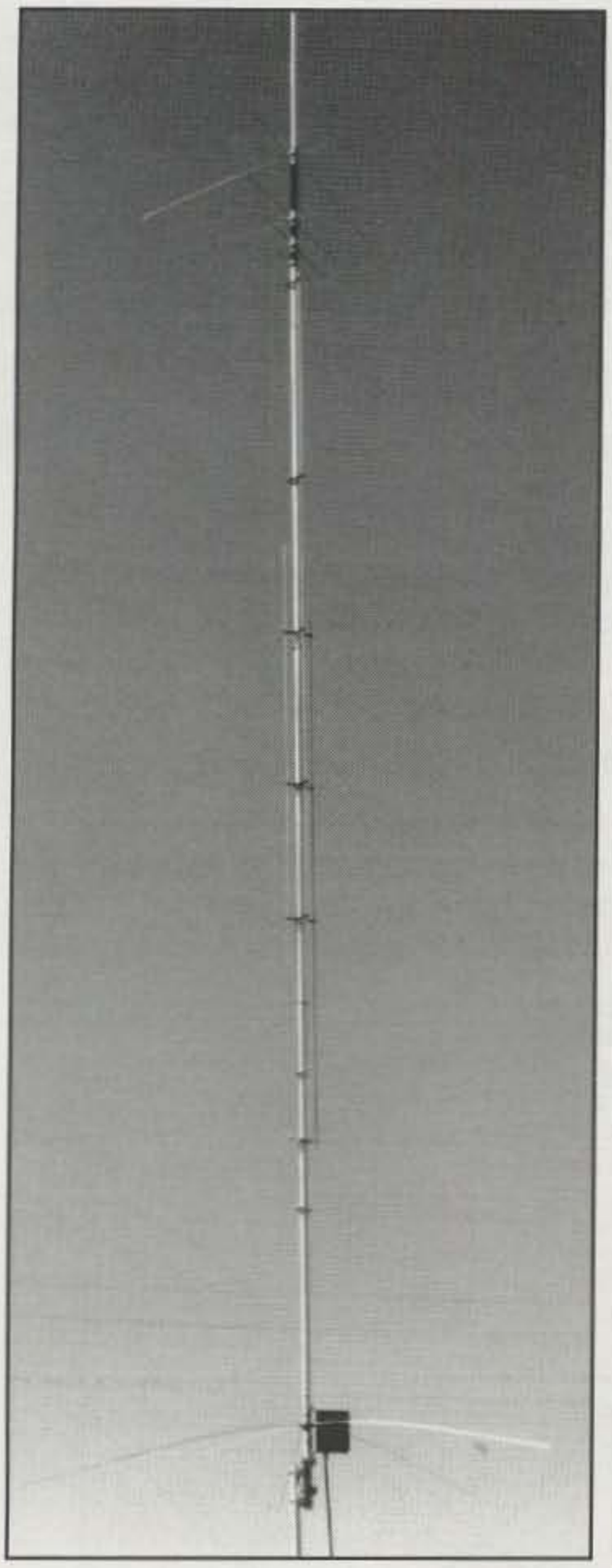

Photo A– New-style multiband 3/8-wave verticals such as this Hy-Gain AV640 reach out better than classic 1/4-wave verticals, but their feedpoint impedance is much greater than 50 ohms. A broadband RF matching unit is thus included at their base. (Photo courtesy Richard Stubbs and MFJ Enterprises)

mission lines are available in unbalanced coaxial types of 50 and 75 ohms and balanced twin wires of 300, 450, and 600 ohms. As we have learned, and depending on the feedpoint, an antenna's impedance can be any value from 50 to 5000 ohms. Now that produces some real matching challenges!

If an antenna with a feedpoint impedance of 50 ohms is connected to a 50 ohm coax cable which, in turn, connects to a 50 ohm transceiver, the SWR is 50/50, or 1.0:1—theoretically ideal. If an

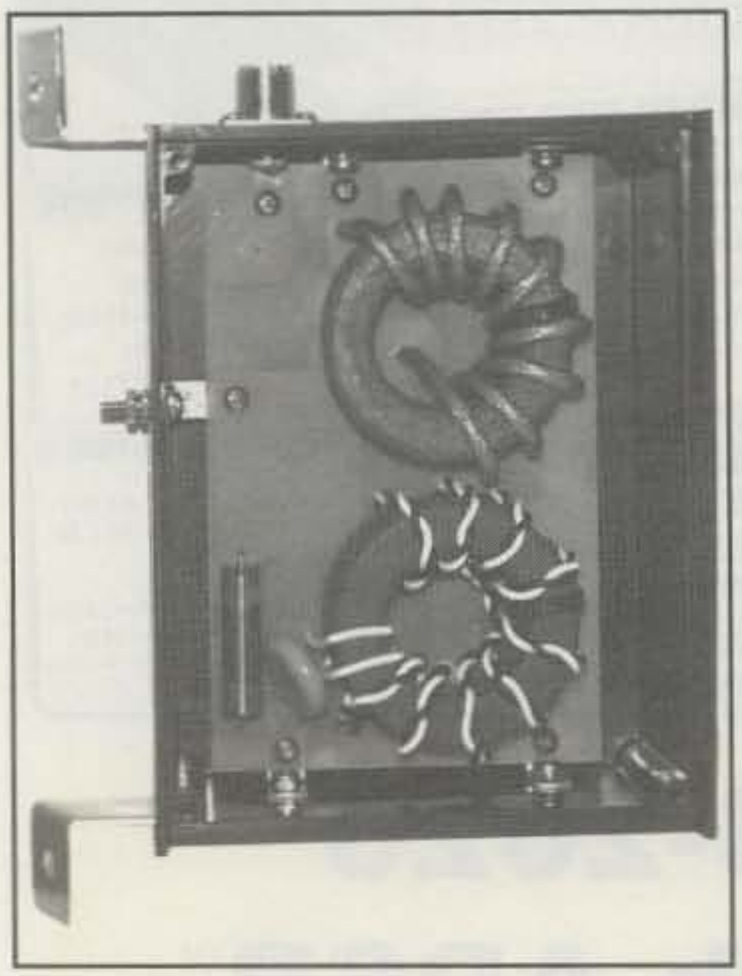

Photo B– Inside view of the AV640's RF matching unit reveals a toroidal core-based impedance-converting transformer covering 40 through 6 meters. Its purpose is matching medium impedance to 50 ohms. (Photo courtesy MFJ Enterprises)

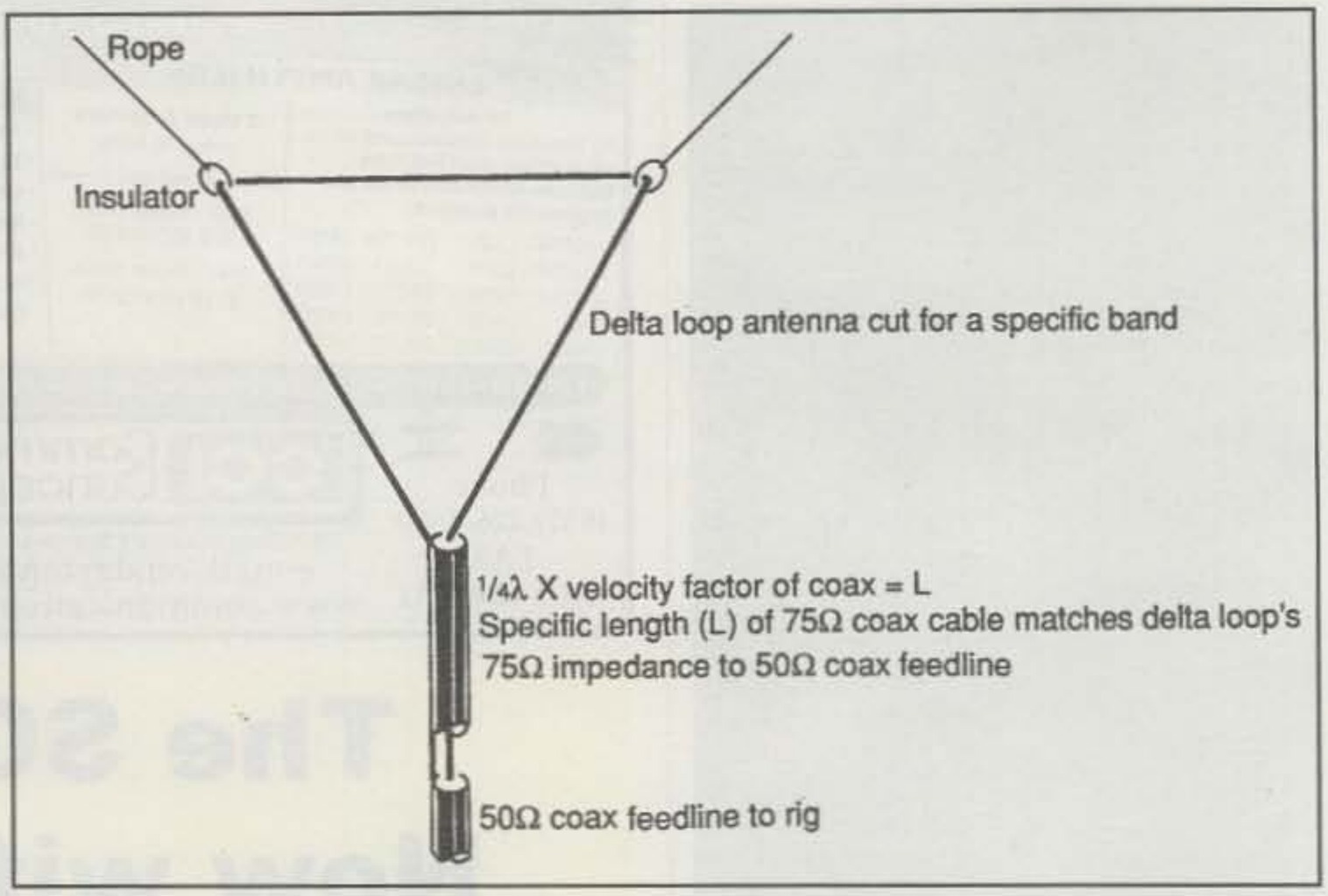

Fig. 4– A quarter wavelength of transmission line being used to transform the feedpoint impedance of a delta-loop antenna from 75 to 50 ohms for a direct match to 50 ohm coax cable.

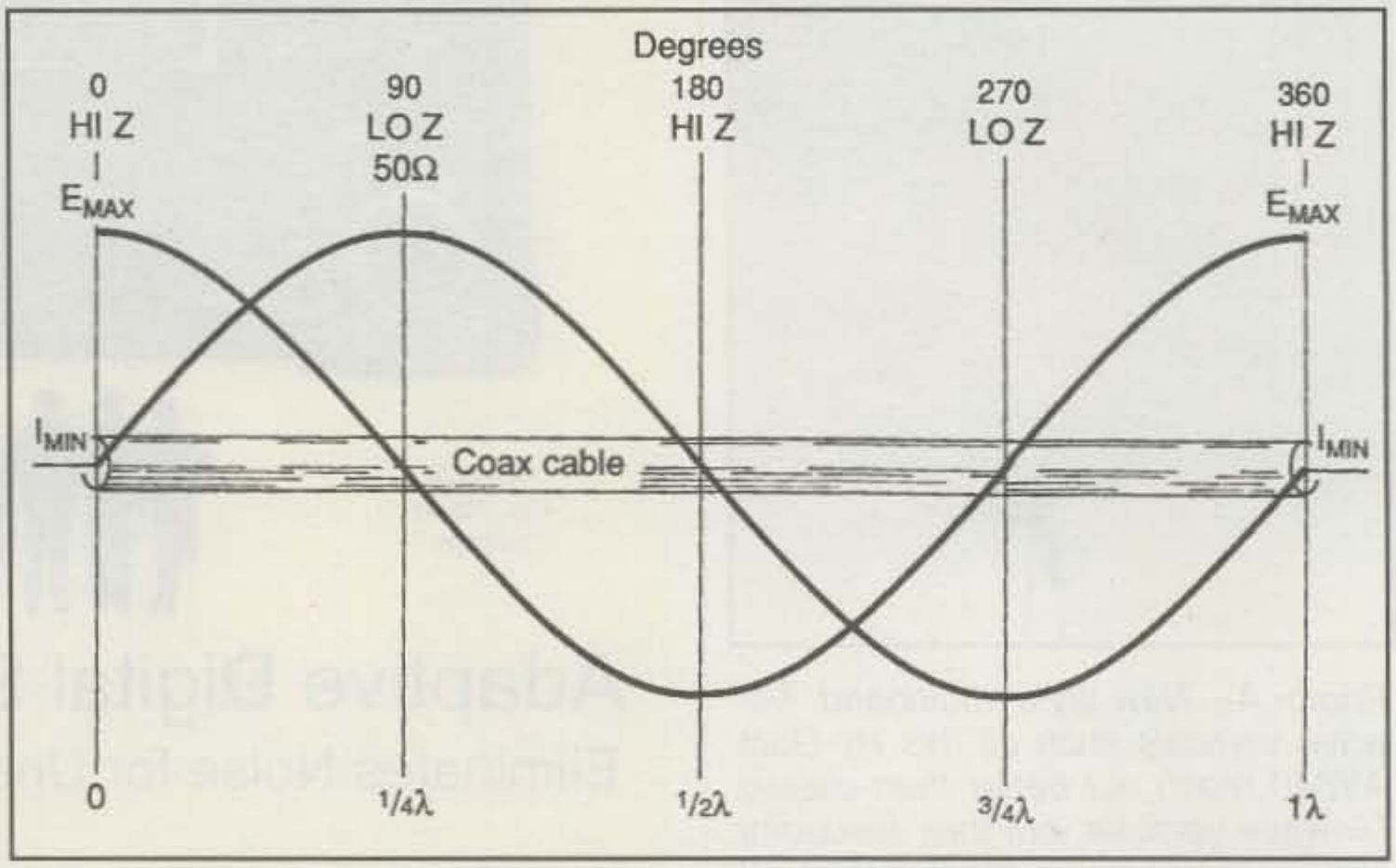

Fig. 5– Voltage, current, and approximate impedance values along a transmission line. Note impedance values repeat in multiples of 180 degrees, or twice per wavelength.

antenna's feedpoint impedance is 75 ohms and its feedline/coax cable is 50 ohms, the SWR is 75/50, or 1.5:1. If the antenna's impedance is 75 ohms, its feedline is also 75 ohms, and the transceiver's impedance is 50 ohms, the SWR is still 75/50, or 1.5:1. The mismatch is now at the rig, however, so a general-purpose or automatic antenna tuner can lower the SWR. If an antenna's impedance is 300 ohms and its feedline is 300 ohm "twin lead," the antenna-to-feedline SWR is 1:1, but the feedline-to-transceiver SWR is 6:1. Including a wide-range antenna tuner with a balanced-line output at the transceiver (and then adjusting its controls) can reduce the SWR to 1:1. Installing a 300 ohm to 50 ohm balun (or a specially configured length of coax cable acting as a balun) at the antenna and then substituting 50 ohm coax for the 300 ohm twin lead can also reduce SWR to 1:1.

With respect to limits of SWR, 2:1 is generally considered the upper limit, with 1.5:1 or lower usually preferred. Most modern transceivers include power-amplifier protection circuits that automatically reduce output power when an SWR approaches or reaches 2:1. This self-protection prevents rig overheating. I prefer tuning my antennas proper for an SWR below 1.5:1, however, as it ensures the coolest possible operation and great mental confidence of a smooth, efficient setup. If you have ever "tweaked" an antenna system to achieve 1:1 SWR, I am sure you will agree with my philosophy.

Transmission Lines

As we all know, the main purpose of transmission lines is transferring signals and RF energy between a transceiver and an antenna. In addition, transmission lines are often employed to transform impedances and/or mate balanced-feed antennas with unbalanced feedlines (a balun). A familiar example of this is illustrated in fig. 4. Here a section of 75 ohm cable (its length calculated as 1/4 wave × velocity factor of cable) transforms a delta loop's feedpoint impedance from 75 ohms to 50 ohms and thus reduces its SWR from 1.5:1 to near 1:1.

This ability of a transmission line to change impedance values at its ends is clarified in fig. 5. Notice that voltage and current distribution along a transmission line are the same as on an antenna. As a result, the impedances at the end of a half-wave line are the same, while a quarter-wave line inverts high

How Long is a Wavelength?

You say you often hear or see antennas or transmission lines referred to as a "quarter wavelength," "half wavelength," or "3/8 wavelength" and question how long that is in feet? Factually, that length depends on the frequency of an applied signal and is calculated mathematically to determine its precise length in feet. The three most common formulas used here are:

234/FQ(MHz) = 1/4 wave (in feet)
468/FQ(MHz) = 1/2 wave (in feet)
936/FQ(MHz) = a full wave (in feet)

Using 20 meters as an example, 234/14.2 = 16.4 feet, 468/14.2 = 32.9 feet, and 936/14.2 = 65.9 feet. Remember just one of these "even multiple" formulas, and calculating antenna lengths will be a cinch.

and low impedances. Sine waves are repetitive, so half-wave, full-wave, 1 1/2-wave, and 2-wave lines exhibit same-impedance ends, while quarter-wave, 3/4-wave, and 1 1/4-wave lines invert impedance.

Since transmission lines can change impedances, doesn't it also make sense that a random-length of coax feedline can alter an antenna's in-shack measured SWR? Yes, and that fact also explains why some (many?) amateurs trim their transmission line's length for lowest SWR in favored band sections. The idea works well with monoband antennas, but it can drive you chop-chop nutty striving for perfection with multiband antennas. Some amateurs say line pruning is unnecessary if an antenna and line are matched, but as I pointed out earlier, true life differs from pure theory. To prune or not to prune is your choice. I am only sharing information for your knowledge base on the subject (and again I recognize all "old pros" as ultimate authorities on antennas, so please refrain from arguing the fine points).

Photo C– Surely today's most useful accessory for evaluating antennas is an MFJ-259B Antenna Analyzer. The unit measures and displays impedance, SWR, resonant frequency, coax lengths, and much more. It also operates from batteries or a "wall wart" AC adapter and thus can be used in or out of the shack. (Photo courtesy MFJ Enterprises)

Closing Notes

Space is now tight, so let's briefly wrap up with some short notes.

If your antenna's SWR is higher than 2:1 in your favored band section, strive to retune/reset it for a lower SWR; your transceiver will run cooler and deliver more output power.

If your antenna's SWR is between 2:1 and 1.5:1, striving for perfection (1:1) is mainly a matter of personal preference. That same philosophy holds true for using a tuner rather than "tweaking" antenna-system dimensions.

If you like working with antennas but dislike associated theory, take heart and check out MFJ's popular 259B antenna analyzer (photo C). This thing really simplifies complexities in building and tuning antennas of all types—fixed and mobile. It will read out impedance, SWR, and resonant frequency right at an antenna (great for on-the-spot tuning) or in the shack, and much more.

Finally, I urge you to peak your antennas, fire up your rig, and enjoy some prime time on-the-air right now—DXing and contesting while sunspots are high and band conditions are great. These are the "good times." Enjoy them!

73, Dave, K4TWJ

Antennas

BY ARNIE CORO, CO2KK

Connecting Your Station To The World

The TVB: A Two-Sloping-Wires-at-an-Angle Homebrew Signal Booster

A single mast, two sloping wires plus two terminating resistors connected to ground, and an additional wire joining the resistors together will not take too much time to install. Once installed, you will be the proud owner of a Terminated V Beam (TVB), one of the most interesting wire antennas I have ever tested. Of course it is a directional antenna system, but it has the advantage that at least two of them can be installed from a single support structure without too much interaction between antennas pointing in opposite directions. Maximum radiation is in the direction of the center of the two sloping wires.

Wire length: 20 meters (approx. 67 feet) Wire diameter: at least No. 12 Apex angle: 30 degrees Height above ground of feedpoint: 15 meters (nearly 50 feet) Height above ground of terminating resistors : 2 meters (about 6.5 feet) Value of terminating resistors: 300 ohms (but you can use between 250 and 500 ohms) Feeder: 450 ohm open-wire line to shack, then connected to 4:1 balun to tuner

Table I– Parameters for a practical 12, 10, and 6 meter band TVB that will also work (with somewhat less efficiency) on 20 and 15.

Why Use a TVB?

Such a simple, easy-to-install antenna is a nice option for contest stations, as it can be set up using a tall tree or a single easily transportable dielectric (non-conductive) mast.

The TVB antenna can be best described by saying that it is made using two sloping wire elements of a certain length, terminated by non-inductive resistors of the same value. The two wires spread out from the dielectric support structure at a certain specific apex angle, and that's one of the important parameters of this antenna system.

The feedpoint of the TVB is located at the top of the mast, at the exact vertex of the two wire radiating elements. You can feed this antenna using a parallel balanced transmission line or a coaxial line, but in the case of coax, you must use a balun.

Some experimenters have tried using a metal tower or mast (conductive structure) as the support, and in that case results do change. There is a way of doing this which may be attractive for those who have a self-supporting tower or one with guy wires broken at appropriate length with insulators. The *apex* of the TVB simply is moved away from the supporting structure a minimum of 1 meter (3.28 feet), and then open-wire transmission line is installed horizontally until it reaches the tower, at which point you can install a balun and continue down to the shack using coaxial cable.

There are certain key TVB design parameters to consider:

1. The length of the radiating elements. (They can be up to several wavelengths long!)
2. The diameter of the radiating elements. (You can improve bandwidth by using more than one wire, or a cage configuration.)
3. The angle formed by the two wires (*apex* angle).
4. The value of the non-inductive terminating resistors.
5. The height of the feedpoint above ground.
6. The height of the terminating resistors above ground.
7. The length of the wire that connects the two terminating resistors (sometimes not used by V beam builders, but found to be very useful for improving the radiation pattern).

Now don't be afraid. I can assure you that the average ham can handle all seven of these antenna parameters to homebrew very effective TVB antennas.

Origins of the TVB

Dr. Jose A. Valladares, Ph.D., now in his late eighties, was the antenna guru who introduced me to the TVB system way back in 1961, when he installed several of them at a commercial HF receiving station. I came to learn about the TVB one day while visiting that pre-satellite-era installation. I observed the sloping wires terminated with carborundum non-inductive resistors located at about 3 meters (approximately 10 feet) above ground level, with a wire going down from those short masts to a ground rod. Another wire joined the two masts and formed a delta-loop-like structure, with the only difference being that the wire linking the two resistors was connected to their ground side, not to the sloping wires. This slanted V configuration, in which the terminating resistors are at a certain height above ground, is much more effective, something that was proven in practice.

Dr. Valladares told me that the great advantage he attributed to the V beam configuration in general and to this specific form of terminated V was its simple installation. He also stated that the flexibility provided by this antenna system was second to none, as he could install several of them using existing masts that supported other commercial receiving antennas such as the fishbone and the rhombics (the log periodic was not yet popular in the early '60s).

For amateur radio installations TVB antennas have an additional advantage in that the sloping wires respond to both the vertical and horizontally polarized waves when receiving and generate mixed polarization when transmitting.

When you design a TVB antenna properly, technically speaking it would be described by the antenna gurus as a traveling-wave antenna, so it will provide users with a rather large operating bandwidth.

The TVB antenna power gain will depend on many parameters, including the operating frequency, ground conductivity, height above ground of the apex, etc.

Try One for 6 Meters!

A typical TVB antenna for the HF bands will require a lot of real estate, as the elements may need to be up to a city block long or even more! However, with minimum sloping element lengths on the order of 20 meters (67 feet), the antenna will work from 14 MHz all the way up to 60 MHz! The effective gain will increase as the frequency goes up, making this par-

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SS-12	10	12	1⅞ x 6 x 9	3.4
SS-18	15	18	1⅞ 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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EF JOHNSON GT-ML81
EF JOHNSON GT-ML83
EF JOHNSON 9800 SERIES
GE MARC SERIES
GE MONOGRAM SERIES & MAXON SM-4000 SERIES
ICOM IC-F11020 & IC-F2020
KENWOOD TK760, 762, 840, 860, 940, 941
KENWOOD TK760H, 762H
MOTOROLA LOW POWER SM50, SM120, & GTX
MOTOROLA HIGH POWER SM50, SM120, & GTX
MOTOROLA RADIUS & GM 300
MOTOROLA RADIUS & GM 300
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SS-18EFJ
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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

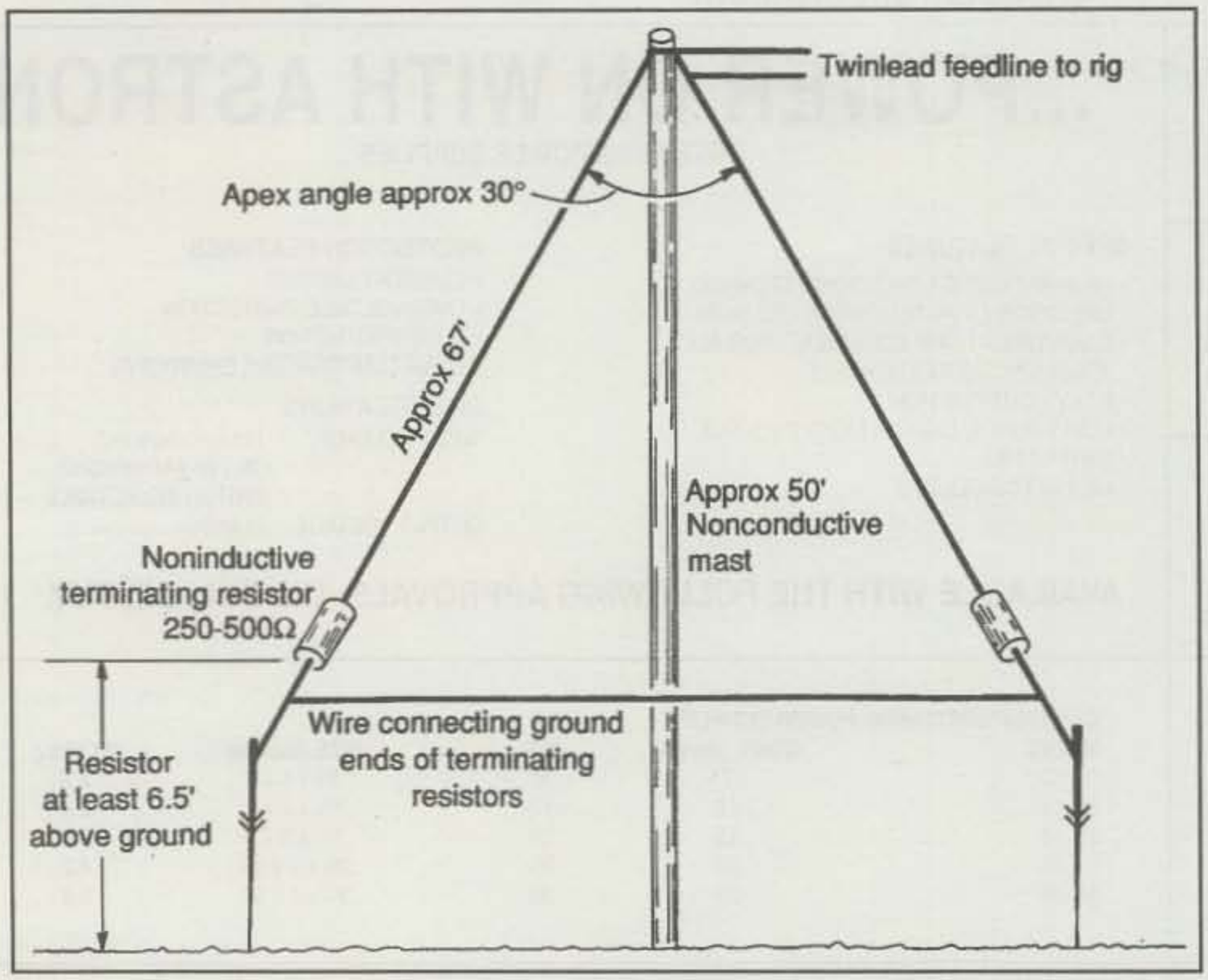

Fig. 1– The Terminated V Beam (TVB) antenna uses two sloping wires from a center feedpoint to non-inductive terminating resistors at least 6.5 feet above ground, with a third wire connecting the ground sides of the two resistors.

ticular TVB configuration especially useful for the 12, 10, and 6 meter bands (see Table I for design parameters).

You will have to choose the optimum apex angle, but in practice, angles between 60 and 30 degrees will produce useful gain and directivity. If you want to favor the higher end of the antenna's frequency range, then *reducing* the apex angle is the way to go.

The terminating resistors connected to the near-ground end of each sloping wire must be non-inductive and capable of dissipating about 30 percent of

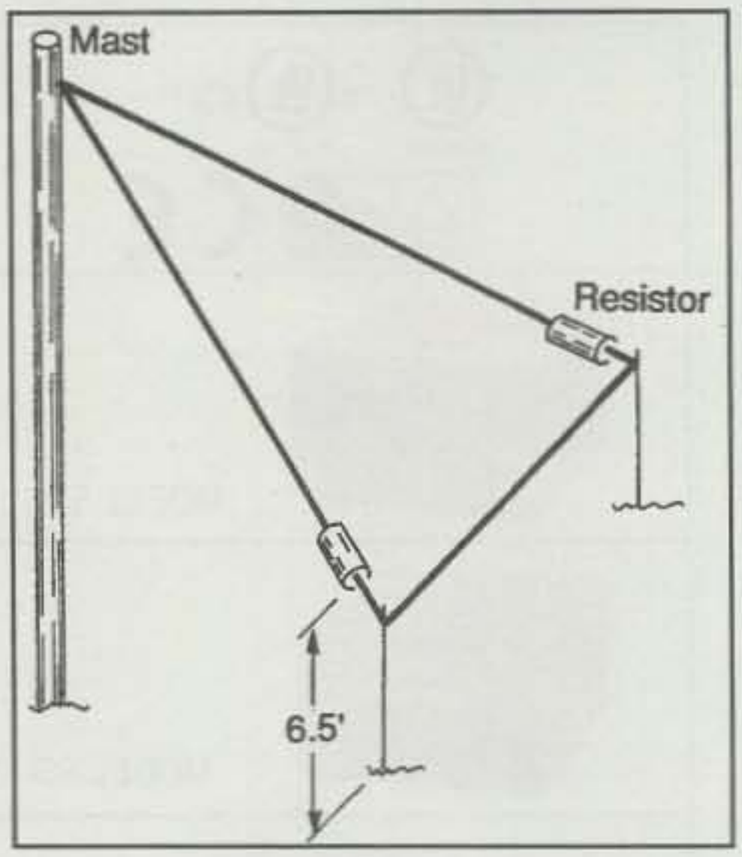

Fig. 2– Side view of the TVB antenna.

the transmitter power if full carrier modes of operation are used. For CW work, with a shorter duty cycle, the resistors may be smaller. For SSB I have used resistors rated for 20 percent of the transmitter power without any signs of overheating problems after many months of constant use.

I have made my own non-inductive resistor assemblies in the 250 to 500 ohm range by connecting series-parallel combinations of 2 watt carbon resistors. The actual value of the terminating resistors is not really important, according to my experimental work here at CO2KK, as the performance of my TVB antennas has proven to be essentially the same with terminating resistor values in that 250 to 500 and even up to 600 ohm range.

Your best option for feeding this low-cost directional antenna is to use open-wire transmission line right to the shack, where a 4:1 balun will allow you to connect it to an antenna tuner.

Start Building!

Antenna experts will provide you with nice graphics to optimize the design of Terminated V Beam antennas, and you can spend quite some time experimenting with different configurations. However, why not start to build the TVB for 12, 10, and 6 meters this weekend, and begin to enjoy operating on those bands with the antenna pointing in the most favorable direction.

My own north-oriented TVB sees a lot of action during the summer *E*-skip season, while the south-pointed TVB keeps me in touch with the many South American 6 and 10 meter operators during the twice yearly transequatorial propagation seasons.

Try the TVB antenna. It is easy to build, costs very little, and works well!

World Of Ideas

BY DAVE INGRAM, K4TWJ

A Look At The World Around Us

Crystal Showcase 2002—Part II

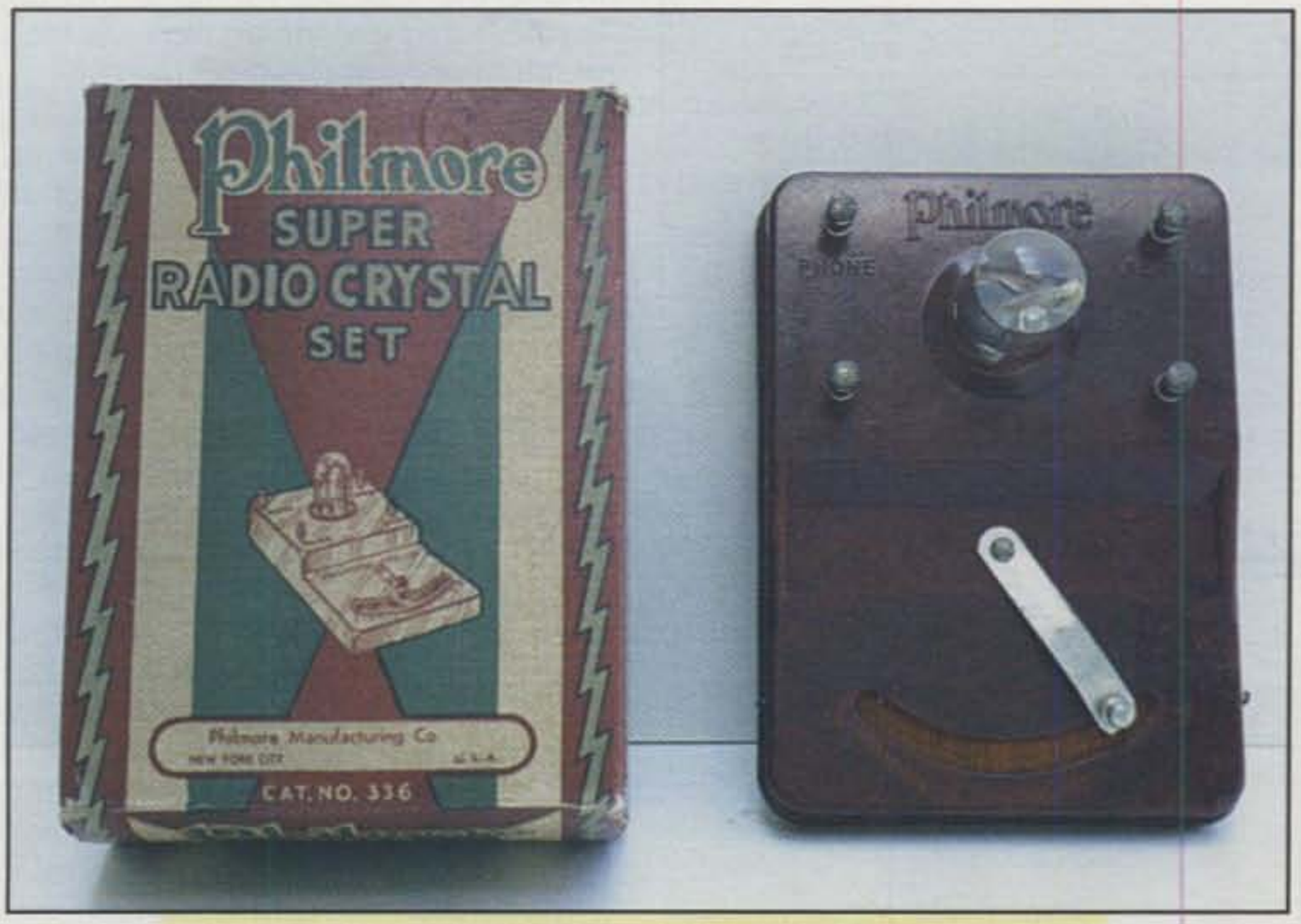

Photo A– A prized collectable of the best kind! This 1940s-style Philmore crystal set is complete with its original box, in like-new condition, and belongs to Arnold Sayre, W8WVM. Do you, too, own one or more commercially made crystal sets? They make great conversation pieces. (Photo by W8WVM)

Photo B– Trim, clean crystal set home-brewed by Leonard Gardner, W2QBC. Receiver sports a genuine National "Velvet Vernier" dial, catwhisker-and-galena detector, plus gold lettering on lacquered copper panel set in a white oak case. Nice! (Photo by W2QBC)

If you enjoyed last month's discussion of the unique Push-Pull crystal set and four-wire antenna, you will really like the gems highlighted in this month's column. In addition to several beautifully crafted crystal sets (compliments of our fine readers), we are also including "build it" details on a unique one-tube regenerative receiver with genuine basket-weave coils. Now this cool collection of classics should definitely generate some big-time home-brewing excitement!

What is the special attraction of crystal sets? Everything! They were our first generation of real radios, they are free-play and survival-ready items that work without external power, and they form the basis of the field-strength meters we use to check antenna patterns or signal levels. Furthermore, any crystal set can be modified into a field-strength meter by substituting a 100 microamp or one milliamp meter for its earphone and modifying its coil to cover a desired frequency range. Although a little-known fact, crystal sets were also the driving force behind Quaker Oats becoming America's favorite hot breakfast cereal. During the early days of AM broadcasting, everyone built crystal sets using coils wound on round Quaker Oats boxes and everyone naturally ate the oats to acquire an empty box for their coil form. The more crystal sets folks made, the more Quaker Oats gained popularity. Would Doctor Dave jest?

Regenerative receivers are also very special items in that they are simple in design, capable of both AM broadcast-band and shortwave reception, and represent the "next step up" for new home-brewers. With regard to a time line, crystal sets were used between 1900 and 1920, "regens" were popular between 1920 and 1930 or 1935, and superhets have been used since then, up until the present day.

That's enough background notes. Now let's check out this month's display of crystal sets! Read carefully, as we again packed maximum information into minimum space!

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Readers' Treats

First up is a remarkably preserved Philmore model 336 crystal set that Arnold Sayre, W8WVM, purchased new during the 1940s (photo A). The galena crystal is enclosed in a clear and magnifying dome near the top, with antenna and ground binding posts on the right and earphone binding posts on the left. A slide-bar tuner that moves across a coil is positioned in the lower area. Even the original box for this 60-year-old classic is in good shape, making it a prized collectible, and it still works well today.

Philmore was a well-known name in radio in the past. In addition to several impressive styles of crystal sets, the company also made a super-neat one-tube Novice transmitter kit, regenerative receiver kit, some nice low-cost hand keys, earphones, and even mic-

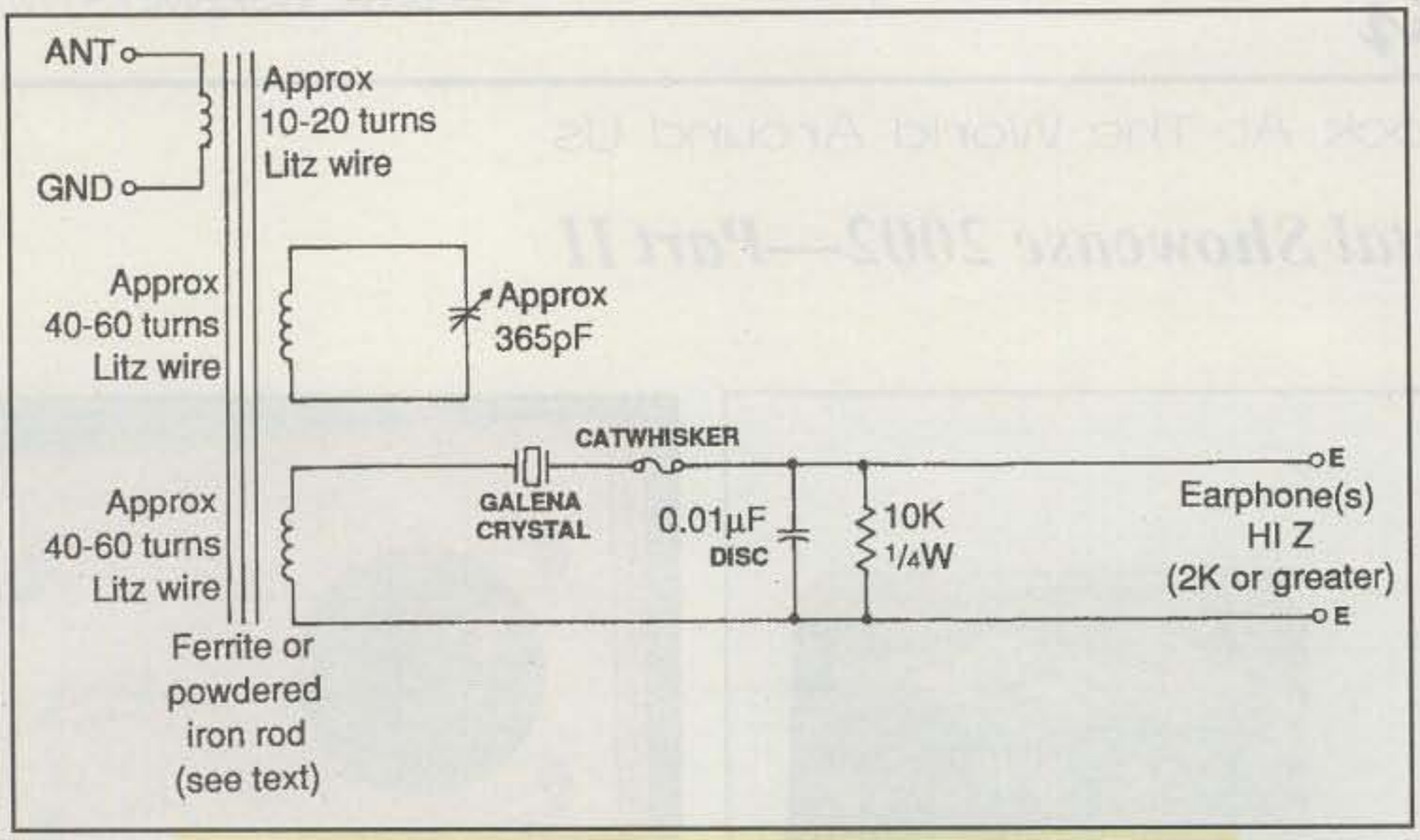


Fig. 1– Circuit diagram of the W2QBC-built crystal set. Leonard says the main factors contributing to this set's good performance are inclusion of litz wire wound on a powdered iron/ferrite rod and a phosphor bronze catwhisker. (Circuit by W2QBC)

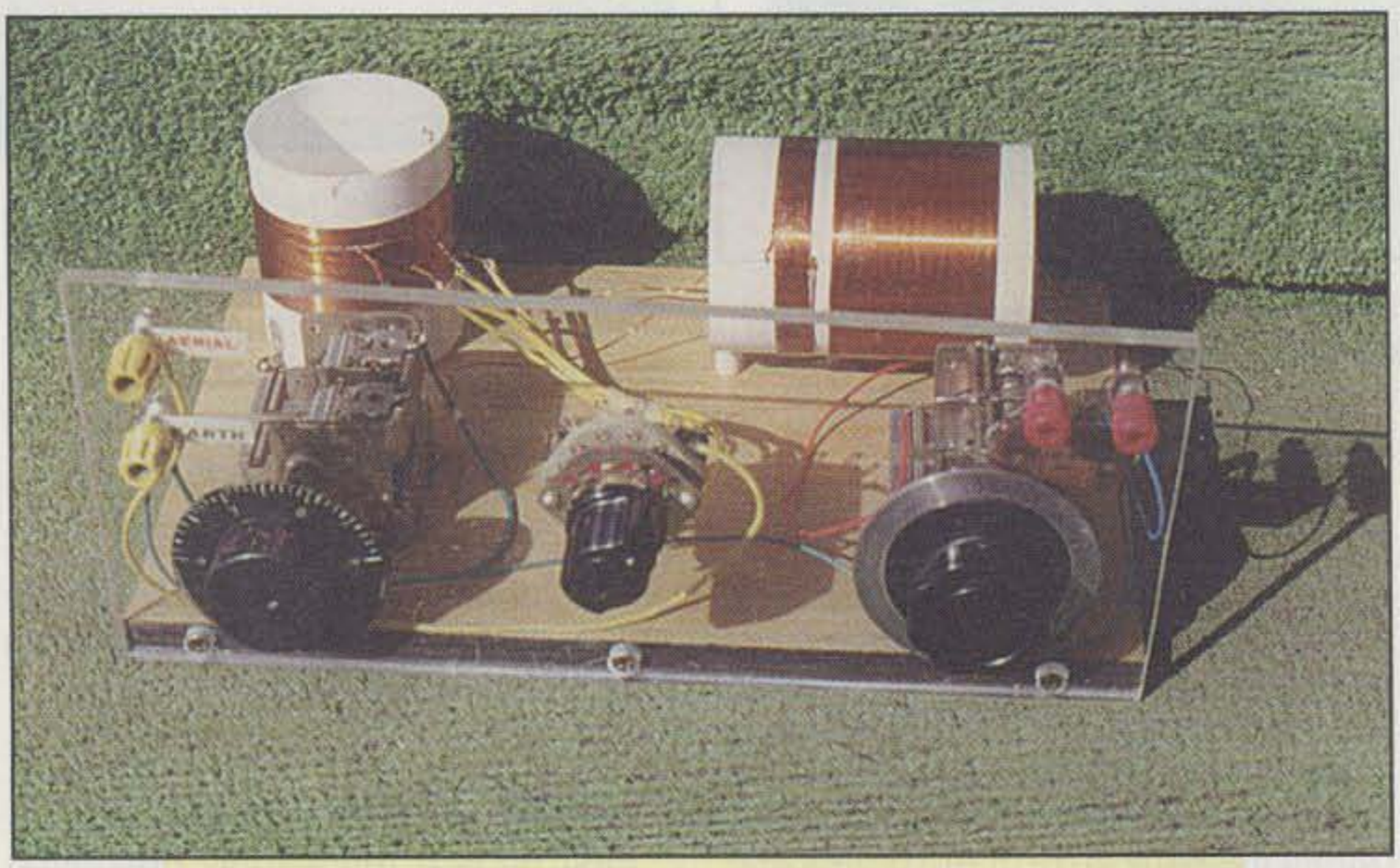


Photo C– Homebrewed crystal set made by Des O'Brien, ZL2OB, "down under" in New Zealand sports an auxiliary antenna tuning circuit for good selectivity. Clear front panel lets you watch electrons flow as it works. (Photo by ZL2OB)

Photo D– This piece of crystal-set art was made by Jeff Forrest of Livonia, Michigan. A circuit diagram was not available, but front-panel jumpers indicate it has a multi-tap detector coil for tuning the international shortwave broadcast bands. (Photo via Forrest and the Crystal Set Society)

rophones. Many of these amazing artifacts are being lost in attic, basement, and garage cleanouts as folks move, and I can only compare that loss to throwing both money and history in the trash. Scrutinize those old-time items before you toss 'em, gang, and if you are uncertain of their significance, ask an old-timer—or carry them to Dayton. Anything and everything old sells for a premium price at Dayton.

Next in the spotlight is the clean, wooden-box-enclosed crystal set recently built by Leonard Gardner, W2QBC, and shown in photo B and fig. 1. Len has been researching and building galena-crystal-type sets for several years, and this set reflects much of his efforts. Its coil, for example, is litz wire wound on a powdered iron or ferrite rod. Len says the combination gives a noticeable improvement over conventional coils and forms. He was not specific as to the size of rods or turns of litz wire to make coils, however, so that will be left to your dinkin' ingenuity. Look closely at Len's set and you will notice an authentic catwhisker-with-galena holder detector, a famous National "Velvet Vernier" tuning knob, and gold lettering on connectors. This thing could even double as a family heirloom!

Our next featured crystal set comes from New Zealand and the continuously active workshop of Des O'Brien, ZL2OB. Des is one of the newer licensed amateurs "down under," but he has lost no time in making good marks in our great hobby. He made some quite impressive paddles we featured in keys columns, then jumped into DXing and started working the world while also building antenna tuners and crystal sets. His special pride, shown in photo C, is a dual-coil unit with separate antenna and detector circuits for maximum selectivity. The set is built open-air style on a 5 by 9 inch pine board with a clear-plastic front panel and 3 inch diameter coil forms. The coils are mounted at right angles to minimize undesired coupling. Jolly good show, Des!

Our next three views are compliments of Jeff Forrest, a dentist in Livonia, Michigan, and another enthusiastic member of the Crystal Set Society. Jeff built these sets in his spare time, and I am sure you will agree each one is a masterpiece. The first set (photo D) covers the AM broadcast band plus shortwave bands up to around 12 MHz. Yes, crystal sets are useful for tuning in international shortwave bands; the main consideration is just using less inductance and capacitance plus efficient antenna coupling.

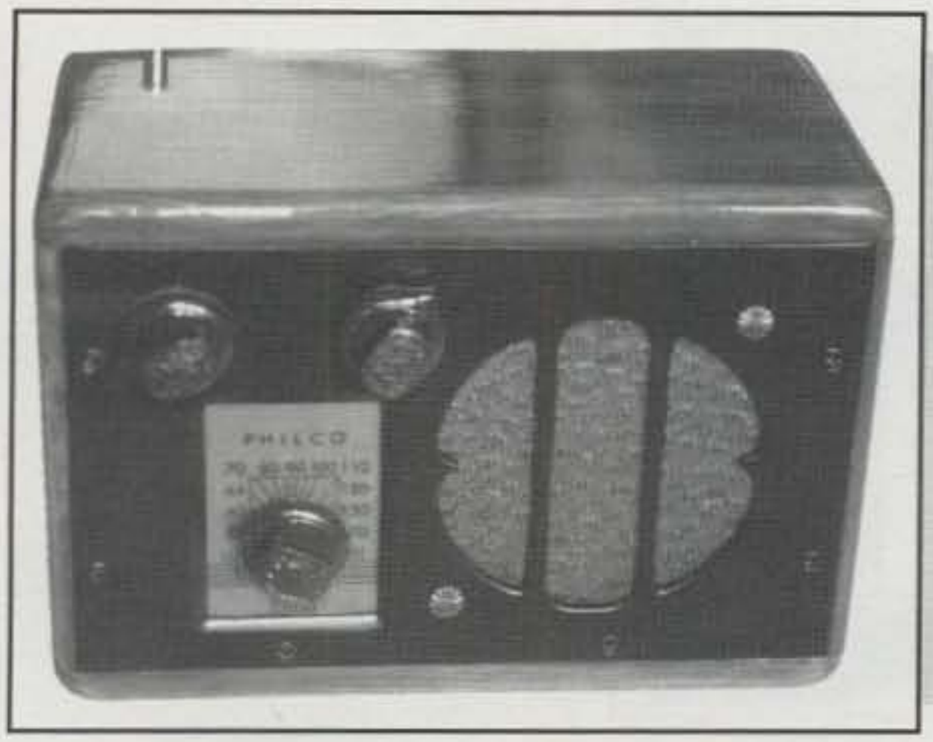


Photo E– Jeff Forrest's second homebrewed set is built like a small Philco bedside radio. It vividly points out that the real glamour of crystal sets is in their enclosure rather than their circuit diagrams. It also sports a beautifully polished wood case that really catches the eye. (Photo via Forrest and Crystal Set Society)

Notice the clip-lead jumpers on the set's front; they select taps on a large-diameter coil for covering various frequency ranges which are then fine-tuned by the main dial. The antenna-coupling capacitor is then used to peak a desired signal and hopefully reduce interference from other same-band stations.

Jeff's second set (photo E) is built to resemble a small Philco "bedside radio" and sports a beautifully polished wood cabinet. The front panel is complete with a fully calibrated dial and speaker cutout with real grill cloth. Evidently this set is also equipped with a small audio amplifier.

An inside view of Jeff's third marvel is shown in photo F. Notice the custom triplate variable capacitor linked to its elaborate tuning dial and adjustable cat-whisker-type detector. Obviously some serious construction and loving care went into assembling this beauty. Our special thanks to Jeff Forrest and Rebecca of the Crystal Set Society for sharing these views. Some additional notes, circuits, and layout plans for building super crystal sets, incidentally, are slated for upcoming "XSS" newsletters. A year's subscription (six issues) is $12.95 for U.S., $19 DX. You can order it from the society at 1-800-927-1771, online at <www.midnightscience.com> or by mail at P.O. Box 1625, Norman, OK 73070. Check it out!

One-Tube "Gennie"

As previously mentioned, regenerative receivers were the next evolution in radio after crystal sets, and as such, they are ideal quick-to-assemble projects for new or extra-busy homebrewers. I say that because they are easy to build, exhibit good sensitivity, and although vintage are still fun to use on the air today.

What is the special attraction of this column's featured "regen" receiver? First, it is designed around a highly prized and collectible vacuum tube from the early days of radio, and second, it employs attention-grabbing basket-weave coils. The combo makes a most impressive-looking receiver, and it also sets the stage for another unique project being planned for a future column—a mini-transceiver using homebrewed spider-web coils!

The circuit diagram of "Gennie" is shown in fig. 2, and a suggested layout of its main components is included in fig. 3. The tube may be a classic UX199, UX201, or UV01A medium-impedance receiving triode. The challenge is finding one or two of these 1920-style tubes in good condition and at an affordable price. Possible sources include Antique Electronic Supply, hamfest flea markets, magazine want ads, and old-timers' basements or garages. The UV199 is particularly attractive because of its small size and unique shape. While on a scavenger hunt roll, also strive to find a breadboard-mount four-pin socket for the tube and a pair of high-impedance (2K or higher) headphones to use with the receiver. Low-impedance (8 or 16 ohm) earphones will not work in this circuit, because they are the tube's plate load.

