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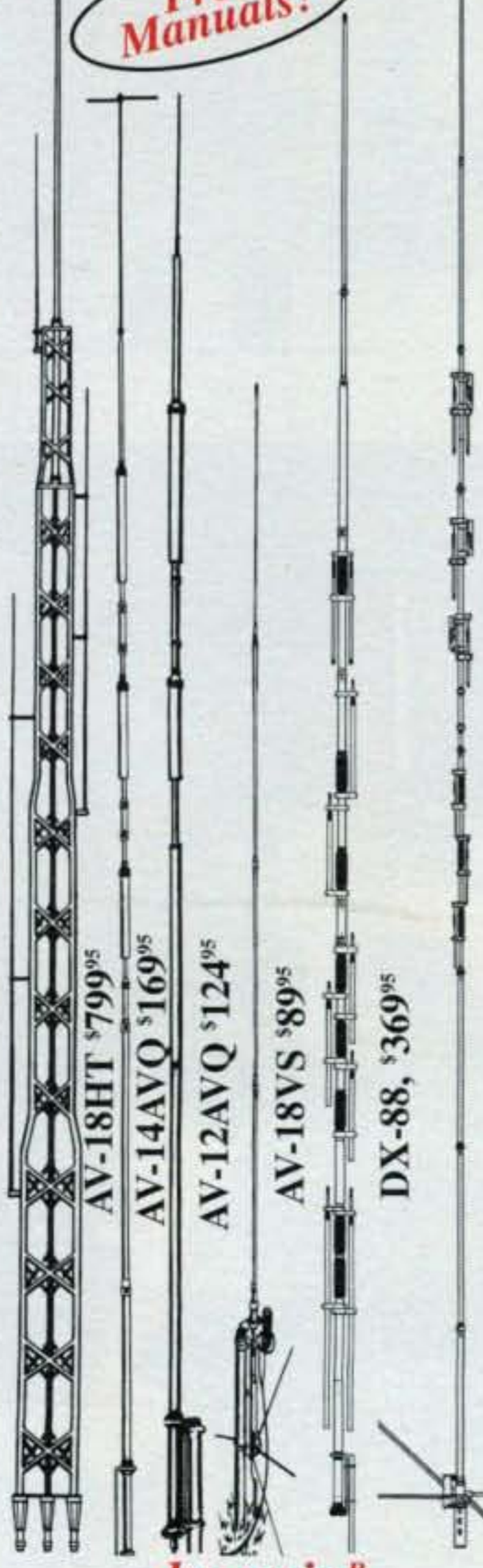

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AV-14AVQ	**$169.95**	**10,15,20,40**	**1500 W PEP**	**18 feet**	**9 pounds**	**80 MPH**	**1.5-1.625"**
AV-12AVQ	$134.95	10/15/20 M	1500 W PEP	13 feet	9 pounds	80 MPH	1.5-1.625"
AV-18VS	**$89.95**	**10 - 80 M**	**1500 W PEP**	**18 feet**	**4 pounds**	**80 MPH**	**1.5-1.625"**
DX-88	$369.95	10 - 40 M	1500 W PEP	25 feet	18 pounds	75 mph 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"**

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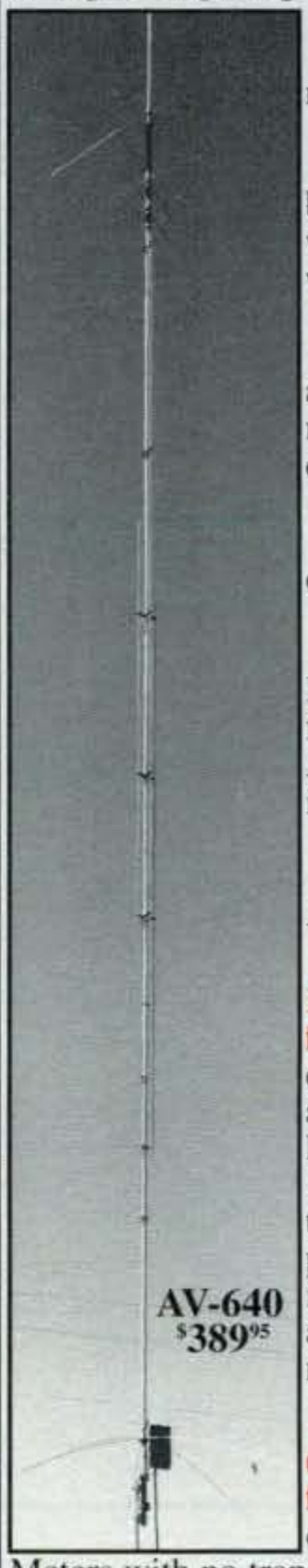

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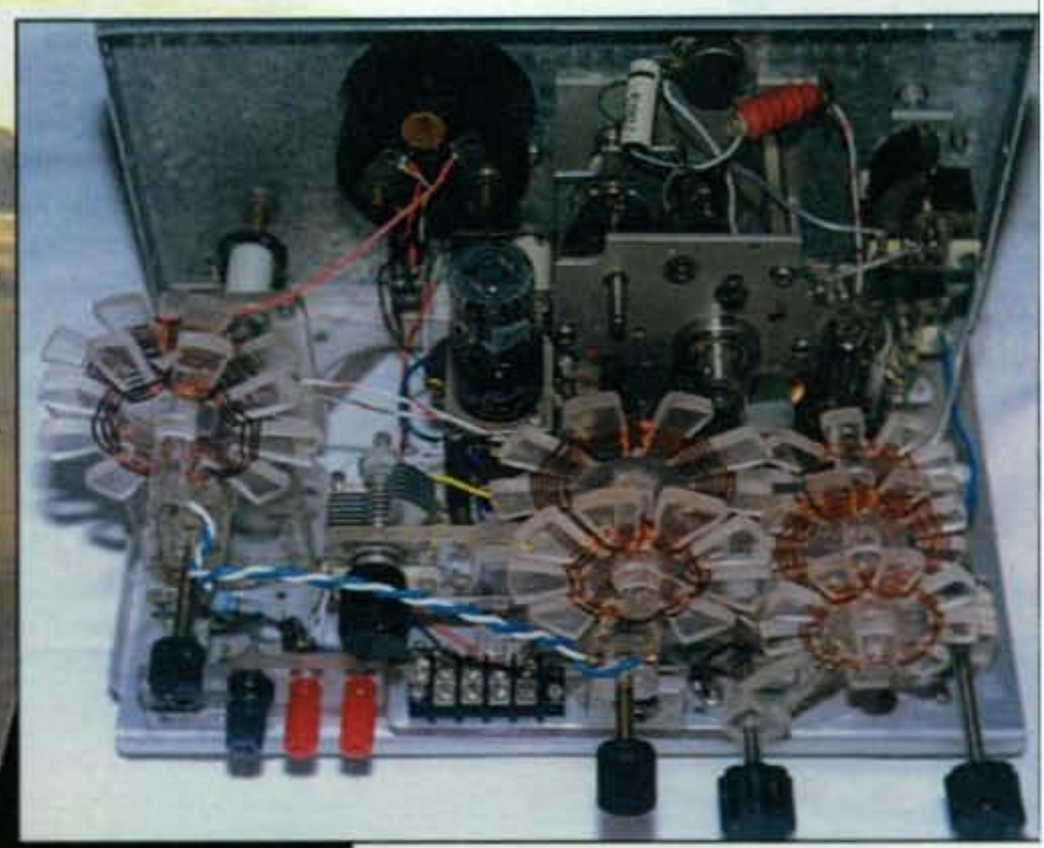

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ham radio news

U.S. Ham Licensing at 5-Year High

The number of radio amateurs licensed by the Federal Communications Commission is at a five-year high, with FCC statistics showing a total ham population of 684,498 as of October 31, 2002. In addition, according to breakdowns provided by Joe Speroni, AHØA (website: <http://www.speroni.com/FCC/>), the primary growth has come among Amateur Extra Class (breaking the 100,000 point for the first time) and General Class licensees. Technician Class figures essentially have held steady, suggesting that upgrading remains popular, since we also had 20,000 new hams entering the hobby in the year ending October 31. License renewal statistics were also encouraging, with the renewal rate climbing from an abysmal 45% two years ago to a better, but still unacceptable, rate of 55% in the past year.

FCC Looks at Radical Changes in Spectrum Management

A task force created last June by FCC Chairman Michael Powell has recommended a radical new approach to spectrum allocation, including time-sharing on underused frequencies, greater sharing of frequencies through the use of "smart" radios that seek out available spectrum, and—for the first time—suggesting that standards be set for interference rejection by receivers. According to both the ARRL and the *W5YI Report,* the FCC Spectrum Policy Task Force recommended moving away from exclusive frequency assignments, what it termed the "command and control" approach, to a more flexible system that would encourage greater sharing of frequencies, especially at times when the primary users are not active. The *W5YI Report* quotes Powell as saying that the current "spectrum management regime" is 90 years old and that "(i)t needs a hard look, and in my opinion, a new direction."

The ARRL had filed comments providing input to the task force, suggesting that amateur radio frequencies be protected from allocation systems based on trying to meet "the relentless spectrum demands of the market." The League noted that amateur radio's non-pecuniary character would make it impossible for hams to compete in a market-oriented allocation process and suggested treating amateur frequencies as a public park or a right-of-way.

IEEE Seeks Papers, Participation by Hams in Pre-WRC Conference

The Institute of Electrical and Electronics Engineers (IEEE) is seeking input from amateurs on issues dealing with operating restrictions imposed or proposed on the basis of alleged health threats from RF radiation, and has scheduled a special session on amateur radio concerns at its International Symposium on Electromagnetic Compatibility this coming May in Turkey. According to the AMSAT News Service, the IEEE has invited hams to submit formal or informal papers on the subject, or to attend and participate in the conference, scheduled for May 11–16 in Istanbul. For more information, see <http://www.ortra.com/emc2003/special-radio1-emc2.htm> on the web.

"Mini-WRC" Held in Geneva

Amateur radio was well represented at the WRC-03 Conference Preparatory Meeting, or CPM, held last November in Geneva. The CPM is a preliminary session to focus on the major issues that will come before next year's World Radiocommunication Conference. According to the *ARRL Letter,* League Executive Vice President Dave Sumner, K1ZZ, described the gathering as a "mini-WRC-03" at which the various items on the agenda for next summer's conference will get their "first worldwide airing."

Sumner predicted that after the two-week meeting (under way at press time), "we'll have a good idea of where things stand in terms of Amateur Radio issues." He is part of a 12-person delegation to the meeting representing the International Amateur Radio Union (IARU). Additional amateurs will also be there as members of national delegations.

Test Fees Increased for 2003

The ARRL/VEC has announced that its exam fees for 2003 will be $12, a $2 increase from the 2002 rate. The fee applies to all exams taken at ARRL-sponsored test sessions, including retests taken on the same day by those who have failed exams, at sessions that permit it. According to the *ARRL Letter,* increased operating costs forced the fee hike. While this decision applies only to ARRL/VEC-sponsored test sessions, most other VECs often follow ARRL/VEC's lead on test fees.

Far-Out JOTA Contact for Dutch Scouts

Hundreds of Boy Scouts and Girls Scouts in the Netherlands listened in on October 20th while about 20 scouts participating in the annual Jamboree on the Air (JOTA) talked via ham radio with Astronaut Peggy Whitson, KC5ZTD, aboard the International Space Station. According to the *ARRL Letter,* Whitson answered questions about food in space (complaining mildly about repeating the same menu every eight days) and about weather on Earth, noting that the space station crew can see hurricanes, thunderstorms, and even the northern lights from orbit. The 2 meter contact was part of the ARISS (Amateur Radio on the International Space Station) program.

FCC Acts on Interference Complaints

An Ohio ham has agreed to a one-year suspension of his amateur license after being cited by the FCC for deliberate interference. Gary Weiler, KI8DI, agreed to hand in his license for one year rather than face possible fines and license revocation. Weiler was cited for numerous instances of interference on a Cincinnati repeater.

Two hams and a repeater trustee have been asked to respond to complaints of alleged interference to emergency communications on a California repeater, and it appears that the Commission plans to hold repeater licensees responsible for misuse of their repeaters by users. While the letters to the two accused hams note that the repeater licensee has asked them not to use the repeater involved until the matter is resolved, the FCC letter to the repeater trustee notes that "(i)f a licensee or control operator of a repeater cannot prevent violation of Commission rules on the repeater, it must be shut down."

In another case involving alleged interference with emergency communications, the FCC has dropped an inquiry into complaints that Merle Garbe, WØSBE, had interfered with the Hurricane Watch Net during Hurricane Isidore. The Commission accepted Garbe's explanation that had tried to move members of his net away from the HWN frequency, but could not hear all of the HWN communications and did not know he was causing interference.

AMSAT Straight Key Night on January 1

AMSAT is sponsoring its 30th annual New Year's Day "Straight Key Night on OSCAR," from 0000–2359 UTC on January 1, 2003. The only rule is to operate CW, using a manual hand key, on any OSCAR satellite (including "OSCAR-Zero"—the Moon) and work as many other SKN stations as possible. Nominations are solicited for "best fist" among stations you work, to be submitted to coordinator Ray Soifer, W2RS at <w2rs@amsat.org>.

FCC Admits Blunder on .52 Letters

The FCC has withdrawn letters to five Ohio amateurs regarding rag-chewing on the 2 meter National Simplex Frequency of 146.52 MHz. FCC Special Counsel Riley Hollingsworth, K4ZDH, initially had advised the five that the voluntary ARRL band plan for 2 meters set aside .52 as a calling frequency, and that long conversations should not be held there. After it was clarified that the ARRL Board of Directors had *never* approved any specific band plan for 2 meters, and that even the de facto band plan only labels it as the National Simplex Frequency, Hollingsworth withdrew the letters, saying they were issued in error and telling the five in an e-mail that "I goofed." He later said the FCC had *no* plans to make band plan compliance mandatory.

National Park Service to Honor Second Marconi Centennial

Guglielmo Marconi made history in December 1901, when he received the first radio signal sent across the Atlantic Ocean. On January 18, 1903 he made the first two-way transatlantic communication, sending a message from U.S. President Theodore Roosevelt to British King Edward VII, and later receiving a reply from the king. Marconi operated from a station at South Wellfleet, Massachusetts, which is now part of the Cape Cod National Seashore. The National Park Service will commemorate the centennial of the beginning of transatlantic radio communication with a daylong series of public events, including a week-long operation of special event station KM1CC by members of the Marconi Radio Club W1AA, between January 11th and 19th. The station will operate on multiple bands and modes.

ARRL Renews Agreement with Red Cross

The ARRL has renewed and updated its Statement of Understanding (SoU) with the American Red Cross. The two organizations have had formal links since before World War II, and the agreement was most recently updated in 1994. According to the *ARRL Letter,* there were no major changes in the document. One change was an agreement that if amateurs are required to carry Red Cross identification during a disaster, the Red Cross will provide operators' names to the ARRL on request. In the aftermath of the World Trade Center attacks in New York, some Red Cross officials reportedly resisted ARRL efforts to get a list of all amateur radio volunteers who responded.

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

zero bias

BY RICH MOSESON, W2VU

Looking Toward the (Digital) Future

Happy New Year! Now that it's 2003, we can safely say that we've managed to bring amateur radio into the 21st century, intact, healthy, and moving forward. We can't necessarily say as much for each individual ham, of course— particularly when it comes to moving forward. All too many of us are all too happy to stick with the familiar and the comfortable, using radios that are 20+ years old and modes that are 50+ years old without taking much individual interest in helping promote future technology.

Now before you start sending me nasty letters saying that I'm anti-CW (I'm not), you should know that the 50+-year-old mode I'm thinking of is single sideband phone. That's right. According to the late Bill Orr, W6SAI, in his wonderful history of ham radio in the 50th Anniversary issue of *CQ* (January 1995), SSB was actually developed in the early 1930s, and was introduced to the ham radio world at large in 1948, once suitable filters were developed and transmitters and receivers (no transceivers then!) were made stable enough to handle SSB.

Bill wrote that hams were slow to accept SSB. That's an understatement. When I became a ham in 1970, there were still hundreds and hundreds of AM signals on the HF bands, and no shortage of people to contact if you came into the ham world with a CW/AM rig, like my original Hallicrafters HT-40 transmitter (bought from a fellow ham who'd just upgraded to his first SSB rig). There were also still plenty of people making fun of sideband's "Donald Duck" sound on an AM receiver. It wasn't until the *end* of the 1970s that SSB truly became the dominant HF voice mode—*30 years* after it was introduced.

Frankly, in the intervening decades, there has been little to no additional development of amateur HF communications technology. Morse code still uses CW (remember, it started out as spark); voice still uses SSB, with dribs and drabs of AM and FM; even PSK-31 and its cousins are really just refinements of Baudot RTTY, another "revolutionary" mode when it was introduced to hams at about the same time as SSB, in 1947. Meanwhile, commercial radio technology has been advancing at a staggering pace over the past ten years.

The New Revolution

Just as HF communication was revolutionized in the 1930s and 40s by the introduction of SSB and radioteletype, a new revolution is underway right now, a digital revolution. In the world of international shortwave broadcasting, engineers are hard at work on something called IBOC, an acronym for "In-Band, On-Channel" digital transmission. In plain English, it's a system for superimposing a digital audio signal—without interference—on top of an analog signal to permit listeners to hear their station regardless of whether they're using an analog or a digital receiver.

So far, though, amateur radio seems to be on the sidelines as we continue to hold fast to our analog technologies, particularly on HF. To be sure, computers have become an essential part of most HF ham shacks, whether used for logging, station and antenna control, internet callsign lookups (so a station on the other side of the world can contact me for the first time and say "Hi, Rich," before I've had a chance to tell him my name), or even for communication via the HF digital modes. But the digital "signals" coming out of our computers are translated into analog audio tones before entering our transmitters. The real digital revolution will come when the analog audio coming into our radios' mic jacks gets turned into digital bitstreams riding waves of RF out to our antennas.

This revolution is already here, of course, *outside* the world of amateur radio. In addition to IBOC mentioned above, as Contributing Editor Jeff Reinhardt, AA6JR, explains in his "Magic in the Sky" column this month, the VHF+ bands are quickly filling up with true digital signals, from digital cell-phones to spread-spectrum cordless phones and even digital garage-door openers. Jeff believes, as we do, that true digital communications on the amateur bands will not go far unless there is agreement—soon—among the manufacturers on technical standards that allow all digital radios to communicate with each other.

Right now, amateur manufacturers are taking baby steps into the digital arena. Alinco was first off the block with its DJ-596 digital handheld introduced in late 2001 (and reviewed in the June 2002 *CQ*). ICOM introduced its D-Star digital system and associated radios at Dayton last year, but the radios have yet to reach the US market. Big problem: As far as we can tell, the radios won't talk to each other. This is why, as Jeff explains in more detail, we need to agree on standards, and we need to do it before various manufacturers all go off in different directions, building mutually-incompatible radios.

But there's another issue: All the digital work so far has been on VHF and UHF. Ham radio's major attraction through the years has been, and still is, working DX on the HF bands. Unless and until the digital revolution makes its way to HF, it will remain on the periphery of amateur radio. For digital audio and spread-spectrum to really take hold in the ham world, we must find ways to make them work on HF.

This is a challenge on which digitally- and technically-oriented hams can take a lead. In the eyes of most folks developing this technology, HF is "so yesterday." Well, we've been down this road before, nearly a century ago, tossed the "useless" HF bands while the important commercial stuff happened above 200 meters. We have another opportunity to re-invent HF radio. How does QSB affect digital communications? What will happen if we plug the output of an 802.11 wireless computer network into an HF transceiver and link to other hams' wireless networks on the other side of the ocean of your choice? Without the internet. Can we compress a wideband signal into HF-friendly bandwidths? The list of challenges is endless ... so is the list of opportunities.

There is a difference, though. The early 20th century was a time of innovations by individuals—lone inventors turning ideas into reality, then finding a way to market them. Ham radio grew up in this tradition and continued it well into the latter half of the century, building satellites and computers in garages and basements. But the day of the individual innovator in technology is largely gone now. The technology is so complex that teams of people are needed to plan, design, and build new products, especially products that represent a quantum leap forward. The basement tinkerer is not going to bring us the next chapter of the

telecommunications revolution. But that doesn't mean we hams have to abandon development of new technology.

The internet (not to mention radio) gives us the means to conduct group research simultaneously in many different places, or to work in a coordinated manner on different aspects of a project. This is the concept behind the SETILeague's Project Argus, in which many listeners/radio-astronomers around the world—a large number of whom will likely be hams—will feed information and observations to a central point where it will be analyzed by trained scientists. The dispersed group theory was also used by AMSAT in building OSCAR-40. A small core group designed the satellite and its systems, then specific parts of the project are parceled out to groups of hams all over the world. The finished pieces came back to a central location, where they were integrated and assembled into the complete package.

There's one essential ingredient missing in this picture, though, if you're going to expand the concept beyond either single-goal projects (Project Argus) or one-of-a-kind product assemblies (AO-40). That missing ingredient is the amateur radio manufacturers. One example: the very creative folks at TAPR, Tucson Amateur Packet Radio, have already developed both spread-spectrum and software-defined ham rigs. But they have no tie-in with any of the major manufacturers, so their designs sit with a few prototypes built, but nothing even approaching wide acceptance and use.

Fact: As a group, we hams don't build our own radios anymore.

Another fact: This is nothing new.

Hams have built gear only when it was the only option. Over the past 60–70 years, as soon as commercially-built gear has become available, patterns have switched from building to buying. If we want to continue to be involved in developing and refining technology that is going to be *used,* we must team up with the people who build our radios. This goes beyond telling the manufacturers what we want in their next generation of transceiver, to sharing knowledge and experimental results.

There has always been some level of suspicion by hams toward manufacturers ("They only want to make money!" This is America, folks, a capitalist society. Making money by making quality products is supposed to be *good.*). We need to build a new relationship among hams, ham organizations, and ham manufacturers, one of mutual trust instead of suspicion. It may take some work to build and maintain that relationship, but it is a necessary one—we all need each other equally in our little world (which, by the way, isn't really so little—by one estimate, the amateur radio industry overall generates annual sales of well over $100 million. As I've said many times before, not bad for a "dying" hobby.).

Example: In Japan, ICOM is working with the JARL (Japan's national ham organization) to develop its "D-Star" digital network. The company benefits by getting real-world field testing of its system before going into large-scale production. Japanese hams benefit by getting a state-of-the art digital repeater network in exchange for their help in creating the system, and JARL benefits by being perceived as a leader in amateur radio digital technology.

In the D-Star example, a manufacturer has approached hams through their national organization and the results have translated directly into new products for the amateur market. This manufacturer-driven approach is the opposite of the "techie-driven" approach generally taken in the US and exemplified by the TAPR and AMSAT models described above. It is an approach that should be given serious consideration here by the manufacturers, the ARRL, and technically-minded hams as a new model for bringing advanced technology into amateur radio. We will do whatever we can to help facilitate it, one bit at a time.

73, Rich, W2VU

announcements

Ham Radio University 2003: Now in its fourth year, HRU 2003, an ARRL NYC-Long Island Section Convention, will take place on Sunday, January 19, beginning at 8 AM, at the East Woods School, Oyster Bay, Long Island, New York. For this day of ham radio education, new forums have been added and will include those geared to the non-ham as well as the experienced ham, with many hands-on demonstrations. Well-known Gordon West, WB6NOA, will also be a featured speaker. In addition, there will be tables set up with information about the different groups, ham radio classes, exam licensing sessions, an HF special event station, and public-service and other activities. Admission is $2.00 per person, and there will be refreshments available. For more details see <www.hudson.arrl.org/NLI>, or contact ARRL NLI Section Manager George Tranos, N2GA, at <N2GA@arrl.org>.

OMARC Project Diana Special Event: From 1600Z January 11 to 0000Z January 12 the Ocean Monmouth ARC will be on from the historic Diana site to commemorate the first successful moonbounce experiment as conducted by the US Army Signal Corps on January 10, 1946. Operation will be CW/SSB and possibly other modes in the General and Novice/Technician subbands of 80, 40, 20, 15, 10 meters. For more info see <http://www.qsl.net/n2mo/>. For a history of the Diana Project go to <http://www.infoage.org/diana.html>.

West Allis RAC Swapfest (WI): Saturday, January 4, from 8 AM to 2 PM at the Waukesha Co. Expo Center Forum, Waukesha, Wisconsin. Tables in advance $12 (deadline December 30), at the door (if available) $12. VE exams. For reservations send business-size SASE to WARAC Swapfest, P.O. Box 1072, Milwaukee, WI 53201 (Phil Gural, W9NAW, 414-425-3649).

Hammond (LA) Hamfest: The Southeast Louisiana ARC is sponsoring this event on Saturday, January 18, beginning at 8 AM, at University Center, Hammond, Louisiana. Celebrating vintage radio, there will be forums, dealer displays, and VE exams. Table reservations: Bill Borstel, KB5SKW, 1-225-695-6414, e-mail: <wborstel@hotmail.com>. Information: SELARC, P.O. Box 1324, Hammond, LA 70404; on the web <www.selarc.org>.

Northwest Missouri Winter Hamfest: The Missouri Valley ARC and Ray-Clay ARC will sponsor this hamfest on saturday, January 18, from 8 AM to 2 PM, at the Ramada Inn, St. Joseph, Missouri. Featured will be major exhibitors, fleamarket, and exams. Dealer info: swap tables $15 each; commercial exhibitors write to Northwest Missouri Winter Hamfest, c/o Neal or Carlene Makawski, WBØHNO/KAØIKS, 3704 Meadowoak Lane, St. Joseph, MO 64503 (phone 816-279-3406; e-mail: <nem3238@ccp.com>). Talk-in 146.85 and 444.925.

Lockport (NY) Hamfest/Auction: Sponsored by the Lockport ARA, Saturday, January 25 at the South Lockport Firehall, beginning at 7 AM. Tables are $5.00. Contact Duane Robinson, W2DLR, P.O. Box 142, Ransomville, NY 14131 (716-791-4096; e-mail: <w2dlr@aol.com>, <http://www.lara.hamgate.net>). Talk-in 146.820 (PL 107.2).

Wheaton (IL) Community Radio Amateurs Midwinter Hamfest: Sunday, January 26, 8 AM to 1 PM, at the Kane County Fairgrounds, St. Charles, Illinois. Included will be commercial booths, fleamarket tables, and VE exams. Contact WCRA, P.O. Box QSL, Wheaton, IL 60189 (phone 630-604-0157; e-mail: <info@wheatonhamfest.org>; <http://www.wheatonhamfest.org>). Talk-in 145.390.

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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.

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Results of the 2002 CQ WPX SSB Contest

BY STEVE BOLIA,* N8BJQ

The combination of a major religious holiday, a solar event, and some post September 11th mail and travel glitches threatened to put a damper on the 2002 CQ WW WPX SSB Contest. However, when the weekend was over, the number of entries was up slightly, two world records were broken, and a good time was had by most. D44 was the "magic" spot in 2002, with both D44AC and D44TD setting world records in the 10 meter and Multi-Single categories, respectively. Several continent and low power records also fell.

DX

The year 2002 saw a North American station take the Single Operator All Band (SOAB) title for the first time in several years. Daniel, T93M/HI9, edged out Jim, W7EJ, at CN2R for the top spot. To win, Daniel had to make 550 more Qs and work 25 more prefixes to offset Jim's point advantage. Daniel used a tribander and wires to rack up over 5400 Qs. Jim had some antenna problems, but still managed 4850 Qs with beams only on 10 and 40 meters and wires for the other bands. Third place went to Sergio, ZX5J (PP5UA), followed by JM1CAX as JY9NX and RW3QC as 5B4/R3CC. ZF2AF (AE6Y operating) finished sixth, followed by U.S. champ KM3T, with Bob, KQ2M, right on Dave's heels. WK4R (K4XS) and WE9V rounded out the top ten. Thirteen stations (including two low power entries) topped 10 million points, up from ten stations in 2001.

Al, 4L5A, went to D44 and dominated the 10 meter category as D44AC. Al's 15.7M point effort broke the EA8AH record set in 2000 by over 1M points. Second place went to PY2LED as ZV2V, with LU1HF third, PJ2T (operated by yours truly) fourth, and OK1FUA as IH9/OL5Y fifth. EA8AH (OH1MA) was the 15 meter champion, with 5B4MF as H22H second, JI3OPA third, LV5V (LU5VV) fourth, and ZF2AH fifth. The 20 meter race was very close, with UR3QCW as UW5Q coming out on top, followed by 9A4X, LZ1ABC, UU7J (UUØJM), and HG9X. Twenty was obviously very good in Europe. OH1RY as AN8AH dominated the 40 meter category. 9A5E edged out PJ2H (WØCG) for second place, with LY5A (LY2PAJ) fourth and LA9HW fifth. I4AVG was the 80 meter champion, with S59CAB (S53MM) second, U.S. champion AA1BU third, Z39Z (Z32AF) fourth, and LZ8T fifth. Top band honors went to YT6A, with S57M second, low power champion TA3J third, LY2BW fourth, and OZ3SK fifth.

These are the two 10 meter antennas used by D44AC. They were phased, and in this photo both are pointing toward Europe.

FY5FY was the world low power SOAB champion (and 11th overall). Second place went to Dave, W5AO, as VP5V. PY2MNL as ZX2B was third, CN8NK fourth, and VA3UZ fifth. Sixth through tenth place went to PY2NDX, KK9A, HC1OT, WP3C, and 3V8CB (JH4RHF), respectively.

I had the pleasure of operating 10 meters low power as PJ2T, and was fortunate to finish first in the category. Most of the credit goes to the PJ2T station. It sure is nice to have a bunch of 10 meter antennas at your disposal. PX2W (PY2YU) was second, with CV4Y (CX1TG) third, LU4DX fourth, and PS5S fifth. 8P6SH as 8P2K took the 15 meter title, with PY3FOX as PS3F second, WA1LNP as WE1USA third, HK3JJH fourth, and JL3VUL/3 fifth. T92D edged out VK4DX and YBØZZ for 20 meter honors, with Z34A fourth and UV8M (UX3MR) fifth. S54A was the 40 meter champion, with OK1DCF, T94DO, USØHZ, and OK2EQ in second through fifth place. T93Y just squeaked by S53F for the 80 meter win, with 4NØB (4N1KW) edging out S52W for third. TA3J was the low power Top band champion (and low power record holder), with UX5NQ second and OK2SNX third.

The Tribander/Single Element (T/S) category is still gaining in popularity. Three of the top six SOAB entries finished one, two, and three. T93M/HI9 was first, JY9NX second, and ZF2AF third, all with over 13 million points. Fourth place went to HA8JV, with OH2PM as XX9TRR fifth and JA7NVF sixth. HR3J operated by JA6WFM was seventh, low power winner VA3UZ eighth, CE8EIO ninth, and VO1TA tenth. 4X/ES2RR was the winner on 10 meters, followed by HSØ/G3NOM and U.S. champ NT1N. VE3ANX turned in a great score to take the 15 meter title, followed by TM1P (F8BON). TA2DX was the 20 meter winner, with 9Y4LDK sec-

*7354 Thackery Rd., Springfield, OH 45502
e-mail: <n8bjq@erinet.com>

ond and NN5Z (K5PX) third. OZ2ZZZ was the winner on 80 meters.

EA9CD's 2.1 million points was the top Rookie score. AD6WL was the the U.S. winner and second-place finisher, with VE3AGC third, YT1LT fourth, and SQ9MZ fifth. S57IIO was the 2002 Band Restricted champion.

K4MA as NV4X was the Single-Op Assisted champion, edging out UA9AM and RN3QO for the top spot. EA5DFV, S57DX and OT2T (DL2CC) were also in the hunt with better than 6 million point efforts. PY5EG operated 10 meters Assisted and turned in the highest SO(A) score with his outstanding 10.6M effort—nice job, Oms. HG5C (HA5WE) was second with a nice 2.5 million point effort. EA5AER was the winner on 15 meters, with AM5YJ second. HG3M (HA3MY) was the 20 meter champion, followed by UT5UGR. YL1ZF took the top spot on 80 meters, as did II8A (IC8JAH) on 160.

Europe was the hotbed of QRP activity, with EU stations claiming the top five spots. First place went to S54AA, who just edged out HG5Z (HA1CW). Third place went to ON6NL, with F5BEG as TM4K fourth and Z31GX fifth. JR3RWB was the 10 meter champion, RAØJJ the 15 meter winner, and UA9SCX the champion on 20. W8QZA as W6QU was the 40 meter winner, with YT1VP claiming the title on 80 meters.

USA

KN1DX (K4ZW), KQ2M, KM3T, WK4R (K4XS), and WE9V waged quite a battle for the U.S. title. WK4R had the highest QSO and prefix totals, KQ2M did the best on the low bands, but KM3T had the most QSO points and enough multipliers to come out on top, edging out KQ2M by 130K for the win. WK4R was not very far behind in third

TROPHY WINNERS

SINGLE OPERATOR, ALL BAND

WORLD: Stanley Cohen, W8QDQ Trophy. Won by **Daniel Horvat, T93M/HI9.**
World Low Power: Steve Bolia, N8BJQ Trophy. Won by: **Didier Bironneau, FY5FY.**
USA: Atilano de Oms, PY5EG Trophy. Won by: **Dave Pascoe, KM3T.**
USA Low Power: Oklahoma DX Association Trophy. Won by: **John Bayne, KK9A.**
USA Zone 4: Society of Midwest Contesters Trophy. Won by: **Jerry Rosalius, WB9Z.**
USA Zone 4 Low Power: Society of Midwest Contesters Trophy. Won by: **George Fremin III, K5TR.**
AFRICA: Peter Sprengel, PY5CC Trophy. Won by: **CN2R operated by Jim Sullivan, W7EJ.**
EUROPE: Jim Hoffman, N5FA Trophy. Won by: **Tine Brajnik, S50A.**
SOUTH AMERICA: Ron Moorefield, W8ILC Trophy. Won by: **Pedro Schmitz, PP5UA (ZX5J).**
CANADA Low Power: Amateur Radio League of Alberta Award. Won by **Yuri Onipko, VA3UZ.**
OCEANIA: Philip Fraizer, K6ZM Memorial. Won by: **Martin Luther, VK5GN.**
***JAPAN:** The DX Family Foundation Trophy. Won by: **Hirofumi Koie, JH7LRS.**
WORLD QRP/p: Dayton Amateur Radio Assn. Trophy. Won by: **Franc Lane Kokoravec, S54AA.**
USA QRP/p: Doug Zwiebel, KR2Q Trophy. Won by: **Phil Krichbaum, NØKE.**

SINGLE OPERATOR, SINGLE BAND

WORLD: John N. Reichert, N4RV Trophy. Won by: **D44AC operated by Al Teimurazov, 4L5A (28 MHz).**
WORLD 28 MHz: Alan Dorhoffer, K2EEK Memorial Trophy. Won by: **Station ZV2V operated by Fernando Cordoba, PY2LED.**
WORLD 7 MHz: William D. Johnson, KVØQ Trophy. Won by: **Station AN8AH operated by Pekka Kolehmainen, OH1RY.**
USA 3.7 MHz: Lance Johnson Engineering Trophy. Won by: **Joe Gagliardi, AA1BU.**
USA – 14 MHz Low Power: Boomer Contest Club Trophy. Won by: **Station NN5Z operated by James Burnette, K5PX.**
USA 21 MHz: Bernie Welch, W8IMZ Memorial. Won by: **John Evans, N3HBX.**

MULTI-OPERATOR, SINGLE TRANSMITTER

USA: Steve Bolia, N8BJQ Trophy. Won by: **NF4A operated by NF4A, N4PN, N4OX, K4WA, KB4ET.**
USA Zone 4: Society of Midwest Contesters Trophy. Won by: **Station NX5M operated by NX5M, K5NZ, UAØOFF, W5SB, W5PF, KE4NT.**
ASIA: W2MIG Memorial Trophy sponsored by Ed Campbell, NT4TT. Won by: **A61AJ operated by A61AJ, N2AA, OH2BH, S53R, T97C.**

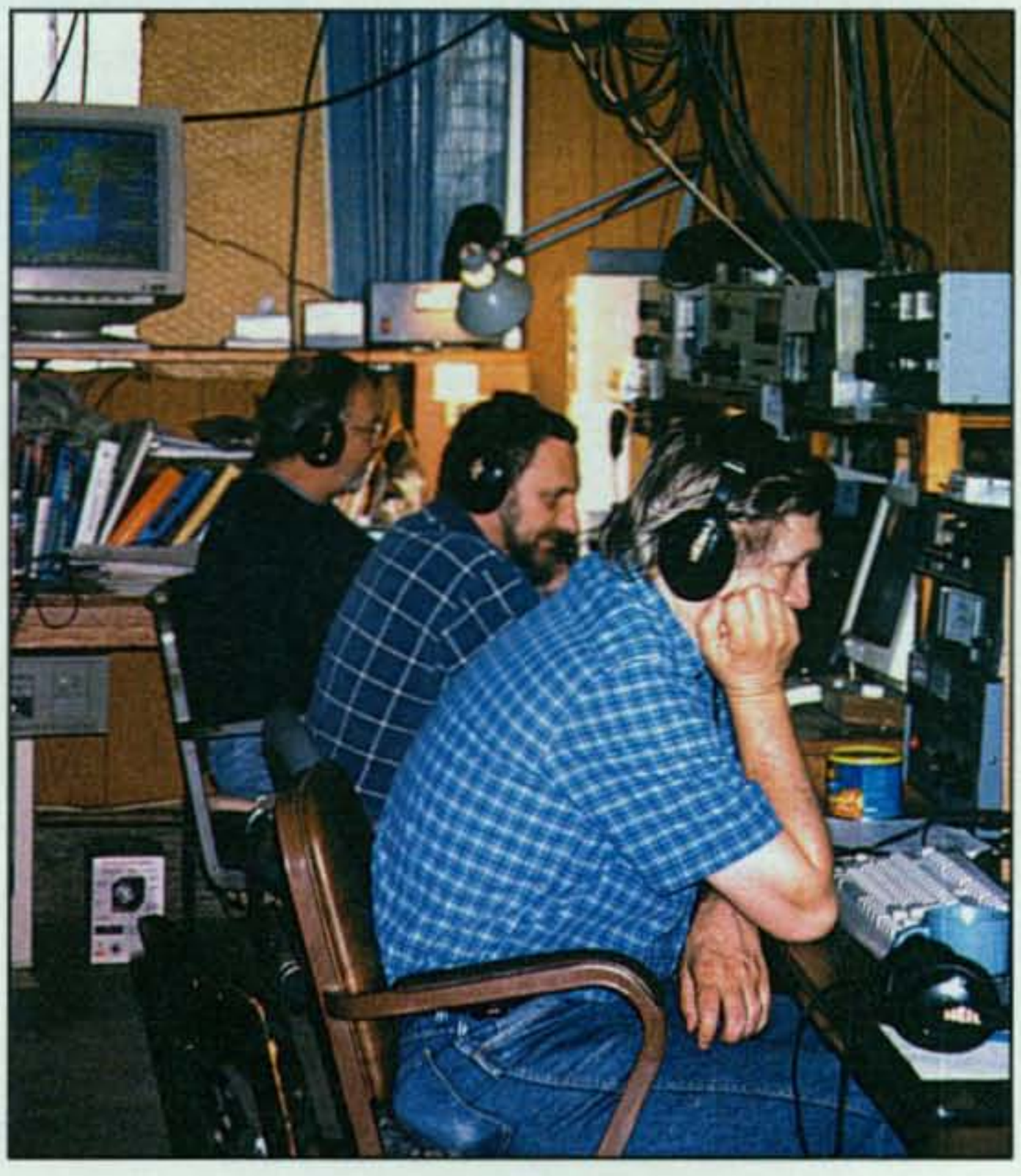
MULTI-OPERATOR, MULTI-TRANSMITTER

WORLD: Gail Schieber, K2RED Trophy. Won by: **YW4M operated by DL2GG, YV2IF, YV3AZC, YV4FZM, YV4GLD, YV4GME, YV4YC, YV5AMH, YV5EED, YV5IQJ, YV5IVB, YV5LMW.**
NORTH AMERICA: Burt Curwen, KL7IRT Memorial (James Dixon, NL7HI sponsor). Won by: **J6DX operated by J69AC, K5ZM, K9JE, KI6T, N9AG, W8QID, W9CEO.**
USA: Glenn Tracey, KC3EK Trophy. Won by: **W4MYA operated by K4MAU, K7MX, KC4AUF, KF4QQY, KG4PMJ, KZ5OH, N4CFL, N4DEN, N4DWK, W4DR, W4HJ, W4HZ, W4MYA, W4TNX, WA4PGM, WK4Y, WU4G, Lilly.**

CONTEST EXPEDITION

WORLD: Kansas City DX Club Trophy. Won by: **D44TD operated by I4UFH, IV3TAN, IK2NCJ, IK2JUB.**

Al, 4L5A (flashing the victory sign), after his 10 meter win and world record effort as D44AC. Nice job, Al.