Input coil L1 and "tickler" coil L2 are wound by carefully weaving stiff cloth or plastic-covered solid wire between seven wood dowels arranged to form a 1 1/2 inch circle as shown in fig. 3. The "easy way" to accomplish this is by drawing a 1 1/2 inch circle on your receiver's baseboard (prior to mounting other parts!), marking seven spots, then gluing seven 3 inch tall wood dowels at those spots. When dry, you can then use the form to both wind and support coils. Winding the coils, incidentally,

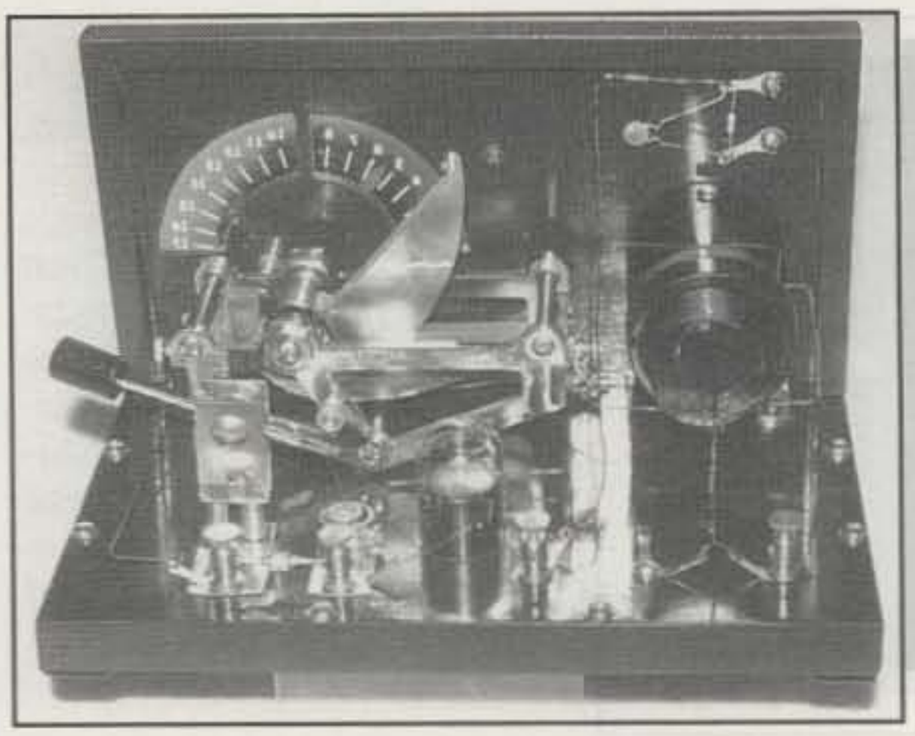


Photo F– Rear/inside view of Jeff's third homebrewed set reveals a fascinating array of exotic parts in the little set's layout. First class indeed! (Photo compliments Forrest and Crystal Set Society)

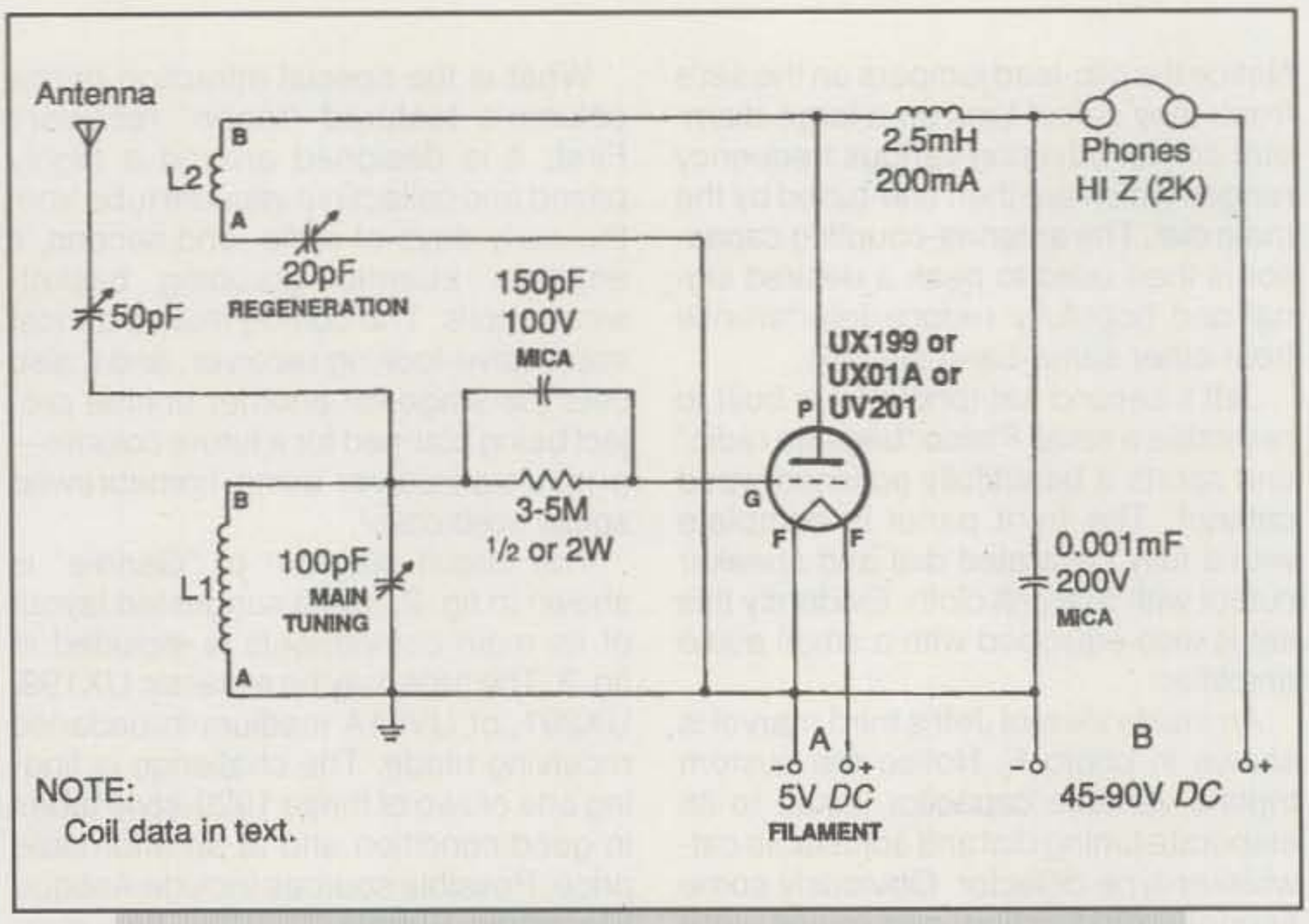


Fig. 2– Circuit diagram of our quick, easy-to-build one-tube regenerative receiver. This little gem goes together in a couple of hours—after you find a vintage tube, socket, and dial and devise a fancy case.

involves weaving alternating turns around the dowels so one turn is "over," the next turn is "under," etc. Wind a couple of "practice coils" using disposable wire, then use fresh wire to wind the final coils. Why two steps? First, practice makes perfect, and second, solid wire is susceptible to breaking with excess bending. Appearance is everything in this golden-age receiver, so old-style cotton-covered and striped wire is ideal for the coils, but it is scarce and sometimes expensive. A modern substitute with almost as much class and flash is plastic-coated "tracer" wire in white or red with an orange or yellow stripe along its length.

Number 18, 20, or even doorbell wire can be used for L1 and L2. For 80 meter coverage (approximately 3 to 4 MHz) wind 36 turns for L1 and 8 turns for L2. For 40 meter coverage (approximately 6.5 to 7.5 MHz) wind 18 turns for L1 and 7 turns for L2. For 30 meter coverage (approximately 10 to 11 MHz), wind 13 turns for L1 and 6 turns for L2. Remember that these turns and frequency-coverage figures are approximate and will surely require "tweaking" or "dinking" for good ham-band reception after final assembly. That is synonymous with regen receivers!

Shortwave receivers built open-air and breadboard style are quite susceptible to hand capacity or shifting frequency as your hand moves to or from front-panel-mounted tuning capacitors. This effect can be minimized by mount-

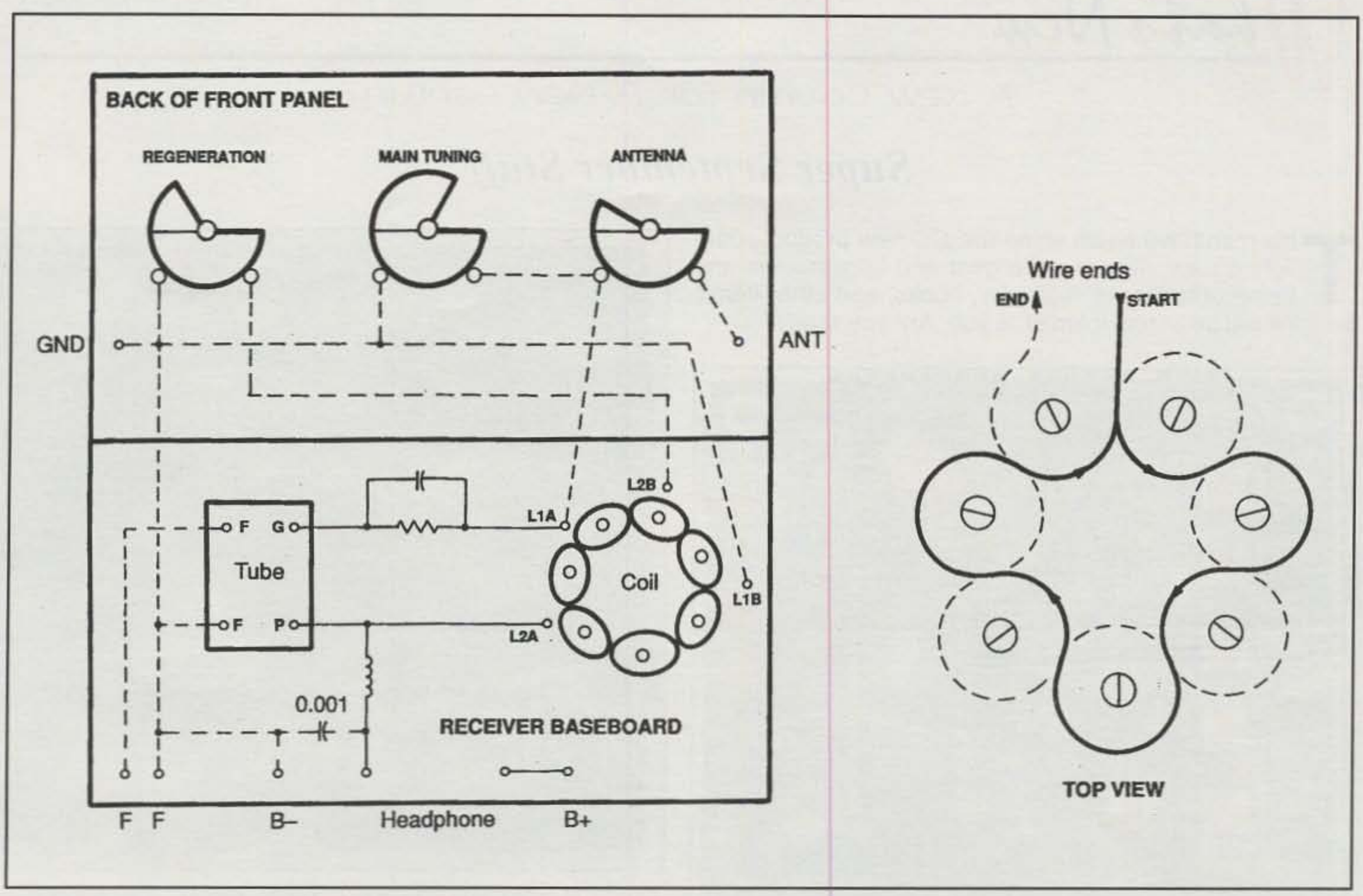


Fig. 3– Suggested layout of main components and guide for winding basket-weave coils used in the one-tube regen receiver. (Discussion in text.)

ing or attaching a metal plate or even an aluminum chassis to the back of the front panel. Use your ohmmeter to ensure the mounting frame of the main tuning capacitor and regeneration capacitor electrically connect to the metal plate. Also route a thick ground strap or wire from the plate to the circuit's ground buss line. Insulate the antenna trimmer capacitor from the metal plate or mount it directly to the receiver's base board.

Check-out and alignment of the completed receiver begins by connecting antenna, earphones, and batteries. Then use your VOM to ensure the tube is drawing filament and plate current. If not, look for an open/broken connection in wiring. Next check receiver operation and coverage as follows: Adjust the regeneration until a howl is heard in the earphones. No howl? Turn tickler coil L2 over on its wood-peg form and vary its spacing from L2 by 1/4 to 1/2 inch. Still no howl? Wind another L2 coil with two or three more turns and repeat adjustments (Older tubes can be fickle, you know!). Once howling or oscillating, you can use your modern, well-calibrated shortwave receiver to tune in the regenerative receiver's howl (which will appear as a weak CW signal on its exact receive frequency) and make a frequency coverage/tuning chart. When making these measurements, connect only a short antenna wire to the regen receiver and do not connect an antenna to your modern receiver. This will help you spot the regen's signal. After noting and fine-tuning frequency coverage, connect a 40 or 50 foot (non-resonant) wire to the regen receiver and set its regeneration control right before the point of oscillation (A hiss should then be heard in the earphones.). Then start tuning your favorite band in style. Regenerative receivers are a blast of fun to use!

That wraps up our views for this time, gang, but stay tuned as we bring you news of exciting new areas of development in future columns. As always, our prime objective (thank you, Spock) is opening your eyes and interest to a full "World of Ideas" within amateur radio's vast array of fascinating pursuits.

73, Dave, K4TWJ

On Your Side

Specialized interests and pursuits within our amateur radio world are more diverse today than ever before. Consequently, we now have a large number of small groups interested in a wide variety of unique areas. These areas encompass everything from SSTV/ATV, satellites, and moonbounce to extra-low-frequency and microwave pioneering, digital audio, HF packing, bike mobiling, QRP, collecting keys, building crystal sets, and more. We strive to cover all of them in this column, and this month's study of crystal sets is only one example of that fact. Enjoy! *—K4TWJ*

What's New

BY KARL T. THURBER, JR., W8FX

A New Column for A New Century

Super September Stuff

This month we again shine the *CQ* new product spotlight on a variety of radio gear and accessories, antenna accessories, software, books, and other items we think will be of real interest to you. Are you ready?

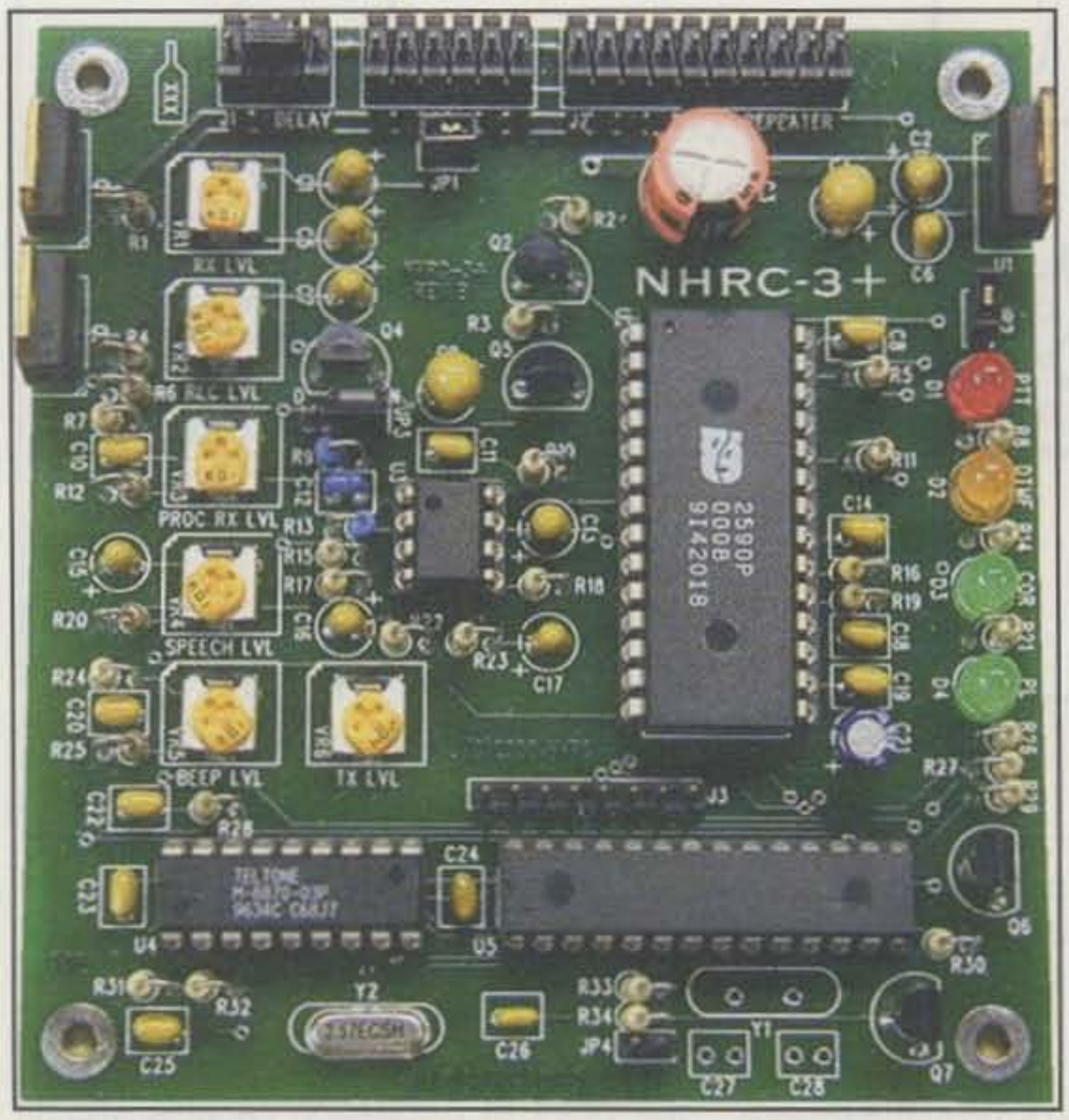


Photo A– Depicted here is the circuitry of the NHRC-3+ Remote Controller, which includes simplified programming, a CTCSS input, multi-tone courtesy tones, fan control output, four digital outputs, and two courtesy tone select inputs. (Photo from the NHRC LLC website)

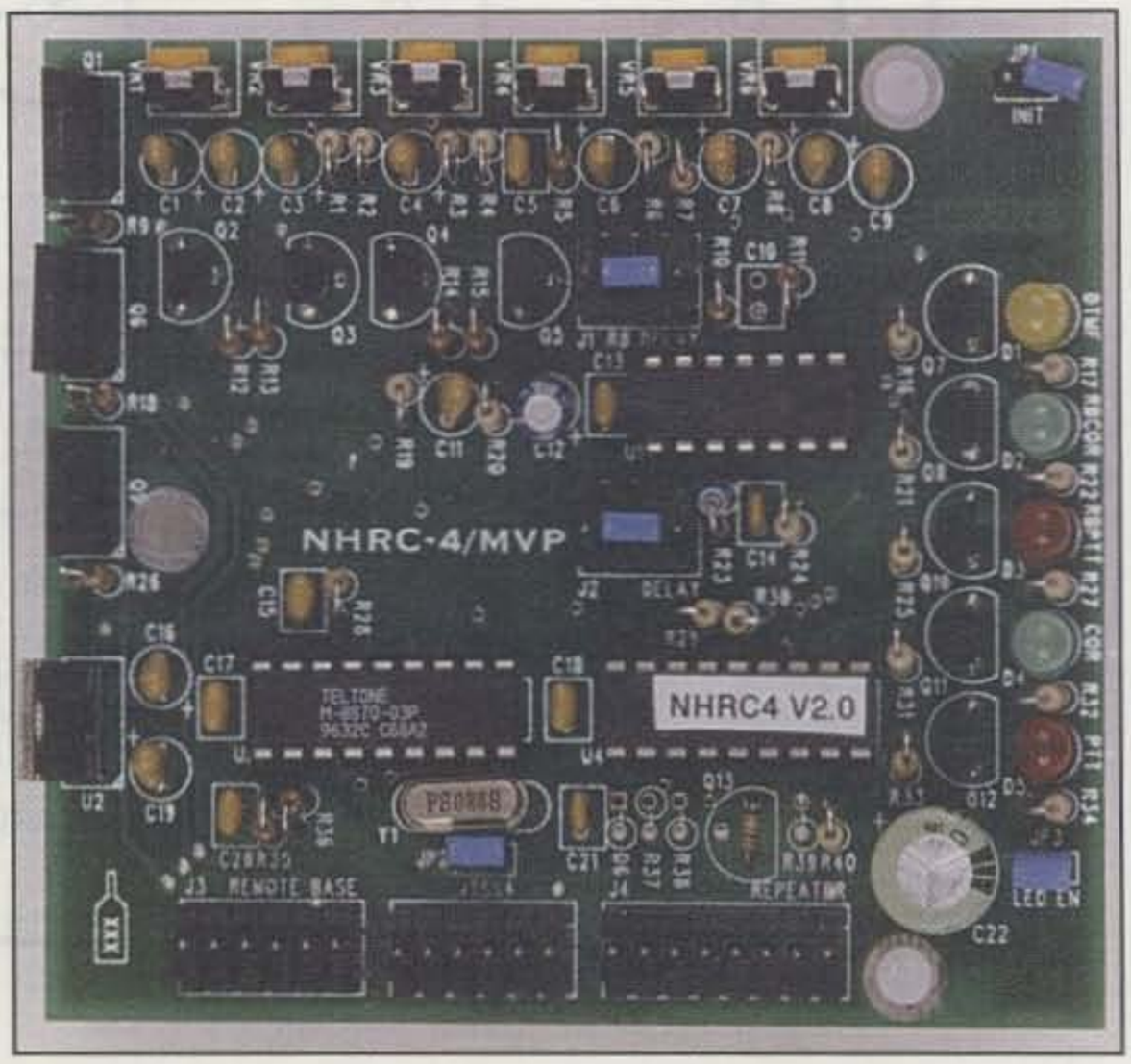


Photo B– Designed primarily for commercial applications, the NHRC4/MVP Repeater Controller easily installs into General Electric™ Custom MVP™ mobiles and stations, converting the radio into a repeater with a remote base port. (Photo courtesy NHRC LLC)

Radio Gear

New Repeater Controllers from NHRC. Recently, NHRC LLC, a major supplier of repeater controllers for the amateur and commercial radio communities, introduced the NHRC-3+ Remote Controller (photo A). It's the latest in the company's series of repeater controllers and accessories. The unit offers simplified programming, a CTCSS input, multi-tone courtesy tones, fan-control output, four digital outputs, and two courtesy tone select inputs, besides the standard features of the NHRC-3.

The NHRC-3+ is programmable by sending DTMF sequences. The CW ID, hang time, timeout timer, and tail message counter all can be programmed by the user. Easily integrated with any repeater, the unit has a duplex or simplex operating mode. The touch-tone remote control and programming includes six programming commands and 29 control operator settings. Onboard audio de-emphasis is jumper selectable. The unit is $169, including the user guide.

NHRC LLC also has introduced the NHRC-4/MVP Repeater Controller (photo B). It's an integrated repeater that installs inside General Electric™ Custom MVP™ mobile radios and stations. Designed primarily for commercial applications, the new unit lets you make your Custom MVP into a repeater with a remote base port. The controller provides CW ID, ID timer, individual timeout timers for the main and

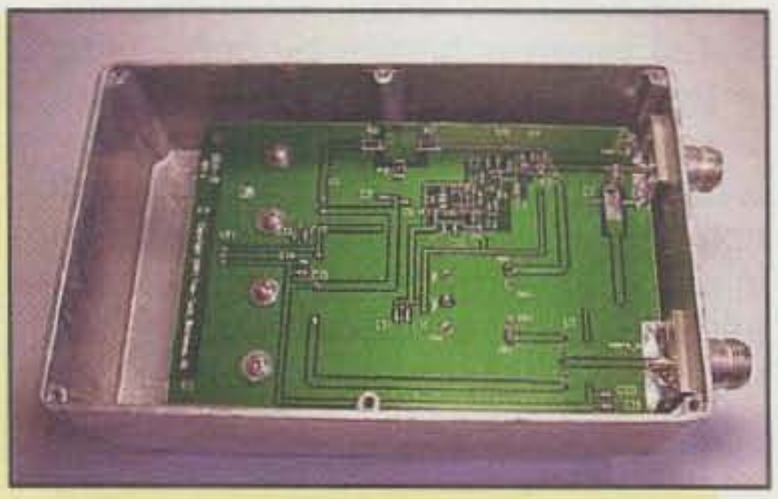


Photo C– According to the folks at Tele-Tech Corporation, the LBA-15 Amplifier is just the ticket to compensate for 1.2 GHz transmission-line losses. Featuring 1 watt in and 15 watts out, it's mast mounted, with clamp provided, and it's even powered up via the transmission line. (Photo from the Tele-Tech Corporation website)

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

remote base ports, and a hang timer. Five different courtesy tones indicate channel activity and remote-base status. A digital output is included for control applications. It's $189.

For more information, contact NHRC LLC, 444 Micol Road, Pembroke, NH 03275 (603-485-2248; e-mail: <info@nhrc.net>; <http://www.nhrc.net>).

LBA-15 L-Band Amplifier from Tele-Tech. Now that you have a great new radio with 23 cm (1.2 GHz) capability, how do you get a potent signal to your antenna? This is the question posed by the folks at Tele-Tech Corporation, and their response is that the LBA-15 Amplifier (photo C) is just the ticket, especially to compensate for transmission-line losses.

The unit features 1 watt in and 15 watts out. It's mast mounted, with clamp provided, and it's even powered up via the transmission line for convenience. A high-current bias Tee is included. The LBA-15 handles SSB, FM, and CW modes, and it's T/R switched. The unit is weather resistant and features Type N connectors. Price is $499 plus $8 s/h.

For more details on the unit, contact Tele-Tech Corporation, P.O. Box 790, Bozeman, MT 59771 (1-888-844-0292; e-mail: <sales@tele-tech-rf.com>; web: <http://www.tele-tech-rf.com>).

Accessories for the Shack

Zap Checker. Alan Susal, KE6UFL, tells us of an intriguing new product offered by his company, Alan Broadband Co., Inc. It's the Zap Checker (photo D), a high-quality, handheld instrument that detects and displays transmitted electronic energy. In fact, this new electronic device is comparable to a sensitive wideband receiver with signal-strength indicators. The Zap Checker also is distantly related to the electric field-strength meters of earlier days, but with much greater sensitivity and broader bandwidth than the older devices.

The Zap Checker's bandwidth extends from less than 10 MHz to over 4.5 GHz. This remarkably wide bandwidth includes a multitude of sources: amateur radio transmitters, cellular and wireless phones, microwave ovens, computer wireless devices, UHF and VHF transmitters, hidden "bugs" and surveillance equipment, baby and security monitors, FM and TV broadcasts, and even electronic car keys and garage-door openers.

Conveniently, the Zap Checker's high sensitivity lets you tune up QRP transmitters and determine antenna radiation patterns from a distance (thus avoiding detuning effects), measure

Photo D– The Zap Checker detects and displays transmitted electronic energy, comparable to a sensitive wideband receiver with signal-strength indicators. It's distantly related to the electric-field-strength meters of earlier days, but with much greater sensitivity and broader bandwidth. (Photo courtesy Alan Broadband Co., Inc.)

RFI signal sources, pinpoint RF leakage in cables, locate hidden transmitters during "fox hunting," and more.

The battery-operated unit also has unique detection and display systems, which involve signal detection in either logarithmic or linear mode to optimize signal presentation. The display is either by an analog meter or by the illumination of colored LEDs. The Zap Checker is $89, including s/h in the U.S. For more info, contact Alan Broadband Co., Inc., 93 Arch Street, Redwood City, CA 94062 (1-888-369-9627; e-mail: <abcom@prodigy.net>; <http://www.zapchecker.com>).

New from Morse Express. Over the past several years we have profiled several keys and other products from Milestone Technologies. Proprietor Marshall Emm, N1FN, has introduced a welcome stream of keys, paddles, bugs, and other accessories to the amateur community. Many of these devices are imported, and a number of them are very unusual and innovative.

One such example is the addition of a genuine, imported Schurr telegraph key for about $60 (photo E). The designer intended the inexpensive key as a "beginner" key, in conjunction with the German radio association, DARC. It's a medium-size key, mounted on an oak base, having all of the style and precision feel of its more expensive brothers, at less than one-third the price. Marshall adds that he also offers new imported lines of gear, including the "Continental" series keys, from CT Keys.

Contact Morse Express, a division of Milestone Technologies, Inc., 2460 S. Moline Way, Aurora, CO 80014-1833 (phone 1-800-238-8205; e-mail: <nifn@MorseX.com>; web: <http://www.morseX.com>).

Weller Silver Series Dual Digital Soldering Station. Contact East, a leading distributor of products for testing, assembling, and repairing electronic equipment, offers the new Weller Silver Series Dual Digital Soldering Station (photo F). This new soldering station permits the use of two irons, each with its own independent temperature setting.

Photo E– Milestone Technologies now offers an imported Schurr telegraph key, designed as a "beginner" key, in conjunction with the German radio association, DARC. It's a medium-size key mounted on an oak base with all the style and precision feel of its more expensive brothers, at less than one-third the price. (Photo from the Milestone Technologies website)

Photo F– The new Weller Silver Series Dual Digital Soldering Station, from Contact East, permits the use of two irons, each with its own independent temperature setting. A pushbutton temperature control with LED readout displays temperature settings and tip temperature. The power base features a static dissipative housing to prevent electrostatic discharge (ESD) damage. (Photo courtesy Contact East)

Tip temperature is electronically controlled through a temperature range of 100° to 850° Fahrenheit. A pushbutton temperature control with LED readout displays temperature settings and tip temperature. The power base features a static dissipative housing to prevent electrostatic discharge (ESD) damage. The station operates on 120 VAC and comes with a three-wire power cord.

For more information or a catalog, dial up Contact East, Inc., 335 Willow St., North Andover, MA 01845 (1-800-225-5370; e-mail: <sales@contacteast.com>; web: <http://www.contacteast.com>).

Inexpensive Digital Recorder from Scientifics®. Scientifics® offers the new and attractively priced Model DW-90 (#3121000) Digital Voice Recorder for commercial or educational use. Priced at under $100, the unit has 8 MB of flash memory that holds up to 90 minutes of information that can quickly and easily be downloaded to your PC via the included USB cable. The DW90 comes with built-in microphone, microphone stand, earphone, strap, and software.

A new, 100-page catalog featuring more than 1500 scientific and educational products for science and engineering enthusiasts also is available. For more information or a catalog, contact Scientifics, Dept. A011-C999, 60 Pearce Ave., Tonawanda, NY 14150-6711 (telephone 1-800-728-6999; e-mail: <cons_order@edsci.com>; on the web: <http://www.scientificsonline.com>).

TIF 660 Capacitor Tester. Michiana Radio's TIF 660 Capacitor Tester is a handy test instrument in that it tests capacitors in place in the circuit. (Capacitors with bleeder resistors or resistors in parallel need one lead disconnected.) An equally important feature is that the unit makes use of a simple audible indicator to identify good, leaking, shorted, or open capacitors.

The shirt-pocket-size TIF 660 has built-in test leads, and it tests capacitors over the range .001 to 5000 microFarads. It makes use of a 9 volt battery (included), having a life of about 6 months with normal use. The unit also performs continuity tests on transformers, coils, fuses, and filaments. The TIF 660 is priced at $34.95 plus $7 shipping and insurance ($12 for Canada).

Photo G– Nemal Electronics has introduced a new series of lightning arrestors for use in 50 ohm RF transmission lines. The Nemal NE9960 series uses plasma discharge switching technology. These units feature low RF insertion loss of less than 0.2 dB from DC to 3 GHz. Other models are available that can be tuned for optimum performance at specific frequencies from DC to 6 GHz. (Photo from the Nemal Electronics website)

For more details, contact Michiana Radio, 1204 Cedar Street, Niles, MI 49120 (616-684-2174; e-mail: <fletchms@qtm.net>; web: <http://www.michianaradio.com>).

Antennas and Accessories

Plasma Discharge Lightning Arrestor. Nemal Electronics International offers a complete line of cables and related products. More than 3000 cable and connector products, including all types of RF connectors and crimping tools, are available. Manufacturing capabilities include the design, production, and testing of a wide variety of specialized cables and connectors.

Recently, Nemal introduced a new series of lightning arrestors for use in 50 ohm RF transmission lines (photo G). The Nemal NE9960 series uses plasma discharge switching technology, providing a short to ground at 75 volts maximum. These units feature low RF insertion loss of less than 0.2 dB from DC to 3 GHz. Other models are available that can be tuned for optimum performance at specific frequencies from DC to 6 GHz. Standard construction features a Type N male on one end and a female bulkhead mount on the other end; other models are available using a wide variety of connector types. Price is $49 per unit.

For more information, 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 the well-designed website.

Software and Computers

TRX-Manager Transceiver Control Software. Personal Database Applications (PDA) probably is best known for the impressive LOGic™ series of full-featured loggers suitable for DXing, nets, paper chasing, and ragchewing, and offered by proprietor Dennis Hevener, WN4AZY. LOGic is up to Version 6 as this is written.

This month, however, we'd like to make you aware of the TRXManager Transceiver Control Software (see fig. 1). While LOGic already comes with a full array of rig control features, some of TRX-Manager's rig control features are even more impressive, and it integrates seamlessly with LOGic. TRX-Manager, developed and published by Laurent Labourie, F6DEX, supports almost all the functions of most Yaesu,

Kenwood, ICOM, and Ten-Tec transceivers, fully integrated in a comprehensive package.

The TRX-Manager software implements all of these functions in conjunction with very fast monitoring and easier, more effective shortwave (SW) listening, DX spotting, logging, award tracking, rotator control, and more. Most impressive, remote control of an HF station by packet or local area network (LAN) is provided, along with other original features—including some real-time features that do not even exist on your transceiver. The TRX-Manager software is $69 from PDA, which is the exclusive TRX-Manager distributor for the U.S. and Canada.

For more information, contact Personal Database Applications, 1323 Center Drive, Auburn, GA 30011-3318 (phone 770-307-1511; e-mail: <pda@hosenose.com>; <www.hosenose.com>). You also can check out the TRX-Manager Home Page of publisher Laurent, F6DEX, at <http://home.nordnet.fr/~llabourie>.

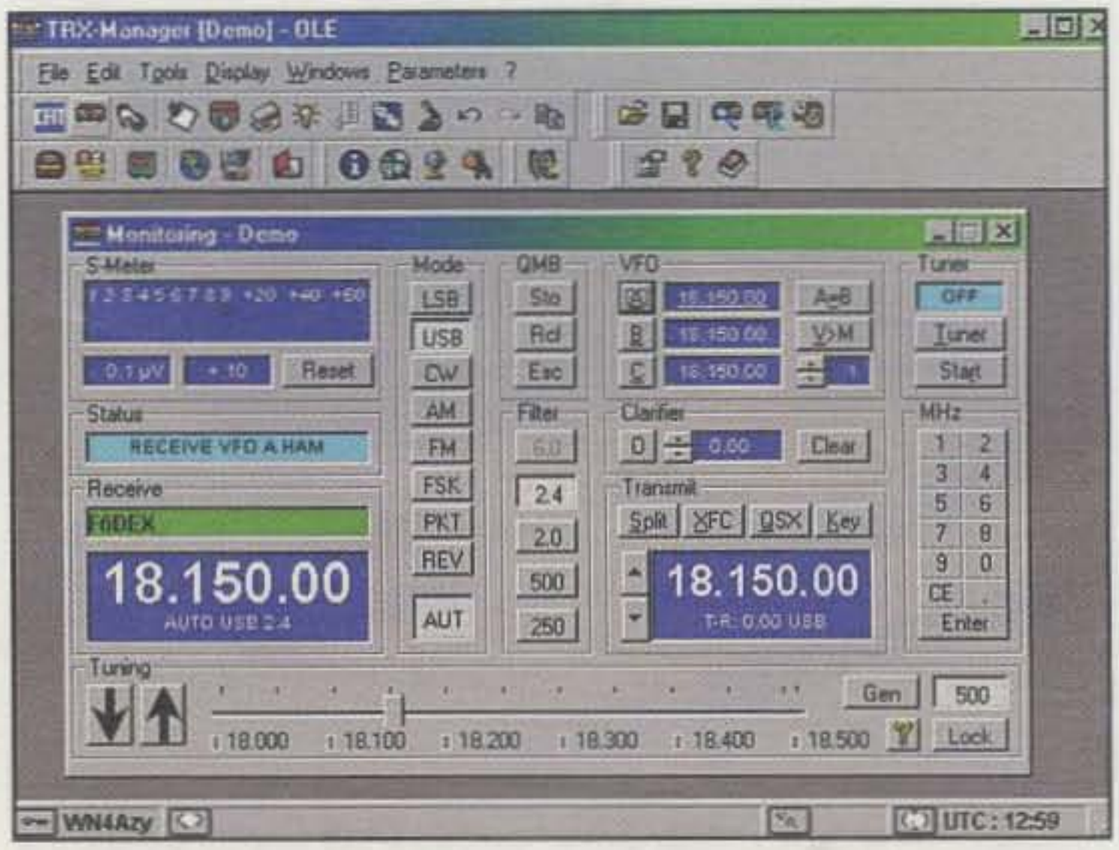


Fig. 1– TRX-Manager, developed and published by F6DEX, supports almost all the functions of most modern Yaesu, Kenwood, ICOM, and Ten-Tec transceivers. The software implements all of these functions in conjunction with very fast monitoring and easier, more effective shortwave listening, DX spotting, logging, award tracking, rotator control, and more. (Screen graphic from the Personal Database Applications website)

From the Bookshelf

New Books from Newnes. Newnes, an imprint of Butterworth-Heinemann, offers many titles in computing, electronics and electrical engineering, broadcasting, film and TV, video and audio, and other technology fields, billing themselves as "publishers for the electronics industry." Newnes recently introduced two new titles which should be of interest to readers of this column.

The *Practical RF Handbook, Third Edition,* by Ian Hickman is a 304-page paperback that gives readers the inside track on RF circuit design from a leading design guru; the book also discusses the cutting-edge technology of the fast-moving world of communications electronics. You'll find the $39.99 book a useful, hands-on guide for engineers, technicians, and electronics enthusiasts working on RF design.

Another handy title is the *Newnes Dictionary of Electronics,* by S. W. Amos and R. S. Amos. The book is an essential item on the bookshelves of electronics engineers, managers, technicians, and enthusiasts. It is in a convenient, compact format that makes it an ideal working dictionary for electronics, TV, radio, and computing, and thus it may well deserve a place in your ham shack. The definitions provided are clear and concise, and they are supported by numerous illustrations and circuit diagrams. The 400-page paperback, at $24.99, includes a substantial new section devoted to acronyms and abbreviations.

Contact Newnes at 225 Wildwood Ave., Woburn, MA 01801-2041 (1-800-366-2665; e-mail: <custserv@bhusa.com>; web: <http://www.bh.com>).

We Get Letters

Once again, we're just about out of space. Before wrapping things up, however, we would like to acknowledge some of the good folks who took the time and trouble to correspond with us in recent months. A tip of the W8FX hat goes to Andrew Buckley; Don Rotolo, N2IRZ; John Drum, W4BXI; Alan Susal, KE6UFL; David Landis, WA3HDW; John Shelton, K1XN; and Richard Mollentine, WAØKKC.

So, gang, keep the cards, letters, and e-mails coming, and let us know what "new stuff" you'd like to see here.

Wrap-Up

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

Overheard: When you're ready to raise your hand with a question but think you'll be embarrassed, just remember that the only really dumb question is the question that you thought about asking but didn't!

73, Karl, W8F

On the Cover

"I've pretty much made contesting my life," says Longmont, Colorado's Chuck Cullian, KØRF. Chuck has been a ham since 1957 and a contester since 1960, when, as he explains, "One day, I came home from school on a Friday, turned on the rig to 20 CW, and the band was full of Europeans." *(He was living in California at the time, so that was somewhat unusual. – ed.)* "I asked my dad —who was then K6TSY and is now K6RF—what was going on, and he said, 'It must be a contest.' I went back and started working them and having a wonderful time."

What really turned Chuck into a contester, however, was ... other contesters. "One of the locals, Roger Mace, W6RW, heard me on and invited me to operate with his group," Chuck continued, noting that he operated with Roger for several years. "Then I operated with Dale Hoppe, W6VSS (now K6UA), for a while, then set up my own multi-multi station. In the mid-60s, I placed second in the CQ World-Wide phone, behind Jim Lawson, W2PV. I moved to Colorado in '78 and built a multi-op station here, and I've been doing multis ever since."

Chuck—who is also a jazz musician, fly-fisherman, and competitive volleyball player—says his most consistent contesting partner is George Schultz, WØUA, but for some of the bigger contests he gathers a bigger group. In 2001 there were 11 ops altogether at KØRF for the CQ World-Wide CW Contest, and while they placed first in their call area for multi-multi, Chuck says poor band conditions made it impossible to achieve their pre-contest goal of breaking the all-time WØ multi-multi record. Maybe this year, Chuck! (Cover photo by Larry Mulvehill, WB2ZPI)

Beginner's Corner

BY PETER O'DELL, WB2D

For the Newcomer to Ham Radio

A Ham's Sacred Space

"Peter, you should not take a shop class. You are in the academic track. The college admission officers won't like it if they see you've wasted time taking a shop class instead of something that will help you."

She was as serious as I was gullible, a high-school kid without a clue about the real world, and the words of the guidance counselor fed into my ego. I would go to college and, therefore, automatically become wealthy. I would never have to lower myself to fixing something around the house. That was something that other people did. Not me.

Flash forward eight years or so. I'm in grad school, married and trying to keep a ten-year-old car running. The shocks had to be replaced, so I was doing the job myself—except I could not get the old ones off. After two hours the nuts had not budged, and my knuckles were a bloody mess. I called my dad, who does not have a magical college degree, let alone a graduate degree.

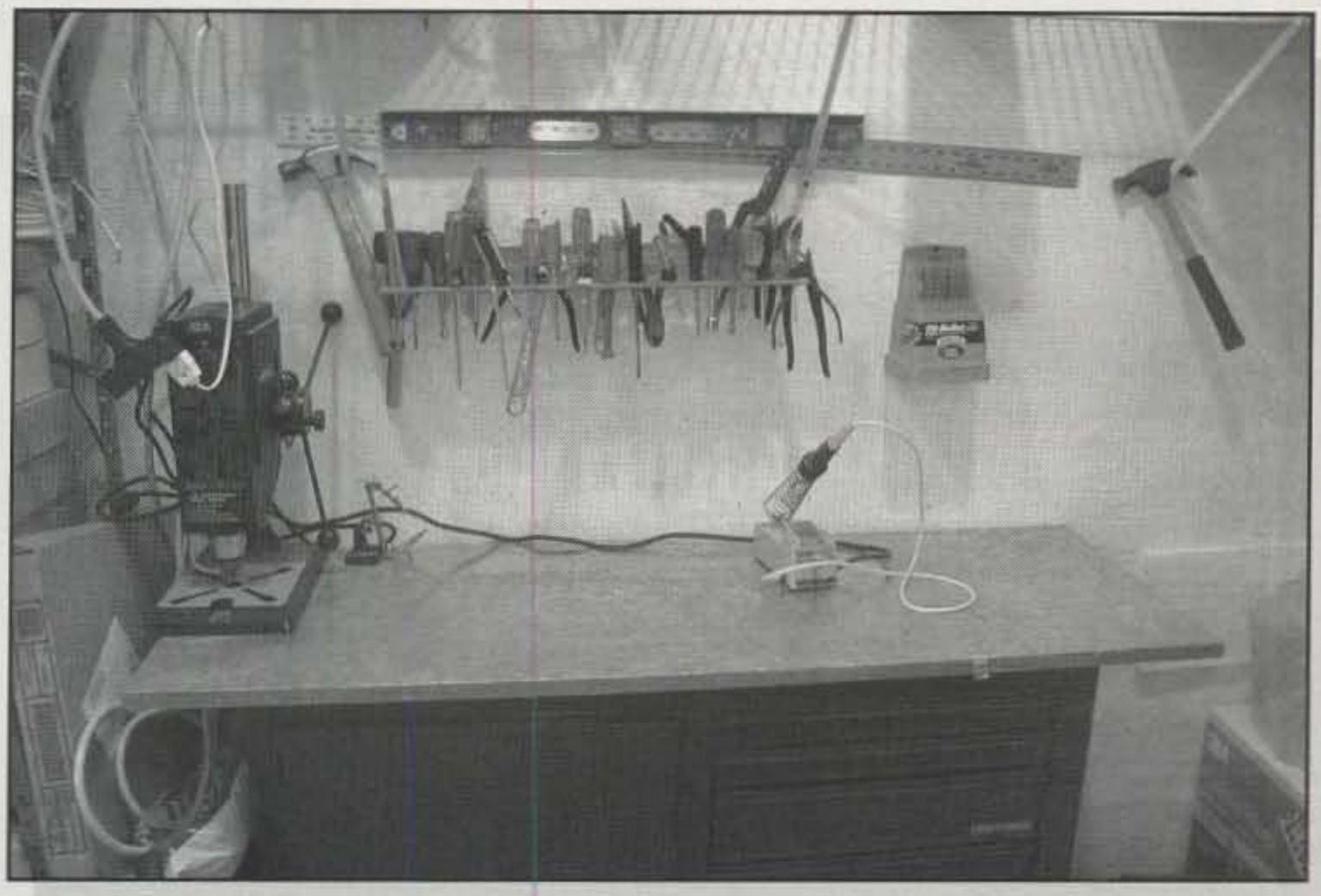
"What are you going to do with the shocks when you get them off the car?"

"Throw them away. They're junk."

"Well, just cut them off with a hacksaw. Why did I send you to college?"

With that dose of reality hammered between my eyes, I crawled back to the car and finished the project in short order. The only thing bloodier than my knuckles was my ego.

As far as I know, there is no 12-step program for this problem, so this month's column is a special edition for the mechanically challenged, for the electrically inept—in short, for the nerds out there like me.



Here is the workbench and the tool rack. The soldering iron is a permanent resident at the top because it is used more than any other tool. The drill press is not used that often, but it is too tall to fit on the shelf above the bench, so it is pushed out of the way in the back corner.

What Next?

In his day, my dad was an excellent mechanic. He could fix anything that went haywire in the house or garage. Those were his strong points. His teaching skills were lacking a bit. His most frequent statement to me was "Stay out of the way. I'm working." Thus, my idea of doing repairs was to hand over to my Dad whatever needed fixing and leave. It would be fixed when I needed it next—whatever "it" was.

The one area where I did learn a little about maintenance and repair was electronics. I became interested in radios and how they worked when I was in grade school, and it was an area in which my dad did not have a lot of experience. I built several kits and one HF transmitter from scratch. Of course, this was all courtesy of my dad's tools and workshop.

What happens, though, when you move out on your own? You ask questions of anyone who might have a clue. You read. You watch Wally on TV (Wally was Bob Vila before Bob Vila.). You attend UBK—the University of Busted Knuckles. And you buy tools, lots and lots of tools. The more tools you have, the more manly you are.

For several years my tools rested in a bunch of plastic trays and one rusty tool box. Somewhere along the line I finally figured out that you really do need a workbench for repairs and projects. It is sort of like a sacred area dedicated to testosterone. Sacred or not, if you inadvertently singe a three-inch circle in the top of a work bench, no one yells. Someone does yell, however, when you do that to the dining room table. Busted knuckles pale in comparison to the wrath of a woman protecting the sanctity of her table.

When we moved a few years back, I left behind my workbench because it wasn't practical to move it. We did not plan to stay in this new house for a long time, so I figured I would do without a workbench until we moved into something more permanent. That changed, though. For about a year I kept my tools in boxes on shelves in the garage with a couple of tool boxes sitting on the garage floor—shades of the days of my first apartment.

Is there a downside to this? You bet. Who wants to do a construction project when it means digging through boxes to find the needed tools? As a result, for that year there were no neat little projects built and repairs were minimal, done only if something essential broke. A ham without a workbench is like an airplane without an airport.

The Real Thing

When the temporary house became a little less temporary, it was time to stop

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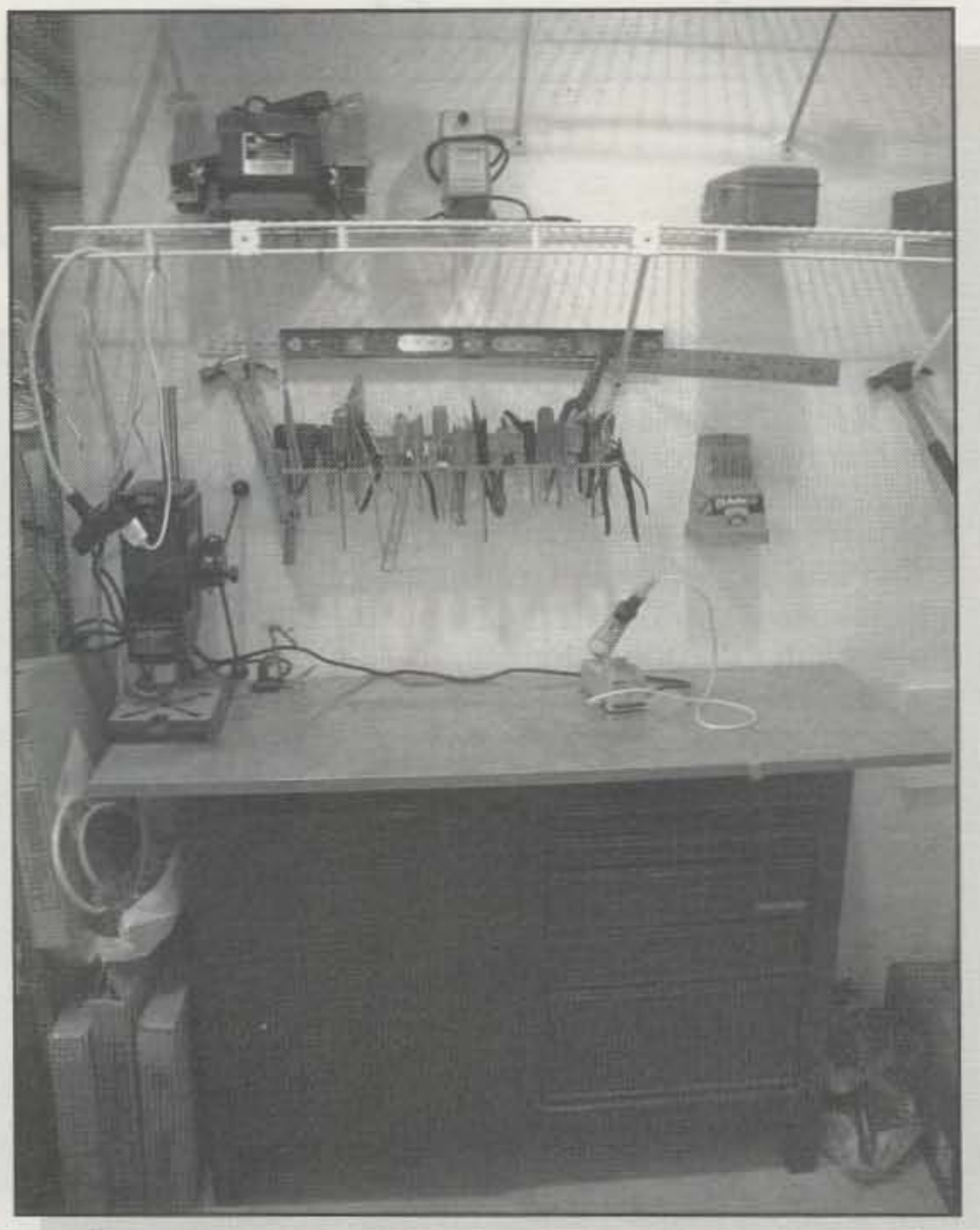

Here you can see the wire shelves above the bench as well as the door and drawers of the bench. A neat, organized work area makes life much more pleasant.

"living out of boxes" where my tools were concerned. First, I looked around the garage and realized that there was about four feet of wall space available if I were to get rid of some junk. There was no electrical outlet on this wall, but that could be handled with a heavy-duty extension cord. Lighting was poor—again something that could easily be remedied.

All I had to say to Wendy was that it would be a way to get my tools organized and the garage cleaned up a bit. She was all for it. Your situation may be different. You may not have a garage or basement area. That can be a real limiting factor in an apartment, for instance. However, if you do have the physical space, then you should consider adding a dedicated workbench if you do not already have one. Tools buried in a box stacked on some shelves in the back of the closet are just not likely to be used.

Once I had decided to acquire a workbench, the first thing was to do a little comparative shopping. I never considered building it from scratch; carpentry is not a strong trait in my genes. I went to a couple of the "mega home centers" ubiquitous to all urban areas, but I did not find anything there that I liked. They had workbenches (and at a good price, too). Unfortunately, they lacked some features that I wanted. They were open-frame construction without drawers, and I wanted to be able to put the tools out of sight beneath the workbench top. I also wanted drawer space for storing all those odds and ends that we tend to collect in the ham "junk box."

On to Sears. Here I found what I was looking for at a reasonable price. Sears carries a line of prefabricated metal workbenches ranging from about $100 to $180 or so. The bottom-of-the-line model would suffice, although it was not

ideal. It had three large drawers on the right and a hinged door on the left. Behind the door were two shelves. A wooden top completed the unit.

I decided to do a little more looking before committing to this unit. Before I had a chance to visit any other stores, a Sears flyer showed up in the mail advertising a sale on workbenches, among other things. Obviously, it was an omen from the universe. As it turned out, I bought a slightly better unit (same size, but five drawers and a metal sheet covering the wooden top) for $119. I walked through Sears just a few days ago. Prices and availability seem to be similar to three years ago, when I bought this unit.

Assembly time for a workbench like this is a couple of hours. There are a lot of nuts and bolts to tighten, so a ratchet comes in handy (battery-powered ones really speed up assembly). Just follow the directions.

I mounted two of those 12 inch deep wire shelves to the wall behind and above the bench. That gave me a place to store a small bench grinder and other tools when not in use (which is most of the time). Also, it provided a very good place to locate a fluorescent "shop light" fixture. Personally, I opted to mount a couple of regular fixtures to the ceiling and loaded them with flood lights. Sure it's ugly, but the lighting is much better.

By the way, the wall that I had available is concrete block. When I first started mounting things, I was using a regular electric drill and concrete bits (wood bits would be destroyed in a matter of seconds). Then I got a deal on a "hammer drill," and that made all the difference in the world. Normal drills work great on wood, wall board, and such, but if you have a concrete wall to work with, get a "hammer drill." A hole that might take five to ten minutes to make with a regular drill can be done in 30 seconds or so. They probably would have taught me that in shop class.

I also picked up an inexpensive plastic rack for holding the most frequently used hand tools. This $5 item turned out to be worth its weight in gold. I can find almost any tool I need at a glance. It is also very easy to put the tool back where it belongs, so there is no reason to procrastinate in that area. Not so with tool boxes and such: "I'll just set this down here and put it away later . . ."

Obviously, a workbench is a versatile and functional unit that lends itself to all sorts of household repairs. Do everything you can to perpetuate this little white lie with your spouse. Never let on that the primary purpose, the real purpose, is to have a sacred space to play around with your electronic toys and construct new ones. Eventually, your spouse may notice that 99% of the work done here involves your hobby. Keep close mental track of that other 1% so that you can list the wonderful things you have done for the house at your workbench if its use comes up in the heat of an argument.

Stocking the Workbench

A well-stocked workbench should have a number of tools in addition to the ordinary drill, screw drivers, and wrenches. One of the first things you will want to add if you do not already have one is a multimeter of some sort. These come in both digital and analog varieties, and each has its strengths. If you have to choose between one or the other, my inclination would be to go with the analog, if you can find one. Digital meters certainly are more available, less expensive, and quite accurate. What you give up with the digital meter is the

ability to watch "how" the needle is moving. Another thing to keep in mind is this: If you are going to work on RF circuits, you will need a FET-VOM (field-effect transistor, volt ohmmeter) or some similar unit that can handle RF. Ordinary meters fold in the presence of RF.

You can get perfectly adequate units at RadioShack, or you can look through the ham magazines for companies that sell industrial-grade units. Obviously, the latter will cost considerably more. Another good source is a hamfest. Here you will find a variety of used test equipment; just make sure the unit works before money changes hands. *Let the buyer beware.*

One of the most useful tools that a ham can have is a wattmeter. Some meters allow you to switch power ranges over some band of frequencies. These inexpensive units can be a good choice if your operating is confined to one band or a couple of bands. However, if you like to try different modes, different power levels, and different bands, your best bet is a unit that uses plug-in "slugs" for different frequency ranges and power levels. The meters and slugs are available new or used at most hamfests. Once you have the basic meter, you can add new slugs as your interests grow.

Since most of the ham equipment today runs on 12 volts, you probably will want to add a regulated 12 volt supply capable of supplying at least 10 amps or so. Look through the ham magazines for the companies that sell power supplies. Great bargains on used equipment show up at hamfests all the time. (Again, just make sure it works!)

One item that a lot of hams overlook that is closely related to the power supply is an AC line monitor. It is a meter that simply plugs into the AC line and tells you if the voltage is within tolerance. The electric utilities in the U.S. are excellent, but sometimes the wiring in a house goes haywire. An AC line monitor can save you from making major mistakes chasing problems that aren't there. (I once almost replaced a refrigerator because some lunatic had done a lousy job of splicing the cable running from the circuit-breaker box to the outlet—not to mention that it was a monumental fire hazard!) You can get one of these handy monitors for less than $10 at RadioShack. Highly recommended.

At least one good soldering iron is a must, too. For work with circuit boards, small wires, and such, you will best be served with a 25–40 watt unit. There is a range of soldering irons on the market that fit this bill. At the low end, you have those which consist of nothing more than an AC cord, a handle, and a heating element molded into a single package. The next step up is units that allow you to plug different size heating elements into the handle. You can also get one that has a variable temperature control built into the base unit. The more versatile the unit, the more it costs. How much soldering will you be doing, and what features do you really need? Incidentally, you could substitute a butane gas torch/soldering iron for the electrical one if you will only be using it occasionally.

You probably will want a higher powered unit for working with larger components and antennas. A 140 watt soldering gun will work for medium-duty jobs. These guns are readily available in hardware stores, K-mart, etc. Since we still are stuck with UHF connectors, a major use of soldering equipment is to put PL-259s onto coaxial cable. A 140 watt gun is barely adequate for this job, but you can do it with practice.

A better choice, if you can find it, is a large soldering iron capable of at least 100 watts. These relics from by-gone days have tips that are about 3/8 inch in diameter. They produce plenty of heat to quickly solder the braid to the barrel of the connector. You may have trouble finding one of these in an electronics store, but several hams have written to tell me that they are readily available in craft stores. I understand people use them in making leaded glass and similar crafts.

By the way, if you are going to do repairs on circuit boards and such, you are going to need some means of removing solder. Solder wick is one inexpensive means of doing this, but it does not always get all of the solder out of holes in the board. A solder sucker of some sort will do better. The least expensive and effective is the simple squeeze bulb that resembles a baby's ear syringe. A better choice is the spring-loaded variety that develops a vacuum when you press a trigger. If money is no object, then go for a soldering station that includes a vacuum desoldering tool. Not only is it highly functional, but it will make you the envy of all the hams around. You can tell your spouse that it is useful in sucking dust particles out of DVD players, resulting in much sharper images.

Although it doesn't suck solder away, a high-speed rotary tool (those made by Dremel or similar) can be used to cut all sorts of things away. I've used one for years. Mine came with a set of different bits for grinding, shaping, polishing, and sanding. By far the most useful attachment, though, has been those miniature cutting disks. Those little devils will cut through almost anything, and with them you can get into tight spots that would be impossible with a saw or file. I don't use this tool that often, but when I do it is worth its weight in gold.

There are other tools that can make life simple at the workbench. A frequency counter is a good example. As time goes by, you will want to add more equipment and gadgets to your workbench, but without the workbench, why bother? Who wants another tool or gadget that will just be stored in a box on a shelf in the back on the garage?

73, Peter, WB2D

VHF Plus

BY JOE LYNCH, N6CL

All About The World Above HF

The Meteor Storm Nobody Saw

There have been two meteor storms witnessed by amateur radio operators during the time that records have been kept on such meteoroid activities. The first, the October 6, 1946 *Draconids,* caused by the Giacobinid-Zinner Comet, was spectacular in its effect on the then fairly new 6 meter ham band. The second was the November 17, 1966 *Leonids* meteor storm, which displayed its wonder on the 2 meter ham band. What they have in common is that they also were very visible storms. There was, however, a storm that apparently far surpassed these two, but that no one is known to have seen.

Evidence of this storm has come by way of the Moon. The *Apollo* astronauts left seismometers on the Moon during their missions in the late 1960s. They were used for experiments, known as Lunar Seismic Profiling Experiments, by subsequent Apollo missions, ending with the 1977 Apollo 17 mission. Subsequent to this mission, these seismometers were permanently turned off, thus making no further observations in the past 25 years.

During their lifetime, however, the seismometers detected meteor impacts of known and unknown meteor showers, in particular the *Leonids*. One such mysterious detection occurred during June 1975, when the seismometers sensed a very intense meteoroid onslaught that lasted for around ten days.

A group of Brazilian astronomers, headed by Pierre Kaufmann, became aware of these reports and decided to examine very low frequency (VLF) data for the same period. They published the results of their studies in an article entitled "Effects of the Large June 1975 Meteoroid Storm on Earth's Ionosphere," which appeared in the November 10, 1989 issue of *Science* magazine (pages 787–790).

They decided to use the VLF data because of the known effects of meteor ionization on the *D*- and *E*-layers of the atmosphere. The *D*-layer forms a waveguide effect on signals within the VLF frequency range, transporting them for long distances across the Earth's surface. Meteoroid vaporization would cause phase shifts in the *D*- and *E*-layers and thus phase shifts in the reception of the VLF signals. Therefore, examination of VLF reception records could reveal any meteor-caused detectable effects on these layers of the atmosphere.

First, by examining data from several different VLF transmitters, they concluded that the radiant was low in the sky, in the same general location of the sun. Because of sunlight, the shower (storm) was not visible. However, their examination of the data indicated that the shower was as much as three to nine times as intense as the October 6, 1946 *Draconids* meteor storm.

Was this shower otherwise detected? While it occurred during the normal sporadic-*E* season, could there be any unusual events on VHF during that time frame, or did what was perceived to be normal sporadic-*E* events mask the effects of the shower?

Kaufmann's research indicated that the days of activity were between June 20 and June 30, with the prime days being June 22–23 and June 26–27. An examination of Bill Tynan's "World Above 50 MHz" column in the September 1975 issue of *QST* shows that sporadic-*E* type propagation occurred during these days, with especially intense reports of events occurring on June 22 and June 30.

One of the most interesting reports (to your editor), is of a three-way QSO on June 22 that Bill (then located in Maryland) had with K3AAY and K8CAY, the latter being only 280 miles away, in West Virginia. He convincingly concludes that the mode of propagation had to be sporadic-*E*. He goes on to refer to other reports of very-short-skip contacts during the same day. Oddly, this short-distance propagation was also cited as typical during the October 6, 1946 *Draconids* meteor storm.

In his column Bill also reported on receptions made by Pat, WA5IYX (near San Antonio, Texas), of numerous signals during the days indicated. Most notable was the reception (on June 30) of many sporadic-*E* type signals throughout the FM broadcast band and the low-band VHF television band. These signals were being copied as early as 7:10 AM, Pat's local time. Pat also reported reception of several high-band VHF television stations east of him in Florida. These receptions lasted for as long as 3 minutes at a time. In addition, on the same day, Glenn Hauser, of Enid, Oklahoma, also reported reception of a high-band VHF television station from Florida. Glenn also reported reception of YVVK, a Caracas, Venezuela, channel 3 television station. Although there was an increase in activity on June 30, there were not correlating data in the Kaufmann studies. It is possible that the data they examined were not complete on this day (a point they allude to in their article).

Bill also quoted a report from W7NFC, in Athens, Oregon, that indicated contacts with all states in the W1, W4, and W5 call areas during the day of June 22. He went on to include other reports that specified that day and others during latter June and early July. Bill concluded these reports by observing "...the day-of-days was June 22, with QSOs all over the country [being reported]."

However, these days are during the sporadic-*E* time frame, and any activity could have been (and was) easily

VHF Plus Calendar

Sept. 1	Highest Moon declination. Very poor EME conditions.
Sept. 7	New Moon.
Sept. 8	Moon perigee. Very good EME conditions.
Sept. 13	First quarter Moon.
Sept. 14-15	ARRL Sept. VHF QSO Party
Sept. 15	Lowest Moon declination. Very poor EME conditions.
Sept. 16	144 MHz Fall Sprint.
Sept. 21	Full Moon.
Sept. 21-22	Second weekend ARRL 10 GHz and Up Contest.
Sept. 22	Moderate EME conditions.
Sept. 23	Moon apogee.
Sept. 24	222 MHz Fall Sprint.
Sept. 27-28	Pacific Northwest VHF Conference (see text)
Sept. 29	Last quarter Moon; highest Moon declination. Very poor EME conditions.

• EME conditions courtesy W5LUU

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interpreted as sporadic-*E* caused propagation. As stated, June 22 seemed to be a key day for both data. However, Bill did not report any correlating data on June 26. Could it be that many hams were on the air on Sunday, June 22 and that few hams were on the air on Thursday, June 26? Could it also be that most of the activity was overnight on June 26–27, during which time many hams were in bed, not expecting or suspecting anything out of the ordinary?

For as much meteor shower activity as there was, there seems to be little other correlating amateur radio VHF data (absence of 2 meter reports, for example). Again the question is asked, "Could the amateur radio observations be incomplete because nobody was on the air?'"

Potentially Solving the Mystery

The International Meteor Organization (IMO) lists almost all known visible and radio meteor showers, the latter not being readily visible but are detected by radio or VHF radar signals. Two showers, one visible and the other a radio shower, coincidentally share a near common time frame of activity. For this year, the June *Bootids*, the visible shower, is listed as occurring June 26–July 2, with a peak on June 27. The *beta-Taurids*, the radio shower, is listed as having active dates of June 5–July 17, with a peak on June 28.

On June 27, 1998 Japanese amateur radio operator and astronomer Kazuhiro Suzuki, JA9YDB, operating from the Toyokawa Meteor Observatory in Aichi, Japan, transmitted a series of CW tests for forward scatter on 53.750 MHz using 50 watts into a dipole antenna. He stated his observations as follows: "The short ping echoes remarkably increased to over 3–5 times of the usual [ZHR: 9-15] at [0800–1000 UTC] and maximum hourly rate of echoes reached to 75 at [1400 UTC]. Almost all echoes have short durations. This prominent activity of the June *Bootids* shower ended completely on June 28 UTC." The log of his observations may be found at his URL: <http://www.tcp-ip.or.jp/~kaze/topics/98boods.htm>.

In 1999 the IMO issued an alert that a "resonant swarm" of meteoroids predicted by Dr. David Asher in 1993 (see D. Asher, "Meteoroid Swarms and the Taurid Complex," in *Proceedings IMC, Puimichel 1993*, ed. P. Roggemans, IMO, 1993, pp.88–91) could produce an outburst of *beta-Taurid* meteors in late June and early July 1999. The coinciding meteor activity from the two showers prompted the writers of the Science@NASA URL <http://science.nasa.gov/newhome/headlines/ast28jun99_1.htm> to issue a Radio Meteor Alert. Indeed, their premise was not without some evidentiary support. They quoted Stan Nelson, an experienced radio meteor observer, who stated, "My neighbor and fellow astronomy enthusiast Russ Lockett and I monitored 217 MHz radar returns for meteors this morning [June 27, 1999]. We started at 5:15 AM MDT and noted 46 'blips' by 6:15 AM. It was very active session and ... most of the returns appeared to be typical meteor signatures."

Concerning the above-quoted Asher prediction, this year the IMO indicated the following regarding the *beta-Taurids*: "There is the possibility of a return of the *Taurid* meteoroid 'swarm' during June 2002 according to work done by David Asher, which may be detected as an increased radio meteor flux during the *zeta-Perseids* or the *beta-Taurids*, both of which are probably associated with the Taurid Complex of meteor showers, asteroids, and comets. The most likely time for anything to be detected is about 5–8 days before the *beta-Taurid* peak, thus around June 20–23, but the enhancement could be quite minor, and its timing is unknown. An investigation into events possibly connected with an earlier predicted *Taurid* 'swarm' encounter in June 1999 was inconclusive, though another 'swarm' prediction for the nighttime October–November *Taurids* in 1998 was apparently confirmed by radio and visual data in the last days of October. The Earth will pass similarly close to the center of the theoretical swarm in 2002 June to [the] 1998 October–November [*Taurids*]."

A preliminary search of the literature by your editor has indicated that subsequent to the 1989 work by Kaufmann, no further or follow-up investigations have been made concerning the mystery lunar meteor storm. Probably a lack of supportive data and/or interest has led to the abandonment of any further research into this mysterious meteor storm. However, it is my suggestion that based upon the recent above-cited observations of the June *Bootid* and *beta-Taurid* meteor showers, one or both of them may have played a role in the lunar storm. Both showers have shown unexplained increases in activity in the past, and as Asher and the IMO have observed, there is unpredictability of the *beta-Taurid* shower.

Radio observations of meteor showers all too often have been hit-and-miss

operations because of the absence of high numbers of observers (as are obviously available for visible observations) and because of the lack of readily available equipment to make such radio observations. The only contemporary radio data available at the time of the lunar storm seems to be the *QST* reports cited above.

It is entirely possible that the mystery of the lunar storm may never be solved, principally because of the lack of deliberate contemporary observations being made at the time of the storm. It is one of those accidents of history that the lunar seismometers were available and detected the storm in the first place. Thanks to Kaufmann's efforts in examining VLF data, one dot of the picture has been connected. Are there other dots to be connected that are related to the June *Bootid* and *beta-Taurid* meteor showers? Possibly, but only subsequent historical examination of present and future collected data on these two meteor showers will let us know for sure.

The Extra Class Question Pool

How many questions in the new Extra Class question pool do you intrinsically already know the answers to? As a regular VHF-plus operator, you might surprise yourself.

In July I examined in depth the first question relevant to the VHF-plus operator that appears in the new Extra Class question pool. This month I take a look at another question that has relevancy to the weak-signal operator regardless of his or her class of license. This question, E2C05, is found under the section "E2C Contest and DX operating; spread-spectrum transmissions; automatic HF forwarding; selecting your operating frequency." It reads:

What does a Maidenhead gridsquare refer to?

A. A two-degree longitude by one-degree latitude square, as part of a worldwide numbering system

B. A one-degree longitude by one degree latitude square, beginning at the South Pole

C. An antenna made of wire grid used to amplify low-angle incoming signals while reducing high-angle incoming signals

D. An antenna consisting of a screen or grid positioned directly beneath the radiating element.

We who operate weak-signal and satellite frequencies need to know the answer regardless of our license class, because beginning with our very first QSO with a fellow weak-signal or satel-

lite operator, we will be asked our grid square.

The question is "What does a Maidenhead gridsquare refer to? First, I need to give a bit of a history lesson. Meeting in Maidenhead, England in April 1980, a group of European VHFers gathered to develop a system by which amateurs could identify their QTH using some sort of letter-and-number combination. They did so because a growing number of competing systems were adding considerable confusion to accurately locating a fellow ham, rather than clarifying one's QTH.

During the 1960s a system of grid locators was introduced in Germany as a way of spurring activity on the VHF-plus ham bands. These locators were assigned two-letter designators. Initially, the system worked well enough for the areas it covered in Europe and North Africa. However, worldwide expansion of the system necessitated replication of the same two-letter designators in other geographic areas, causing obvious confusion.

By coincidence, two hams, working independently of one another, tried to alleviate this problem. They developed nearly identical designator systems. Folke Rosvall, SM5AGM, created the first system in October 1979. The system started at the principal dateline and involved 20-degree by 10-degree large units (called fields), 2-degree by 1-degree middle units (called grids), and 6-minute by 3-minute small units.

The second system, developed by Dr. John Morris, G4ANB, in December 1979, also involved 20-degree by 10-degree large units and 2-degree by 1-degree middle units. However, the small units were 5 minutes by 2.5 minutes in size. The proposed starting location for his system was the Greenwich longitude.

While these two systems were the front-runners, there were 20 or so other proposals presented at the Maidenhead meeting. After some debate, the group determined that the best solution would be to modify Morris's system to start at the principal dateline. Hence, the assignment of the name Maidenhead to the alphanumeric system of identifying longitude and latitude coordinates of one's QTH.

Unfortunately, the nomenclature *grid square* has become the genre here in North America, but for an incorrect reason. As indicated, the grids are not square. Rather, as the size indicates, the system is based on a 2:1 longitude-to-latitude ratio. The European designation of *grid locator* is the correct way of identifying the system. Nevertheless, despite extended efforts by both Emil Pocock, W3EP, *QST*'s VHF editor, and myself in our respective VHF columns to deliberately use *grid locator* as the correct designator, *grid square* has stuck, and apparently has now made it into the Extra Class question pool—ironically, even in an incorrect spelling format (gridsquare)!

Where did the term *grid square* originate? You can thank the Central States VHF Society for this inaccurate addition to the annals of VHF-plus activity history. At the 1981 Central States VHF Society conference held in Sioux Falls, South Dakota, the Committee on Society Awards (headed by Lance Collister, then WA1JXN, and now W7GJ) proposed a series of three awards. The first was for making 100 contacts on VHF, the second for making contacts in 100 1-degree by 1-degree grid locators, and the third for scoring 1,000 points by working stations at increasing distances from one's home QTH. Distances were measured on the basis of 1-degree by 1-degree grid locators.

Regarding the nomenclature *grid square*, here is where it all went wrong: In spite of the grid locators for the society's awards program not being truly square anywhere on the Earth's surface, because the award program was based on a 1:1 longitude-to-latitude ratio, its designation took on the incorrect nomenclature of *grid square*. The proposal was adopted (including the incorrect nomenclature), and the awards were put in place and publicized.

In the months that followed the adoption of the awards program, activity on the VHF-plus ham bands did increase, and a few awards were issued in the early years following their inception. However, in a recent conversation I had with Kent Britain, WA5VJB, the society's unofficial historian, he pointed out to me that although the awards are still on the society's books, none have been issued in several years.

The aftermath of the worldwide adoption of the Maidenhead grid locator system brought about the ARRL's development of the VUCC program, which awarded amateurs certificates for contacting other amateurs in given numbers of grid locators per amateur radio frequency bands. With the adoption of the VUCC program, the society ceased to publicize its awards thereby deferring to the League's more extensive awards program, which was based on the Maidenhead grid locator program rather than the society's grid square program.

Despite the changeover to the Mai-

denhead grid locator system, thanks to the society's effort in promoting VHF-plus activity, the name *grid square* incorrectly traveled with the change for us in North America. Europeans still refer to the Maidenhead system as *grid locator*, however.

There you have it, all that you ever wanted to know in order to correctly answer the incorrectly worded Extra Class question. As I pointed out above in the opening of this section, knowledge of one's grid locator is necessary for the weak-signal and satellite operator.

Current Conference

The 9th Annual Pacific Northwest VHF Conference will be held in Bend, Oregon on September 27–28. Sponsored by the recently formed Pacific Northwest VHF Society, the event will kick off with a Friday evening no-host "Pizza Bash" where old friendships can be renewed and new ones made. Saturday's program will include a catered breakfast and a daylong schedule of well-known speakers. At the end of the day a brief business meeting of the Pacific Northwest VHF Society will be held. Cost for this conference is $25.

Flyer and registration forms are available in electronic format from the society's web page at <http://www.qsl.net/pnwvhfs>. For those without internet access, information may be obtained by sending a note and SASE to Pacific Northwest VHF Society, P.O. Box 527, Preston, WA 98050.

Current Contests

The ARRL September VHF QSO Party is Sept. 14–15. For more information visit <http://www.arrl.org/contests/rules/2002/VHFQSO.pdf>.

The 144 MHz Fall Sprint is Sept. 16. The 222 MHz Fall Sprint is Sept. 24. For more information on the Fall Sprints visit the Southeast VHF Society's website at <http://www.svhfs.org> and click on the link on the left side of the screen.

The second weekend of the ARRL 10 GHz and Above Cumulative Contest is Sept. 21–22. For more information visit <http://www.arrl.org/contests/rules/2002/10GHzandUp.pdf>.

Current Meteor Showers

Two minor showers, the *Piscids* (two peaks, Sept. 8 and 21) and the *Aurigids* (Sept. 30) can be seen this month. However, their activity has not been much above what is considered sporadic activity. For more information on these and other meteor showers around the world and year-round go to the International Meteor Organization's website: <http://www.imo.net>.

And Finally . . .

I saw something really remarkable happen at the Ham-Com convention in Arlington this past June. It seems that Keith Pugh, W5IU, AMSAT's Operations Vice President, took Kent Britain, WA5VJB, "Antennas" columnist for *CQ VHF* magazine, seriously when Kent wrote about cheap 435 MHz AMSAT antennas in the spring issue of the magazine. Keith built one of the described antennas and had it on display at the AMSAT booth. At one point he even took it outside and made a satellite contact with it!

There was collective glee among those who witnessed Keith make the contact. Keith and Kent also witnessed how easy it is to inspire others to take on new challenges in our exciting hobby. This is the fun of the hobby—being pioneers in our own way and learning something new in the process—and this column strives to challenge you to also do something new and have fun doing it. When you have done so and want to tell others about it, please let me hear from you so that via this column or *CQ VHF* magazine I can help you tell others about your accomplishments. Who knows? You too may inspire someone to do something a bit more challenging within our hobby.

Until next month...

73, Joe, N6CL

Computers and Internet

BY DON ROTOLO, N2IRZ

Ham Radio's Online Connection

Learning the Code (Computer Code, That Is)

Plastics. There's a great future in plastics. Back in 1967 that was good advice.[1] Now, in 2002, I'll give you some more good advice: *Software. The world runs on software.* Remember that one.

The great software boom started, in my opinion, around the late 1980s, when video games and computers became available to anyone for a reasonable price. Some decades later, software is still one of the few products you can make and sell which costs virtually nothing to reproduce, warehouse, or distribute.

This month I'd like to explore programming a little bit—programming, as in writing software to make microprocessors and computers do things that you find useful. Now before we get started, please understand that there is no way that I can teach you how to program *anything* in the space allocated to this column. A good tutorial wouldn't fit in a year's worth of *CQ*. However, that doesn't mean you can't learn something today, and maybe gain a toehold in something sure to enhance your enjoyment of amateur radio.

Programming can be as simple as storing a frequency in your HT's memory, or as complex as a full-blown application written in Visual Basic. We have hundreds of opportunities to program things. While this can lead to confusion, the proliferation of different ways of writing computer software (called *code* by programmers) actually has made it much easier for regular folks like you and me to learn it. With such a wide variety available, there is bound to be something that will fit your needs and skills perfectly.

Languages

Before I go further, let's talk about programming languages. Just as in human speech, there are many programming languages available to us. You can accomplish more or less the same things with almost any programming language, although some are better suited to certain tasks than others. These languages have names such as BASIC, COBOL, Pascal, C++, Fortran, Java, and the like.

Older languages, which were originally intended to be run on large mainframe computers, tend to be *linear* in nature. That is, each instruction is on its own numbered line, and the computer executes each line in order. Newer languages, written for the Graphical User Interface (GUI) environment (such as Windows™), tend to be *event-driven*, in which some event (such as a mouse click) causes a little snippet of the program to execute.

BASIC (an acronym for Beginners All-purpose Symbolic Instruction Code) is a great language for a beginner to learn. Although it is a linear language, it exposes you to all the major programming concepts and types of commands available in most languages, is reasonably powerful, and is readily available (see Resources box). BASIC in its regular form is included with most versions of DOS (I said it was older!) and has been adapted to many simpler microprocessor platforms, the most notable of which is the Basic Stamp from Parallax Corporation. I strongly recommend that you try some form of BASIC for a first effort.

For more advanced programming efforts, look towards a more modern Object-Oriented Programming (OOP) language, such as C++ or any of the Microsoft "Visual" series. My current expertise is in Microsoft Visual Basic (which, despite the name, is very unlike BASIC). It combines OOP with simplified GUI programming.

OOP

For the record, OOP is a very powerful, but often misunderstood, concept in modern programming. OOP is a concept in which you bundle more complex events or processes into an "object." It becomes a lot easier to handle the "object" than its individual pieces. This greatly simplifies operations that are very complex (but not impossible!) in non-OOP languages.

As an example, you could write a program that treats a Microsoft Word document as an object. That makes any operations on the document very simple, as you don't care about what is inside the object. To print a document from Visual Basic using the default printer, you simply would write: **Document1.Print**, and it would happen. You can also change the properties of the object—i.e., **Document1.Orientation = Landscape**, and when you send it to the printer it will print sideways. Essentially, an object is just a convenient way of bundling up something so it's easier to program with, and it's not a concept to be afraid of.

Enough of that. Let's look at some of the things you can do.

Robots

I bought a Lego MindStorms robot kit the other day for my seven-year-old daughter. I promised her we'd build a robot sometime, and I had been considering one I saw in the Jameco catalog which follows a line drawn on the ground. She, on the other hand, wanted a robot that would clean her room for her. After I explained the slight differences between the two projects, she agreed that maybe we should start out simple and work our way up.

The MindStorms programming language is simple to learn, and the hardware couldn't be easier (They're Legos!). You build a robot using motors and sensors, write a program on your regular computer, and load it into the controller module, where it (hopefully) does what you want it to do. While the programming language that comes with the MindStorms kit

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[1] The "Plastics" quote comes from the 1967 film The Graduate. *Visit <http://www.filmsite.org/grad.html>, or browse to <http://www.sdplastics.com/oneword.ram> for a sound bite.*

21st Annual Digital Communications Conference

In just a few days TAPR and the ARRL will present the 21st annual Digital Communications Conference. This year it's being held at the Denver Marriott Southeast Hotel, Denver, Colorado, September 13–15. If you are within driving distance, or can somehow get to Denver for the weekend, you will not be disappointed. This is the annual meeting of the doers in digital communications, a treat not to be missed. For more info visit <http://www.tapr.org/tapr/dcc/>.

is somewhat limited, there are others available (on the internet) that allow you to do more.

Computers

Some years ago, I had a business problem that wouldn't go away. It involved cataloging the locations of various parts of a complex assembly so a repair technician could locate the parts he was looking for. I started keeping a notebook of where these parts were, but that became tedious to maintain. I got a copy of Visual Basic (VB) and wrote a kind of database program which showed where the parts were with a photo and descriptive text. The program was a hit and ended up being distributed worldwide.

Before I started, I'd never used VB. By the name, I was fooled into thinking it was just like the BASIC I learned to use in high school. I ended up buying a book and learning through trial and error (mostly error) how to write VB code. The point is, don't try to learn how to program until you have something in mind you want to accomplish. That way you have a goal and can learn as you go. Without a goal it can become an exercise in frustration.

As an added bonus, nearly every Microsoft application today (such as Word, Excel, Access, etc.) uses a version of VB for its "macro" language, known as Visual Basic for Applications (VBA). If you know VB, you know most of VBA, and vice-versa. Think of how valuable that skill could make you at work. I know what it's done for me!

Microprocessors

For the 15th Digital Communications Conference some years ago I helped write a paper on a 9k6 G3RUH-type Packet modem for the parallel port, implemented using a PIC microprocessor. The computer did most of the TNC work, but the modem had to provide the link between data and audio. The hardware was surprisingly simple, and the whole trick was in using some fancy software. Eventually marketed as the PICpar modem, it allowed users to implement 9600 baud packet stations for just a few dollars.

The Basic Stamp series by Parallax, and many similar products, are designed for ease of programming. They are powerful enough to do almost any smaller job, inexpensive enough to lose, and easy enough for a grade-schooler. The reference materials alone are worth studying, and you can make some really nifty, useful projects almost from thin air. Morse code keyers or decoders, a balloon controller, timers, robots—the possibilities are endless. This is an excellent way to get into programming, and you can even create useful and really marketable products for a very small investment.

How do you think all those logging programs got started? Yep, a ham with a problem to solve. How about a better rotator controller? I haven't even begun to talk about internet programming, what with Active-X, Java, and even HTML. I ran out of space already!

The Rest

A fact of life today is that almost anything electronic has some software inside it. While the software in your new HT is probably hard-coded in silicon (which is less expensive and more durable than using programmable memory), your large HF rig might actually be reprogrammable. At least the DSP filters, which are pure software, are fair game. DSP has other uses besides filtering, including modulation, demodulation, and even spectrum displays. *(Experiment, but be cautious and be sure you know what you're doing before you start reprogramming your rig. You don't want to reprogram it right into the repair shop.—ed.)*

I guess what I'm trying to say is this: Software is everywhere, the possibilities literally are endless. It isn't difficult or expensive to write your own. Try it; you might be surprised.

Until next time . . . 73, Don N2IRZ

Resources

BASIC Language: While there are many on-line resources, try <http://dmoz.org/Computers/Programming/Languages/BASIC/> for some excellent links.

LEGO makes the MindStorms line of programmable robots and accessories. Visit them at <http://mindstorms.lego.com/>.

Microsoft offers a wide range of programming languages, including their popular and powerful Visual series. Visit them at <http://www.microsoft.com/catalog/navigation.asp?subid=22&nv=3>.

Parallax Inc. makes the Basic Stamp series of microcontrollers. Visit them at <http://www.parallaxinc.com/> and download free documentation and utilities. See <http://www.basicmicro.com/> for a competitor's similar products and <http://www.nutsvolts.com/stmpindx.htm> for some great articles about Stamps.

PICs are manufactured by Microchip, Inc. Visit them at <http://www.microchip.com/index.asp>.

At the Tucson Amateur Packet Radio site <http://www.tapr.org/tapr/html/Fcnc15.html> you can listen to a presentation about the PICpar modem, given by Keith Sproul, WU2Z, when I could not attend at the last minute.

DX

BY CARL SMITH, N4AA

News Of Communication Around The World

"Where's My Card?"

The lull in summertime propagation is upon us as I write this. There aren't many DXpeditions scheduled for this time of year, but we have other activities to keep us busy, along with all of the usual family obligations.

QSLing—Again

With fewer DXpeditions to "chase," it seems as if DXers are spending more of their time thinking about collecting those needed QSL cards—not only thinking about it, but going after them somewhat aggressively.

There were several DXpeditions earlier this year, and the cards have been getting out, some more slowly than others. It's those "more slowly" that some DXers seem to be worried about. It seems to me that we all have become too obsessed with getting answers to our QSL requests by "return mail." Come on, folks, you can't expect anyone to go on a DXpedition, make 20,000 QSOs, come back home to boxes and boxes of envelopes of QSL requests, and have cards printed and mailed back to you within a week. That's totally unreasonable, and it's time all of us acknowledged that fact.

How many of you have even seen 500 QSL requests, let alone 5,000 or 10,000 at one time? Not many, I'm sure. How long do you think it takes just to open the envelopes, remove the contents, and stack the cards/envelopes to be answered? Once the envelopes have been opened, then the computer log (at least we hope that many contacts are on a computer) has to be checked to verify the contact(s). If labels are being printed, that comes next. Then the label has to be affixed to the card and the card has to be stamped with a "VERIFIED" rubber stamp (that's the usual way). The card(s) next must be put in your return envelope and the envelope sealed. You did put return postage on the envelope, didn't you? For requests from outside the country of the QSL Manager, postage still has to be put on the envelope before it can be put in the mail.

I'm exhausted even writing about this. There is a *lot* of work involved in answering QSL cards, and when you consider there could be thousands of the above actions required . . . well, would you want the job? QSL Managers are typically volunteers with jobs and families. They do have a life outside of QSLing.

What do you say? Let's give these folks a break and not start hounding them with "Where's my card?" until they have had a reasonable length of time to get everything done. There are exceptions, so please don't shoot the messenger. Most DXpeditions take QSLing very seriously and recognize that you

(Left to right) Paul, K5RT, CQ's WAZ Award Manager, Roger, G3LQP, and Mike, KH6ND. Paul presented a 5 Band WAZ plaque to Roger, who took hold of it tightly! He had worked so very hard to get it, there was no separating him from that award. The smile on his face never faded for the entire Dayton weekend. Congratulations to Roger and a huge thank you to Mike for helping make it possible. (Photo by Carl, N4AA)

P.O. Box DX, Leicester, NC 28748-0249
e-mail: <n4aa@cq-amateur-radio.com>

The WPX Program

SSB

2834.....WW3K
2835.....JA3EY
2836.....KT2C
2837.....EA4AQQ
2838.....OH8MWD

CW

3092.....DL1MBI

Mixed

1900.....WW3K

CW: 450 DL1MBI. 950 WD6CKT. 950 W4GP. 2150 K9UQN. 3550 K9VB. 3800 N4NO.

SSB: 400 N4OWG, EA3FYD. 450 WW3K. 700 KU4BP. 750 VE3NQK. 950 VE7SMP, W4GP. 3250 N4NO.

MIXED: 650 WW3K. 1350 WD6CKT. 1450 W4GP. 2500 K9UQN. 3700 WB2YQH. 4350 N4NO.

15 meters: LZ1CY

No. America: WW3K
So. America: LZ1CY
Europe: JH8WGT, EA3FYD
Oceania: LZ1CY

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, KU0A, 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.*

The WAZ Program

10 Meter SSB

537 ..... PY2DBU

15 Meter SSB

578 ..... DS5GSP 579 ..... PY2DBU

20 Meter SSB

1097 ..... PY2DBU

12 Meter CW

32 ..... WA5VGI

17 Meter CW

42 ..... JN3SAC

40 Meter CW

227 ..... NA2X

6 Meters

51 ..... N8KOL (26 zones)
52 ..... K2YOF (26 zones)
53 ... WA1ECF (26 zones)

160 Meters

178 ..... W9NGA (34 zones)

All Band WAZ SSB

4780 ..... EA1CS
4781 ..... IK2UWA
4782 ..... DH6LS
4783 ..... K3MI
4784 ..... CT1EHX
4785 ..... IK3AES
4786 ..... JA2YIP
4787 ..... N6DHZ
4788 ..... BV2RS
4789 ..... EA8RR
4790 ..... KA4RRU
4791 ..... HL4CBX
4792 ..... DL3SUG
4793 ..... W5AVU

Mixed

8164 ..... NW4V
8165 ..... GU4YOX
8166 ..... YB2PBX
8167 ..... EA5AIH

All CW

316 ..... N5ZM
317 ..... KA4RRU
318 ..... EA1WX
319 ..... AE0Q
320 ..... HL2FDW
321 ..... I1RQJ
322 ..... N8MR

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>.

DXers want that confirmation in your hand. They will do whatever is necessary to accomplish that task as quickly as possible.

You also might want to consider the fact that many DXpeditions have their QSL cards donated and that the donor has to wait for artwork, etc., before he or she can even start printing the cards. You all like the pretty, full-color cards, and it takes time to prepare, and print, such cards. If we all were satisfied with QSL cards that merely confirm the contact, rather than one which has all the "bells & whistles," then the cards could be printed and waiting when the team gets home. Are we our own worst enemy in this regard? Do you want the confirmation or do you want the pretty wallpaper?

By the way, what do you do with all that pretty "wallpaper"? Is it really wall-

Timo, OH1NOA, Ari, OH1EH, and Seppo, OH1VR, at the DX Publishing booth at Dayton show off the WRTC 2002 commemorative crystal candle holders. (Photo by N4AA)

paper, or do you stick your cards in a binder or a drawer? Unless you are displaying all of those cards for others to see, does it really matter if it is an expensive full-color, folded card? If all you want is "confirmation," a simple card will suffice. If you want the full-color type, would you donate more money and wait longer to get it? Think about that.

I haven't heard anything lately about the E-QSL project at the ARRL. If we could be satisfied with this type of confirmation, it could go a long way toward putting a stop to the constant haggling over "Where's my card?"

Speaking of QSLs . . .

Some time ago I received an e-mail from François Bergez in Macon, France. François is a member of a French Logistics Team that goes to the geographic North Pole each April. He says they establish a drifting base at 89 degrees north latitude, named Borneo, for scientific research.

Choon, XW1CW/E20HHK, at one of the stations during the XW1HS operation. Choon was the license coordinator for the DXpedition. (Photo courtesy Champ, E21EIC)

François is not a licensed amateur, but an SWL. His hobby is collecting polar QSL cards from the North or South Pole regions. If any of you have cards you would care to share with François (I'm sure even a good copy would be appreciated.), his address is: François Bergez, 6 rue de la Liberte, F-17000 Macon, France.

Field Day 2002

We've just finished the annual ARRL Field Day event. This is always a big one for us in the U.S., and this year they added all of Region 2 to the participation, thus increasing activity. For me, it wasn't all that great. I was relegated to 80 meters CW this year, and conditions

5 Band WAZ

As of July 15, 2002, 602 stations have attained the 200 zone level and 1282 stations have attained the 150 zone level.

New recipients of 5 Band WAZ with all 200 zones confirmed:
N0AV

The top contenders for 5 Band WAZ (zones needed, 80 meters):

N4WW, 199 (26)
W4LI, 199 (26)
K7UR, 199 (34)
W0PGI, 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)
EA5BCX, 198 (27, 39)
G3KDB, 198 (1, 12)
KG9N, 198 (18, 22)
K0SR, 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)
W6BCQ,198 (37,34on40)
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)

The following have qualified for the basic 5 Band WAZ Award:

IK3TZB (151 zones)
IK8BIZ (186 zones)
I1NVU (153 zones)
I5KHX (153 zones)
RV1CC (190 zones)
W9NGA (199 zones)

Endorsements:
N8KOL (180 zones)
K1AR (200 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>.

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 333	EA2IA 333	NØFW 332	W6DN 330	W4QB 327	WA8DXA 325	KE5PO 322	CT1YH 313	F6HMJ 296
K2FL 333	F3AT 333	W8XD 332	W2UE 330	I1JQJ 327	I5XIM 325	W7IIT 322	N7WO 312	WG7A 295
K9BWQ 333	DJ2PJ 333	WØHZ 332	I4LCK 330	YU1TR 327	K5UO 325	K6CU 321	K9DDO 312	KD8IW 288
K2ENT 333	K2JLA 333	WØJLC 332	VE7CNE 330	I4EAT 327	N5HB 325	N4OT 321	W3II 312	EA3BHK 282
N7FU 333	W7CNL 333	K8LJG 332	4N7ZZ 330	DL8CM 327	YU1AB 325	HA5DA 321	YT1AT 310	YC2OK 282
K3UA 333	YU1HA 333	KA7T 331	K3JGJ 330	SM6CST 327	IK2ILH 325	VE7DX 320	KF8UN 308	UA9SG 279
K9MM 333	PA5PQ 333	N5FG 331	N4AH 330	N4KG 327	W4UW 325	HA5NK 319	PY4WS 308	XE1MD 278
K2OWE 333	DL3DXX 333	PT2TF 331	K7LAY 329	IT9TQH 326	N5FW 325	K1FK 318	IKØADY 307	EA2CIN 278
N4MM 333	IT9QDS 333	K6LEB 331	K9IW 329	K7JS 326	9A2AA 325	G3KMQ 317	W6YQ 306	I3ZSX 276
W4OEL 333	G4BWP 333	N4JF 331	WB4UBD 329	I2EOW 326	LA7JO 324	K8JJC 315	YU7FW 306	G3DPX 275
W7OM 333	N7RO 332	VE3XN 331	G3KMQ 329	NC9T 326	SM5HV/HK7 324	WG5G/QRPp 315	LU3DSI 302	
F3TH 333	K6GJ 332	W1WAI 331	KZ4V 329	K4JLD 326	W6SR 323	OZ5UR 315	F5OIU 302	
WB5MTV 333	K4IQJ 332	K2JF 331	K1HDO 328	OK1MP 325	9A2AJ 323	HB9DDZ 314	KH6CF 301	
W2FXA 333	K4CN 332	N4CH 330	K8PV 327	W4LI 325	KUØS 322	N1HN 313	KØHQW 299	

SSB

K6YRA 335	IK8CNT 333	YV1KZ 332	EA1JG 331	W2FKF 329	UY5XE 327	K5NP 322	NØMI 313	OA4EI 292
K4MZU 334	VK4LC 333	YV1AJ 332	K1UO 331	KE4VU 328	K6BZ 327	NI5D 322	KD5ZD 312	KØOZ 291
K2TQC 334	N5FG 333	W2FXA 332	YV5IVB 331	K1HDO 328	KE5K 327	PY2DBU 322	W5GZI 311	I3ZSX 290
W6EUF 334	DJ9ZB 333	W8ZET 332	VE4ROY 331	K5UO 328	W6SR 326	LU5DV 322	WZ3E 311	N8SHZ 290
K2JLA 334	EA2IA 333	OE2EGL 332	KX5V 331	KF8UN 328	N4KG 326	WR5Y 322	VE3CKP 311	W4PGC 288
K4MQG 334	XE1L 333	KSØZ 332	I8LEL 331	EA3EQT 328	K7TCL 326	XE1CI 321	CT1YH 311	YV5NWG 287
IK1GPG 334	4N7ZZ 333	N5ZM 332	K9OW 331	KB2MY 328	W5LLU 326	W6MFC 321	YV5NWG 311	RW9SG 286
K5OVC 334	KE5PO 333	WB4UBD 332	W2CC 331	AE5DX 328	W9HRQ 326	N3RX 321	LU3HBO 310	N5WYR 286
NØFW 334	PY4OY 333	WB3DNA 332	W4WX 330	W2JZK 328	W4QB 326	WA4ZZ 321	SV3AQR 310	VE7HAM 285
OZ5EV 334	VE1YX 333	CT1EEB 332	W9SS 330	KZ4V 328	K8PV 326	CT1ESO 321	HA6NF 310	KKØDX 285
K9MM 334	XE1VIC 333	K4CN 332	W7FP 330	KD8IW 328	DL6KG 326	YT1AT 321	HB9DDZ 310	F5RRS 284
DU9RG 334	IN3DEI 333	K9PP 332	WDØBNC 330	ZL1BOQ 328	W4LI 326	EA8TE 321	EA3BHK 307	CT1CFH 284
N7BK 334	I4LCK 333	W6SHY 332	K8CSG 330	I1EEW 327	IKØIOL 325	SV1RK 320	N1ALR 306	WØIKD 283
N7RO 334	VE3XN 333	I8KCI 332	W6DN 330	SV1ADG 327	K1EY 325	K3LC 320	XE1MDX 305	EA3CYM 283
W6BCQ 334	OE7SEL 333	LU4DXU 332	WA4IUM 330	DL8CM 327	K9IW 325	N4CSF 320	EA5OL 305	W9ACE 283
XE1AE 334	W2JZK 333	W5RUK 332	EA3KB 330	W2FGY 327	WA4JTI 325	N4HK 320	WB2AQC 305	AC6WO 283
K5TVC 334	EA4DO 333	VE3MRS 332	YV1CLM 330	I1JQJ 327	NI5D 325	DL3DXX 320	N1KC 305	F5JSK 281
K2FL 333	VE3MR 333	VE2WY 332	K9HQM 330	F9RM 327	KC4MJ 325	KØFP 320	KE4SCY 304	WN6J 281
K6GJ 333	PA5PQ 333	VE2GHZ 332	LA7JO 330	XE1MD 327	K7HG 324	EA1JG 320	KC4FW 304	YU1TR 280
K2ENT 333	K8LJG 333	VE7WJ 331	WS9V 329	I4EAT 327	AC7DX 324	EA7TV 320	K3BYV 303	KK5UY 280
K7LAY 333	W8AXI 333	PT2TF 331	I2EOW 329	W3GG 327	KØHQW 324	WA4DAN 319	YC2OK 303	KA5OER 280
ZL3NS 333	K3UA 333	W8KS 331	K2JF 329	AA6BB 327	WØULU 324	CE1YI 318	WB2NQT 303	EA3CWT 278
N4MM 333	K4JLD 333	W3AZD 331	ZL1AGO 329	SM6CST 327	W9IL 324	YV4VN 317	VK3IR 303	VE2DRN 277
OZ3SK 333	WØYDB 333	OE3WWB 331	N5FG 329	W9OKL 327	EA3BKI 323	EA5GMB 317	W2GZI 302	XE2NLD 277
N4CH 333	VE4ACY 333	DL9OH 331	DU1KT 329	WD8MGQ 327	K4JDJ 323	W5OXA 317	N5QDE 302	9A9R 277
IØZV 333	W4UW 332	N2VW 331	4Z4DX 329	CX4HS 327	EA3BMT 323	CT1AHU 316	KD4YT 302	W6UPI 276
W7OM 333	K9BWQ 332	YZ7AA 331	VE7DX 329	IØSGF 327	WW1N 322	N5HSF 316	YT7TY 300	VE2AJT 275
KZ2P 333	KØKG 332	YV1JV 331	N5ORT 329	IT9TQH 327	F6BFI 322	K6RO 316	4X6DK 300	Z31JA 275
K7JS 333	W4NKI 332	WA4WTG 331	CT1EEN 329	IT9TGO 327	K6CF 322	CP2DL 314	KK4TR 293	G4URW 275
W4UNP 333	VE2PJ 332	N4JF 331	K3JGJ 329	DK5WQ 327	LU7HJM 322	K9YY 313	K7ZM 292	

RTTY

K2ENT 331	NI4H 321	W2JGR 316	KE5PO 297	I2EOW 291	EA5FKI 284	W4QB 280	YC2OK 280	PA5PQ 272
WB4UBD 325	K3UA 317	G4BWP 312	W4EEU 291	I1JQJ 289				

certainly didn't favor that band/ mode from our location. I did have a lot of fun using a 30-year-old Drake C-line and a really old Hallicrafters HA-1 keyer, though. The equipment came from our local Southern Appalachian Radio Museum, and we operated from a converted school bus right outside the building in which the museum is located. The bus actually belongs to the county Emergency Preparedness Agency and is one of their Emergency Operating vehicles. With its own generator, air conditioning, etc., it made a great operating facility for Field Day.

Do you recognize these guys? On the right is Wayne, W4MPY (The QSL Man), who prints a lot of QSL cards for Steve, KU9C (left). Steve is one of the "big guns" in answering your QSL requests for DXpeditions. They both happened to be at the DX Publishing booth at Dayton. (Photo by N4AA)

Recent Contests

The IARU HF Championship along with the WRTC 2002 activity (from Finland this year) are now history. This always generates a lot of activity for us to hone our skills for future operations.

Using virtually identical stations, the 52 teams competing in the WRTC 2002 event used the brand-new prefix OJ to make things even more interesting. The team of Jeff Steinman, N5TJ, and Dan Street, K1TO, using OJ3A from the station of OH2HXP, came out on top. This was the third straight win for this team. Second place went to the Russian team of RA3AUU and RV1AW operating as OJ8E from the station of OH3AXA. Third place went to DL2CC and DL6FBL as OJ2V from OH1XX's station. Hearty congratulations to all who participated as the OJ stations!

The annual IOTA contest at the end of July will add a lot of activity, too. These things will be old news by the

CQ DX Awards Program

CW

1031.....HP2CWB

RTTY

33.....HP2CWB

SSB Endorsements

320.....K6YRA/335
320.....K4MZU/334
320.....K2TQC/334
320.....W6EUF/334
320.....K2JLA/334
320.....K4MQG/334
320.....IK1GPG/334
320.....K5OVC/334
320.....N0FW/334
320.....OZ5EV/334
320.....K9MM/334
320.....DU9RG/334
320.....N7BK/334
320.....N7RO/334
320.....W6BCQ/334
320.....XE1AE/334
320.....K5TVC/334
320.....K3UA/333
320.....W8AXI/333
320.....K4JLD/333
320.....W0YDB/333
320.....VE4ACY/333
320.....VE2GHZ/332
320.....ZL1BOQ/328
320.....LU5DV/322
320.....WA4ZZ/321
320.....YT1AT/321
320.....CT1ESO/321
275.....VE7SMP/284
200.....YU7FW/200

CW Endorsements

320.....N0FW/332
320.....K4JLD/326
310.....YT1AT/310
300.....YU7FW/306
250.....HP2CWB/253

RTTY Endorsements

310.....K3UA/317
150.....HP2CWB/155

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.

time you read this, but I hope you all had a chance to participate in at least some of them.

And Finally . . .

Hopefully we will see more stable propagation in the near future, and with the late-year changes in propagation, perhaps we will see more DXpeditions to generate more activity on the bands.

Speaking of DXpeditions, I am thinking about who needs what. The annual DX Magazine Most Wanted Survey will be conducted during the months of September and October. The survey is available on the web at <www.dxpub.com>. If you are not connected to the internet, the survey will be available through various DX clubs and conventions. The results of the last survey are also available at the above website.

Meet the hams of Sao Tome (left to right): Luís Beirão, S9LB, and wife Berta; Tom Wojciechowski, S9TX; Lesley Lewis, S9YL; Charles Lewis, S9SS; and Angus Gascoigne, S9AG. (Photo courtesy Charles, S9SS)

I do appreciate the comments and suggestions that come from readers of this column. I've heard from a lot of you, and I do try to respond as much as is possible. However, like many of you, I have a family and home-owner obligations that must be attended to. I may even find time to get on the air once in awhile. Perhaps I'll find you there?

Have fun. Work lots of DX, and I'll be back again next month with more on the world of DXing.

73, Carl, N4AA

QSL INFORMATION

2Q0APH via M0DXR
3A/IK1OWC via I1YRL
3A/IK1SLP via I1YRL
3A100GM via I1YRL
3D2DX via EA4DX
3D2XU via PA3AXU
3D2ZF via DK2ZF
3DA0CF via K5LBU
3G1X via XQ1IDM
3V8KO via I5JHW
3W2AP via HL2AQN
3W2LC via VK6LC
3W6GM via DF5GF
3W6LC via VK6LC
3XA8DX (CW) via DJ6SI
3XA8DX (SSB) via DL1QW
3Z0EMC via SP6ECA
3Z0ZAG via SP8AJC
4A3R via XE3RCC
4J3M via 4Z5LO
4K6DI via W3HNK
4L4MM via ON4FCI
4N1KW via DJ0LZ
4N6IOTA via YU7DR
4U0ITU via I1YRL
5B4/G3NOM via GM4FDM
5B4ABP via OE2GEN
5C8M via DL6FBL
5H3PM via I1YRL
5N41EAM via IK2IQD
5N6EAM via IK2IQD
5R8EW via AD6KA
5R8GN via FA1AWH
5R8GQ via AD6KA
5V7XO via VE2XO
5W0DL via K8AA
5X1CW via F6GQK
5X1HR via KF7E
5Z4DU via KE4DA
6V6U via 6W6JX
6Y2A via WA4WTG
701CL via G4HCL
7Q7BP via G3MRC
8A3M via IZ8CCW
8J2C via JA1KSO
8P4A via VE3DZ
8P4A via VA3UZ
8P9EG via K4BAI
8Q7PA via PA0LPE
8S4C/5 via SM4DDS
8S5T/0 via DF6JC
9A0A via OK1FLM
9A0LH via 9A7K
9A0R via DJ2MX
9A8RR via OM7JG
9E1C via IV3OWC
9G1AA via PA3ERA
9G5DX via JH8PHT
9H0A via LA2TO
9H3BC via DF6MS
9H3UT via DL9GDB
9H3Z via ON4BAM
9J2CF via K5LBU
9K9O via KU9C
9L1CF via K5LBU
9L2CF via K5LBU
9M2/G3NOM via GM4FDM
9M6A via N2OO
9M8RC via 9M8MA
9V1BH via UA0AGI
9Y4/NG5E via NG5E
9Z4BM via 9Y4NZ
A35RK via W7TSQ
A35ZF via DK2ZF
A45WD via YO9HP
A52NOM via GM4FDM
A61AF via W4CK
A61AJ via N4QB
A61AO via N1DG
AH6PN/HR6 via W7TSQ
AM1AEH via EA1AEH
AN2BDS via EA2BDS
AN8NQ via EA8NQ
AP1A via AP2A
AP2AUM via KK5DO
AX8AM via VK4EJ
AY1ECZ via EA5KB
BA4DX via BA4CH
BA4EG/8 via BA4EG
BV4VE via BV4KR
BZ4DHI via I1YRL
C56JJ via PA9JJ
C6AJR via W8GEX
C6ALG via N5PA
C6ARJ via W8GEX
C6DX via N8QET
CA0YAM via CE1VLY
CB4A via CE4USW
CE0Y/7K1WLE via JN1HOW
CG1JA via VY1JA
CI1JA via VY1JA
CI1RAC via VY1JA
CK1JA via VY1JA
CK3JA via VY1JA
CK5JA via VY1JA
CK7JA via VY1JA
CK9JA via VY1JA
CM2AI via EA7FTR
CM8RPD via EA7FTR
CN8LI via ON4ANT
CN8WW via DL6FBL
CO2TI via EA7FTR
CP6AA via W3HC
CP6XE via IK6SNR
CQ2EHX via CT1EHX
CS8W via DJ9MH
CT3/K7BV via KU9C
CT7T via ON5UM
CT9M via CS3MAD
CU3FT via EA7FTR
CU9/CT3FN via HB9CRV
CU9AB via WA3HUP
CU9D via WA3HUP
CY9DH via W7XU
DA1VC via G0TQJ
DL0FFF via DL1WH
DT4FWC via HL0IHQ
E20HHK via E21EIC
E20HHK/6 via E21EIC
E20NTS/8 via E21EIC
E22DX via GM4FDM
E28DX via GM4FDM
EA6/SP4AOQ via EC6TK
ED6DD via EA6IB
EH9IB via EA9IB
EK1700JJ via W6QKB
EK3GM via DK6CW
EK4GK via W6QKB
EK4JJ via W6QKB
EK6LF via DJ0LZ
EL2AR via EL2BA
EM3J via KG6AR
ER4DX via UT7ND
ES0/UA1CIO via RZ1AK
ES2RW via ES2RIQ
ES9C via ES5RY
EU6DX via G0RWR
EW/NP3D via W3HNK
FG/F5CW via F8CMT
FM5BH via W3HNK
FO/7K1WLE via JN1HOW
FO8DX via JF1SQC
FP/K9WM via NN9K
FP5KE via F5TJP
FR5ZU/T via JA8FCG
FT1Z via F4DOT
G3NOM via GM4FDM
G5BXP via DK2ZF
GB2COS via G7BQY
GB5SI via MM0BQI
GM5A via GM0RLZ
GM6UW via M0BLF
GM7X via G3SQX
GQ5LP via G5LP
GQ6YB via G3SWH
GU3MHV via G3MHV
GU4WHV via KP3YL
HA40ZH via HA1ZH
HB9A via HB9JOE
HC8A via KU9C
HG450EV via HA6KVB
HG6N via HA6KNB
HH2PK via N3SL
HL17CFY via HL2CFY
HQ4C via HR2NLL
HR2/AC4LN via UA4WHX
HR3J via JA6VU
HR3J via JA6WFM
HS0/G3NOM via GM4FDM
HS0AC via G3NOM
HS0AC/2 via G3NOM
HS4BPQ/9 via E21EIC
HS7CDI via HS0/7L1MFS
HT4T via TI4SU
HZ1AB via K8PYD

(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>.)