West Coast powerhouse station NR6O came in second in the U.S. in the Multi-Multi category. Shown here, left to right, are three of the nine ops.: N6RO, WA6O, and K3EST. (Photo via K2RED) →

WORLD TOP SCORES

SINGLE OPERATOR HIGH POWER ALL BAND

T93M/HI9	15,812,349
CN2R (W7EJ)	15,722,875
ZX5J (PP5UA)	14,624,642
JY9NX (JM1CAX)	13,919,586
5B4/R3CC (RW3QC)	13,713,554
ZF2AF (AE6Y)	13,232,968
KM3T	11,394,493
KQ2M	11,256,036
WK4R	11,019,862
WE9V	10,678,624
*FY5FY	10,633,812
KN1DX	10,340,508
*VP5V (W5AO)	10,134,240
K3ZO	8,740,950
NJ1F (S51TA)	8,575,770
VC6R (VE5MX)	8,552,736
WB9Z	8,352,795
S5ØA	8,028,776
WC4E	7,893,920
KR1G	7,883,216
VE3AT	7,868,610
NB1B	7,865,715
WT6V (N6IG)	7,713,070
NS4W	7,358,338
*ZX2B (PY2MNL)	7,284,722

28 MHz

D44AC (4L5A)	15,707,401
ZV2V (PY2LED)	9,745,408
LU1HF	8,561,514
*PJ2T (N8BJQ)	7,829,447
IH9/OL5Y (OK1FUA)	6,920,654
9HØA (9H1EL)	6,656,650
9K2ZZ	6,297,330
*PX2W (PY2YU)	5,812,625
*CV4Y (CX1TG)	5,165,090
7J2YAF (JA1KSO)	5,119,280
NN5P (W5PR)	4,856,072
FY5FU	4,643,562
GM7V (GM4YXI)	4,592,265
YTØA (YU1AO)	4,547,568
YZ1AU	4,438,980

21 MHz

EA8AH (OH1MA)	8,797,155
H22H (5B4MF)	6,475,296
JI3OPA	5,963,688
LV5V (LU5VV)	5,673,024
ZF2AH	5,335,770
OD5/OK1MU	5,315,907
VE3ANX	5,258,040
IH9/OL7N (OK1DUO)	5,065,728
CX5BW	4,964,991
UT7QF	4,637,127
*8P2K (8P6SH)	4,149,360
RSØF	3,997,840
OHØV (OH6LI)	3,947,592
OMØM (OMØWR)	3,928,276
P49MR (VE3MR)	3,753,501

14 MHz

UW5Q (UR3QCW)	4,889,925
9A4X	4,820,030
LZ1ABC	4,587,510
UU7J (UUØJM)	4,119,774
HG9X	4,098,464
VA7RR	3,755,889
S53M (S51ZO)	3,168,895
VE7AV	3,162,920
KX8R (K8DX)	3,128,840
S51CK	3,103,595
LY9A (LY3BA)	3,009,604
RJ9J (RA9JR)	3,007,744
F2EE	3,005,856
OH4A	2,968,202
TM8C	2,869,116

7 MHz

AN8AH (OH1RY)	6,537,860
9A5E	3,130,550
PJ2H (WØCG)	3,031,776
LY5A (LY2PAJ)	2,369,440
LA9HW	2,157,680
YT7A	1,766,448
I5FCK	1,617,475
UA9CI	1,400,256
UR6F	1,137,930
YP3A (YO3GRE)	797,176

3.7 MHz

I4AVG	1,177,689
S59CAB (S53MM)	940,008
AA1BU	832,870
Z39Z (Z32AF)	815,634
LZ8T	789,488
YTØT (YU1WV)	784,176
OK1WF	461,083
*T93Y	460,350
YV5LIX	444,444
*S53F	442,216

1.8 MHz

YT6A	376,992
S57M	285,152
*TA3J	267,699
LY2BW	230,944
OZ3SK	221,806
VY2ZM	157,644
*UX5NQ	151,368
*OK2SNX	70,668
*YT1R	60,494
VA3KA	53,010

LOW POWER ALL BAND

FY5FY	10,633,812
VP5V (W5AO)	10,134,240
ZX2B (PY2MNL)	7,284,722
CN8NK	5,822,553
VA3UZ	5,352,670
PY2NDX	5,242,084
KK9A	4,547,760
HC1OT	4,312,830
WP3C	4,142,768
3V8CB (JH4RHF)	3,902,720
ZC4BS	3,550,112
K5TR	3,328,284
YL/RZ3BY	3,054,124
9G5MD (F5VCR)	2,894,228
AY8A (LU8ADX)	2,832,498

28 MHz

PJ2T (N8BJQ)	7,829,447
PX2W	5,812,625
CV4Y (CX1TG)	5,165,090
LU4DX	3,919,764
PS5S	3,697,468
LU3HIP	3,014,550
NP3P (NP3E)	1,809,438
4N1SM	1,715,905
IU2C	1,697,190
4X/ES2RR	1,681,130
AM7FTR	1,636,800
ET3PMW (W4PFM)	1,602,594
PY2SBY	1,453,725
PR8RZJ	1,382,100
JF3BFS	1,317,292

21 MHz

8P2K (8P6SH)	4,149,360
PS3F (PY3FOX)	3,395,220
WE1USA (WA1LNP)	2,408,868
HK3JJH	2,407,951
JL3VUL/3	2,161,737
L44DX (LW1DTZ)	1,960,046
EX8AA	1,896,041
AM7HBP	1,450,260
AAØNW (WØAH)	1,424,944
EA8AG	1,423,647
N4MO	1,123,070
TM1P (F8BON)	1,104,840
JR3RIY	920,034
US7IGF	732,033
EA5FIV	646,947

14 MHz

VK4DX	2,389,860
YBØAZ	2,308,284
Z34A	1,697,520
UV8M (UX3MR)	1,561,611
IT9ICS	973,749
PY2XAT	594,320
9Y4LDK	484,617
UR6IJ	422,873
PR7QI	370,734
SV1DZB	363,264

7 MHz

S54A	420,133
OK1DCF	245,125
T94DO	237,110
USØHZ	214,490
OK2EQ	144,690
CT1CAD	111,696
ES2NA	95,407
OK2PPM	90,479
KX9DX	68,093
AN1QA	62,376

3.7 MHz

T93Y	460,350
S53F	442,216
4NØB (4N1KW)	329,220
S52W	320,910
LZ1DM	80,850

1.8 MHz

TA3J	267,699
UX5NQ	151,368
OK2SNX	70,668
YT1R	60,494
G4VGO	47,684

TRIBANDER/SINGLE ELEMENT

T93M/HI9	A	15,795,036
JY9NX (JM1CAX)	A	13,889,856
ZF2AF (AE6Y)	A	13,226,584
HA8JV	A	7,019,595
XX9TRR (OH2PM)	A	6,852,638
JA7NVF	A	5,386,125
HR3J (JA6WFM)	A	5,385,702
*VA3UZ	A	5,352,670
CE8EIO	A	4,358,247
VO1TA	A	4,318,930
RA3AJ	A	4,143,825
*3V8CB (JH4RHF)	A	3,902,720
S59KW	A	3,674,619
S57CQ	A	3,330,844
N2XD	A	3,034,651
G5W	A	2,961,395
AM1DDO (EA1DDO)	A	2,957,475
*4X/ES2RR	28	1,681,130
HSØ/G3NOM	28	1,176,822
NT1N	28	1,058,480
*H6C (YN4SU)	28	756,391
OH6NJ	28	678,198
YV6DBW	28	651,960
VE3ANX	21	5,258,040
*TM1P (F8BON)	21	1,104,840
*PA1TT	21	424,708
*F8AKS	21	304,764
*WA3AAN	21	119,067
TA2DS	14	799,596
*9Y4LDK	14	484,617
*NN5Z (K5PX)	14	316,575
OZ2ZZZ	3.7	128,535

BAND RESTRICTED

*S57IIO	A	2,328,750
*EC5CPL	A	503,052
*ES6KW	A	135,676
*DJ1AD	A	124,696
*OK1MJA	A	124,435
*RU3DM	28	224,812
*RV3APM	28	53,856
*YY5JMM	28	50,292
*EI9HQ	28	42,312
*EC3CJN	21	390,158
*EF1DMQ (EC1DMQ)	21	159,077
*M4T (GØVQR)	14	252,414
*RX9CEL	14	53,704

ROOKIE

*EA9CD	A	2,183,040
AD6WL	A	1,433,600
*VE3AGC	A	818,349
*YT1LT	A	738,675
*SQ9MZ	A	587,673
*KD7GGZ	A	550,440
*KCØJVG	A	475,416
YU8/OK1CRM	A	311,928
*K8KHZ	A	310,185
*J69EN	A	254,546
*RU1AB	A	189,720
*UA9LAU	28	355,500
IZ1EGV	28	236,320
*SQ8GHY	28	81,438
*YY5JMM	28	50,292
*YY5JRU	28	46,580
*EA5FIV	21	646,947
*YU1AFR	21	88,350
*WB2BXO	21	30,590
*KG4OJT	21	23,387
*EC1CSV	21	21,000
4N1N (4N1JA)	14	1,465,455
*AM1AVO (EA1AVO)	14	173,754
*PY3KK	7	7,137

ASSISTED

NV4X (K4MA)	A	7,331,832
UA9AM	A	7,144,004
RN3QO	A	6,959,953
EA5DFV	A	6,684,938
S57DX	A	6,256,224
OT2T (DL2CC)	A	6,214,302
UZ7U (UT3UA)	A	4,169,478
OH6NIO	A	3,820,026
KI1G	A	3,362,256
AM3NY (EA3NY)	A	3,217,250
K2PLF	A	3,215,669
WZ7ZR (W7ZR)	A	2,654,085
WZ6Z	A	2,616,480
WN9O (W9IU)	A	2,574,379
OH7M (OH4JFN)	A	2,224,827
HG5ØRT	A	2,175,992
OH3BU	A	2,053,072
LY8X (LY2BIL)	A	1,921,052
YBØAVK	A	1,809,534
N2BJ	A	1,731,645
ZW5B (PY5EG)	28	10,598,952
HG5C (HA5WE)	28	2,546,875
*ZY2W (PT2ND)	28	791,517
*WW3S	28	698,544
DF2LH	28	265,694
*EA5AER	21	2,123,496
AM5YJ (EA5YJ)	21	1,484,190
N3PUR	21	1,129,888
ON7LX	21	941,688
*KK1H	21	510,542
HG3M (HA3MY)	14	3,603,714
UT5UGR	14	1,257,876
YL1ZF	3.7	577,280
AA4MM	3.7	272,844
*II8A (IC8JAH)	1.8	15,795

QRP/p

S54AA	A	1,681,295
HG5Z (HA1CW)	A	1,507,650
ON6NL	A	1,384,440
TM4K (F5BEG)	A	1,320,576
Z31GX	A	1,312,460
NØKE	A	996,996
LZ7X	A	817,719
VA3TTT	A	494,270
KKØQ	A	379,824
W1AMF	A	322,300
JR3RWB	28	467,313
LW7DQW	28	314,080
LR7E (LW3DX)	28	308,708
RZ6BU	28	199,548
RZ9IB	28	86,592
RAØJJ	21	751,744
RA9UAD	21	601,290
RZ6HX	21	304,480
K2WY	21	158,010
T94OM	21	149,572
UA9SCX	14	99,994
W3SE	14	55,245
W6CN	14	51,546
OK1UHZ	14	37,800
DK7IH	14	32,544
W6QU (W8QZA)	7	14,144
SP9BMH	7	1,652
YT1VP	3.7	84,042
SP3J (SP3NGB)	3.7	3,999

MULTI-OP, SINGLE TRANSMITTER

D44TD	33,443,856
HC8N	28,998,277
P4ØV	24,910,758
CT9M	24,857,664
A61AJ	23,610,785
3V8BB	23,243,061
FM5GU	21,920,715
9A7A	19,034,950
TM5C	18,729,585
WP2Z	15,339,850
9K9K	14,885,578
RF9C	14,366,775
UPØL	14,301,890
HG1S	13,566,944
LRØN	13,138,760
OM7M	12,694,953
DL6RAI	12,574,968
AL1G	12,472,702
PQ2Q	12,101,751
NF4A	11,568,480
OE2S	11,534,776
RT9W	11,419,500
RM6A	10,989,048
9A1P	10,918,232
DL2ARD	10,717,508

MULTI-OP, MULTI-TRANSMITTER

YW4M	42,707,630
OT2A	36,494,276
L75FM	34,522,992
KH7R	32,806,032
ES9C	24,549,374
LT1F	24,144,930
J6DX	17,427,839
W4MYA	17,339,252
NR6O	16,948,256
LY7A	15,780,447
N2VV	14,844,112
YZ7A	12,632,636
EA4URE	11,792,664
AE9B	11,792,144
OL5T	11,671,128
DAØAA	11,100,746
ED7VG	10,580,416
DL1EK	10,500,288
WX5S	10,425,657
VE5RI	10,073,070

*Low Power

place, with WE9V fourth and KN1DX fifth. The top five were bunched pretty close together with only 1million points separating them. K3ZO finished sixth, edging out S51TA at NJ1F, WB9Z, KR1G, and WC4E.

W5PR as NN5P was the U.S. 10 meter champ, with K4WI as AI4AA second, K9NW third, N4BP fourth, and K4EA as NJ4U fifth. In one of the closest U.S. finishes, only 46,000 points separated N3HBX and K3NM for the 15 meter title, with W4WTB also above 3 million points in third. Low power leader WE1USA was fourth and K6HNZ was fifth. K8DX as KX8R was the 20 meter winner, with WY3T second, NN5Z (K5PX) third, K9OP fourth, and KX2J fifth. There was not a whole lot of U.S. low band activity. W9SE was the 40 meter winner, with KX9DX second. AA1BU was the only 80 meter single band entrant and turned in an excellent 832K-point effort. On Top band, W2MF was the winner, with WO9S second.

KK9A did a great job from the famous "black hole" to capture the U.S. Low Power title. K5TR was second, with N4TZ at KS9K third, ACØW fourth, and K8EP (now N1UR) fifth. KT3RR was the 10 meter winner, with KS2G second and N7PD third. WE1USA (WA1LNP) was the 15 meter winner, with WØAH as AAØNW second and N4MO third. NN5Z (K5PX) was the low power 20 meter winner, with K9OP second and KX2J third. KX9DX topped N2KX and WQ2M for the 40 meter title.

John, N2XD, was the U.S. T/S champion, with John, K4BAI, second; Doug, WB8TLI, third; KL9A as KD7ORP fourth; and N2GC fifth. Dave, NT1N, was the T/S 10 meter winner, as was WA3AAN on 15 and K5PX as NN5Z on 20.

NV4X topped the U.S. (and the world) Assisted category, with Rick, KI1G, second,

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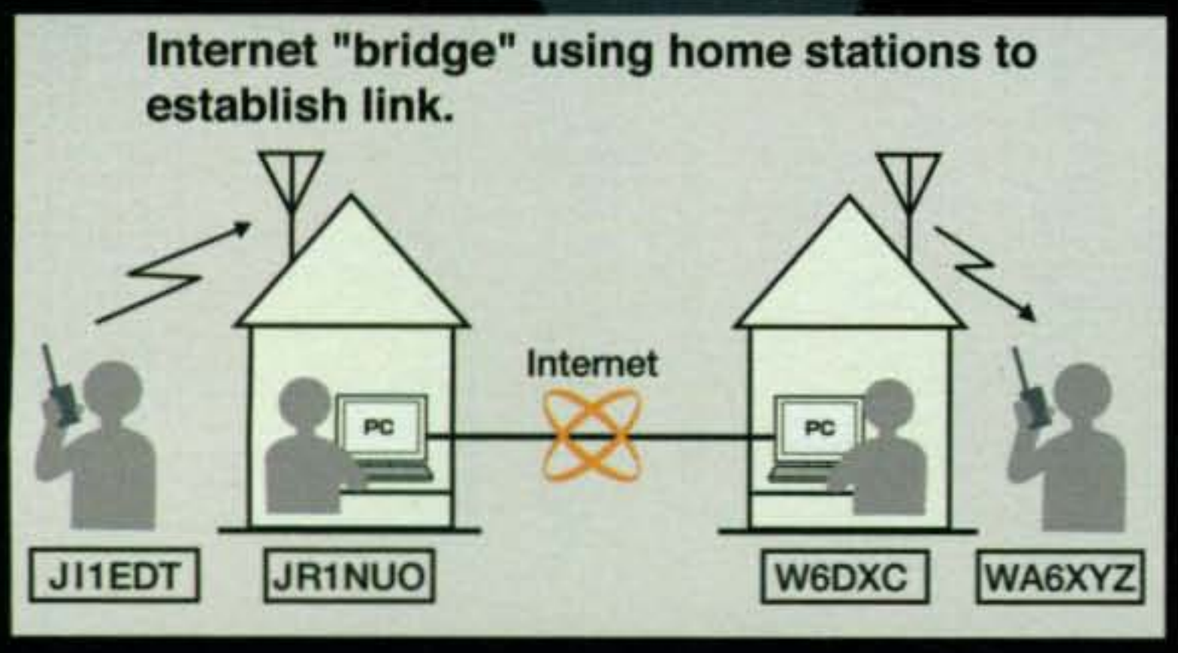

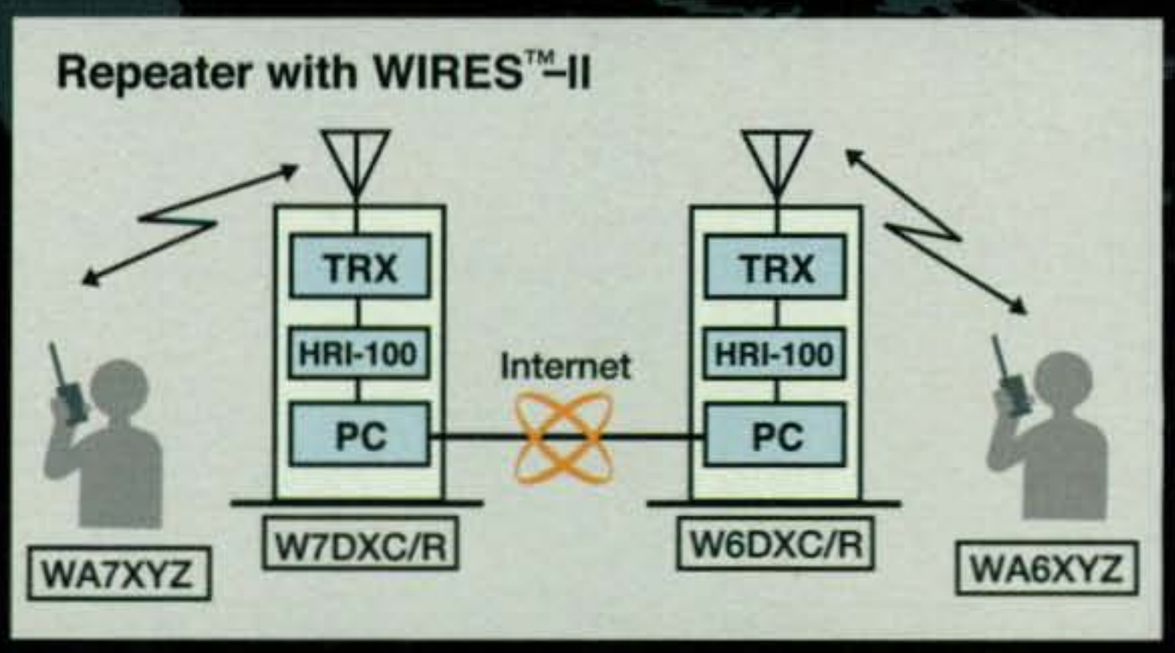

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HRI-100 Interface Box (Requires 12 V DC Input)

Components

- AP01 CD-ROM (Including Manual)
- Power Cable
- Data Cable (RS-232C DB-9 Plug)
- Data Cable (8-pin Mini-DIN Plug)
- Audio Cable (3.5 mm Plug) (2)
- WIRES™–II User/Server Agreement
- •Optional Accessory: NC-72B AC Adapter

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50/144/430 MHz 5W FM Transceiver

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USA TOP SCORES

SINGLE OPERATOR HIGH POWER ALL BAND

KM3T	11,394,493
KQ2M	11,256,036
WK4R (K4XS)	11,019,862
WE9V	10,678,624
KN1DX (K4ZW)	10,340,508
K3ZO	8,740,950
NJ1F (S51TA)	8,575,770
WB9Z	8,352,795
WC4E	7,893,920
KR1G	7,883,216
NB1B	7,865,715
WT6V (N6IG)	7,713,070
NS4W	7,358,338
WZ4F (K4AB)	6,052,275
K9ZO (KB9UWU)	4,719,680
KT6RU (K6IF)	4,708,445
*KK9A	4,560,360
KZ6D (W6NL)	4,176,177
N3HXQ	3,685,040
NRØX	3,658,204

28 MHz

NN5P (W5PR)	4,856,072
AI4AA (K4WI)	4,081,104
K9NW	3,334,519
N4BP	2,753,946
NJ4U (K4EA)	2,647,152
KT8X	2,067,000
W6AAN	1,954,194
NT1N	1,058,480
AG4W	937,358
KKØSS	865,347

21 MHz

N3HBX	3,546,628
K3NM	3,502,670
W4WTB	3,070,416
*WE1USA (WA1LNP)	2,408,868
K6HNZ	1,430,784
*AAØNW (WØAH)	1,424,944
N6WIN	1,408,264
N5KC (W5ASP)	1,214,565
*N4MO	1,123,070
N9LCR	1,100,408

14 MHz

KX8R (K8DX)	3,128,840
WY3T	397,750
*NN5Z (K5PX)	316,575
*K9OP	224,616
*KX2J	183,162

7 MHz

W9SE	99,220
*KX9DX	68,093
*N2KX	51,490
*WQ2M	34,354
*KU6T	14,850

3.7 MHz

AA1BU	832,870

1.8 MHz

W2MF	39,546
WO9S	2,448

LOW POWER ALL BAND

KK9A	4,560,360
K5TR	3,328,284
KS9K (N4TZ)	2,575,320
ACØW	2,432,380
K8EP	2,005,254
KD7ORP (KL9A)	1,859,208
K2LV	1,653,136
WS1A	1,641,520
AI9U (K9LJS)	1,475,986
NX6T (K6AM)	1,473,524
N4IG	1,381,776
K5IID	1,310,675
N4YDU	1,292,856
W4SAA	1,036,450
WA1Z	993,102
KR4TG	980,120
KI5DR	947,139
K4BEV	866,578
AA6PW	801,229
W3UJ	794,385

28 MHz

KT3RR	756,370
KS2G	554,280
N7PD	404,268
K6EID	304,507
W7UPF	250,562

21 MHz

WE1USA (WA1LNP)	2,408,868
AAØNW (WØAH)	1,424,944
N4MO	1,123,070
KT8O	391,875
W4LC	189,776

14 MHz

NN5Z (K5PX)	318,528
K9OP	224,616
KX2J	183,162
WD9DJD	22,900
W4IDX	2,720

7 MHz

KX9DX	68,093
N2KX	51,490
WQ2M	34,354
KU6T	14,850

TRIBANDER/SINGLE ELEMENT

N2XD	A	3,034,651
K4BAI	A	2,750,658
WB8TLI	A	1,965,319
*KD7ORP (KL9A)	A	1,859,208
N2GC	A	1,681,595
*K2LV	A	1,653,136
W6TK	A	1,562,904
*AI9U (K9JLS)	A	1,475,986
*NX6T (K6AM)	A	1,473,524
4U1WB	A	1,175,346
*W4SAA	A	1,036,450
W1UR	A	973,497
K2BF	A	952,690
*K4BEV	A	866,578
K1CN	A	803,712
NT1N	28	1,058,480
*W7UPF	28	250,562
WB6NFO	28	43,099
*WA5SWN	28	20,320
*WA3AAN	21	119,067
*WM5R	21	15,106
*NN5Z (K5PX)	14	316,575

ROOKIE

AD6WL	A	1,433,600
*KD7GGZ	A	550,440
*KCØJVG	A	475,416
*K8KHZ	A	310,185
*NQ4S	A	178,266
*WB2BXO	21	30,590
*KG4OJT	21	23,387

QRP/p

NØKE	A	996,996
KKØQ	A	379,824
W1AMF	A	322,300
N9IJ	A	192,480
KBØMZG	A	123,624
W1CEK	A	115,746
KC8LTL	A	97,559
K6TV	A	89,280
K9FOH	A	53,064
K8CV	A	27,930
AA8UP	28	19,908
K2WY	21	158,010
N3XT	21	91,256
KQ5U	21	78,260
WB7OCV	21	44,820
W1CTN	21	39,780
W3SE	14	55,245
W6CN	14	51,546
W6QU (W8QZA)	7	14,144

ASSISTED

NV4X (K4MA)	A	7,331,832
KI1G	A	3,362,256
K2PLF	A	3,215,669
WZ7ZR (W7ZR)	A	2,654,085
WZ6Z	A	2,616,480
WN9O (W9IU)	A	2,574,379
N2BJ	A	1,731,645
N1RK	A	1,588,818
W2YC	A	1,569,952
W7OM	A	1,018,656
*WW3S	28	698,544
*K5WW	28	92,964
KO4MR	28	88,184
N5MT	28	77,087
*K9GY	28	30,498
N3PUR	21	1,129,888
*KK1H	21	510,542
AA4MM	3.7	272,844

MULTI-OP, SINGLE TRANSMITTER

NF4A	11,568,480
NX5M	7,811,598
NI2W	6,522,731
AA5NT	6,437,394
NZ1U	5,041,047
KX7M	4,988,724
NT6K	4,045,658
KC7V	3,787,590
K3WW	3,348,453
KS3F	3,100,048
NZ6Q	2,988,333
W2YE	2,709,408
NN6NN	2,352,000
NN6X	2,161,520
KTØR	1,526,096

MULTI-OP, MULTI-TRANSMITTER

W4MYA	17,339,252
NR6O	16,948,256
N2VV	14,844,112
AE9B	11,792,144
WX5S	10,425,657
AI7B	7,970,992
NG6O	5,593,200
K3DI	1,937,331
WR3L	1,842,912
NJ2BB	1,788,248

*Low Power

K2PLF third, WZ7ZR (W7ZR) fourth, and WZ6Z fifth. WW3S was the 10 meter winner. N3PUR was the winner on 15 meters, and AA4MM took the 80 meter title.

NØKE just missed the world top five on his way to the U.S. QRP title. KKØQ finished second, with W1AMF third, N9IJ fourth, and KBØMZG fifth. AA8UP, K2WY, W3SE, and W6QU (W8QZA) were the 10 through 40 meter QRP winners, respectively.

Multi-Ops

The all Italian crew of I4UFH, IV3TAN, IK2NCJ, and IK2JUB ventured to Cape Verde to challenge the some of the best Multi-Single stations and came away with a record-setting victory as D44TD. N5KO and XE1KK at HC8N were second when the contest ended, with AI6V and KI7WX at P40V third, CT9M fourth, and A61AJ fifth. 3V8BB was sixth, NA champ FM5GU seventh, 9A7A eighth, TM5C ninth, and WP2Z tenth.

NF4A, N4PN, N4OX, K4WA, and KB4ET piloted NF4A to the U.S. M/S title with a fine 11.5M point effort. NX5M, K5NZ, UAØOFF, W5SB, W5PF, and KE4NT finished second as NX5M. NI2W, K2XR, VE3XAP, K2OWR, and N2YFH as NI2W were in third place. AA5NU was fourth, followed by NZ1U.

YW4M was the world Multi-Multi champion, with OT2A second, L75FM third, Oceania record setter KH7R fourth, and ES9C fifth. LT1F was sixth, followed by NA leader J6DX, U.S. winner W4MYA, NR6O, and LY7A.

After many years of trying, the hard work finally paid off with a win for US M/M champion W4MYA. Bob and the boys have been improving steadily every year. Second place went to West Coast powerhouse NR6O operated by K2RED, K3EST, K6AW, K6CTA, N6BV, N6RO, WA6O, WJ6O, and ZL2DX. N2VV was third, with AE9B fourth and WX5S fifth.

The Rest of the Story

Entries were up slightly (about 20 more) from last year. About 88% of the logs were electronic. Thanks to Trey, N5KO, for his efforts with the "robots" (that's not what everyone called them!). Getting the majority of logs in Cabrillo format with the proper header information probably saved me over a month of pre-log-checking preparation. Until you've opened 1500–1600 e-mails, extracted the files, sent a reply, and filed the log, you don't really appreciate the time and effort saved by the robot. A direct result of Trey's efforts is that you are reading this at least a month earlier than in previous years. Please continue to use Cabrillo and send your logs to the proper robot (see the contest rules in the December 2002 issue of *CQ*, at <www.cq-amateur-radio.com>, or at the WPX Contest website <http://home.woh.rr.com/wpx/>). If you get an error reply back, read it carefully. It usually will tell you what you need to correct. Most of the logs rejected were for improper category names. The correct names are on the WPX Contest website. Check what your logging program puts out in the CABRILLO header before you send it.

WT4I gets another big hand for his excellent software support. It almost makes log checking fun (but not quite). This year 1850 logs were cross-checked, representing nearly 1.6 million QSOs and almost 60,000 unique callsigns. Thanks, Bruce! Thanks also to EA3DU and OH5DX (ex-OH1EH), who have provided some valuable help with EA and OH logs.

Serial-number cross checking was implemented this year. All in all, the majority of you are doing a good job copying and logging the numbers, with a few exceptions. Remember, it is your responsibility to submit a log with the correct serial number sent and received. Logs submitted with no sent serial number (a requirement) or incorrectly recorded sent serial numbers may be rejected or classified as check logs. If you are using a converter program, make sure it provides the correct information in the proper format. Check out your logging software beforehand to see how it handles serial numbers, especially in multi-op situations. All we ask is that you submit the numbers that were actually sent and received.

As always, thanks to the many fine stations around the world who made the effort to activate a special prefix or a DX country. Your efforts are appreciated by all of us. Some of these special stations were D44AC and D44TD, CN2R, VC6R, JY9NX, 9K2ZZ, CV4Y, H22H, 8P2K, PJ2H, AN8AH, VP5V, FY5FY, PS3F, XX9TRR, HR3J, H6C, and others to numerous to mention. When you

CONTINENTAL LEADERS

AFRICA

1.8	No Entry	
3.5	No Entry	
7	AN8AH	6,537,860
14	No Entry	
21	EA8AH	8,797,155
28	D44AC	15,707,401
AB	CN2R	15,722,875

ASIA

1.8	TA3J	267,699
3.5	*JE1SPY	2,208.00
7	UA9CI	1,400,256
14	RJ9J	3,007,744
21	H22H	6,475,296
28	9K2ZZ	6,297,330
AB	JY9NX	13,919,586

EUROPE

1.8	YT6A	376,992
3.5	I4AVG	1,177,689
7	9A5E	3,130,550
14	UW5Q	4,889,925
21	UT7QF	4,637,127
28	9HØA	6,656,650
AB	S50A	8,028,776

NORTH AMERICA

1.8	VY2ZM	157,644
3.5	AA1BU	832,870
7	VE6FI	459,654
14	VA7RR	3,755,889
21	ZF2AH	5,335,770
28	NN5P	4,856,072
AB	T93M/HI9	15,812,349

OCEANIA

1.8	No Entry	
3.5	No Entry	
7	VK8AA	185,184
14	VK4DX	2,389,860
21	*YC1GTS	43,650
28	9M6BG	3,299,307
AB	VK5GN	5,547,783

SOUTH AMERICA

1.8	YV1CP	3,952
3.5	YV5LIX	444,444
7	PJ2H	3,031,776
14	PY2XAT	594,320
21	LV5V	5,673,024
28	ZV2V	9,745,408
AB	ZX5J	14,624,642

MULTI-OP, SINGLE TRANSMITTER

AF	D44TD	33,443,856
AS	A61AJ	23,610,785
EU	9A7A	19,034,950
NA	FM5GU	21,920,715
OC	YBØZDD	3,214,701
SA	HC8N	28,998,277

MULTI-OP, MULTI-TRANSMITTER

AF	No Entry	
AS	JA1YPA	6,494,832
EU	OT2A	36,494,276
NA	J6DX	17,427,839
OC	KH7R	32,806,032
SA	YW4M	42,707,630

**Low Power*

This is the QTH of HA8JV, who finished fourth in the world in the Tribander/Single Element category.

work these stations, and others who provide all the multipliers for us, take a second to say thanks.

On the CQ website you can find additional WPX Contest related stories, records, and stats. Added to the list of station operators and QRM, you will find some contest write-ups and other items which didn't make it into the printed results. Suggestions and additional content for the web are welcomed.

The 2003 WPX Contests

There will be a major rule change for the 2003 contests. A Multi-Two category will be implemented, as has been done with the CQ WW. Both stations can work anyone at any time, but must observe the band-change rule (eight changes per clock hour per transmitter). This should be especially appealing for expeditions and smaller stations who can't quite field a Multi-Multi, but would like to do more than what is allowed under the Multi-Single rules. Please check with your software vendor to make sure that the software correctly supports the new rules. Your Cabrillo file must indicate which transmitter made each QSO. The Cabrillo category name is Multi-Two.

The 2003 CQ WPX SSB Contest will be held on 29 and 30 March. If you have not participated before, please give it a try. It's fun, there's lots of action, and everyone can be a multiplier. E-mail logs are again highly encouraged. Cabrillo is the format of choice. All of the major logging programs support the Cabrillo format. Your SSB Cabrillo logs should be sent to the robot at **<wpxssb @kkn.net>**. For questions regarding the 2003 contest, contact Steve, K6AW, at **<k6aw@cqww.com>**.

All good things must come to an end. The 2002 contests are my last as CQ WPX Contest Director. When I was first convinced to take this job by Bernie, W8IMZ, I never thought I would be doing it for the next 20 years. The folks at *CQ* have been great to work with. I've really enjoyed my association with the contesters, some of the world's best operators and really great people. I've learned a lot, had lots of fun, and hopefully left the contest in good shape for the next director. Steve Merchant, K6AW, has volunteered (I don't think Bob, K3EST, held a gun to his head.) to take over the director's job starting with the 2003 WPX SSB Contest. I'm confident Steve will do an excellent job. Please continue to support him and the CQ WPX Contests.

Good luck to all, and see you in the contest. 73, Steve, N8BJQ

Thank You, Steve, N8BJQ

Over the last 20 years the CQ WW WPX Contest has grown in popularity and prestige. Such a phenonenon was not left to chance. After taking the reins from Bernie Welch, W8IMZ, 20 years ago, the dedicated and professional work of Steve Bolia, N8BJQ, has helped shape the contest you enter today.

The WPX Contest has always been a fun event, attracting entrants from around the world. It is also the most democratic contest: A WA2 is just as valuable as an AP2. Throughout his long leadership Steve has maintained the "fun" aspect of the contest while pulling the WPX up to meet today's standards of contesting excellence. After all these years of hard work, handling awards and the general QRM a contest director faces, Steve has decided to step down.

Since the WPX Contest is the second largest contest in the world, finding a replacement for Steve involved his blessing and steady input over the last half year. The new director of the CQ WPX Contest will be Steve Merchant, K6AW. The two Steves have been working together for several months now to ensure that the transition will be smooth. After working with Steve, N8BJQ, for the last 20 years, we will continue to seek his wise input on contest matters. Steve will remain a valuable member of the CQ WW Contest Committee.

From the contest community, we thank you Steve, N8BJQ, for your thousands of hours of dedication so that we could enjoy the CQ WW WPX Contest.

Bob Cox, K3EST
CQ WW Contest Director

QRM

Yohei, AD6AJ, and David, N6AN, decided to have some fun sharing the station and entered M/S. David was able to make a few hundred QSOs Friday night, and Yohei rounded out the log handsomely with another 400 QSOs Saturday and Sunday afternoons....**W6UE**. Aurora overhead would go bright and the bands would fade, aurora would fade away and the bands would come back in 5 minute cycles....**KL7RA**. Three days before, the neighbors attacked us and destroyed the antennas, but we repaired and were even more pugnacious. 40 meters sick, 75 meters dead, but what a thrill on the upper bands! Thanks to everyone for the reports ....**FM5GU**. Like 2001, used another first-issued prefix. In 2001 it was CC4A. Now CB4A in Multi-Single. See you in CW in late May, as Single-Op....**CB4A**. All contacts from the Battleship New Jersey (museum) ported in Camden, NJ using only shipboard military antennas—verticals and wires....**NJ2BB**. Thanks to all at multi-multi NR6O for your encouragement and another great contest experience . . . and no, K3EST, I didn't get put in a corner without a rig! Also my thanks to N8BJQ for 20 years as CQ WPX Contest Director; it has been just great work-

CQ WW WPX SSB CONTEST ALL-TIME RECORDS

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

WORLD RECORD HOLDERS

Single Operator

1.8	VA1A('99)	535,225	271
3.5	EA8/OH1MA('97)	4,317,284	562
7.0	ZX9A('97)	10,787,128	814
14	EA8AH('97)	11,142,198	981
21	ZW5B('95)	14,095,142	1054
28	D44AC('02)	15,707,401	1123
AB	HC8A('01)	25,180,199	1199
QRP/p	HC8A('94)	7,520,562	714

Multi-Operator Single Xmtr.

D44TD('02)		33,443,856	1332

Multi-Operator Multi Xmtr.

CN8WW('99)		55,151,562	1334

U.S.A. RECORD HOLDERS

Single Operator

1.8	K1ZM('95)	327,712	308
3.5	WE3C('95)	1,519,300	475
7.0	KC7EM('95)	1,950,228	495
14	KK9A('00)	6,621,446	962
21	KX8R('00)	7,556,250	930
28	NY4A('00)	6,006,573	877
AB	KQ2M('00)	11,875,240	1066
QRPp	KR2Q('00)	2,688,158	649

Multi-Operator Single Transmitter

KM3T('99)		14,091,468	1077

Multi-Operator Multi- Transmitter

KM3T('00)		29,338,460	1355

CLUB RECORD
Contest Club Finland ('00) 250,320,141

QRPp RECORD
HC8A('94) 7,520,562

WPX (Prefix) RECORD
OTØA('00) 1528

CONTINENTAL RECORD HOLDERS

AFRICA

1.8	EA8/OH1MA('99)	404,976	208
3.5	EA8/OH1MA('97)	4,317,284	562
7.0	EA8AH('96)	7,101,380	715
14	EA8AH('97)	11,142,198	981
21	EA8AH('01)	12,387,139	1063
28	D44AC('02)	15,707,401	1123
AB	CN2R('01)	20,530,495	1115

ASIA

1.8	UL7ACI('91)	331,008	128
3.5	UA9CSS('94)	1,074,780	315
7.0	H24LP('87)	5,348,975	503
14	H2A('91)	6,297,464	758
21	7L1GVE('92)	6,848,136	838
28	H22H('00)	9,092,146	931
AB	JY9NX('01)	15,463,485	1017

EUROPE

1.8	LY6K('95)	481,164	303
3.5	YT6A('96)	1,976,436	558
7.0	9A9A('99)	4,624,188	724
14	DJ7AA('00)	7,955,224	1052
21	CQ1BOP('00)	6,989,997	1029
28	GM7V('00)	8,305,756	982
AB	OK1RI('01)	10,844,592	1034

NORTH AMERICA

1.8	VA1A('99)	535,225	271
3.5	VE1BY('00)	2,226,300	492
7.0	TE1C('95)	7,281,630	745
14	KP2A('95)	7,088,976	912
21	WP3R('98)	10,167,632	986
28	KP2A('00)	11,385,710	1046
AB	TI1C('99)	17,078,930	1117

OCEANIA

1.8	AH6PR('99)	18,963	49
3.5	N6VI/KH6('94)	1,016,652	273
7.0	WH7Z('99)	4,582,773	507
14	KG6DX('90)	4,558,527	733
21	AH7DX('00)	7,645,990	890
28	TXØDX('00)	12,049,422	847
AB	KH6ND('01)	15,498,798	1029

SOUTH AMERICA

1.8	YV5JEA('84)	40,320	63
3.5	P4ØA('96)	1,715,076	426
7.0	ZX9A('97)	10,787,128	814
14	PYØFM('95)	9,660,432	939
21	ZW5B('95)	14,095,142	1054
28	ZX5J('99)	14,405,820	1095
AB	HC8A('01)	25,180,199	1199

MULTI-OPERATOR SINGLE TRANSMITTER

AF	D44TD('02)	33,443,856	1332
AS	A61AJ('02)	23,610,785	1243
EU	9A7A('02)	19,034,950	1306
NA	VP2EC('92)	24,409,580	1115
OC	T33RD('99)	17,778,372	998
SA	HC8A('93)	32,502,677	1107

MULTI-OPERATOR MULTI-TRANSMITTER

AF	CN8WW('99)	55,151,562	1334
AS	P3A('00)	53,554,592	1456
EU	9AY2K('00)	42,477,343	1493
NA	WL7E('00)	42,013,215	1395
OC	KH7R('02)	32,806,032	1304
SA	ZX5J('00)	46,550,452	1508

ing with you *all* of those years....**K2RED.**

We were pleased to break the 13-year-old Oceania record with just a skeleton crew and terrible conditions on Saturday. Little sleep was had!...**KH7R** (KH6ND, one of the ops at KH7R). Despite ill and missing operators, nasty QRM, poor band conditions, and below-our-usual-standard signal, a good time was had by all. Our rookie, W9CEO, was a great addition for his humor and hard work. Many thanks to Ernest, J69AZ, and Givan, J69AC, for their help. It would have been impossible without them....**J6DX**. A great part-time effort; lots of good QSOs and fun. Highlights were having four of five stations going at once, and a few good European runs on 20 late at night and 15 early morning. Sure wish I could have operated a bit more. Looking forward to summer and WPX CW during Memorial Day weekend!....**AK3Z**. Never operated a multi-multi before, so I set out to create one. With about three months planning and setup, this group of combined KCDXC, SMC, and local club operators put together a team at the AE9B location outside Kansas City, Missouri. The truly mixed bag of operators included casual ops, DXers, and contesters. We all had a great time....**AE9B**.

The WPX continues to be the highlight of my contesting season. I'll be looking for everyone again next year!...**VA3JFF**. A dream came true! Twenty years ago I became European QRPp champion in the CQ WPX SSB. I always wanted to go for this again, so needed real antennas. The antenna farm of Luc, ON4AKL, did its job. If I did not make it, it was all my fault!...**ON6NL**. Really enjoyed my first HF contest, but wish stations would take a little more time for QRP

YV6DBX operating portable with a rotating dipole and wires finished first in Venezuela in the Low Power category.

The antenna farm of HB9AON, who made 197 Qs on 10–80 meters with his magnetic loop and whip antennas.

stations. But on the whole a very good contest. Will be doing another one. Many new countries worked. Many thanks ....**MU3DHI**. This was my first contest expedition. Thanks to Bruce, ZF2NT, for his gracious hospitality and the use of his fine station. Operating from the Caribbean sure is more fun than from California!...**ZF2AF**.

Several years ago this 8.1 meg would have been good for top spot. This year it's almost not even top 10 material.....**NB1B**. Always can find a new prefix to work in this one and it's always great if I can return the favor. Condx strange here, but good enough to keep going!...**KS7T**. This was my first serious contest effort. Despite challenging band conditions I had lots of fun. Bring on the next one!....**K2BF**. It's been over 15 years since I've been very serious about contesting alone, and this is the first time I used a logging program. Thank you for sponsoring the contest.....**KØIH**. Lost voice on Saturday night and could not continue on 40/80. Should have drunk some of local bordeaux to soothe the throat....**F5VHJ**. Great contest! Finally met my goal of five years for 1k contacts and 1 meg points....**AE6Y**. As always I enjoy the WPX Contest. It is full of surprises. This year the K stations were very rare and I worked about twice as many JA's and UA9's as K's. Could it be that the Asians hunt prefixes more than the North Americans do?...**7S2E**.

(Continued on page 106)

Here's the first in an occasional series we'll be running on the various special events and hamfests that we attend throughout the year.

Travels With CQ – Fall 2002

Each year CQ is represented at over a dozen different events and hamfests around the country. This fall, Publisher Dick Ross, K2MGA, went to the grand opening of Yaesu's new US headquarters in southern California and to MFJ's 30th anniversary hamfest, while Editor Rich Moseson, W2VU, attended Ten-Tec's annual hamfest and took his camera on a factory tour. Here's a look through our lenses at these events, with additional photos posted on the new "CQ Photo Gallery" on our website. Just go to <http://www.cq-amateur-radio. com> and look for the "CQ Photo Gallery" link, then click on the photos to look inside each "album."

Vertex Standard Grand Opening

The very impressive exterior of Vertex Standard's new US headquarters is matched by an equally-impressive interior, complete with Koi pond, teak benches, and hundreds and hundreds of brand new Yaesu radios!

Vertex Standard President Jun Hasegawa, JF1AAA, cuts the ribbon to officially open the company's new headquarters building. Photos of the building's interior are on our website, in the new CQ Photo Gallery.

At 175,000 square feet, the new Vertex Standard US headquarters officially opened September 20, 2002 in Long Beach, California, and *CQ* was there, along with about 200 other notables from the amateur radio, land-mobile, aviation, data, and marine-radio industries. Better known to the ham radio community as the parent company of Yaesu, Vertex Standard is a world-wide $100 million communications company.

The ultra-modern Long Beach headquarters is quite a sight, with a 125-foot-long Koi pond in the main lobby (Koi yet to arrive!), complete with waterfall and teak benches! But as dramatic as the entrance may be, the "real stuff," as far as the ham is concerned, is in the 3000-square-foot area set aside for service pods specializing in each product area. It's a techie's dream, to say the least, with test facilities sporting scopes and analyzers that would put a healthy down payment on a new home. If that isn't enough to get a dyed-in-the-wool ham salivating, a visit to the 80,000-square-foot warehouse certainly will. While all products from all divisions are represented, the ham product area occupies about a quarter of the space currently in use. That's a lot of transceivers, rotors, amplifiers, etc., racked and stacked at least 15 feet high.

As guests of Vertex Standard, we were treated with the graciousness so typical of the Japanese culture, with every need tended to and every whim met. The highlight of the two-day event was the welcoming address by Jun Hasegawa, JF1AAA, President of Vertex Standard. Mr. Hasegawa was particularly emphatic about the major role amateur radio has played in the development of the entire

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company, pointing several times to the technology relationship between products in diverse divisions. The company may be large and diverse, but its ham roots are clear and strong.

The visit wrapped up with a well-catered banquet which was made all the more pleasant by the absence of speeches! Having the opportunity to visit with several of the larger ham dealers added to the weekend's ham radio presence, as did chatting with Kaki, JR1NUO, in Japan using a VR-7X handheld and Yaesu's WIRES technology. I freely admit to being a rather jaded old-time ham, but this new tech stuff certainly is impressive. Is this the future? Stay tuned. — *K2MGA*

CQ Publisher Dick Ross, K2MGA, makes a presentation to JF1AAA at the opening ceremonies.

Ten-Tec Hamfest

Anyone who thinks life is slower and more relaxed in eastern Tennessee than in other parts of the country has never been to one of Ten-Tec's factory hamfests! I, for one, was looking forward to a more relaxed pace after sprinting through the airport in Atlanta to make my connection with three minutes to spare (and no food on either flight). But alas, that was not to be...

The hamfest/factory tour was supposed to start at 5:00 PM on Friday. There was already a crowd outside when I arrived at about 3:30, and it seemed I couldn't get set up quickly enough inside the big circus tent Ten-Tec had set up outside for visiting vendors and on-air demo stations. By 4:30, the line to sign up for factory tours stretched around the tent and outside ... and stayed that way until about 8:30, despite an hour or so of pretty heavy rain.

The following morning was cloudy but dry, and the hamfest out back, behind the factory, filled up early with both sellers and buyers (no fee for either!). Back in the tent, we were busy all day. Once the hamfest was over, I finally got a chance to take a tour of the factory with Amateur Radio Product Manager Scott Robbins, W4PA. I'll let the photos and captions tell that part of the story.

Two tents outside the Ten-Tec factory in Sevierville, Tennessee contained part of the hamfest. The white tent on the left in the photo was the "forum room," while commercial vendors and demo stations (connected to the antennas on the right) were in the tent with the striped roof.

Best surprise of the day: When I had to go give a talk and needed someone to cover the booth for me, Ten-Tec VP Gary Barbour, AC4DL, said, "Gee, I'm not sure who's available. I don't know if I can pull anyone away from what they're already doing. But let me go look..." A few minutes later, Gary returned with my "relief op"—Ten-Tec President and co-founder Jack Burchfield, K4JU! Not only was Jack more than happy to help out ("It lets me sit down for a while!" he told me), but he also did a great job of selling subscriptions! Thanks again, Jack! — *W2VU*

Neither wet grass nor gray skies kept folks away from the tailgating area behind the Ten-Tec factory. It was bigger and busier than we can show in a photo.

Ten-Tec Factory Tour

While most hams identify Ten-Tec with amateur radio, only 80% of the company's business is in radio, both amateur and military. The other 20%, says Amateur Radio Product Manager Scott Robbins, W4PA, is in tool-and-die and custom-enclosure manufacturing. In fact, your car may have Ten-Tec's "fingerprints" on it, as the company makes dies and molds for auto parts for major car makers; it also does custom metal fabrication for various industries and specializes in small-quantity runs (as low as 50) and makes off-the-shelf enclosures for any number of products. The company currently has 100 employees, 28 of whom are hams.

On the radio side, Robbins says all production work is done in batches, so nothing is continually set up for any one specific task. All through-hole insertion is done by hand; this is limited to big parts such as filter capacitors. The factory has a surface-mount robot that does all the surface-mount parts placement; plus two wave soldering machines, one for the through-hole boards and the other for the SMT (surface-mount technology) boards.

While most parts are placed on boards by a robot and soldered by machine, all radios are hand-assembled. There are six production workstations, but only four technicians who do alignment and testing. Robbins says each station is set up for a specific task, and it's often easier to move the technician than the work.

There is a multi-step quality-control process for each radio built. First, after wave soldering, each board is visually checked for obvious flaws. Next, at the production workstations test fixtures are used to check that the boards are electrically OK. Once the radio is assembled, it goes through a 24-hour burn-in, in which it's cycled on and off, cycled between transmit and receive, and receivers are cycled through all of their bands. Next, there's a shake table test, after which radios are given a final inspection to make sure the knobs are OK and that there are no dents or scratches in the case.

Ten-Tec's policy is to repair any rig it's ever made, so the company keeps a stock of 4000 obsolete components on hand for repairs of older radios. The Service Department has a staff of five service technicians, each with an area of specialty. Repairs are routed to the tech who specializes either in the radio being serviced or the type of repair that's needed. Average turnaround time for repairs is two weeks.

The factory is currently outgrowing its 40,000 square feet, and Robbins says an expansion is likely in the near future. There have been several expansions already, and Robbins says space is not a problem, as the company owns 15 acres of land surrounding the current building. —*W2VU*

Ready to roll ... a batch of brand-new Argonauts waits for final inspection before being packed and shipped to customers. Please see additional photos on our website's new CQ Photo Gallery.

MFJ Day In The Park

With Hurricane Lili flirting with Louisiana and Mississippi, the folks at MFJ Enterprises in Starkville, Mississippi, were kept on their toes planning the second annual MFJ Ham Radio Day In The Park on October 4, 2002. Lili was a Category 4 storm as late as Wednesday evening, and storm-track predictions indicated that it might very well wash out the event. The MFJ team scrambled to bring indoors as much of the event as possible, leaving only the flea market

One of many displays of MFJ gear at the company's second annual "Ham Radio Day In The Park." There were also five operating stations and great southern fried chicken!

ARRL Sales and Marketing Manager Dennis Motschenbacher, K7BV (left), listens as MFJ President Martin F. Jue, K5FLU, explains the finer points of a piece of equipment.

outdoors, and the authentic southern fried chicken lunch under cover in the nearby picnic pavilion at the park.

Along about Thursday morning, Lily ran into some cold water as she approached the Louisiana coast and quickly diminished from a dangerous Category 4 hurricane to a tropical storm. The coastal areas were spared a second hurricane blast in the wake of hurricane Isidore, which only days earlier had wracked the Gulf Coast. The MFJ Ham Radio Day In The Park was spared.

As all this weather excitement was playing out, I was doing all that I could in New York to figure out how I could gracefully excuse myself from attending the event in the midst of the anticipated hurricane. Now understand that I've experienced the fury of a dozen or more vicious storms over the years from my Long Island QTH, some of which were exciting indeed. But I had no choice with them, other than to hunker down and wait them out, and mop up afterwards. Here, however, I was faced with the prospect of knowingly and willingly flying into the path of a major storm. Surely Martin Jue, President of MFJ, would understand if I bowed out. But wait. Who else was going to be there? ARRL President Jim Haynie, W5JBP, and *QST* Sales and Marketing Manager Dennis Motschenbacher, K7BV. The mere fact that they were already down south didn't matter...if they were going to brave the weather, so would I. So off I flew, into the wild unknown. You already know the rest. The storm fizzled. The weekend turned out to be gloriously sunny and pleasant.

Saturday morning at the MFJ main building featured event registration and displays of a wide range of MFJ's 1000-plus amateur products, as well as plant tours of the MFJ, Hy-Gain, Ameritron, Vectronics, and Mirage assembly lines. *CQ*, ARRL, and ICOM also set up small display tables and distributed literature. Five HF stations at five different locations were set up for the event on several bands all using the call W5MFJ, making over 700 contacts in about a six-hour span, with special QSLs going to all contacted stations. The nearly 300 attendees had a grand time touring, talking, shopping, knob twiddling, and enjoying some of the best fried chicken I've ever had. At the luncheon in the park pavilion, Martin Jue was honored by several notables, including the Mayor of Starkville, who presented him with a proclamation honoring him for his 30 years in business in Starkville. Among the more moving presentations was one made by the employees of MFJ, thanking Martin for being their rock of leadership and strength. Little known among the ham fraternity is the fact that Martin F. Jue has nurtured so many of his 125-employee staff to positions of responsibility and trust, providing opportunities to many dozens of ordinary people who might otherwise have had little chance to excel in the business world.

Of course, as with any event, there's the behind-the-scenes crew that makes all the magic happen: Steven Pan, Vice President; Randy Romero, Human Resources Manager; Richard Stubbs, Customer Service Manager; and the lady who was everywhere at once, Phyllis Randle, Domestic Dealer Sales Manager. Great show, folks. We look forward to visiting again next year, but please try not to schedule another hurricane for the occasion.

— K2MGA

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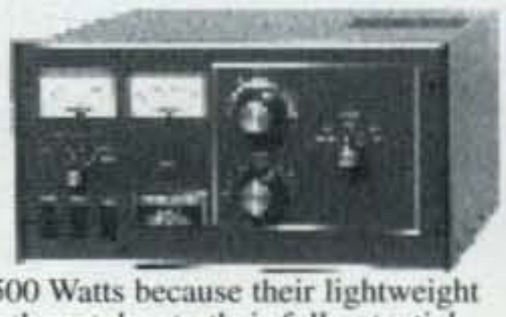

This linear gives you full legal output using a pair of 3-500s. Most competing linears using 3-500s can't give you 1500 Watts because their lightweight power supplies can't use these tubes to their full potential.

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This isn't a story about ham radio, but it is a story about a ham radio operator who used his ham ingenuity to bring an emergency communications network to the Australian Outback in the 1920s, a network that is still operating today.

Pedal Power

The Story of Alf Traeger, VK5AX, and the Royal Flying Doctor Service

BY STEVE IRELAND,* VK6VZ

About fourteen years ago, when I was G3ZZD and contemplating leaving the United Kingdom to live "Down Under," my favorite TV program was the Aussie *Flying Doctors* series. Every Saturday evening during dinner I avidly watched the drama. It had a few of my favorite things in it: the wide, brown Australian landscape, a couple of Aussie "true-blue" character actors named Maurie Fields and Val Jellay, and the whole enterprise centered around long-distance radio communications. Good grief . . . the radio operator at the imaginary Royal Flying Doctor Service (RFDS) hospital base where the drama took place was actually one of its main characters!

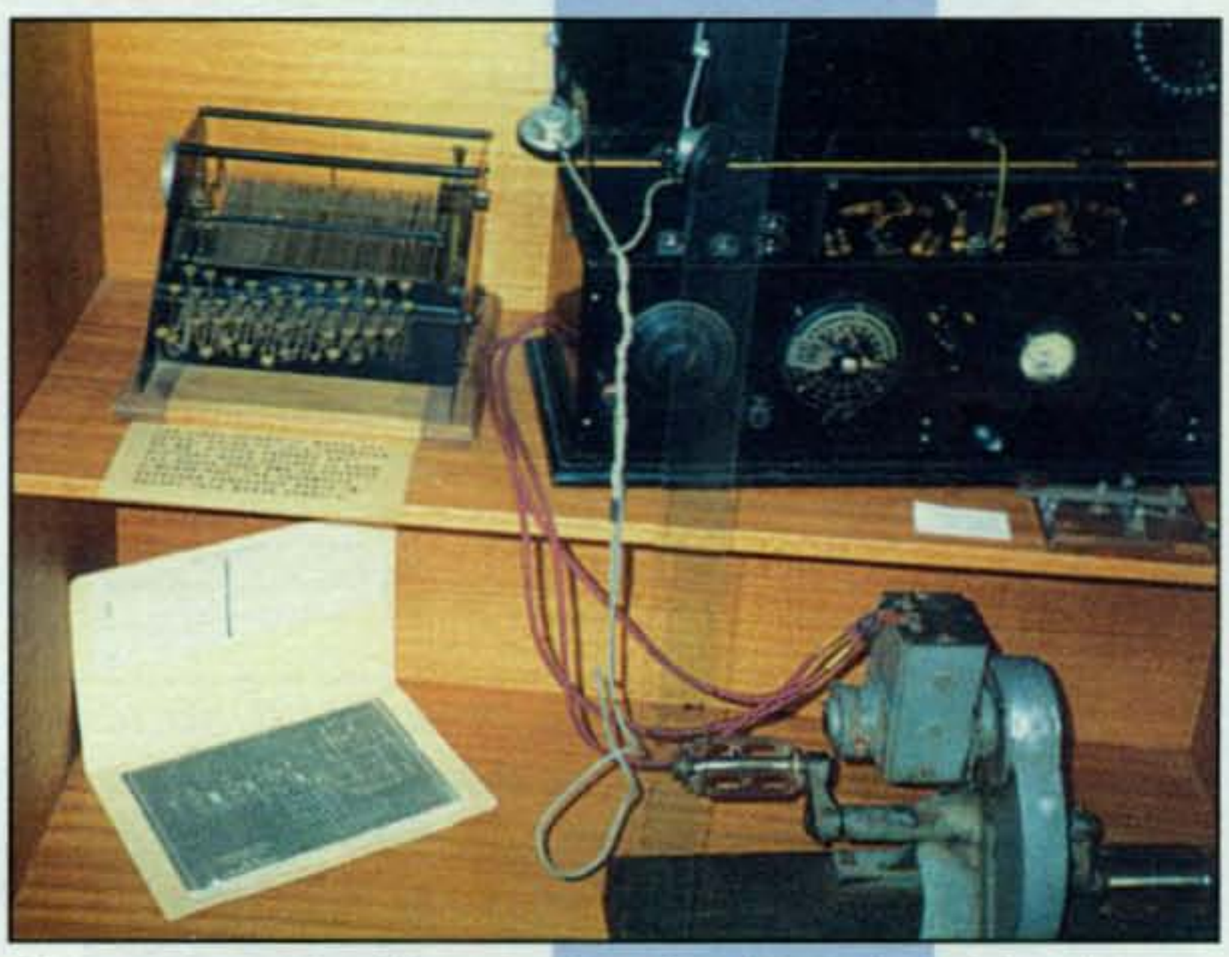
When my migration papers came through in late 1988, I decided one of the things I would do upon my arrival was to visit outback Australia and find out more about the RFDS. In 1989 this idea took me to central Australia and the RFDS operation in Alice Springs and introduced me to the work of Alfred Hermann Traeger, professional engineer and radio amateur VK5AX. Over 70 years ago, "Alf" Traeger established an Australia-wide radio communications network which formed the backbone of the fledgling RFDS and which still exists today.

Before talking about Alf Traeger, let's familiarize ourselves with the ideas behind the RFDS—the first comprehensive medical organization in the world based on air transport—and introduce another character in this story, the Reverend John Flynn, the RFDS's famous founder. Without both John Flynn and Alf Traeger there would have been no RFDS.

Flynn's Dream

In 1911 John Flynn, a Presbyterian clergyman, took up his first position in the church at Beltana mission in the hot, arid north of South Australia. Very soon he recognized that the large distances and poor communications that existed in the Outback (using horse, camel, or new-fangled car) meant that anyone who was seriously sick or injured could easily die before getting suitable medical attention.

As a result, a year later John Flynn set up the Australian Inland Mission (AIM), a far-flung network of bush hospitals and hostels which went part of the way toward addressing the problem. However, he was still anxious to find a way for people who were a long way from these hospitals/hostels to summon help quickly from them.



Traeger's amazing Morse keyboard and an early pedal radio set, complete with pedals.

Telephone lines across the vast treeless expanses of much of the Australian bush were at that time impractical, but Flynn could see that radio had possibilities. However, there were obvious problems with the fledgling "wireless" technology, particularly with regard to powering it. Mains electricity supplies in rural Australia were virtually non-existent, and although batteries and conventional generators could be bought, they were heavy and less than portable.

Despite these limitations, John Flynn decided that he had to learn as much as possible about radio. He started to read books on the subject and even joined the Wireless Institute

**e-mail: <sire@iinet.net.au>*

of Australia, the Aussie equivalent of the ARRL, which is still in existence today.

In 1925, with the assistance of George Towns, a retired army officer and radio enthusiast, John Flynn set out on a 2400 km trek down dirt tracks from Adelaide (the South Australian capital) to Beltana and on to central Australia (Innamincka, Birdsville, and finally Alice Springs) to carry out radio trials. Using a portable station carried in a Dodge Buckboard car, with a 100 watt transmitter and wire antenna, Flynn intended to try to communicate back to a base station in Adelaide from a variety of Bush sites.

Power for the transmitter and receiver was supplied by two generators which, after the back of the Dodge was jacked up, were driven from the car's rear wheel via a belt. Unfortunately, a few days before Flynn and Towns were due to leave Adelaide on their trip, tests revealed that neither of the two generators worked properly. In desperation, Flynn told Harry Kauper, technical manager of the 5CL broadcast station in Adelaide, about his problems. A few minutes later he was headed to a mechanical workshop, where Kauper told him that someone named Alf Traeger worked—a man who recently had built a 600 volt generator.

John Flynn burst into the workshop and asked the surprised Traeger if the generator was for sale. The answer was yes, and Alf Traeger soon found himself £29 10/- (29 pounds, 10 shillings) richer, and the relationship with Flynn began. Shortly after their first meeting, Traeger was offered a job as a radio engineer and electrician by Flynn, working forthe AIM.

The radio trials went ahead with some success, with communications being established from the bush sites to Adelaide, about 140 km (about 87 miles) away. However, there were two main stumbling blocks: The crude method of driving the generator from the car's back wheel meant it was virtually impossible to transmit a stable signal, and the only method of reliable communication was using Morse Code, a mode not readily accessible by ordinary people.

Both of these problems were soon to be imaginatively solved by Alf Traeger, in the spirit of pure Australian inventiveness.

Getting "On-Air"

Alf Traeger, John Flynn, and Harry Kauper soon put together three radio stations that were to form the first Australian Inland Mission radio net-

The Royal Flying Doctor Service office in Alice Springs.

work—the base station 8AB (Alice Springs), plus two satellite stations, 8AC (Hermannsburg mission) and 8AD (Arltunga mission). Sufficient power was available at the Alice Springs base station for it to transmit using AM telephony, but the satellites were only able to use Morse transmission due to the limitations of their dry-cell battery and generator power supplies.

In 1928, on behalf of the AIM, Flynn established the Aerial Medical Service (AMS), the forerunner of the Royal Flying Doctor Service, at Cloncurry in Queensland. A De-Havilland DH 50A biplane was leased for 2/- (that's two shillings, for those unfamiliar with the old Australian pre-dollar currency) a mile from a new air service that had started just down the road—the Queensland and Northern Territory Aerial Service, known today worldwide as Qantas.

The DH 50A has a covered-cabin forward of the pilot, where the doctor and his or her patient could be carried. However, in contrast, the pilot's seat was totally open to the elements, in true pioneer aviation fashion.

With the launching of the AMS, Alf Traeger found himself with a number of pressing technical challenges. First, there was the problem of how to power the portable miniaturized transmitter/receivers that he had designed with Harry Kauper for use by the AMS; dry cell batteries had a limited life, while conventional generators often lacked a suitable drive source. Added to this was the problem of teaching Morse Code to the AIM pastors and sisters who staffed the growing number of remote missions/hostels, and to the farming families who lived on the remote cattle stations that formed the second line of communication for the fledgling AMS. While some of Traeger's students took to Morse like "a duck to water," others were more like a fish out of water, a situation with which many radio amateurs are all too familiar.

Hand-generators offered something of a solution to the power problem, but unfortunately they made the second problem even worse. Imagine a novice radio operator trying to operate a Morse key, while turning a hand-generator at the same tim!

The story goes that Alf Traeger was sitting on a box in his workshop eating lunch when he suddenly put down his sandwich, told his brother Jack he was going to buy some bicycle pedals, and rushed out the door. A short time later he brought John Flynn into his workshop to show him his first "baby "or miniaturized, transceiver. Underneath the table where the radio sat was a slim, circular assembly with a pair of shiny new pedals attached to it.

The assembly was a pedal-driven generator that had to be pedaled at a rate of about one revolution per second. This spun the armature of the generator at about 1000 rpm, using a 12:1 gearing/drive system, and provided about 180 VDC,via a 26-segment commutator.

Traeger's transceiver—or "Pedal Wireless," as it quickly became known —consisted of a two-valve (tube) regenerative tunable receiver using two Phillips A141 tetrodes, one as a detector and the other as an audio stage. The transmitter was a simple crystal-controlled oscillator using a Phillips B205 valve and operated just below the 80 meter amateur band, on 3.4 MHz. RF power output was a couple of watts at best!

School of the Air studios in operation in Alice Springs, April 1989. Note on the left the wall painting by the Australian artist and entertainer Rolf Harris.

School of the Air transmitting site in Alice Springs. In 1989 the antenna was a simple parallel multi-band dipole, about 15 meters above ground.

The filament voltages of the valves were supplied by three 1.5 volt dry-cell batteries, while the case of the original set was made of wood. An example of an early pedal wireless is shown an accompanying photo.

Antenna requirements for the Pedal Wireless were simple, with the transceiver designed to work into a random-length end-fed wire, operating against a counterpoise run just above the ground. Using an antenna of this kind, the Pedal Wireless was intended to have a range of up to 500 km (300 miles).

Pedal Power

It took Alf Traeger about three more years to solve the Morse problem, again by some amazing ingenuity. He got around the problem of teaching the operators Morse Code by building a mechanical "automatic" Morse keyboard. If you thought keyboard-generated Morse is a 1990s invention, think again!

Traeger's Morse keyboard resembled a standard 1930s four-gang typewriter. Its keys were connected to pivoted steel bars with long arc-shaped indented ends. When the alphabet keys were struck, they produced the corresponding dots and dashes of the code.

The use of the keyboard meant that no knowledge of Morse Code was necessary for those who operated the AMS radio network, except for the operator at the central hub station. In practice, the experienced hub-station operator would receive the Morse Code keyboard transmissions from the remote stations and reply to them using AM phone.

Traeger built around 50 of these Morse keyboards, which became a part of every baby pedal wireless setup in the AMS network.

As a result of Alf Traeger's success, by 1932 the Aerial Medical Service network had grown to 25 stations. By 1935, when he developed AM telephony facilities for the transceivers, this number had doubled to 50.

John Flynn's view of the importance of enlarging the radio network to create "a mantle for safety" for the people living in Outback Australia was simple and stark. He remarked, "Without a wireless transmitting station at every isolated homestead, an aerial ambulance service would be 75 percent futile."

The widespread availability of AM phone facilities meant easier radio communication throughout the Bush and led to the establishment of what became known as the *galah session* on the Aerial Medical Service radio network. Named after the noisy and extremely

Call/Base Location	Organization	Frequencies (kHz)	Telephone contact
VJY Darwin	St Johns Ambulance Service	*2360, 4010, 6840, 7975	08 8922 6262
VJB Derby	RFDS Western Operations	*2792, 5300, 5360	08 9414 1200
VKL Port Hedland	RFDS Western Operations	*2280, 5300, 5360	08 9414 1200
VJT Carnarvon	RFDS Western Operations	*2280, 5300, 5360	08 9414 1200
VKJ Meekathara	RFDS Western Operations	*2280, 5300, 5360	08 9414 1200
VJQ Kalgoorlie	RFDS Western Operations	*2792, 5300, 5360	08 9414 1200
VJD Alice Springs	RFDS Central Section	*2020, 5410, 6950	08 8952 5355
VNZ Port Augusta	RFDS Central Section	*2020, 4010, 6890, 8165	08 8642 5555
VJC Broken Hill	RFDS NSW Section	*2020, 4055, 6920	08 8080 1777
VJN Charlesville	RFDS Queensland Section	*2020, 4980, 6845	07 4654 1233
VJI Mt Isa	RFDS Queensland Section	*2020, 5110, 6965	07 4743 2800
VJN Cairns	RFDS Queensland Section	*2020, *2260, 5145, 7465	07 4053 1952
VZX Firefly	Penta Comstat	call	02 6559 1888
Perth	Telstra Radphone		1800 810 023

Table I– List of frequencies of base stations taken from RFDS website in September 2001. Note that frequencies and times of operation are subject to change without notice, so check details. The 2 MHz frequencies are primarily for nighttime use.

sociable pink and grey Aussie parrot, this net, at 7 AM each day, was a chat session that allowed members to swap details of their lives and local happenings, and relieve the loneliness and isolation of living in the Bush.

The idea of the daily chat on the radio came from two nursing sisters, Amy Bishop and Edna McLean, at the Birdsville AIM mission. The story goes that they approached Traeger for new supplies of antenna wire, after theirs was repeatedly snapped by flocks of galahs (VK6VZ knows all about this problem...). At the same time, the two nurses suggested to Traeger the idea of an informal gathering on the radio.

Traeger apparently sent the sisters supplies of new antenna wire, along with an encouraging note giving them permission for the net, saying, "Go ahead; the Post Master General says you can transmit on 148 meters if you fix your times with the base station in Cloncurry, and what about making your chatter to one another just like the galahs on your aerial?" Because of Traeger's remark, the term *galah session* resulted—and stuck.

For the last 50-plus years, this term has often been used for any informal chat session on the radio in Australia, including those carried out by radio amateurs. The idea of the galah session also contained the seed of an Australian institution to rival the Flying Doctor service—the famous School of the Air. This used the same Flying Doctor transceivers so that children living in the remote missions and cattle stations of the Australian Outback could communicate by radio with teachers living in Australian cities and be taught by them.

Incidentally, the three main radio frequencies used by the Flying Doctor pedal radios of the 1930s were jokingly known as *long wave, medium wave,* and *short wave* after the bands used for domestic broadcasting—148 meters (2.0205 MHz), 85.7 meters (3.110 MHz, and 34.7 meters (8.630 MHz), respectively.

In 1934 a resolution to make a "federal flying doctor service" was put to a conference of the Premiers of the various Australian States. Later that year the AMS became known as the Australian Aerial Medical Service (AAMS), and over the next few years a web of radio networks was established across the continent. Perhaps the defining moment of the Flying Doctor service came in the same year, when Alf Traeger and his friend Maurie Anderson, VK5MA, installed a transceiver in the De-Havilland DH 50A, allowing Dr. Jock Russell to carry out air-to-ground consultations by radio for the first time.

In 1937 Traeger set up his own independent radio transceiver manufacturing company, contracted to the AAMS. In 1942 the AAMS was renamed the Flying Doctor Service, and 13 years later it became the Royal Flying Doctor Service, after permission to use the royal appellation was granted by Queen Elizabeth II.

Traeger's innovative involvement with the radio communications used by the RFDS continued right through to 1974, through changes that embraced the use of vibrator power supplies, the start of School of the Air, and the introduction of single sideband (SSB) transmissions. As he had always done, Alf Traeger led from the front.

The Reverend Fred McKay, who succeeded John Flynn as superintendent of the Australian Mission in 1951, paid this tribute to Alf Traeger and his work: "He created a social revolution. Human relations were transformed. In a very real way, he made Outback Australia."[3]

The RFDS Today

Today the RFDS has grown to become one of the most famous emergency medicine-based organizations in the world. Covering the length and breadth of Australia, it operates from 20 bases, 24 hours a day, 365 days a year. One of my closest VK6 amateur radio friends owes his life to the RFDS, after suffering a heart attack in the isolated northwest of Western Australia. Note, too, that the modern RFDS is not just for people in the Outback. It starts its operations just an hour's drive from most of Australia's capital cities.

Traditionally, radio has served as the backbone of the RFDS's famous "mantle of safety" communications network. However, the penetration of telephones into households in even the remotest parts of the Australian Bush and the growing use of satellite telephones by mining and other companies that operate in the Outback has meant that the RFDS radio network is now used mainly by travelers and tourists in four-wheel-drive vehicles.

Within the last decade calls for medical assistance from the RFDS via radio have declined from 100 percent of all calls to only about two percent. However, radio communications continues to be vitally important to the RFDS as a link to patients requiring medical assistance.