Contesting

BY JOHN DORR, K1AR

News/Views Of On-The-Air Competition

Are Computers Hurting Contesting?

September's Contest Tip of the Month

In the world of trade shows and exhibitions, there is the concept of staging equipment—in other words, setting up all the gear ahead of time to make sure everything works in the precise configuration that has been planned. A similar requirement should exist for your contest station. Some of the more successful station owners credit a portion of their results to consistent configurations that stay in place year round, or at the very least are tested well in advance of the contest season. Now not all of us have this luxury, but the more you can "stage" your setup in advance of a contest, the more likely it is that you will avoid problems during the contest.

Calendar of Events

Aug. 24-25	SCC RTTY Championship
Aug. 24-25	Ohio QSO Party
Ag.31-Spt.1	YO DX HF Contest
Sept. 7-8	All Asian SSB Contest
Sept. 7-8	IARU Region 1 SSB Field Day
Sept. 8	North American CW Sprint
Sept. 11-13	YLRL Howdy Days
Sept. 14-15	Worked All Europe SSB Contest
Sept. 15	North American SSB Sprint
Sept. 21-22	Scandinavia Activity CW Contest
Sept. 21-22	Washington State Salmon Run
Sept. 22-23	Fall Classic (& Homebrew) Radio Exchange
Sept. 28-29	**CQ/RJ WW RTTY DX Contest**
Sept. 28-29	Scandinavia Activity SSB Contest
Sept. 28-29	Texas QSO Party
Sept. 28-29	Louisiana QSO Party
Oct. 5-6	Oceania SSB DX Contest
Oct. 5-6	California QSO Party
Oct. 5-6	QCWA QSO Party
Oct. 6	ON SSB Contest
Oct. 6	RSGB 21/28 MHz SSB Contest
Oct. 26-27	**CQ WW DX SSB Contest**
Nov. 23-24	**CQ WW DX CW Contest**

This year at the Dayton Hamvention® Contest Dinner, Leif Ottosen, OZ1LO, was added to the distinguished list of CQ's Contest Hall of Fame members. Nominated by the Danish DX Group, Leif's achievements in CW contesting as well as his knowledge of propagation and DX have made him well known and respected around the world.

As a group, contesters take credit for a significant share of the technical advancements within amateur radio, and rightfully so. We have been at the forefront of many of the high-profile improvements in our hobby, ranging from antennas to packet radio/computers to our influence on manufacturers around the world.

When I compare the competitive contest station of today to one of 30 years ago, the differences are truly amazing. In the 1960s/70s our equipment had to "warm up" when it was turned on. There really was no automatic "anything" in most shacks. Instead of computer-controlled antenna switching directly integrated with the latest in logging software, there were large, clunky switches that moved us from band to band. Our logging software was simply a piece of paper and a No. 2 pencil. In today's world, for the young contester dupe sheets have the same relevance as vinyl LP records. Nowadays a contester struggles with the relevance of an old rule that used to invoke penalties based on one's submitted dupe percentage. After all, what's a dupe percentage in the first place? At best, today's definition would categorize that as a software bug.

In years past only a few contest stations would consider stacking Yagi antennas. With the advent of the legendary W2PV designs, new ground was broken in the contesting world—not only with specific antennas, but also in the way they were installed and configured. Now large, stacked arrays have become commonplace around the world. You even find them installed at Field Day sites.

In a similar way, computers have become the engine of today's contesting environment. The computer has become vital for logging purposes. In addition, it is the traffic cop for antenna control, packet spots, interfaces to the radio, and so on. Its high-speed connectivity to the internet provides real-time information about propagation and allows operators from around the world to communicate with each other using real-time messaging. If you're wondering if a certain DXpedition will be active during a contest weekend, simply take a minute or two and look it up!

Clearly, the contest community can't claim credit for all of our hobby's technical advancements. Amateur radio probably would have done just fine without us in that regard. However, whether you are an avid contest operator or just a casual ragchewer, your enjoyment of the hobby has been enhanced by the technical interest and commitment of others.

If life then is so wonderful, what is the concern? Let me begin by pointing out where I'm coming from on the subject. I work for a wireless software company and I have two engineering degrees (although in my marketing role, they are covered with quite a bit of dust these days). My background therefore makes me predisposed to technology as a means of solving problems. It is, in fact, what I do for a living. However, there is always the lingering concern that technology sometimes goes too far. We see that every day in my business, and I'm sure you've had the same conversations in many of yours.

As Doug, K1DG, and I were preparing for WRTC 2002 this time around, I was struck by a disturbing reality. Although we admittedly had a complicated setup, the reality was that we spent only 20% of our time and energy working on problems related to RF and communicating and a disproportionate 80% on computer challenges. From what we heard, we were not alone. It made me ask whether or not I belonged to a radio hobby or a computer society. The list of computer requirements was endless. Here's just a subset of what we had to do to be prepared and operational:

- Procure two Windows 2000 laptops.
- Configure each with an Ethernet connection.
- Build a crossover cable to allow for communications between machines.
- Set up a peer-to-peer network under W2K and define the systems' static IP addresses.
- Establish a common W2K work group so that the computers would see each other on the network.
- Set up shared C drives so we could pass files back and forth as needed.
- Load logging software.
- Replace all of the above with two entirely new computers after discovering that the original computers interfered with

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e-mail: <K1AR@contesting.com>

the LPT ports at the BIOS level, resulting in poor CW being sent from the logging program.

• Download driver software from the Ethernet card manufacturer's website after discovering one of the machines didn't have a diskette drive.

• Re-load multiple versions of logging software as last-minute bugs were worked out.

• Prepare backup copies of boot disks, CDs, and other utilities for the inevitable "just in case" moments.

• Find and test two remote keyboards to complement the limitations of the laptop keyboards.

The necessities that have emerged from seriously participating in contests on the world stage have required much more of its competitors. Unfortunately, we've had to become computer jocks and are spending less and less of our time actually working on RF problems. When we do focus on RF, it's all too often trying to avoid problems that come from RF getting into our computers!

Well, at least I now have the WRTC computer issues off my chest. However, all kidding aside, a viable case can be made for the fact that computer technology is starting to take the fun out of our hobby. While I'm hardly advocating the elimination of computers, there is reason for some pause in establishing their contribution to our fun. From my high-tech point of view, I engage in computer work all day long. Ham radio and contesting for me provide a special attraction when I get on the air and work people, not when I'm in the shack looking at "win.ini" files.

I'm sure many of you recall the simpler approach that was taken by the recent DXpedition led by N5KO and team to VP8THU/VP8GEO. Their modest strategy of small antennas and low power resulted in one of our hobby's most successful DX operations in recent memory. While the days of hooking up our TS-930S to a common feedline driving a manual B&W bandswitch may be ending sooner than we'd like, I wonder what you think about all of this new-fangled technology we now use. I, for one, sometimes long for the old days. It may be due to the fact that I had the luxury of actually experiencing them. My kids don't share my affection for 33 RPM LP records because they never had them. In a similar way, a 20-year-old contester probably looks at today's modern, competitive contest station in awe from a technological point of view.

This month I'm being largely rhetorical in my comments. Nevertheless, I don't feel guilty in wanting some of the past to come back to us, and neither should you.

Final Comments

As I write these final words, I'm less than two weeks away from heading off to Helsinki and WRTC 2002. Next month's column will include a full report on "WRTC #4" and will certainly contain a boat load of stories as well. Until then, keep those summer antenna projects cooking. Ole Sol is starting his downward spiral, and we need all the aluminum in the air that we can get.

Also, I've been busy compiling the results of your 2002 Contest Survey responses. There's just so much to write about and so little space and time. You can count on a full report of the survey in the coming months as well.

73, John, K1AR

Awards

BY TED MELINOSKY, K1BV

News Of Certificate And Award Collecting

This month we start off with some county hunting bits and pieces that should be of interest.

The *Independent City of Clifton Forge, Virginia* reverted to a town status effective 7-1-2001. Clifton Forge is now an incorporated place within Alleghany County, rather than a separate county-equivalent surrounded by Alleghany County. This change will be reflected in the next reprint of the *USA-CA Record Book*. Since Clifton Forge is surrounded on all sides by Alleghany County, there should be no practical effect on USA-CA applications.

Armed Forces Day contacts: Do contacts with Army MARS and other military communication stations count for their counties? Not surprisingly, the USA-CA rules do not cover this situation, but my suggestion is that if the contacts are made with quasi-amateur authorized stations who are operating outside the regular ham bands, they should not be counted.

Expedition contacts: A DXpedition member asked if contacts he made during a multi-op DX operation count for USA-CA. He was the only PSK31 operator on the expedition and one of two RTTY operators, and he has access to the official operating schedule to determine which contacts were "his." The answer is yes, the contacts count, as long as the operator has a high degree of certainty as to which contacts he or she made.

Robert Allen, KK5MI
USA-CA All Counties #1042

Bob, KK5MI, received his USA-CA All Counties #1042 award on April 24, 2002. Here is the story of his quest and some of the strategies he learned along the way.

I am still a relatively "new" ham, having been licensed for the first time in 1994. I upgraded to General and Advanced within a few months (and to Extra later), because I felt the future of ham radio for me was on the HF bands. When I got my license, I was living in an antenna-restricted neighborhood, so all I could do was put up a "stealth" dipole and get on the air.

My first three years were spent working some DX and domestic stations, mainly on weekends, as I was still working full time then. I concentrated on getting Worked All States and I also started DXing.

One day in 1977 I was driving to Lubbock, in northwest Texas, from my home in Austin. I had the HF rig in the car and was dialing around trying to find someone to talk to. Suddenly, I heard a strange voice saying, "2-2, 2-2, 2-2, minimum, minimum." I thought, "What the heck is that?" After listening for a while, I finally figured out that everyone was trying to work some mobile station somewhere. It still took a while to figure out that this was the county hunters net and people were working counties.

When I got home, I sent for info on county hunting and decided to take on the challenge. I still didn't have WAS and only had about 50 DX countries confirmed, so I don't know why I thought I could work over 3000 counties, but I decided to try.

As I got more and more into county hunting, I came to appreciate the efforts of some of the old timers on the net. There were many mobiles out running counties, and it didn't take me long to get to know some of them on the air. The first year I worked a lot of counties, with KIØJD, N4CD, KC4UG, KA1JPR, N8STF, N8OYY, N4UJK, KCØJG, to name just a few. There were many, many others. I also came to appreciate the net control stations, as county hunting would be very much more difficult without them. Eventually, I got out and tried running counties myself, nervously putting out a few nearby counties until I got the hang of it. I was still working full time and only had time for contacts on the weekends for the most part.

In 1998 MARAC (Mobile Amateur Radio Awards Club) had their national convention in San Antonio, Texas, just down the road from me. Naturally, I attended. This was even more exciting, as I got the chance to meet a lot of the county hunters I had been talking to on the air. By that time I had over 500 counties confirmed.

For the next two years I worked counties when I could, but there were times when I just didn't have the time and would sometimes go for several weeks without getting any new ones. In the summer of 2000 I retired from my weekday job and was able to spend a lot more time on the air getting counties. My XYL and I own a small business which keeps us busy mainly on weekends, so my county hunting went from a weekend activity to a weekday effort.

Finally, in 2002, I could see the light at the end of the tunnel and I finished all 3077 counties in April. Toward the end I hounded a lot of hams to get me their counties or ones nearby.

What have I learned from my county hunting experiences? First, don't be afraid of the challenge. Some hams work all the counties within a year or so, but many take several years to finish. In the meantime, there are other activities on the air, plus I finished WAS, WAZ, DXCC, and others in the interim.

Bob Allen, KK5MI, USA-CA All Counties #1042, April 24, 2002.

USA-CA Special Honor Roll

Gilles Laroche, VE2MAM
USA-CA All Counties #1046
June 22, 2002

USA-CA Honor Roll

500

WO7GI	3196
WO7HI	3197
WA2VQV	3198
IK2QPR	3199
BD4XA	3200
VE2MAM	3201

1000

VE2MAM	1601

1500

VE2MAM	1339

2000

AD1B	1237
VE2MAM	1238

2500

VE2MAM	1158

3000

DJ4GJ	1068
VE2MAM	1069

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, 65 Glebe Road, Spofford, NH 03462-4411 USA. DX stations must include extra postage for airmail reply.

65 Glebe Road, Spofford, NH 03462-4411
e-mail: <k1bv@cq-amateur-radio.com>

The Radio Clubs Achievement Award is a variation of DXCC, requiring contacts with 100 different club stations, each in a different DXCC country (100 countries).

If you want to get into county hunting, do it all the way. Join MARAC, the county hunters' organization. Go to the conventions and meet other county hunters. Get on the net and help out by assisting the net control, moving mobiles, helping with relays, and yes, even running the net. Get out and run counties for others, and don't consider it an effort to go out of your way and get last counties for others. . . . They will go out of their way for you.

What is left after you get all the counties? Well, many of the regular county hunters have gotten all the counties several times. There are other awards to go for—one called Bingo, and another the Big Rig Award where you just work 18-wheelers in the counties.

If you decide to try for USA-CA, then really go for it! It is a very satisfying experience to not only get all the counties yourself, but to help others get them as well. You also will build some really lasting relationships with other county hunters. *—73, Bob, KK5MI*

Awards Available

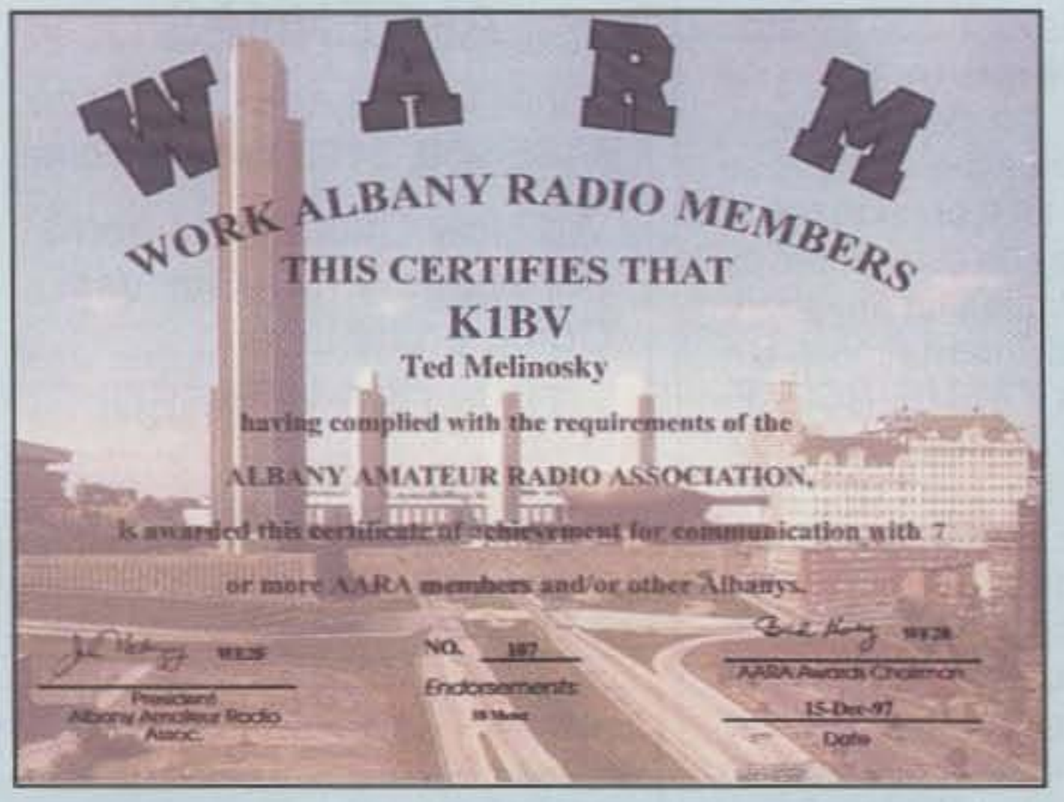
Radio Clubs Achievement Award. This award from France is a variation of DXCC, requiring contacts with 100 different club stations, each in a different DXCC country (100 countries). The award is an original silk-screen print by modern artist Jarcel Poulet, FD1NII. The prints are prepared in limited editions of 50 and change when all 50 of a particular design have been issued. The fee (see below) is somewhat higher than usual, but this is a unique award.

Contacts must have been made since 15 November 1945. No deleted countries may be used. Since the award is so difficult to achieve, a total of up to ten of the country/QSOs may be substituted by contacts with expeditions that are sponsored by recognized international DX associations such as YASME, NCDXF, FDXF, Clipperton DX Club, Lyon DX Gang, Chiltern DX Club, Lynx DX Club, Five Stars, OKDXF, EUDXF, the Danish DX Group, and the German DX Foundation. Note, however, that the substitute contacts must also be from different DXCC countries so that 100 are worked. The award may be endorsed for CW, Phone, Monoband, or WARC. Send GCR list and fee of 200FF, 31 Euros, $US35, DM75, or $Can45 to Pierre Peruchon, F2WS, 10 route d'Auxerre, F-89110 Aillon-sur-Tholon, France.

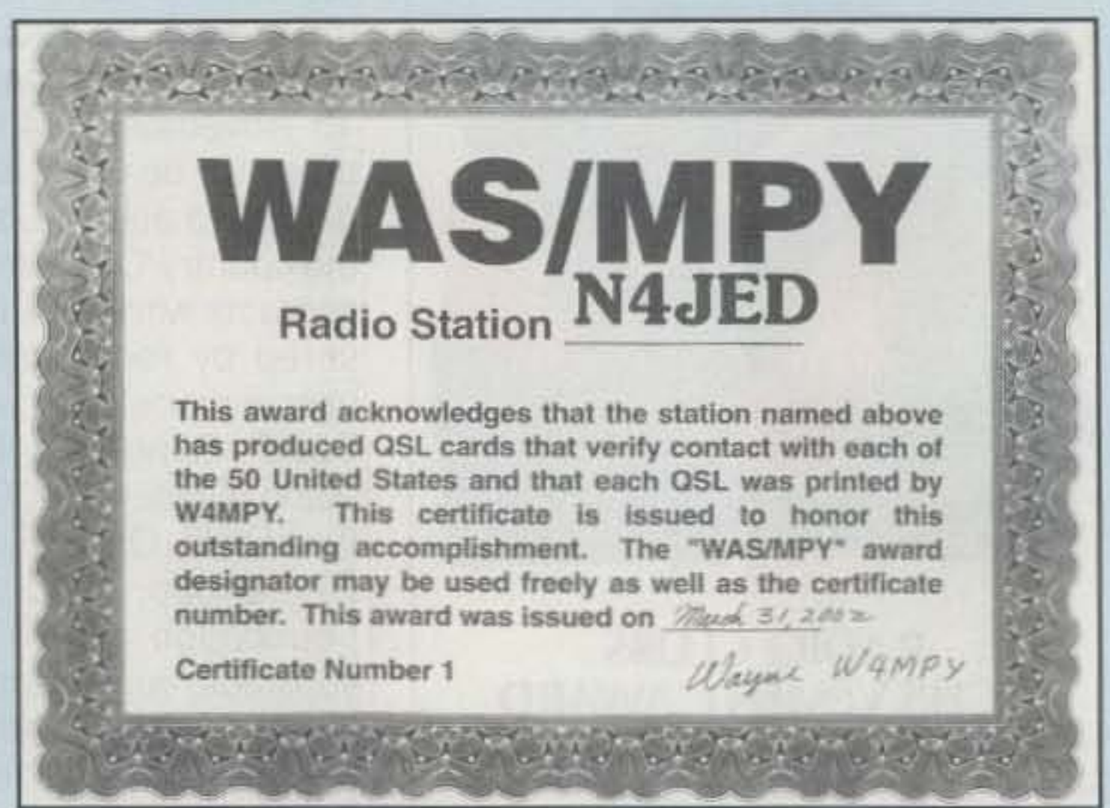
Worked All Guantanamo Award. This award has been resurrected by Bill Gallier, KG4DX. Guantanamo Bay, a pleasant Caribbean oasis, most recently has been in the news as the living

The Worked All Guantanamo Award, sponsored by KG4DX is issued for contacts with at least six KG4 stations.

Contact and confirm QSOs with at least 20 of the 22 countries in which Formula I races have been held since 1980 to earn the Formula I Award.



The Worked Albany Radio Members Award is issued for two-way contacts with any station in a place called Albany—i.e., any county, town, or city with that name—or with any Albany ARA member.



QSL printer Wayne, W4MPY, offers a certificate for contacting stations in all 50 U.S. states who use one of his cards to confirm the contact.

area for various "detainees" from Afghanistan. It is a military post with a high personnel turnover. Ham radio is a pleasant diversion there, and contacts with KG4's at GITMO are not very rare. However, various sponsors of the award have been of short duration, as they continue on to other assignments. Bill found a supply of the certificates on his last trip to Guantanamo Bay and has assumed the duties of award custodian.

Submit photocopies of QSL cards from at least six KG4 stations. All bands and modes okay. No time limitation. The fee is $US2. Apply to Bill Gallier W4WX/KG4DX, 2694 N. Camel Ave., Middleburg, FL 32068 (e-mail: <w4wx @bellsouth.net>).

Ukraine's Formula I Award. Formula I racing car enthusiasts now have their own award, and it is very colorful and well designed, featuring small photos of 40 famous international drivers.

Contact and confirm QSOs with at least 20 of the following 22 countries in which Formula I races have been held since 1980: Argentina LU, Germany DL, Mexico XE, Australia VK, Great Britain G, Monaco 3A, Austria OE, Holland PA, Portugal CT, Belgium ON, Hungary HA, San Marino T7, Brazil PY, Italy I, South Africa CT, Canada VE, Japan JA, Spain EA, France F, Malaysia 9M, Switzerland HB, and U.S. W/K.

Each country may be used one time. All contacts must be on or after 1 January 1980. All bands and modes. SWL okay. Send GCR list and fee of $US10 to Victor Gania, UU5JFY, via Hermann Warneke, Feuerwehstr. 11, D-28857 Syke, Germany.

WARM (Worked Albany Radio Members) Award. WF2B advises that this award is now free of charge. In fact, you may apply by e-mail and the club will mail the award directly to you, no SASE required.

Albany is the capital of New York State. The award shows the government buildings complex. In 2000 I had to attend several meetings sponsored by the NY Insurance Department, and I was truly impressed by the size of the complex. Note that there are "Albanys" in GA, IN, KY, LA, ME, MN, MO, NH, OH, OK, OR, PA, TX, VT, WI, and WY, as well as in several DX countries.

Contact Albany ARA members and others in Albany, Rensselaer, and Schnectady counties, NY. A point is one two-way contact with any station in a place called Albany—i.e., any county, town, or city with that name—*or* with any AARA member. The club roster is available for SASE/2 IRCs.

AARA members and stations in the named counties need 15 points, at least 5 of which must be AARA members. Other NY state stations need 10 points, including 1 AARA member. Other U.S. stations (except KH and KL) need 7 points, including 1 AARA member. The rest of the world needs 5 points, including 1 AARA member.

For the President's special endorsement, fulfill the basic requirements, 4 points of which are different and unrelated Albanys other than NY, U.S. Send GCR list to Harry Hovey, WF2B, 15 Sylvan Lane, Troy, NY 12180 (e-mail: <WF2B@arrl.net>).

WAS/MPY Award. W4MPY is the well-known printer who supplies QSL cards to many of us. In 1997, as a kind of gag, Wayne began a special award which requires making contacts with all states and hams who use the cards Wayne prints. Award #1 was issued to N4JED. How many states do you have where the card has the "Printed by W4MPY" along the bottom?

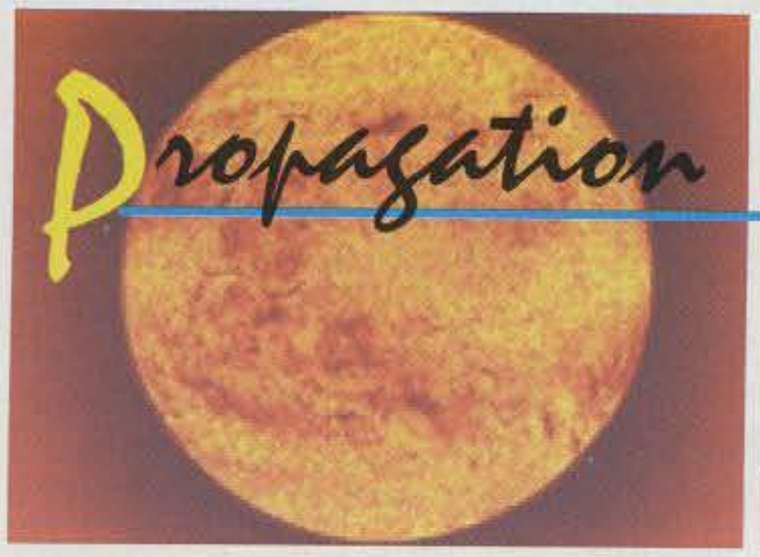
Wayne, W4MPY, is a long-time QSL printer who offers a *free* certificate for providing proof of contacting stations in all 50 U.S. states who use one of his cards to confirm the contact. Send either the cards or photocopies which show his "A W4MPY QSL" logo to Wayne Carroll, W4MPY, 682 Mt. Pleasant Road, Monetta, SC 29105.

URL of the Month

The YLRL group sponsors DX-YL, YLCC, YL-DXCC, WAC-YL, and WAS-YL awards. The rules for all of these may be found on their website: <http://www.qsl.net/ylrl/>.

I'm still waiting for you to submit your club or group's award so that *CQ* can give you the publicity necessary to make your program successful.

73, Ted, K1BV



Propagation

BY TOMAS HOOD, NW7US

The Science Of Predicting Radio Conditions

Aurora Season Begins

The end of September marks the start of the autumn aurora season. Geomagnetic storms that ignite auroras occur more often during the months around the equinoxes in early autumn and spring. This seasonal effect has been observed for more than 100 years. Scientists are still puzzled about the reasons, but some are understood.

Geomagnetic storms develop when gusts of solar wind or coronal mass ejections (CMEs) hit the Earth's magnetosphere. The magnetosphere is filled with electrons and protons that are normally trapped by lines of magnetic force that prevent them from escaping to space or descending to the planet below. The impact of a CME breaks loose some of those trapped particles, causing them to rain down on the atmosphere. Gasses in the atmosphere start to glow under the impact of these particles. Different gasses give out various colors. Think of a neon sign and how the plasma inside the glass tube, when excited, glows with a bright color.

These precipitating particles mostly follow the magnetic field lines that run from Earth's magnetic poles. The circular regions of auroral light around the magnetic poles, or auroral ovals, expand during magnetic storms. The stronger the storm, the more these ovals will expand. Sometimes they grow so large that people at middle latitudes, such as California, can see these "Northern Lights."

So why do these storms increase in strength and number during spring and autumn? In the early 1970s scientists recognized a connection between the component of the interplanetary magnetic field (IMF) that lies along the Earth's magnetic axis—known as B sub z (B_z)—and Earth's changing seasons: The average size of B_z is greatest each year in early spring and autumn.

At the magnetopause, the part of our planet's magnetosphere that fends off the solar wind, Earth's magnetic field points north. If the IMF tilts south (i.e., B_z becomes large and negative) it can partially cancel Earth's magnetic field at the point of contact. This causes the two magnetic fields (Earth's and the IMF) to link (Think of how two magnets link with one magnet's south pole connecting with the other's north pole.), creating a magnetic field line from Earth directly into the solar wind. South-pointing B_z's open a window through which energy from the solar wind and CME can reach Earth's inner magnetosphere.

The interplanetary magnetic field is carried outward from the Sun by the solar wind. Since the Sun rotates once every 27 days, the IMF has a spiral shape, the *Parker spiral* (named after the scientist who first described it). Earth's magnetic dipole axis is most closely aligned with the Parker spiral in April and October. As a result, southward (and northward) excursions of B_z are greatest then.

The Sun's rotation axis is tilted 7 degrees with respect to the plane of Earth's orbit. Because the solar wind blows more rapidly from the Sun's poles than from its equator, the average speed of particles buffeting Earth's magnetosphere waxes and wanes every six months. The solar-wind speed is greatest, by about an average of 50 km/s, around September 5th and March 5th, when Earth lies at its highest heliographic latitude.

Look for aurora-mode propagation when the *Kp* rises above 3, and look for visual aurora after dark when the *Kp* rises above 5. The higher the *Kp*, the more likely it is you may see the visual lights. I have a wealth of links at <http://prop.hfradio.org/> that provide up-to-the-minute aurora information and data. One of the most useful resources is <http://aurora.n1bug.net/>, the "Aurora Sentry." Aurora-mode propagation has a distinct sound. Signals become fluttery and raspy, sometimes fading quickly, then coming back with great strength. I've observed the effect of aurora and associated geomagnetic storminess even on lower HF frequencies (40 and 80 meters). When the *Kp* rises above 4, point your beam antenna toward the North, tuning 10, 6, and 2 meters. It can be very exciting!

September Equinox

September is a month of radical improvement in HF radio propagation conditions. On September 23, 2002, at about 0448 GMT, the Sun will be almost directly over the equator. This happens twice a year, in the spring and fall, and

P.O. Box 213, Brinnon, WA 98320-0213
e-mail: <cq-prop-man@hfradio.org>

LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for September 2002

	Expected Signal Quality			
Propagation Index.....	**(4)**	**(3)**	**(2)**	**(1)**
Above Normal: 6, 7	**A**	**A**	**B**	**C**
High Normal: 1, 4, 10-12, 14, 16-19, 22-24, 28	**A**	**B**	**C**	**C-D**
Low Normal: 3, 8, 13, 15, 21 25, 27, 30	**B**	**C-B**	**C-D**	**D-E**
Below Normal: 2, 9, 20, 29	**C**	**C-D**	**D-E**	**E**
Disturbed: 5, 26	**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 S9, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S6, 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 Sept. 1st, poor to fair (D-C) on the 2nd, fair to good (C-B) on the 3rd, etc.

CQ WW DX Contest 2002

This year's CQ WW DX Contest will be held on the following dates:

SSB: October 26–27
CW: November 23–24

In keeping with this column's tradition for the past 50 years, next month will be devoted to a special, comprehensive forecast focusing on both weekends of the 2002 contest, with an update in the November issue for the CW weekend. Besides the usual worldwide band-opening predictions and propagation forecasts, tips and resources will be included for efficient operation and for maximizing scores during the contest periods.

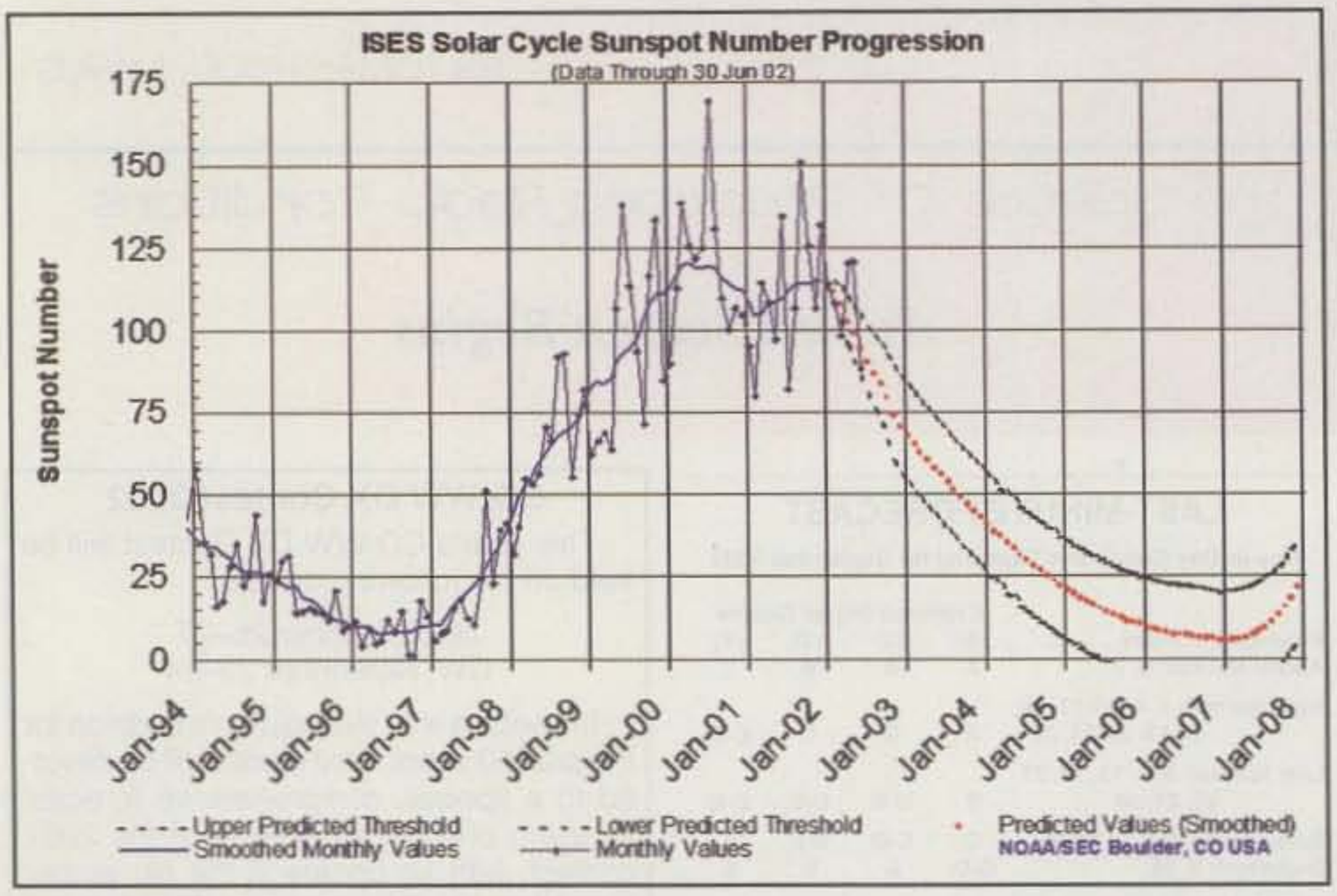


Fig. 1– Solar Cycle 23 sunspot number progression. (Courtesy NOAA/SEC Boulder, Colorado)

is called an *equinox*. The fall, or *autumnal,* equinox is the day on which the Sun will cross the equator as it appears to travel from northern to southern skies. On this day everywhere in the world the hours of daylight are equal to the hours of darkness. Sunrise should take place at approximately 6 AM local time and the Sun should set around 6 PM local time, no matter where you are located in the world.

This results in an ionosphere of almost similar characteristics over large areas of the world and is usually the best time of the year for long DX openings between the temperate regions of the northern and southern hemispheres on all HF bands. Expect a vast improvement on 10 through 20 meters, with more frequent openings from mid-September through mid-October between North America and South America, the South Pacific, South Asia, and southern Africa. The strongest openings will occur for a few hours after sunrise and during the sunset hours.

Long-path openings improve during the equinoctial periods. A variety of paths are opening up on 20 meters. Expect a path to southern Asia around sunset, and daily morning openings to southern Asia and the Middle East, expanding to Africa. Also look for Antarctic short path, and signals from the Indian Ocean region long-path over the North Pole. Afternoons will fill with South Pacific long path, and then extend to Russia and Europe. Look for possible long-path openings on 30, 40, and 80 meters for an hour or so before sunrise and just before sunset.

The winter DX season is about to open up, making for exciting DX conditions. While the weather is still warm and fair, tighten hardware on your antenna system, check coax cables, and fine-tune your radio station. Get ready to reap the DX.

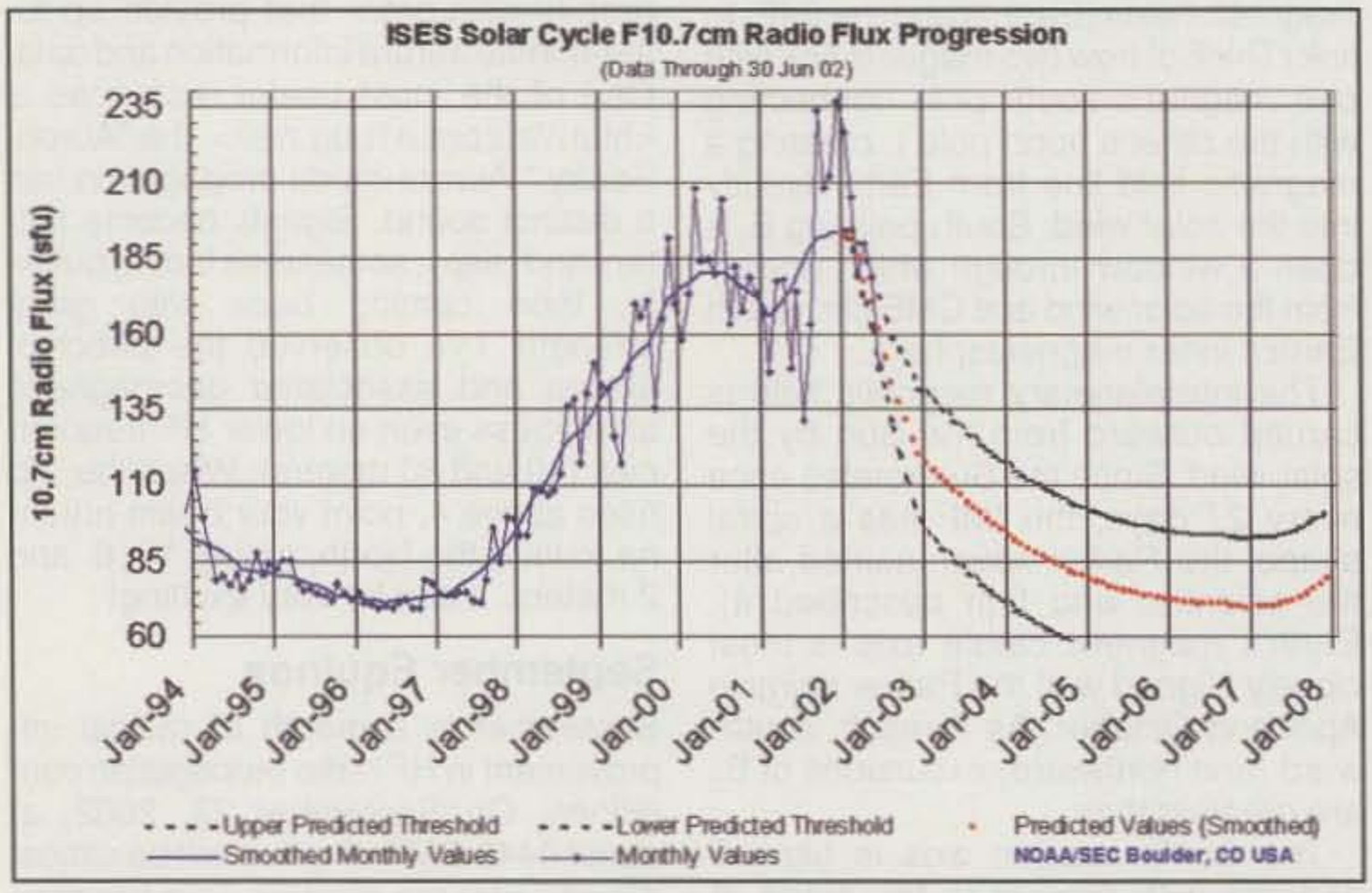


Fig. 2– Solar Cycle 23's 10.3 cm radio flux progression (Courtesy NOAA/SEC)

September Propagation

With the 10.7 cm flux levels ranging from the 90's to over 150 this month, propagation on 10 through 20 meters will vary greatly. Some days conditions will be much as they were during the summer. Other days (and more often) conditions will be more like those experienced during the winter season.

The 10 meter DX season is starting to open up, and by the end of September will open daily. Paths to Europe and the South Pacific as well as Asia are becoming more reliable and will occur on days of High Normal and better conditions. Ten meters is most reliable with flux levels above 150. Conditions may be marginal during the month, but the band is certainly coming alive. There will be less polar propagation as we move toward winter, though, making some parts of the world difficult over these paths. To catch the openings over high latitudes, get on the band shortly after sunrise, or watch for polar signals as the band closes for the evening. On those days when conditions are more like those of summer, dust off that Morse Code key, or fire up the digital-signal gear, and get on the band. Twelve meters will experience much of the same conditions that exist on 10 meters.

When conditions make signals weak or non-existent on 10 and 12, switch to 15 meters. This band will usually supply day-path propagation even over the polar paths. Watch 15 for many long-path opportunities. A considerable improvement is expected in DX propagation on 15 and 17 meters, both opening shortly after sunrise and remaining open until after sundown. However, 15 will not stay open late into the night as it does during the spring season. Openings should be possible to all areas of the world, with conditions best toward Europe and the northeast before noon, and to the rest of the world during the afternoon hours. Openings toward the South Pacific, Australia, New Zealand, and the Far East should be possible well into the early evening, particularly when propagation conditions are High Normal or better.

Twenty meters competes with 17 and 15 meters for the best daytime DX band honors this month. Look for 20 to open for DX at sunrise and remain open in all directions for a few hours. It should be possible to work into many areas of the world throughout the daylight hours, with a peak in the afternoon. Nighttime conditions will favor openings toward the south and to tropical areas, but some openings will also be possible to other areas, especially during High Normal or better days. Look for polar gray-line propagation into Asia. Long-path is common on 20 meters to southern Asia, the Middle East, and northeastern Africa, as well as the Indian Ocean region, via the North Polar path.

Expect an improvement in nighttime DX conditions on 30, 40, 80, and 160 meters during September and October. This is due to the increasing hours of darkness and a seasonal decrease in the static level. Thirty and 40 meters should be best for worldwide DX from sunset to sunrise. Check 80 and 160 meters during the hours of darkness, especially for an hour or so before local sunrise.

For short-skip propagation during September and early October, use 80 meters during the day for openings shorter than 250 miles, and either 80 or 160 at night. For distances between 250 and 750 miles try 30 and 40 meters during the day and 80 meters at night. For openings between 750 and 1300 miles 20 meters should work during the day, 30 and 40 from sundown to midnight, and 80 from midnight to sunrise. For openings greater than 1300 miles try 15, 17, or 20 meters during the day, and 30 and 40 during the hours of darkness. Check 10 and 12 meters for some fairly good openings beyond 1300 miles in the afternoon hours, especially when conditions are High Normal or better.

Progress of Cycle 23

The Royal Observatory of Belgium, the world's official keeper of sunspot records, reports an observed monthly mean sunspot number of 89 for June 2002, down from 121 for May. The twelve-month running smoothed sunspot number centered on December 2001 is 115, one point down from November. The sunspot low for June 2002 was 15 on June 13. The sunspot high of 150 occurred on June 4.

The Dominion Radio Astrophysical at Penticton, BC, Canada, reports a 10.7 cm observed monthly mean solar flux of 149 for June, down from May's 178. The twelve-month smoothed 10.7 cm flux centered on December 2001 is 194, remaining the same as it was for November 2001.

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 160 meter openings. An ** indicates possible 10 meter openings.

2. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. In 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. On the Short-Skip Chart appropriate *daylight* time is used at the path midpoint. For example on a circuit between Maine and Florida, the time shown would be EDT, on a circuit between New York and Texas, the time at the midpoint would be CDT, etc. Times shown in the Hawaii Chart are in HST. To convert to daylight time in other USA time zones add 3 hours in the PDT zone; 4 hours in the MDT zone; 5 hours in the CDT zone; and 6 hours in the EDT zone. Add 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 15 or 3 PM in Los Angeles; 18 or 6 PM in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *daylight* time in other areas of the USA subtract 7 hours in the PDT zone; 6 hours in the MDT zone; 5 hours in the CDT zone; and 4 hours in the EDT zone. For example, at 20 GMT it is 16 or 4 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
September & October 2002
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	10-21 (0-1)	08-10 (1) 10-13 (1-2) 13-15 (1-3) 15-16 (1-2) 16-21 (0-1)	08-10 (1) 10-13 (2) 13-15 (3) 15-16 (2-3) 16-17 (1-2) 17-19 (1) 19-21 (1-0)
15	Nil	08-10 (0-1) 10-15 (0-2) 15-21 (0-1)	08-09 (1) 09-10 (1-2) 10-15 (2-4) 15-17 (1-4) 17-18 (1-3) 18-20 (1-2) 20-21 (1) 21-08 (0-1)	08-09 (1) 09-10 (2-3) 10-11 (4-3) 11-17 (4) 17-18 (3) 18-19 (2-3) 19-20 (2) 21-08 (1-0)
20	12-14 (0-1) 14-16 (0-2) 16-22 (0-1)	08-09 (0-1) 09-10 (1-2) 10-11 (0-3) 11-12 (1-4) 12-14 (1-4) 14-16 (2-4) 16-18 (1-4)	06-08 (1-2) 08-09 (1-3) 09-10 (2-4) 10-11 (3-4) 11-18 (4) 18-19 (3-4) 19-22 (2-3)	06-08 (2) 08-09 (3) 09-14 (4-2) 14-16 (4-3) 16-19 (4) 19-21 (3-4) 21-22 (3) 18-19 (1-3) 19-22 (1-2) 22-08 (0-1)	22-00 (1-2) 00-06 (1)	22-23 (2-3) 23-00 (2) 00-06 (1)
40	08-10 (1-3) 10-12 (2-4) 12-18 (3-4) 18-19 (2-3) 19-21 (1-2) 21-06 (0-1) 06-08 (0-2)	08-10 (3-4) 10-12 (4-3) 12-16 (4-2) 16-18 (4-3) 18-19 (3-4) 19-21 (2-4) 21-23 (1-4) 23-03 (1-3) 03-06 (1-2) 06-08 (2-3)	08-10 (4-2) 10-12 (3-1) 12-16 (2-1) 16-18 (3-2) 18-19 (4-2) 19-20 (4-3) 20-23 (4) 23-03 (3-4) 03-06 (2-3) 06-08 (3-4)	08-10 (2-1) 10-16 (1-0) 16-18 (2-1) 18-19 (2) 19-20 (3) 20-21 (4-3) 21-03 (4) 03-05 (3-4) 05-06 (3) 06-08 (4-3)
80	07-09 (3-4) 09-12 (4) 12-19 (4-3) 19-23 (4) 23-05 (3-4) 05-07 (2-3)	07-09 (4-2) 09-12 (4-1) 12-17 (3-1) 17-19 (3-2) 19-21 (4-3) 21-05 (4) 05-06 (3-4) 06-07 (3)	07-09 (2-1) 09-17 (1-0) 17-19 (2-1) 19-21 (3-2) 21-22 (4-3) 22-04 (4) 04-06 (4-3) 06-07 (3-2)	07-09 (1) 09-17 (0) 17-19 (1) 19-21 (2) 21-22 (3-2) 22-04 (4-3) 04-06 (3-2) 06-07 (2-1)
160	17-19 (1-0) 19-21 (2-1) 21-06 (4) 06-08 (3-2) 08-10 (2-1) 10-12 (1-0)	18-20 (1-0) 20-21 (1) 21-03 (4-3) 03-06 (3-2) 06-08 (2-1) 08-10 (1-0)	20-21 (1-0) 21-23 (3-1) 23-03 (3) 03-06 (2-1) 06-08 (1)	21-23 (1-0) 23-03 (3-2) 03-06 (1) 06-08 (1-0)

HAWAII
September & October 2002
Openings Given in GMT

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern USA	08-10 (1) 10-13 (2) 13-14 (1)	067-11 (1) 11-12 (2) 12-14 (3) 14-15 (2) 15-16 (1)	11-13 (1) 13-14 (2) 14-18 (3) 18-20 (2) 20-04 (1) 04-07 (2) 07-08 (1)	18-20 (1) 20-22 (2) 22-00 (3) 00-02 (2) 02-03 (1) 10-21 (1)* 21-00 (2)* 00-01 (1)*
Central USA	08-10 (1) 10-14 (2) 14-16 (1)	07-10 (1) 10-12 (2) 12-16 (3) 16-17 (2) 17-18 (1)	09-13 (1) 13-14 (2) 14-15 (3) 15-18 (4) 18-19 (3) 19-21 (2) 21-04 (1) 04-09 (2)	18-20 (1) 20-22 (2) 22-02 (3) 02-04 (2) 04-05 (1) 19-21 (1)* 21-00 (2)* 00-02 (1)*
Western USA	08-09 (1) 09-10 (2) 10-15 (3) 15-16 (2) 16-17 (1)	07-09 (1) 09-10 (2) 10-13 (3) 13-15 (4) 15-16 (3) 16-17 (2) 17-19 (1)	10-12 (2) 12-14 (3) 14-18 (4) 18-20 (3) 20-00 (2) 00-05 (1) 05-06 (2) 06-10 (3)	18-19 (1) 19-20 (2) 20-02 (4) 02-04 (3) 04-05 (2) 05-06 (1) 19-20 (1)* 20-22 (2)* 22-02 (3)* 02-04 (2)* 04-05 (1)*

ALASKA
September & October 2002
Openings Given in GMT

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern USA	19-22 (1)	17-19 (1) 19-23 (2) 23-00 (1)	12-15 (1) 18-21 (1) 21-23 (2) 23-01 (3) 01-02 (2) 02-04 (1)	08-12 (1)
Central USA	20-00 (1)	17-19 (1) 19-21 (2) 21-23 (3) 23-01 (2) 01-02 (1)	13-22 (1) 22-00 (2) 00-03 (3) 03-04 (2) 04-06 (1)	08-11 (1) 11-13 (2) 13-14 (1) 11-13 (1)*
Western USA	20-22 (1) 22-01 (2) 01-02 (1)	18-21 (1) 21-22 (2) 22-00 (4) 00-01 (3) 01-02 (1) 02-03 (1)	16-18 (1) 18-20 (3) 20-00 (2) 00-02 (3) 02-03 (4) 03-04 (3) 04-05 (2) 05-07 (1)	08-11 (1) 11-14 (2) 14-16 (1) 11-14 (1)*

HOW TO USE THE DX PROPAGATION CHARTS

1. Use chart appropriate to your transmitter location. The Eastern USA Chart can be used in the 1, 2, 3, 4, 8, KP4, KG4, and KV4 areas in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9, and 0 areas; the Western USA Chart in the 6 and 7 areas; and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (10 through 80 meters) for a particular DX region, as shown in the left-hand column of the charts. An * indicates the best time to listen for 160 meter openings.

3. The propagation index is the number that appears in ( ) after the time of each predicted opening. 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.

4. Times shown in the charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. Appropriate *daylight* time is used, not GMT. To convert to GMT, add to the times shown in the appropriate chart 7 hours in PDT Zone, 6 hours in MDT Zone, 5 hours in CDT Zone, and 4 hours in EDT Zone. For example, 14 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 03 GMT, etc.

5. The charts are based upon a transmitted power of 250 watts CW, or 1 kw, PEP on sideband, into a dipole antenna a quarter-wavelength above ground on 160 and 80 meters, and a half-wavelength 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.

6. 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.