If you are going to any remote area of Australia in a vehicle, the RFDS recommends all travelers "investigate the possibility of obtaining and using an HF radio."[4] To put into context how useful

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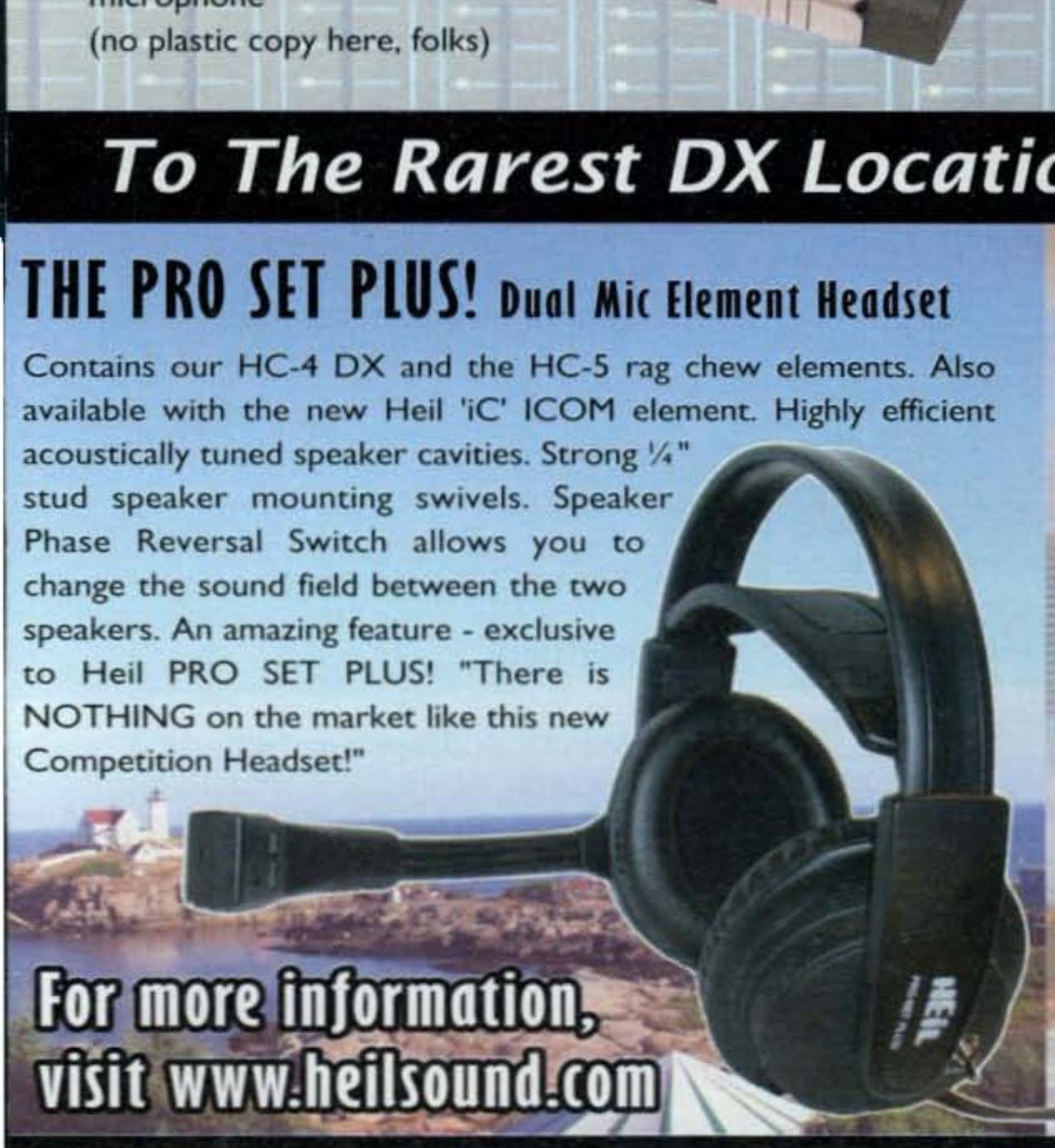

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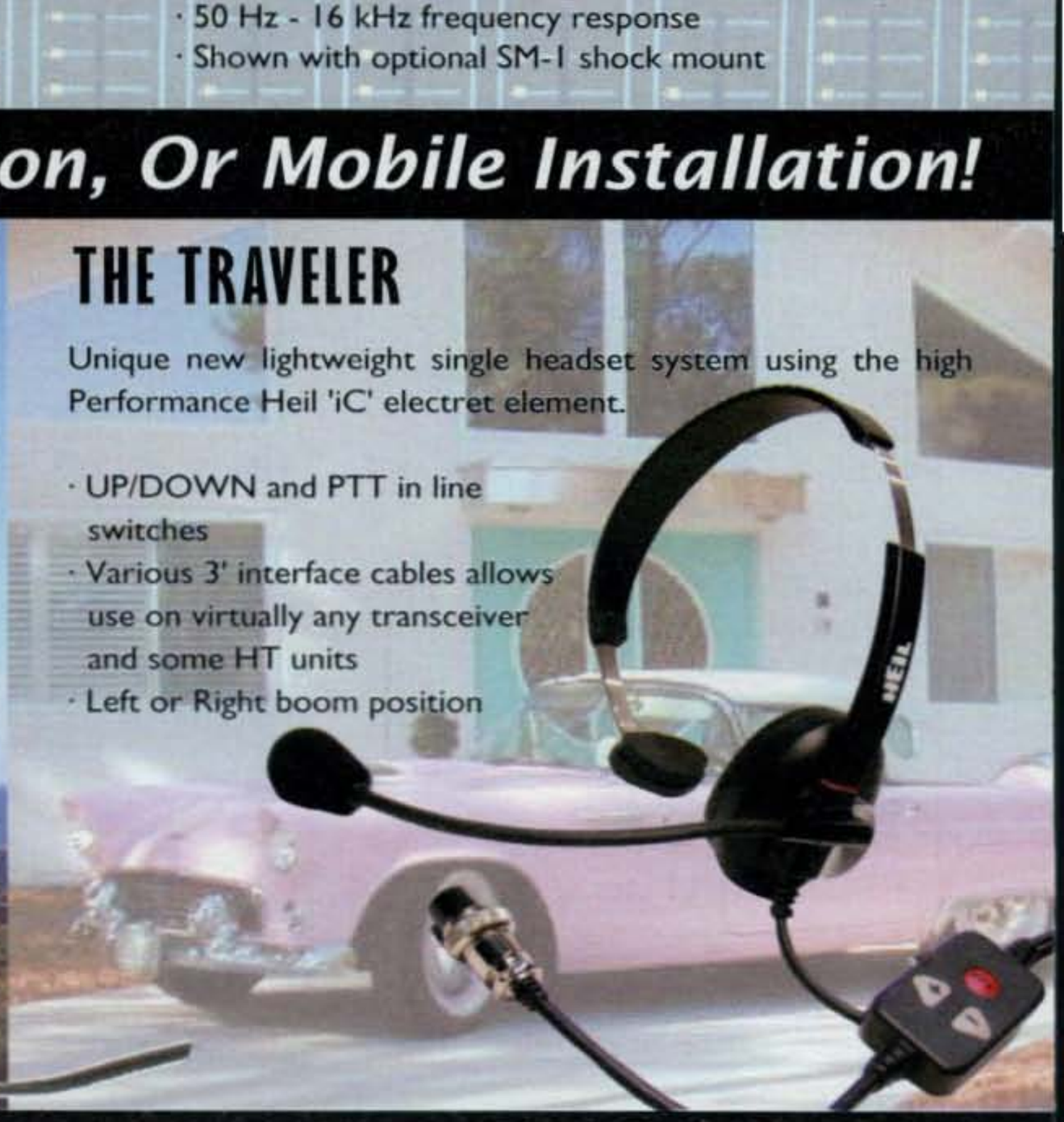

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having a radio can be, the RFDS says when an emergency call is received by a Flying Doctor Communications Officer, they can be in contact with a doctor, nurse, and pilot within 30 seconds and an aircraft can be airborne within 45 minutes, and as a result of the number of RFDS bases in Australia, no one is more than two hours away from medical help.

HF radio equipment suitable for RFDS purposes, made by Australian manufacturers such as Barrett and Codan, is commercially available in most Australian regional and capital cities. The RFDS recommends that when tourists and four-wheel-drive enthusiasts are planning outback trips they should contact a Flying Doctor base to ensure they are equipped with the appropriate communications equipment and information.

There are currently 12 RFDS bases around Australia (see Table I), and each one uses a different set of frequencies, although some frequencies are common to several bases. If propagation is good, at your sunset or sunrise you may be able to receive signals from the RFDS radio network on the 5, 6, and 7 MHz frequencies detailed in Table I.

Communications suppliers in Australia can configure RFDS transceivers so they contain the frequencies that are used in the area in which a traveler is going to be, and if required, may provide training and support for the equipment. Depending on the equipment and the services offered by the relevant RFDS base, the traveler will be able to make contact with the base itself, other Flying Doctor radio users, or with any telephone in the world! Radios contain an Emergency Call Button that should allow the traveler to make contact with the nearest base station. Operating hours vary from base to base, but the RFDS says a 24-hour emergency call watch is kept.

The only other thing travelers using RFDS radios should need—apart from a suitable microphone and a good antenna on their vehicles—is a license from the Australian Communications Authority, our federal radio communications agency. Callsigns for RFDS purposes are issued in a manner similar to amateur radio calls.

One final note: The RFDS is heavily dependent on charitable donations for its operation. Every year there is a national appeal on our national broadcaster, the ABC, plus a fund-raising program known as the RFDS Community of the Year (CotY) awards. Since the RFDS's inception of the CotY awards about 12 years ago, country communities throughout Australia have raised over $1.6 million for the organization.

If you visit the real Aussie Outback in a vehicle, think about John Flynn and Alf Traeger and make sure you get a vehicle with a Flying Doctor radio. When you return home, remember to say thank you by sending a few dollars donation to the RFDS. It might help to save a life.

Further Information

If you would like to know more about the amazing exploits of Alf Traeger, VK5AX, a truly great Australian, there is an excellent book written by Fred McKay called *Traeger – The Pedal Radio Man*, which can be obtained from the RFDS (see below). It is interesting to note that Fred McKay dedicates the book to the memory of Maurie Anderson, VK5MA, and Vernon Kerr, the original operators at the Cloncurry pioneer AMS base who taught McKay about the mysteries of radio.

Unfortunately, Maurie Anderson died in 1960 from a tropical illness he contracted while on active service in World War II with the North Australian Observations Unit.

You can find further information about the RFDS, its history and operations, on their excellent internet website at <http://www.rfds.org.au/>.

References

1. *Traeger – The Pedal Radio Man,* by Fred McKay, published in 1995, Boolarong Press, Australia. Contact your local bookshop or the Royal Flying Doctor Service for details/prices.

2. "Book Review: Traeger – The Pedal Radio Man," by Graham Thornton, VK3IY, in *Amateur Radio*, the journal of the Wireless Institute of Australia, December 1995.

3 & 4. Royal Flying Doctor Service website (see above). ■

Announcing:

2003 Nominations Open for The *CQ* Amateur Radio Hall of Fame

Amateur radio operators have been responsible for many advances in communications technology and entire industries have been built on the foundation of amateur radio experimentation and activity. In an effort to recognize outstanding amateurs and their achievements, and help the public appreciate the far-reaching and long-standing value of amateur radio in our society, we established the *CQ* Amateur Radio Hall of Fame. Nominations for the 2003 "class" are now open. Members of the 2002 "class" were announced last May and appeared in the July issue of *CQ*.

The *CQ* Amateur Radio Hall of Fame honors those whose technical or other accomplishments have helped propel amateur radio forward, or whose achievements in other areas of life have helped improve ham radio's reputation simply through association. Nominees for the *CQ* Amateur Radio Hall of Fame will be judged on the basis of qualifying in one of two broad areas: those individuals—whether licensed amateurs or not—who have made significant contributions to the amateur radio hobby, and those radio amateurs who have made significant contributions to society in general. Nominees must have made *significant* contributions of nationwide or worldwide impact.

The Envelope, Please...

Between now and March 31, 2003 we will be accepting nominations for the 2003 "class" of the Amateur Radio Hall of Fame. Nominations received after that date will be considered for future selection. You may either use the form on the following page or on our website, or simply write us a letter stating your candidate's name, where to contact him/her if still living, for which category you are nominating him/her, and a brief one or two paragraph description of this person's accomplishments. Please include your name and contact information as well. E-mail to <hall-of-fame@cq-amateur-radio.com> or mail to *CQ* Amateur Radio Hall of Fame, 25 Newbridge Rd., Hicksville, NY 11801. If you feel someone has earned this recognition, please submit a nomination. Please *don't* assume that someone else will nominate the person you may have in mind.

We'll be making up our own candidate list at the same time and will announce this year's selections at the Dayton Hamvention in May 2003. Please help us recognize these "ham radio heroes" whose contributions have helped shape our hobby, our nation, or our world.

(Official nomination form is on the next page.)

CQ DX and Contest Halls of Fame

Nominations are also open for the *CQ* DX Hall of Fame and the *CQ* Contest Hall of Fame, which recognize those amateurs who have made major contributions to DXing and contesting, respectively. The activities and accomplishments that qualify one for membership in these elite groups involve considerable personal sacrifice and can usually be described by the phrase "above and beyond the call of duty."

Nominations for the Contest and DX Halls of Fame are made by contesting or DX clubs or national organizations, and must be submitted by March 1 of each year to be considered. A maximum of two (2) people may be inducted into each hall of fame each year. Nominations for the CQ Contest and DX Halls of Fame should be directed to Bob Cox, K3EST, c/o CQ Communications, 25 Newbridge Road, Hicksville, NY 11801; or via e-mail to <k3est@cqww.com>.

CQ Amateur Radio Hall of Fame Nomination Form

The purpose of the CQ Amateur Radio Hall of Fame is to recognize individuals who have made significant contributions to the amateur radio hobby, and/or radio amateurs who have made significant contributions to society at large.

Name of Person Nominated:_____

Callsign (if licensed amateur/if multiple callsigns, list most recent): _____

If your nominee is still living and you know how to contact him/her, please supply the following contact information:

Mailing address: _____

City: _____ State/Prov._____ Zip/Postal Code:_____

Country: _____

Phone: _____ Fax: _____

E-mail address:_____ @ _____

Please write a brief (one to two paragraph) description of this person's accomplishments/achievements and why you feel he/she should be elected to the CQ Amateur Radio Hall of Fame (if you need more room please attach a separate piece of paper):

Nominator Information

(This is only for the purpose of contacting you in case of questions, and will not be published.):

Your name: _____ Callsign: _____

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City: _____ State/Prov._____ Zip/Postal Code:_____

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The ARRL Handbook *is rightly considered by many to be the "Bible" of amateur radio. Even so, as K4ZA explains, even this venerable volume doesn't always have ALL the answers....*

Things Not Covered In *The Handbook*

BY DON DASO,* K4ZA

One of the first purchases I made after getting licensed was my very own, personal copy of *The Radio Amateur's Handbook.*[1] I'd been given a 1953 version, but it was ten years old, and I had the notion I needed an up-to-date edition. While the electrical laws might not have changed, I felt that having the current edition would guarantee, in some small way, that I was "with it" in terms of knowing all the proper things a young ham should know in 1963.

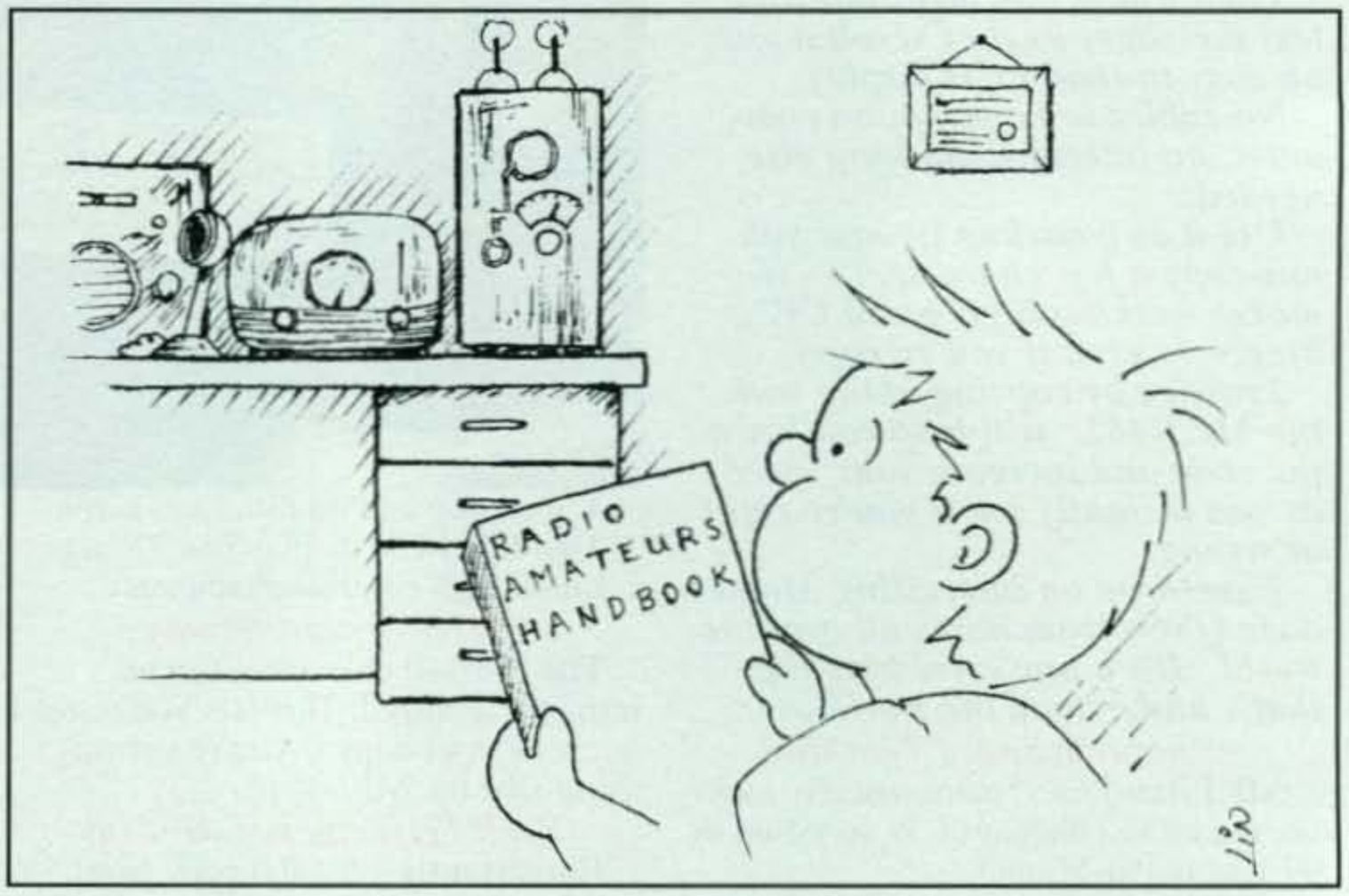
The *Handbook*, I figured, would answer all my questions—things I wanted to know but didn't know whom to ask. (After all, I lived in a small rural community; hams weren't that well known or visible then.) I managed to save up the $3.50 and bought one. I can't remember how or where I got it, whether it was mail order or at a hamfest or required a trip to the big city (Cleveland), but I finally had my very own copy.

I was young and eager to learn. Slowly, but surely, I worked my way through the thick, dark-green book, through chapters on circuit theory, building, operating, etc. I read about long wires because I had one. I built an antenna coupler because the *Handbook* convinced me I should have one. A year later I upgraded easily, so I must have learned something from all this studying and reading.

This was my approach to our hobby. I considered the *Handbook* a virtual Bible of ham radio, and I kept going back to it, searching for solutions or at the very least suggestions—words of wisdom, guidance, that sort of thing.

Over the years, however, I began to notice there were times or circumstances where things weren't covered by the *Handbook*. Various questions, incidents, theories, and so on simply were not covered within my source book of answers. I began to take notes.

Here, then, are some things I have found in nearly 40 years of hamming ... things that have *not* been covered in the *Handbook*. (As a popular TV police show used to claim that only the names and locations have been changed. This is to protect me, I suppose, although the statute of limitations on these foibles and follies has long since expired. Okay, I don't want to embarrass anyone, either.)



All artwork by Kai Lin.

The Summer of 1964

The very first incident is absent from my journal or notes, but I remember it well. It was the summer of 1964, and I had driven over to another ham's home to talk about antennas. We had met on 6 meters, where we had spent hours discussing building better beam antennas. I was big on VHF at the time, mostly because I seemed to have more success on 6/2 meters than I did on HF, probably because of my antenna setup. Anyway, I was a big fan of Ed Tilton, W1HDQ, ARRL's resident VHF guru. There was a 5-element, 6 meter beam in the *Handbook* which Ed had designed and supposedly worked very well. Together, this ham and I were planning to build a pair of them.

As a high-school student I didn't necessarily have the resources to buy the parts, but I did have the time to do the cutting, drilling, assembly. In exchange for all my work, this guy was to provide me with *my* aluminum, etc. He had told me to show up some weekend, so I drove over. I knocked. I had the *Handbook* in my hand. I knew the page by

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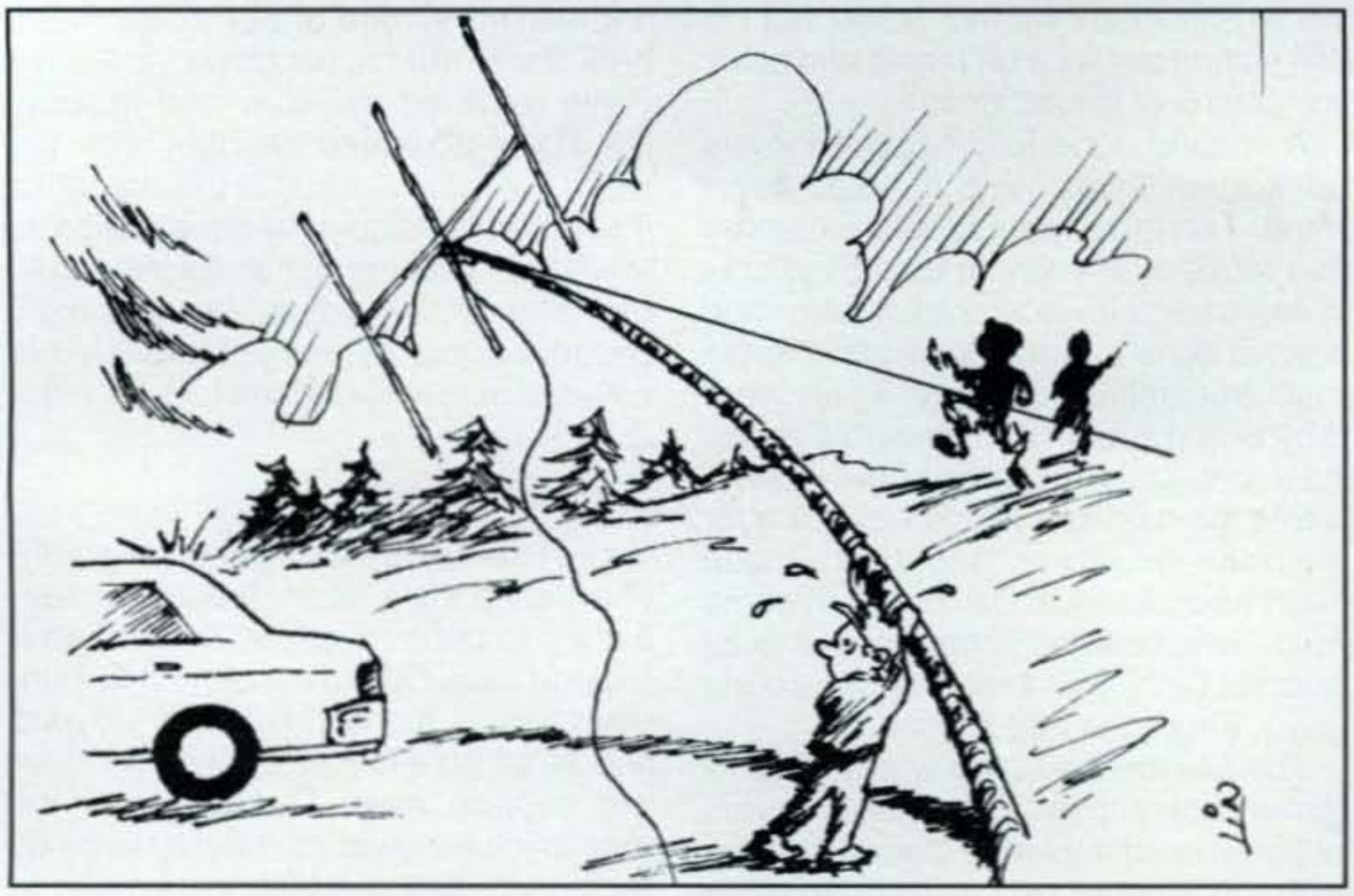


heart—page 461, complete with pictures. Indeed, I'd memorized the dimensions. I was ready to start building. He answered the door and surprised to see me. He was knotting his tie as he invited me to come in and wait. He and his wife were going out, he told me, but just wait, he said.

I was standing in the foyer, *Handbook* in hand. I recall actually opening the book to the design, thinking about discussing the boom-to-mast clamp he had been using, when his wife walked right in front of me and on into their kitchen. I was stunned. She was wearing, well, only her underwear. For a 16-year-old this was something of a shock to put it mildly.

I instantly spun around, but her image was forever frozen in my memory as she stood there calmly stirring something on the stove. I looked down at the *Handbook* and shook my head. Then I realized a mirror on the wall next to the door now gave me a reverse-angle view of her, still slowly stirring, unaware of me.

I knew being discovered in what could only be considered a voyeuristic pose probably would mean the end of the 6 meter beam project. I looked down at the *Handbook*, wishing this was covered so I'd know what to do, how to react. Should I clear my throat or something? Say hello (I had met her once before.)? Or should I simply ooze into the carpet?

In typical teenage fashion, I did nothing. To this day I have no idea whether she ever knew I was there or not. Certainly, when her husband came out and talked to me he gave no indication anything was amiss. Indeed, he asked me if I wanted to join them for lunch or simply take the aluminum and go. I chose the latter course of action and fled for fear I'd say or do something to further embarrass someone. (I used that beam for years, by the way. It worked great.)

The First Journal Entry

The first actual entry in my journal occurred later that summer. While it's something that *is* covered in the *Handbook*, I mention it because it's so simple, so obvious, that I overlooked it, and it taught me a valuable lesson.

I had been a General for over a year by then and wanted to work phone, simply because I could. A large collection of parts was available,[2] so I had decided to build a plate modulator for my heavily modified AT-1. I drew up a circuit (referring to the *Handbook*, of course) and connected everything for the ultimate test. I had checked and re-checked voltages and so forth. I was confident.

I reached out and eased up the mic gain, leaned forward, and just when I was about to utter my first words on phone (probably "Hello...test..."), I came to under the operating desk. Hmmm, some strange, tingling numbness in my lips couldn't be a good sign; it certainly wasn't mentioned in the *Handbook*.With some fear and trepidation I reached out with a yardstick and turned off everything and went outside. Days later I discovered that I simply had neglected to couple the two chassis (the modulator and the AT-1) together, so I was the return for those 600 volts of plate voltage. Not a good idea. (Once I resolved this issue, the modulator worked fine, but phone never really held my interest after that.)

I noted all this in my journal. I knew it was in the *Handbook*, but I also knew I needed to remember it. I call such notes "Forget Me Nots."

June Follies

Later, when I was much more mature and in college, another journal entry finds my university radio club out on Field Day. I was a big fan of the *QST* covers by Phil Gildersleeve, W1CJD. They were often in two parts, May and June issues, to coincide with the annual outing. Of course, our club wasn't as large or as serious as the Podunk Hollow Radio Club, but there *was* some interest, so off we went.

The plan was a simple tribander and dipoles; the idea was to have fun, a good time. One of our members was a university club athlete, a big bruiser of a guy. He said he'd push the mast up. Now this ritual is repeated (to this day!) at FD sites all over the country. Somewhere, somehow, sometime, this probably has happened to someone else. However, at the time, I thought it was unique and noteworthy.

The beam was assembled and stuck on the little CDE rotator (remember those clacker boxes so popular back then?). Finally, all was ready, so as one of the smaller members stood with his foot braced against the base of the water pipe (Some of you already know where this is going, don't you?), the lineman eased his shoulder into the pipe and pushed up. Even I was impressed. However, the vertical travel happened a lot faster than anyone (especially the lineman) expected, and as the mast slid past vertical, our boy ran around the pipe and grabbed for it to limit this vertical travel.

Whether it was the suddenness of his movement or the fear which caused the second member to remove his foot from the base (After all, he now was in the way.), the pipe mast was suddenly, swiftly, jerked aloft and into our boy's hands, high above his head, although leaning precariously toward the ground. To counter this, he ran the other way, of course. This meant he was holding the heavy pipe, with beam attached (coax and rotator cable dangling), over his head. Of course, he was also now running backwards. While the coax wasn't yet connected, some optimistic soul *had* hooked up the control box. When the four-wire control cable jerked up short, our boy stopped, the beam slammed down into the faculty advisor's car (a new Pontiac), and FD more or less ended before it really got started. (Years later we all chuckled over this fiasco, but I'm still putting tag lines on masts and poles as a result of this incident.)

A second June folly occurred years later when I was living in, well, never mind. Too many people will remember this incident anyway. It was Field Day time, and our local radio club had always done a gangbuster effort in the multi-transmitter category. Every year they would submit a respectable score. As a contester, I loved the effort. Indeed, it was the highlight of this local club for me. Also, for just as long this club had been after our local DX maven to come help—maybe bring some gear, at least operate CW (I was their only other code guy.). Finally he had agreed.

The site the club used was superb. A former government installation, it was covered with miles of buried copper wire, on a ridge, and so forth. In other words, it was a superb radio location. I operated 40 meters using a 2-element wire quad oriented E-W and was loud, loud, loud. However, I digress; back to our folly.

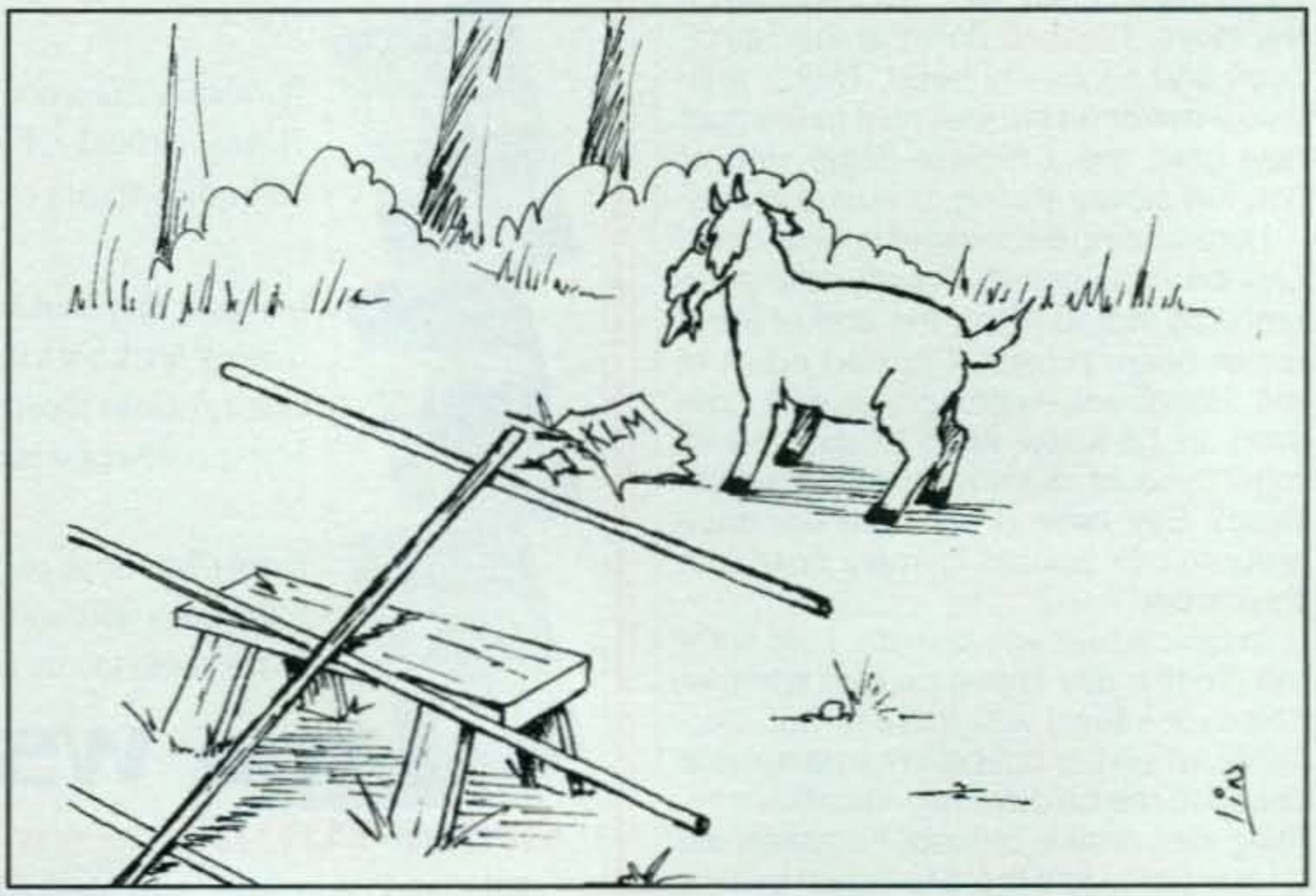
The DXer had brought along his Collins S-line rig and we were ready to rock and roll. The one thing no one had really taken into consideration was that one of our club members was deaf. How he ever drove is beyond me, but he arrived, helped with setup and so forth, and then prepared to go home. As he started down the hill, no one noticed the RG-213 coax that had somehow looped around his rear bumper, until amid shouts and screams the 32S-3 came rocketing out the side of the 20 meter tent. Then the SO-239 chassis mount gave way, and the club member waved and waved as one of our faster members finally ran his car down.

We retrieved the coax and assured the DXer all would be right with the world. I vividly recall all of this, because it seemed to happen in slow motion at the time. I was certain someone would die after this incident, but it simply became a journal entry. Definitely not covered in the *Handbook*.

Good Intentions . . .

Years later I was helping with yet another antenna installation. It became necessary to put a "tag line" over another support rope. One of our crew of helpers volunteered the opinion that "anyone should be able to toss something" over this support rope. (Taking down the rope involved lowering a rather large 80 meter wire beam, which we wanted to avoid.) Selecting a large, open-end wrench, our intrepid volunteer tied off the tag line and then stood under the line in question, judging the distance with a keen and wary eye. Finally, he tossed the wrench up and away—woefully short.

After about 10 minutes the rest of the crew was getting bored. People were walking away. Some decided it was lunchtime; others looked for shade. (It was high noon, summer, and okay, we were in the South.) Ultimately, in a desperate attempt at success, our hero twirled the wrench in an ever-widening arc over his head. The thrumming sound such spinning makes is low and primitive—truly a force to be reckoned with. Indeed, it drew back some crew members to watch.



At what he apparently decided was just the right moment, our hero let go and the missile headed away from his hand. Of course, the direction and force (simple physics says it's a vector) were slightly off, and the (new) Craftsman wrench, and the tag line, both ended up tightly wrapped in a pine tree 60–70 feet high, and about 50 feet to the wrong side of where we needed to be.

At this point, the station owner slowly walked into the house. No one spoke. Moments later he returned with a rifle. He fired into the tree, over and over again, shooting at the end of the branch where the wrench was stuck. Since he was using a .22-caliber rifle, this required nearly an entire box of shells. Someone jokingly referred to this as "Stooges antenna work," but the joke fell flat. Finally, a long pole was able to hook the tag line and pull the line, wrench, and tree branch back to the ground. After this incident I wrote in my journal that I must learn to use a bow and arrow. I vowed that I would never again either witness or experience such embarrassment.

Of course, intentions are one thing, and circumstances are another. Thus, some time later I found myself at yet another antenna installation. (Some of the same folks were involved.) We were building a 4-element KLM 40 meter beam. It was not a large 40 meter beam necessarily, but it was one with a rather large number of pieces and parts.

It was August, the South, and it was hot, yet we all were having a good time out in the country. Progress was being made. The contest QSOs were already playing out in everyone's mind. Then, just about the time we were ready to put the finishing touches on the log cell construction, someone wondered out loud, "Where are the directions?" Everyone looked around. Nothing. Suddenly someone cried out, "The goat's got 'em!"

Yes, it certainly did. In fact, the goat had *eaten* the directions, or very nearly so. It was standing there calmly, placidly chewing the pages. No amount of shouts, screams, or shoving would bring them back. All those mental contest QSOs fade into oblivion. Luckily, no gunfire followed this incident, and years later we all were able to laugh about it.

Speaking of Contest QSOs . . .

Something else the *Handbook* did not prepare me for occurred one December day, deep in the 10 Meter Contest, an operating event I've been fortunate enough to win a few times.

I was running guys on phone (I usually do mixed mode to maximize my fun.) when a KG4 called in. I was glad for the multiplier. He wasn't a new stateside ham, but rather was operating down at GITMO, Guantanamo Bay, the U.S. Naval Base in Cuba. Naturally, I asked if he could work me on CW for another multiplier. I was surprised and pleased when he agreed.

I gave him the frequency (I was running two radios), switched rigs, called him, and waited. I heard *something* in the headset, but it was distorted and sounded funny. I called again, and again the funny sound came back. Finally, in desperation, I reached over and switched out the CW filter. There was the KG4, and he was *speaking* the code to me—*dah dit dah, di di di di dah, dah dah di dit,* and so on. Slowly, but surely he was spelling out the callsigns and exchange!

I was frantic. I knew other people had heard me tell him to QSY. I thought surely someone must have been on the phone to the League right at that moment seeking my disqualification. Hiram was probably rolling over in his grave, but I turned down the speed control on my keyer and completed the QSO. I then quickly went back to phone just so I wouldn't have to answer any possible questions on the CW frequency. I thought about that one QSO the rest of the contest—and left it in. I needed the mult.

These are just a few moments or incidents "not covered in the *Handbook*," which to this day remains a faithful and informative source of information and direction in my ham radio life. Read it wisely. In fact, read between the lines! You never know when you're going to need the information.

Notes

1. *The Radio Amateur's Handbook* was retitled *The ARRL Handbook for Radio Amateurs* in the intervening years since 1963. It remains a standard reference for both amateurs and professionals in RF communication.

2. See "The Junk Box," *QST*, November 1992.

What You've Told Us...

The main lesson we learned from our October survey is about the power of internet mailing lists. When our October QRP Special came out, members of at least one low-power enthusiasts' e-mail reflector were urged by their colleagues to buy the issue and send in the survey. Typically, a little more than one quarter of the readers who respond to our surveys say they're active on QRP. This month that number jumped to more than 50%. So ... the numbers we're about to present are more representative of the typical QRP operator than of the typical *CQ* reader. With that caveat in mind, here's what the respondents had to say:

A full 80% of the people who sent in the survey say they've operated on HF with 5 watts or less at least once, and 60% say they currently do; 35% say QRP is their favorite way to operate, 45% say it's fun once in a while; 10% say "life's too short for QRP"; and 7% say they'll go low if it's the only way they can get on the air.

Among those who do operate QRP, CW is the favorite mode of 71%, followed by SSB (25%) and digital (3%). QRP radios built from kits are the favorite of our respondents (41%), followed by standard commercial rigs with the power turned down (37%), commercial QRP rigs (33%), and homebrew gear (16%). More than half (56%) use a permanent wire antenna as their primary QRP antenna, followed by a Yagi on a tower (25%), something portable (12%), a temporary wire (11%), and a mobile antenna (7%). The vast majority (85%) do most of their QRPing from home, followed by 11% who operate from a fixed portable location, 4% while mobile, and 2% while walking. Finally, 37% belong to a QRP specialty club.

This month's free subscription winner is William Pieri of Maple Grove, Minnesota.

Reader Survey January 2003

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

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

This month we'd like to hear your views on ham radio and advanced technology.

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

1. ... whether you believe ham radio *is* on the leading edge of communications technology:
- Yes....1
- No....2
- No opinion....3

2. ... whether you believe ham radio *should be* on the leading edge of communications technology:
- Yes....4
- No....5
- No opinion....6

3. ... which statement best describes your views on purchasing or building a ham rig incorporating advanced technology (e.g., digital audio, spread-spectrum, or software-defined radio):
- Have already done so....7
- Want one as soon as I can....8
- Will wait until the "bugs" are worked out....9
- Will wait until it's well-accepted by most hams....10
- Probably will never buy or build an advanced-technology rig....11

4. ... your basic technical requirements for an advanced technology radio (circle all that apply):
- Standalone radio OK....12
- Must be compatible with other similar radios (i.e., one brand must be able to talk to other brands)....13
- Must be "backward-compatible" with current analog modes on bands covered....14
- No specific requirements....15

... how widely-accepted each of the following was when *you* first started using it:

5. ... CW
- Brand new....16
- Becoming popular....17
- Already popular....18
- Have never used....19

6. ... AM Phone
- Brand new....20
- Becoming popular....21
- Already popular....22
- Have never used....23

7. ... SSB Phone
- Brand new....24
- Becoming popular....25
- Already popular....26
- Have never used....27

8. ... FM Phone
- Brand new....28
- Becoming popular....29
- Already popular....30
- Have never used....31

9. ... Packet radio
- Brand new....32
- Becoming popular....33
- Already popular....34
- Have never used....35

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

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The name Argonaut has been synonymous with low power operation since Ten-Tec's original Argonaut 505 was released in 1971. Our commitment to offering quality QRP rigs to the hobby continues today with the new Argonaut V HF transceiver. Adjustable 1-20 watts output power, AM/FM/CW/SSB/digital operation, 35 built-in IF-DSP receive filters, legendary Ten-Tec QSK, internal keyer, PSK31 ready (no interface needed!), and solid general coverage receiver performance in a small five-pound package. Like all of our recent rigs, Argonaut V is equipped with Flash-ROM to enable instant upgrading of your rig if future features and bands become available. Call Ten-Tec today or visit our web site for additional information or to place your order.