September 15 - October 15, 2002
Time Zone: EDT (24-Hour Time)
EASTERN USA To:

Reception Area	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	09-11 (1) 11-12 (2) 12-14 (1)	08-09 (1) 09-11 (2) 11-14 (4) 14-15 (3) 15-16 (2) 16-17 (1)	03-04 (1) 04-06 (2) 06-10 (3) 10-12 (2) 12-15 (3) 15-17 (4) 17-19 (3) 19-20 (2) 20-21 (1)	18-19 (1) 19-21 (2) 21-23 (3) 23-02 (4) 02-03 (3) 03-04 (2) 04-05 (1)* 20-22 (1)* 22-01 (2)* 01-04 (1)*
Northern Europe & European CIS	09-12 (1)	08-09 (1) 09-10 (2) 10-12 (3) 12-13 (2) 13-15 (1)	03-06 (1) 06-08 (2) 08-11 (3) 11-13 (2) 13-17 (3) 17-18 (2) 18-20 (1)	18-20 (1) 20-04 (2) 04-06 (1) 21-04 (1)*
Eastern Mediter-ranean & Middle East	10-13 (1)	08-09 (1) 09-12 (2) 12-14 (3) 14-16 (2) 16-17 (1)	07-09 (2) 09-15 (1) 15-17 (2) 17-20 (3) 20-21 (2) 21-23 (1) 23-01 (2) 01-07 (1)	19-21 (1) 21-00 (2) 00-01 (1) 22-23 (1)*
Western Africa	11-13 (1) 13-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	07-09 (1) 09-13 (2) 13-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	05-08 (2) 08-15 (1) 15-17 (2) 17-18 (3) 18-21 (4) 21-23 (3) 23-03 (2) 03-05 (1)	20-23 (1) 23-02 (2) 02-04 (1) 00-03 (1)*
Eastern & Central Africa	13-15 (1) 15-17 (2) 17-18 (1)	08-09 (1) 09-13 (2) 13-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	12-14 (1) 14-17 (2) 17-21 (3) 21-01 (2) 01-02 (1)	20-02 (1) 00-01 (1)*
Southern Africa	09-11 (1) 11-13 (2) 13-14 (1)	08-11 (1) 11-12 (2) 12-13 (3) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	14-16 (1) 16-19 (2) 19-23 (3) 23-01 (2) 01-02 (1) 06-08 (1)	19-22 (1) 22-00 (2) 00-02 (1) 23-01 (1)*
Central & South Asia	09-11 (1) 19-21 (1)	09-10 (1) 10-12 (2) 12-13 (1) 20-22 (1)	07-08 (1) 08-10 (2) 10-12 (1) 17-19 (1) 19-22 (2) 22-00 (1)	05-07 (1) 20-23 (1)
Southeast Asia	11-13 (1) 18-20 (1)	09-11 (1) 14-16 (1) 18-19 (1) 19-20 (2) 20-21 (1)	06-07 (1) 07-10 (2) 10-12 (1) 15-18 (1) 20-21 (1) 21-23 (2) 23-01 (1)	06-08 (1)
Far East	18-20 (1)	10-12 (1) 16-18 (1) 18-20 (2) 20-21 (1)	07-08 (1) 08-10 (2) 10-12 (1) 17-20 (1) 20-22 (2) 22-00 (1)	05-08 (1) 18-19 (1) 06-07 (1)*
South Pacific & New Zealand	09-15 (1) 15-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	09-14 (1) 14-18 (2) 18-20 (3) 20-21 (2) 21-22 (1)	08-10 (3) 10-12 (2) 12-20 (1) 20-23 (2) 23-03 (3) 03-07 (1)	01-02 (1) 02-03 (2) 03-06 (3) 06-08 (2) 08-09 (1) 03-05 (1)* 05-07 (2)* 07-08 (1)*
Austral-asia	10-12 (1) 16-17 (1) 17-19 (2) 19-20 (1)	09-11 (1) 14-17 (1) 17-18 (2) 18-20 (3) 20-21 (2) 21-22 (1)	07-09 (2) 09-11 (13) 11-13 (2) 13-16 (1) 16-18 (2) 18-21 (1) 21-23 (2) 23-01 (3) 01-03 (2) 03-07 (1)	02-04 (1) 04-06 (2) 06-07 (3) 07-08 (2) 08-09 (1) 04-05 (1)* 05-06 (2)* 06-07 (1)*
Caribbean, Central America & Northern Countries of South America	10-11 (1) 11-14 (2) 14-17 (4) 17-18 (2) 18-19 (1)	08-09 (1) 09-10 (2) 10-13 (3) 13-18 (4) 18-19 (3) 19-20 (2) 20-21 (1)	04-06 (1) 06-07 (2) 07-08 (3) 08-10 (4) 10-15 (2) 15-17 (3) 17-22 (4) 22-03 (3) 03-04 (2)	19-20 (1) 20-21 (2) 21-04 (4) 04-06 (3) 06-07 (2) 07-08 (1) 21-23 (1)* 23-04 (2)* 04-06 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	09-10 (1) 10-12 (2) 12-14 (1) 14-15 (2) 15-17 (4) 17-18 (3) 18-19 (1)	08-09 (1) 09-11 (2) 11-14 (1) 14-16 (2) 16-17 (3) 17-19 (4) 19-20 (3) 20-21 (2) 21-22 (1)	11-16 (1) 16-17 (2) 17-20 (3) 20-01 (4) 01-03 (3) 03-04 (2) 04-07 (1) 07-08 (2) 08-10 (3) 10-11 (2)	21-00 (1) 00-05 (2) 05-07 (1) 01-06 (1)*
McMurdo Sound, Antarctica	16-18 (1)	12-15 (1) 15-18 (2) 18-19 (3) 19-20 (2) 20-21 (1)	16-18 (1) 18-21 (2) 21-23 (3) 23-01 (2) 01-03 (1) 07-09 (1)	23-01 (1) 01-05 (2) 04-06 (1) 04-06 (1)*

Time Zones: CDT & MDT
(24-Hour Time)
CENTRAL USA To:

Reception Area	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	09-12 (1)	08-10 (1) 10-11 (2) 11-13 (3) 13-14 (2) 14-16 (1)	06-07 (1) 07-10 (2) 10-13 (1) 13-14 (2) 14-16 (4) 16-17 (3) 17-20 (2) 20-23 (1)	18-20 (1) 20-23 (2) 23-01 (3) 01-02 (2) 02-03 (1) 21-23 (1)* 23-01 (2)* 01-02 (1)*
Northern Europe & CIS	09-11 (1)	08-10 (1) 10-12 (2) 12-14 (1)	06-07 (1) 07-10 (2) 10-12 (1) 12-13 (2) 13-15 (3) 15-16 (2) 16-18 (1) 20-01 (1)	20-23 (1) 23-01 (2) 01-02 (1) 22-01 (1)*
Eastern Mediter-ranean & Middle East	10-12 (1)	08-10 (1) 10-13 (2) 13-14 (1)	06-07 (1) 07-09 (2) 09-15 (1) 15-18 (2) 18-21 (1) 21-23 (2) 23-00 (1)	20-23 (1) 21-23 (1)*
Western Africa	11-13 (1) 13-15 (2) 15-17 (1)	07-10 (1) 10-13 (2) 13-15 (3) 15-17 (4) 17-18 (2) 18-19 (1)	05-06 (1) 06-08 (2) 08-15 (3) 15-17 (2) 17-18 (3) 18-19 (4) 19-22 (3) 22-00 (2) 00-01 (1)	20-23 (1) 23-01 (2) 01-02 (1) 23-01 (1)*
Eastern & Central Africa	12-15 (1)	09-11 (1) 11-15 (2) 15-16 (3) 16-17 (2) 17-18 (1)	13-15 (1) 15-17 (2) 17-19 (3) 19-21 (2) 21-22 (1)	21-00 (1)
Southern Africa	10-11 (1) 11-13 (2) 13-14 (1)	07-09 (1) 09-12 (2) 12-13 (3) 13-14 (4) 14-15 (3) 15-16 (2) 16-17 (1)	06-08 (2) 08-14 (1) 14-16 (2) 16-19 (3) 19-21 (2) 21-23 (1) 23-01 (2) 01-02 (1)	20-21 (1) 21-23 (2) 23-01 (1) 21-23 (1)*
Central & South Asia	09-11 (1) 18-20 (1)	09-11 (1) 18-19 (1) 19-21 (2) 21-22 (1)	07-08 (1) 08-10 (2) 10-12 (1) 17-19 (1) 19-21 (2) 21-23 (1)	06-08 (1) 19-21 (1)
Southeast Asia	10-12 (1) 18-20 (1)	09-11 (1) 14-17 (1) 17-19 (2) 19-21 (1)	06-08 (1) 08-10 (2) 10-13 (1) 16-21 (1) 21-00 (2) 00-02 (1)	05-09 (1)
Far East	17-18 (1) 18-19 (2) 19-20 (1)	10-16 (1) 16-18 (2) 18-20 (3) 20-21 (2) 21-22 (1)	07-08 (1) 08-10 (3) 10-12 (2) 17-21 (1) 21-00 (2) 00-02 (1)	03-05 (1) 05-08 (2) 08-09 (1) 06-08 (1)*
South Pacific & New Zealand	13-15 (1) 15-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	09-13 (1) 13-17 (2) 17-19 (4) 19-20 (3) 20-21 (2) 21-23 (1)	07-08 (2) 08-11 (3) 11-13 (2) 13-18 (1) 18-20 (2) 20-22 (3) 22-00 (4) 00-01 (3) 00-03 (2) 03-07 (1)	00-01 (1) 01-06 (3) 06-08 (4) 08-09 (2) 09-10 (1) 02-04 (1)* 04-07 (2)* 07-08 (1)*
Austral-Asia	14-16 (1) 16-18 (2) 18-19 (3) 19-20 (2) 20-21 (1)	09-11 (1) 13-17 (1) 17-19 (2) 19-20 (3) 20-21 (2) 21-22 (1)	16-18 (2) 18-21 (1) 21-23 (2) 23-03 (3) 03-04 (2) 04-07 (1) 07-09 (2) 09-11 (3) 11-13 (2) 13-16 (1)	02-03 (1) 03-05 (2) 05-07 (3) 07-08 (2) 08-09 (1) 05-06 (1)* 06-07 (2)* 07-08 (1)*
Caribbean, Central America & Northern Countries of South America	09-10 (1) 10-11 (2) 11-13 (3) 13-16 (4) 16-18 (2) 18-19 (1)	07-08 (1) 08-10 (2) 10-13 (3) 13-17 (4) 17-18 (3) 18-20 (2) 20-21 (1)	07-10 (4) 10-12 (3) 12-15 (2) 15-17 (3) 17-22 (4) 22-01 (3) 01-03 (2) 03-05 (1) 05-07 (2)	19-20 (1) 20-21 (2) 21-01 (3) 01-05 (4) 05-06 (3) 06-07 (2) 07-08 (1) 20-23 (1)* 23-05 (2)* 05-06 (1)
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	09-10 (1) 10-13 (2) 13-15 (3) 15-17 (4) 17-18 (2) 18-19 (1)	07-08 (1) 08-11 (3) 11-15 (2) 15-16 (3) 16-19 (4) 19-20 (3) 20-21 (2) 21-22 (1)	04-08 (1) 08-10 (2) 10-16 (1) 16-18 (2) 18-20 (3) 20-23 (4) 23-02 (3) 02-04 (2)	21-00 (1) 00-04 (2) 04-06 (1) 01-05 (1)*
McMurdo Sound	15-18 (1)	11-16 (1) 16-18 (2) 18-19 (3) 19-20 (2) 20-21 (1)	08-09 (1) 17-19 (1) 19-20 (2) 20-23 (3) 23-00 (2) 00-03 (2)	00-03 (1) 03-05 (2) 05-07 (1) 04-06 (1)*

Time Zone: PDT (24-Hour Time) WESTERN USA To:

Reception Area	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Western Europe & North Africa	09-11 (1)	08-09 (1) 09-12 (2) 12-14 (1)	06-07 (1) 07-10 (2) 10-13 (1) 13-14 (2) 14-16 (3) 16-17 (2) 17-19 (1)	20-21 (1) 21-23 (2) 23-00 (1) 21-23 (1)*
Central & Northern Europe & European CIS	Nil	08-09 (1) 09-11 (2) 11-13 (1)	06-07 (1) 07-09 (2) 09-12 (1) 12-14 (2) 14-16 (2) 21-23 (1)	20-00 (1) 20-22 (1)*
Eastern Mediterranean & Middle East	Nil	08-09 (1) 09-11 (2) 11-12 (1) 20-22 (1)	06-07 (1) 07-10 (2) 10-13 (1) 13-15 (2) 15-16 (1) 19-20 (1) 20-22 (2) 22-23 (1)	20-23 (1)
Western & Central Africa	11-12 (1) 12-14 (2) 14-15 (1)	08-10 (1) 10-13 (2) 13-16 (3) 16-17 (2) 17-18 (1)	06-07 (1) 07-09 (2) 09-14 (1) 14-15 (2) 15-16 (3) 16-18 (4) 18-20 (3) 20-22 (2) 22-00 (1)	21-00 (1)
Eastern Africa	11-14 (1)	10-13 (1) 13-16 (2) 16-17 (1)	07-09 (1) 12-15 (1) 15-19 (2) 19-21 (1)	20-22 (1)
Southern Africa	10-13 (1)	07-09 (1) 09-11 (2) 11-13 (3) 13-15 (2) 15-16 (1)	05-07 (1) 07-09 (2) 09-10 (1) 12-14 (1) 14-16 (2) 16-18 (3) 18-19 (2) 19-22 (1) 22-00 (2) 00-01 (1)	19-22 (1)
Central & South Asia	17-19 (1)	08-11 (1) 16-17 (1) 17-19 (2) 19-21 (1)	07-08 (1) 08-11 (2) 11-13 (1) 17-19 (1) 19-21 (2) 21-23 (1)	06-08 (1) 19-21 (1)
Southeast Asia	16-19 (1)	10-11 (1) 11-13 (2) 13-16 (1) 16-18 (2) 18-21 (1)	05-07 (1) 07-09 (3) 09-11 (2) 11-12 (1) 21-23 (1) 23-01 (2) 01-02 (1)	01-03 (1) 03-06 (2) 06-08 (1) 03-06 (1)*
Far East	16-17 (1) 17-18 (2) 18-19 (1)	14-15 (1) 15-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	07-08 (1) 08-09 (2) 09-10 (4) 10-13 (3) 13-15 (2) 15-20 (1) 20-22 (2) 22-00 (3) 00-01 (2) 01-03 (1)	01-03 (1) 03-07 (2) 07-08 (3) 08-09 (1) 03-05 (1)* 05-07 (2)* 07-08 (1)*
South Pacific & New Zealand	11-13 (1) 13-15 (2) 15-17 (3) 17-19 (2) 19-20 (1)	09-11 (1) 11-13 (3) 13-17 (2) 17-19 (3) 19-21 (4) 21-22 (3) 22-23 (2) 23-01 (1)	13-19 (1) 19-21 (2) 21-23 (3) 23-01 (4) 01-03 (3) 03-05 (2) 05-06 (1) 06-07 (2) 07-09 (3) 09-13 (2)	21-22 (1) 22-23 (2) 23-00 (3) 00-05 (4) 05-07 (3) 07-08 (2) 08-09 (1) 23-02 (1)* 02-06 (2)* 06-07 (1)*
Austral-Asia	14-15 (1) 15-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	08-10 (1) 13-17 (1) 17-19 (2) 19-21 (3) 21-22 (2) 22-03 (1)	19-21 (1) 21-23 (2) 23-01 (4) 01-03 (3) 03-04 (2) 04-07 (1) 07-08 (2) 08-10 (3) 10-12 (2) 12-13 (1)	01-02 (1) 02-03 (2) 03-06 (3) 06-08 (2) 08-09 (1) 02-04 (1)* 04-06 (2)* 06-07 (1)*
Caribbean, Central, America & Northern Countries of South America	09-10 (1) 10-11 (2) 11-13 (3) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	07-08 (1) 08-10 (3) 10-12 (2) 12-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	06-08 (4) 08-10 (3) 10-15 (2) 15-17 (3) 17-23 (4) 23-01 (3) 01-03 (2) 03-05 (1) 05-06 (2)	19-21 (1) 21-02 (3) 02-04 (2) 04-07 (1)* 22-03 (2)* 03-05 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	09-10 (1) 10-12 (2) 12-14 (3) 14-16 (4) 16-17 (3) 17-18 (2)	07-08 (1) 08-09 (2) 09-13 (1) 13-15 (2) 15-16 (3) 16-19 (4) 19-20 (2) 20-21 (1)	06-15 (1) 15-17 (2) 17-19 (3) 19-23 (4) 23-01 (3) 01-06 (2)	21-23 (1) 23-02 (2) 02-04 (1) 00-03 (1)*
McMurdo Sound, Antarctica	14-18 (1)	11-15 (1) 15-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	08-10 (1) 17-19 (1) 19-20 (2) 20-23 (3) 23-01 (2) 01-03 (1)	01-03 (1) 03-05 (2) 05-07 (1) 03-06 (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.

The observed monthly mean *Ap*-index for June 2002 is 11. The twelve-month smoothed *Ap*-index centered on December 2001 is 12.

A smoothed sunspot level of 84 and a 10.7 cm solar flux of about 137 are predicted for September 2002. Stronger storms and disturbances will increase this month. The geomagnetic planetary *A*-index (*Ap*) will rise a bit this month and through October, before slowly decreasing through the winter season. Cycle 23 is expected to remain in the High solar range for the remainder of 2002. See figs. 1 and 2 for an overview of solar Cycle 23.

VHF Ionospheric Openings

The month of September statistically has the lowest amount of sporadic-*E* propagation activity. Aurora is a much more probable mode. Toward the end of September trans-equatorial (TE) propagation will begin to occur between southern North America and northern South America. Openings will generally occur in the late afternoon to early evening.

F2 activity may occur during the day on 6 meters, although the 10.7 cm flux levels are not going to support propagation at these higher frequencies. Don't expect any east-west paths to be open.

Tropo conditions are generally very good for many of the VHF bands up to 440 MHz during September with the appearance of different weather fronts. This will be the primary mode for working up to 300 miles. A very useful internet resource for viewing tropospheric conditions is available at William Hepburn's "VHF/UHF Tropospheric Ducting Forecast" site: <http://www.iprimus.ca/~hepburnw/tropo_nat.html>.

Continue to expect a high number of solar flares and CMEs, possibly triggering aurora during September and October. Consult the Last-Minute Forecast to find those days that are forecast to be Disturbed or Below Normal. Don't forget to check out the new *CQ VHF* magazine as well as the "VHF-Plus" column in this issue.

WML/Wireless Propagation Resource

If you have a cell phone or other wireless device that is able to view WML/WAP pages, direct your device to <http://wap.hfradio.org/> to view current solar, geomagnetic, and other related propagation information.

I welcome your thoughts, questions, and experiences regarding this fascinating science of propagation. I also welcome corrections and clarifications. I hope to serve the radio hobbyist with ever more accurate and useful information each month. You may e-mail me, write me a letter, or catch me on the HF amateur bands. See you on the air!

73, Tomas, NW7US

Announcing:

The 2002 CQ WW DX Contest

Phone: October 26–27 CW: November 23–24

Starts 0000 GMT Saturday
Ends 2400 GMT Sunday

I. OBJECTIVE: For amateurs around the world to contact other amateurs in as many zones and countries as possible.

II. BANDS: All bands, 1.8 through 28 MHz, except for WARC bands.

III. TYPE OF COMPETITION (choose only one):

For all categories: All entrants must operate within the limits of their chosen category when performing any activity that could impact their submitted score. *All high power categories must not exceed 1500 watts total output power on any band.* Transmitters and receivers must be located within a 500 meter diameter circle or within the property limits of the station licensee's address, whichever is greater. All antennas used by the entrant must be physically connected by wires to the transmitters and receivers used by the entrant. Only the entrant's callsign can be used to aid the entrant's score. A different callsign must be used for each CQ WW entry.

A. Single Operator Categories: Single band or all band; only one signal allowed at any one time; the operator may change bands at any time.

1. Single Operator High: Those stations at which one person performs all of the operating, logging, and spotting functions. The use of DX alerting assistance of any kind places the station in the Single Operator Assisted category.

2. Single Operator Low: Same as III A 1 except that the output power shall not exceed 100 watts (see rule XI.11).

3. QRPp: Same as III A 1, except that the power output must not exceed 5 watts (see rule XI.11).

B. Single Operator with DX Spotting Net: Same as III A 1 except the passive (self- spotting not allowed) use of DX spotting nets is allowed.

C. Multi-Operator (all band operation only):

1. Single Transmitter (*MS*): Only one transmitter and one band permitted during any 10-minute period, defined as starting with the first logged QSO on a band. Exception: One—and only one—other band may be used during any 10-minute period if—and only if—the station worked is a new multiplier. Logs found in violation of the 10-minute rule will automatically be reclassified as multi-multi.

2. Two Transmitter (M2): A maximum of two transmitted signals at any time on different bands. Both transmitters may work any and all stations. A station may only be worked once per band regardless of which transmitter is used. Each of the two transmitters used must keep a separate chronological log for the entire contest period , or if electronic logging is used, the electronic log submittal (Cabrillo) must indicate which transmitter made each QSO. Each transmitter may make a maximum of 8 band changes in any clock hour (00 through 59 minutes).

3. Multi-Transmitter *(MM)*: No limit to transmitters, but only one signal and running station allowed per band.

D. Team Contesting: A team consists of any five radio amateurs operating in the single operator category. A person may be on only one team per mode. Competing on a team will not prevent any team member from submitting his/her personal score for a radio club. A team score will be the sum of all the team member scores. SSB and CW teams are totally separate. That is, a member of an SSB team may be on a totally different CW team. A list of a team's members must be received at CQ Headquarters by the time the contest begins. Mail or fax the list to CQ, Att: Team Contest, 25 Newbridge Road, Hicksville, NY 11801 U.S.A.; fax 516-681-2926. Awards will be given to the top teams on each mode.

IV. NUMBER EXCHANGE: Phone: RS report plus zone (i.e., 5705). CW: RST report plus zone (i.e., 57905).

V. MULTIPLIER: Two types of multiplier will be used.

1. A multiplier of one (1) for each different zone contacted on each band.

2. A multiplier of one (1) for each different country contacted on each band.

Stations are permitted to contact their own country and zone for multiplier credit. The CQ Zone Map, DXCC country list, WAE country list, and WAC boundaries are standards. Maritime mobile stations count only for a zone multiplier.

VI. POINTS:

1. Contacts between stations on different continents are worth three (3) points.

2. Contacts between stations on the same continent but different countries, one (1) point. *Exception:* For North American stations *only,* contacts between stations within the North American boundaries count two (2) points.

3. Contacts between stations in the same country are permitted for zone or country multiplier credit but have zero (0) point value.

VII. SCORING: All stations: the final score is the result of the total QSO points multiplied by the sum of your zone and country multipliers.

Example: 1000 QSO points × 100 multiplier (30 Zones + 70 Countries) = 100,000 (final score).

VIII. AWARDS: First-place certificates will be awarded in each category listed under Sec.III in every participating country and in each call area of the United States, Canada, European Russia, Spain, and Japan.

All scores will be published. To be eligible for an award, a Single Operator station must show a minimum of 12 hours of operation. Multi-operator stations must operate a minimum of 24 hours. A single-band log is eligible for a single-band award only. If a log contains more than one band it will be judged as an all-band entry, unless specified otherwise.

In countries or sections where the returns justify, 2nd and 3rd place awards will be made.

All certificates/plaques will be issued to the licensee of the station used.

IX. TROPHIES AND PLAQUES:

Plaques and trophies are awarded for top performance in a number of categories. They are sponsored by individuals and organizations. For a current list of plaques and sponsors, or to learn how to become a sponsor, see the CQ website: <http://www.cq-amateur-radio.com/cqwwhome.html>. A station winning a World trophy will not be considered for a sub-area award; the trophy will be awarded to the runner-up in that area.

X. CLUB COMPETITION:

1. The club must be a local group and not a national organization.

2. Participation is limited to members operating within a local geographic area defined as within a 275 km radius from center of club area (except for DXpeditions specially organized for operation in the contest; club contributions of DXpedition scores are percentaged to the number of club members on the DXpedition).

3. To be listed, a minimum of 3 logs must be received from a club, and an officer of the club must submit a list of participating members and their scores, both on phone and CW.

XI. LOG INSTRUCTIONS:

1. All times must be in GMT.

2. All sent and received exchanges are to be logged.

3. Indicate zone and country multiplier only the FIRST TIME it is worked on each band.

4. Logs must be checked for duplicate contacts, correct QSO points, and multipliers.

5. *We want your electronic log. The Committee* ***requires*** *an electronic log for any possible high-scoring log.*

E-MAIL Required Content: *Please submit your log in the Cabrillo file format created by all major logging programs.* Be sure to put the STATION CALLSIGN and the MODE in the "Subject:" line of each message. Your software may automatically encode your log as an attachment. Your e-mail log will automatically be acknowledged by the server. You will also receive a personal access code from the server. Use this code to view your log for completeness and later to retrieve your computer analysis. Submit your CQ WW SSB log to **<ssb@cqww.com>** and your CQ WW CW log to **<cw@cqww.com>**.

DISKS: Please send your IBM, MS-DOS compatible computer disk. A disk containing your Cabrillo file may be submitted in lieu of a paper log. Label your disk clearly with YOUR CALL, files included, the mode (SSB or CW), and your category. Name your disk file correctly (for example, HSØAC.log).

6. For paper logs, use a separate sheet for each band.

7. Each paper log entry *must* be accompanied by a summary sheet showing all scoring information, category of competition, and contestant's name and address in BLOCK LETTERS. Electronic submission implies a signed declaration that all contest rules and regulations for amateur radio in the country of operation have been observed.

8. Sample log and summary sheets and zone maps are available from *CQ*. A large, self-addressed envelope with sufficient postage or IRCs must accompany your request. If official forms are not available, make up your own, 80 contacts to the page on 8½" × 11" paper.

9. All paper log entrants are required to submit cross-check sheets (an alphabetical list of calls worked) for each band on which 200 or more QSOs were made.

10. Bad QSO penalty: three (3) additional contacts removed.

11. QRPp and Low Power stations must indicate their category on their summary sheets and state the actual maximum power output used, with a signed declaration.

XII. DISQUALIFICATION: Violation of amateur radio regulations in the country of the contestant, or the rules of the contest; unsportsmanlike conduct; taking credit for excessive unverifiable QSOs or unverifiable multipliers will be deemed sufficient cause for disqualification. Incorrectly logged calls will be counted as unverifiable contacts.

An entrant whose log is deemed by the Contest Committee to contain a large number of discrepancies may be disqualified from eligibility for an award, both as a participant operator or station, for one year. If an operator is disqualified a second time within 5 years, he/she will be ineligible for any *CQ* contest awards for 3 years.

The use by an entrant of any non-amateur means such as telephones, telegrams, internet, or the use of packet to SOLICIT contacts during the contest is unsportsmanlike and the entry is subject to disqualification. Action and decisions of the CQ WW Contest Committee are official and final.

XIII. DEADLINE:

1. All entries must be postmarked NO LATER than December 1, 2002 for the SSB section and January 15, 2003 for the CW section. **Indicate SSB or CW on the envelope, disk, or e-mail.**

2. An extension of up to one month may be given if requested by letter or other means. The granted extension must be confirmed by letter sent to the attention of the Contest Director, must state a legitimate reason, and the request must be received before the log mailing deadline. Logs postmarked after the extension deadline may be listed in the results but will be declared ineligible for an award.

Both Phone and CW mailed logs should be sent to CQ Magazine, 25 Newbridge Road, Hicksville, NY 11801.

Number groups after call letters denote following: Band (A = all), Final Score, Number of QSOs, Zones, and Countries. An asterisk (*) before a call indicates low power. Certificate winners are listed in bold. (All country terminology reflects the DXCC list at the time of the contest.)

CW RESULTS
SINGLE OPERATOR
NORTH AMERICA
UNITED STATES

K5ZD/1	**A**	**7,048,856**	**3790**	**157**	**510**
K1AR	**"**	**6,271,568**	**3381**	**161**	**500**
N2NT/1	**"**	**6,027,840**	**3411**	**153**	**491**
KQ2M/1	**"**	**5,389,614**	**3314**	**145**	**458**
W1KM	**"**	**5,369,000**	**3233**	**139**	**451**
K1DG	**"**	**4,461,795**	**2775**	**142**	**443**
KR1G	**"**	**3,851,925**	**2705**	**123**	**402**
WC1M	*	3,157,596	2218	126	381
NR1DX	*	2,616,963	1801	116	413
KS1J	*	2,603,058	1999	111	356
W1WEF	*	2,555,168	1733	118	426
W1FJ	*	2,197,539	1707	107	370
W1CU	*	2,074,345	1223	136	475
N6RFM/1	*	1,610,070	1066	121	440
W1QK	*	1,601,292	1294	98	364
KC1F	*	1,567,368	1396	92	304
W1ECT	*	1,466,457	1382	93	308
K1VDF	*	1,042,730	1222	77	261
W1GF	*	1,026,434	985	84	298
K5MA/1	*	887,964	910	90	251
K1HI	*	763,732	681	98	345
K1ZZ	*	693,330	677	97	266
W1EQ	*	669,288	761	76	240
W1BIH	*	384,750	447	102	303
K1CN	*	302,791	414	72	219
W1RZF	*	278,588	413	61	196
W1TO	*	208,260	291	66	201
K1GW	*	204,672	466	52	156
K1RV	*	67,878	162	43	119
W1AW	*	43,673	158	36	83
			(Op: W1ND)		
K1AJ	*	15,949	167	9	32
NY1E	**28**	**77,256**	**284**	**25**	**86**
K2SS/1	21	2,448	31	13	21
K1BV	**14**	**113,741**	**404**	**25**	**82**
K1QS	*	104,720	335	31	105
W1MK	**3.5**	**236,280**	**738**	**26**	**94**
K1IR	*	79,143	341	19	74
***W1UK**	**A**	**2,719,830**	**1973**	**112**	**398**
***KM1X**	**"**	**1,571,948**	**1325**	**95**	**339**
***K1QA**	**"**	**1,523,376**	**1270**	**96**	**330**
***KB1EAX**	**"**	**1,490,370**	**1256**	**104**	**349**
			(Op: WA1LNP)		
*W3EF/1	*	1,476,475	1223	110	345
*K1HT	*	1,246,245	1032	99	330
*W1WAI	*	1,241,790	1069	93	333
*NY1S	*	1,156,287	1042	93	314
*NT1N	*	758,098	747	100	274
*W1KT	*	588,504	590	88	284
*K1IB	*	466,612	671	68	216
*W1ZK	*	444,264	523	85	236
*N1DC	*	369,873	473	71	238
*N3KCJ/1	*	307,317	467	64	203
*W1ZS	*	282,163	441	50	183
*K1VSJ	*	229,424	402	55	153
*K1VUT	*	211,276	345	66	173
*K1NU	*	196,582	329	64	163
*K1RO	*	195,201	346	52	155
*WA1Z	*	136,213	258	58	145
*K1EP	*	128,028	276	45	143
*K1JB	*	106,176	216	59	133
*KR1B	*	76,860	266	47	133
*W1END	*	74,814	254	26	85
*N1DS	*	74,654	194	48	115
*K1SWG	*	60,738	160	49	110
*K1BD	*	59,947	152	49	102
*W6FC/1	*	52,649	136	48	115
*KG1D	*	49,200	140	50	100
*KY1B	*	42,312	152	51	113
*W1DAD	*	34,720	118	44	80
*W1RJ	*	30,888	124	40	92
*KN1H	*	30,806	197	43	103
*W1TW	*	16,744	139	29	75
*K3UFG/1	*	6,804	106	33	51
*N1LW	28	1,368	21	9	15
*K1RFD	14	580	13	7	13
N2LT	**A**	**3,821,056**	**2470**	**130**	**414**
K2UA	**"**	**3,458,004**	**2524**	**126**	**380**
WW2Y	*	3,136,140	2294	125	407
K2SX	*	2,370,576	1685	118	406
N2GC	*	2,278,458	1482	124	422
K2NV	*	1,936,809	1395	121	376
N2MG	*	1,855,656	1542	104	322
W2LC	*	1,715,805	1390	108	347
N2PP	*	1,678,892	1550	114	340
K2ONP	*	1,482,302	1480	88	285
N2NU	*	1,450,382	1251	119	324
W2FU	*	1,449,112	1192	116	342
WA2VYA	*	1,089,792	1005	96	291
N2CQ	*	844,701	734	100	329
N2MR	*	807,396	799	87	279
W2XL	*	702,472	913	65	212
N1JP/2	*	439,960	502	75	265
W2YE	*	340,200	486	84	216
KE2WY	*	334,665	515	80	253
KQ2O	*	314,150	568	49	157
NO2T	*	302,045	444	70	243
KA2D	*	260,764	393	66	212
K2BX	*	260,190	344	74	220
WB2HJV	*	227,940	351	68	194
K2XT	*	217,328	304	63	209
N2OO	*	81,498	199	38	103
W2FUI	*	60,463	244	66	133
W2GG	*	37,605	137	39	70
W2UDT	*	29,694	148	24	77
K2SZ	*	4,725	42	23	40
KV2X	*	100	48	25	38
N2MF	**21**	**579,439**	**1378**	**37**	**124**
K2XA	*	30,005	142	27	58
K2XR	**14**	**467,425**	**958**	**41**	**134**
K2BA	**"**	**362,700**	**904**	**39**	**116**
KD2RD	**7**	**285,625**	**877**	**27**	**98**
K2LP	*	35,218	155	21	67
W2VO	**1.8**	**1,566**	**34**	**9**	**18**
***N2BA**	**A**	**2,494,682**	**1981**	**111**	**367**
***W2TZ**	**"**	**947,574**	**969**	**84**	**282**
*N2WK	*	822,948	769	93	311
*K2UF	*	736,575	796	78	267
*WA2C	*	438,165	685	83	232
*W2TX	*	426,818	524	74	227
*KM2L	*	409,308	533	73	203
*WA2YSJ	*	317,768	393	81	233
*W2TN	*	307,076	432	84	224
*WA2VZQ	*	200,605	378	54	190
*K2UR	*	194,432	322	53	171
*WA2FGK	*	183,708	333	69	174
			(Op: K2LNS)		
*WA2EYA	*	154,638	300	52	146
*W2WC	*	140,885	330	54	117
*WA2VQV	*	131,172	266	57	147
*N2CG	*	101,032	226	48	125
*N2LK	*	89,838	220	49	137
*K2TV	*	60,750	183	35	100
*W2EZ	*	40,386	156	35	92
*K2UG	*	37,888	223	64	192
*W2BEE	*	37,525	153	26	69
*K2YW	*	36,703	124	40	87
*KF2EW	*	36,267	169	49	108
*W2BVH	*	26,460	119	30	75
*WA2IAU	*	14,784	89	24	64
*NA2NA	*	6,720	53	20	40
*K2YLH	*	100	41	21	34
***K2MFY**	**28**	**162,238**	**433**	**31**	**117**
*AI2C	*	92,682	305	26	88
*N2VM	*	19,929	107	28	63
*N2GM	*	17,600	110	20	60
***N2CU**	**21**	**155,484**	**437**	**30**	**96**
*WB2BXO	*	12,800	78	18	46
***K2CDJ**	**7**	**47,530**	**201**	**19**	**78**
*WB2DVU	*	37,136	158	19	69
*WB2SXY	*	14	5	2	5
K3ZO	**A**	**4,727,816**	**3017**	**134**	**423**
W3BGN	**"**	**3,630,500**	**2420**	**125**	**423**
K3CR	*	3,557,020	2359	142	444
			(Op: LZ4AX)		
W3ZL	*	1,355,928	1307	102	290
K3MD	*	1,347,696	1239	105	336
N3UM	*	1,248,520	1176	96	296
K3NK	*	1,104,742	951	108	338
K3TM	*	1,080,792	1000	96	312
K3ZZ	*	1,064,679	1056	101	318
W3VT	*	957,924	816	113	338
K3UL	*	901,511	1058	108	295
K3TC	*	792,810	772	102	312
N3KR	*	675,948	712	84	280
W3AZ	*	669,535	675	96	277
K4JLD/3	*	569,584	643	99	289
W3BYX	*	516,600	622	80	270
K3GW	*	463,821	524	88	261
W3KV	*	424,992	520	76	241
N3RJ	*	405,414	582	73	230
W3RJ	*	328,900	618	57	163
W3DAD	*	307,980	427	65	196
W3UL	*	205,656	350	56	172
N4GG/3	*	179,816	281	73	193
AA3JU	*	153,792	268	72	195
N3NZ	*	139,460	273	54	136
W3GN	*	103,372	227	51	121
AA3VA	*	63,794	153	51	116
W3BEN	*	11,645	70	29	56
WY3T	**14**	**62,760**	**224**	**32**	**88**
KT3Y	**7**	**434,420**	**1189**	**31**	**109**
***NY3A**	**A**	**1,552,896**	**1541**	**93**	**291**
***N1WR/3**	**"**	**1,423,830**	**1117**	**107**	**358**
*K2YWE/3	*	916,992	1012	94	304
*N3FR	*	629,223	668	93	268
*W3UJ	*	628,544	707	89	279
*K1EFI/3	*	606,060	605	81	283
*WA3SES	*	536,300	658	79	231
*W3TB	*	427,038	534	68	241
*NY3C	*	399,840	582	71	209
*KE3VV	*	334,048	494	77	215
*W3DF	*	328,192	481	68	188
*W3IUU	*	280,358	399	71	192
*W3CP	*	265,265	371	69	196
*WF3M	*	249,368	382	63	181
*K3DSP	*	199,320	354	56	164
*K3VA	*	195,600	362	43	157
*N3GPU	*	166,531	336	68	173
*KF3DC	*	111,930	222	53	142
*K3YD	*	90,395	228	43	136
*N3EA	*	61,335	184	35	106
*N9GG/3	*	22,344	113	40	74
*W3FQE	*	14,625	159	32	93
*NS3T	*	3,969	47	24	39
*W3IZ	*	2,970	35	18	27
*KD3TB	*	980	57	17	32
*W3/ WH6CMI	*	100	80	36	69
***WW3S**	**28**	**184,080**	**498**	**31**	**99**
***K3SWZ**	**21**	**74,693**	**248**	**27**	**86**
*K3CC	*	3,003	48	10	29
*NJ3K	14	16,352	138	18	55
*NZ3O	*	5,658	48	12	34
N2AN/4	**A**	**3,823,896**	**2581**	**142**	**424**
					(Op: WC4E)
W4RX	**"**	**2,658,071**	**1944**	**131**	**402**
K4AB	*	2,289,113	1866	118	339
K7SV/4	*	2,236,338	1711	126	377
NQ4I	*	2,017,470	1709	122	333
W4YE	*	1,650,855	1265	112	359
N4ZZ	*	1,371,960	1392	93	267
W4OX	*	1,311,380	1020	121	355
N4ZJ	*	1,131,480	901	108	341
KW4DA	*	1,102,308	1193	100	288
K4NO	*	1,050,830	938	116	335
W9WI/4	*	977,315	1019	96	259
K4LTA	*	973,256	1119	94	267
N4ZIQ	*	964,100	1266	76	234
					(Op: N4GI)
KO7X/4	*	814,680	857	99	266
K4IE	*	653,015	689	105	278
KØEJ/4	*	615,740	736	107	233
K4LQ	*	582,840	603	87	273
N4MM	*	579,078	595	98	283
K4HA	*	536,670	627	83	252
KG7H/4	*	516,360	674	108	204
WC4H	*	461,240	767	69	191
N8PR/4	*	341,912	411	88	228
W4SI	*	266,490	425	68	202
K1KO/4	*	195,424	338	71	177
K4WJ	*	178,266	289	62	160
W4NZ	*	151,613	302	45	134
W4ZYT	*	151,360	250	64	156
N4IR	*	101,108	240	45	116
N4BG	*	96,264	210	45	123
AD4L	*	90,160	211	46	115
KØCOP/4	*	86,426	252	40	118
K4XG	*	84,968	200	42	130
N4UH	*	83,824	198	50	119
W4JN	*	24,465	108	29	76
N4PD	*	21,320	80	39	65
W4ZW	*	20,097	84	35	64
W7QF/4	*	9,936	64	25	44
W4ZV	**28**	**692,750**	**1472**	**37**	**133**
NN4X	**"**	**673,140**	**1576**	**36**	**120**
N4BP	**"**	**601,965**	**1459**	**35**	**112**
K4OAQ	**21**	**586,022**	**1341**	**38**	**120**
K9AY/4	**7**	**352,060**	**996**	**35**	**110**
N4PN	**"**	**334,170**	**983**	**37**	**121**
W4SO	*	316,800	821	33	111
N4UK	1.8	666	17	8	10
***N4IG**	**A**	**1,595,086**	**1198**	**111**	**367**
***N4YDU**	**"**	**1,530,606**	**1368**	**109**	**353**
***K4GKD**	**"**	**1,472,499**	**1125**	**129**	**348**
*WO4O	*	1,139,850	973	117	333
*NA4K	*	988,218	861	105	309
*K4FPF	*	731,147	730	80	303
*KT4ZX	*	573,196	729	80	212
*N4PSE	*	533,365	589	88	255
*WA4DOU	*	486,000	547	84	240
*W4IDX	*	480,816	548	83	241
*WA4TT	*	376,356	458	84	232
*K4UVT	*	347,916	427	75	241
*WD4JR	*	330,956	430	82	232
*K4FXN	*	230,786	341	74	183
*W3TMZ/4	*	220,286	280	93	248
*AE4Y	*	211,515	352	59	180
*N4TL	*	182,721	313	65	166
*NE4S	*	174,960	307	86	184
*KS4YX	*	142,416	311	46	138
*K4MX	*	131,670	231	69	141
*N4JED	*	118,170	239	51	144
*AA4KD	*	106,147	214	56	146
*N4OHE	*	102,238	225	56	138
*W4EBA	*	97,464	248	51	135
*W4AA	*	93,456	193	69	108
*K4BEV	*	93,240	201	70	140
*W4OV	*	91,287	235	58	149
*K4ORD	*	88,672	204	44	119
*N4EK	*	84,315	221	43	122
*NX9T/4	*	80,640	206	62	130
*K4OGG	*	70,970	171	52	99
*W4AU	*	67,894	165	52	114
*W4SD	*	43,957	150	31	82
*W4UM	*	41,327	132	43	100
*NF4A	*	39,746	131	48	71
*W4KYW	*	37,544	173	41	111
*K4RFK	*	31,482	116	33	73
*W4NTI	*	29,044	121	32	74
*W4EEH	*	25,466	104	37	70
*WJ9B/4	*	19,536	116	24	50
*N4LF	*	19,467	92	32	71
*N4CW	*	17,264	66	41	63
*N4XM	*	17,160	81	36	52
*W4AUI	*	15,486	82	31	56
*KO4E	*	9,758	73	29	53
*WR4I	*	6,790	57	26	44
*KR4TG	*	6,100	77	34	66
*N4CU	*	2,450	32	20	30
*KA6R/4	*	100	77	31	47
***NO4S**	**28**	**372,154**	**1023**	**32**	**114**
					(Op: K9OM)
*K4WI	*	164,548	494	31	93
*ND4AA	*	138,096	385	31	106
*KN4Y	*	67,392	297	27	77
*K2UFT/4	*	51,940	197	27	71
*K3CQ/4	*	1,674	29	15	16
***N4MO**	**21**	**292,336**	**711**	**34**	**117**
*K6ETM/4	*	6,794	50	16	41
*W4OGG	14	2,753	39	7	21
***WØYR/4**	**7**	**86,496**	**329**	**24**	**78**
N5RZ	**A**	**3,259,797**	**2301**	**150**	**423**
K5YA	**"**	**2,637,152**	**2036**	**135**	**353**
K5YAA	*	2,046,707	1534	133	370
N5PO	*	1,555,697	1214	122	351
N5RG	*	1,460,624	1149	134	339
NM5O	*	1,399,648	1264	127	331
			(Op: OH7WV)		
WQ5L	*	616,373	642	86	251
K5RA	*	608,119	676	103	264
N2LA/5	*	522,200	539	97	276
W5OM	*	473,496	645	95	267
WA5SOG	*	339,568	484	89	215
N8SM/5	*	248,123	344	90	191
K1TU/5	*	92,352	205	67	125
AB5C	*	54,945	158	51	114
W5GAI	*	17,766	76	32	62
K5RX	**28**	**481,920**	**1122**	**34**	**126**
N7DF/5	*	316,774	928	33	116
K5SZ	*	229,120	519	34	126
W5WMU	**7**	**144,145**	**470**	**30**	**97**
NX5M	1.8	1,000	23	8	12
***N5AW**	**A**	**1,921,000**	**1245**	**149**	**416**
***N5DO**	**"**	**879,671**	**860**	**123**	**308**
*N5DUW	*	178,055	313	83	156
*AA5CK	*	116,436	275	62	124
*WØUO/5	*	105,903	354	28	95
*W5TA	*	87,764	261	50	98
*N5CHA	*	79,002	184	52	102
*KM5WR	*	77,400	185	50	100
*NN5T	*	68,328	166	58	98
*NO5W	*	4,860	42	20	25
***K5NX**	**21**	**56,257**	**254**	**27**	**74**
*K5TA	*	26,973	89	29	82
W6EEN	**A**	**3,574,011**	**2305**	**169**	**424**
					(Op: N6RT)
N6RO	**"**	**2,867,841**	**2152**	**160**	**381**
W6NWS	*	1,110,670	1052	110	329
AC6DD	*	1,048,992	1093	117	275
N6HR	*	746,512	780	128	260
K6NR	*	641,920	748	104	216
WA5VGI/6	*	625,100	677	116	234
N6TW	*	558,025	687	102	223
K6LRN	*	342,087	420	106	197
N6IJ	*	272,833	601	70	117
			(Op: AD6TF)		
W6NKR	*	254,400	369	93	172
K6III	*	212,482	325	98	164
K6VNX	*	209,306	342	77	152
N6VH	*	193,909	352	81	130
K6XX	*	129,636	311	61	95
KC6X	*	117,312	228	67	125
KK6F	*	76,700	215	58	72
KE6QR	*	73,305	216	54	81
W6TE	*	38,801	153	55	106
AA6PW	*	26,100	132	41	59
W1SRD/6	*	15,471	72	30	51
W6RKC	*	13,616	69	25	49
W6FRH	*	13,072	74	38	48
K6KO	*	2,320	21	19	21
W6NL	**28**	**264,928**	**724**	**35**	**101**
N6ZB	*	119,988	431	26	75
W6DCC	**14**	**85,632**	**321**	**33**	**95**
W6EU	**7**	**84,864**	**365**	**27**	**69**
K6SE	1.8	780	27	8	7
N6PE	*	154	10	6	5
***K6XV**	**A**	**1,019,131**	**1058**	**119**	**260**
***WN6K**	**"**	**407,025**	**756**	**78**	**147**
*WO6M	*	341,634	690	104	187
*W3SE/6	*	185,256	331	85	163
*AA6EE	*	159,191	341	69	127
*K6CU	*	129,258	209	92	166
*WA6OGO	*	123,096	282	72	112
*AD6G	*	88,963	235	58	121
*N6NF	*	77,510	250	50	65
*K1ES/6	*	77,112	206	66	87
*N6EM	*	63,350	180	79	96
*K6UM	*	63,050	178	52	78
*W6IYS	*	41,952	156	49	89
*KQ6NN	*	40,843	188	37	42
*K6FA	*	38,634	138	50	71
*WW6D	*	27,324	118	38	54
*K6LDX	*	22,671	92	40	59
*K6OWL	*	21,597	128	31	38
*WA6BOB	*	21,526	113	47	47
*K6CEO	*	14,268	137	50	73
***K8PO/6**	**28**	**365,508**	**959**	**32**	**111**
*WY6DX	*	163,243	522	30	92
*NT6K	*	84,550	357	27	68
*NK6A	*	34,237	215	25	48
*K6UO	*	20,384	111	25	46
***W6EUF**	**21**	**70,936**	**292**	**29**	**74**
*W6YJ	*	60,027	219	29	78
*WD6DX	14	4,815	49	17	28
***NF6S**	**7**	**101,136**	**500**	**28**	**70**
*KU6T	*	5,054	66	17	21
W7GG	**A**	**2,649,024**	**1968**	**159**	**345**
W2VJN/7	**"**	**2,503,720**	**1776**	**163**	**367**
K7NV	*	1,710,098	1550	138	304
K4XU/7	*	1,514,528	1322	128	296
K7ZZ	*	1,013,600	1193	107	255
K9JF/7	*	870,750	749	139	311
W7YS	*	601,312	658	109	235
K7ZA	*	370,447	468	91	192
KS7T	*	331,408	446	84	185
W7OT	*	315,792	475	93	165
KA7T	*	296,296	482	93	166
W7QN	*	271,328	418	81	163
K7ABV	*	247,737	404	86	165
W7IIT	*	213,345	371	84	148
W7IJ	*	209,220	346	74	146
W7WHY	*	120,018	300	65	101
KC7UP	*	112,796	254	60	113
N7LOX	*	81,679	306	42	61
KX7J	*	24,645	211	57	107
K7DD	*	21,917	104	38	63
K7QE	*	14,592	113	36	40
N7KU	**28**	**370,560**	**1009**	**37**	**123**
					(Op: NJ6D)
K7QQ	*	220,500	664	33	93
WA7LT	**21**	**148,122**	**526**	**30**	**87**
W7AYY	*	6,673	47	23	36
K7PI	**14**	**178,432**	**428**	**39**	**125**
WA6IQM/7	**7**	**68,600**	**307**	**31**	**64**
W7CB	*	15,403	108	24	49
K7ON	3.5	2,511	93	13	18
***W7QDM**	**A**	**481,104**	**591**	**98**	**214**
***AC7LX**	**"**	**283,960**	**452**	**88**	**141**
*AB7RW	*	215,280	394	76	154
*N3AIU/7	*	191,970	321	95	142
*W7HS	*	98,040	235	82	133
*W7IY	*	68,628	192	63	109
*W7GTO	*	58,449	183	52	75
*W7LKG	*	58,293	167	57	96
*AK7O	*	52,311	204	54	87
*N7UK	*	48,600	154	58	77
*N7VS	*	36,889	152	50	59
*N7XY	*	29,637	111	51	60
*N7TL	*	14,872	106	42	46
*N7ZN	*	13,320	68	33	39
*WG7X	*	4,558	52	25	28
*KC7WUE	21	2,720	30	15	19
***N7WA**	**14**	**113,220**	**393**	**31**	**80**
*N7VM	*	5,214	53	13	20
*W7DRA	1.8	24	10	4	4
K8GL	**A**	**2,817,863**	**1801**	**141**	**416**
K8AL	**"**	**1,967,216**	**1314**	**147**	**445**
K2UOP/8	*	958,784	875	102	320
K3JT/8	*	813,950	815	92	273
W8UD	*	412,704	590	84	204
AD8J	*	382,136	515	73	223
N8PW	*	328,440	657	72	208
KB8PGW	*	93,292	234	44	122
N9AG/8	**21**	**484,292**	**1087**	**36**	**128**
W8TWA	14	26,208	126	20	58
K8MD	**3.5**	**11,289**	**121**	**18**	**53**
***KV8Q**	**A**	**635,040**	**733**	**95**	**283**
***K8AJS**	**"**	**632,730**	**596**	**92**	**301**
***K5IID/8**	**"**	**613,970**	**671**	**90**	**268**
*K8IA	*	393,442	526	86	228
*W8VE	*	311,362	446	91	211
*W8PN	*	190,060	343	56	159
*AD8P	*	185,856	319	71	171
*AF8A	*	141,240	265	63	157
*K8KU	*	118,976	247	43	126
*W8PI	*	101,067	248	46	131
*K8CV	*	87,262	214	46	115
*K8CI	*	57,785	176	34	93
*W8VJW	*	34,006	143	22	76
*WN8P	*	5,961	53	39	49
*KB8UMD	*	3,540	65	24	35
***NØFW/8**	**28**	**134,384**	**440**	**34**	**114**
*K8IR	*	103,768	322	28	91
***W8GOC**	**21**	**96,896**	**308**	**31**	**97**
*W8IQ	*	68,325	257	29	84
***WA8WV**	**7**	**51,548**	**213**	**23**	**75**
*AA8UP	*	26,082	127	20	61
*AF8C	*	252	19	6	12
W9RE	**A**	**5,712,255**	**3186**	**172**	**483**
					(Op: N9RV)
N9CK	*	2,163,420	1528	126	384
K9MA	*	1,440,738	1207	110	313
N9NS	*	600,607	671	102	257
W3HDH/9	*	413,770	496	84	238
WO9S	*	38,454	154	32	70
WB9AYW	*	7,245	52	25	44
KC9FC	*	100	206	48	105
W9YYG	**28**	**157,413**	**458**	**31**	**106**
KB9JD	*	104,390	296	31	115
W9OF	**21**	**238,392**	**558**	**36**	**118**
K9CAN	**14**	**125,789**	**360**	**36**	**99**
WT9U	*	94,657	353	24	79
K9CJ	**7**	**62,856**	**248**	**25**	**83**
K8LEE/9	*	30,250	255	30	95
***N4TZ/9**	**A**	**1,774,584**	**1313**	**120**	**383**
***W9AU**	**"**	**824,216**	**787**	**104**	**279**
*K9MMS	*	683,655	730	93	264
*N9UA	*	619,275	645	93	266
*W9SE	*	532,620	606	85	245
*N9CIQ	*	479,382	535	89	238
*K9IG	*	469,820	530	93	245
*WD9DZV	*	424,600	820	65	210
*K9JE	*	405,536	491	78	226
*W9WUU	*	314,433	454	75	204
*WA9S	*	86,742	231	51	132
*KX9DX	*	73,606	226	43	106
*N9TF	*	51,810	138	48	109
*N9BOR	*	31,472	124	37	75

*W9LYA	*	30,523	142	47	84
*K9XE	*	26,037	103	34	65
*W9YO	*	22,347	114	47	70
*AA9NF	*	6,549	54	23	36
*N9KO	*	5,250	43	21	29
*K9OSH	*	2,992	30	12	22
*K9MI	*	100	78	26	48
***W9OP**	**28**	**150,785**	**410**	**34**	**109**
*W9ILY	*	125,955	353	31	104
*K6OMB/9	*	51,574	211	26	69
*N9XR	*	1,700	92	23	45
***KJ9C**	**21**	**217,986**	**557**	**32**	**109**
*K9KJ	14	5,940	56	13	32
NRØX	**A**	**1,591,858**	**1148**	**130**	**384**
KØKX	**"**	**1,338,660**	**1167**	**118**	**326**
NØKV	*	979,352	1044	112	247
KEØUI	*	869,982	1007	100	266
WØGG	*	861,050	789	120	305
WBØO	*	757,620	671	118	296
NØDY	*	636,804	763	107	235
WØNXS	*	621,867	876	77	214
WØZQ	*	454,260	555	92	247
KJØG	*	392,808	564	99	213
WAØMHJ	*	355,498	473	75	211
WØHW	*	222,640	356	68	174
WØOR	*	146,496	256	68	156
WØTY	*	68,322	316	60	117
KØGT	*	53,655	135	42	105
KØJPL	*	52,998	149	55	91
WØRT	*	40,086	127	49	82
WØML	*	38,772	130	37	71
KCØIDI	*	28,356	120	57	82
WØMN	*	23,052	104	38	75
K2VV/Ø	**28**	**544,320**	**1223**	**35**	**127**
WNØL	*	47,508	218	28	79
K4VX/Ø	**21**	**481,120**	**1058**	**36**	**124**
					(Op: K9BGL)
KGØUA	*	61,914	226	25	77
***KU1CW/Ø**	**A**	**998,202**	**984**	**123**	**315**
***WØETT**	**"**	**528,040**	**616**	**102**	**242**
*WØVX	*	272,136	405	83	193
*KNØV	*	231,556	347	78	166
*KØGN	*	200,600	330	73	163
*KØSQ	*	171,990	310	68	166
*KØUK	*	163,172	574	88	138
*WØBV	*	112,200	236	52	113
*KSØM	*	107,856	278	63	151
*KØIL	*	104,112	199	70	146
*KJØB	*	89,908	211	57	125
*KØRC	*	45,144	128	42	90
*WØSLW	*	28,272	140	58	94
*ADØH	*	24,625	123	47	78
*NØQE	*	20,460	103	43	50
*WAØIYY	*	13,425	64	27	48
*ACØW	*	8,500	55	30	38
*WØEB	*	7,616	52	21	35
*NØIBT	*	7,366	63	27	31
*KØCOM	*	6,060	46	24	36
*WA2HFI/Ø	*	1,960	29	18	22
*KØMPH	*	180	28	13	23
*WBØTRA	*	4	1	1	1
***KØCO**	**28**	**154**	**7**	**5**	**6**

ALASKA

KL7RA	**A**	**398,695**	**1442**	**32**	**89**
KL7WV	*	327,510	1136	58	77
					(Op: W3YQ)
AL7PJ	*	45,506	237	42	80
KL7Y	**28**	**142,560**	**795**	**26**	**46**
					(Op: WA2GO)
WL7E	**21**	**519,018**	**1576**	**37**	**101**
KL9A	**14**	**597,800**	**1755**	**37**	**103**
					(Op: K7NT)
KL7FH	**7**	**123,420**	**899**	**25**	**35**
KL7G	**3.5**	**38,342**	**398**	**17**	**21**
					(Op: KL7Y)

ANTIGUA

***V26K**	**A**	**7,744,605**	**5404**	**131**	**430**
					(Op: AA3B)

BAHAMAS

***C6ARS**	**A**	**3,875,949**	**4072**	**105**	**318**
					(Op: K8EP)
*C6AGY	*	212,520	1018	55	106

BARBADOS

8P9Z	**A**	**10,006,568**	**6814**	**136**	**436**
					(Op: K4BAI)
***8P2A**	**A**	**6,135,096**	**4668**	**139**	**422**
					(Op: K9PG)