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308 Snap-on Fan Kit $15

705 Desk Microphone $99.95

937 Power Supply $89

S&H cost in 48 states for Argonaut V is $16. With Power Supply, $21.

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

antennas

BY ARNIE CORO,* CO2KK

More Low-Cost Antennas for 2 Meters

Two meters is the most popular amateur band worldwide, and everything indicates it will continue to be a favorite for newcomers to the hobby. In some parts of the world the band spans a full 4 megahertz, while in others it is just 2 megahertz wide. Building your own 2 meter antennas is a lot of fun, will cost almost nothing, and will give you a lot of hands-on experience in antenna work. It will also be a challenge for you.

Each of the projects that follows will give you an antenna better than a "rubber duckie," but will require some skill and patience. On the other hand, building your own rubber duckie is no simple task, either.

Photo A– Full-size, 2 meter ,omnidirectional, vertically polarized antenna at CO2KK's QTH using three 5/8-wavelengths elements. With its estimated 6 dB gain over a dipole, it's my standard of comparison for 2 meter FM work.

Nearly every amateur in the world today owns at least one 2 meter FM radio. Many of us own two or more. Some hams give their 2 meter handheld a lot of use, while others enjoy working FM from the mobile. Still others own multi-mode rigs, so they need to install a horizontally polarized antenna for the weak-signal modes as well as a vertical antenna for FM.

It is well known that the helically wound short vertical antenna, or "rubber duckie," provided with the typical 2 meter handheld is a pretty poor radiator. Losses may range from –6 to as much as –10 dB when compared with a reference-standard half-wave vertical dipole. Why do we keep using it? The obvious answer is that the popular rubber-duckie fits nicely and provides communications when you are either talking to a nearby station or using a hill-top repeater. At home you may be tempted to hook up your HT to a big outdoor antenna (photo A), but that may have drawbacks as well as benefits. The typical HT cannot handle the high field intensity of nearby out-of-band stations, something that leads to very bad cross-modulation problems. A rubber duckie isn't sensitive enough to pick up these stations, but a big outdoor antenna is. HTs require either smaller antennas or tight bandpass filters between the external antenna and the radio.

Better HT Antennas

Of course, you can carry a better antenna for your handie-talkie, such as my favorite 0.32-wavelength vertical which provides a substantial increase in signal strength while at the same time matching the 50 ohm output impedance of the transceiver. Antenna experts will tell you that the 0.32-wavelength vertical has a resistive component that is near 50 ohms, while also having a reactance that is easily compensated by introducing a series matching capacitor between the antenna and the rig's antenna connector.

The 0.32-wavelength antenna measures about 56 cm (22 in.) in length when cut for the 145 to 146 MHz segment and a little less when you resonate it for operation between 146 and 148 MHz.

Homebrewing your 0.32-wavelength vertical for a handie-talkie is a nice weekend project, but remember that you must tune out the antenna's reactance by using a small trimmer capacitor, located at the base of the antenna and connected in series with the radiator.

Because handheld FM transceivers happen to use the case of the radio as part of the antenna system (yes, believe me, the metal case of your radio is the actual "ground system" to complete the vertical antenna's image), you must adjust the 0.32-wavelength vertical with the help of a field-strength meter and a lot of patience.

A weak station will provide the first approximation, because you can tune the series trimmer capacitor with a non-inductive tool, looking for maximum signal strength. The second step will be to use the field-strength meter out in the open and

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

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.

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Super strong fiberglass mast has huge 1¼ 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

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

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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

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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
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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 auto-tunes 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.

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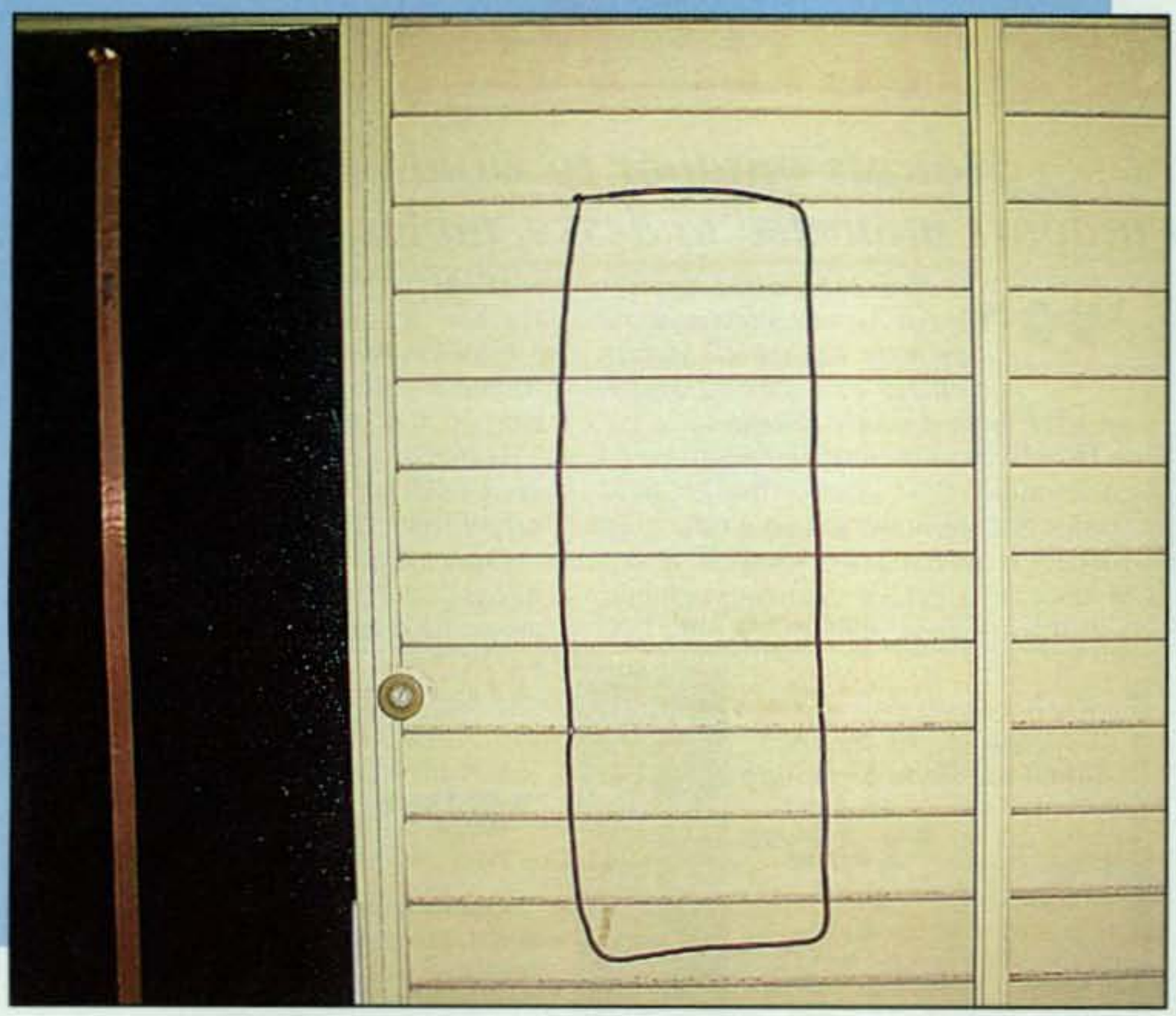

Photo B– Two of my indoor 2 meter band antennas—the copper-foil-tape half-wavelength end fed, and the elongated rectangular loop. There is no feedline connected to the loop.

carefully adjust the series trimmer for maximum radiated signal.

One of the difficulties involved in this otherwise very effective and low-cost replacement for the rubber-duckie helical whip is that you must make it in such a way as to provide good mechanical strength, while at the same time not causing too much stress on the HT's often-fragile antenna connector.

Half-Wave Verticals Are Still Better

By combining a small loading and matching coil, plus a simple impedance transformation network, commercial manufacturers offer telescopic half-wave verticals specially designed for handie-talkie use. The typical half-wave vertical for 2 meter FM use will be about 95 cm (37 1/2 in.) long when extended, something that certainly will require a lot of care when handling a radio equipped with such an antenna. In practice, the telescopic whip and matching network can be designed so that when the whip is not extended; it can provide the user with the performance of the standard rubber-duckie antenna. When the whip is extended to its full length, the increase in efficiency of the radiating system is outstanding.

The fact is, a half-wave antenna, when fed at the bottom , presents a very high impedance, so it requires much less of a "ground system" than a quarter-wave vertical or any other similar antenna, such as the rubber duckie. Homebrewing a half-wave 2 meter vertical for use on a handheld radio does require using a telescopic whip and some kind of weatherproof box in which the tuned matching network can be housed.

Again, the use of a telescopic whip is a *must,* and finding the appropriate circuit parameters to make the half-wave vertical work properly when fully extended as a true 0.5-wavelength antenna, and as near as possible to a 0.25-wavelength vertical when the whip is collapsed to its minimum length, can be tricky, to say the least.

My advice for newcomers and old-timers alike is that the half-wave vertical is an excellent antenna for portable work *if* it is properly built from both an electrical and mechanical standpoint. This leaves little room for homebrewing, except for those *CQ* "Antennas" column readers who have a lot of practical experience in building their own VHF and UHF antennas. Commercial versions are inexpensive, and if you're mainly looking for improved communication, consider buying one. If you're looking for a challenge, build one instead.

Magnetic Loops on 2 Meters

Yes . . . they both are pretty small and work very well *when properly designed and tuned to the operating frequency.* Magnetic loops for VHF work have the same narrow bandwidth feature as those made for the HF bands, so you may find yourself having to *retune* the magnetic loop when changing frequency . Not doing so may harm your radio's output stage, something that many of us have learned the hard way (and include your columnist among those who have blown a nice HT output module while testing a magnetic loop).

What may move the average ham to build and use a magnetic loop with a 2 meter radio? The answer is not that difficult to find: The magnetic loop is a very small antenna, and it has two very marked nulls, something that will help *fox hunters* a lot!

Following standard magnetic-loop practice, the antenna must be used with a variable tuning capacitor, and you may use one of the two typical matching systems—the gamma match or the coupling-loop method. Both work well, but for the 2 meter band magnetic loop I prefer to use the gamma-match system, because once set, the SWR at the operating frequency will stay low. (I don't have space here to get into the specifics of building a gamma match, but standard antenna references such as the *ARRL Antenna Book* (ARRL) and Joe Carr's *Practical Antenna Handbook* (Tab) cover the topic well. In contrast, the coupling loop (fig. 1) is more prone to moving out of the place where it gives the best match, something that may prove dangerous to your rig, as the SWR may go up abruptly when the coupling loop is moved out of place.

Don't be surprised by the small size of even the largest 2 meter magnetic loop (fig. 2). According to antenna theory, a magnetic loop cannot be more than approximately one tenth of a wavelength long. Thus, for the 2 meter band, with a wavelength between 2.08 meters and 2.02 meters from 144 to 148 MHz, the maximum length of the magnetic loop should be around 20.5 cm (8 in.) for the center of the band. That gives a diameter of 20.5 divided by PI, or 3.1416 in round numbers, so the diameter of the magnetic loop is just 6.42 cm (about 2.5 in.).

I have made several of these antennas using either 3 mm (1/8 in.) diameter wire or a 10 mm (3/8 in.) wide cop-

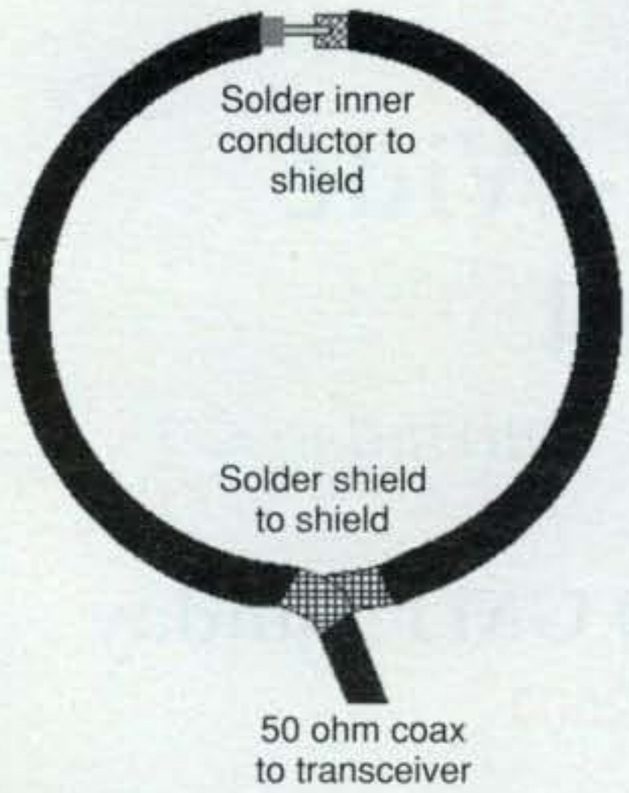

Fig. 1– If you build a magnetic loop and want to feed it using the coupling-loop method (although I recommend a gamma match, because these loops are so small), this is how it should be made.

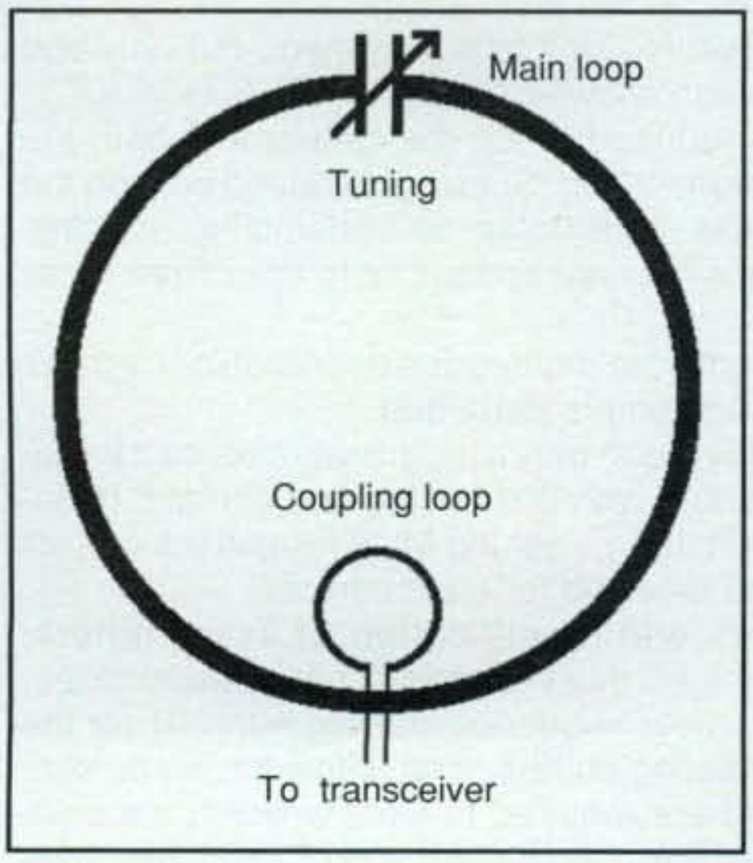

Fig. 2– This is the schematic diagram of a typical magnetic-loop antenna using the coupling-loop method. Again, this is not especially practical for 2 meter antennas due to the extremely small size of the coupling loop required.

per strip. Both construction materials provide excellent results, and as a matter of fact, local hams here have built the 2 meter magnetic loop to replace lost rubber-duckie verticals. The magnetic loops are pretty efficient, and they do have two rather sharp nulls that can be used very effectively during a fox hunt, or to find a source of interference.

Copper-Tape Antenna For Window Use

Copper-foil tape used by glass artists usually comes with an adhesive backing, so it makes an ideal material with which to build a group of low-cost antennas that are taped to glass windows. the easiest of them all is the half-wave vertical dipole, which when properly fed gives excellent results. Two cm wide (3/4 in.) copper-foil tape makes excellent broadband 2 meter antennas!

Of course, you must win the approval of the lady of the house to install a copper-foil window antenna, but once installed it will last for a long time, and you can always use it (even right in the middle of a storm), because the antenna is *indoors.*

I use RG174 coaxial cable to feed my copper-foil dipole that is located exactly behind my workbench. Tuning the dipole for minimum SWR is not difficult at all using a standard VHF SWR meter. Do remember to exit the coaxial feeder at exactly 90 degrees from the dipole center, and run it for no less than 60 cm (about 2 ft.) before making any turns. You may also try feeding a half-wave vertical made of copper foil at the bottom, but that will require a matching network that somehow must be hidden from sight.

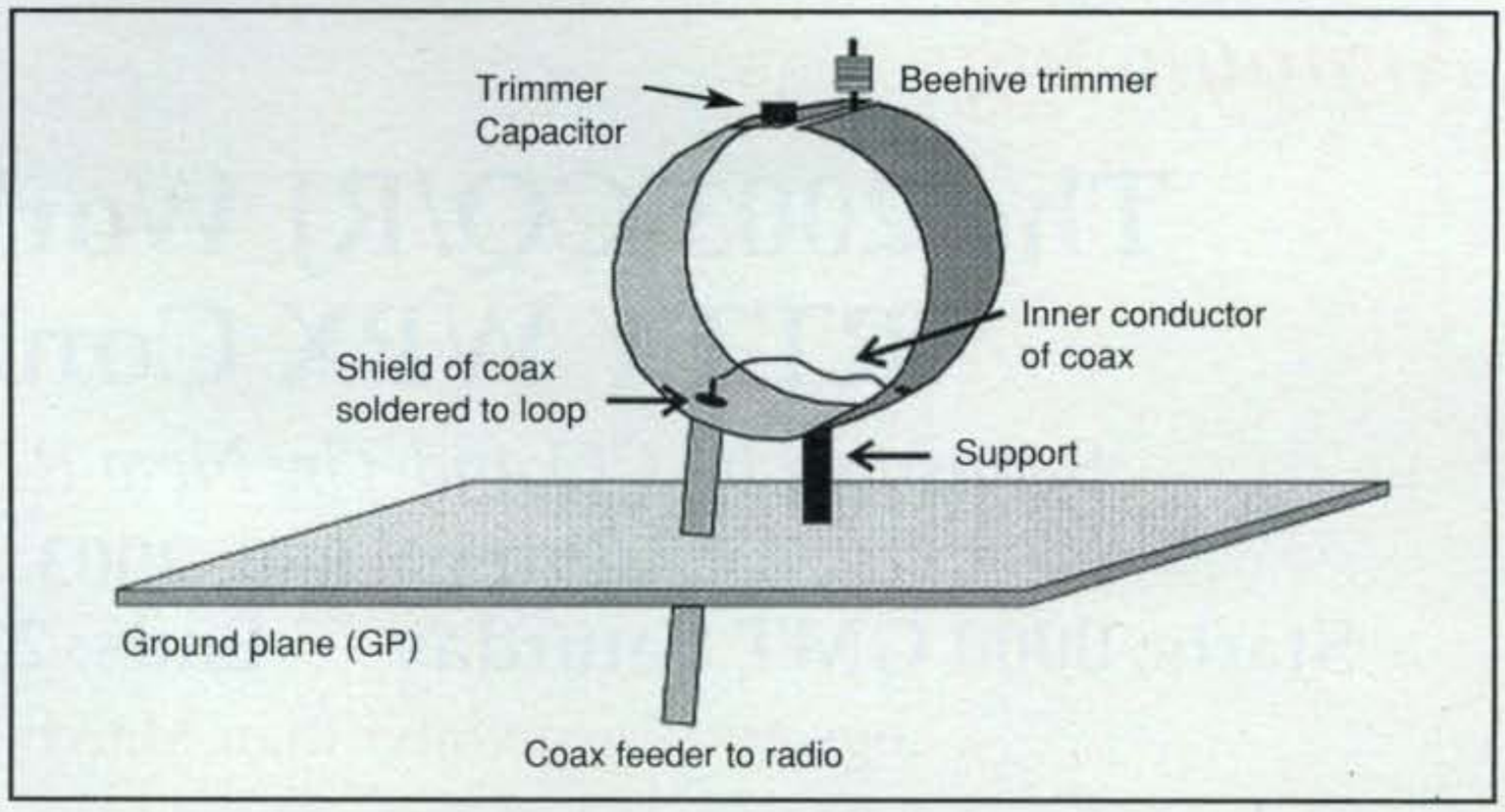

Fig. 3– A 2 meter magnetic loop made using wide copper laminate in order to increase the bandwidth. Notice the use of a ground plane below the antenna, the trimmer capacitor required to tune the antenna to resonance, and the gamma-match feed system used. In order to fulfill the magnetic-loop design criteria, the antenna may not exceed one tenth of a wavelength.

A Full-Size Circular Loop

Sure, it's pretty easy to build this antenna. I have mine sitting behind a wooden window. The loop is made using No. 12 or No. 10 bare copper wire and is fed either for vertical or horizontal polarization. I made two loops (fig. 3), one of which is fed at the bottom for horizontal polarization and the other fed to provide vertical polarization. Changing from one loop to the other takes less than a minute !

The full-size loop is 208 cm (82 in.) long, and it does require a quarter-wave coaxial matching section made from 75 ohm cable in order to match the loop's approximately 110 ohm impedance to the 50 ohms typically used by 2 meter radios. One advantage of this low-cost, homebrew, full-size 2 meter band loop is that it is quite effective for direction finding if you carefully wind the quarter-wave matching section as a coil using a 25 mm (1 in.) diameter PVC pipe section as a coil form. Before using the coaxial choke balun, the nulls were not as sharp!

Last But Not Least . . .

. . . A rectangular loop that matches 50 ohms. With appropriate tweaking , a full-size rectangular loop can be made to provide an almost-perfect match to a 50 ohm coaxial line. However, please don't forget to include the vitally important decoupling coaxial choke balun right at the feedpoint. My rectangular loop, seen in photo B just before soldering the feedline, was tested at the same window position as the circular loop, and there was no measurable change in performance. This loop was made using No. 8 copper wire that came from a burned-out power transformer, making it an antenna from recycled materials.

As you can see, there are plenty of alternatives to your rubber-duckie antenna. All it takes is patience, careful construction, and little or no money! Have fun!

73, Arnie, CO2KK

Announcing:

The 2003 CQ/RJ World-Wide RTTY WPX Contest

Sponsored by CQ and The New RTTY Journal

February 8–9, 2003

Starts: 0000 GMT Saturday Ends: 2359 GMT Sunday

Logs are due no later than March 12, 2003

I. Period of Operation: Single Operator stations may operate only 30 hours of the 48-hour contest period. Off time periods must be a minimum of 60 minutes in length and must be clearly marked on the Summary Sheet. Multi-Operator stations may operate the entire 48-hour contest period.

II. Objective: The object of the contest is for amateurs around the world to use RTTY to contact as many amateurs in other parts of the world as possible during the contest period.

III. Bands: The 3.5, 7, 14, 21, and 28 MHz bands may be used. No 1.8 MHz or WARC bands.

IV. Terms of Competition (for all categories): All entrants must operate within the limits of their chosen category when performing any activity that could impact their submitted score. Transmitters and receivers must be located within a 500 meter diameter circle or within the property limits of the station licensee, whichever is greater. All antennas must be physically connected by wires to the transmitters and receivers used by the entrant. All high power category entrants must not exceed 1500 watts total output power on any band. Only the entrant's callsign can be used to aid the entrant's score.

Any form of DX alerting assistance is permitted in ALL categories. However, no self-spotting of any form on DX spotting nets is permitted for any category. Self-spotting is defined as generating packet spots for your contest callsign, including, for example, the following methods: (a) using your own callsign; (b) spotting your callsign while using another callsign; or (c) spotting of your callsign by other stations as a result of prearranged solicitation. A different callsign must be used for each entry.

V. Categories:

Note: Category names for the Cabrillo header are shown in *(italics)* after each category definition.

1. Single Operator (Single Band and All Band)

(a) Single Operator stations are those at which one person performs all of the operating, logging, and spotting functions. Only one transmitted signal is allowed at any time. *(SINGLE-OP)*

(b) Low Power: Same as 1(a) except that output power is 150 watts or less. Stations in this category compete with other low power stations only.

(c) Rookie: An entrant in this category shall, at the time of the contest, have been licensed as a radio amateur three years or less. If you are entering this category, please indicate it on your Summary Sheet. *(ROOKIE)*

2. Multi-Operator (All band operation only)

(a) Single-Transmitter: Only one transmitted signal at any time. Limited to 6 band changes in any clock hour (0 through 59 minutes). For example, a change from 20 meters to 40 meters and then back to 20 meters constitutes two band changes. Violation of the 6 band change rule will result in reclassification to the Multi-Multi category. *(MULTI-ONE)*

(b) Multi-Two: A maximum of two transmitted signals are allowed as long as each transmitter is on a different band. Each of the two transmitters is limited to 6 band changes in any clock hour (0 through 59 minutes). For example, a change from 20 meters to 40 meters and then back to 20 meters constitutes two band changes. Violation of the 6 band change rule will result in reclassification of the entry to the Multi-Multi category. Each transmitter must keep a chronological log containing its own serial numbers and unique transmitter identifier (0 or 1 in the Cabrillo format). *(MULTI-TWO)*

(c) Multi-Transmitter: No limit to transmitters, but only one signal and running station allowed per band. *(MULTI-MULTI)*

3. SWL: SWLs are required to log the callsigns of both the heard and correspondent station. Scores are based only on the heard station, using the same rules as transmitting stations. Correspondent callsigns may not appear more than three times per band in your log.

VI. Modes: Baudot only. No unattended operation or contacts through gateways or digipeaters permitted.

VII. Exchange: RS(T) report plus a progressive contact three-digit serial number starting with 001 for the first contact. (Continue to four digits if past 999.) Your log MUST show the correct serial number sent and received for each contact.

VIII. Serial Numbers and Identification of Transmitters: Single Operator log entries must contain a progressive three- (or four-) digit serial number sequence starting with 001 for the first contact. Multi-Single log entries must follow the same serial number scheme and are required to identify which transmitter made each QSO in the log. Multi-Two and Multi-Multi entries must provide a separate log and serial number sequence for each transmitter.

IX. QSO Points:

1. Contacts between stations on different continents are worth three (3) points on 28, 21, and 14 MHz, and six (6) points on 7 and 3.5 MHz.

2. Contacts between stations on the same continent but in different countries, and contacts with maritime mobile stations, are worth two (2) points on 28, 21, and 14 MHz, and four (4) points on 7 and 3.5 MHz.

3. Contacts between stations in the same country are worth one (1) point on 28, 21, and 14 MHz, and two (2) points on 7 and 3.5 MHz.

X. Multiplier: The multiplier is the number of "valid" prefixes worked. A prefix is counted only once regardless of the number of times the same prefix is worked.

1. A prefix is the letter/numeral combination which forms the first part of the amateur call. Examples: N8, W8, AB8, DL5, DJ2, HG1, WD200, WF96, 3DAØ, GB75, ZS66, U3, etc. Any difference in the numbering, lettering, or order of same shall constitute a separate prefix. A station operating from a DXCC country different from that indicated by its callsign is required to sign

portable. The portable prefix must be an authorized prefix of the country/call area of operation. In cases of portable operation, the portable designator will then become the prefix. Example: AB5KD operating from Wake Island would sign AB5KD/KH9 or AB5KD/NH9. American DX (KL7, KH6, KP2, KH3, etc.) operating within the 48 states must sign with a full designator of their choice. KH6XXX operating from Ohio must use an authorized prefix for the U.S. 8th district (W8, K8, etc.). United States portable stations are not permitted to select a portable prefix designation. For example, WS7I/2 is permitted, but WS7I/WY2 or WS7I/KZ2 is not. Portable designators without numbers will be assigned a zero (Ø) after the second letter of the portable designator to form a prefix. Example: N8BJQ/PA would become PAØ. All calls without numbers will be assigned a zero (Ø) after the first two letters to form the prefix. Example: XEFTJW would count as XEØ. Maritime mobile, mobile, /A, /E, /J, /P, or interim license class identifiers do not count as prefixes.

2. Special event, commemorative, and other unique prefix stations are encouraged to participate. Prefixes must be assigned by the licensing authority of the country of operation.

XI. Scoring:

1. Single Operator: **(a) All Band** score = total QSO points from all bands multiplied by the number of different prefixes worked (prefixes are counted only once). **(b) Single Band** score = total QSO points on the band multiplied by the number of different prefixes worked.

2. Multi-Operator: Scoring is the same as Single Operator, All Band.

3. A station may be worked once on each band for QSO point credit.

XII. Awards: First-place certificates will be awarded in each category listed under Section V in every participating country and in each call area of the United States, Canada, Australia, 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. (Single-band entrants who also operate on other bands are encouraged to submit their logs to aid in the log-checking process. *Note:* If a log contains more than one band, it will judged as an all-band entry unless specified otherwise.) In countries or sections where returns justify,second- and third-place awards will be made. All certificates and plaques will be issued to the licensee of the station used. To the extent sponsors or winners purchase plaques through the Contest Director, plaques will be awarded in the following geographical areas for each of the categories listed in Rule V: World, North America, USA, South America, Africa, Europe, Asia, and Oceania.

XIII. Instructions for Preparation of Logs:

1. Logs must be submitted no later than March 12, 2003.

2. Electronic Submissions. All electronic logs must be submitted in Cabrillo format via e-mail to **<wpxrtty@kkn.net>. Receipt of all e-mailed logs will be confirmed via return e-mail.**

(a) In the "Subject" line of your e-mail message please include your callsign and the category you entered—i.e., SOABL, M2, MS, etc. Logs should be sent as an e-mail attachment, not in the text of the e-mail, and the **filename** for the log should be **yourcall.log.**

(b) Entries from **Multi-Single, Multi-Two,** and **Multi-Multi** stations must be merged into a single chronological log that *clearly* indicates which transmitter made each QSO (column 81 of Cabrillo QSO template for CQ contests). Multi-Single and Multi-Two should designate their transmitters as 0 and 1.

(c) If the Cabrillo format is unavailable, contact the log checker, Joe Wittmer, K9SZ, at <k9sz@rttyjournal.com>.

3. Disks and paper logs may be submitted via mail to CQ/RJ RTTY WPX Contest, 25 Newbridge Road, Hicksville, NY 11801 USA. However, all logs containing more than 100 QSOs and which were generated using a computer program ***must*** be submitted via e-mail or on a 3.5 inch floppy disk. Log and summary sheets are available for download on the CQ website, <www.cq-amateur-radio.com>, or with SASE from CQ at the address listed above.

4. Questions pertaining to the CQ/RJ RTTY WPX Contest may be sent to the contest Director, Glenn Vinson, W6OTC, 488 Locust Street #401, San Francisco, CA 94118; e-mail <w6otc@garlic.com>.

XIV. Disqualification: Violation of amateur radio regulations in the country of the contestant, or the rules of the contest, unsportsmanlike conduct, taking credit for excessive duplicate contacts, unverifiable QSOs or multipliers will be deemed sufficient cause for disqualification. An entrant whose log is deemed by the RTTY WPX Contest Committee to contain a large number of discrepancies may be disqualified as a participant operator or station for a period of one year. If within a five year period the operator is disqualified a second time, he or she will be ineligible for any CQ contest awards for three years.

XV. Deadline: All entries must be postmarked **no later than March 12, 2003.** E-mail logs are subject to the same deadline. Logs postmarked after the deadline may be listed in the results but will be ineligible for any awards.

magic in the sky

BY JEFF REINHARDT,* AA6JR

Digital Hamming: A Need for Standards

Amateur radio is a curious blend of the new, the old, the traditional, the innovative, the adaptive and the (dare I say it?) the stubborn. As we all know, "Magic In The Sky" comes in many forms; we are a diverse group, but we continue to enjoy our mutual pursuit, whether it's moonbounce, AM, FM, ATV, PSK 31, CW, SSB, RTTY, APRS, or any other "alphabet soup" concoction you can think of.

A New Age

As 2003 dawns, we find ourselves standing Janus-like in the doorway, considering two new modes that need our collective attention and pondering what was along with what will come to pass. By "ourselves," I mean you, me, the FCC, the ARRL, the manufacturers, and anyone else defined as a "stakeholder" in ham radio. Those new modes are digital and spread spectrum. Why are they important *now*? Read on.

In a ham radio context, digital communications are in their infancy. Given that packet started to become popular almost 15 years ago, I dare opine that it's an arrested infancy, but in this case I'm referring to digitally modulated voice communications. We, as hams, are merely scratching the surface in this pursuit, in that to date, only one manufacturer has come forth with radios that transmit digital voice signals. To say the format is off to a tepid start is to be kind. Yet we pride ourselves on being the innovators, the forebears of new technology, the place where things happen first. <ahem> A funny thing happened while perusing the bands; you may have noticed that many public-safety agencies, for better or worse, have already gone digital—so have cell phones, home phones, and even garage-door openers.

The Good, The Bad and The Ugly

Proponents of digital say we can make more of available spectrum through narrower bandwidths and enjoy better quality audio. Detractors say what we have now works just fine and digital signals are easily corrupted, making them unusable where conventional FM now functions. The problem is, both sides are right.

The biggest challenge I see to the adoption and exploration of any available digital benefits is simple: *We have no standard format!*

Public safety has rallied around the APCO 25 protocol. Whether or not it would work for ham radio could be debated, but by whom? Ah, go back to the second paragraph of this missive.

Some History

In the world of commercial communications, the FCC used to decide things such as acceptable formats. Old-timers may recall the battle over the adoption of the NTSC TV format, or later on, the selection of color TV conventions and stereo FM standards. The bottom line is, right or wrong, the FCC made selections that resulted in a standard everyone could build to, and it worked. As deregulation came along a turn was made, "letting the marketplace decide." This gave us incompatible Betamax and VHS standards for videotape and the resulting marketplace battle that VHS eventually won. It also resulted in broadcast AM stereo becoming a still-born in the early 1980s. There were four formats proposed, the FCC refused to make a choice, and AM stereo has been little more than a footnote ever since. The marketplace decided it couldn't decide and confusion reigned.

The marketplace may be adept at decisions such as DVD being better than VHS and VHS over Beta, but in the world of ham radio we can't afford to have a standards battle, and the manufacturers have shown no signs of agreeing on a digital voice format.

Why is that important? It may seem to be a frivolity or inconvenience if you can't talk to your friend because he has a different brand of radio. It takes on blood-curdling proportions when it means you are unable to pass emergency traffic because you don't own the "right" brand of radio. Imagine the chaos when different emergency agencies in the same geographic area choose different digital standards for their responders. *We need to avoid that scenario.*

In these post 9-11 times, if we can't serve the public in a time of need, it only strengthens the arguments of those who covet our spectrum.

A Time For Leadership

The ARRL has a Digital Voice Working Group studying possible standards for digital voice, but it has declined to recommend any one standard be adopted. "We continue to embrace the idea that there is room for more than one digital voice system in Amateur Radio right now," the group wrote in its July 2002 report to the ARRL Board of Directors. "Rather than dictate a single standard, we choose to allow things to evolve as experimenters do their bit. Users will ultimately decide what is best."

Unfortunately, this is the very same philosophy that brought us VHS vs. Betamax, and the non-

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growth of AM stereo broadcasting. We need a standardized format, folks, or there are only two possible outcomes:

1. Ham radio voice communications will remain forever analog or
2. Chaos will prevail.

What scenarios are possible under the second possibility? Imagine a repeater system or simplex communications where only one manufacturer's digital radios work. If you own a Kenwood, you won't be able to talk to the owner of a digital ICOM, etc. Is this possible? Yes. Is it progress? You decide.

The first draft of this column suggested that someone, perhaps the ARRL, consider organizing a conference that gets *all* the major manufacturers, and perhaps the FCC, around the same table to discuss digital formats for HF, VHF, UHF, and ATV. Well, the idea caught the interest of the powers that be at CQ, and we all are engaged right now in figuring out whether such a conference will be feasible and what it might accomplish. We will keep you informed as the discussions progress.

Here's my take on one major goal: If we can "simply" aid in getting the manufacturers to agree on a digital protocol that is open to all, with no royalties due anyone, I say we have a chance at making amateur radio ready to take that first, giant, digital step. It *sounds* simple, but it's not. Manufacturers and engineers have a lot of pride. They are competitive. It may be tempting for one manufacturer to try to develop "THE" standard, at the expense of its competitors, either in driving them out of business or exacting stiff royalties. My guess is that the other guys won't roll over and play dead without a fight. The result will be a terrible conflict of protocols, from which there can be only one winner and many, many losers. This is avoidable bloodshed. OK, I over-dramatize, but the "blood" in this case is your money. How would like to be the owner of an expensive but useless radio? Imagine tuning across the 2 meter band and hearing nothing but buzzing from protocols your radio can't decode. Doesn't sound like fun to me.

Does Government Have A Role?

The FCC may have a role, too. Through rule-making or directives, it can help ensure that amateur radio continues to serve its most valued role—emergency response. Ambitious thinkers might even consider the formation of new "digital only" bands for the Amateur Service. Wouldn't that be a breath of fresh air, and help us avoid "turf wars" on existing bands? Surely a sliver of spectrum exists, particularly in areas now being abandoned by public-safety users as they embrace digital communications and trunking protocols on higher frequencies.

These are heady problems, and they won't be solved by your author dropping the FCC an NPRM in the mailbox. We need a good collective period of thought, discussion, and leadership from all concerned.

Whither SS?

The second "new" issue that needs to be addressed is Spread Spectrum, where again, amateur radio seems to be lagging. It seems that the FCC is allowing everyone and their uncle to engage in SS communications while keeping it in the developmental stage for us hams, meaning you and I can't do it under the aegis of our ham licenses. I have telephones that are SS. Wireless computer routers and seemingly a zillion other over-the-counter devices use SS, all adding merrily to the noise floor. The question is, when will you, me, the League, and the FCC get serious about an SS format for amateur Radio? It's the 21st century, and I'm sure we could do our typical ham radio thing by coupling fun, experimentation, and innovation with SS, and who knows what good may result? How can you not have fun with an idea conjured up by Hedy Lamarr? (It's true! Like they say, you can look it up!)

The Keys to Resolution in 2003

All that's needed in these matters is some good, honest, unselfish thinking, some give and take, the cooperation of the manufacturers, the ARRL, and other key players, and we just might get the ball rolling. The digital train is leaving the station, but it's not too late for us to run and jump aboard. It's a project that's achievable in 2003, and it has the potential to ensure there's much more "Magic In The Sky." 73, Jeff, AA6JR

The "Rehabilitation" of ex-KV4FX and N6NHG

Two High-Profile Hams Likely To Be Relicensed

BY FREDERICK O. MAIA,* W5YI

Two high-profile radio amateurs apparently are about to regain their amateur radio licenses after their applications were held up by the FCC for several years. The Commission had designated the pending applications of former U.S. Virgin Islands amateur Herbert L. Schoenbohm, ex-KV4FZ, and the license renewal of famed computer hacker Kevin Mitnick, N6NHG, for hearings before an FCC Administrative Law Judge.

The objective of the hearings was to determine whether Schoenbohm and Mitnick "...possessed the requisite character qualifications to be a Commission licensee." Both had been convicted of felonies involving wireline fraud and computer hacking. Here's a look at the background of both cases.

Herb Schoenbohm, KV4FZ

On April 24, 1992 Herbert L. "Herb" Schoenbohm, KV4FZ, a high-profile St. Croix ham operator, was found guilty in federal court of knowingly defrauding a Virgin Islands long-distance telephone-service reseller. KV4FZ was controversial on the ham bands because he was very vocal in publicly criticizing the operating habits of other operators.

Schoenbohm was born in 1939, the son of a Lutheran minister, and amateur radio has played a major role in his life. He first obtained a ham license at the age of 14, and with his father, founder of the Courage Center in Minnesota, participated in a program to assist handicapped persons to become hams.

During his ham career Schoenbohm received many commendations for utilizing amateur radio during emergencies, including being named by the governor of the Virgin Islands as a "Hero of Hurricane Hugo" for keeping vital communications lines open in the aftermath of the most devastating storm ever to hit St. Croix.

In 1987 Schoenbohm was convicted on three counts of using stolen long-distance access codes which allowed him to make more than $1000 in free long-distance calls (although the prosecution said he was responsible for far more). The access codes belonged to the Caribbean Automated Long Lines Service, Inc. (CALLS) of St. Thomas, U.S. Virgin Islands. Schoenbohm, who also was an official in the Virgin Islands Republican Party, could have received a maximum of ten years on each count.

Much of the evidence at the four-day trial centered on people who received long-distance telephone calls in 1987 from KV4FZ as recorded by the CALLS computer. The prosecution produced 20 witnesses from various U.S. locations, including government agents from the Secret Service, the U.S. Marshals Service, the Treasury Department and the FCC. In addition, anti-Herb Schoenbohm ham operators testified for the prosecution.

Schoenbohm was portrayed as a criminal who had defrauded CALLS out of hundreds of thousands of dollars. He said he believed the case was politically motivated since he had been criticizing a Virgin Islands Congressional delegate. Schoenbohm was suspended with pay from his Communications Chief job with the Virgin Islands Police Department after being indicted and was fired when the conviction was upheld. He was sentenced to two months in prison (later suspended) and two years probation and fined $5000.

Schoenbohm made many enemies on the amateur airwaves, and several ham operators wanted his amateur radio license pulled—and made certain that the FCC was aware of his communications-related conviction.

The FCC agreed that his conviction was "...relevant to evaluating the likelihood that he will comply" with the FCC's rules. In early 1994 the FCC refused to renew his ham radio license and began an enforcement proceeding. Following two separate hearings, the Commission, in July 1998, stripped him of his ham ticket. The FCC did, however, extend the expiration date of the license until all appeals were exhausted, a process which took more than five years.

The Commission found that Schoenbohm had testified deceptively about his conviction in 1995 and again in 1997. In addition, the Commission found that Schoenbohm had testified deceptively in 1997 about an amateur radio transmission he made in 1995, during which Schoenbohm solicited others to make illegal ex parte presentations to the Commission on his behalf.

All of Schoenbohm's appeals ended in 2000, when the U.S. Supreme Court refused to hear the case. His operating authority expired in January 2001. It took the FCC nearly 15 years to get him off the air.

On April 14, 2001 Schoenbohm applied for a new amateur radio license and passed the General exam at an ARRL-VEC testing session. The Commission again designated his pending application for a hearing, to determine if Schoenbohm deserved to be a Commission licensee.

Kevin Mitnick, N6NHG

Kevin Mitnick has been convicted of several well-publicized crimes, including telephone hacking,

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computer fraud, wire fraud, and causing damage to computers. Like Schoenbohm, Mitnick was first licensed as a ham operator when he was just a youngster.

Again like Schoenbohm, the FCC said "...Mr. Mitnick's criminal behavior raises a substantial and material question as to whether he possesses the proper character qualifications to be Commission licensee." The case was heard by Administrative Law Judge Richard L. Sippel in Washington, D.C. on June 18, 2002. Mitnick was represented by an attorney, Lauren Colby of Frederick, Maryland.

Mitnick began hacking computers when he was 16 and continued for approximately 15 years. To him, "hacking" was an "intellectual challenge" which eventually got him into a lot of trouble. He was arrested in December 1988 for hacking computers owned by Digital Equipment Corporation and agreed to a plea bargain that provided for a year in jail and three years probation which expired on December 7, 1992.

In January 1993 Mitnick learned that a parole violation warrant had been issued for his arrest and he skipped town, using false names to avoid apprehension. After two years on the run, he was arrested again in February 1995 and spent the next five years in prison, first in a state prison in North Carolina and then a federal prison in California.

As a result of another plea-bargain agreement, Mitnick admitted that he stole software from various firms and was sentenced to 46 months (which included the time already served) and ordered to pay $4125 restitution. He got out of prison on January 21, 2000 and was placed on probation for three years.

Mitnick's ham ticket expired on December 12, 1999, and he renewed it while he was in prison serving time. He testified that his hobby as an amateur radio operator "...started with his intense desire to learn about and help improve technology and the Amateur Radio Service."

Mitnick's ham radio license was continued during the enforcement proceeding, and his probation officer permitted him to operate on the amateur airwaves. He was prohibited, however, from using a computer. He used his ham station daily.

Evidence of Schoenbohm's Rehabilitation

After going through the hearing process last fall, the FCC reached an initial decision agreeing to let both Herb Schoenbohm and Kevin Mitnick routinely back on ham radio.

The purpose of the hearings was to determine whether Schoenbohm and Mitnick had "been sufficiently rehabilitated" to the point that the FCC could be confident that they "could be relied upon to...deal with the Commission in an honest and forthright manner."

Schoenbohm, in his defense, said that he had worked hard to rehabilitate himself and to overcome the effects of his conviction and "...to demonstrate that [he is] capable of obeying the law and, in particular, the FCC's rules and regulations."

To his credit, when Hurricane Lenny hit the Virgin Islands in 1999, the power supply for broadcast station WSTX

(AM) was interrupted and the station's tower had toppled to the ground. The Virgin Islands Emergency Management Agency asked Schoenbohm to install an antenna to ensure that station WSTX was able to operate "so the public could be informed by FEMA and by the local government agencies on relief supplies." It was considered vital to put that station back on the air, as WSTX was the primary AM station that people listened to during emergencies. Schoenbohm restored the station's antenna and tuned the transmitter so that the station could continue operating. He was commended by the government of the Virgin Islands for his work.

To Schoenbohm's detriment, however, the FCC wanted to know more about the accusation that he had operated ham radio after his license was canceled. It seems that in October 2001, Schoenbohm served as a host for a participant in an international radio contest. The purpose of the competition was to have contestants make contacts with other amateur stations around the world. The contestant who had the highest score would win.

Some months earlier, Schoenbohm had placed a notice on the Internet advising that his home would be available to amateur radio operators who wished to participate in the contest. Steven S. Reichlyn, amateur radio licensee of station AA4V, accepted Schoenbohm's offer. Reichlyn arrived at Schoenbohm's home on October 25, 2001, two days before the start of the contest, and did not leave Schoenbohm's premises until October 29, 2001, after the contest had ended.

The contest began on Saturday, October 27, 2001, at 00:00 Coordinated Universal Time (UTC) and lasted 48 hours. Reichlyn operated from inside Schoenbohm's house, a single-level dwelling that is "basically a very open area that is separated only by...windows [that] are all louvered." Reichlyn became fatigued and stopped transmitting at 0627 UTC, October 27th. He asked Schoenbohm if he would like to operate, since he was an expert at operating on low frequencies. Schoenbohm said he "reluctantly accepted" and began operating the equipment under Reichlyn's callsign from 0627–0758 GMT.

Schoenbohm contacted multiple operators during that period, including hams in St. Martin, Scotland, the Canary Islands, Mexico, New Zealand, Costa Rica, Ireland, Cuba, Antigua, and Aruba. Although Reichlyn did not stay in the equipment room with Schoenbohm at all times, Schoenbohm believed that he was supervised by Reichlyn during this period because Reichlyn remained on the premises, stayed within earshot of his transmissions, and observed his operations.

Reichlyn resumed operating at 0758 GMT and did not ask Schoenbohm to take over for him again until the following day. Again, during this second time period, Reichlyn "did not leave the premises" and was "always in a position to exercise the necessary controls to comply with the rules and regulations."

Schoenbohm was very aware that Section 97.115 of the Commission's Rules prohibits certain communications involving a "third party." However, Schoenbohm did not believe that he violated Section 97.115 since he operated radio equipment under Reichlyn's callsign and supervision. As Schoenbohm understood that rule, he would be prohibited, as an unlicensed operator, "from passing messages to third parties." However, the rules would not prohibit him "from being a voice behind the microphone to establish the communication" with another operator. Schoenbohm also understood that as long as a licensed operator supervised the transmission, an unlicensed operator could "speak into [the] microphone." The FCC judge apparently agreed with the Schoenbohm testimony.

The FCC also found that Schoenbohm has not engaged in any criminal misconduct since his 1992 conviction for fraud. In addition, for about the past eight years Schoenbohm has held a responsible position with the government of the Virgin Islands. In that position, Schoenbohm has been in charge of expenditures and supervision of large amounts of money and property. During this time, no one has accused Schoenbohm of any dishonesty in connection with his work.

Schoenbohm's reputation for good character was also confirmed by his current employment record, by his conduct during Hurricane Lenny, and by his position as an elected and non-elected official of the Republican Party of the United States Virgin Islands.

In light of Schoenbohm's prominence and notoriety in the amateur radio community, as well as the positions of responsibility and trust he occupies in the Virgin Islands Department of Property and Procurement, it was concluded that the loss of his licenses, and the shame and humiliation that resulted, have had the desired deterrent effect. As Schoenbohm stated, "the fact that I lost the license...is a significant deterrent from screwing up ever again in the future."

As a result, the FCC "concluded that Schoenbohm now possesses the requisite character qualifications to be a Commission licensee, and that the captioned applications should be granted.

Evidence of Mitnick's Rehabilitation

Kevin Mitnick said that he spent the majority of his time since release from prison caring for his sick father, who had suffered a heart attack and later cancer. His father passed away on July 4, 2001. During the time he cared for his father, he said he "...reflected on what he had done with his life and decided to turn his life around and dedicate his life to a career in broadcast radio, public speaking, and writing to help government, businesses, and individuals minimize the risks associated with computer intrusions." Toward that end, he said he testified before Congress in March 2000

on the reliability of federal government computer systems and provided information to the U.S. Commission on National Security on protecting U.S. national critical infrastructures. He also co-hosted a weekly Los Angeles radio show called "The Darkside of the Internet" about demystifying the internet for the public and helping people and businesses better protect their privacy and security when using the internet and telephone systems.

During the first half of 2002 Mitnick co-wrote a book focusing on how computer systems and confidential business information can be compromised, and he is now looking into hosting a nationally syndicated talk show.

Mitnick testified that it "...was never his intent to profit or otherwise harm the victims. His motivation was to learn about technology by exploring computer systems and networks, and to enjoy the intellectual stimulation of outwitting other programmers." He said he now realizes and regrets that his actions did cause harm and damage to others.

Mitnick said he has matured and that hacking is young man's crime you eventually grow out of. "Right now my goals in life [are] to live a productive life, to earn a living, and try to make up for all the time that I lost and try to be a productive citizen."

The FCC agreed that it appears Mitnick now possesses the appropriate character qualifications and that the evidence of "rehabilitation is significant."

"Mitnick has been using his [ham] radio regularly since his release; and given his notoriety and the amateur radio community's penchant for self-policing, we find it significant that there have been no complaints regarding his radio operations," the ALJ wrote in an opinion released Sept. 19, 2002. "Mitnick's post-prison conduct demonstrates his rehabilitation, notwithstanding the relatively short period of time since his release from prison."

The judge agreed that "Kevin David Mitnick committed serious crimes [but] has paid his debt to society, both with five years of imprisonment and by apologizing and making restitution to many of the entities harmed by his crimes. The evidence indicates that he has experienced a dramatic change of attitude and is living the life of a responsible citizen. It is concluded, therefore, that he has been adequately rehabilitated and that he possesses the requisite character to remain a Commission licensee. Accordingly, the applications of Kevin David Mitnick for renewal of his amateur station and operator licenses should be granted."

On October 9th, CNN posted a story about how "computerist terrorist" Kevin Mitnick is auctioning off his autographed laptop computer, a Toshiba 1960CS, on eBay (high bid was over $5000). According to CNN, "Mitnick said he will use the money to pay an attorney who has been trying to get his revoked amateur radio license back."

The final decision in both cases lies with the full Commission. While it is unlikely that the commissioners will disagree with the findings of the Administrative Law Judges, it is possible, and no decision had been made as of press time.

73, Fred, W5YI

public service

BY BOB JOSUWEIT,* WA3PZO

Ham TV in Public Service

Each month we write about various forms of public-service and emergency communications hams provide. Traditionally, this focuses on voice communications. Last month we mentioned how the internet was used to link together various ARES and RACES groups during Hurricane Lili. This month we take a look at the visual medium we call *television*. The old saying of a picture is worth a thousand words certainly holds true in public-service and emergency communications.

Why Use TV?

In times of emergency, often a ham can go to a particular location to radio back to the command post or emergency operations center what he or she is seeing. This could lead to interpretation by the persons on the scene, the radio operator receiving that information, and then the message being sent to a key official. If there is a lot going on at the scene, it may take the ham a long time to describe what is happening. Let's look at a few situations in which television would help.

An airplane crashes into a river near a large metropolitan airport. There are small islands in the river. Emergency personnel arrive on the river bank to assist. They can't see the airplane because one of the islands blocks the view of the crash site. A camera on a boat near the crash site could send pictures back to the main command post.

An accident has occurred at the local nuclear power plant. Officials need to determine how large an area to evacuate. Wind speed and direction are changing rapidly. A picture of the smoke plume coming off of the cooling tower could give an immediate indication of a change in wind direction or speed.

TV is Not All the Same

Two forms of television are common in amateur radio—Slow Scan TV (SSTV) and Fast Scan TV (FSTV), more commonly called ATV. Both send a picture, but the type of reception is different. SSTV can be compared to a color fax coming across your screen one line at a time. The reception and picture quality depend on the signal, monitor, computer, and software. On HF you can hear SSTV signals on 20 meters between 14.230 and 14.233 MHz.

SSTV is not limited to the HF bands. A few years ago Kenwood introduced the VC-H1, which combines an image-scan converter, CCD camera, and LCD monitor. When this compact, battery-operated unit is hooked up to a Kenwood transceiver, you are able to send and receive color images over the air. Some groups use it during a Skywarn activation. The EOC runs MMSSTV software and then is able to send radar updates to the spotters in the field, as well as receive weather pictures and damage reports. Midwest Skywarn spotters have reported capturing pictures of tornadoes, which they sent to the EOC. There the picture was save as a file and e-mailed to the National Weather Service office within seconds. MMSSTV is free SSTV software for amateur radio use.

FSTV requires much more bandwidth than SSTV, but delivers pictures of a quality similar to commercial television. Many operators will send weather radar images via FSTV. However, very few spotter training programs include a course in how

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Severe Weather Strikes Hams are There

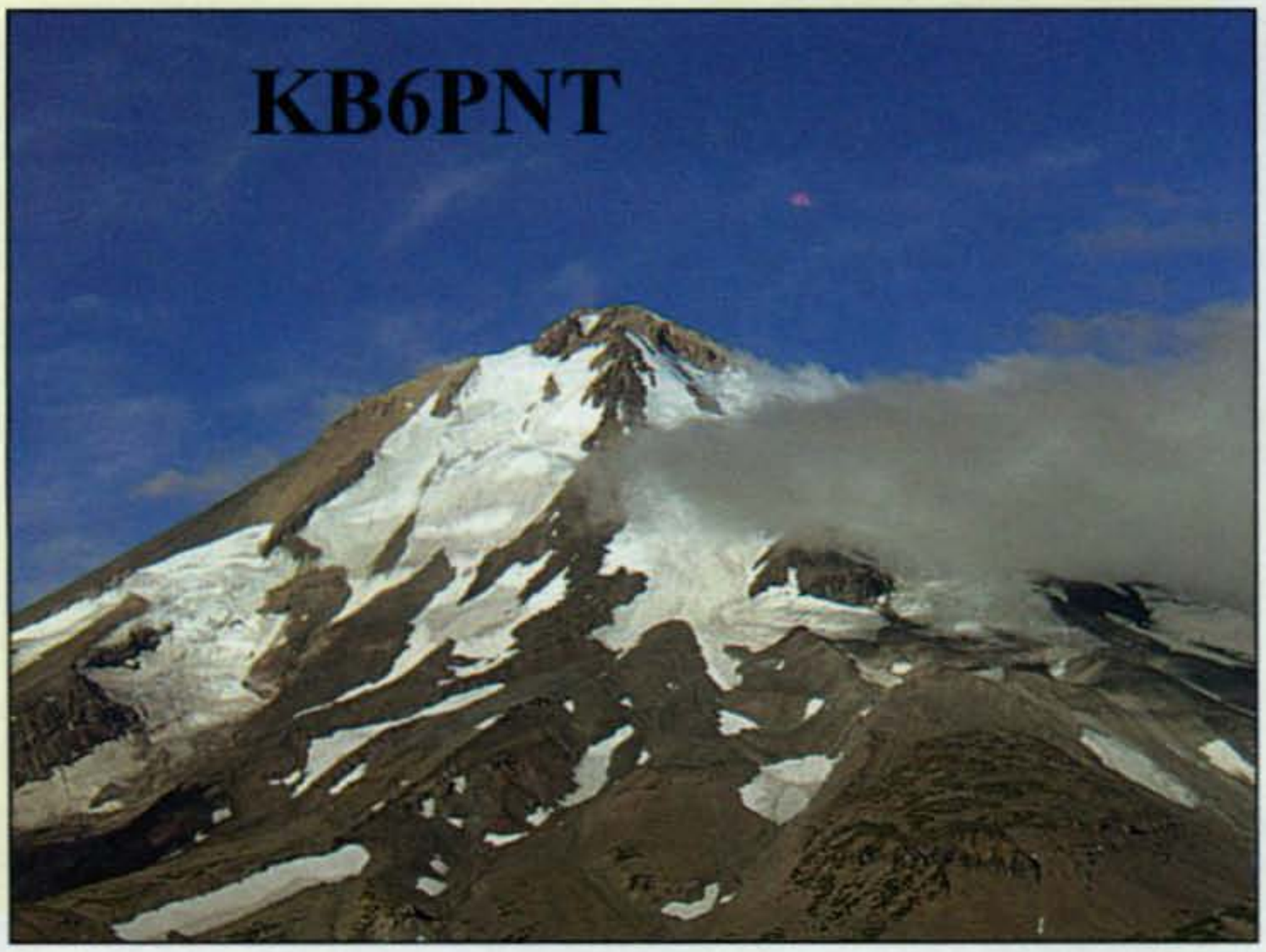
At deadline for this issue of *CQ*, amateur radio operators were activated to provided emergency communications in parts of Ohio and Tennessee.

On November 10, 2002 a series of devastating tornadoes and severe storms ripped through Tennessee, Ohio, Alabama, Pennsylvania, and Mississippi. There were additional reports of large power outages in the Carolinas. In Van Wert County, Ohio, local emergency management officials reported that the whole northwest corner of Van Wert was gone. Early estimates indicated that a strong F-4 tornado touched down. An F-4 tornado can carry winds of up to 270 mph. As of this writing, there were at least two deaths confirmed in the county, with rescue efforts still going on. Nationwide the storm was responsible for at least 33 deaths and more than 100 injuries. Members of the Van Wert Amateur Radio Club responded to the disaster. They had met in the emergency management offices and completed Skywarn training last year. (The club also gives back to the community by contributing funds to community causes.)

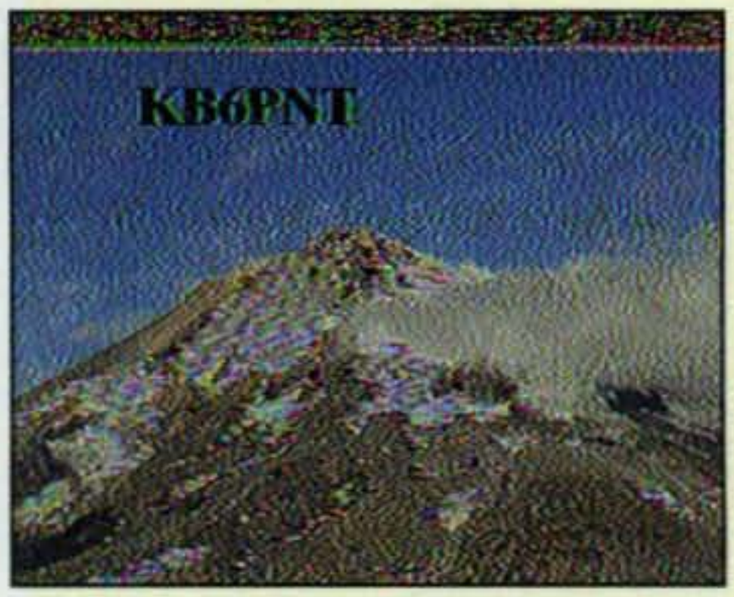
Mayor Steve Gehres said, "I want to thank the city police and fire department for their quick response and dedication, also the Sheriff's Department and State Highway Patrol, and the Red Cross and their volunteers, the EMA, the amateur radio club, and the people in the hospital who responded immediately to take care of our people."

In Lisbon, Ohio, Skywarn spotters were keeping an eye out for severe weather Sunday night as it went through the region. Emergency management officials decided to activate the system at 6:00 PM. This alerted 30 ham radio operators and emergency personnel to watch for potentially severe weather. Within a few hours most of this weather had passed.

In Tennessee at least 45 people were unaccounted for in the rural town of Mossy Grove as of this writing. Sunday night a tornado cut a path 5 to 6 miles long, killing at least seven people in the town. News reports indicated that telephone lines were down and roads were blocked. With phone service out, emergency crews had to rely on ham radio operators for communications. There were fears that the death toll would rise in the town. As one officer described it, "Mossy Grove is destroyed."



"Before" picture of the north face of Mt. Shasta (14,192 ft. elevation) as sent to the California OES Sacramento via SSTV on 7232 kHz. (Photos courtesy Nannette Thorne, KE6MZT)



Picture of the north face of Mt. Shasta as received at California OES Sacramento via SSTV with "less than optimal" band conditions.

to interpret weather radar. If you are going beyond your role as a communicator, it is important to make sure you have training in that area.

SSTV Put to the Test

In October 2002 the California Office of Emergency Services and members of the Siskiyou County ARES team successfully completed slow-scan television tests during the annual ARRL Simulated Emergency Test.

Nannette Thorne, KE6MZT, the Siskiyou-Modoc County Emergency Coordinator, reported that the test simulated seismic activity occurring on Mt. Shasta (a volcano), and the scenario called for "transmitting SSTV images of the mountain via amateur radio to state OES officials in Sacramento [about 300 miles to the south]." Mt. Shasta is located about 40 miles south of the Oregon-California border and is about midway between the Pacific Coast and the Nevada border. The volcano last erupted in the late 1700s.

The Siskiyou team set up a field station near the north face of the mountain. The station included a digital camera, a Dell laptop computer, and a Tigertronics Signalink interface connected to an ICOM IC-718 transceiver with a G5RV inverted-V antenna supported at the apex by a 25 ft. portable mast and matched with an MFJ-941D antenna tuner. The NVIS antenna sent the signal up and over the 14,192 ft. peak and south to Sacramento. Voice contact was first established on 7232 kHz, followed by the SSTV images.

Thorne continued to explain that the State Operations Communications Center in Sacramento utilized a Kenwood TS-570 matched to a log-periodic beam antenna to receive the voice transmissions and SSTV images. Participants in the test included Mt. Shasta team leader Dave Nicholson, KB6PNT; George Dibelka, AB6UE; David Bell, N2RSI; Terry Bell, N2RSN; and Dave Thorne, K6SOJ. At the State EOC Dave Mauldin, WA6TWJ, was the team leader, along with Ken Wing, N6MPH; Tom Preston, KQ6EO; and Herb Bennett, KA6VHF.

Thorne reported that in spite of considerable interference and fluctuating propagation conditions, the SSTV image was received by California OES and viewed "on the screen." Nicholson is attempting to arrange SSTV nets on 20, 40, and 80 meters with those interested in emergency communications. KB6PNT can be reached at <sissar@inreach.com>.

The Siskiyou County ARES Field Station team on north side of Mt. Shasta during SSTV test, Simulated Emergency Test (S-E-T), October 5, 2002. Left to right: Terry Bell, N2RSI; David Bell, N2RSN; George Dibelka, AB6UE; and D. W. Thorne, K6SOJ.

Amateur SSTV can be another valuable tool in your emergency-communications tool box. All you need is a digital camera, a computer, software, and a radio, and that picture could be of value to those who need the information.

HAZMAT Drill uses ATV

ATV, or FSTV, is more local in use. A group in central Pennsylvania transmitted images over a 17 mile path from Lemoyne to Carlisle, PA. The area is south of Harrisburg, near the Pennsylvania Turnpike.

ARRL Eastern Pennsylvania Assistant Section Manager Pete De Volpi, K3PD, reported that the group had given an ATV demo to the Cumberland County Emergency Management staff. They were so impressed with the demonstration that they requested full-motion video from the drill site to the EOC (Emergency Operation Center). ATV relies on a direct path for a signal. Cumberland County has a rolling terrain, so finding the perfect spot to place a transmitter was not always easy. Considerations included not only the height above sea level, but also the fact that there were over 200 participants and multiple vehicles involved in the drill.

They located a county site that was over 1100 feet above sea level and which served as a good midway relay point for the ATV signal. Because of the frequencies used for ATV transmissions it is important to know your equipment. Here a 16 dB gain, 1.2 GHz loop Yagi was used with a 2 watt FM ATV Videolynx transmitter. A 35 watt linear was placed in the circuit. This produced perfect (P5) pictures. The maximum permissible exposure (MPE) for the station indicated that a person should stay at least 20 feet away from the front of the main lobe of the Yagi.

Steve Gobat, KA3PDQ, and Chuck Greiner, N3WL, brought the REACT van to the site. The van, a former ambulance, was filled with ham radio gear. Several different cameras were used, including one at the end of 150 ft. of coax. The pointing of the 12 ft. long loop Yagi with over 18 dB of gain was very critical. Moving the antenna just one foot was the difference between having or not having a picture. A separate elevation adjustment was not possible, so the brackets holding the mast were adjusted for the most favorable angle to accommodate the 7 mile path. A second transmitter on 434.00 MHz AM was used to send the pictures three blocks to a firehouse. The downconverter output was TV channel 3, so that was connected directly to the TV cable connection on the outside of the building. All TVs in the firehouse could then display the drill video. An attempt was made to send the video to a mobile command post, but problems came up. As one operator put it, "This is why we have drills."

At the EOC in Carlisle, a gain 440 MHz omni antenna was used to receive. The signal's RF was converted to TV channel 3 and was viewed by all the Emergency Management Officials, evaluators, and guests. At the conclusion of the drill, the Emergency Management Officials said that the video far exceeded their expectations. They would like them to do more in the future.

Texas Tornado Requires Amateur Radio Response

In late October last year amateur radio operators in Corpus Christi, Texas provided communications during a tornado which killed one person and caused about two dozen injuries.

ARRL South Texas District Emergency Coordinator Robert Lobaugh, W5JYJ, told the ARRL that Skywarn volunteers and the South Texas Amateur Repeater Club weather station, N5CCW, were activated in advance of the severe weather that hit Corpus Christi. Lobaugh said that ARES teams responded as needed.

Mark Mireles, AD5CA, said amateurs staffed the emergency operations center for 10 hours on October 25 and reported back for another 4 hour shift the next morning. "We have been well-received by all the city officials, from the city manager to the police chief," Mireles told the ARRL, "and I almost have the EMS director talked into becoming a ham." He said amateurs made use of a networked repeater system to facilitate communications.

Philadelphia Hams Drill

Philadelphia emergency management officials requested the help of local amateurs during a mass casualty exercise this past fall. Simulated casualties were transported from Philadelphia International Airport to 26 hospitals in surrounding counties. Hams were responsible for tracking the retrieval of the "patients" from participating hospitals.

While the drill went smoothly, there were a few lessons learned. The patients were picked up by modern tour buses. Magnetic-mount antennas could not be mounted on the roofs because they were not metal. In addition, various electronic systems on the buses caused RF interference to the HTs being used. Better lines of communications were established by switching from 2 meters to 440 MHz. One of the key elements of being prepared was knowing what the back-up frequencies were for each of the counties. In fact, one suggestion that came out of the drill was for all members of the local ARES groups to program their HTs with the same frequency in the same memory channel. With as many memory channels as there are available on modern radios, surrounding county repeaters that are used for emergency communications can also be programmed so that if there is a need to provide assistance across county lines, local operators are ready.

Goals for 2003

Many of us make New Year's resolutions. Maybe some are broken a few days into the new year. Maybe others are forgotten by the end of the month. As we move forward into the new year, has your ARES, RACES, or club made some resolutions or set some goals for 2003?

If you're looking for a possible start to the list, here are some that may be beneficial.

1. Take at least the ARRL Emergency Communications Level 1 class.
2. Take other ARRL classes or a selection of FEMA, Red Cross, or Skywarn classes during the year.
3. Is your group identified to the general public by using vests, hats, badges, etc.? Make that a project in the new year.
4. Are your emergency plans, rosters, and other documentation up to date?
5. Have you put together your "go-kit"?
6. Have you experimented with an NVIS antenna? Do you know how to assemble one?
7. Do you know how to operate the equipment at your club station or EOC?
8. Are you familiar with some of the newer amateur radio modes including ATV, SSTV, PSK31, IRLP, Echolink, etc.?
9. Does your group have an effective public-relations/news-media relations program to publicize your group's activities?
10. If you participated in a drill last year, have you taken steps to make improvements should you be called at a moment's notice?

Providing a Public Service

This month we reported on several events where hams served in the public interest. Many of these stories could not be told without help from you. This month I want to thank Nannette Thorne, KE6MZT; the EMCOMMWEST Bulletin; Pete De Volpi, K3PD; and the ARRL for providing information.

Do you have a story to tell? Drop us a note. Until next time . . .

73, Bob, WA3PZO

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beginner's corner

BY WAYNE YOSHIDA,* KH6WZ

Go Fly A Kite: Getting Back to Basics

I recently spent a sunny Saturday afternoon at a local park. I was on a hilltop location, overlooking the ocean. Temperatures were in the upper-70° Fahrenheit range, with a nice ocean breeze (I live in southern California, where winter doesn't exist.). There was a slight salty taste in the mist that floated by. A local cultural event was taking place in the outdoor venue below. Sounds of exotic dance music filled the air . . . and I had decided to leave my radio in the car on this trip.

I noticed a young couple flying an elaborate kite—a very fancy, multiple-tetrahedral flying machine with lots of colors, and quite aerobatic. It made a flapping, zipping sound as it turned and dived and pulled upward and back and forth across the sky.

I went in for a closer look, and watched the man have fun diving and spinning the kite. I asked him about the kite, and he was pleased to tell me all about the details and its construction. The body was made of sections of Tyvek® and rip-stop nylon; the spars and skeleton were made of fiberglass tubing and rods. The 200 feet of flying "line" was braided Dacron®, and the control handles were made of aluminum tubing and cushioned for comfort. He had just spent over 200 bucks on his kite.

Then I thought of something. The spectacular, complex flying machine had one very basic attraction—the simple, pure joy of flying a kite. As his wife said, "He's just like a kid again." Back in my day, our kites were made of lightweight wood covered in tissue or newspaper, and the flying line was actually called "string." If we went the "store-bought route," the kite cost a dime.

This is very similar to my ham radio experience, and that of many others, I am sure. When I started out, Novice was strictly a CW-only license, and although radios were available with solid-state finals, most of us trusted the "hybrid" radios with solid-state receivers and tube-type transmitters (the 2BY7A driver tube and 6146 finals) instead.

My first rig was a very old hand-me-down with a tradition: I got it from a friend, Bob, WN6AFR (now KA7CRE), who got it from his cousin, also a ham. Bob told me to continue the tradition by giving the transmitter to another fellow ham just starting out. The transmitter was an EICO 723, a 60

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For one reason or another, Novice station WA6SGH, a vintage-radio setup, was never on the air. (Photo by KH6WZ)

watt, crystal-controlled CW-only transmitter. I remember I had only a single 40 meter crystal and it had a slight chirp, making my signal "unique." My receiver was an old Collins (!) 75A-3. That old receiver took up the entire desktop and had 18 tubes inside. Needless to say, when the station was powered up, the room became quite warm. Since I was living at home with my parents, I never gave much thought as to how much the electric bill was each month. I am sure it raised my dad's eyebrows as he wrote the check to the electric company each month.

Although I made plenty of pretend QSOs into the light-bulb dummy load, unfortunately there never were any real QSOs from WA6SGH. It could have been for a multitude of reasons, but ham radio took a "back seat" as I left home and went on to college.

Fast forward to a few years later. Now attending UCLA, one of the first things I noticed on the campus in Westwood was a beautiful four-element, tri-band quad and a two-element Yagi on 40 meters on top of Boelter Hall, the engineering building. My ham radio interest was re-ignited, and I went over to The Penthouse to see what was going on and to meet the hams who were lucky enough to operate that legendary station, W6YRA. I figured I would become a member of the club and get some radio time—in between classes and exams, of course.

I really did get some radio activity. Somewhere between classes and work and other things, I managed to upgrade to General. I do recall that working the ARRL Novice Roundup *(since discontinued—ed.)* was the best thing I did for my CW skills. I was introduced to multi-single contesting, pulling "all-nighters" in front of (and sometimes in back of) the HF radios. I remember listening to the radio connected to that big quad for the first time. Signals were not only strong, I heard prefixes I never even knew existed from countries I had to discover by looking them up in an atlas. It was a great time. I even became club president for two consecutive years.

In case you are wondering, yes, just before I graduated I did find a beginner to give that transmitter to, but we lost touch years ago.

Today my station equipment list is a little bit more extensive, and even includes a computer, something I thought would never happen. "Computers and ham radio don't mix," I used to say. How untrue that is now. I really was young back then.

My current HF rig is all solid-state, with microprocessor control and digital signal processing (DSP) built-in. It covers almost every ham band available, from 160 meters through 70 cm, operates in just about every mode, and is small enough to fit into a laptop carrying case. Not so long ago, I thought DSP was something you add to your breakfast cereal.

I operate the 2 meter and 70 cm bands with a tiny HT that even has 6 meter capability, and in the car I have an APRS (Automatic Position Reporting System) station that fits in a cigarette-size package and a dual-band transceiver that puts out 50 watts and fits in the palm of my hand. There is not a single tube in my ham station, except for the computer monitor. Well, yes, there is an old Collins 30L-1 amplifier in the closet waiting to be pressed into service someday. So okay, that's a rig with four tubes inside.

Even now, though, I have that same feeling whenever I turn on my radios. I still enjoy the very basic feeling that is the core of ham radio—the joy of using technology to communicate and exchange ideas and thoughts with others next

door or thousands of miles away. My ham radio operations now include community service (Huntington Beach RACES), adding a new purpose to my ham radio communications.

As licensed amateur radio operators, we struggled to learn the ins and outs of our technical hobby. Some stations are super-incredibly elaborate, while some are very modest. However, let's not forget that there is the simple, pure joy in what we choose to do with our ham radio—communicating with others and making friends.

73, Wayne, KH6WZ

Introducing Wayne Yoshida, KH6WZ

With this issue we welcome a new Beginner's Editor, Wayne Yoshida, KH6WZ. Wayne continues a long-standing CQ tradition of welcoming and encouraging new hams...a tradition that goes back to 1951, when CQ launched the first Novice column in any amateur magazine. The original Novice Editor, Carl Drumm, W2GJV, was succeeded by ham radio luminaries such as Herb Brier, W9EGQ; Don Stoner, W6TNS; and Bill Welsh, W6DDB. Many of today's old-timers credit the folks who have held the reins of CQ's beginner's columns with helping them get on the air and keeping them interested and enthusiastic even when local hams were less than welcoming to them. Today, once again, CQ is the only U.S. amateur magazine with a column dedicated to new hams.

We asked Wayne to provide us with some personal background so you can get to know him. Here's what he told us...

CQ was the first amateur radio magazine to devote a regular column to new hams, starting with the "Novice Shack" column, which debuted in late 1951. Today it is once again the only U.S. amateur radio magazine with a column devoted especially to new hams.

I've been licensed since 1976, just when the "WN" prefixes for Novices were being phased out. My Elmer and I were hoping to get the callsign KA6AAA or something similar to that. When my "ticket" arrived, we were surprised to see a "recycled" callsign, WA6SGH, printed on the license.

While attending the University of California at Los Angeles (UCLA), I operated many contests from club station W6YRA with my fellow Bruin ham operators. I was probably the only English major who hung out at the engineering labs back then. I had as many as a dozen declared majors while in school, and ended up with a sociology degree and the hopes of going to law school.

Alas, I was getting weary of books and such, and found a job with the ARRL working at the Public Information office and reporting to Peter O'Dell, WB2D, then KB1N. My most memorable experience at the ARRL was working in the Press Room at the NASA-Johnson Space Center (Mission Control, Houston, Texas) during the first manned ham-in-space mission, STS-9/SpaceLab-1, with Dr. Owen Garriott, W5LFL (1983). Peter and I passed information about the ham radio operations aboard SpaceLab-1 to the worldwide news media.

To say that amateur radio had a significant influence on my life is an understatement. After working at the ARRL for two years, I left the snowy winters behind and moved "back home" to sunny southern California. I landed a job with a ham radio and consumer electronics company and stayed with them for almost a decade. I've been to hamfests all over the country, as well as overseas conventions. I wrote text for the advertisements for various radio products, edited operating and service manuals, visited radio dealerships, and "took care of business" selling ham radio equipment.

I enjoy HF contesting, and especially DXpeditioning for the CQ World-Wide DX Contest. I have operated from several locations in the Caribbean, most recently from Barbados, with my old friend Dean, 8P6SH, under the contest call 8P4B. I am active in Huntington Beach RACES (<www.hbraces.org>), and participate in as many events as time allows. Although not an engineer, I enjoy tinkering with the "hardware side" of ham radio and always have "something brewing" on the workbench. I am looking forward to sharing some of my stories with you, and I would enjoy hearing about your experiences, too.

We welcome Wayne to the Beginner's Editor chair and wish him a long and successful tenure.
– W2VU

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SRM-30	25	30	3½ x 19 x 9¾	7.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M	20	25	3½ x 19 x 9¾	6.5
SRM-30M	25	30	3½ x 19 x 9¾	7.0

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BY DAVE INGRAM,* K4TWJ

Spider Webs, Vacuum Tubes, and Fun Galore!