BERMUDA

***VP9/ W6PH**	**A**	**4,386,287**	**4255**	**105**	**326**

CANADA

VO1MP	**A**	**2,204,559**	**2091**	**101**	**340**
VE1AI	*	533,376	732	75	213
VE1ZJ	**7**	**189,306**	**728**	**26**	**91**
***VO1WET**	**A**	**473,801**	**819**	**51**	**178**
*VE1GPL	*	39,240	401	63	155
VE2AYU	**A**	**1,618,232**	**1621**	**92**	**315**
***VE2AWR**	**A**	**902,627**	**1103**	**79**	**262**
*VE2XAA	*	164,486	326	61	156
*VE2FFE	*	94,188	324	43	98
*VE2OWL	*	3,536	40	8	26
VA3UZ	**A**	**4,397,493**	**3237**	**140**	**397**
VE3EJ	**"**	**4,154,496**	**3403**	**128**	**368**
					(Op: N6AA)
VA3NA	*	2,690,662	2649	111	322
VE3AT	*	2,667,470	2395	112	330
VA3UA	*	1,608,150	2033	88	267
VE3PN	*	690,543	1041	79	212
VE3UKR	21	27,432	163	17	55
VA3MG	1.8	1,141	155	4	3
***VE3XB**	**A**	**1,382,784**	**1476**	**102**	**314**
***VE3ANX**	**"**	**1,271,589**	**1468**	**80**	**283**
*VE3KP	*	663,552	942	72	216
*VE3MQW	*	613,868	746	85	247
*VE3BUC	*	502,112	742	72	212
*VE3OM	*	403,310	488	78	232
*VA3IX	*	31,411	194	40	47
*VE3RSA	*	3,920	45	17	23
***VA3TTT**	**3.5**	**25,461**	**492**	**9**	**18**
VE4IM	**A**	**449,098**	**638**	**92**	**207**
***VE4YU**	**A**	**112,100**	**225**	**61**	**129**
*VE4MF	21	7,930	82	16	49
VE5UA	**A**	**387,208**	**835**	**77**	**155**
VE5AAD	*	21,735	115	28	55
VE5GC	**21**	**44,321**	**361**	**10**	**32**
***VE5SF**	**A**	**642,541**	**1115**	**86**	**185**
VE6JY	28	10,472	210	16	18
					(Op: TI2WGO)
VE6WQ	7	1,968	43	10	14
***VE6TN**	**A**	**403,260**	**681**	**86**	**174**
***VE6BF**	**21**	**170,404**	**650**	**25**	**91**
***VE6EX**	**14**	**127,600**	**621**	**28**	**72**
VE7UF	**A**	**1,185,064**	**1634**	**110**	**218**
VE7CC	**3.5**	**35,457**	**313**	**20**	**33**
***VE7XF**	**A**	**686,066**	**922**	**104**	**207**
***VA7RR**	**"**	**506,952**	**998**	**86**	**130**
*VE7FO	*	387,860	828	81	134
*VE7XB	*	202,470	518	69	101
*VE7NH	*	152,721	297	85	128
*VE7ASK	*	16	4	4	4
***VE7IN**	**28**	**72,072**	**433**	**26**	**51**

CAYMAN ISLANDS

ZF2AM	**28**	**1,205,246**	**3065**	**37**	**124**
ZF1A	**21**	**775,782**	**2782**	**31**	**95**
					(Op: W5ASP)

COSTA RICA

TI3M	**21**	**266,680**	**1816**	**29**	**89**
					(Op: TI3TLS)
***TI2/VE2EM**	**A**	**996,138**	**1456**	**81**	**216**

CUBA

***CO8ZZ**	**A**	**2,884,484**	**2800**	**110**	**348**
*CO8LY	*	1,860,577	2650	85	252
***CO2PH**	**28**	**26,786**	**270**	**20**	**39**
***CO8TW**	**14**	**60,606**	**316**	**19**	**72**
***CO2JD**	**7**	**220,524**	**1203**	**22**	**70**

DOMINICAN REPUBLIC

HI3/K6CT	**A**	**2,455,434**	**2653**	**102**	**312**
***HI9/ F6AUS**	**A**	**1,377,060**	**2767**	**75**	**220**
*HI8RV	*	145,824	326	68	149
*HI3LFE	*	3,022	66	11	12
***HI3K**	**21**	**765,459**	**2219**	**35**	**118**
					(Op: AD4Z)

GUATEMALA

***TG9AJR**	**28**	**638,932**	**2089**	**31**	**102**
					(Op: N6AN)

MARTINIQUE

FM5GU	**28**	**977,976**	**3049**	**35**	**106**

MEXICO

XE1ZOI	**A**	**1,059,288**	**1731**	**94**	**182**
XE2AC	*	595,776	1479	84	130
XE1V	*	515,125	1016	96	221
***XE2MX**	**A**	**272,688**	**426**	**100**	**204**
*XE2AUB	*	384	28	13	11
*XE1AVM	*	100	591	42	44
***XE1RGL**	**21**	**270,710**	**1225**	**25**	**82**

NICARAGUA

***H6C**	**A**	**940,975**	**1658**	**100**	**159**
					(Op: YN4SU)

PANAMA

HO1A	**28**	**1,673,777**	**4283**	**35**	**122**
					(Op: DL5XX)
3E1DX	21	497	37	4	3
					(Op: DL5XX)
***HP1AC**	**28**	**114,811**	**567**	**24**	**69**

PUERTO RICO

WP3W	**A**	**485,034**	**796**	**81**	**202**
WP4F	**7**	**374,604**	**1832**	**26**	**88**
***KP3CW**	**28**	**589,917**	**2045**	**32**	**97**
					(Op: KP3W)
*KP3W	1.8	550	27	5	6

ST. KITTS & NEVIS

V47KP	**A**	**1,222,046**	**2067**	**79**	**208**
					(Op: W2OX)

ST. VINCENT

***J88DR**	**A**	**2,848,950**	**3181**	**96**	**294**
					(Op: G3TBK)

SAN ANDRES/PROVIDENCIA

***HKØGU**	**A**	**2,046,080**	**2433**	**101**	**267**
					(Op: DL7VOG)

TURKS & CAICOS ISLANDS

VP5V	**21**	**1,054,482**	**3437**	**35**	**108**
					(Op: W5AO)
***VP5G**	**A**	**4,194,364**	**3922**	**110**	**348**
					(Op: K3TEJ)

U.S. VIRGIN ISLANDS

***KP2/KØDI**	**A**	**3,071,520**	**3530**	**101**	**294**
*KP2E	*	1,043,746	1957	57	185
					(Op: N4FD)

AFRICA

ASCENSION ISLAND

ZD8Z	**A**	**9,287,860**	**5494**	**149**	**461**
					(Op: N6TJ)

CANARY ISLANDS

EA8EA	**A**	**12,516,906**	**6613**	**161**	**493**
					(Op: OH2MM)
EA8IN	21	53,322	224	20	70
***EA8/ DJ1OJ**	**A**	**1,710,000**	**1574**	**86**	**289**
*EA8CN	*	1,436,088	1594	76	242
***EA8AH**	**28**	**1,010,794**	**2391**	**35**	**116**
					(Op: OH1MA)
***EA8NN**	**21**	**703,110**	**1872**	**31**	**107**
*EA8NQ	*	125,766	455	20	82

CEUTA & MELILLA

EA9LS	**A**	**8,838,332**	**5099**	**138**	**466**
					(Op: K6NA)
***EA9EU**	**21**	**745,745**	**1868**	**31**	**112**

EGYPT

***SU1ER**	**7**	**750,172**	**2272**	**29**	**87**
					(Op: N9NC)

GHANA

***9G5XA**	**28**	**306,520**	**1107**	**23**	**74**
					(Op: G3XAQ)

MADAGASCAR

5R8HD	**21**	**1,378,533**	**2953**	**39**	**130**
					(Op: KD6WW)
*5R8FU	28	2,496	41	10	16

MADEIRA ISLANDS

CT9L	**A**	**1,676,280**	**1317**	**97**	**361**
					(Op: DJ6QT)
***CT3KN**	**A**	**1,593,704**	**1976**	**70**	**228**

MAURITIUS

***3B8/ LA7MFA**	**A**	**2,162,451**	**2052**	**107**	**282**

MOROCCO

CN2JS	**A**	**8,569,470**	**4946**	**137**	**465**
					(Op: F6BEE)
***CN8YR**	**A**	**1,313,434**	**1954**	**59**	**195**

NIGERIA

5NØNHD	**A**	**320,589**	**576**	**56**	**143**
					(Op: JK1UWY)
*5NØ/ G3SVW	A	30,336	123	32	64

REUNION

***FR5FD**	**A**	**3,263,958**	**3016**	**100**	**287**

SOUTH AFRICA

ZS4TX	**28**	**1,304,606**	**2951**	**37**	**121**
ZS6MG	7	15,400	108	19	36
*ZSØE	A	52,100	205	38	62
					(Op: ZS6AJS)
*ZS5RON	28	20,286	229	12	30
*ZS6EGB	21	12,288	131	19	45

TUNISIA

3V8BB	**A**	**10,812,725**	**5862**	**159**	**526**
					(Op: YT1AD)

UGANDA

5X1Z	**14**	**1,540,658**	**3790**	**36**	**122**
					(Op: SM7PKK)

TRISTAN DA CUNHA

ZD9IR	**A**	**844,668**	**1462**	**67**	**170**

ASIA

ASIATIC RUSSIA

UA9CLB	**A**	**3,753,585**	**2908**	**129**	**366**
RA9SG	**"**	**2,125,150**	**1873**	**119**	**356**
UA9CI	*	1,777,932	1742	99	294
UA9BS	*	1,561,654	1563	90	301
RZ9AE	*	986,860	1035	90	290
UA9CKS	*	817,028	1030	72	242
RA9UV	*	789,536	1220	100	252
UA9FM	*	696,982	973	75	211
UA9SC	*	361,572	405	97	251
RX9TX	*	102,000	418	35	90
UA9FEG	*	6,175	65	26	39
UA9OS	*	4,216	46	29	39
RX9JC	**28**	**173,875**	**633**	**22**	**85**
RX9LW	**21**	**187,236**	**734**	**32**	**94**
UA9XC	*	126,882	491	23	83
UA9JLL	*	121,278	496	24	78
RJ9J	**14**	**651,467**	**1711**	**39**	**128**
					(Op: RA9JR)
RW9OW	*	343,057	1284	35	108
UA9LAO	*	150,100	603	28	72
RU9WZ	*	51,184	408	31	81
UA9UHD	*	8,772	98	10	33
RW9TA	**7**	**180,360**	**690**	**26**	**82**
RK9AY	**3.5**	**85,224**	**501**	**15**	**52**
UA9SP	*	75,600	421	14	58
UA9AT	**1.8**	**100,639**	**524**	**15**	**62**
RV9SV	*	6,132	174	10	32
***RA9DZ**	**A**	**1,334,880**	**1328**	**96**	**309**
***RN9RZ**	**"**	**1,091,793**	**1061**	**112**	**327**
*UA9AX	*	959,247	861	115	362
*RK9AD	*	880,542	892	108	318
*RA9AE	*	828,008	1060	74	258
*RA9XF	*	805,560	1059	64	230
*RX9JW	*	793,544	1134	81	200
*UA9OA	*	790,866	1012	76	242
*RA9CGK	*	531,092	744	66	224
*UA9HN	*	495,816	730	78	214
*UA9APA	*	362,544	501	64	209
*RV9XJ	*	269,607	510	55	168
*UA9OSV	*	201,690	512	37	129
*UA9CR	*	175,336	330	50	152
*RA9FTM	*	122,090	358	29	116
*RA9DA	*	114,426	264	36	127
*RU9UG	*	110,536	329	50	114
*RA9XE	*	71,721	253	29	88
*RX9JM	*	64,416	242	28	94
*RZ9IB	*	49,749	225	29	74
*RA9KM	*	38,280	154	37	79
*UA9UR	*	27,295	131	32	71
*RU9BB	*	19,776	110	31	72
*RA9FLW	*	225	8	7	8
***UA9YAB**	**28**	**249,560**	**784**	**33**	**103**
*UA9KJ	*	187,812	772	26	82
*UA9AB	*	147,810	482	32	98
*UA9WQK	*	127,292	420	28	93
***RW9QA**	**21**	**245,070**	**743**	**30**	**96**
*UA9OUB	*	22,154	205	13	40
***UA9CBM**	**14**	**247,804**	**662**	**35**	**109**
*UA9CCL	*	145,424	474	32	90
*UA9FGJ	*	93,312	315	28	80
*UA9XAB	*	55,182	210	26	76
*RV9WZ	*	7,700	71	19	36
*UA9QCP	*	684	26	6	13
RIØF	**A**	**3,077,857**	**2969**	**157**	**346**
					(Op: N6ZZ)
RAØFU	*	764,082	1263	130	244
UAØDC	*	367,616	735	88	168
RWØLIA	*	263,549	517	85	162
UAØANW	*	221,728	576	66	142
UAØSR	*	196,040	471	65	167
UAØJDD	*	129,775	410	68	111
UAØLS	*	47,068	138	67	97
UAØJQ	**21**	**222,976**	**1071**	**33**	**95**
RUØAAB	**14**	**103,104**	**471**	**29**	**67**
RWØAB	**7**	**306,657**	**1186**	**29**	**88**
RAØJJ	3.5	4,158	161	15	18
***UAØACG**	**A**	**789,049**	**1377**	**77**	**216**
*RAØJX	*	417,924	1027	82	165
*UAØYAY	*	181,420	410	80	155
*RAØFF	*	144,336	396	82	104
*RUØAT	*	142,690	421	59	131
*UAØFAI	*	66,297	192	59	88
***RAØFN**	**28**	**109,386**	**475**	**29**	**74**
***UAØFDX**	**21**	**152,207**	**743**	**31**	**70**
*UAØLMO	*	6,204	56	19	28
*RWØBG	14	26,418	156	22	52
*RUØUQ	*	360	30	5	6

ASIATIC TURKEY

*YM3WW	3.5	4,470	101	4	26
					(Op: TA3BN)
***TA3D**	**1.8**	**101,380**	**550**	**12**	**62**

AZERBAIJAN

4K9W	**A**	**251,940**	**421**	**64**	**183**
4K6GF	**28**	**119,928**	**833**	**18**	**58**

CAMBODIA

***XU7AAV**	**A**	**1,042,920**	**1625**	**112**	**248**
					(Op: G4ZVJ)

CYPRUS

C4A	**A**	**8,509,568**	**5313**	**149**	**459**
					(Op: 5B4ADA)
C4W	**"**	**6,093,360**	**4016**	**140**	**445**
					(Op: 5B4WN)
H2G	**21**	**1,168,128**	**2914**	**37**	**119**
					(Op: 5B4AGC)

GEORGIA

4L4KW	14	7,954	92	9	32

HONG KONG

***VR2BG**	**28**	**804,780**	**2178**	**37**	**116**

INDIA

VU2PAI	**A**	**2,411,810**	**2140**	**113**	**320**
***VU2MTT**	**A**	**273,498**	**540**	**74**	**163**

IRAN

***EP3PTT**	**28**	**90,820**	**632**	**17**	**59**

ISRAEL

4Z5LA	A	14,996	63	39	53
4X4WN	**28**	**857,556**	**2129**	**37**	**127**
4X3A	**1.8**	**109,280**	**557**	**16**	**64**
					(Op: 4X4NJ)
***4X/ES2RR**	**A**	**1,454,112**	**2243**	**61**	**182**
*4Z5OL	*	297,871	548	80	122
*4Z5AX	*	270,265	627	42	149
***4X/OK1EE**	**7**	**178,500**	**777**	**17**	**67**

JAPAN

JK1OLT	**A**	**1,419,348**	**1348**	**137**	**290**
JK1OPL	**"**	**1,121,184**	**952**	**145**	**313**
JR1UJX	*	723,840	993	113	199
JA1QOW	*	580,851	699	103	200
JA1HP	*	435,130	646	83	182
JI1NJC	*	348,161	409	121	220
JR1LEV	*	302,841	535	82	149
JS1PWV	*	227,331	489	94	167
JA1SJV	*	223,964	570	47	99
7J1ABD	*	63,495	169	63	90
JH1EVD	*	42,401	149	42	67
JR1LQK	*	29,526	118	48	66
JA1HHU	*	27,810	132	32	58
JR1ATA	*	21,090	90	48	47
JH1AEP	**28**	**497,068**	**1292**	**36**	**107**
JR1AIB	**21**	**383,918**	**1124**	**34**	**105**
					(Op: JE1CKA)
JO1QZI	*	23,033	131	24	51
JR1XFS	**14**	**149,816**	**606**	**35**	**87**
JA1LZR	*	80,184	354	30	74
JK1LUY	*	18,724	111	19	43
JA1QZC	7	2	1	1	1
JA1XEM	3.5	731	20	7	10
***JS1OYN**	**A**	**1,058,697**	**1189**	**115**	**224**
***JE1REU**	**"**	**488,877**	**717**	**86**	**181**
*JN1NOP	*	379,690	670	89	126
*JA1CP	*	350,065	587	89	176
*JM1NHZ	*	333,328	534	92	159
*JA1BNW	*	295,539	478	80	157
*JG1OWV	*	197,984	303	109	160
*JE1HJV	*	146,371	292	75	122
*7M1MCU	*	136,325	300	61	114
*JJ1JGI	*	134,023	340	81	142
*JP1SRG	*	128,250	302	75	115
*JF1HPC	*	118,469	279	57	112
*JA1XRH	*	109,296	235	72	104
*JH1DYV	*	94,668	247	52	86
*JH1PXY	*	82,928	229	64	89
*JF1FEV	*	64,625	199	40	85
*JN1MSO	*	59,392	207	45	71
*JH1MTR	*	55,000	164	48	77
*JA1XPU	*	51,667	161	50	71
*JA1EJD	*	42,478	184	51	83
*JE1JAC	*	32,334	135	39	63
*JH1NXU	*	24,346	129	34	40
*JA1AZS	*	22,454	131	42	67
*JA1BCP	*	20,094	116	46	56
*JA1IZ	*	17,497	84	38	53
*JQ1AHZ	*	17,025	107	32	43
*JG1FGL	*	3,445	38	6	24
*JR1UMO	*	3,276	30	20	22
***JI1RXQ**	**28**	**263,375**	**799**	**36**	**89**
***JH1AZO**	**"**	**156,800**	**720**	**30**	**68**
*JA1NLX	*	115,056	462	29	73
*JA1PS	*	84,500	327	31	69
*JA1SKE	*	81,840	307	33	77
*JA1BUI	*	67,218	289	31	71
*JA1KI	*	40,095	186	26	55
*JA1VVH	*	34,048	204	26	50
*JI1HFJ	*	32,223	174	23	46
*JA1EMQ	*	28,424	174	25	51
*JH1OLB	*	13,621	112	20	33
*7L3AUA	*	11,825	75	19	36
*JH1TXG	*	11,403	84	21	42
*JA1GS	*	10,920	84	22	38
*7K2PBB	*	7,708	74	17	24
*JG1TVK	*	3,952	35	23	29
*7N1BHO	*	3,201	38	10	23
*JO1CRA	*	2,225	36	11	14
*JA1AAT	*	273	10	7	6
***7M2ALP**	**21**	**169,916**	**665**	**29**	**78**
***7K4XNN**	**"**	**164,312**	**786**	**27**	**67**
*JJ1NZA	*	116,994	415	29	82
*JF1SQC	*	46,176	219	26	52
*7N4KDU	*	36,926	188	22	52
*JA1TEG	*	19,234	125	18	41
*JO1WIZ	*	18,135	117	24	41
*JA1BFN	*	17,505	77	19	38
*7K3BKY	*	10,620	93	20	40
*JO1COB	*	6,532	99	22	49
***JH1APZ**	**7**	**46,248**	**203**	**29**	**65**
*JE1SPY	1.8	81	9	4	5
*JP1ODJ	*	2	1	1	1
JA2QVP	**A**	**121,920**	**258**	**78**	**114**
JF2FIU	*	21,484	101	39	43
JF2VUF	*	2,436	30	19	23
JE2HCJ	**28**	**119,554**	**418**	**31**	**82**
JE2WWB	*	53,059	241	29	68
JG2TKH	*	32,120	167	28	60
JF2ION	**21**	**237,056**	**821**	**34**	**94**
JA2QXP	*	134,667	476	31	86
JE2HVC	**14**	**57,424**	**221**	**30**	**67**
JA2VQF	3.5	1,815	42	13	20
***JH2NWP**	**A**	**1,073,688**	**1105**	**115**	**277**
***JF2QNM**	**"**	**769,369**	**1144**	**83**	**188**
*JA2CUS	*	451,308	643	89	197
*JA2JTN	*	324,648	582	73	143
*JA2VZL	*	197,308	374	75	139
*JA2BQX	*	116,402	346	52	91
*JH2WIC	*	79,734	230	48	89
*JQ2EHD	*	59,736	163	63	89

*JA2KPW	*	30,674	119	41	57
*JA2MZ	*	18,414	123	39	60
*JJ2TKX	*	5,635	50	19	30
*JE2XBS	*	2,343	30	15	18
*JJ2SHW	*	42	4	2	2
*JR2TMB	28	2,070	29	13	17
*JL2LPX	14	21,014	139	28	51
JS3CTQ	**A**	**2,810,328**	**2377**	**141**	**315**
JA3YPL	*	795,987	941	97	220
			(Op: JJ3TBB)		
JF3MKC	*	202,103	360	76	133
JA3ARM	*	67,980	196	53	79
JA3RK	*	12,402	70	37	41
JA3WFQ	*	6,612	42	24	34
JA3XOG	**28**	**240,950**	**766**	**33**	**89**
JH3AIU	**21**	**684,483**	**1672**	**37**	**114**
***JO3JYE**	**A**	**892,240**	**1281**	**100**	**204**
*JA3PYC	*	255,162	401	91	167
*JK3GWT	*	232,787	712	33	98
*JG3NKP	*	207,617	410	63	128
*JG3LGD	*	197,570	340	89	141
*JA3UWB	*	138,582	304	59	111
*JE3UHV	*	63,365	185	61	84
*JA3DAY	*	30,562	98	47	71
*JR3NDM	*	6,800	65	33	47
*JO3UDL	*	2,684	24	23	21
*JA3HC	*	2,631	29	19	17
*JE3WOM	*	2,380	24	14	20
***JF3BFS**	**28**	**298,740**	**851**	**35**	**95**
*JF3IYW	*	69,222	347	27	56
*JN3DSH	*	49,929	242	27	62
*JF3KQA	*	29,896	162	25	49
***JR3EOI**	**21**	**336,144**	**912**	**36**	**113**
*JK3AHS	*	896	33	13	19
*JG3EHD	14	330	13	2	9
JH4UYB	**A**	**5,310,168**	**3411**	**163**	**419**
JA4AQZ	21	31,932	122	23	46
***JR4PMX**	**A**	**792,414**	**856**	**120**	**222**
***JR4GPA**	**"**	**588,264**	**893**	**81**	**173**
*JA4EZA	*	254,648	484	81	148
*JA4BAA	*	69,061	199	57	90
*JJ4PPK	*	65,401	256	40	62
*JA4YHX	*	44,526	146	54	69
			(Op: JA4CZM)		
*JH4WBY	*	4,416	44	20	26
***JA4ETH**	**28**	**63,356**	**311**	**30**	**64**
*JA4AQR	*	23,572	160	26	57
*JA4XNF	7	465	14	8	7
JH5FXP	**A**	**5,588,323**	**3698**	**163**	**396**
JA5DQH	**"**	**4,248,174**	**2751**	**166**	**408**
JA5IP	*	114,345	286	68	97
JA5APU	**21**	**122,416**	**579**	**32**	**80**
JA5EZI	1.8	48	10	6	6
***JH5OXF**	**A**	**790,320**	**857**	**114**	**256**
*JA5IDV	*	7,788	56	27	32
***JH5PHC**	**14**	**114,016**	**412**	**32**	**80**
*JA5ATN	7	20,735	159	19	46
*JA5JGV	1.8	24	3	3	3
JA6GCE	**A**	**2,753,456**	**2643**	**124**	**300**
JA6JAP	**"**	**1,181,950**	**1272**	**128**	**257**
JH6OPP	*	1,158,510	1226	118	247
JL6HKJ	*	436,149	602	88	213
JR6LLN	*	104,692	231	65	119
JA6BGA	*	38,364	112	61	78
JH6WBN	*	21,984	108	39	57
JR6EZE	**28**	**400,384**	**1105**	**35**	**101**
JM6FMW	*	6,960	92	19	29
JA6WW	*	1,372	48	11	17
***JA6SRB**	**A**	**348,243**	**495**	**107**	**202**
*JA6CYL/6	*	126,854	307	62	120
*JA6AVT	*	115,920	276	54	107
*JA6QDU	*	42,183	147	38	71
*JA6BWB	*	9,167	109	8	33
***JH6WHN**	**28**	**272,056**	**850**	**35**	**89**
*JA6WFM	*	123,324	568	25	61
*JJ6DGP	*	4,192	60	13	19
*JK6ISK	21	559	30	7	6
*JL6IPK	7	8,208	89	18	30
JH7XGN	**A**	**2,508,624**	**2214**	**132**	**300**
JA7IC	*	67,735	188	66	89
JA7MJ	*	8,308	62	32	30
JH7LRS	**28**	**283,544**	**826**	**35**	**99**
			(Op: JR7XKN)		
JI7NUF	**21**	**303,107**	**874**	**35**	**98**
JA7QQK	7	9,638	99	23	38
JA7NI	**1.8**	**2,528**	**70**	**15**	**17**
***JA7DNO**	**A**	**312,480**	**502**	**85**	**155**
*JR7HOD	*	97,376	264	74	105
*JH7QNG	*	70,215	249	56	95
*JN7OJA	*	26,312	108	40	52
*JR7XGL	*	10,653	59	29	38
***JH7XMO**	**28**	**148,409**	**640**	**31**	**76**
*JH7CJM	*	83,781	328	31	76
*JI7OED	*	72,376	317	28	55
*JH7MEX	*	45,441	173	29	70
*JF7GDF	*	25,866	182	23	31
*JA7COI	*	15,132	112	21	31
*JO7BBS	*	3,136	43	11	17
*JA7AXP	*	1,791	28	12	17
***JF7PHE**	**21**	**50,800**	**320**	**24**	**56**
*JH7FUJ	7	13,623	117	21	36
*JL7AIA	*	4,847	57	17	20
JA8RWU	**A**	**1,996,004**	**1862**	**133**	**261**
JA9VOK	**21**	**156,562**	**577**	**30**	**76**
JA9CWJ	**14**	**297,153**	**799**	**36**	**101**
***JH9VSF**	**28**	**262,508**	**866**	**34**	**90**
***JH9KVF**	**21**	**214,840**	**709**	**35**	**96**
*JR9NVB	*	209,408	641	34	94
JAØQWO	**A**	**1,379,730**	**1557**	**111**	**228**
JRØWZR	*	378,730	574	104	209
JAØXZD	*	85,485	245	48	91
JHØFUW	**28**	**330,240**	**1022**	**35**	**93**
JAØBPY	*	27,144	131	26	52
JRØPJR	**21**	**47,628**	**220**	**28**	**70**
***JEØUXR**	**A**	**813,138**	**914**	**110**	**244**
*JAØFVU	*	516,312	691	105	198
*JHØIXE	*	295,404	497	84	155
*JAØBJY	*	269,115	451	81	152
*JHØNEC	*	69,048	207	61	107
*JAØPPE	*	65,552	243	56	80
*JIØNXA	*	55,242	262	73	113
*JGØAXT	*	44,688	189	47	65
*JAØRCK	*	8,330	43	29	41
***JHØNVX**	**28**	**151,685**	**498**	**34**	**81**
*JHØSDA	*	66,338	350	28	54
*JAØEMS	*	61,669	280	27	56
*JGØEXP	21	32,886	170	25	56
*JAØIOF	*	22,680	150	25	56
*JAØBMS	*	11,118	79	17	34
*JRØQKR	*	8,064	81	16	32
***JHØEPI**	**14**	**172,492**	**562**	**35**	**81**
*JAØGZ	*	1,723	34	11	9
*JJØJGS	7	3,588	72	17	22
***JAØAOQ**	**3.5**	**8,007**	**138**	**21**	**30**

JORDAN

JY9NX	**A**	**8,745,472**	**5270**	**133**	**475**
			(Op: JM1CAX)		

KAZAKHSTAN

UN1LT	**A**	**5,951,875**	**3613**	**152**	**473**
			(Op: UA9BA)		
UPØL	**"**	**4,911,742**	**3459**	**133**	**438**
			(Op: UN9LW)		
UN6T	**21**	**309,636**	**994**	**31**	**110**
UN7TS	**7**	**129,120**	**671**	**21**	**75**
UN7CZ	**3.5**	**20,723**	**197**	**12**	**41**
***UP6P**	**A**	**1,651,050**	**1709**	**119**	**331**
			(Op: UN6P)		
*UN6G	*	973,791	1025	92	285
*UN7EX	*	30,921	126	39	60
*UN8FM	*	10,270	85	29	36
***UN5J**	**28**	**422,378**	**1283**	**34**	**112**
***UN4PG**	**21**	**135,740**	**495**	**23**	**87**
***UN7JX**	**14**	**221,568**	**807**	**32**	**96**
*UN9LN	*	180,047	609	31	88
*UN4PD	*	133,454	493	28	78
*UN7SW	*	101,474	377	32	81

KOREA

HL1XP	**A**	**1,057,350**	**1481**	**114**	**257**
***HL5UOG**	**A**	**445,104**	**806**	**98**	**183**
*HL1/WX8C	*	127,160	308	63	124
*HL3AMO	*	5,824	59	24	28

KUWAIT

9K9X	**A**	**3,892,717**	**3187**	**115**	**388**
			(Op: DL1HCM)		
9K9Z	**28**	**105,768**	**488**	**30**	**74**
			(Op: K4CY)		

KYRGYZSTAN

EX2A	**A**	**2,017,011**	**2099**	**111**	**310**
EX/K4ANA	*	269,666	653	66	152
EX2X	**14**	**179,424**	**583**	**33**	**93**

LEBANON

OD5/					
OK1MU	**3.5**	**261,024**	**990**	**20**	**76**

MONGOLIA

JT1/K4ZW	**A**	**2,523,276**	**2807**	**130**	**304**

OMAN

A45XR	**A**	**8,919,400**	**5131**	**155**	**489**
			(Op: SP5EXA)		
***A45WD**	**A**	**774,786**	**1087**	**72**	**206**
			(Op: YO9HP)		

SAUDI ARABIA

HZ1AB	**28**	**1,145,920**	**2855**	**36**	**124**
			(Op: SMØCXU)		
*7Z1SJ	21	20,350	155	18	56

SINGAPORE

9V1YC	**14**	**443,525**	**1243**	**40**	**117**

TAIWAN

BV/JAØID	**A**	**1,751,484**	**2703**	**106**	**242**
BV4/UA3VCS	*	339,525	883	61	164
BV2CR	*	105,560	267	59	123
BV7FF	**28**	**226,080**	**1020**	**32**	**88**

TAJIKISTAN

EY7AF	**28**	**261,568**	**951**	**30**	**92**
EY8MM	**21**	**354,450**	**1073**	**37**	**113**
***EY7AB**	**21**	**38,805**	**386**	**16**	**49**

THAILAND

HSØ/					
SM3DYU	**21**	**107,875**	**473**	**31**	**94**
***HSØ/**					
OZ1HET	**A**	**295,707**	**596**	**69**	**172**
*E2ØHHK	*	13,197	76	34	49
***HSØ/**					
G3NOM	**28**	**268,657**	**908**	**34**	**103**
***HS4BPQ**	**21**	**57,969**	**303**	**29**	**84**

UK BASES ON CYPRUS

***ZC4DW**	**A**	**5,877,190**	**4318**	**120**	**385**
***ZC4BS**	**21**	**397,964**	**1330**	**28**	**94**
			(Op: G4KIV)		

UNITED ARAB EMIRATES

A61AJ	**A**	**10,720,332**	**5957**	**161**	**523**
			(Op: S53R)		

UZBEKISTAN

UK9AA	**28**	**596,120**	**1781**	**35**	**105**

VIETNAM

***3W2ER**	**A**	**946,050**	**1524**	**88**	**230**
			(Op: G4ZFE)		
*3W2LWS	*	232,408	525	66	143
			(Op: WA1LWS)		
***XV9SW**	**21**	**351,392**	**1267**	**32**	**107**
			(Op: SM5MX)		

WEST MALAYSIA

***9M2TO**	**A**	**707,078**	**1801**	**95**	**239**
			(Op: JAØDMV)		

EUROPE

4U-VIENNA

4U1VIC	**A**	**2,414,517**	**3395**	**123**	**360**
			(Op: JH4RHF)		

ALAND ISLANDS

OHØR	**A**	**3,664,440**	**3061**	**152**	**496**
			(Op: OH2PM)		
OHØV	**21**	**587,832**	**1775**	**39**	**129**
			(Op: OH6LI)		
***OHØN**	**28**	**325,500**	**1074**	**34**	**116**
			(Op: DJ2QV)		

ALBANIA

***ZA/S57AW**	**3.5**	**33,792**	**296**	**21**	**86**

AUSTRIA

OE2BZL	**A**	**1,823,756**	**2323**	**103**	**355**
OE75CWL	*	832,314	1943	77	217
			(Op: OE5CWL)		
OE75SLH	*	32,175	210	58	107
			(Op: OE9SLH)		
OE3I	**28**	**318,339**	**1027**	**37**	**126**
			(Op: OE1JNB)		

BALEARIC ISLANDS

*EA6XQ	28	1,860	96	7	23
***EA6/**					
DL8NBY	**14**	**74,672**	**384**	**22**	**82**

BELARUS

EU1SA	**A**	**1,296,584**	**1677**	**109**	**363**
EW2AA	**21**	**443,754**	**1316**	**40**	**138**
EW8MW	*	391,391	1511	35	126
EW2DN	**7**	**33,669**	**317**	**17**	**70**
EW1WZ	**3.5**	**167,272**	**1216**	**25**	**91**
			(Op: EU1UN)		
EU6EU	**1.8**	**64,070**	**840**	**13**	**63**
EW3LN	*	8,219	172	7	40
***EU1DX**	**A**	**3,028,248**	**2857**	**139**	**475**
*EW1CQ	*	583,889	814	87	302
*EW1ABA	*	120,267	553	41	166
*EU6TV	*	38,608	131	48	79
***EW8OU**	**28**	**80,865**	**311**	**32**	**103**
*EW1MN	*	50,903	239	25	74
***EW7DK**	**21**	**56,028**	**243**	**26**	**86**
***EU6AA**	**14**	**26,936**	**303**	**16**	**58**
*EU1CC	7	12,025	150	11	54
***EW8DX**	**3.5**	**79,704**	**965**	**15**	**66**
***EW8OS**	**1.8**	**10,780**	**250**	**5**	**39**

BELGIUM

***OQ4CAS**	**A**	**838,530**	**1177**	**91**	**294**
*ON4XG	*	366,981	706	75	266
*ON9CLV	*	77,973	299	46	95
			(Op: SMØELV)		
*ON6LY	*	28,899	206	39	132
*OQ5HY	*	26,499	153	36	85
*ON5JD	*	21,252	138	36	88
*ON4CHK	*	7,407	100	16	33
*OQ4KVA	*	5,301	88	15	42
*OQ6TJ	28	35,074	249	17	54
***OT1H**	**21**	**403,701**	**1396**	**36**	**123**
			(Op: ON5UM)		
*OQ6CW	*	163,250	802	34	80
***OQ6NR**	**3.5**	**107,355**	**1130**	**15**	**70**
			(Op: ON4RU)		

BOSNIA-HERZEGOVINA

T97J	A	17,127	95	39	60
T94MZ	**21**	**435,472**	**1880**	**32**	**104**
*T9ØC	28	9,280	111	17	41
*T97M	21	7,320	79	12	49
*T97Y	"	3,515	62	11	26
***T92D**	**14**	**378,609**	**1534**	**35**	**114**
*T95C	"	62,280	395	30	90
*T95O	7	30,090	183	18	67

BULGARIA

LZ1QZ	**A**	**740,558**	**1678**	**80**	**258**
LZ2DL	*	130,865	483	68	150
LZ2PL	**28**	**363,315**	**1169**	**36**	**123**
LZ2JA	*	168,780	670	28	88
LZ2SSB	*	67,321	364	28	78
LZ5A	**21**	**380,972**	**1472**	**38**	**126**
			(Op: LZ1ZF)		
LZ9V	*	113,410	667	28	80
LZ2GTR	*	34,812	253	21	60
LZ2RF	**7**	**126,200**	**709**	**92**	**130**
LZ9X	**3.5**	**61,600**	**760**	**15**	**65**
LZ8T	**1.8**	**66,456**	**792**	**13**	**65**
			(Op: LZ2FV)		
***LZ1QH**	**A**	**174,892**	**388**	**72**	**203**
*LZ5ZI	*	170,362	594	47	159
*LZ1AQ	*	167,475	481	47	128
*LZ1NJ	*	96,570	322	35	95
*LZ1FJ	*	23,088	190	23	88
*LZ4BU	*	13,013	69	31	46
*LZ4CB	*	4,352	85	17	30
***LZ1FH**	**28**	**104,995**	**485**	**24**	**91**
*LZ2NB	*	84,637	341	29	84
*LZ1AG	*	30,495	120	30	77
*LZ1EP	*	22,446	156	22	53
***LZ1CW**	**21**	**89,404**	**422**	**28**	**96**
***LZ4ZP**	**14**	**488,674**	**1736**	**39**	**124**
*LZ2VP	*	66,515	545	30	86
*LZ1ZP	*	3,150	31	17	25
***LZ1ABC**	**7**	**137,352**	**796**	**26**	**92**
***LZ2LDS**	**3.5**	**46,743**	**597**	**23**	**50**
*LZ1MC	*	29,232	392	13	59
***LZ2UZ**	**1.8**	**10,290**	**209**	**7**	**42**

CROATIA

9A3MA	**A**	**2,808,836**	**3167**	**130**	**447**
9A7D	**28**	**512,253**	**1438**	**39**	**134**
			(Op: 9A2SD)		
9A5W	**21**	**853,216**	**2395**	**40**	**142**
9A6A	**14**	**701,575**	**2478**	**40**	**135**
9A5Y	**3.5**	**246,196**	**1486**	**26**	**96**
			(Op: 9A3LG)		
***9A3W**	**A**	**352,098**	**755**	**69**	**210**
			(Op: 9A2YD)		
*9A3CY	*	42,532	219	28	70
***9A3VM**	**28**	**287,289**	**1135**	**29**	**108**
*9A2W	*	129,258	496	33	96
			(Op: 9A4KW)		
*9A3ZO	*	8,804	75	20	42
*9A4RV	14	7,632	90	14	39

CZECH REPUBLIC

OK1EP	**A**	**2,176,146**	**2235**	**130**	**437**
OK1FDY	**"**	**1,828,860**	**1992**	**123**	**438**
OK1AVY	**"**	**1,660,032**	**1676**	**109**	**415**
OK1FPS	*	1,539,664	1858	105	361
OK2PDT	*	1,426,473	1600	99	350
OK1BA	*	1,208,465	1296	112	393
OK1OX	*	1,008,580	1297	97	325
OL4M	*	894,852	1444	88	314
OK2ABU	*	854,880	1355	93	323
OK2EQ	*	760,182	1228	89	313
OK1AOV	*	487,772	632	93	301
OK1KZ	*	253,134	570	61	185
OK1ZF	*	238,542	600	56	193
OK1ASG	*	160,146	473	60	186
OK2PZ	*	110,776	413	52	175
OK1FJD	*	5,301	72	22	35
OK1AUP	*	3,519	28	23	28
OK1FPG	**28**	**345,780**	**956**	**37**	**133**
OK1FZM	**"**	**300,300**	**816**	**35**	**130**
OK1AES	*	140,505	409	32	113
OK2BJT	*	120,686	389	30	103
OK1DTP	*	119,796	520	32	102
OL3E	*	79,929	480	28	79
			(Op: OK1MBZ)		
OK1DEK	*	61,360	324	23	81
OL5Y	**21**	**479,680**	**1488**	**35**	**125**
			(Op: OK1FUA)		
OK2ZC	**"**	**368,155**	**1431**	**32**	**113**
OK2GG	*	276,791	977	35	122
OK2ZO	*	211,391	822	29	108
OK2GZ	**14**	**329,300**	**1305**	**36**	**112**
OK1RF	**7**	**721,952**	**2083**	**40**	**136**
OK1XC	*	122,148	840	26	90
OLØE	**3.5**	**174,400**	**1218**	**24**	**85**
			(Op: OK2ZU)		
OK1XJ	**1.8**	**15,892**	**308**	**8**	**50**
OK1TP	*	7,904	225	6	46
OK1DWJ	*	7,630	71	10	60
***OK2PP**	**A**	**2,507,014**	**2613**	**121**	**448**
***OK1DOL**	**"**	**1,563,408**	**1679**	**107**	**410**
***OK1HX**	**"**	**1,399,159**	**1572**	**107**	**372**
*OK2BGK	*	1,287,250	1586	100	375
*OK2MBP	*	1,144,050	1472	84	351
*OK2TBC	*	1,039,142	1259	109	333
*OK2DU	*	992,870	1447	97	333
*OK1ZP	*	938,740	1553	80	294
*OK2EC	*	863,226	1313	92	311
*OK1TN	*	832,728	960	107	364
*OK2PAE	*	719,504	1176	90	296
*OK2BND	*	550,722	913	72	277
*OK2SJ	*	490,110	900	68	242
*OK2PHC	*	439,679	886	72	245
*OK1FKV	*	407,258	769	80	234
*OK2HIJ	*	359,307	688	73	260
*OK2PCN	*	316,098	630	77	229
*OK1DVK	*	305,046	430	85	281
*OK1DKO	*	295,035	492	67	200
*OK2VP	*	230,472	576	57	207
*OK1AOU	*	214,793	523	55	188
*OK2BDF	*	196,826	512	58	180
*OK2BNC	*	183,480	418	66	203
*OK2PBG	*	156,492	372	63	170
*OK1ES	*	105,248	366	34	109
*OK1DXR	*	103,950	300	50	139
*OK2AJ	*	103,293	386	42	111
*OK2HFC	*	42,884	179	44	107
*OK1DXD	*	31,500	106	47	78
*OK1FFH	*	22,776	203	28	76
*OK2PAD	*	22,192	120	28	48
***OK1MNW**	**28**	**204,445**	**591**	**35**	**120**
*OK2PTZ	*	149,093	497	30	103
*OK1FHI	*	145,871	413	36	113
*OK2SW	*	108,429	352	33	108
*OK2QA	*	95,472	329	29	88
*OK2TCW	*	77,392	323	25	87
*OK1DUG	*	62,946	315	30	87
*OK1LO	*	36,192	222	23	73
*OK2XA	*	16,080	105	21	46
***OK2ZV**	**21**	**293,181**	**939**	**35**	**126**
***OK2NN**	**"**	**261,600**	**817**	**35**	**125**
*OK1VD	*	188,496	638	36	118
*OK2QX	*	163,116	626	30	108
*OK1AXA	*	129,780	481	29	111
*OK1GI	*	76,672	329	29	99
*OK2PKF	*	73,848	386	22	80
*OK1MMN	*	66,216	372	18	75
*OK2BRV	*	34,354	249	18	71
*OK1SRD	*	812	43	9	20
*OK1JDJ	14	1,618	50	6	24
***OK1FKM**	**7**	**164,521**	**787**	**29**	**104**
*OK1FCA	*	118,992	677	23	88
*OK2KJ	*	54,900	370	18	72
*OK1TGI	*	46,893	423	18	69
*OK1ABF	*	6,090	62	14	44
***OK2HI**	**3.5**	**53,860**	**521**	**17**	**67**
*OK1SI	*	44,919	707	10	53
*OK1FOG	*	30,940	464	11	57
*OK1JST	*	9,309	181	7	43
***OK1JOK**	**1.8**	**11,342**	**273**	**6**	**47**
***OK2SNX**	**"**	**11,008**	**328**	**5**	**38**
*OK1DKM	*	4,496	142	5	33

DENMARK

OZ1LO	**A**	**3,376,776**	**3433**	**131**	**417**
OZ1AA	**"**	**3,183,104**	**3161**	**124**	**388**
OZ4KG	*	34,780	468	57	178
OZ4RT	*	6,962	102	11	48
OZ5DX	**28**	**49,595**	**241**	**23**	**68**
OZ4O	**7**	**124,410**	**842**	**22**	**88**
OZ4OC	*	14,632	193	14	48
OZ7YL	*	9,789	116	14	44
***OZ8SW**	**A**	**734,594**	**986**	**88**	**295**
***OZØRS**	**"**	**448,804**	**871**	**64**	**228**
*OZ5UR	*	304,560	614	68	214
*OZ4FF	*	248,611	489	73	231
*OZ7BQ	*	3,870	38	20	25
*OZ1BMA	14	47,250	342	21	69

DODECANESE

J45KLN	**A**	**1,051,940**	**2483**	**69**	**229**
			(Op: SMØCMH)		

ENGLAND

G4BUO	**A**	**5,129,800**	**3686**	**152**	**498**
M5X	**"**	**3,457,443**	**3136**	**122**	**439**
			(Op: G4TSH)		
G3UFY	*	1,975,061	2522	97	342
G3MXJ	*	1,260,637	1109	113	398
GØIVZ	*	1,080,742	1463	87	307
G3SJJ	*	489,270	1090	77	270
G4BJM	*	354,688	809	61	211
G3YXX	*	249,812	788	48	125
G3WUX	*	247,725	783	58	167
M2W	*	227,520	633	52	140
			(Op: GØPZA)		
G3LUW	*	112,796	346	56	117
G3VYI	*	85,500	279	41	109
G3NAS	*	71,712	227	66	150
G4BUE	**7**	**110,962**	**625**	**25**	**84**
MØC	*	106,920	915	19	71
			(Op: MØDXR)		
G3VPS	**3.5**	**63,900**	**591**	**16**	**74**
***G4IIY**	**A**	**1,270,512**	**1817**	**91**	**341**
***GØMTN**	**"**	**971,813**	**1812**	**78**	**281**
*G3KKQ	*	728,992	1001	90	328
*G3KKP	*	705,180	1122	75	290
*G3NKS	*	576,271	897	73	258
*G4KFT	*	422,892	747	74	232
*G3JJZ	*	350,207	522	85	256
*G4DDX	*	268,804	674	58	210
*GØUKX	*	255,013	598	53	186
*G3ZRJ	*	248,036	539	57	179
*G3GGS	*	164,284	347	59	209
*G/N9LYE	*	100,606	387	40	147
*G4SLE	*	81,192	368	45	154
*G4ZME	*	48,384	247	30	78
*G3ECS	*	27,354	160	28	69
*GØDAY	*	10,804	138	21	53
*2EØATS	*	9,800	129	19	51
*MØAEK	*	6,486	97	24	45
*G3VQO	*	1,440	20	13	17
***G3KHZ**	**28**	**371,266**	**1053**	**34**	**127**
*G3RSD	*	81,396	440	23	91
***G4OGB**	**21**	**55,292**	**444**	**19**	**73**
*G3IZD	*	35,583	279	19	68
*G4HTD	*	13,104	144	14	34
***M4T**	**14**	**112,832**	**853**	**20**	**62**
			(Op: GØVQR)		
***G4ODV**	**7**	**92,232**	**625**	**22**	**86**
***G3WGV**	**1.8**	**32,240**	**506**	**10**	**55**

ESTONIA

ES4RD	**A**	**121,352**	**670**	**36**	**118**
ES5QA	**28**	**195,096**	**834**	**31**	**101**
***ES2DJ**	**A**	**747,192**	**1176**	**89**	**293**
*ES1CW	*	183,330	342	69	246
*ES1RF	*	159,858	437	59	190
*ES7FU	*	68,418	268	33	93
***ES1OX**	**28**	**75,184**	**374**	**28**	**99**
*ESØNW	*	26,674	124	24	60
***ES1TM**	**21**	**54,450**	**462**	**20**	**70**
*ES6CO	3.5	5,136	100	8	40
***ES6PZ**	**1.8**	**8,004**	**181**	**5**	**41**

EUROPEAN RUSSIA

RK4FF	**A**	**5,111,302**	**4378**	**154**	**508**
UA1QM	**"**	**2,642,972**	**2281**	**138**	**488**
RZ3AZ	**"**	**2,616,889**	**2461**	**142**	**517**
UA4FER	*	2,587,040	2296	149	459
RW4PL	*	1,700,569	1830	124	385
RA3TT	*	1,677,968	1975	112	415
RN6AL	*	1,530,500	1924	116	384
RA3NN	*	1,219,374	1772	110	376
UA3ABJ	*	1,116,542	1283	110	351
RU3GN	*	998,784	1185	106	353
UA3AP	*	914,196	1241	99	345
UA1OMS	*	906,910	1236	105	340
RV3ID	*	803,952	1039	102	330
RA3NZ	*	668,349	1154	83	304
UA4LY	*	564,300	760	107	311
UA1OZ	*	553,164	1264	90	282
RK3BA	*	503,891	832	93	274
RU3DX	*	494,040	895	85	273
RT3A	*	352,590	1276	38	123
			(Op: RU3AA)		
UA4FEN	*	316,632	809	69	265
RA3XO	*	309,750	455	85	265
RK3AZ	*	206,064	444	70	173
UA3ICK	*	188,496	601	54	210
RX4HX	*	159,445	488	57	166
RW3SK	*	152,076	477	72	204
RN6AH	*	119,852	493	41	125
RV1CC	*	104,640	275	60	132
RN3RC	*	39,060	184	33	93
RZ1AZ	*	35,750	124	48	95
RU3RQ	*	23,320	100	41	69
RA4AFZ	*	168	28	9	19
UA1ORT	*	140	12	5	5
UA1OSA	*	100	11	10	11
UA6ADC	28	19,437	117	22	71
UA4LL	**21**	**427,152**	**1350**	**39**	**137**
RF4R	*	278,512	949	37	132
			(Op: UA4RC)		
R73A	**14**	**547,792**	**1970**	**38**	**108**
			(Op: RZ3AA)		
UA4CJJ	*	226,014	1075	33	106
UA1CEC	*	57,511	429	27	86
RD4M	**7**	**101,870**	**523**	**26**	**96**
			(Op: UA4LU)		
RA4PO	**3.5**	**34,816**	**438**	**13**	**55**
RA3SL	*	27,580	422	12	58
RA6AX	**1.8**	**21,106**	**290**	**12**	**49**
UA4CCG	**"**	**20,358**	**280**	**9**	**49**
RK3DK	*	7,728	156	8	40
***RZ4FA**	**A**	**1,615,880**	**1604**	**135**	**445**
***RA3AF**	**"**	**1,480,248**	**1627**	**123**	**411**
***UA1QV**	**"**	**1,067,640**	**1460**	**100**	**365**
*RA3XM	*	946,220	1161	116	390
*UA1ANA	*	884,884	1115	95	347
*RA3UT	*	726,180	1178	93	327
*RZ3AV	*	593,895	1027	94	317
*RN6CF	*	549,066	1055	82	275
*RA3UAG	*	525,872	934	87	281
*RA4CTR	*	456,228	797	81	267
*RW4CG	*	424,152	798	82	262
*RN3BK	*	383,760	845	71	257
*RN6AI	*	367,290	746	73	257
*UA3XBB	*	356,724	701	80	244
*RN1AO	*	346,983	586	74	213
*RX3RZ	*	336,545	746	76	243
*RX3RB	*	319,140	687	84	240
*RV3LO	*	291,030	533	72	255
*RZ3FQ	*	270,322	654	60	221
*UA1ZZ	*	268,217	706	65	214
*RU4LM	*	266,490	575	74	241
*UA4WLI	*	196,098	739	37	163
*RU3WR	*	187,912	553	67	216
*RU3AT	*	156,058	300	79	235
*UA3UMT	*	125,244	427	43	170
*UA3VLO	*	124,090	319	55	197
*UA3AKI	*	118,252	289	53	135
*RN3FA	*	96,810	212	87	123
*RA1WJ	*	90,312	381	49	164
*RV3YR	*	87,761	389	45	104
*RK1NA	*	80,640	309	45	147
*RV6ASU	*	70,266	229	35	112
*UA3LIZ	*	66,528	450	26	118
*RW3TN	*	66,126	185	63	143
*RA3MB	*	51,275	204	52	123
*UA3RAX	*	50,912	157	63	109
*RK3AFP	*	50,862	265	39	134
*UA1ONG	*	46,374	217	30	101
*RU4CO	*	43,168	209	37	115
*UA3LEO	*	42,120	210	28	80
*RW3AFY	*	42,036	119	49	75
*RW3SU	*	36,512	129	54	109
*UA6ACK	*	34,020	316	22	83
*UA4QK	*	32,322	228	36	50
*RA4POC	*	31,588	173	29	77
*UA1OMO	*	25,476	124	39	93
*RW3VZ	*	25,283	152	32	99
*UA3AMZ	*	18,894	106	34	60
*RA1TV	*	11,868	113	22	64
*RX3MM	*	5,510	68	20	38
***RZ6FA**	**28**	**297,206**	**984**	**34**	**127**
*RA3EA	*	223,200	723	35	115
*RV3ACA	*	200,577	728	32	107
*UA3SAQ	*	130,545	542	32	103
*RA3WA	*	129,456	414	30	114
*RA3AN	*	112,920	589	30	90
*UA3OQQ	*	48,858	255	25	77
*RK6LP	*	24,294	143	22	56
*RA3YO	*	4,399	50	15	38
*UA4NF	*	1,026	37	5	22
***RX3DBG**	**21**	**63,671**	**378**	**23**	**82**
***RN6HZ**	**14**	**225,169**	**951**	**31**	**102**
*UA6LAM	*	182,475	881	34	99
*RU6FA	*	171,696	719	34	113
*UA4FCO	*	110,656	492	34	99
*RV6AA	*	62,384	404	29	73
*RA1QR	*	30,744	238	22	62
*RV6FG	*	13,420	96	23	38
*RA1OHL	*	837	19	13	18
***UA3RF**	**7**	**89,010**	**502**	**24**	**91**
*UA4FHW	*	71,694	345	28	98
*UA6NZ	*	19,646	317	22	72
*RV6LFE	*	19,440	204	15	57
*RW3VA	*	12,546	109	17	65
*RW4VA	*	100	12	7	9
***UA3XAC**	**3.5**	**33,431**	**165**	**28**	**73**
*RA6FV	*	29,011	363	11	56
*UA6AKD	*	24,882	344	11	54
*UA3AMY	*	22,976	339	10	54
*RV6LO	*	22,691	302	14	55
*RV6LA	*	11,809	287	8	41
*UA6ATG	*	5,202	95	9	42
*RW3WM	*	4,949	96	7	42
*RV3QH	*	2,485	101	5	30