Happy 2003, friends! The new year promises to be absolutely terrific for amateur radio, and with the help of Peter Demmer, KH6CTQ, we are kick-starting it in high style. How so? This month's column features a neat two-tube trans-receiver with genuine spider-web coils. It is a mini-rig you can homebrew and have fun using on the air right now, and a radio with more glitz and glamour than the law allows.

You have never dinked with spider-web coils? That's a sheltered life for sure, but where there's interest, there's hope! Once exposed to spider-web coils, you may even get hooked on them and start integrating them into other homebrew projects, and that's fine, too! In fact, we will even support your new-found addiction by following this month's feature with an easy-brew antenna tuner also designed by KH6CTQ and also using a snazzy spider-web coil. Join the low-cost homebrewing fun with us, and you too will soon agree that nothing compares to the real radio class, flash, and heartwarming beauty of spider-web coils—especially those made by KH6CTQ.

We also understand Peter will make or custom cut his clear Lucite™ coil forms for others at a reasonable cost. Wind these critters with striped insulation solid wire, and you have a sheer work of art. What else could one want?!

That's enough of the preliminaries. Now let's discuss the rig!

Photo A– Front view of the two-tube trans-receiver with spider-web coils built by Peter Demmer, KH6CTQ. The unit consists of a regenerative receiver and a 5 watt transmitter for 40 meters, and can be homebrewed as is or modified/expanded according to personal preference and creativity. (Photo courtesy KH6CTQ)

Trans-receiver Overview

This unique trans-receiver is made up of a basic one-tube regenerative receiver and a separate one-tube, push-pull transmitter, both using 12SN7 tubes. The circuits are adapted from similar units described in the 1936 *Jones Radio Handbook* and modified (by Peter) to use spider-web coils. Why spider-web coils? We could cite their high Q and good coupling abilities, or their flat physical nature and space-saving design, but the bottom line is they just look great—and work well to boot!

As described, this little gem covers 40 meters with good sensitivity and 3 to 4 watts output. The coils could, of course, be altered and the crystal changed for operation on 30 meters or even 60 meters when it is opened for general amateur radio use. Think about that and you surely will agree that using such a beautiful, old-time rig on a new amateur band would be a real attention grabber—like driving a 1936 Ford on a recently completed freeway!

Peter built his little marvel "open air style" on an approximately 11 by 7 inch board with an aluminum front panel, so all of its beauty is immediately visible. As you study the photos of the rig and the circuit diagram (photos A and B and fig. 1), you may discover some minor variations (such as a single- rather than dual-section antenna-tuning capacitor). Don't be alarmed. Peter just used components he had on hand to start (version one, so to speak), then upgraded the rig after photographing it. This also brings up another noteworthy point: This is a "semi-concept" type project; that is, you can homebrew an exact copy of it or you can add your own modifications, expansions, and "junkbox changes" any way you desire. In other words, it is a project

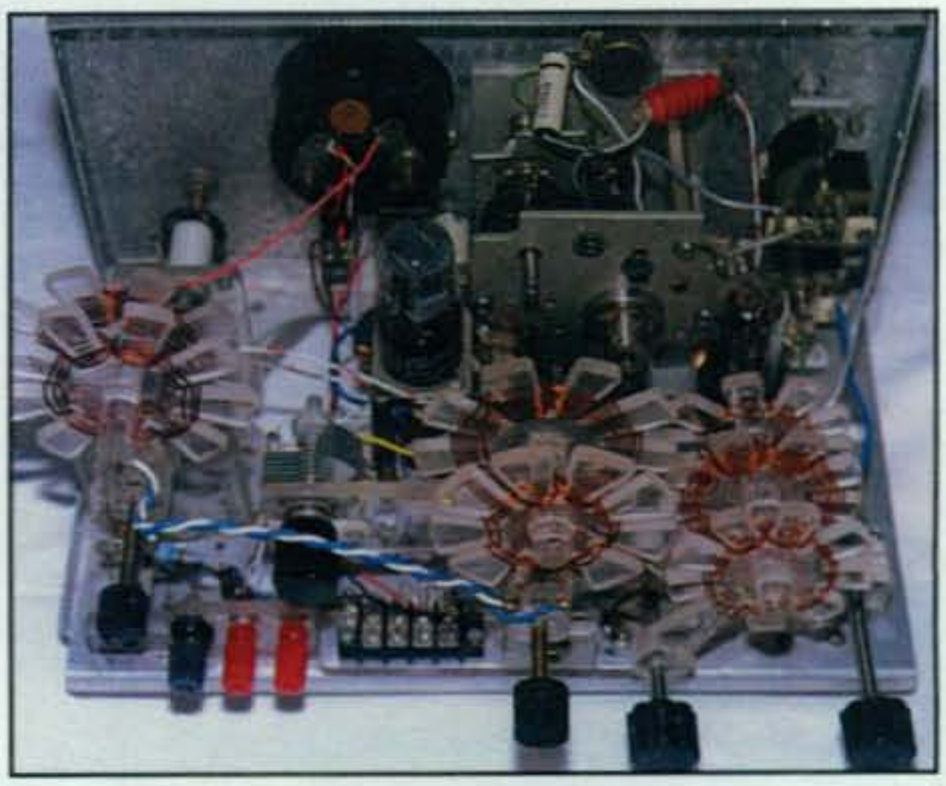

Photo B– Rear view of the KH6CTQ mini-rig. Dual spider-web coils on the left side are in the transmitter's output circuit. Dual coils near the middle are in the ATU circuit, and triple coils on the right side are the receiver's "regen" link, main tuning, and antenna link. Three of the five rear knobs move coil forms left to right to vary coupling. (Photo courtesy KH6CTQ)

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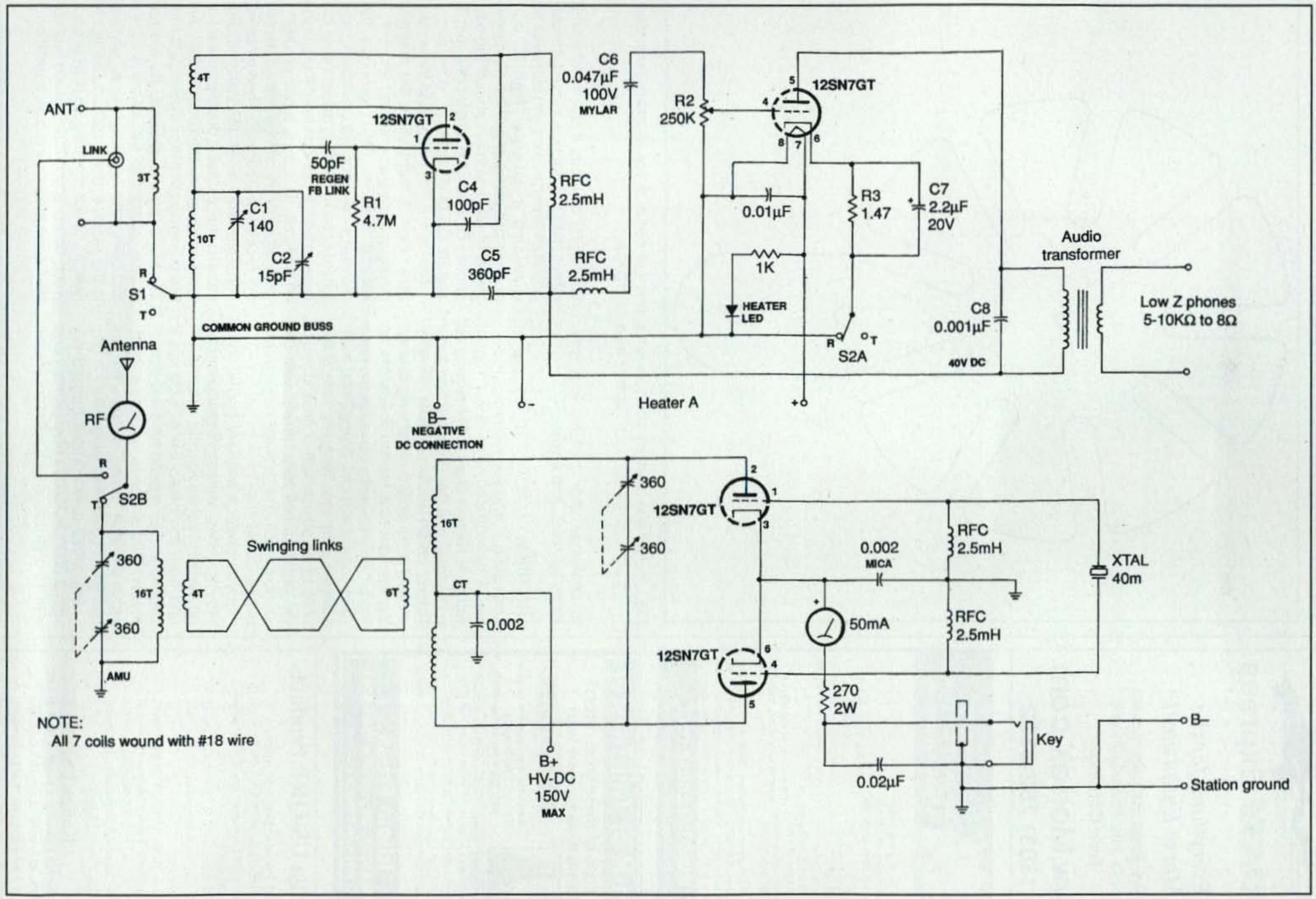


NOTE:
All 7 coils wound with #18 wire

Fig. 1– Circuit diagram of the KH6CTQ mini-rig, which was inspired by similar circuits in the 1936 Jones Radio Handbook.

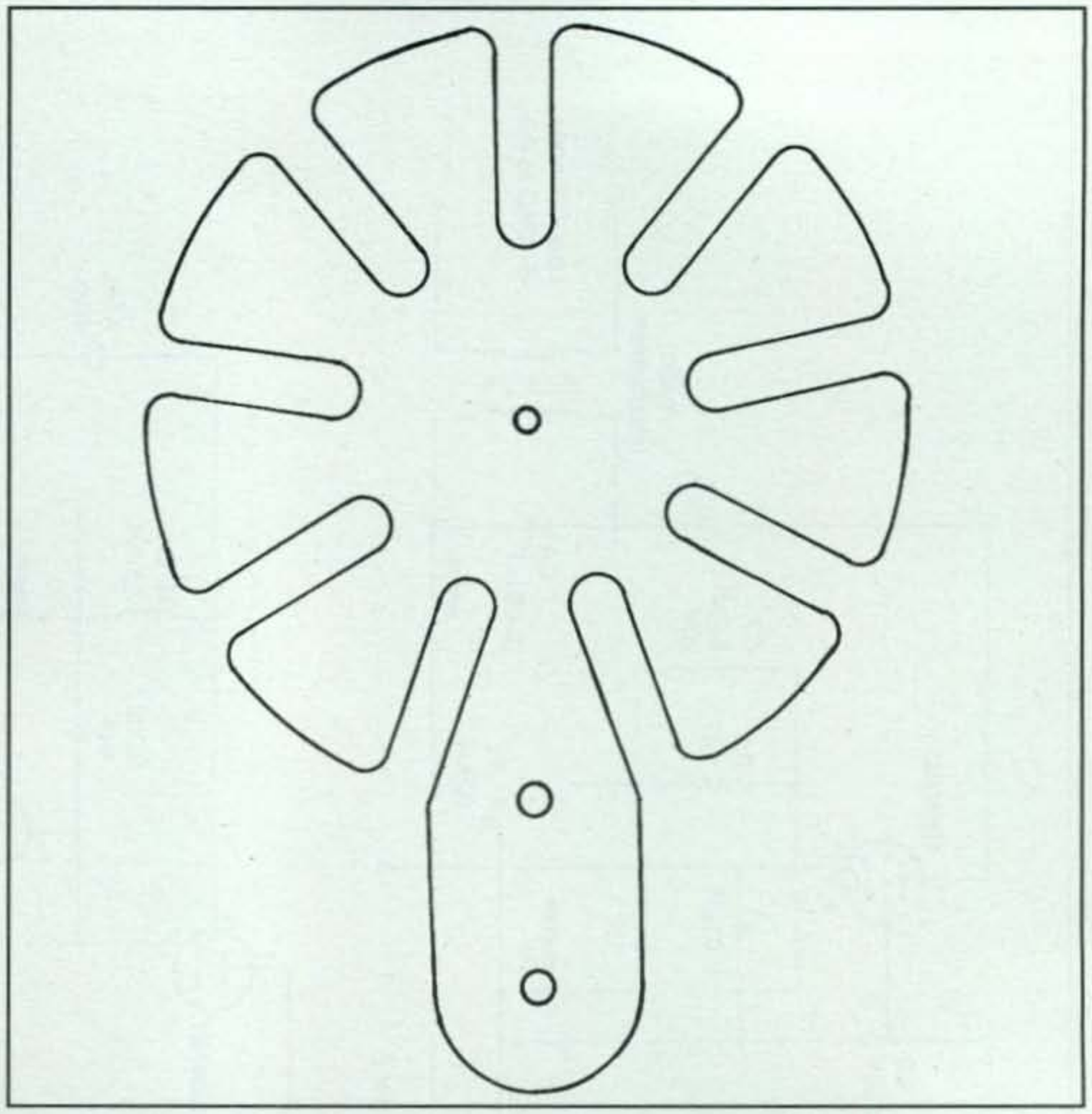


Fig. 2– Full-size pattern you can copy and cut out or trace to make your own spider-web coil forms.

to challenge your creative ingenuity. Have fun, dink, and enjoy!

Circuitry

Look at fig. 1 and you will notice the receiver's circuit is a conventional "regen" with one section of a 12SN7 serving as a detector and the other section functioning as an audio amplifier. Regeneration is controlled by moving or varying the four-turn feedback link/coil on the tube's plate with respect to the main (grid-connected) coil. Since Peter triple stacked and mechanically linked the coils to an adjustment shaft and knob, the antenna coil also moves with the feedback coil. This linkage is illustrated in figs. 3 and 4.

If you prefer stationary (rather than moving) coils, variable capacitors can be added in series with the antenna link and from the regen link's "tube pin 2 connection" to ground for level adjustments. This design is included in numerous old-time "genny" circuits. We just jazzed it up with swinging links.

Any small audio-output transformer with a 5000 or 10,000 ohm primary and 8 or 16 ohm secondary will work fine on the 12SN7's output. It just matches the tube's high impedance to modern low-impedance earphones and can even be eliminated if old-style "high Z" earphones are wired in its (the primary's) place. In other words, connect the earphones between the tube's plate (pin 5) and B+ (35 to 45 volts).

Notice the T/R switch has three sections: One (SW2b) shifts the antenna between the transmitter and receiver, a second section (SW1) grounds the receiver's swinging link on receive, and a third section (SW2A) disconnects the receive tube's cathode from the ground on transmit. If desired, a pair of 1N914 or similar diodes can be placed across the receiver's input link. Then by using separate long wires for transmit and receive plus a classic double-contact or "pole changer's telegraph key," full break-in operation is possible. Just wire the key's arm to ground, its (usual) "make" contact to the transmit tube's cathodes, and its (rear) "break" contact to the receive tube's cathode (in lieu of SW2A). Since this little rig is built on a wood board, a common ground buss or "B–" connection serves as a traditional

chassis ground. Peter's inclusion of a "filament on"-indicating LED (with 1K ohm dropping resistor) adds a nice cosmetic touch.

A second dual-section 12SN7 tube makes up this rig's transmitter, with a crystal connected between its grids and a center-tapped spider-web coil connected between its plates. A series-wired dual-section 360 pFd variable capacitor resonates the coil. If desired, a single-section 150 or 170 pFd variable capacitor can be substituted here. It all depends on your junkbox and the components you have on hand. Although filament connections (to pin 7 and 8) are not shown on the "transmit 12SN7," we are sure you will remember to include their wiring, right?

Finally, the antenna matching unit (AMU) is employed for connecting the transmitter to a random-length wire antenna and the swinging links vary output coupling. If desired, a regular dipole can be connected directly to the transmitter and receiver links. This takes time to explain and space is limited, so I will continue with more notes and ideas for expansions in next month's column.

Coil Details

As you probably surmised, the big attraction of this little transreceiver is its unique spider-web coils. These coils date back to the early days of radio and have been utilized in everything from crystal sets to AM broadcast receivers of the 1940s and '50s. They also have a close cousin sharing their limelight—pancake coils. What is the difference? Pancake coils are wound like a single turn of wire continuously spiraling outward. They are flat (like a pancake, in fact)—no pizzazz. Conversely, spiderweb coils consist of wire woven around a spoked form—total class. Spider-web coils are more scarce, but check ten radios from the 1940s or '50s, and you probably will find at least one to study.

Homebrewing your own spider-web coils is sort of like making a box kite. It involves drawing a pattern for the form, cutting out the forms, weaving wire between the form's spokes, and then physically mounting the forms. As a helpful aid here, an exact-size pattern you can trace and use for cutting out your own forms from heavy cardboard or light (1/8 inch) wood is included in fig. 2. Peter's drawings of his great-looking Lucite™ forms plus mechanical details of his swinging-mount concept are also included in fig. 3 and 4.

Since you wind spider-web coils by weaving wire between their forms' spokes, only half the total number of turns will be visible on each side of the form. Start winding from the form's center section and progress outward with each turn while striving for accuracy and neatness. Practicing with surplus wire before winding the actual coils is highly recommended.

For 40 meter operation, the receiver's antenna link/coil should be three turns (two on one side of the form and one on the other side). The "regen," or feedback, link should be four turns, and the main (middle coil in this triple stack) winding should be ten turns. The transmitter's push-pull plate coil should be 16 turns, center tapped at eight turns, and its mating output link should be six turns. The AMU should have a four-turn input link and a 16-turn main coil. All seven coils are wound with No. 16 or 18 solid wire (copper enameled or insulation covered—your choice). The three antenna links and the receiver's "regen" link each consist of only a few turns of wire, so their turns should be positioned near their respective forms'

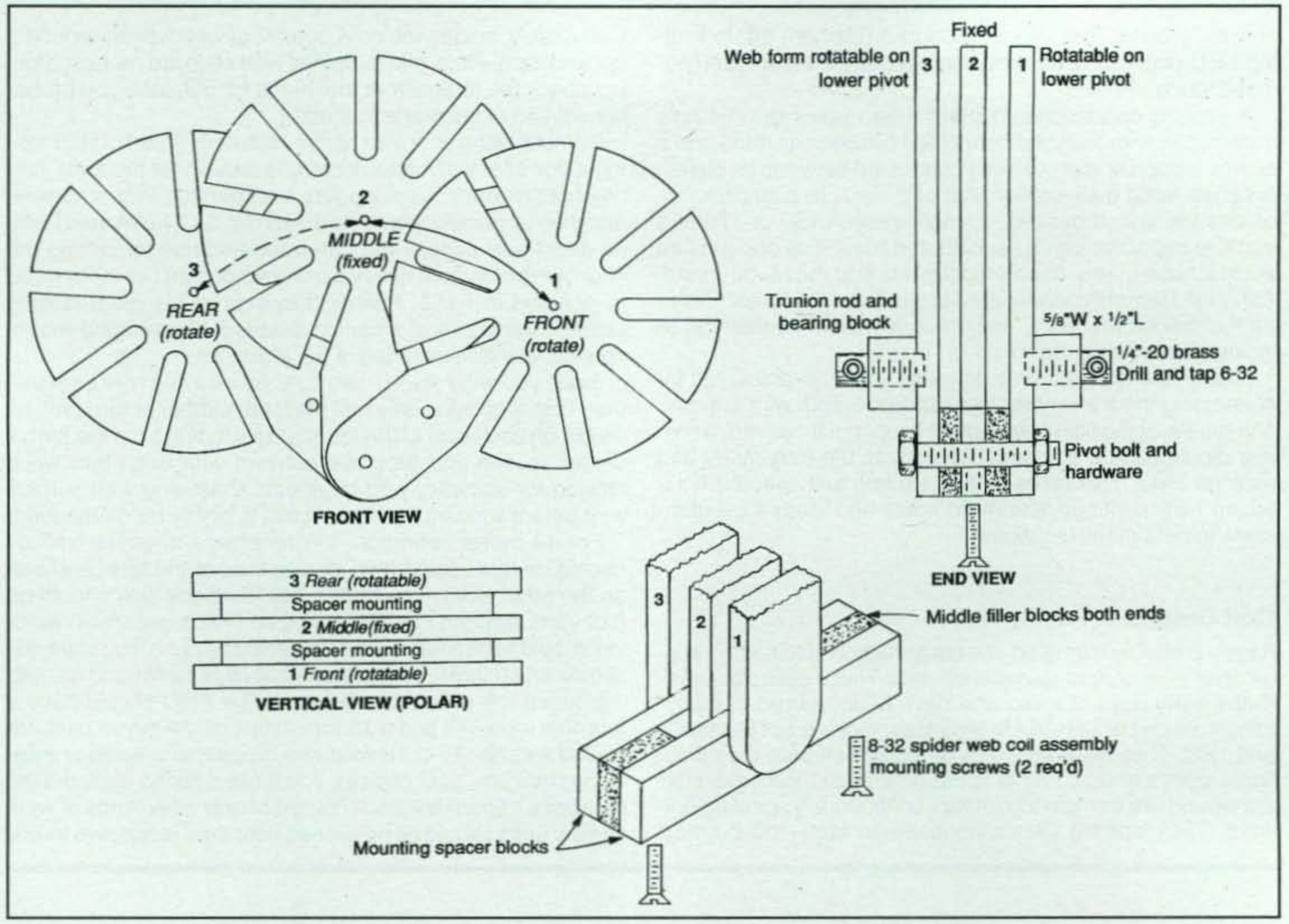
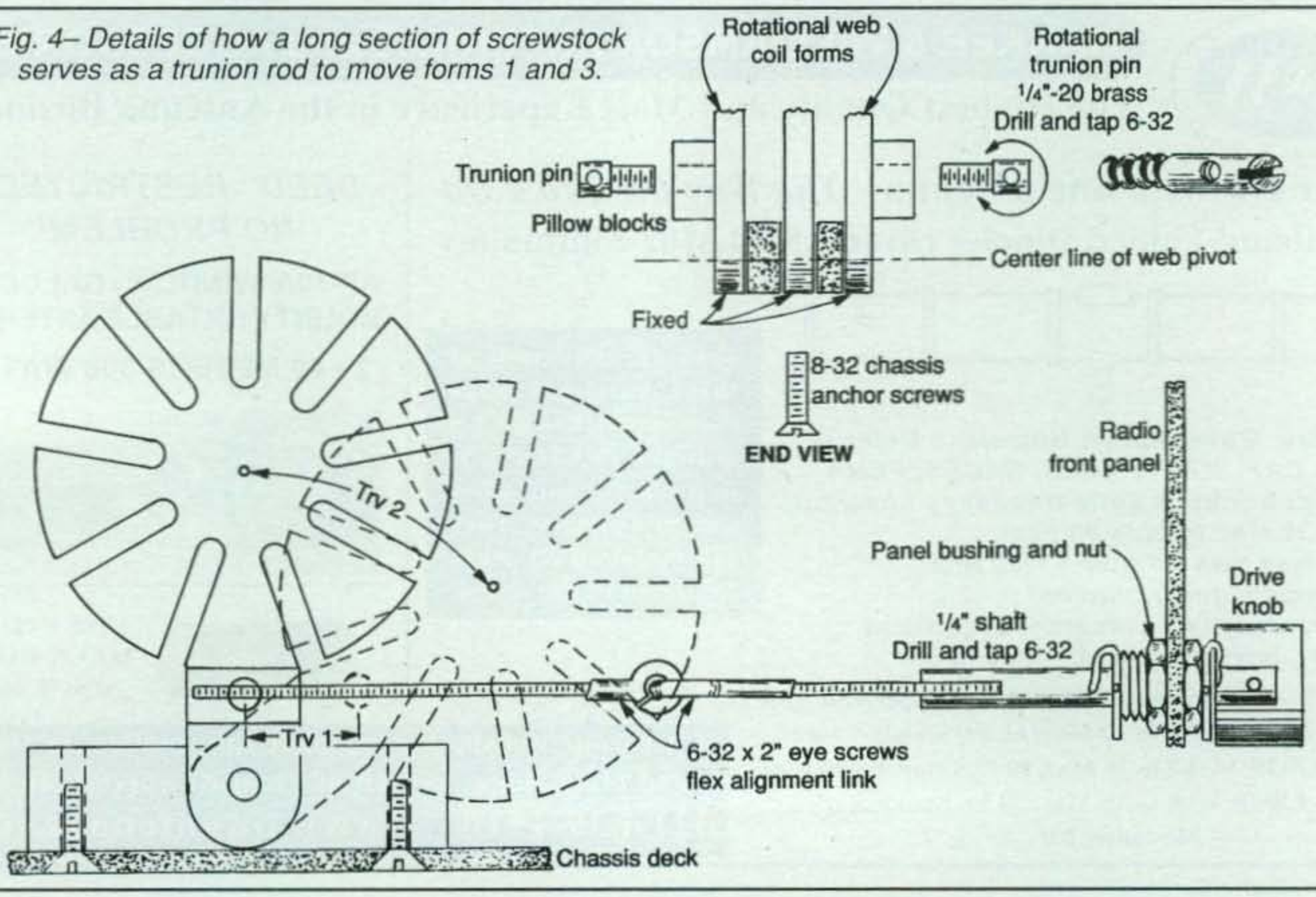


Fig. 3– Assembly and mounting details for "triple stack" receive coils. The front and rear forms (1 and 3) swing left to right, while the middle form (2) remains stationary.

Fig. 4– Details of how a long section of screwstock serves as a trunion rod to move forms 1 and 3.



outer (rather than inner) edge. This mini-rig can also be built to work 30, 80, or even 160 meters, but you must experiment with (scale up or down) coil turns. For 30 meters, a good starting point is eight turns for the main receive coil and 12 turns for the transmitter's plate and AMU coils. The links should work fine as is. Both coil and tuning-capacitor sizes should be increased for 80 and 160 meter operation. We'll have more coil notes next month; stay tuned.

Generally speaking, there are two ways to make the two receiver coils/links and transmitter swinging links adjustable—by moving them forward and backward or side to side. This is where your mechanical ingenuity really comes into play. If you go the straight homebrew route, you might mount each coil set/pair on a long length of screwstock, with double nuts providing back and forth adjustment while holding each form in place. The screwstock could extend through each form's center section or bottom spoke—your choice. Adjustment might be slow, but that's acceptable, as this is a fun project. As an alternative, you can go first class and add side-to-side swinging links as outlined by Peter in figs. 3 and 4. In fact, Peter soon may even offer ready-to-assemble and use swinging mechanisms to complement his Lucite™ forms mentioned earlier in this column. Just contact him directly at 98-1559 Akaaka St., Alea, HI 96701-3051, or via e-mail: <ampruss@lava.netattnpeterkh6ctq> for more details.

Tune-up and Operation

After assembly, you can check receiver operation by touching your finger to the "top"/C6 connection on R2 and listening for a buzz in the earphone. Another way to check is by connecting the "line output" from a portable CD player, etc., across R2 and listening for audio-amplified music. Then connect a receive antenna and adjust the two receive link/coils positions for a right-before-regeneration howl and good CW reception. No luck? Set the "regen link" to produce a howl in the earphones, tune in that signal on a general-coverage receiver, and then adjust bandset capacitor C1 and plot/adjust frequency coverage as necessary.

Checking transmitter operation begins by installing an in-band crystal (An old-style FT-243 type 40 meter crystal is ideal.). Connect a quarter-wave (or longer) wire and a ground to the AMU, preset the tuning capacitors to minimum, and then close the key and quickly tune the plate capacitor for minimum tube current or maximum output power. Then alternately adjust the AMU and plate capacitors until reaching 45 ma of current or maximum output. Double check transmitted signal quality on a modern transceiver, reduce power as necessary to produce a crisp and delightful to copy signal, and then hit the band in high style with a real glow-in-the-dark ham rig. Now that's living the good life!

More Coming Next Month

Although our description this month was quite brief (and may have left a couple of unanswered questions), we overflowed available space. I thus encourage you to tune in again next month when we will fill in the blanks, discuss the fine art of experimenting with circuits ("dinking"), plus present homebrew details of a neat antenna tuner with spider-web coils. In the meantime, enjoy some good on-the-air time every day, and may the force of good signals be with you!

73, Dave, K4TWJ

what's new

BY KARL T. THURBER, JR.,* W8FX

Finger Tip Tappers to PathMINDERS

A very hearty, happy, and prosperous New Year to all our readers! That having been said, let's dig into this month's column. We'll focus on some noteworthy ham shack accessories, antennas and antenna accessories, and software we think will be of considerable interest to you in this brand new year.

Accessories for the Shack

Finger Tip Tapper. A key that doesn't move as you tap the keys represents a new and different approach to sending Morse code, according to Jim Panzitta, N2CAU. He's the inventor of the Finger Tip Tapper, a simple and clever iambic key that's said to be great for backpacking and mobile work. Jim says the key stays in place with no weighted base, helping you to effortlessly send smooth, swift CW with a light touch. The key is a flat, flexible business-card size with a magnetic base. It boasts state-of-the-art tactile contact; a water-resistant, clear-vinyl pouch; and a mini 3.5 mm stereo plug.

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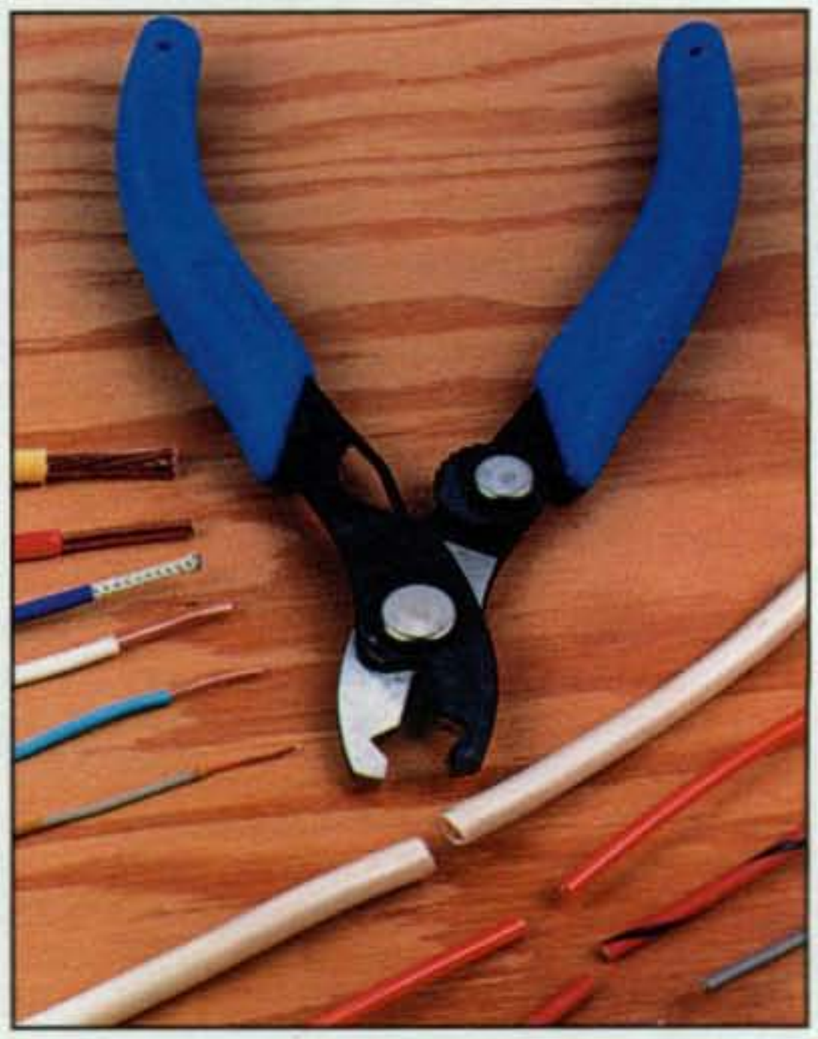

Photo A– The Xuron Model 501 Wire Cutter/Stripper is a combination hand tool that features a thumb-adjustable cam for easily setting the tool to accommodate a variety of wire sizes for stripping, without requiring other tools. (Photo courtesy Xuron Corporation)

Xuron Model 501 Wire Cutter/Stripper. Whether you are wiring a radio, model-train layout, or light fixture, this new specialty tool may be just for you. It's a combination wire cutter and stripper that features a thumb-adjustable cam for easily setting the tool to accommodate the different-

Photo B– Worldradio Antennas has introduced a line of heavy-duty, precision-made trapless monobanders imported from Germany. The 10 meter trapless beam, representative of the ZX series, is shown in this photo. (Photo courtesy Worldradio Antennas)

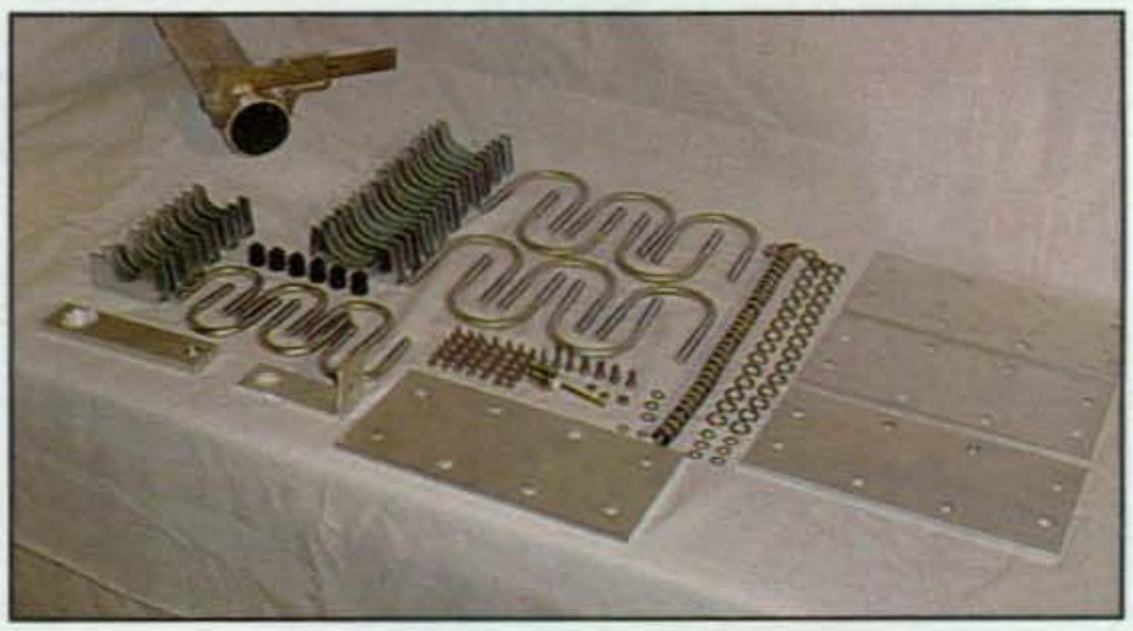

Photo C– The three-element ZX series monoband Yagis imported by Worldradio Antennas feature full-size elements, proper boom lengths, heavy-duty plates, thick-walled tubes with clamps, nuts and bolts of stainless steel, and a water/humidity proof connector. Some of the high-quality hardware is shown here. (Photo courtesy Worldradio Antennas)

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by Lew McCoy, W1ICP

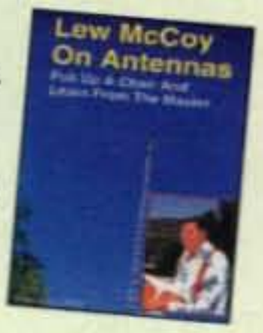

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Photo D– Alpha Delta has introduced the PathMINDER 6 Position Digital Coax Antenna Switch, which has a wide array of safety and operational features not before available in a coax switch. Various alarm, operating mode, and grounding configurations are available. Check out details in the text. (Photo courtesy AlphaDelta Communications)

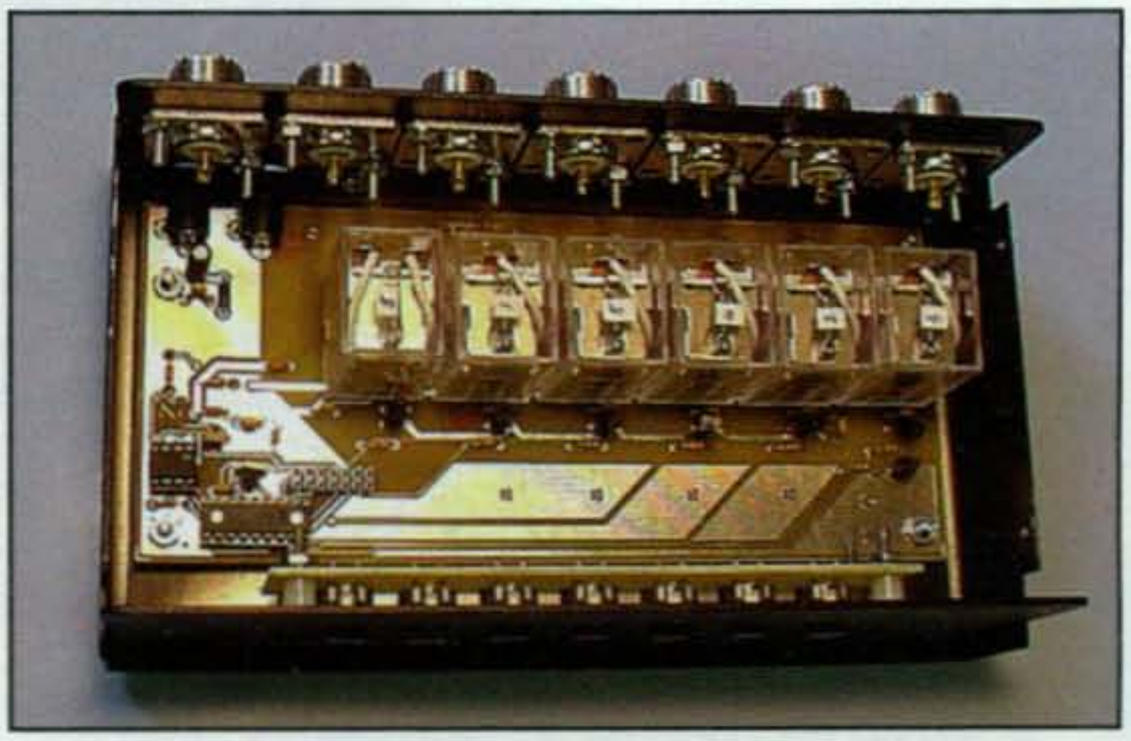

Photo E– Top view of the PathMINDER 6 Position Digital Coaxial Antenna Switch. It has an internal microprocessor and RF sensor that will not allow "hot switching" at levels above 50 watts, which could damage switch contacts and equipment. The unit requires a separate 12 VDC supply voltage for power. (Photo courtesy AlphaDelta Communications)

size wires used for projects by home handymen, crafters, hobbyists, and model builders.