FAROE ISLANDS

OY1CT	**A**	**678,868**	**1557**	**67**	**247**

FINLAND

OG1MM	**A**	**3,780,421**	**3196**	**142**	**505**
			(Op: OH1MM)		
OH5CW	**"**	**3,259,200**	**3059**	**130**	**430**
OG1F	**"**	**2,978,858**	**2827**	**137**	**429**
			(Op: OH1MDR)		
OH2BH	**"**	**2,946,240**	**3242**	**131**	**409**
			(Op: OH2JTE)		
OH4R	*	2,164,234	2446	119	402
			(Op: OH4YR)		
OH3RR	*	435,100	636	88	292
OH1BOI	*	399,605	632	73	276
OH4OD	*	295,050	672	66	215
OG3JF	*	247,741	589	64	157
OH1TV	*	237,384	427	63	189
OH6OS	*	235,125	629	63	162
OH2EV	*	142,352	451	54	163
OH3JR	*	68,016	175	64	154
OH7JHI	*	43,836	300	31	125
OH5NE	*	33,744	251	29	123
OH5PT	*	32,277	117	54	86
OH2KQ	*	29,832	89	58	77
OH2KU	*	24,428	174	35	89
OH3VX	*	13,120	120	22	60
OH2XF	**28**	**56,118**	**225**	**31**	**110**
OH8OB	*	34,656	156	27	87
OH3MC	**21**	**44,308**	**259**	**22**	**84**
OG4A	**14**	**649,800**	**2239**	**38**	**114**
			(Op: OH6QU)		
OG8L	*	115,100	753	28	72
			(Op: OH8LQ)		
OH2BCD	*	71,451	473	26	61
OG2BAH	**7**	**76,146**	**500**	**22**	**76**
			(Op: OH2CV)		
OH2BYS	**3.5**	**42,984**	**539**	**11**	**61**
***OG5A**	**A**	**1,250,964**	**1713**	**99**	**330**
			(Op: OH5BM)		
*OH2LU	*	490,211	902	70	261
*OH2HEN	*	428,835	801	75	264
*OG3WS	*	356,072	512	88	288
*OH6RC	*	231,011	410	77	241
*OH4LJL	*	175,088	306	55	175
*OH7DK	*	96,096	326	52	179
*OH3IR	*	86,625	301	42	133
*OH3TZ	*	79,588	232	51	176
***OH1KF**	**28**	**85,591**	**296**	**31**	**100**
*OH3TY	*	68,628	279	26	88
*OH2LP	*	56,703	215	27	96
***OH2BSI**	**21**	**182,248**	**688**	**35**	**117**
*OH6MBQ	*	18,392	210	12	58
***OH2NN**	**14**	**240,000**	**818**	**36**	**114**
***OH2BSQ**	**3.5**	**13,300**	**275**	**6**	**44**

FRANCE

F5RZJ	**A**	**1,318,488**	**1660**	**124**	**424**
F5TNI	**"**	**1,047,242**	**1694**	**110**	**324**
F6IRA	**"**	**921,576**	**1294**	**93**	**363**
F5RAB	*	825,365	1089	95	336
F6HWU	*	671,429	1017	79	262
F8BQQ	*	330,921	850	70	179
F2AR	*	238,680	542	57	203
F6GQO	*	102,172	335	46	132
F6DZD	*	98,640	389	40	140
F5OIH	**3.5**	**57,057**	**656**	**15**	**62**
F6CWA	**1.8**	**45,504**	**528**	**14**	**65**
***F5JBR**	**A**	**1,527,938**	**1651**	**100**	**399**
***F8BPN**	**"**	**1,109,375**	**1837**	**84**	**271**
***F5PHW**	**"**	**1,019,110**	**1348**	**94**	**352**
***F6FTB**	**"**	**1,002,540**	**1327**	**89**	**345**
*F5ICC	*	869,316	1142	77	316
*F5NQL	*	602,932	1200	82	304
*F5VV	*	510,048	890	70	238
*F5UKL	*	414,750	1275	59	178
*F5OIU	*	395,560	718	76	265
*F5YJ	*	312,000	696	67	253
*F5SGI	*	283,080	548	69	211
*F5JLV	*	264,410	596	100	132
*F8AWQ	*	132,010	462	50	165
*F6FJE	*	131,098	341	57	145
*F5RPB	*	102,054	328	46	137
*F/G3VQQ	*	15,096	110	28	74
*F5JDG	*	4,825	77	13	46
***F6IIE**	**28**	**102,676**	**389**	**31**	**102**
*F5LJY	*	58,860	258	28	80
*F5TGR	*	100	84	17	44
***F8PDR**	**21**	**127,602**	**509**	**32**	**107**
*F5JY	*	109,263	495	28	93
***F5MMX**	**7**	**52,500**	**712**	**16**	**54**

GERMANY

DJ9DZ	**A**	**2,594,880**	**2610**	**138**	**438**
DL2MEH	**"**	**2,546,976**	**1892**	**147**	**541**
DK5PD	**"**	**1,940,625**	**1738**	**127**	**448**
DL3YBM	**"**	**1,786,535**	**1906**	**115**	**400**
DL2DX	*	1,633,104	1559	139	389
DL6JZ	*	1,500,707	1760	107	372
DL1VDL	*	1,474,884	1714	108	369
DK3KD	*	1,332,240	1702	105	350
DFØFS	*	1,254,267	1848	87	300
			(Op: DL1EKC)		
DL6UNF	*	1,049,104	1292	96	310
DL2ZAE	*	997,863	1563	99	388
DL1NEO	*	899,790	1057	97	348
DL5JS	*	722,880	1085	70	250
DL2MDU	*	719,576	1021	90	284
DL1LOD	*	674,561	1268	80	279
DJ1YH	*	631,069	813	102	361
DL4YAO	*	547,146	808	75	264
DK5OS	*	480,976	610	94	274
DL6AG	*	451,731	678	83	260
DL5YM	*	450,120	814	74	256
DL6NCY	*	369,161	509	95	294
DJØIF	*	363,150	657	78	192
DL6MHW	*	350,924	693	63	239
DL9ABM	*	315,945	626	75	220
DL8KAW	*	306,936	639	66	228
DL4RU	*	213,642	495	57	192
DL8UFO	*	182,280	367	57	191
DK4RM	*	157,500	326	80	170
DLØMFL	*	134,101	493	44	123
			(Op: DL2JRM)		
DL3JPN	*	114,168	295	56	157
DL7UGO	*	109,350	291	63	180
DK2BJ	*	73,445	300	39	146
DL4KBS	*	70,097	303	47	144
DK6CQ	*	56,918	195	46	103
DF2IY	*	52,452	203	41	83
DL9NCR	*	46,436	181	68	120
DL3YA	*	46,008	293	37	105
DL6RBH	*	32,385	195	42	85
DF6JC	*	30,956	133	31	78
DL7VEE	*	24,375	79	51	74
DF5AU	*	16,800	80	35	70
DJ9UW	*	12,510	166	36	103
DL6DVU	*	10,703	114	28	49
DL5JMN	*	5,967	46	25	26
DL7VRG	*	5,712	57	23	45
DL3JRA	*	5,406	52	23	28
DF2IAX	*	5,355	133	33	86
DL8NCR	*	100	32	22	26
DJ7MG	**28**	**85,428**	**316**	**30**	**96**
DJ2GM	*	39,196	272	25	57
DJ9FG	*	32,110	185	17	48
DL1DRD	*	2,232	41	13	23
DJ5JH	**21**	**214,656**	**703**	**35**	**121**
DL4WA	*	132,969	519	30	97
DL8QS	**7**	**65,780**	**489**	**28**	**82**
DK2GZ	**3.5**	**105,242**	**831**	**19**	**82**
DL1CW	*	77,840	974	13	67
DL2RUG	*	32,868	472	9	57
DJ6OI	*	15,210	303	10	55
DL4SL	*	4,704	116	6	36
DJØMDR	**1.8**	**64,206**	**680**	**16**	**71**
***DL1IAO**	**A**	**3,013,755**	**2576**	**133**	**474**
***DL5ASE**	**"**	**1,709,050**	**2104**	**103**	**372**
***DL5YYM**	**"**	**1,209,096**	**1410**	**109**	**395**
***DL3JAN**	**"**	**1,201,824**	**1370**	**104**	**364**
*DJ7IK	*	939,136	1098	111	353
*DK7ZH	*	719,261	1031	90	299
*DL5KUD	*	652,883	868	92	335
*DF3OL	*	634,200	866	95	325
*DL3BRA	*	612,720	1113	80	290
*DL1SAN	*	561,735	996	81	284
*DL2ZAV	*	455,511	803	72	255
*DL9XY	*	451,328	839	71	257
*DK5IM	*	442,603	858	75	296
*DL3ZAI	*	424,512	740	75	277
*DL2GBB	*	412,965	683	72	243
*DF3QG	*	412,800	560	114	316
*DL7UXG	*	406,461	717	79	260
*DK8AX	*	378,752	580	89	263
*DL1AO	*	357,798	746	75	219
*DF3IAL	*	342,426	687	65	198
*DL8ULO	*	307,747	688	65	212
*DL3KWF	*	299,300	752	63	229
*DL8HCO	*	290,780	654	76	259
*DM5JBN	*	278,967	485	71	240
*DL7IZ	*	269,075	494	69	166
*DJ8UV	*	262,737	776	72	261
*DL8NBJ	*	243,714	630	67	235
*DL1TH	*	237,630	621	63	204
*DL3NSM	*	232,288	534	67	205
*DL2ANM	*	230,090	510	68	198
*DL6ZNG	*	212,025	511	61	196
*DL2FDL	*	202,880	877	73	247
*DJ2YE	*	195,285	549	52	183
*DL4AAE	*	185,920	400	54	112
*DJ4PT	*	185,832	440	56	176
*DF6QV	*	176,088	413	58	218
*DLØFR	*	170,520	427	59	144
			(Op: DJ5IW)		
*DL5RMH	*	169,242	429	49	152
*DL5ST	*	146,076	271	72	150
*DL5DBH	*	145,387	483	60	151
*DL3KWR	*	137,112	416	56	176
*DL3BZZ	*	130,050	326	62	163
*DL4JYT	*	113,033	402	66	173
*DJ2IA	*	108,360	308	56	154
*DL7VAF	*	101,673	253	62	175
*DL2MIH	*	101,282	280	50	128
*DJ6NH	*	95,604	294	47	139
*DL5ASK	*	78,223	194	59	120
*DL7ON	*	74,448	216	52	92
*DK5WO	*	71,145	287	35	100
*DL8UGF	*	65,155	230	49	108
*DL2AL	*	59,096	276	46	132
*DL5AOJ	*	52,542	260	34	105
*DF7ZS	*	48,096	194	48	119
*DL1DQW	*	42,140	174	46	94
*DL3HRF	*	36,720	281	55	161
*DL3YEI	*	33,184	195	27	34
*DL8DWW	*	32,004	182	38	89
*DJ9AO	*	26,676	191	31	86
*DL2FDD	*	25,823	154	37	82
*DK7AN	*	24,102	113	40	63
*DL6UAM	*	20,874	199	19	79
*DL9GUN	*	13,900	130	27	73
*DL3SKF	*	12,844	107	25	51
*DF6WE	*	10,323	92	31	62
*DK7FP	*	3,264	55	10	22
*DJ5IW	*	1,500	25	12	18
***DL4JU**	**28**	**230,202**	**691**	**37**	**125**
***DK5JM**	**"**	**137,632**	**558**	**35**	**101**
*DL4UL	*	130,114	485	32	102
*DJ4FZ	*	126,982	676	28	89
*DF6LQ	*	90,400	371	26	87
*DL6QW	*	67,281	234	26	97
*DL7UIO	*	47,985	310	25	80
*DH6JL	*	44,954	237	20	71
*DF6QC	*	44,019	261	19	54
*DJ1WQ	*	39,933	231	20	67
*DL3ARK	*	26,250	148	23	52
*DL3NBL	*	13,338	123	29	85
*DL8DXL	*	5,995	100	16	39
*DK5JG	*	3,740	78	12	22
*DJ6XB	*	143	7	5	6
***DL1LH**	**21**	**405,309**	**1210**	**39**	**128**
*DL1RG	*	164,920	565	31	109
*DL7BY	*	158,599	654	30	109
*DL3DTH	*	145,672	506	30	109
*DJ5GG	*	139,586	506	32	110
***DK3DM**	**14**	**412,830**	**1297**	**38**	**127**
*DL6RDE	*	64,792	525	23	68
*DL1FMG	*	30,161	274	22	59
*DKØMM	*	28,152	197	24	68
			(Op: DJ7IK)		
*DL6UBF	*	7,005	45	26	40
***DJ2XC**	**7**	**61,388**	**415**	**20**	**83**
***DL2SDQ**	**3.5**	**25,632**	**385**	**14**	**58**
*DL2RZG	*	609	30	3	18
*DJ3RA	1.8	2,680	61	6	34

GREECE

J41YM	**A**	**2,137,689**	**2821**	**101**	**348**
			(Op: OK1YM)		
***SV1ENG**	**A**	**630,306**	**1613**	**72**	**219**
*SV1BSX	*	77,405	587	27	110
***SV2BOH**	**28**	**125,437**	**598**	**30**	**105**
***SV1DPJ**	**14**	**266,012**	**1289**	**34**	**112**

GUERNSEY

GU4YOX	**3.5**	**31,260**	**517**	**9**	**51**
***MU/**					
DL2OBF	**A**	**3,110,894**	**3699**	**108**	**394**
*MUØFAL	*	211,347	675	51	156
*GU3SQX	28	16,402	169	13	46

HUNGARY

HA8JV	**A**	**3,747,072**	**3117**	**161**	**511**
HA3LI	*	1,590,055	2123	108	379
HA3A	*	1,229,184	1286	117	411
			(Op: DF4PD)		
HA3PT	*	585,580	1116	82	298
HA3OU	*	426,438	836	82	236
HG8W	*	94,461	341	35	81
			(Op: HA8ZO)		
HA1ZZ	*	11,713	384	6	47
HG5C	**28**	**379,148**	**1209**	**36**	**118**
			(Op: HA5MA)		
HA8UH	*	9,804	122	16	41
HA3MQ	**21**	**531,054**	**1545**	**40**	**141**
HA9RU	*	363,204	1907	37	134
HA8FM	**14**	**654,974**	**2204**	**39**	**128**
HA8DU	**7**	**370,629**	**1696**	**38**	**121**
HA8A	*	211,544	1026	30	94
HG3M	**1.8**	**65,875**	**949**	**13**	**72**
			(Op: HA3MY)		
***HA8IH**	**A**	**2,176,160**	**2639**	**113**	**351**
*HAØDD	*	154,077	388	62	191
*HA4YG	*	23,302	162	17	37
***HA6VA**	**28**	**64,952**	**263**	**31**	**90**
*HA8YU	*	12,090	75	22	40
***HA3JB**	**21**	**169,341**	**639**	**30**	**111**
*HA5PP	*	150,675	554	33	114
***HA8AR**	**14**	**65,946**	**465**	**22**	**65**
***HA8EU**	**3.5**	**102,108**	**968**	**18**	**75**
*HG6V	*	66,665	698	15	71
			(Op: HA6IAM)		
*HA7JJS	*	49,344	724	10	54
*HA6PQ	*	25,326	358	11	52
***HA8BE**	**1.8**	**45,296**	**650**	**12**	**60**
*HA3LN	*	10,920	215	7	45

ICELAND

***TF3GB**	**A**	**229,152**	**887**	**42**	**144**
*TF8SM	*	144,326	550	43	126

IRELAND

EI5GM	**28**	**168,516**	**1209**	**26**	**67**
EI4BZ	**3.5**	**142,870**	**1140**	**18**	**73**

ITALY

IK6SNQ	**A**	**2,153,767**	**2071**	**134**	**447**
IK2AHB	*	788,085	1103	99	316
IK2UCK	*	319,422	628	77	201
IZ4COW	*	195,300	384	74	205
IK1FVO	*	136,740	361	54	161
IK2AOO	*	68,960	287	41	119
IO4L	**28**	**460,260**	**1395**	**37**	**143**
				(Op: I4LCK)	
IQ3X	**"**	**410,328**	**1272**	**38**	**126**
				(Op: IV3SKB)	
II2K	*	20,196	213	18	50
			(Op: IK2BUF)		
IU7M	**21**	**408,043**	**1451**	**35**	**122**
				(Op: IK7JWY)	
IR4T	**3.5**	**309,213**	**1571**	**27**	**102**
				(Op: IK4UPB)	
IK4AUY	1.8	2,553	67	5	32
***I3JSS**	**A**	**2,464,176**	**2507**	**118**	**410**
***IK4EWX**	**"**	**981,057**	**1337**	**90**	**321**
*IV3FHH	*	457,104	805	76	280
*IN3FHE	*	425,646	698	79	242
*IR7A	*	280,320	541	70	222
			(Op: I7ALE)		
*IK2WXV	*	266,054	705	68	206
*IK3SCB	*	227,855	704	57	172
*IK4DCS	*	187,270	434	71	236
*IK1YLL	*	163,620	445	80	223
*IZØANC	*	126,236	351	57	152
*I6FDJ	*	116,180	422	44	141
*IK4NPC	*	85,526	281	41	108
*IK1SPR	*	80,214	245	55	119
*IK2RLS	*	67,122	273	59	139
*IK2NCF	*	53,640	195	41	108
*IV3RLB	*	50,596	202	37	102
*IK3ORD	*	44,616	145	58	98
*IQ5B	*	36,972	204	46	110
			(Op: I5VXG)		
*IU3A	*	34,560	370	18	90
			(Op: IV3HAX)		
*IK2NUX	*	22,903	110	37	44
*IZ8DBJ	*	5,074	71	33	53
*IV3KSE	*	2,575	39	12	13
***IK3RIY**	**28**	**104,188**	**378**	**28**	**94**
***I2GXS**	**21**	**35,280**	**200**	**20**	**70**
***IO7C**	**14**	**211,464**	**980**	**32**	**100**
				(Op: I7PXV)	
***IK2AIT**	**7**	**21,105**	**320**	**11**	**52**

JERSEY

GJ2A	**A**	**2,663,696**	**3097**	**99**	**377**
				(Op: K2WR)	

KALININGRAD

RA2FW	**A**	**378,056**	**769**	**72**	**272**
UA2CZ	*	33,456	155	38	98

LATVIA

YL2KO	**A**	**2,309,244**	**2342**	**121**	**397**
YL2SM	**"**	**2,303,244**	**2354**	**137**	**411**
YL2GD	*	1,337,860	1510	108	335
YL2PQ	**1.8**	**56,376**	**788**	**12**	**60**
***YLØA**	**A**	**1,568,448**	**1709**	**107**	**397**
				(Op: YL2KA)	
*YL2UZ	*	831,059	1537	89	351
*YL3AD	*	359,478	887	69	248
*YL2PN	*	210,634	484	60	181
*YL2PA	*	168,696	565	59	205
*YL2LW	*	51,336	165	54	84
*YL2GTD	*	20,000	164	30	95
*YL2IP	*	19,320	107	35	70
*YL2CQ	28	39,130	228	23	63
*YL2BJ	14	31,878	218	22	55
***YL1ZF**	**7**	**109,172**	**885**	**22**	**76**

LITHUANIA

LY2CY	**A**	**3,305,008**	**2548**	**144**	**500**
LY4AA	**"**	**3,276,660**	**3072**	**138**	**444**
LY2OX	*	2,539,128	2379	138	426
LY1CX	*	2,034,120	1830	146	514
LY2MM	*	1,651,125	1535	119	436
LY2HN	*	1,335,250	1378	121	424
LY3BX	*	738,621	1071	79	242
LY2OO	*	205,712	700	62	237
LY2CI	**28**	**148,032**	**574**	**32**	**112**
LY7Z	**21**	**571,200**	**1789**	**36**	**124**
				(Op: LY2TA)	
LY5W	**14**	**696,600**	**2035**	**40**	**132**
				(Op: LY1DR)	

LY2LF	"	3,330	45	15	22
LY2BM	3.5	121,532	1131	20	72
LY2BW	"	30,555	485	12	51
*LY9A	A	3,155,273	2816	129	460
(Op: LY3BA)					
*LY6M	"	3,017,946	2737	144	482
(Op: LY1DS)					
*LY2FN	"	1,050,547	1360	101	362
*LY2BBF	"	696,510	1247	79	276
*LY2DX	"	582,298	1080	76	283
*LY3IW	"	519,010	1005	83	272
*LY2OU	"	311,360	825	72	248
*LY3ID	"	178,360	352	69	176
*LY3CY	"	133,331	453	39	148
*LY2TE	"	85,608	400	41	123
*LY2OM	28	86,310	351	30	96
*LY2AT	"	69,984	293	29	79
*LY2MW	7	90,395	724	22	79
*LY1CT	3.5	50,297	697	13	60
*LY2HK	"	26,550	495	9	50
*LY2GW	1.8	11,115	241	6	39

LUXEMBOURG

LX4B	28	343,940	1274	31	114
(Op: OH2PQ)					
*LX1JH	A	123,768	387	50	166

MACEDONIA

Z35M	A	1,251,778	1897	85	289
Z32XX	28	328,185	1097	34	119
Z37GBC	14	15,226	142	10	36
Z32AF	3.5	126,868	1187	19	73
*Z32RS	28	2,484	33	11	16
*Z37A	21	335,070	1568	30	105
*Z33A	1.8	400	20	3	9

MALTA

9H1ZA	A	3,016,497	2954	127	500
9H3NM	"	127,350	527	58	167
9HØA	28	1,025,312	3031	38	141
(Op: 9H1EL)					

MOLDOVA

ERØND	A	1,644,132	1903	121	397
(Op: UT7ND)					
ER100	1.8	35,648	590	9	55
*ER6A	A	3,551,989	3759	129	428
(Op: ER1LW)					
*ER3AU	"	389,459	945	64	223
*ER1OM	28	38,606	247	27	70
*ER3DX	1.8	14,469	272	8	45

NETHERLANDS

PAØRCT	A	1,211,049	1953	88	321
PAØCOR	"	108,243	366	47	124
PAØJNH	"	97,237	300	49	154
PA5WT	"	82,502	399	29	113
*PA3AAV	A	1,485,710	1659	113	392
*PA3EMN	"	712,974	1060	80	279
*PAØJED	"	647,112	1074	81	273
*PAØJR	"	642,720	935	97	319
*PA3ELD	"	476,550	964	69	201
*PA3BFH	"	361,400	690	67	258
*PAØCYW	"	102,800	367	43	157
*PA5GU	"	77,120	270	45	115
*PAØRBS	"	48,490	235	38	92
*PA4TU	"	17,668	128	22	72
*PAØRRS	21	16,058	122	14	48
*PA3AFF	7	3,914	73	8	30
*PA5AT	3.5	44,957	624	10	57

NORTHERN IRELAND

GI4KSH	A	108,783	391	34	119
GIØKOW	21	879,069	2562	40	139
(Op: GIØNWG)					
*GI4SNC	28	103,410	726	21	69
*GIØKVQ	"	39,748	332	20	56

NORWAY

LA9AU	A	5,451	94	19	50
LA9VDA	28	252,824	1050	34	102
LA8GK	21	19,040	116	22	58
LA6YEA	7	254,898	1476	32	94
LA9HW	"	121,275	880	26	79
LA2O	3.5	14,651	407	6	43
*LA3BO	A	1,220,100	1690	90	330
*LA9HFA	"	1,118,480	1795	88	322
*LA8OM	"	815,678	1499	62	251
*LA8PDA	"	384,462	1104	61	173
*LA2HFA	"	306,873	674	61	223
*LA9DK	"	44,280	196	39	81
*LA5TFA	"	13,836	105	24	69
*LA8PV	"	12,528	65	35	52
*LB8AE	"	3,510	61	11	43
*LA1YE	21	127,296	631	24	93
*LA8WG	"	38,586	261	22	74
*LA5UF	3.5	36,205	504	10	55

POLAND

SP7GIQ	A	5,138,420	4265	150	428
SP6CPF	"	931,192	1146	101	351
SPØPZK	"	464,808	772	87	275
(Op: SP2UKB)					
SP2HPM	"	250,162	706	63	211
SP3KRE	"	79,401	379	32	101
(Op: SQ3HTX)					
SP2IW	"	49,932	221	36	110
SP5GBJ	"	46,282	250	41	105
SP2DKI	"	40,936	205	33	86
SP5BNB	"	38,610	146	41	89
SP4AVG	"	36,065	176	41	106
SP6XP	"	25,666	147	31	51
SP8FHM	"	16,008	68	40	52
SP6AYP	"	13,287	53	50	53
SP4DGN	28	402,852	1113	37	140
SP6AZT	"	309,760	990	37	123
SP5WA	"	216,512	762	34	102
SP2IU	"	61,464	269	25	79
SP3GEM	21	731,634	1985	40	143
SP5GRM	"	701,811	1887	40	147
SN2A	"	422,347	1493	37	114
(Op: SQ2EAK)					
SN8R	"	180,765	755	31	104
(Op: SP8MI)					
SP2BLC	"	112,752	509	34	86
SP2HXY	"	3,626	112	12	37
SP2PIK	14	422,730	1402	37	117
(Op: SQ4GXO)					
SP9W	"	348,697	1218	36	121
(Op: SP9HWN)					
SP2OG	"	83,655	660	24	75
SP4DEU	7	75,285	537	23	82
SP8BRQ	3.5	213,760	1203	26	102
SN8F	"	161,262	1391	24	78
(Op: SP8FHK)					
SP7JOA	"	33,374	418	12	62
SP5GH	"	23,868	127	17	76
SP3KFH	1.8	27,440	517	9	47
(Op: SP3JZR)					
*SP4ZO	A	1,540,136	1783	109	393
*SP3KCL	"	1,248,274	1535	107	372
(Op: SP3FLR)					
*SP9DAE	"	1,194,675	1737	86	339
*SP3MGP	"	644,520	975	86	307
*SP2FGO	"	578,733	878	89	290
*SP8BVN	"	573,048	833	85	294
*SP5ASY	"	565,618	508	100	225
*SP5ATO	"	506,544	687	91	275
*SP2DNI	"	472,550	997	75	250
*SP9LAS	"	411,825	875	72	251
*SP6LV	"	404,240	887	68	258
*SP6CDP	"	317,724	545	72	247
*SP3JUN	"	307,024	765	64	184
*SP3DIK	"	268,919	588	72	215
*SP9GKM	"	260,864	683	53	203
*SP2MKI	"	239,760	498	61	209
*SP3HC	"	223,860	644	46	159
*SP6CES	"	221,706	473	66	152
*SP6GNJ	"	202,833	511	63	216
*SP3VT	"	168,966	711	34	115
*SP5ICS	"	161,385	456	51	152
*SP9NSV	"	158,268	483	52	190
*SP9GFI	"	138,888	400	54	162
*SP9FZC	"	138,852	298	60	150
*SP6BEN	"	122,422	270	67	198
*SP5CGN	"	122,412	375	53	149
*SQ9DXN	"	103,833	253	69	180
*SP3DOF	"	83,174	248	60	122
*SP6NIG	"	62,494	192	50	96
*SP9UPH	"	62,000	193	47	108
*SP9MRQ	"	50,960	327	26	114
*SP3GRQ	"	49,539	204	43	104
*SP7FBQ	"	47,946	296	31	100
*SP9ADV	"	47,792	205	39	77
*SP8FHJ	"	36,062	197	48	98
*SQ9MZ	"	28,556	151	37	81
*SP6BSL	"	28,060	182	37	78
*SQ9FMU	"	27,360	137	33	57
*SP5JSZ	"	25,482	129	31	62
*SP5ULV	"	22,270	102	39	46
*SQ9Q	"	17,819	248	42	131
(Op: SQ9DLD)					
*SP2JHJ	"	16,910	100	37	52
*SP8SW	"	13,764	109	37	87
*SP7DBS	"	9,132	97	22	60
*SQ1EUG	"	1,120	14	14	14
*SP1DPA	28	202,664	576	33	121
*SP3LWP	"	202,125	558	37	128
*SP9VEG	"	197,184	547	36	120
*SQ9PM	"	155,870	550	33	97
*SP8GEY	"	138,232	519	32	116
*SP5LCC	"	92,354	355	29	93
*SP4DC	"	64,362	256	24	78
*SP3EQE	"	52,800	238	26	84
*SQ8GHJ	"	216	10	4	5
*SP1MVG	"	172	8	5	6
*SP4Z	21	342,855	992	38	133
(Op: SP4EEZ)					
*SP9BBH	"	233,376	858	30	113
*SP2AVE	"	179,965	663	35	121
*SN4T	"	166,056	798	27	109
(Op: SP4TKR)					
*SP5GDY	"	111,228	455	30	94
*SQ2HEB	"	72,688	308	28	90
*SP2AYC	"	67,053	320	23	80
*SP2JLR	"	33,312	282	25	71
*SP5UAF	14	167,256	672	34	104
*SP8BAB	"	115,020	385	33	102
*SP9EWO	"	49,417	425	18	61
*SO5BX	"	17,025	214	18	57
*SP6DMI	"	15,677	248	14	47
*SP8GNF	"	12,709	175	19	52
*SP6KYU	"	1,890	65	10	32
*SP2DVH	"	1,288	23	10	13
*SP2FWC	7	111,510	637	28	98
*SP7HKK	"	50,687	409	20	71
*SP9ABU	"	49,428	276	21	81
*SP3GTS	"	44,190	359	20	70
*SP9AKD	"	28,739	265	16	61

PORTUGAL

CT1BNW	A	66,528	244	38	94
CT8T	28	990,250	3044	37	133
(Op: OH1NOA)					
CT1FJK	21	640,851	2114	37	133
*CS7T	A	4,764,272	4079	129	455
(Op: DF4SA)					
*CT1GFK	"	1,299,412	2163	91	303
*CT1CJJ	"	1,059,480	1451	98	338
*CT1AOZ	28	34,596	149	30	94
*CT1FNT	"	32,832	326	19	57
*CT1BWW	21	25,816	189	20	54
*CT1DVG	3.5	1,404	63	6	30

ROMANIA

YO3FF	A	106,970	341	53	137
YO9IF	"	24,920	157	31	58
YO4RHK	"	4,970	90	23	48
YO4RLP	"	2,016	80	26	58
YR4A	28	465,843	1853	35	112
(Op: YO4NF)					
YO4HW	21	29,920	276	22	66
YO9FJW	7	221,832	1336	29	88
YO2BEH	1.8	9,890	220	6	40
*YO3APJ	A	2,364,936	2129	128	460
*YO6BHN	"	948,460	1230	105	365
*YO7DO	"	337,866	627	77	251
*YO6ADW	"	294,987	608	69	230
*YO8RFS	"	202,400	636	54	199
*YO4CIS	"	173,475	484	64	193
*YO5DAS	"	168,272	686	45	163
*YO2CJX	"	111,232	500	41	135
*YO7LS	"	61,296	257	61	104
*YO9FYP	"	42,000	285	36	114
*YO8DHD	"	37,797	198	37	92
*YO4UQ	"	18,079	158	24	77
*YO7ARY	"	9,078	133	29	73
*YO3KYO	"	1,610	42	11	26
(Op: Copilor)					
*YP8A	28	227,204	1076	36	122
(Op: YO8WW)					
*YO2IS	"	110,302	414	33	98
*YO3FLQ	"	8,867	114	15	37
*YO6EZ	"	4,933	24	10	32
*YO8DDP	"	3,440	30	17	26
*YO3JW	"	3,431	67	11	36
*YO2AQB	"	2,584	137	23	45
*YO5OHO	21	169,671	742	30	106
*YO9AGI	14	100,363	672	33	70
*YO6AJK	7	10,028	175	21	30
*YO7BGA	1.8	4,756	107	7	24
*YO2KHK	"	1,400	52	4	24

SARDINIA

*ISØOMH	A	444,297	882	66	212
*ISØHQJ	"	442,470	1119	62	183
*ISØIGV	"	391,552	885	67	193
*ISØILP	"	392	28	9	19
*ISØSDX	21	42,968	314	18	64
*ISØUWX	14	13,392	274	22	71

SCOTLAND

GM3W	A	808,800	1733	75	225
(Op: GM3JKS)					
*GM4SID	A	853,860	1295	79	301
*GM3CFS	28	97,092	459	27	93

SICILY

*IR9AF	28	75,192	574	29	75
(Op: IT9AF)					
*IT9ZAU	"	33,264	508	16	47

SLOVAK REPUBLIC

OM5M	A	4,540,625	3759	149	476
(Op: OM3BH)					
OM6T	"	387,499	882	70	211
(Op: OM5AW)					
OM7VF	"	80,772	520	50	162
OM3IAG	28	195,990	664	32	107
OM8AG	"	161,546	629	33	121
OM3OM	"	43,050	289	21	61
OM5DX	14	234,118	1093	33	89
*OM4XA	A	849,352	1230	92	314
*OM5NL	"	807,940	1025	87	319
*OM7AG	"	731,430	1234	79	299
*OM4TX	"	701,624	1158	75	299
*OM4DN	"	698,400	1179	81	279
*OM7CA	"	614,880	1066	80	286
*OM8FF	"	489,762	1119	70	229
*OM3PQ	"	454,784	893	67	237
*OM1AF	"	337,395	924	52	219
*OM6RM	"	229,215	600	56	203
*OM8PG	"	183,983	495	67	184
*OM7AT	"	171,271	420	43	118
*OM3CDZ	"	138,554	464	69	140
*OM3ROM	"	78,029	394	30	127
(Op: OM4TQ)					
*OM7RC	"	74,250	270	37	98
*OM1AW	"	24,656	110	32	60
*OM2TB	"	19,634	177	42	68
*OM8CD	"	6,688	126	24	64
*OM7YC	21	96,679	480	26	95
*OM5AR	"	60,213	392	20	90
*OM5LR	"	39,328	299	23	70
*OM3RRF	"	17,105	179	11	44
(Op: OM4AA)					
*OM4WW	14	124,967	565	30	105
*OM6RU	"	12,730	190	15	52
*OM8HG	"	11,623	99	18	41
*OM1II	7	62,160	515	18	66
*OM3CDN	"	13,911	176	25	40

SLOVENIA

S5ØA	A	4,622,800	3835	156	494
S53O	"	2,150,685	2350	127	410
S59AA	"	2,056,275	1950	128	427
S56M	28	556,341	1754	36	123
S5ØC	"	508,849	1507	36	131
(Op: S53RM)					
S5ØK	"	88,908	383	30	94
S5ØR	21	458,658	1497	38	128
S53AK	"	146,044	864	31	85
S57DX	7	555,012	1927	36	126
S52O	"	398,650	1977	34	100
S59CAB	3.5	207,252	1396	25	89
(Op: S53MM)					
S51NM	"	19,136	293	10	54
S5ØU	1.8	76,038	836	14	73
*S51F	A	2,019,402	1794	118	440
*S51RJ	"	1,066,545	1555	95	316
*S54X	"	487,302	786	86	251
*S52AU	"	479,864	948	65	201
*S51VI	"	97,433	246	57	160
*S58RU	"	100	301	46	134
*S58AL	14	296,063	1397	35	114
*S57Z	7	88,308	678	21	78
*S51JM	"	1,540	82	5	30
*S53F	3.5	76,188	827	15	69
*S52W	"	59,866	784	12	62
*S51W	"	52,930	597	17	62
*S52GO	"	44,583	572	12	65
*S54A	1.8	30,730	447	9	61
*S5ØO	"	10,416	259	9	53
*S52U	"	5,371	132	5	36

SPAIN

EA5FV	A	3,703,008	3577	123	421
EA5YU	"	944,168	1301	92	336
EA5SM	"	641,646	949	93	294
EA1JO	"	595,984	930	90	296
EA3BOW	"	308,790	772	62	220
EA5BY	"	202,622	380	81	206
EA5AVC	"	180,240	502	73	167
EA2AOI	"	173,280	387	63	177
EA1AEH	"	124,033	369	57	146
EA7EZQ	"	115,566	378	47	140
EA7CA	"	83,620	286	56	129
EA7HAB	"	73,950	271	51	123
EA3AEI	"	70,215	236	49	102
EA7MT	"	58,926	213	38	84
EA1HF	"	53,176	145	57	127
EA1ABM	"	24,100	176	34	66
EA1VM	"	17,577	106	35	58
EA3KN	"	11,977	89	25	34
EA1FAE	"	7,345	42	25	40
EA3DU	"	5,400	85	14	26
EA3GIZ	"	100	78	19	38
EA2AIJ	28	78,900	650	27	73
EA5GIE	"	12,159	133	18	45
EA2LU	21	103,896	688	20	58
EA3FM	14	1,537	117	13	40
EA7GSU	3.5	35,517	365	15	69
*EA7GTF	A	2,605,562	2704	102	356
*ED7TG	"	1,292,085	1489	114	345
*EA7AJR	"	900,575	1473	76	249
*EA2BNU	"	784,030	1248	82	288
*EA7WA	"	696,192	1242	75	219
*EA1FD	"	678,940	1221	76	256
*EA1CXH	"	452,285	969	63	226
*EA1WX	"	295,715	564	60	185
*EA5EOH	"	190,035	410	52	153
*EA4EFJ	"	179,643	565	57	176
*EA1FBJ	"	155,250	577	48	177
*EA5QB	"	113,659	349	46	120
*EA4ANN	"	69,398	317	59	110
*EA3AXM	"	63,990	246	43	119
*EA5AGW	"	63,080	298	38	128
*EA5HT	"	61,320	296	44	124
*EA7FZ	"	57,641	262	38	94
*EA5BKV	"	42,312	219	33	96
*EA5AL	"	39,721	184	51	106
*EA1FBB	"	33,276	186	40	101
*EA5AKR	"	28,182	186	45	77
*EA5GNV	"	15,862	113	32	54
*EA7SL	"	13,464	86	29	44
*EA5GFX	"	4,190	37	30	36
*EA2AHZ	"	3,705	43	26	39
*EA4BNQ	"	3,528	58	13	36
*EA4WD	"	3,276	103	23	55
*EA1DFP	"	1,155	21	14	21
*EA7AKJ	28	144,958	702	25	96
*EA7GYS	"	90,965	497	27	88
*EA4UB	"	8,384	53	21	43
*EA1BYA	"	3,424	61	9	23
*EA7ASZ	21	87,854	423	24	85
*EA3CKX	"	83,358	469	25	74
*EC2ADR	"	38,070	267	22	68
*EA5GX	14	135,070	554	32	98
*EA1CS	"	82,708	405	29	87
*EA4BWR	"	78,692	515	26	77
*EA4DBM	"	20,764	197	15	43
*EA1ND	"	11,220	177	10	20

SWEDEN

8S5W	A	2,704,166	2977	125	401
(Op: SM5IMO)					
8S2F	"	1,937,724	2671	104	348
(Op: SM2LIY)					
7S2E	"	833,222	1230	106	333
(Op: SM2DMU)					
SM7E	"	461,360	879	67	249
(Op: SM7BHM)					
SM5CLE	"	381,984	734	79	267
SM3R	"	63,304	249	48	116
(Op: SM3CBR)					
SM6DUA	"	26,865	193	36	105
SM5BEU	"	4,200	31	25	31
7SØMG	21	122,870	477	30	115
(Op: SMØKV)					
SM2JEB	14	50,676	276	29	74
SM6CDG	"	5,406	90	12	39
SM5CEU	3.5	126,381	951	21	82
*SM5G	A	1,552,544	1714	98	380
(Op: SM5JBM)					
*SM5CIL	"	1,290,144	1505	96	357
*SM2T	"	809,532	1448	87	311
(Op: SM2EZT)					
*SM6BSK	"	744,390	871	89	316
*SM6DER	"	690,690	1068	83	307
*SMØBDS	"	385,285	634	70	237
*SM2KAL	"	359,268	981	63	219
*SM3EAE	"	182,962	627	52	175
*7S6J	"	171,041	497	49	174
(Op: SMØJSM)					
*SM7MS	"	79,515	186	57	114
*SM7GXR	"	68,448	303	43	141
*SM7CWI	"	66,548	262	36	91
*SMØGRD	"	48,924	209	42	109
*SM6AOU	"	22,748	78	50	71
*SM7BUN	"	16,926	144	31	62
*SM7BQX	"	11,780	109	19	57
*SM4TU	"	7,606	43	26	36
*SM7BJW	"	5,434	67	17	21
*SM6CRM	28	83,588	278	32	102
*7S5Q	21	41,417	268	23	60
(Op: SM5COP)					
*SM3X	14	186,998	871	31	102
(Op: SM3CVM)					
*8SØF	"	88,477	668	24	79
(Op: SMØOGQ)					
*SM4SX	"	61,256	394	27	77
*7S5C	"	26,427	312	19	50
(Op: SM5CBM)					
*SMØWRA	7	22,791	276	14	57
*8S6A	"	3,604	104	6	28
(Op: SM6DPF)					

SWITZERLAND

HB9FBS	A	853,200	1683	78	238
HB9CIC	"	351,945	833	71	226
*HB9ARF	A	1,578,564	1735	100	368
*HB9DCM	"	1,011,690	1383	91	314
*HB9DOT	"	295,656	743	59	232
*HB9IAL	"	95,956	353	42	119
*HB9CBR	28	97,695	389	26	91
*HB9DDE	"	12,354	139	14	44
*HB9CPS	7	6,223	86	9	40

UKRAINE

UV5U	A	2,167,452	2158	134	430
(Op: UX1UA)					
UY5ZZ	"	2,007,540	2120	130	457
UR6F	"	1,996,186	2506	125	417
(Op: UXØFF)					
EOØIDX	"	1,983,762	3410	106	360
(Op: UX7IA)					
UY3QW	"	1,834,614	2704	103	346
UT2UB	"	1,335,725	1547	119	410
UW5U	"	1,332,086	1839	113	380
(Op: UY2UA)					
UR7EU	"	487,394	925	86	293
UR5EDX	"	331,168	656	80	236
UT7WR	"	302,804	785	50	194
UT5ECZ	"	183,592	696	38	174
UUØJC	"	163,750	301	75	187
UU9JFA	"	45,900	123	70	110
EO1I	28	325,220	1163	37	124
(Op: UT1IA)					
UT5IZ	"	244,640	909	34	105
UT1FA	"	183,866	603	33	116
UT4EK	"	170,826	597	35	107
UU9JH	21	270,354	974	37	120
UXØIB	"	227,176	1119	33	113
US7IGF	"	218,556	849	33	123
UR3IWA	"	116,508	1060	33	100
(Op: UR3IBM)					
UX7UN	"	48,396	350	25	86
UX3HA	"	39,726	390	18	61
USØMR	14	232,050	1139	35	95
UT3EK	"	8,526	103	12	46
UU1JO	"	4,185	42	16	29
UT4UBJ	"	100	50	4	16
UYØZG	3.5	54,636	570	15	72
UY2UF	"	51,375	668	17	58
UT2IW	"	46,134	299	21	78
US9PA	"	15,318	197	12	57
UR4UWY	"	2,579	65	6	33
*UX4UA	A	778,734	986	94	324
*UR3PDT	"	681,941	1409	100	171
*USØKW	"	546,555	857	101	314
*UW7M	"	529,948	1051	85	282
(Op: UR3MP)					
*UY5TE	"	458,040	1017	65	265
*UY5ZI	"	364,110	685	78	240
*UR9MM	"	320,416	812	66	257
*UY7C	"	310,134	862	53	201
(Op: UR3CMA)					
*UR5FEO	"	267,605	586	71	228
*UR3PA	"	255,633	600	57	202
*UT8IT	"	225,335	713	55	186
*UU5JSP	"	200,160	421	68	220
*UR5MID	"	170,775	358	71	204

*UU2JA	*	55,622	179	57	146	
*UY5QJ	*	53,019	152	57	80	
*UT2QQ	*	48,807	223	44	109	
*UT3UZ	*	43,090	201	34	105	
*USØYA	*	32,665	117	50	89	
*UT5UCP	*	21,660	111	35	60	
***UT4PZ**	**28**	**260,876**	**797**	**33**	**121**	
*US2WU	*	139,608	401	37	131	
*UT4EO	*	93,728	448	27	89	
*UT5UML	*	7,238	84	17	30	
***UR6QS**	**21**	**110,856**	**495**	**30**	**94**	
*UX5EF	*	73,294	379	27	87	
*UTØH	*	55,438	420	27	79	
			(Op: UT1HT)			
***US1ITU**	**14**	**255,024**	**1081**	**35**	**119**	
*UR6IJ	*	180,472	766	33	103	
*US1PM	*	139,482	684	30	93	
*UR4LZA	*	137,326	799	31	88	
			(Op: UY4LI)			
*UT2AU	*	34,242	333	18	60	
*UX7QD	*	30,861	290	21	60	
*UY5YA	*	21,663	172	22	65	
*UR5EU	*	11,832	112	15	53	
***US5QCT**	**7**	**48,330**	**376**	**19**	**71**	
*UT3QT	*	45,600	319	21	74	
*US5MTJ	*	35,280	354	20	70	
*UR5FCD	*	20,493	292	11	58	
*UT5PW	3.5	23,892	366	10	56	
***UX5NQ**	**1.8**	**39,310**	**654**	**10**	**54**	

WALES

GW7X	**A**	**1,938,609**	**2882**	**93**	**330**
			(Op: GW3NJW)		
GW3JXN	*	646,112	1049	84	247
***GW3KDB**	**A**	**1,561,908**	**2181**	**95**	**343**
*MW5EPA	*	10,873	144	20	63

YUGOSLAVIA

YT7R	**A**	**4,546,840**	**3368**	**161**	**549**
			(Op: YU7BW)		
YU7JX	*	92,872	943	19	75
4N1N	**28**	**239,844**	**1263**	**38**	**120**
			(Op: 4N1LB)		
YZ1AU	**21**	**723,536**	**2144**	**39**	**137**
YT6A	**"**	**630,412**	**2010**	**40**	**133**
YT9X	**14**	**709,280**	**2481**	**41**	**135**
			(Op: YU1ZZ)		
YU7CF	*	389,808	1617	39	105
YU1TT	*	168,345	1277	32	103
YT1AD	**7**	**622,776**	**2199**	**35**	**119**
			(Op: YU7NU)		
YT7A	**"**	**599,950**	**2176**	**39**	**130**
			(Op: YZ7UN)		
YU1AST	*	13,237	190	15	46
YTØT	**3.5**	**108,120**	**966**	**21**	**81**
			(Op: YU1EA)		
***4N7N**	**A**	**1,676,824**	**2214**	**108**	**370**
			(Op: YT7KM)		
*YT1LT	*	307,685	706	74	221
*YU1KT	*	182,672	495	59	174
*YU7BJ	*	138,372	525	43	113
*YU7AM	*	113,220	338	48	137
*YT1AT	*	87,360	596	23	81
*YU7RN	*	17,670	112	34	61
*YU8/S57AW	*	14,875	125	20	65
***YU7WW**	**28**	**414,072**	**1156**	**37**	**125**
*YU7SF	*	93,960	370	29	96
*4N7A	*	17,577	163	20	43
			(Op: YU7FTN)		
***YU1QJ**	**21**	**383,292**	**1255**	**39**	**130**
***YU1AEK**	**14**	**127,674**	**794**	**28**	**95**
*YT1VM	*	30,363	135	27	73
***YU7KM**	**7**	**43,792**	**366**	**18**	**70**
*YZ1SG	*	14,707	98	16	61
***YU1KR**	**3.5**	**115,515**	**1086**	**17**	**68**
*YU1CC	*	40,044	506	10	64
*YU7YZ	*	4,212	102	5	34
***4N1A**	**1.8**	**47,854**	**673**	**11**	**60**
			(Op: YT1DX)		
*YU1RA	*	15,785	295	6	49

OCEANIA

AUSTRALIA

VK8AV	**A**	**583,347**	**642**	**98**	**239**
VK8TX	*	29,458	134	45	58
VK2QF	*	20,100	113	29	46
VK6VZ	**28**	**339,694**	**1244**	**26**	**77**
***VK4DX**	**A**	**761,634**	**1757**	**36**	**117**
*VK2DPD	*	252,623	518	75	164
***VK4XY**	**28**	**260,508**	**949**	**29**	**73**
*VK4TT	*	108,966	497	30	48
*VK3FEI	21	572	16	6	7
			(Op: PAØMIR)		
***VK6LW**	**14**	**588,252**	**1518**	**33**	**108**
***VK2IA**	**7**	**46,297**	**277**	**25**	**42**

BELAU

T88JA	**A**	**1,950,641**	**2492**	**96**	**233**
			(Op: JA6VZB)		

EAST MALAYSIA

9M6NA	**A**	**6,228,504**	**3961**	**162**	**389**
			(Op: JE1JKL)		
9M8YY	**14**	**579,538**	**1383**	**36**	**115**
			(Op: JR3WXA)		

EAST TIMOR

***4W6MM**	**A**	**995,674**	**1484**	**86**	**153**
			(Op: TF1MM)		

FED. STATES OF MICRONESIA

V63A	**A**	**855,738**	**1359**	**90**	**144**
			(Op: JA7HMZ)		

GUAM

KH2/					
KG4PPO	**28**	**373,890**	**1439**	**30**	**73**

HAWAII

KH6TO	**A**	**3,818,897**	**3682**	**138**	**253**
NH7/N6HC	**28**	**298,634**	**1262**	**29**	**54**
KH7R	**21**	**1,193,592**	**2568**	**38**	**126**
			(Op: KH6ND)		
AH6OZ	**14**	**75,072**	**339**	**32**	**64**
KH7U	**7**	**354,240**	**1153**	**35**	**73**
*AH7R	A	1,092	32	8	6

INDONESIA

YBØAVK	**28**	**270,633**	**707**	**34**	**105**
			(Op: HA7VK)		
***YBØUNC**	**A**	**201,285**	**391**	**80**	**133**
*YE1A	*	127,257	337	83	168
***YB5QZ**	**28**	**91,440**	**542**	**24**	**56**
*YB2UDH	*	9,359	77	20	29
***YC1ANA**	**21**	**87,947**	**329**	**28**	**76**
*YC8UFF	*	66,762	343	24	50
***YBØGJS**	**14**	**242,808**	**728**	**34**	**100**
*YC3LVR	7	744	46	12	19

NEW CALEDONIA

***FK8GM**	**A**	**55,380**	**166**	**52**	**90**

NEW ZEALAND

ZL1BYZ	**A**	**444,850**	**1028**	**57**	**98**
ZL1ALZ	*	14,625	141	19	20
***ZL1GO**	**A**	**795,684**	**1249**	**89**	**155**
*ZL2AL	*	144,855	388	70	115
***ZL1TM**	**7**	**43,164**	**243**	**23**	**43**

NIUE

***ZK2MO**	**A**	**1,998,055**	**2345**	**119**	**186**
			(Op: KM9D)		

NORTHERN MARIANAS

WHØV	**7**	**41,630**	**352**	**19**	**27**

PHILIPPINES

DU3NXE	**A**	**538,153**	**1008**	**82**	**121**
***DU9/NØNM**	**A**	**87,764**	**241**	**61**	**87**

SOLOMON ISLANDS

***H44MA**	**A**	**93,522**	**335**	**63**	**80**
			(Op: VK2GR)		

SOUTH AMERICA

ARGENTINA

LU1AEE	**A**	**1,431,716**	**1801**	**92**	**194**
LU1DZ	**"**	**874,312**	**1131**	**82**	**211**
LO7H	*	622,750	1197	66	169
			(Op: LU7HN)		
LU7DIR	*	344,240	624	79	181
LU6UO	**28**	**679,575**	**1968**	**28**	**95**
LP1F	**"**	**644,151**	**2129**	**30**	**93**
			(Op: LU5FC)		
LU5FA	*	470,960	2032	25	87
LU7YS	**21**	**115,287**	**546**	**24**	**59**
LW9DAH	**14**	**724,128**	**1711**	**36**	**116**
***LQØF**	**A**	**1,700,680**	**2408**	**81**	**224**
			(Op: LU5FF)		
*LU1EWL	*	1,071,014	1398	81	209
*LU1XS	*	75,766	395	24	62
***LT1F**	**28**	**1,041,032**	**2574**	**34**	**114**
			(Op: LW9EUJ)		
*L4ØE	*	494,000	1778	26	78
			(Op: LW1EXU)		
*LU7DNN	*	161,727	528	26	85
*LU8HWD	*	34,958	241	19	58
*LU8ADX	*	23,520	114	25	55
*LU7EAR	*	12,180	78	18	42
*LU4FAK	*	2,032	46	14	18
***LU1FAM**	**21**	**607,770**	**1753**	**33**	**102**
*LU7HHE	14	2,394	73	13	25

ARUBA

P4ØQ	**A**	**9,877,730**	**5957**	**145**	**465**
			(Op: KØDQ)		
***P4ØW**	**A**	**10,198,792**	**5723**	**151**	**475**
			(Op: W2GD)		
*P43E	*	1,032,402	1367	82	200

BRAZIL

PT5T	**A**	**8,447,616**	**5372**	**149**	**427**
			(Op: CT1BOH)		
PY7IQ	*	515,424	691	75	198
PY3AU	*	223,392	389	65	143
PY2YU	*	157,530	512	39	79
PY2FUS	*	125,430	248	70	156
ZY5A	**28**	**1,531,754**	**3575**	**37**	**124**
			(Op: PY1KN)		
PP1CZ	**21**	**162,711**	**640**	**26**	**75**
ZV5A	**7**	**158,670**	**864**	**26**	**60**
			(Op: PP5BRV)		
ZX5J	**1.8**	**1,911**	**46**	**9**	**12**
			(Op: PP5JR)		
***PY2NDX**	**A**	**3,711,441**	**2929**	**123**	**314**
***ZV8O**	**"**	**2,703,700**	**2612**	**106**	**274**
			(Op: PV8DX)		
*PY2NY	*	2,441,736	2248	112	284
*PY8AZT	*	629,937	1205	61	170
*PY2AER	*	435,072	873	59	133
*PP7CW	*	93,830	257	46	104
*PP7ZZ	*	80,478	341	49	104
*PP2RON	*	75,000	251	38	82
*PY2GG	*	25,648	113	38	55
*PY2PAI	*	10,146	74	24	33
*PY3FOX	*	64	4	4	4
***PY4FQ**	**28**	**115,876**	**409**	**28**	**90**
*PY7OJ	*	23,475	125	19	56
*PY2NZR	*	1,606	57	11	42
*PT2AW	*	1,100	21	6	14
*PY4CY	*	135	5	4	5
***PY5BLG**	**21**	**141,332**	**595**	**26**	**64**
*PY2APQ	*	20,060	132	20	43
*PP2JT	14	31,339	184	20	57
*PR7AR	7	10	8	3	1

CHILE

XR1X	**A**	**1,642,039**	**2311**	**89**	**240**
			(Op: XQ1IDM)		
CE3BFZ	**28**	**58,710**	**390**	**16**	**41**
***XQ1ZW**	**A**	**1,007,128**	**1459**	**93**	**169**
***CE4U**	**14**	**405,557**	**1271**	**30**	**83**
			(Op: CE4USW)		

COLOMBIA

HK3DDD	A	10,293	63	38	35

NETHERLANDS ANTILLES

PJ4M	**A**	**3,245,100**	**3275**	**94**	**254**
			(Op: K2QM)		

PERU

OA4O	**A**	**5,863,242**	**4531**	**129**	**333**
			(Op: OHØXX)		
OA4SS	**21**	**584,676**	**1360**	**37**	**112**

URUGUAY

CX5BW	**28**	**1,466,046**	**3790**	**33**	**120**
***CX5AO**	**21**	**670,026**	**1672**	**34**	**113**
***CX9AU**	**14**	**598,185**	**1618**	**35**	**100**

VENEZUELA

***YV7QP**	**A**	**273,028**	**832**	**57**	**142**
*YV5NWG	*	19,511	69	41	68
***YV4GLD**	**28**	**362,404**	**1437**	**24**	**74**

QRP

LY5A	**A**	**2,055,896**	**1643**	**140**	**492**
			(Op: LY2PAJ)		
FY5FY	**"**	**1,985,941**	**2380**	**81**	**256**
TI5X	**"**	**1,581,010**	**1872**	**102**	**268**
			(Op: NØKE)		
HG5Z	**"**	**1,293,716**	**1734**	**113**	**390**
			(Op: HA1CW)		
YT7TY	**"**	**1,252,100**	**1525**	**103**	**372**
N3BJ/4	**"**	**1,215,200**	**1076**	**104**	**330**
DL6RDR	**"**	**1,178,052**	**1226**	**114**	**394**
UT9FJ	**"**	**1,073,610**	**1395**	**107**	**367**
N4KG	**"**	**949,531**	**860**	**108**	**299**
JR4DAH	**"**	**817,298**	**931**	**109**	**225**
DL3NCI	**"**	**788,359**	**1011**	**87**	**320**
N8ET	**"**	**755,978**	**784**	**94**	**288**
SM3C	**"**	**691,200**	**1074**	**82**	**318**
			(Op: SM5CCT)		
VP5ED	**"**	**630,008**	**1235**	**66**	**178**
			(Op: WA3WSJ)		
WA3NKO	**"**	**628,254**	**658**	**80**	**262**
DL3KVR	*	585,809	1061	73	298
N1TM	**"**	**568,320**	**661**	**75**	**245**
UAØKCL/3	**"**	**518,330**	**730**	**77**	**277**
N5TW	**"**	**505,808**	**664**	**92**	**221**
UA4YJ	**"**	**503,600**	**770**	**85**	**315**
S52P	**"**	**495,208**	**1000**	**67**	**229**
W6JTI	**"**	**472,166**	**571**	**106**	**201**
UR5SFX	*	460,910	882	100	249
S59D	*	405,302	840	82	300
RN6FO	*	393,900	908	73	252
DL1DQY	*	378,172	567	98	279
W3GK	*	306,878	424	68	218
MUØASP	**"**	**294,550**	**698**	**55**	**219**
			(Op: F5SHQ)		
HB9CZF	**"**	**281,371**	**533**	**69**	**182**
AA1CA	*	278,460	427	63	197
K8ZT	*	250,708	406	70	199
NU4B	**"**	**248,589**	**372**	**76**	**203**
JH3CUL	**"**	**232,308**	**402**	**79**	**160**
UA9SG	**"**	**230,436**	**518**	**55**	**167**
GIØGDF	**"**	**221,256**	**606**	**56**	**196**
JA2IU	**"**	**197,170**	**381**	**81**	**132**
VE7CA	**"**	**195,536**	**524**	**75**	**101**
W1AMF	*	187,440	323	55	165
PAØADT	**"**	**185,641**	**530**	**52**	**183**
K4RV	*	181,200	473	35	116
OH2NFS	**"**	**173,160**	**446**	**52**	**182**
W1JR	*	164,223	256	71	186
UR5FCM	*	156,800	567	41	159
K1TS	*	148,144	308	45	143
WØHEP	*	142,284	295	73	140
RU9UN	*	137,295	273	62	153
NØUR	*	126,250	266	60	142
WØETC/4	*	126,000	252	61	139
HB9AYZ	*	121,436	411	62	140
AF7O	*	118,340	314	65	129
DF1DX	*	112,117	437	46	145
EA1GT	**"**	**111,708**	**418**	**47**	**127**
DL1LAW	*	108,454	507	38	173
UA3UNP	*	107,750	298	49	201
W6RCL	*	106,344	277	68	100
DF1DV	*	104,618	406	48	133
DJ3GE	*	100,570	345	45	133
JA5CDL	**"**	**95,524**	**273**	**61**	**106**
N9IJ	**"**	**95,178**	**223**	**60**	**114**
GM4HQF	**"**	**93,934**	**369**	**30**	**104**
AD4J	*	87,894	206	53	118
VE3XL	*	81,000	353	21	79
K4UK	*	80,908	204	53	126
S57NRO	*	80,136	376	43	116
F5IQJ	*	78,579	386	51	110
WD4GBW	*	77,145	201	30	109
WB8B	*	67,222	251	29	93
UR5FAI	*	63,114	385	24	110
NQ7X	*	61,919	187	56	87
OK1AIJ	*	61,593	312	32	115
SN8A	**"**	**60,264**	**198**	**50**	**112**
			(Op: SP8AQA)		
F5PBL	**"**	**57,900**	**300**	**32**	**118**
KG4HTT	*	53,504	203	42	110
VE7NI	*	46,731	220	50	61
K2JT	*	45,555	303	56	159
YO4AAC	**"**	**40,104**	**242**	**31**	**103**
JK8NLB	**"**	**38,907**	**150**	**40**	**59**
JJ6WYS	**"**	**38,430**	**127**	**48**	**74**
DK4CU	*	32,893	222	25	114
NFØN	*	32,670	124	32	67
OK2ZAW	*	30,600	192	32	88
JN2FSE	*	30,352	130	46	66
HB9DOZ	*	28,224	236	31	95
OQ7CC	**"**	**25,498**	**220**	**27**	**95**
UA4ANZ	*	24,892	135	33	94
EU2DX	**"**	**24,500**	**193**	**21**	**79**
SP8JHM	*	24,150	156	41	97
K9WIS	*	21,645	110	37	80
RV9COI	*	20,276	107	17	57
KQ4YY	*	17,910	82	32	58
W2JEK	*	16,709	79	35	64
DL4GBR	*	15,493	106	18	38
UU4JO	*	15,331	111	28	61
DJ9XB	*	14,784	115	22	26
NC3G/4	*	12,393	63	28	53
WE7G	*	12,168	127	39	39
EA7HCB	*	11,571	106	23	64
SM6AHU	*	10,045	97	11	35
DL8MTG	*	9,944	69	30	58
N2JNZ	*	9,792	71	24	48
OK1DMP	*	8,532	49	32	47
DF9JZ	*	8,094	105	15	56
WC7S	*	7,696	85	34	40
OK2KFK	*	6,745	77	18	53
			(Op: OK2ZAW)		
DK3IP	*	5,145	72	14	35
DK3RED	*	4,560	177	25	70
PA3CLQ	*	4,557	154	18	75
KL7GN	*	4,512	58	15	17
KG4NXP	*	4,424	45	22	34
EA4OA	*	4,158	62	24	53
JH8MWW	*	3,827	39	21	22
KC8LTL	*	1,178	22	13	18
KA6SGT	*	1,166	81	26	27
AB8DF	*	630	22	14	21
W4/LZ3SM	*	414	11	8	10
WB9MII	*	414	18	11	12
K5DI	*	100	59	22	24
KIØG/5	*	100	119	49	70
K6MI	*	54	7	3	3
SQ4HRN	*	22	8	5	6
6Y1A	**28**	**724,154**	**2508**	**30**	**97**
			(Op: K2KW)		
S54AA	**"**	**193,581**	**607**	**34**	**123**
JR3RWB	**"**	**187,000**	**560**	**33**	**92**
SP5DDJ	**"**	**160,838**	**509**	**33**	**104**
RA9SO	**"**	**122,729**	**434**	**24**	**83**
SP4GFG	**"**	**120,888**	**416**	**34**	**112**
CT1ETE	**"**	**108,295**	**447**	**25**	**96**
OK1FHL	**"**	**103,578**	**415**	**28**	**94**
I1BAY	**"**	**92,852**	**450**	**33**	**106**
RV3QX	**"**	**89,670**	**420**	**29**	**93**
W9XT	**"**	**87,285**	**282**	**26**	**89**
JA2KVB	**"**	**83,436**	**298**	**32**	**70**
OM7PY	**"**	**75,522**	**250**	**30**	**93**
DL5MBY	**"**	**69,188**	**305**	**24**	**74**
T94DO	**"**	**61,880**	**501**	**23**	**81**
HB9AFH	**"**	**51,294**	**231**	**26**	**77**
WA6FGV	**"**	**50,850**	**217**	**26**	**64**
CE3DNP	**"**	**49,125**	**301**	**21**	**54**
W5TD	**"**	**48,863**	**170**	**32**	**99**
DL9YX	*	46,389	154	32	109
MØO	**"**	**38,480**	**268**	**19**	**61**
			(Op: G4JZO)		
EA3AEK	**"**	**30,422**	**281**	**19**	**63**
IK5EKB	*	19,860	210	17	43
JI5SKS	**"**	**14,016**	**88**	**26**	**38**
SP9IBJ	*	12,104	109	19	49
SQ9IET	*	10,205	106	13	33
JA5DIM	*	7,912	79	17	26
SP8MI	*	6,111	76	17	46
EA2CR	*	3,696	65	10	38
DL8DXW	*	3,626	41	14	23
IKØNOJ	*	3,375	76	13	32
JL3SBE	*	3,101	42	12	24
OMØTT	*	3,042	32	15	23
K9IUA/Ø	*	2,376	33	12	21
S57IIO	*	1,408	34	7	9
TF3MA	*	1,344	24	13	19
9A3Z	*	96	4	4	4
WB6BWZ	*	1	0	0	0
6Y9A	**21**	**578,816**	**2126**	**28**	**91**
			(Op: KE7X)		
RW3GB	**"**	**270,240**	**899**	**33**	**127**
G4EDG	**"**	**206,822**	**647**	**37**	**121**
N6MU	**"**	**191,088**	**471**	**34**	**110**
KH6/W8QZA	**"**	**134,320**	**505**	**30**	**62**
RZ6HX	**"**	**134,136**	**597**	**31**	**107**
7K4QOK	**"**	**112,750**	**404**	**31**	**79**
			(Op: JR2BNF)		
BV3FG	**"**	**98,070**	**536**	**28**	**77**
LY1DT	**"**	**85,068**	**542**	**26**	**76**
OH7FF	**"**	**83,930**	**473**	**24**	**85**
N7IR	**"**	**78,122**	**266**	**28**	**78**
G3TXZ	**"**	**76,760**	**501**	**21**	**74**
SM5D	**"**	**60,840**	**339**	**21**	**83**
			(Op: SM5DJZ)		
G2HLU	*	43,775	291	17	68
T94OM	**"**	**41,026**	**380**	**18**	**55**
JQ1NGT	**"**	**39,886**	**273**	**25**	**49**
S59AV	**"**	**37,807**	**266**	**19**	**58**
LU1FC	**"**	**31,188**	**238**	**14**	**32**
ES1CR	**"**	**27,979**	**239**	**17**	**63**
LZ4AE	**"**	**6,768**	**114**	**9**	**38**
JF3WNO	**"**	**6,588**	**60**	**19**	**35**
W1CTN	*	6,084	78	14	38
PY2QA	*	2,066	36	13	12
VK6AA/2	*	378	9	9	9
LU7EE	**14**	**183,480**	**507**	**35**	**97**
6Y2A	**"**	**181,023**	**1146**	**21**	**62**
			(Op: N6XG)		
Z33F	**"**	**178,160**	**904**	**35**	**96**
RW4LR	**"**	**149,758**	**657**	**33**	**100**
G4ELZ	**"**	**131,300**	**632**	**30**	**100**
N4IJ	**"**	**122,493**	**379**	**33**	**100**
YU1LM	**"**	**105,444**	**630**	**27**	**89**
OK1IF	**"**	**95,593**	**578**	**28**	**81**
US3QW	**"**	**37,436**	**315**	**25**	**73**
K7MM	**"**	**36,763**	**168**	**29**	**68**
FM5CW	**"**	**36,242**	**199**	**16**	**61**
OK1DSA	*	35,866	336	15	64
WD3P	**"**	**10,302**	**86**	**10**	**41**
UT5UBJ	*	9,552	196	8	40
EA6BB	*	7,500	138	15	45
VE3IGJ	*	1,863	61	8	15
EA3BES	*	100	73	9	30
6Y4A	**7**	**246,870**	**1292**	**21**	**69**
			(Op: WØYK)		
Z31GX	**"**	**102,544**	**576**	**27**	**89**
EA2CAR	**"**	**64,416**	**418**	**19**	**77**
LY5G	**"**	**53,172**	**515**	**14**	**70**
			(Op: LY2FE)		
G3VPW	**"**	**45,920**	**427**	**17**	**63**
HB9CEY	**"**	**38,076**	**357**	**15**	**61**
UR5FFC	**"**	**34,128**	**294**	**15**	**64**
F5LEN	**"**	**31,078**	**258**	**19**	**63**
K3TW	**"**	**21,559**	**126**	**15**	**55**
RX6LDK	**"**	**21,483**	**255**	**9**	**54**
SMØJ	**"**	**20,830**	**241**	**13**	**56**
GWØVSW	**"**	**13,293**	**167**	**11**	**52**
JF9JOD	**"**	**10,528**	**97**	**19**	**28**
7K1CPT/1	**"**	**4,983**	**61**	**16**	**17**
GØWAT	*	4,704	106	6	36
RU4WT	*	2,520	43	8	28
UT3WWJ	*	1,720	60	10	30
YO9HG	*	1,537	62	5	24
LU7DW	*	893	29	9	10
6Y8A	**3.5**	**76,230**	**575**	**14**	**52**
			(Op: N6BT)		
UN4L	**"**	**48,918**	**314**	**12**	**50**
9A2EY	**"**	**19,985**	**355**	**6**	**51**
OM3THV	**"**	**12,593**	**267**	**5**	**44**
Z31MM	**"**	**9,898**	**200**	**6**	**43**
KH6SQ	**"**	**6,174**	**99**	**11**	**10**
			(Op: W8QZA)		
S57LWG	*	221	17	3	10
OK2BUZ	**1.8**	**7,120**	**197**	**5**	**35**
6YØA	**"**	**6,831**	**158**	**6**	**17**
			(Op: K2KW)		
T99T	**"**	**4,200**	**127**	**5**	**37**
OK2PMS	*	756	34	5	22
GØDCK	*	238	20	3	14
S57KRI	*	176	15	4	12

ASSISTED

NORTH AMERICA

UNITED STATES

KI1G	**A**	**3,079,736**	**1795**	**146**	**486**
W1RM	**"**	**2,110,680**	**1271**	**143**	**472**
N1DG	**"**	**2,026,752**	**1176**	**133**	**491**
N4XR/1	*	1,961,916	1347	130	404
W1NG	*	1,884,762	1172	137	457
AA1V	*	1,668,590	1020	134	471
W1CSM	*	1,578,097	1101	125	416
W1ZT	*	1,472,050	1085	109	390
N8RA/1	*	1,435,050	1151	98	352
W1RH	*	1,237,600	1118	89	311
K1GU	*	997,464	859	99	318
WA1RR	*	991,446	826	97	350
			(Op: K1JN)		
K1YR	*	873,754	744	101	348
N1MD	*	492,954	496	77	286
AA1QD	*	478,828	523	76	267
NQ1K	*	401,280	391	93	287
NC1N	*	283,216	405	56	192
K1TH	*	178,876	332	60	167
WY1U	*	167,166	336	53	169
W1WFZ	*	143,190	252	45	170
KW1DX	*	94,336	207	42	134
K1JE	*	85,600	160	60	140
K1KU	*	73,336	208	55	151
K1TW	*	65,436	168	35	98

N1NQD	"	1,440	16	16	16	
WA1FCN	**21**	**190,990**	**512**	**30**	**112**	
W2UP	**A**	**4,914,343**	**2621**	**152**	**525**	
K2NG	**"**	**4,768,500**	**2336**	**165**	**583**	
N2MM	**"**	**3,849,480**	**2204**	**150**	**516**	
K2DM	"	3,280,320	1989	138	465	
K2TW	"	3,191,940	2128	122	418	
N2ED	"	2,590,258	1799	126	436	
N1EU/2	"	2,584,217	1433	146	497	
W2WB	"	2,402,582	1541	140	474	
NO2R	"	2,210,625	1309	137	488	
W2EN	"	2,125,776	1451	121	415	
AB2E	"	1,625,092	1165	112	396	
N3RG/2	"	1,487,300	1125	114	421	
K2NJ	"	999,617	789	111	352	
W2LE	"	982,839	821	98	331	
N2SS	"	919,055	722	103	360	
K2RW	"	825,360	699	102	354	
K2RD	"	764,544	549	131	412	
K2XF	"	752,346	653	93	348	
N2FF	"	630,000	585	90	330	
N2TK	"	556,597	441	112	381	
W2RD	"	475,020	443	105	315	
KD2P	"	463,680	536	72	248	
W2YK	"	417,375	478	86	285	
K2SB	"	354,299	401	82	259	
K2MP	"	252,476	391	59	195	
N2UM	"	145,908	232	75	177	
W2RDS	"	97,610	190	49	166	
WB2TPS	"	53,508	139	43	113	
NJ2DX	"	35,632	108	35	101	
AB2DE	"	31,330	116	43	87	
K3WW	**A**	**5,730,417**	**2998**	**159**	**534**	
AA1K/3	**"**	**3,794,703**	**2196**	**149**	**500**	
N3RR	**"**	**3,303,450**	**1816**	**154**	**521**	
KQ3F	"	3,128,544	2009	129	439	
W3FV	"	2,982,625	1994	124	411	
K3PH	"	2,542,482	1537	133	458	
W1GD/3	"	2,321,585	1402	130	457	
N3AM	"	1,987,150	1318	123	427	
K3NZ	"	1,829,516	1156	141	463	
K3ND	"	1,637,106	1062	128	434	
K3OO	"	1,535,328	1279	106	326	
K3DI	"	1,375,920	995	118	402	
K3SV	"	1,204,976	866	115	393	
W3AP	"	1,165,090	1160	105	338	
W3OV	"	1,110,054	1030	99	318	
N3DL	"	1,071,248	731	128	440	
WT3P	"	1,000,450	861	89	336	
N3NA	"	989,664	878	96	320	
K3JG	"	948,290	827	99	335	
KB3MM	"	826,758	740	89	325	
W3ZJ	"	762,966	697	86	312	
W3HVQ	"	728,160	632	114	378	
KF3B	"	726,869	975	79	220	
W3EKT	"	702,464	682	108	340	
N3ZA	"	501,584	522	82	286	
N3QQ	"	498,316	507	77	287	
NG3K	"	396,576	509	68	220	
K3CP	"	380,144	394	89	279	
K3PP	"	162,564	222	76	200	
W3BG	"	152,375	244	75	190	
WT3W	"	126,284	237	62	179	
K3SX	"	126,280	273	61	144	
NB3I	"	37,465	181	38	89	
K3FH	"	26,775	98	38	67	
WR3L	**21**	**157,534**	**411**	**32**	**114**	
W3BP	7	77,478	261	22	89	
K1PT/4	**A**	**3,600,390**	**2180**	**147**	**498**	
W4WA	"	1,875,338	1169	153	493	
K3KO/4	"	1,580,708	1051	127	429	
N4WW	"	913,260	711	122	369	
N4DW	"	875,075	744	98	327	
K4PB	"	818,120	688	113	339	
N4VV	"	792,540	704	108	312	
K4GMH	"	450,790	708	71	234	
AA4GA	"	290,043	318	80	253	
K4YT	"	185,856	283	79	185	
W4ATL	"	94,482	194	45	136	
K8YC/4	"	55,848	153	50	129	
KE1F/4	"	23,842	117	47	84	
W4WNT	"	13,736	70	38	63	
KW4CW	**28**	**205,764**	**497**	**35**	**121**	
K4WW	"	28,490	154	20	54	
K5NA	**A**	**3,131,700**	**1636**	**170**	**545**	
AD5Q	**"**	**2,175,120**	**1585**	**139**	**391**	
W5GN	"	974,792	921	99	313	
WQ5W	"	810,858	728	118	329	
AB5K	"	763,008	789	96	288	
N5JR	"	721,764	729	84	285	
K5LP	"	451,777	499	103	264	
W5FL	"	313,866	354	95	276	
AF5Z	"	271,185	351	97	206	
N3BB/5	"	102,128	181	71	137	
NA4M/5	"	51,972	146	35	107	
N5MT	"	14,245	76	29	48	
W5ZO	**28**	**173,700**	**554**	**34**	**116**	
W5FO	**14**	**95,493**	**289**	**38**	**101**	
N6IG	**A**	**3,537,512**	**2011**	**175**	**496**	
N6CW	**"**	**1,105,315**	**838**	**139**	**346**	
K6XT	"	717,060	636	119	325	
N6ND	"	698,340	656	98	314	
NF6R	"	168,644	335	70	126	
K6EP	"	96,030	191	80	114	
W4EF/6	"	72,600	168	73	92	
W6KC	"	66,303	191	53	86	
K6XC	"	49,420	134	51	89	
KC6T	"	11,557	76	35	56	
AD6TF	"	9,500	96	18	20	
K6ACZ	"	5,880	69	29	31	
N6IC	"	100	36	0	0	
KA6BIM	**28**	**248,250**	**635**	**35**	**115**	
K6TA	**7**	**116,676**	**373**	**34**	**92**	
W7UT	**A**	**1,855,920**	**1338**	**145**	**383**	
N7FO	**"**	**1,136,822**	**830**	**145**	**376**	
						(Op: KN5H)
NX7K	"	710,964	855	108	240	
W7OM	"	421,587	564	106	231	
W7BX	"	277,816	419	85	157	
W7MCU	"	110,432	210	86	138	
K7LJ	"	108,256	201	69	130	
K7FL	"	36,531	109	46	77	
NV7A	**28**	**138,635**	**436**	**32**	**87**	
						(Op: K5RC)
WJ7R	"	16,416	106	21	33	
W7CT	**21**	**265,060**	**702**	**34**	**111**	
N8BJQ	**A**	**2,069,595**	**1321**	**134**	**431**	
ND5S/8	**"**	**1,250,415**	**849**	**127**	**428**	
K8RS	"	171,584	373	59	165	
K8HJ	"	159,162	290	75	171	
AA8TC	"	152,152	234	56	210	
KC9TV	**A**	**491,049**	**526**	**81**	**270**	
K9UQN	**"**	**460,101**	**552**	**82**	**227**	
KG9X	"	273,000	442	64	196	
K9OR	"	216,580	333	60	178	
NF9V	"	147,210	264	73	137	
WA9TPQ	"	118,440	190	58	177	
KB9KEG	"	49,141	158	53	104	
N9XX	**28**	**102,704**	**281**	**28**	**103**	
N9AU	**7**	**87,207**	**271**	**30**	**93**	
N2WW/0	**A**	**1,497,500**	**1170**	**128**	**372**	
NØAT	**"**	**1,113,838**	**817**	**128**	**386**	
KTØR	"	715,460	665	113	318	
KØOB	"	434,393	501	90	247	
KØIR	"	428,460	452	103	267	
NØIJ	"	173,990	239	77	197	
NØHJZ	"	169,472	262	77	179	
WØTT	"	132,111	284	65	168	
WØCP	"	119,756	250	62	126	
WØDET	"	42,300	138	56	85	
WØAH	"	23,424	112	41	55	
KØCA	"	14,229	57	36	57	
AKØM	"	7,245	44	24	39	

CANADA

VE1OP	**A**	**934,833**	**1194**	**76**	**241**	
VE3HG	"	208,128	294	59	212	
VE9FX	"	30,590	117	35	80	
VA3WN	**28**	**251,375**	**813**	**29**	**96**	
VE7AV	**14**	**256,212**	**852**	**36**	**96**	
VY2ZMM	**1.8**	**74,690**	**494**	**14**	**56**	

MEXICO

XE2/W6RW	**28**	**353,970**	**1266**	**32**	**83**	

PUERTO RICO

KP3Z	**A**	**7,763,460**	**4843**	**158**	**547**	
						(Op: NP4Z)

AFRICA

MADEIRA ISLANDS

CT9M	**A**	**10,263,390**	**5330**	**159**	**546**	
						(Op: DL2CC)
CT3KU	"	17,644	105	37	83	

TANZANIA

5H1X	**A**	**1,371,110**	**1225**	**111**	**287**	
						(Op: K1XM)

ASIA

ASIATIC RUSSIA

UA9AM	**A**	**4,453,686**	**3143**	**128**	**415**	
RM9H	"	585,442	981	81	205	
						(Op: RZ9HT)
RW9QW	**21**	**204,624**	**812**	**31**	**95**	
RA9AC	"	202,502	561	33	113	
RUØLL	**A**	**1,966,728**	**2140**	**137**	**319**	
UAØAGI	"	578,745	781	118	287	
RAØFA	**28**	**308,693**	**1004**	**35**	**98**	

JAPAN

JI2KVW	**A**	**1,787,770**	**1852**	**125**	**270**	
JH8SLS	**"**	**1,449,162**	**1324**	**141**	**288**	
JN2AMD	**"**	**1,265,566**	**1606**	**130**	**252**	
JR4QZH	**"**	**424,274**	**543**	**99**	**208**	
JH3LFL/1	**"**	**418,932**	**697**	**93**	**150**	
7L4IOU	"	409,257	534	119	214	
JA1XUY	"	380,635	526	96	173	
JN4FNZ	"	279,837	383	97	182	
JI1EFP	"	70,348	317	40	46	
JA9KUG	"	10,160	73	36	44	
JA9XBW	**28**	**344,886**	**894**	**35**	**106**	
JM2FCJ	**"**	**291,980**	**910**	**34**	**96**	
JH4UTP	**"**	**151,680**	**580**	**35**	**85**	
JF3PLF	"	76,440	333	31	60	
JR5EHB	"	1,425	21	12	13	
JR9DPV	"	18	2	1	2	

EUROPE

AUSTRIA

OE1A	**A**	**2,415,876**	**2292**	**144**	**510**	
						(Op: OE1EMS)
OE3GSA	"	536,739	810	113	314	
OE1TKW	"	28,435	120	44	77	
OE5OHO	**21**	**60,996**	**258**	**23**	**69**	
OE3ZK	**14**	**294,786**	**1210**	**39**	**120**	

BELGIUM

OQ1T	**A**	**3,435,105**	**2505**	**150**	**559**	
						(Op: ON4UN)
OT1A	"	1,097,911	1285	123	370	
						(Op: ON7CC)
ON4AEK	"	134,487	1088	33	120	
OT1L	**7**	**389,774**	**1637**	**35**	**119**	
						(Op: ON4AKL)
ON4ATW	**3.5**	**116,280**	**890**	**21**	**81**	
ON4WW	**1.8**	**81,171**	**824**	**15**	**72**	

BULGARIA

LZ9R	**A**	**1,583,100**	**2260**	**98**	**352**	
						(Op: LZ3YY)

CROATIA

9A3GW	**28**	**823,368**	**2186**	**39**	**143**	

CZECH REPUBLIC

OK2FD	**A**	**3,837,627**	**2524**	**158**	**581**	
OK2ZJ	**28**	**62,361**	**221**	**31**	**86**	
OK1KT	**21**	**321,056**	**1070**	**35**	**123**	

ENGLAND

M/UT3UA	**A**	**3,180,942**	**2886**	**142**	**497**	
G4OWT	"	229,577	477	74	207	
G4IRN	"	130,050	292	68	221	
G4OBK	"	19,920	85	40	80	
G5X	**28**	**313,316**	**1276**	**36**	**112**	
						(Op: G4RCG)
G4PDQ	**14**	**35,856**	**342**	**21**	**51**	
G5LP	**7**	**89,919**	**769**	**21**	**82**	

EUROPEAN RUSSIA

R3CC	**A**	**5,584,144**	**3694**	**179**	**650**	
						(Op: RW3QC)
RM4W	**"**	**3,677,352**	**2806**	**148**	**488**	
						(Op: RW4WR)
RM3C	"	1,798,406	1713	138	476	
						(Op: RA3CW)
RN4WA	"	1,283,632	1742	120	391	
RX3APM	"	894,132	1053	118	369	
RK3BY	"	614,655	890	97	338	
UA3DNR	**14**	**128,592**	**700**	**30**	**84**	
UA6LV	**3.5**	**246,528**	**1104**	**31**	**113**	
RK6BZ	"	30,400	349	15	61	
RA3AJ	**1.8**	**20,764**	**348**	**10**	**48**	

FINLAND

OG6NIO	**A**	**1,789,344**	**1862**	**102**	**354**	
OH2VZ	"	353,600	642	82	243	
OH5UX	"	6,045	40	27	38	
OH2BN	"	4,136	34	23	24	
OG6NJ	**28**	**217,566**	**753**	**34**	**119**	
OH3BU	**7**	**24,480**	**306**	**12**	**56**	
OH3XR	**3.5**	**59,942**	**640**	**18**	**68**	

FRANCE

F5RBG	**A**	**325,728**	**681**	**60**	**201**	
F5LMJ	**21**	**80,460**	**425**	**22**	**86**	

GERMANY

DL4NAC	**A**	**4,599,990**	**3263**	**151**	**480**	
DK3GI	**"**	**4,054,905**	**2617**	**166**	**587**	
DF3CB	**"**	**3,721,947**	**2318**	**161**	**556**	
DJ2YA	"	2,970,825	1866	162	553	
DL4RDJ	"	2,406,394	2063	133	460	
DJ5BV	"	1,888,560	1513	133	477	
DF4RD	"	1,724,604	1242	151	535	
DH7KU	"	1,448,172	1700	109	368	
DJ9RR	"	963,540	993	115	390	
DK9IP	"	657,600	790	108	372	
DL8YR	"	468,852	755	82	274	
DL5DXF	"	441,674	540	100	294	
DL8KJ	"	433,314	633	93	269	
DF5ZV	"	432,729	608	105	318	
DL8AAM	"	382,140	634	72	258	
DK1RP	"	224,282	443	77	177	
DL6KVA	"	206,500	261	94	201	
DF1HF	"	156,674	476	61	205	
DL5XL	"	131,300	298	61	141	
DK3WN	"	128,800	388	60	170	
DK3QJ	"	78,166	223	63	146	
DL2RTJ	"	50,575	215	45	130	
DJ4KW	"	23,360	138	20	60	
DL8WX	"	11,550	81	28	47	
DJ5AV	"	6,164	42	28	39	
DF9ZP	**28**	**240,576**	**690**	**38**	**130**	
DL3NM	"	96,824	386	29	104	
DJ6TK	"	83,517	312	26	97	
DK8ZB	**7**	**388,443**	**1541**	**36**	**113**	

HUNGARY

HA5NG	**A**	**916,725**	**1207**	**100**	**325**	
HA3O	**21**	**606,195**	**1840**	**40**	**131**	
						(Op: HA3UU)
HA5BSW	**7**	**70,015**	**474**	**22**	**73**	
HG5A	**3.5**	**64,608**	**1097**	**19**	**77**	
						(Op: HA5IW)

IRELAND

EI4DW	**A**	**453,789**	**655**	**81**	**262**	

ITALY

IKØYVV	**A**	**3,887,162**	**2889**	**155**	**543**	
IKØYUT	"	1,594,866	2159	104	379	
IK3UNA	"	1,163,541	1545	103	344	
IR2K	"	316,848	783	74	213	
						(Op: IK2HKT)
IO2A	"	226,968	686	55	141	
						(Op: IK2RZP)
IO2L	**21**	**518,336**	**1505**	**40**	**138**	
						(Op: IK2PFL)

LATVIA

YL8M	**A**	**3,746,800**	**2767**	**156**	**569**	
						(Op: YL2KL)
YL2LY	"	1,233,664	1487	107	381	
YL9W	**21**	**686,154**	**1882**	**40**	**146**	
						(Op: YL3DW)

LITHUANIA

LY3MR	**A**	**2,093,395**	**1813**	**133**	**480**	
						(Op: LY2BIL)
LY2GV	"	1,365,820	1696	111	359	
LY2KM	"	418,664	547	104	368	

MACEDONIA

Z36W	**28**	**419,760**	**1361**	**35**	**130**	

NETHERLANDS

PA3EWP	**A**	**1,095,388**	**1412**	**105**	**392**	
PI4TUE	"	123,464	569	31	61	
						(Op: PA3EZL)
PAØEHF	"	49,680	178	40	68	
PA1AW	28	19,314	112	26	61	
PA1CC	**21**	**257,250**	**1041**	**36**	**114**	

POLAND

SN7N	**A**	**1,893,108**	**1526**	**143**	**508**	
						(Op: SP7PS)
3Z1V	"	50,874	154	55	84	
						(Op: SP1MHV)
SP3KEY	**21**	**545,923**	**1575**	**39**	**128**	
						(Op: SP3HRN)
SP5AKG	"	85,188	327	26	101	

SLOVAK REPUBLIC

OM7PA	**7**	**129,584**	**875**	**25**	**87**	

SLOVENIA

S58A	**A**	**5,500,230**	**3924**	**160**	**535**	
S52ZW	"	3,588,920	3047	147	517	
S56A	"	2,341,822	1758	136	522	
S53AU	"	179,559	278	83	198	
S53M	**14**	**167,620**	**791**	**33**	**112**	
						(Op: S53ZO)

SPAIN

EA3GM	**A**	**365,541**	**754**	**85**	**278**	
EA1AK	**28**	**88,312**	**422**	**26**	**107**	

SWEDEN

8S5A	**A**	**2,472,516**	**2519**	**113**	**406**	
						(Op: SM5AJV)
SM4DHF	"	137,668	410	66	188	

SWITZERLAND

HB9FAP	**A**	**2,013,903**	**1766**	**145**	**476**	
HB9HFN	"	48,960	145	40	113	

UKRAINE

UR6L	**A**	**2,748,108**	**2590**	**150**	**504**	
UU5YL	"	84,107	367	40	111	
UU2JQ	"	2,280	25	15	23	
UR5IOK	**28**	**266,616**	**951**	**35**	**126**	
UR8QX	**21**	**553,518**	**1872**	**39**	**122**	
U5WF	**14**	**301,070**	**1077**	**37**	**124**	

WALES

GW3YDX	**A**	**4,432,635**	**3358**	**157**	**562**	

YUGOSLAVIA

YT7AW	**A**	**2,264,265**	**2054**	**131**	**472**	
YU1EW	"	5,671	43	21	32	
4N1SM	**28**	**201,085**	**947**	**31**	**100**	
YZ9A	**14**	**840,160**	**2482**	**41**	**137**	
						(Op: YU1NW)
YT1BB	"	382,923	1813	37	120	

MULTI-OPERATOR SINGLE TRANSMITTER NORTH AMERICA

UNITED STATES

K2LE/1	**5,157,208**	**2657**	**155**	**548**	
N1RR	1,770,125	1249	135	460	
N1AU	1,089,375	985	89	326	
W1NR	607,560	554	91	324	
W1SRG	499,408	544	85	279	
W6XR/2	**4,764,435**	**2696**	**154**	**535**	
KQ2F	**4,256,405**	**2526**	**142**	**493**	
WE2F	2,016,406	1493	117	394	
N2LBR	1,036,606	882	93	326	
WB2ELW	114,450	257	66	144	
N3RS	**7,663,500**	**3627**	**173**	**607**	
N3BNA	2,475,270	1536	142	488	
NE3F	1,998,863	1507	136	463	
W3LJ	643,200	668	95	307	
K4XS	**8,993,439**	**4031**	**185**	**634**	
W4AN	**7,736,256**	**3768**	**181**	**611**	
K4JA	**7,428,048**	**3324**	**177**	**639**	
N4TO	6,106,968	3009	172	584	
K4NNN	5,696,920	3007	167	563	
W4MR	3,840,872	2234	143	498	
K5TR	**4,980,646**	**2694**	**173**	**564**	
AA5NT	2,930,760	1923	156	474	
N5KA	446,557	740	107	254	
W5IBM	72,864	210	61	123	
K6ZM	**2,998,763**	**2184**	**148**	**393**	
W6TER	595,998	735	105	246	
N6VR	230,364	329	111	205	
W6YRA	59,451	275	53	96	
K7ZUM	**986,328**	**1146**	**119**	**223**	
W7VJ	556,950	779	99	183	
NG7Z	184,800	387	82	138	
K8AZ	**6,847,945**	**3393**	**173**	**596**	
W8AV	4,018,248	2277	160	529	
W9SZ	**1,894,347**	**1524**	**137**	**430**	
WN9O	1,655,720	1161	135	433	
NØNI	**3,906,327**	**2246**	**167**	**552**	
KBØVVT	636,740	570	105	298	

CANADA

VE1JF	**7,226,772**	**4097**	**163**	**595**	
VE6SV	1,795,102	1895	122	327	
VE7GL	1,685,792	2203	121	258	
VE3QDR	2,960	105	9	11	

PUERTO RICO

WP4NOW	**1,109,796**	**1918**	**74**	**202**	

AFRICA

CANARY ISLANDS

EA8ZS	**12,982,992**	**5738**	**179**	**625**	

ASIA

ASIATIC RUSSIA

RT9W	**7,869,435**	**4130**	**159**	**586**	
RF9C	**7,735,500**	**3809**	**167**	**597**	
RW9C	4,811,250	3226	143	482	
RK9CZO	3,830,280	2490	139	451	
RZ9SWP	1,919,190	1827	100	355	
RK9CYA	277,420	563	48	172	

CYPRUS

P3A	**17,928,172**	**8112**	**177**	**661**	

JAPAN

JE4VVM	**6,447,028**	**3596**	**179**	**507**	
JA7YAA	**5,574,100**	**2971**	**180**	**520**	
JH7PKU	5,030,156	3040	179	455	
JK6SEW	**3,964,142**	**2880**	**164**	**434**	
JJ3YBB	**3,255,108**	**3011**	**142**	**345**	
JA2ZJW	**2,267,340**	**1937**	**142**	**323**	
JA1YNE	**2,038,498**	**1784**	**138**	**296**	
JI3BFC	1,765,110	1366	149	361	
JI2ZJS	1,519,452	1559	125	271	
JA2YKA	693,596	891	104	213	

KYRGYZSTAN

EX9A	**6,174,749**	**4532**	**152**	**461**	

THAILAND

E21EIC	**1,159,728**	**1495**	**102**	**265**	

EUROPE

4U-GENEVA

4U1ITU	**5,890,503**	**5180**	**147**	**554**	

AUSTRIA

OE2S	**7,468,632**	**4509**	**181**	**671**	

AZORES

CU2A	**6,303,528**	**5424**	**139**	**477**	

BALEARIC ISLANDS

EA6IB	**10,584,440**	**6350**	**179**	**677**	

BELARUS

EU5F	**3,200,856**	**3788**	**132**	**459**	
EW1WN	70,336	287	46	178	

BELGIUM

OT1P	**1,828,684**	**2241**	**127**	**429**	

BULGARIA

LZ9W	**4,587,108**	**3721**	**162**	**589**	

CROATIA

9A7A	**8,804,340**	**5501**	**171**	**649**	
9A1P	2,744,416	2912	128	489	
9A8M	1,181,664	2024	92	304	

CZECH REPUBLIC

OK5W	**8,114,004**	**4575**	**190**	**687**	
OL3A	**4,869,120**	**3605**	**163**	**605**	
OL7R	3,811,845	3603	136	461	
OL5Q	3,652,100	3021	142	477	
OL2A	1,759,936	2322	107	321	

Sergio, LU7YS, took the top spot Single Op, High Power, 21 MHz in Argentina.

OK1KAO	815,262	1350	94	319
OK2KOD	688,860	1018	98	332
ENGLAND				
M2A	**3,505,677**	**4035**	**142**	**537**
EUROPEAN RUSSIA				
RM6A	**6,072,143**	**4083**	**191**	**656**
RI3A	**3,310,416**	**3354**	**136**	**446**
RZ1AWO	2,700,578	2477	139	508
RI4M	2,558,746	2512	146	527
RK4WWA	2,170,335	2400	137	478
RZ4AWR	2,026,646	2358	127	411
RX3RXX	1,911,395	2539	136	429
RW3WWW	1,367,820	2060	109	350
RU6LWT	1,336,087	2225	109	358
RN3AY	1,194,496	1636	118	394
RK3WWA	1,112,004	1692	114	360
RK6AYN	878,636	1403	94	324
RK3MZZ	211,184	614	58	210
RK4FWX	170,040	502	61	199
RK3DZD	115,478	573	45	136
FINLAND				
OH7M	**4,293,242**	**2788**	**166**	**607**
OH6MSZ	1,362,456	1731	134	462
FRANCE				
TM5C	**8,926,542**	**5356**	**176**	**641**
TM2Y	**6,823,485**	**4507**	**171**	**624**
TMØDX	3,115,980	3214	139	491
F6ENO	1,009,846	1730	105	317
F6KJX	378,421	1049	58	189
GERMANY				
DL1QW	**4,623,183**	**3179**	**160**	**587**
DK5QN	**4,232,800**	**2881**	**160**	**580**
DK4WA	3,380,480	2907	151	544
DL7ANR	2,659,996	2230	150	517
DFØCI	2,428,174	2021	151	540
DKØMN	1,959,200	2340	104	392
DJ9MH	1,558,994	1530	126	475
DLØIT	650,560	1137	90	290
DFØRF	380,835	643	109	346
GREECE				
SW1R	216	23	4	14
HUNGARY				
HG1S	**9,979,570**	**5618**	**194**	**696**
HA1BC	1,701,340	1769	113	401
HG4I	1,087,410	1682	95	307
HA6KZS	156,636	485	60	168
ITALY				
IQ4A	**8,187,885**	**4428**	**188**	**691**
IQ4T	**5,935,104**	**4201**	**160**	**576**
IU2M	5,849,928	3969	159	597
II1H	4,523,776	3508	149	507
IU2R	4,448,376	3374	162	582
LATVIA				
YL7C	**1,915,544**	**2149**	**121**	**475**
YL5W	843,608	1305	91	345
LITHUANIA				
LY1YK	**2,932,636**	**2725**	**154**	**553**
LUXEMBOURG				
LX5A	**7,669,536**	**5078**	**170**	**638**
LX/DL4SDX	3,235,822	3677	134	432
LX9DIG	2,284,350	3178	101	384
NETHERLANDS				
PI4DEC	**2,766,034**	**2808**	**137**	**485**
PI4ZLD	1,964,050	2326	119	431
PB6X	1,457,260	2111	99	391
POLAND				
SQ6Z	**6,001,984**	**3839**	**166**	**598**
SN8V	2,901,326	2935	133	409
SP1PEA	2,380,650	2220	141	449
SP9KRT	629,748	1129	101	340
SP3KPN	47,946	214	38	129
ROMANIA				
YP3A	**4,526,756**	**4516**	**149**	**513**
SLOVAK REPUBLIC				
OM8A	**9,268,980**	**5215**	**184**	**686**
OM7M	8,302,320	4687	193	694
OM3A	6,683,110	4210	176	629
SLOVENIA				
S52Z	**4,535,685**	**3226**	**151**	**542**
S59ABC	**3,269,538**	**3326**	**135**	**438**
S560	2,239,979	2534	116	381
SPAIN				
EA5KM	**2,644,213**	**3031**	**119**	**414**
ED7TST	**1,791,153**	**3343**	**86**	**265**
SWEDEN				
SK3W	**6,350,880**	**4050**	**172**	**636**
SKØCC	1,526,616	1672	113	391
SL2ZA	366,912	840	79	257
SI9AM	264,614	790	58	229
SWITZERLAND				
HB9A	**2,299,374**	**2841**	**126**	**413**
HB9OK	810,225	2088	63	214
UKRAINE				
UU7J	**4,598,245**	**3226**	**178**	**621**
UT7L	**3,727,496**	**2973**	**164**	**552**
UTØAZA	1,715,283	2809	109	350
UR4PWC	153,819	564	44	167
UR4LWY	92,117	238	83	168
UX8IXX	100	124	22	64
WALES				
MW2I	**3,418,129**	**3879**	**125**	**458**
YUGOSLAVIA				
YT1Z	**1,065,036**	**1625**	**89**	**320**
YU1INO	285,420	946	63	205

OCEANIA

AUSTRALIA				
VK5GN	**329,897**	**720**	**72**	**107**
EAST MALAYSIA				
9M6A	**3,963,352**	**3205**	**142**	**349**
GUAM				
AH2R	**9,283,872**	**4961**	**170**	**522**
INDONESIA				
YE1ZTC	**377,501**	**821**	**75**	**152**
NEW ZEALAND				
ZL6QH	**4,748,230**	**3762**	**144**	**313**
NORTHERN MARIANAS				
NHØS	**8,542,360**	**4919**	**169**	**451**

SOUTH AMERICA

ARGENTINA				
LU8XW	**296,670**	**840**	**48**	**97**
BRAZIL				
PQ2Q	**4,683,420**	**4192**	**121**	**320**
PY4NQ	2,681,124	2884	101	272
ZX3S	593,541	1475	70	177
ZY2Y	13,494	133	18	21
PT2CM	5,400	104	32	68
FERNANDO DE NORONHA				
PTØF	**11,702,286**	**6834**	**153**	**513**
NETHERLANDS ANTILLES				
PJ2T	**10,109,968**	**5506**	**155**	**527**
PERU				
OA4DKC	**1,276,800**	**1698**	**83**	**197**

MULTI-OPERATOR MULTI-TRANSMITTER NORTH AMERICA

UNITED STATES				
KC1XX	**16,892,980**	**7268**	**188**	**672**
K3LR	**15,789,074**	**6661**	**191**	**687**
W3LPL	**15,686,595**	**6965**	**196**	**691**
N2RM	**14,400,585**	**6549**	**183**	**654**
K9NS	**11,915,522**	**5651**	**191**	**647**
NY4A	**10,609,911**	**5431**	**172**	**595**
K1TTT	9,081,895	4823	166	589
K8CC	**8,061,618**	**4227**	**172**	**581**
K1RX	8,049,750	4282	163	587
W3PP	7,971,952	4298	168	584
W4MYA	7,737,756	4060	171	601
KØRF	**7,702,200**	**4043**	**184**	**594**
K3NM	7,450,212	4003	158	568
N6AW	**7,023,660**	**3937**	**184**	**551**
N3AD	6,825,345	3944	155	532
K5GO	**6,320,916**	**3454**	**174**	**582**
KB1H	6,103,300	3489	156	544
N4RV	5,977,047	3136	160	559
WØAIH	5,302,729	3176	166	537
K3II	4,284,297	2581	149	508
K5KG/4	4,202,708	2337	148	505
W2CG	3,809,182	2361	140	473
W8ZA	3,413,901	2107	134	459
W1HR	3,042,094	1946	130	453
N7DR/Ø	2,213,610	1406	151	430
N3SB	1,018,500	876	101	319
KV1W	943,824	843	92	332
W6OAT	501,410	489	114	263
W8VS	411,171	581	80	223
BAHAMAS				
C6AKP	**1,440,234**	**2155**	**94**	**264**
CANADA				
VE3DC	**3,471,300**	**2588**	**133**	**437**
VE7SV	**3,226,610**	**3344**	**152**	**306**
VE2FU	**826,590**	**2712**	**92**	**262**
GRENADA				
J3A	**23,133,600**	**12563**	**184**	**616**

AFRICA

BURKINA FASO				
XT2DX	**36,947,232**	**15560**	**187**	**677**
CHAGOS ISLANDS				
VQ9X	**3,898,036**	**2680**	**131**	**393**

ASIA

JAPAN				
JA3YBK	**12,163,806**	**6365**	**192**	**570**
JA5BJC	**11,686,311**	**6001**	**187**	**564**
JA1YPA	**1,533,010**	**1545**	**133**	**282**
JA3YWW	1,728	23	13	19

EUROPE

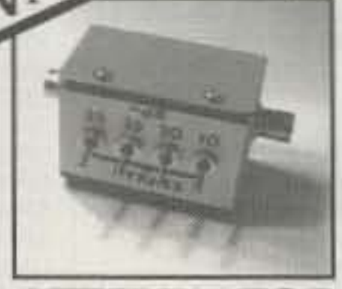
CZECH REPUBLIC				
OL7W	**9,511,865**	**6770**	**173**	**642**
OL5T	**5,547,096**	**4555**	**157**	**575**
OK2KOJ	1,645	50	9	26
DENMARK				
OZ5W	**5,779,345**	**4634**	**153**	**532**
OZØXX	**3,906,500**	**4468**	**142**	**508**
ESTONIA				
ES9C	**13,946,796**	**9618**	**191**	**685**
EUROPEAN RUSSIA				
RU1A	**17,108,421**	**10116**	**203**	**730**
FINLAND				
OH2U	**15,382,160**	**9020**	**199**	**741**
OH2K	600,457	1014	77	246
GERMANY				
DFØHQ	**18,071,850**	**10581**	**203**	**747**
HUNGARY				
HG6N	**12,664,938**	**8961**	**186**	**672**
KALININGRAD				
RW2F	**18,508,032**	**11003**	**195**	**733**
LITHUANIA				
LY7A	**10,272,493**	**7822**	**174**	**607**
POLAND				
SP7PGK	**2,236,509**	**2098**	**137**	**490**
SN3UU	1,292,148	1552	117	385
SCOTLAND				
GM7V	**12,207,936**	**9153**	**177**	**655**
SHETLANDS				
MZ5A	**4,332,589**	**3944**	**143**	**560**
SPAIN				
EA4ML	**10,790,642**	**8322**	**164**	**602**
SWEDEN				
SK6M	**6,712,540**	**5797**	**170**	**602**
SK6D	896,850	1459	93	357
YUGOSLAVIA				
YZ7A	**3,416,496**	**3959**	**143**	**511**

SOUTH AMERICA

GALAPAGOS ISLANDS				
HC8N	**47,176,688**	**17502**	**211**	**745**

CHECK LOGS

4X1RF, CT1DJE, DL1DTC, DL1ARJ, DL2AWW, DL2TM, DL3BVA, DL3HWF, DL5CD, DL5MHR, DL5NA, DL6UCD, DL6USA, DL7UCX, DL7VMM, DL8AKA, DL8DZV, DM2AIF, EA1BID, EA3GFB, EA5OI, EA8AVN, EA8BIE, EW2EG, EW6CU, GØOGN, GØPSE, G3HCT, GJ3YHU, HA1AG, HB9LDO, HG3DX, JA4AVO, JHØOQL, K6FM, KB9AMG, KF3CV, KO3Q, LA1CCA, LA5QC, LA7TO, LA9TJA, LY2CU, LZ1IA, LZ1JZ, LZ1XZ, LZ2FM, LZ3AB, LZ4UU, MØUNF, NJ9Z, OH2JXA, OH8SP, OK2BCJ, OM5RJ, OZ1EUO, OZ6TL, PAØRBO, PA2ALF, PA3HGF, PA5TT, PY3CQ, RAØZN, RA3DNC, RA3WDK, RA4YM, RA6LAE, RUØBB, RV3DBK, RV3DGY, RV3PN, RW3DY, RW4FX, SMØCSX, SM4AWC, SM5BTX, SM5ENX, SM5FUG, SM5OL, SM7BHM, SM7BVO, SM7EH, SM7LZQ, SP1DMD, SP1EGN, SP2EXE, SP3CUG, SP4BY, SP4DZT, SP5AHZ, SP6ALE, SP6BGZ, SP7HQ, SP7JQQ, SP8AJC, SP8HKT, SP8JMA, SP9CQ, SP9CVY, SP9MDY, SQ4NR, SV5DZX, T99C, UAØBA, UAØQNV, UAØYM, UA1OSM, UA1ZCQ, UA3AVR, UA3DEE, UA3MBP, UA3MDX, UA3MOM, UA3YH, UA4ARL, UA9JMS, USØSY, W6ISQ, XT2SX, YO2NAA, YO3GDA, YO5AY, YO9BGV, YO9JIM, YV1DIG.



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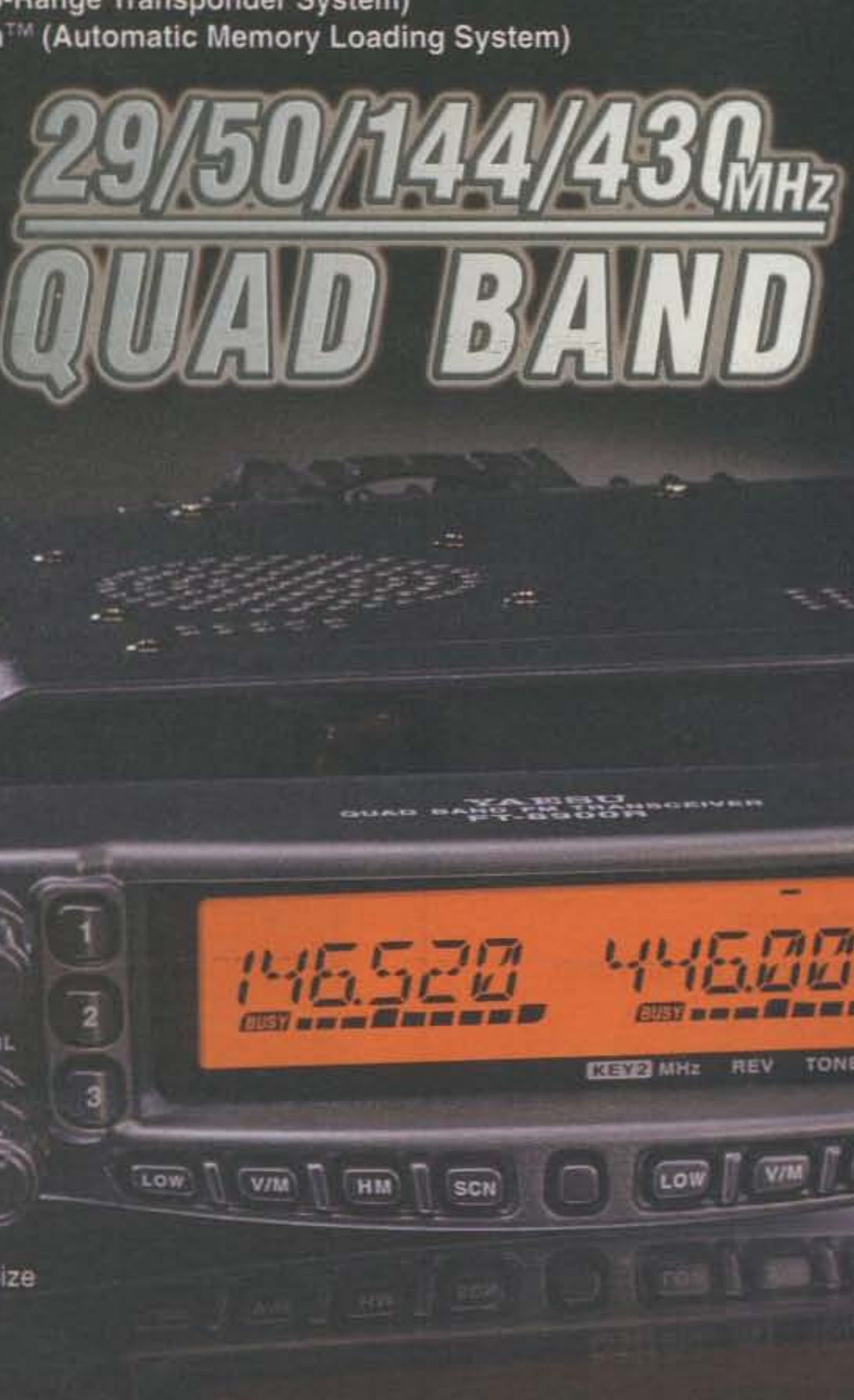

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