The Xuron Model 501 Wire Cutter/ Stripper (see photo A) accommodates wire sizes from 10 to 26 AWG for stripping, without requiring other tools. The stripper is ideal for those who frequently cut and strip different-size wires.

Manufactured from alloyed steel for durability, the Model 501 is an industrial-grade tool that has been ergonometrically designed to fit large and small hands comfortably. It has XuroRubber™ cushioned hand grips and a Light-Touch™ return spring for ease of use.

For more information, contact Xuron Corporation, 62 Industrial Park Rd., Saco, ME 04072 (207-283-1401; e-mail: <info@xuron.com>; web: <http://www.xuron.com>).

Photo F– The N3IYR S Band Antenna is produced for AO-40 work, but it can be used for any satellite or point-to-point work in the 2.4 to 2.5 GHz range. The waterproof antenna produces 25 dBi circular gain. (Photo courtesy N3IYR Antennas)

Antennas and Antenna Accessories

Imported HF Antennas from Worldradio Antennas. We tend to recognize German products as coming from a nation known for its science and precision engineering. Glen Rudesill, W6RWR, of Worldradio Antennas, has proudly introduced a complete line of heavy-duty, precision-made monobanders (photos B and C) from Germany.

The trapless, three-element ZX series monoband Yagis feature full-size elements, proper boom lengths, heavy-duty plates, thick-wall tubes with clamps, nuts and bolts of stainless steel, and a water/humidity proof connector. Four versions of the rugged monobanders covering 10, 15, 17, or 20 meters are available from Worldradio Antennas. These range in price from $256 for the 10 meter model to $326 for the 20 meter model. The antennas are UPS shippable, but require an additional $45 for "oversize" UPS shipment.

Contact Worldradio Antennas, 2120 28th St., Sacramento, CA 95818 (telephone 916-457-3655; e-mail: <orders@wr6wr.com>; web: <http://www.wr6wr.com>). An antenna brochure is available online.

Alpha Delta PathMINDER 6 Position Digital Coax Switch. In the July 2002 column we profiled the new Alpha Delta PathFINDER Digital Automatic Antenna Tuner. As we pointed out, the attractive, digital-readout tuner, which provides continuous coverage tuning from 1.8 through 30 MHz plus 6 meters, combines in one unit features previously available only in several separate products.

Now Alpha Delta's Don Tyrrell, W8AD, has come up with the state-of-the-art PathMINDER 6 Position Digital Coax Switch. The companion PathMINDER (photos D and E) has many important safety and operational features never before available in a coax

Photo G– Here's a finished AN Series Self Supporting HD-50 Tower. The rugged, lightweight, open-lattice, modular-design towers are assembled outside the company's shop to ensure everything fits together prior to full hot-dip galvanizing treatment. The inset photo details a typical section joint in a rugged AN Wireless tower. Steel plates are used on both the outside and inside of each joint, and tower sections are connected together with 24 bolts per connection to offer maximum strength. (Photos from the AN Wireless website)

switch. For example, its internal microprocessor and RF sensor will not allow "hot switching" at levels above 50 watts, which could damage switch contacts and equipment. Various alarm, operating-mode, and grounding configurations are available in the unit. With its internal sensing circuitry, PathMINDER will automatically place the antenna ports to ground, with several grounding options, when the radio is turned off or timed out, or if station power is lost. The unit also features a nonvolatile memory that stores the current mode and position selection in case of power failure. The PathMINDER is rated at 1500 watts through 54 MHz. Standard SO-239 UHF-type connectors are provided.

For more information and pricing, contact Alpha Delta Communications, Inc., P.O. Box 620, Manchester, KY 40962 (phone 1-888-302-8777; e-mail: <sales@alphadeltacom.com>; web: <http://www.alphadeltacom.com>).

N3IYR AO-40 S-Band Antenna. Glenn Rollins, N3IYR, tells us that he's begun to market the N3IYR AO-40 S-Band Antenna (photo F), one which he says will improve results dramatically when compared with a "grill"-type dish.

According to Glenn, his A0-40 antenna isn't just any dish with a feed slapped on it. Rather, the 3 ft., powder-coat-finish dish is a specially formed, off-center bathtub-like design in an oval shape in proper proportion for S-band (2.4–2.5 GHz) signals. Thus, the antenna can be used for any satellite or point-to-point work in this range, besides use in AO-40 work.

Producing 25 dBi circular gain, its waterproof, low-noise helical feed and offset design enable the user to connect any downconverter directly to the feed without signal loss or aperture blockage. Mounting options include vertical and horizontal mast/boom sizes from $1^{5}/_{8}$ to 2 inch diameter. The antenna is $179.95 plus shipping.

For more information, contact Glenn Rollins at N3IYR Antennas, 6080 Estes Court, Arvada, CO 80004-5450 (phone 720-422-1077; e-mail: <glennrollins@n3iyr.com>; <http://www.n3iyr.com>).

AN Wireless RF Communications Towers. A few years ago, Dan Simmonds, KK3AN, realized that the growing wireless industry was in need of a modern, lightweight, affordable, severe-duty, self-supporting communications tower. To meet this need, Dan released the company's line of AN Series Self Supporting Towers, which present very robust tower packages (photo G).

To make the AN Wireless towers a truly turnkey solution, the firm includes all the prime components in one package. Inclusive with all the self-supporting towers are industry-standard $^{5}/_{8}$ inch climbing step bolts spaced apart every 9 inches; a full subsurface steel base foundation matched to each tower; a three-sided, double-duty removable work-surface platform secured to each top section; a full fasten-

Fig. 1– The new version of the popular CXP1318FX 50 ohm low-loss coaxial cable mentioned this month is representative of Cable Experts' diversified, quality product offerings. Their well-designed website at <http://www.cablexperts.com> will calculate your order, including shipping charges.

er set for each tower; and provisions for a safety-cable lifeline system.

Some of the many benefits of the towers include construction from 50 KSI steel throughout; towers fully hot-dip galvanized to ASTM-A123 specs; inclusion of all galvanized connection hardware; availability of custom rotor plates and side arms; allowable tower wind exposures from 70 to 120 mph; available tower heights from 20 to 100 ft.; and a very competitive price structure.

For additional information, contact AN Wireless Co., 430 South Columbus Avenue, Littlestown, PA 17340 (717-465-0519; e-mail: <dan@anwireless.com>; web: <http://www.anwireless.com>).

New Low-Loss Coax from Cable X-Perts, Inc. Cable X-Perts, Inc. (see fig. 1) has announced a new version of their popular CXP1318FX, a 50 ohm low-loss coaxial cables. Manufactured with a "gas-injected" foam polyethylene dielectric and a 19-strand center conductor, the new cable gives exceptional flexibility and reliability, according to Cable X-Perts. Other enhancements include a double-shield (100% bonded-foil and 95% tinned copper braid) and non-contaminating direct-burial jacket. The low-loss cable is stocked in bulk and ready-made lengths with UHF (PL-259) and "N" type connectors.

To learn more about this cable and other products, contact Cable X-Perts, Inc., 225 Larkin Dr., Suite 6, Wheeling, IL 60090-7209 (1-800-828-3340; e-mail: <cxp@cablexperts.com>; web: <http://www.cablexperts.com>).

Software and Computers

NuTest for Windows Version 2.0 from Nu-Ware. In the January 2001 column we profiled an updated NuTest for Windows, a very capable, Windows®-based amateur radio teaching program offered by Tony Lacy, G4AUD's Nu-Ware computer study software firm. Now we're happy to see that the program once again has been updated.

Nu-Ware has released a completely revised Version 2.0 of NuTest for Windows (figs. 2 and 3). It is a full-featured teaching program designed to help users through the FCC written theory tests at any level from Technician through Extra. The software contains the actual question pools issued by the ARRL/ Volunteer Examiner Coordinator (VEC) for use after July 2002.

NuTest generates on-screen tests as well as printed tests that are identical to the real thing, including ancillary diagrams and tables relevant to the questions displayed or printed. A special program feature is a file of comprehensive explanations for every question, as well as links to files of FCC Part 97 regulations, RF exposure information, and useful math formulas. To motivate you, NuTest will grade your answers and log your scores for review in graphical form. The program will also produce printed tests and student grading sheets in a form suitable for use by VEs.

Prices vary from $15.95 for a single license class version up to $34.95 for a version that will take you from Technician class through to Extra class (prices are for delivery by e-mail).

For further details, or an evaluation copy, contact Tony Lacy, G4AUD, at Nu-Ware, Llanoris, Llanerfyl, Welshpool, Powys, SY21 ØEP United Kingdom (phone +44 1938 820496;

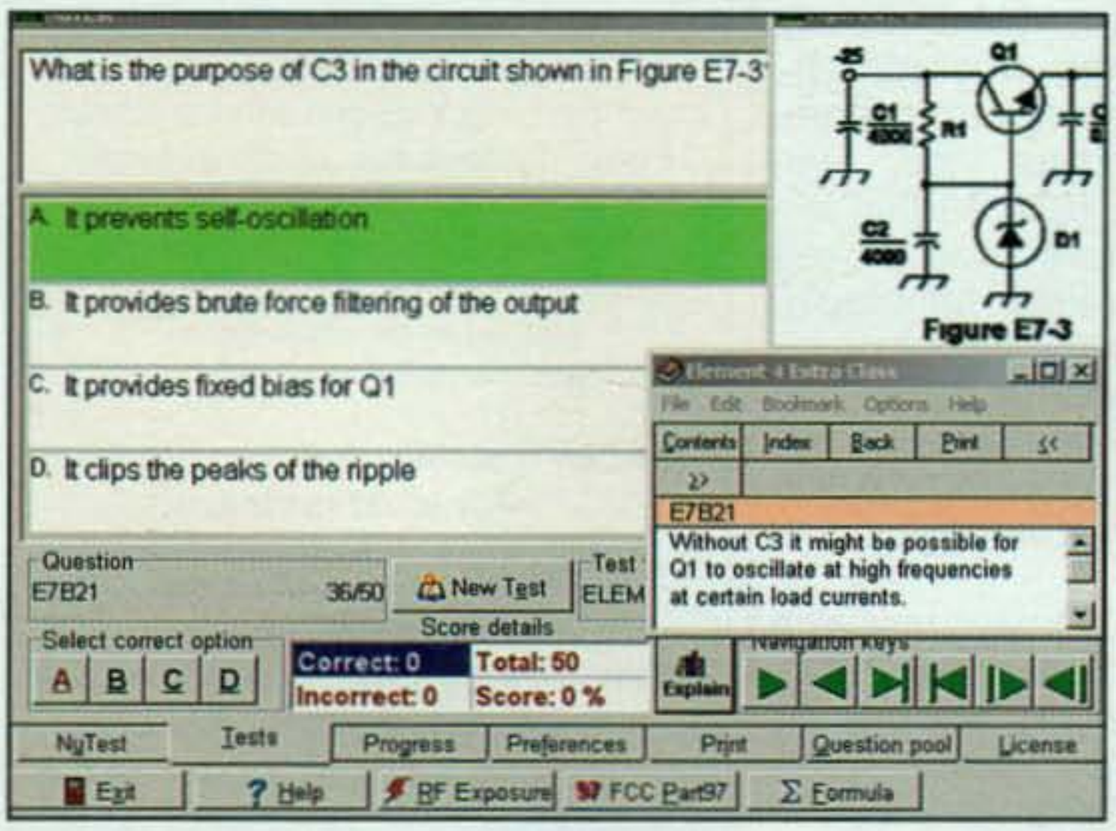

Fig. 2– Nu-Ware has released a completely revised Version 2.0 of NuTest for Windows, a full-featured teaching program. This is a shot of the on-screen test feature plus the diagram referenced in the question. Also shown is an expla nation of the correct answer. (Artwork courtesy Nu-Ware)

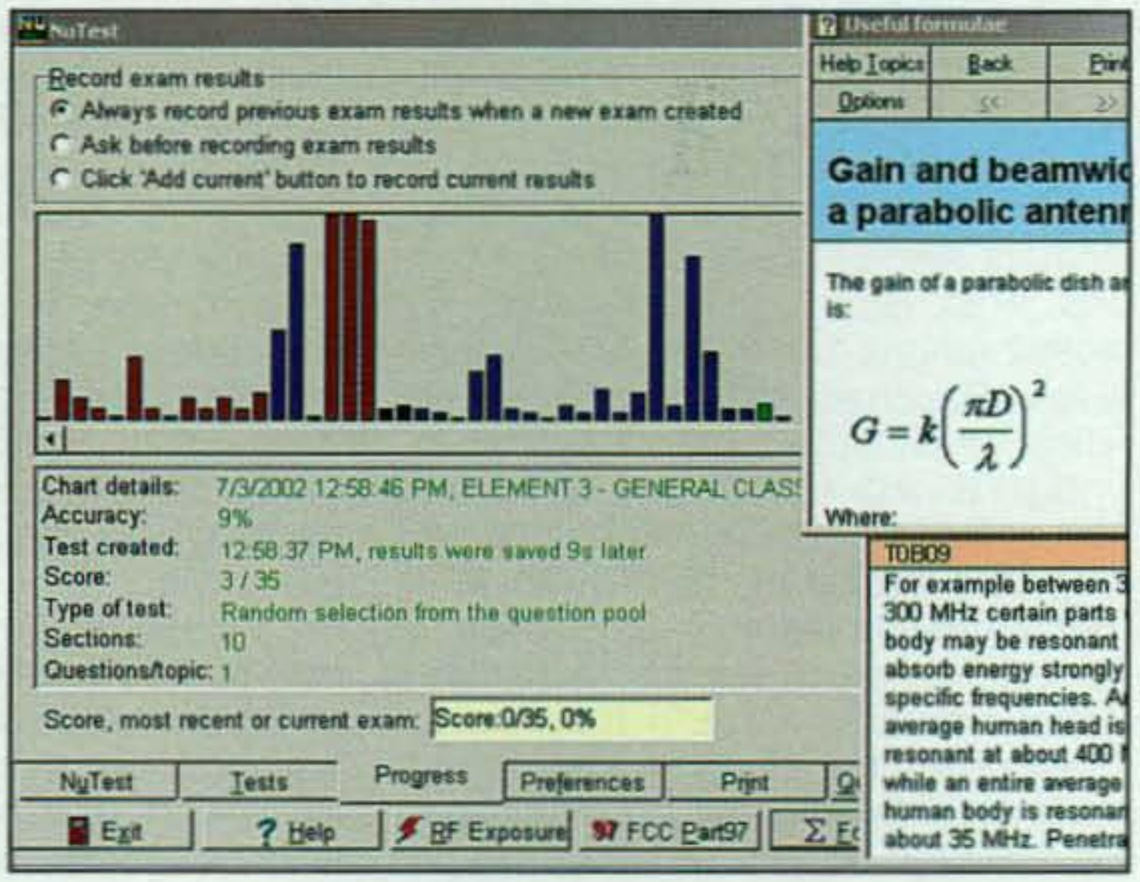

Fig. 3– With NuTest for Windows, your exam results can be recorded and a history of your previous scores shown in this window. Some of the many useful help windows are also open in this view. (Artwork courtesy Nu-Ware)

e-mail: <TonyLacy@Nu-Ware.com>; web: <http://www.Nu-Ware.com>).

DXTelnet from IK4VYX. Fabrizio Sartoni, IK4VYX, made us aware of his program, DXTelnet, which he says was especially designed for Telnetting to Internet DX Clusters. It allows multiple split screens, backspacing, voice on DX spots, and much more. In fact, some users say it's the best such program.

The powerful program is offered as fully functional shareware; the only thing that's different from the registered version ($35 USD) is that the shareware version allows only 30 minutes of use per session. Also, if you are a registered user of DXTelnet, you are a registered user of all future upgrades.

For more information, contact the developer, Fabrizio Sartoni, IK4VYX, via e-mail at <rac2610@racine.ra.it> or by going to the official DXTelnet download website: <http://www.qsl.net/wd4ngb/telnet.htm>. Fabrizio indicates that payments can be made via web form at <http://www.golist.net>.

N3FJP's Net Manager Log. In the July 2000 column we drew your attention to N3FJP's Amateur Radio Software Site. As we noted, many useful shareware and freeware amateur radio programs are offered there. The site, designed and operated by Scott Davis, N3FJP, now is located at <http://www.n3fjp.com>. Later, in February 2002, we briefly profiled Amateur Contact Log (AC Log 1.8), available for download from Scott's attractive website.

Scott has announced that N3FJP's Net Manager Log now is available. The intuitive, easy-to-use program is designed to serve as a net manager program for amateur radio nets. According to Scott, whether you are the net manager or simply are checking into the net, the software will let you easily keep track of the net order, check-ins, and traffic. The program's functions include recording the check-in's callsign, date, time, name, QTH, traffic (if traffic has been delivered), and time off. The program also will record a history file of net check-ins.

The Net Manager Log is fully functional for 45 days. For permanent use of Net Manager Log, a $10 fee is required. Scott also offers N3FJP's Software CD, which contains the Net Manager Log and installation files for all of his software programs. The CD, with Net Manager registration only, is $23 (shipping/handling included).

For more details, contact G. Scott Davis, at 118 Glenwood Rd., Bel Air, MD 21014-5533 (e-mail: <snkdavis@aol.com>; <http://www.n3fjp.com>). Please note that registration fees—cash, checks, or money orders—should be made payable to G. Scott Davis. Purchase may also be made by credit card via PayPal.

Wrap Up

Before wrapping up things, 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 Jack Main, W4YCZ; Ronnie Dean, WB4GNI; Tommy Primm, AB4WA; Glen Rollins, N3IYR; Tony Lacy, G4AUD; Fabrizio Sartoni, IK4VYX; and Scott Vaughn, to mention just a few correspondents. Keep the cards, letters, and e-mails coming, gang, and let us know what "new stuff" you'd like to see in your column. (*Note:* If you e-mail us, please include your name and callsign [if any]. It would be nice to know we're corresponding with a real person, and not just an e-mail address. Thanks.)

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

Overheard: Over the years I've learned that it's well worth the effort it takes to be organized. This having been said, every solution I reach is, alas, somewhat less than perfect.

73, Karl, W8FX

Irwin Math's notes

BY IRWIN MATH,* WA2NDM

It Seems Like Old Times—Again

The response to our "old schematic diagram" column in the July 2002 issue was overwhelming. Since so many asked for another such schematic, we thought that a good way to begin the new year was to reminisce about an older one.

Before the days of the LM555 timer (and even the unijunction transistor), there was the old CK722. If you don't recognize this designation, you simply are not old (mature?) enough. It was the first readily available transistor for the experimenter—ever. These devices were used for a multitude of purposes in the early days of solid-state exploration, and timers were one of them.

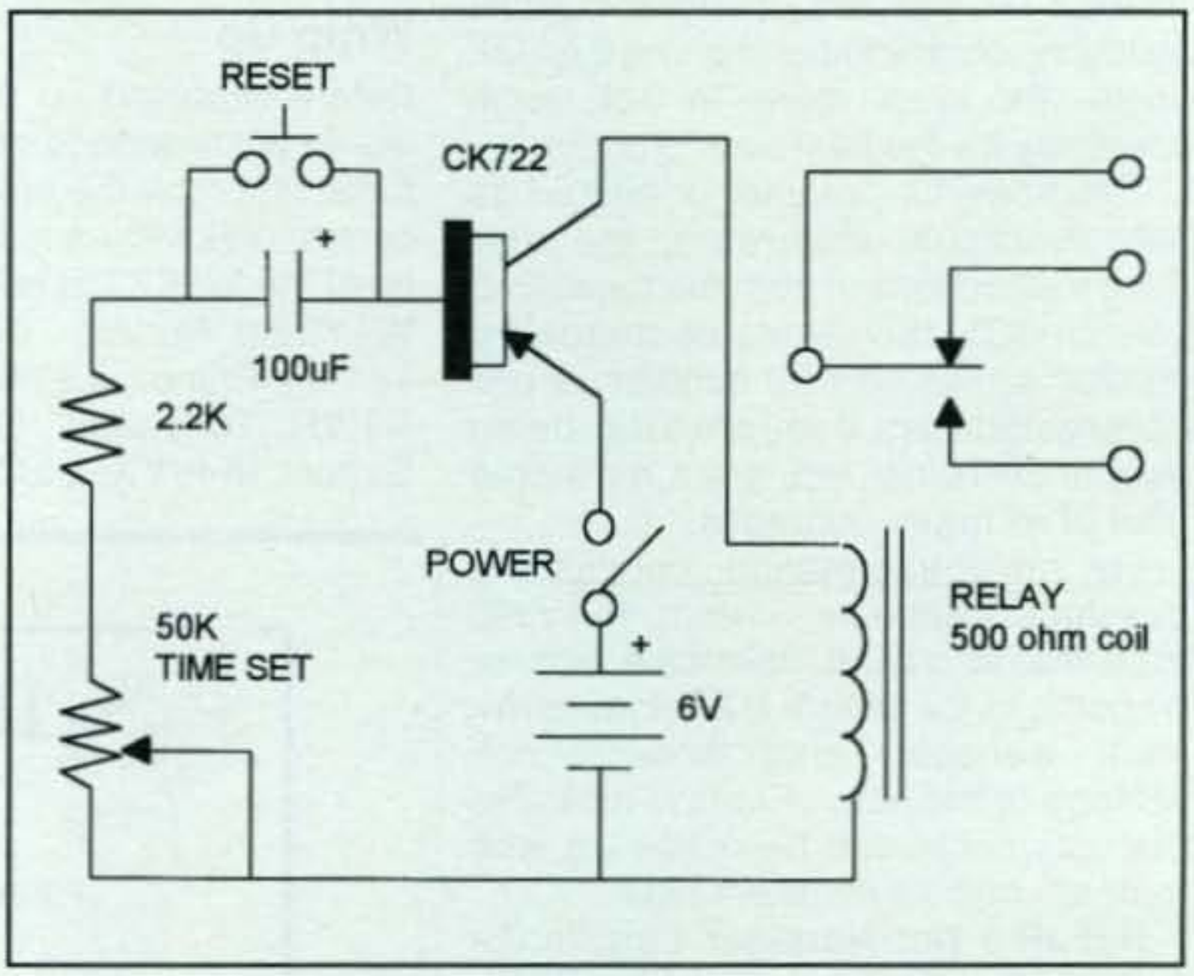

Fig. 1– Early transistorized timer.

Fig. 1 is a schematic of a typical 1960s version timer using this popular device. The circuit is based on the idea that when the reset button is pressed, the transistor will conduct until the 100 µF capacitor charges. When the voltage drops below the base turn-on level, the transistor cuts off and the relay drops out. We built this circuit to control a photographic enlarger, and as I recall, the range was from about 1/2 second to 5 seconds. An internal battery was used to provide complete isolation from the AC line, thereby allowing the relay contacts to safely control 115 VAC. By the way, a high-resistance relay coil was necessary, since the maximum collector current of the transistor was limited to a few milliamperes for these devices and we wanted reasonable battery life.

For those of you who are wondering what the unijunction transistor mentioned above is, you are in luck. In the same "early days" we personally had a lot of experience with timers in the form of plug-in time-delay "modules." Fig. 2 is a schematic of the type of units we built and sold. This plug-in time-delay module (complete with an 8-pin plug that was

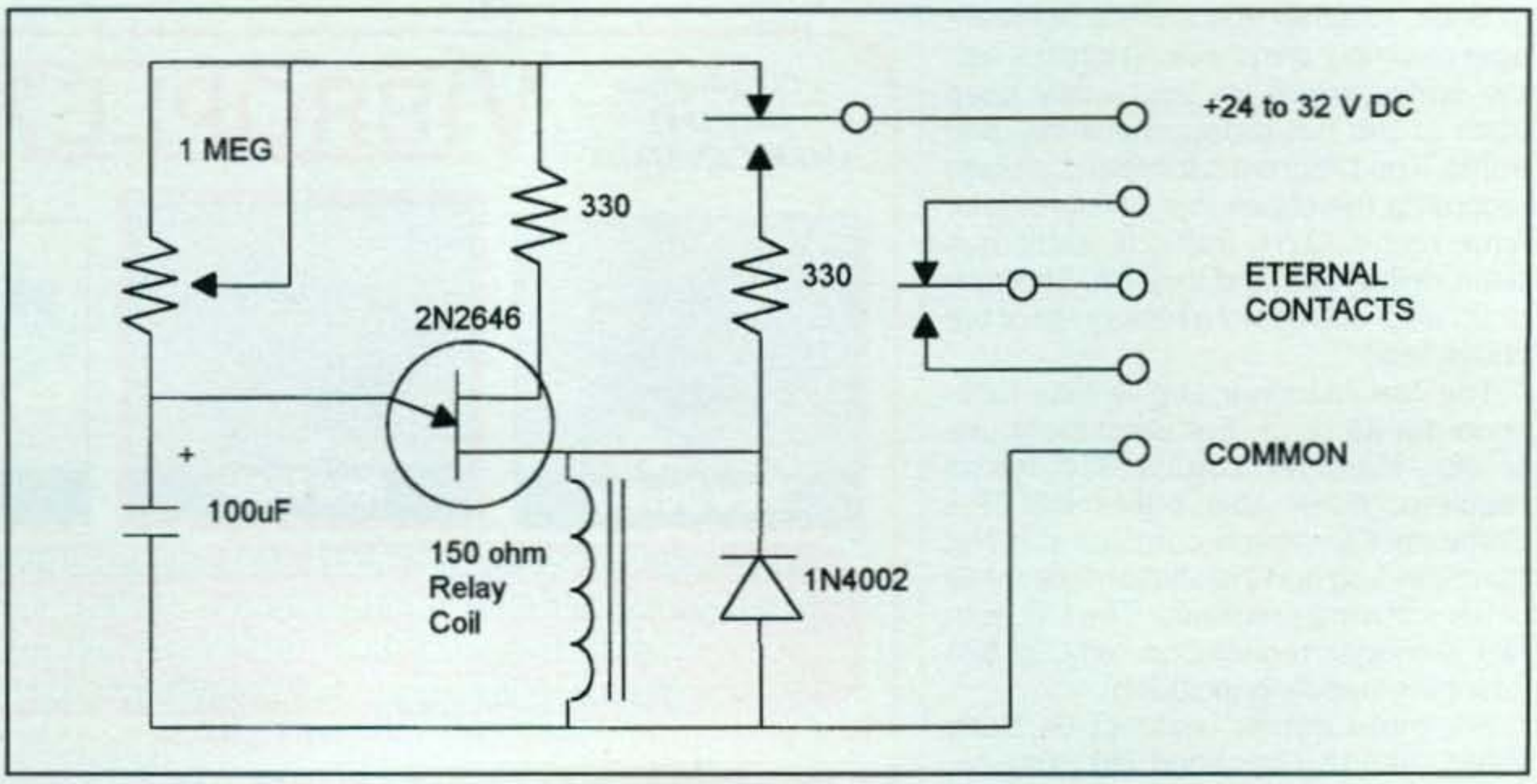

Fig. 2– Unijunction transistor time-delay relay.

*c/o CQ magazine

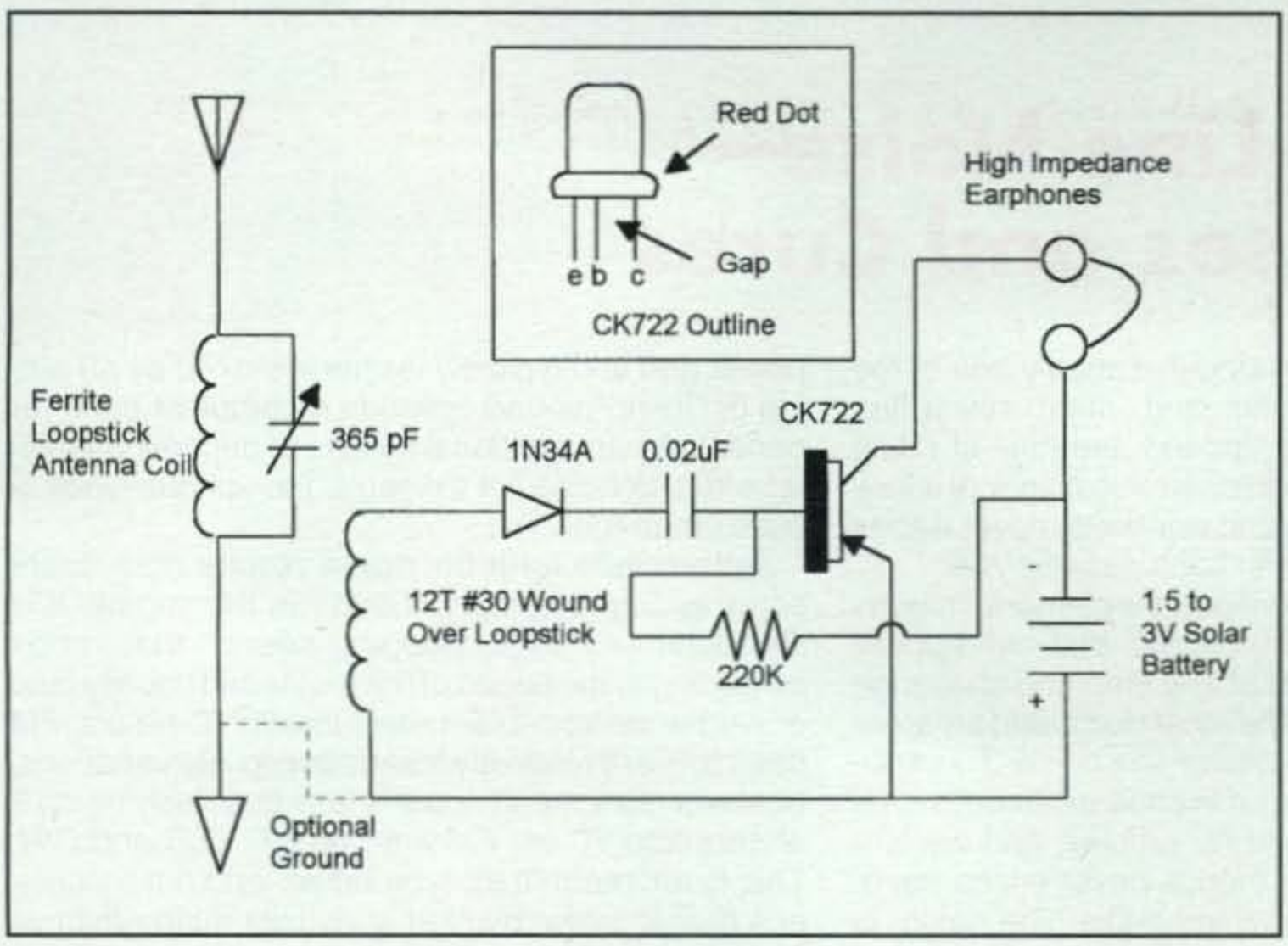

Fig. 3– Early solar-powered radio receiver.

intended to mate with a standard octal tube socket) was used in a wide variety of industrial applications. Upon application of power, the 100 µF capacitor began to charge through the 1 megohm potentiometer. When the firing point of the unijunction was reached, the capacitor discharged and the relay pulled in, latching itself through the contacts. Resetting the module required that the input voltage be removed, allowing the relay to drop out. Then the cycle could be repeated. The 1N4002 diode, by the way, was used to prevent high back EMF voltages from being produced by the relay coil when current was cut off.

The great attraction of such time-delay relays was their low cost, high reliability, and repeatable timing accuracy. We manufactured literally hundreds of these devices back in the early 1970s, and they sold quite well. Units such as this are still being manufactured today, but alas, not with unijunctions. If you can still find these unique transistors, you might wish to experiment with them. They are a lot simpler to use than a 555.

Our final offering is a solar-powered transistor radio just to show how "advanced" our thinking was in those days. A wide range of selenium and silicon "solar batteries" made their appearance in the '60s, and because of the low voltages and currents used by transistors, it seemed that they were the ideal power sources. Fig. 3 is a simple radio that we built to check them out. The unit is really not much more than an amplified crystal set, but performance was much better due to the amplifier stage.

The antenna circuit used a ferrite core "loopstick" coil that had a fairly high Q for the time. A pickup winding drove a germanium diode detector and 0.02 µF coupling capacitor/filter. I am not sure what the DC return for the diode was, but it worked quite well as shown. The transistor provided the gain and the 220K resistor, the base bias. A set of high-impedance headphones completed the circuit. The amazing part of such a radio in those days was to vary the volume simply by blocking the light falling on the solar cell with one's hand.

Needless to say, the better the antenna, the better the overall performance. We even used this radio to pick up a 160 meter amateur station a mile or two away.

I have included a rough drawing of the CK722 for those who still have some and wish to use them. I have about 20 or so (both the blue and the black versions), and they all are still operational, so longevity for a 1960 solid-state device is pretty good. Then again, my vacuum tubes from the 1940s and '50s also are still good! It will be interesting to see which fail first.

Best regards and wishes for 2003, and may all of your hopes and aspirations come true.

73, Irwin, WA2NDM

how it works

BY DAVE INGRAM,* K4TWJ

Power-Line Noise— Its Causes and Cures

Amateur radio is unquestionably one of the world's greatest and most rewarding hobby/pursuits. Indeed, the thrill of riding the waves of ether and communicating with fellow amateurs both locally and worldwide never wanes but only gets better with each passing year.

There is one unnerving entanglement, however, a sort of "electronic ghost" that can appear almost anywhere and at any time and challenge the patience of even the most dedicated amateur until it is eliminated—power-line noise. This subject is seldom covered in license exam questions or discussed in magazine articles, and we sincerely hope all of our friends never encounter it. However, knowing how to handle "line noise" is always a beneficial asset (photo A).

This month's column presents some basic and definitely worth knowing facts relative to line noise, facts to remember for many years hence. Let's begin by discussing the various types of noise to help you understand their similarities and differences. We then will consider the causes, cures, and methods of tracking down power-line noise. As an opening word of encouragement and reassurance, I can say with accuracy that I have experienced the agony of line noise in two of the eight places I have lived over the years, and I was successful in getting both cases cleared up. You do not need to give up hamming or live with line noise. You can find the culprit, and your local power company will correct the problem. You will even help your neighborhood (by ultimately eliminating line-noise-type TVI) and the power company (by uncovering damaged/defective lines and hardware) in the process. Looking at it from that viewpoint, having a radio amateur in the neighborhood can actually be an asset!

Types of Noise

What is power-line noise and how does it sound? It usually results from problems within an area's power grid and typically is characterized by an arcing or "frying" sound covering a complete band (or bands). As an additional means of becoming familiar with line noise, let's discuss the various types in plain language.

Automobile/ignition noise results from spark plugs arcing to ignite fuel and run the engine. It is characterized by a "popping sound" that varies according to the speed of the motor and usually covers all bands from 160 meters through 2 meters. FM detectors are relatively insensitive to AM variations, however, so ignition noise is less troublesome on 2 meters and 70 cm FM than on HF SSB and CW. This is an intermittent-type noise, and a transceiver's built-in noise blanker is usually quite effective in removing or eliminating it. One noteworthy suggestion: If your rig's noise blanker is adjustable, use only enough blanking to reduce the noise to an acceptable level—until you check further. Excessive noise blanking can cause "buckshotting" noise and distortion on the cleanest signals, making them sound muddy and difficult to copy.

Electric-motor noise typically is produced by home appliances such as mixers, can openers, and hair dryers and is usually recognized by a sort of whine or grinding-type sound in a receiver. Since it is more constant in nature, a transceiver's noise blanker is not very effective in removing it, although it may be reduced by excessive blanking level (and produce distortion plus "buckshotting" on received signals in the process). As an alternative, try using your rig's attenuator and/or manually adjustable IF notch filter alone and in conjunction with its noise blanker to minimize electric-motor noise. The combo often works quite well, provided you do not notch out or reduce a desired signal into the noise.

Band or atmospheric noise is a natural part of radio communications, especially on the HF bands, where most activity involves the SSB and CW modes. Band noise is a constant hiss or "rushing sound" that is usually low enough to ignore. However, it can become quite loud and even mask weaker signals during solar flares and magnetic storms. While an IF-level notch filter can be adjusted to lower band noise, digital signal processing (DSP) is usually much more effective in minimizing

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e-mail: <k4twj@cq-amateur-radio.com>

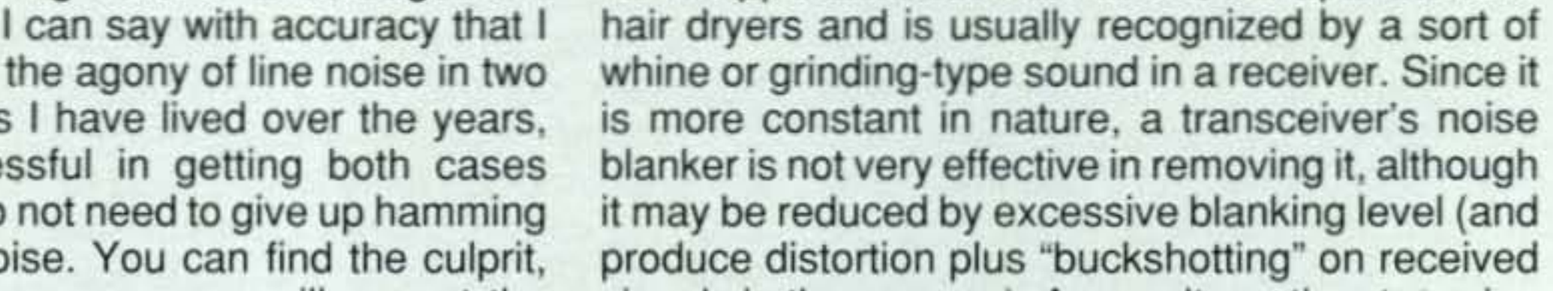

Photo A– A high (S9) level of power-line noise can mask everything on a band except the strongest signals and make both normal and emergency communications exceptionally difficult. On the "good side," however, tracking down and elimnating line noise is a fairly easy process.

this constant sound. Use only enough DSP to reduce the noise to an acceptable level; otherwise received signals will acquire an unusual and phony sound.

Power-line noise differs from the previously described noises, as it usually exhibits a "frying" sound rather than a popping, whining, or hiss-type noise. It often covers several HF bands, and depending on its cause and severity, it can extend into the MF/AM broadcast band plus VHF/UHF bands of 2 meters and 70 cm. A transceiver's noise blanker, attenuator, notch filter, and/or DSP system is seldom effective in eliminating power-line noise. However, an experimentally determined mix of the combo can (and often does!) cut line noise down to a near-acceptable level. There is, however, only one real solution to eliminating line noise: Find its source and encourage the responsible party to repair the problem. As we will discuss, your "detective work" is paramount in locating this "villain," and since you live in its affected area, you are perfectly situated to uncover it. How? Read on!

Line Noise—Causes and Cures

Since a city's power-line system or the "commercial power grid" is exposed to all types of weather and environmental extremes, it is a natural culprit for, or source of, electrical noise. Most often the noise is caused by worn or damaged components, and finding its source involves understanding basic system hardware. Let's take a closer look in that direction.

The most common causes of line noise are loose or oxidized aluminum clamps on power-line junctions, cracked or broken insulators, and corroded connections on swing-out line fuses (photo B). Less common, yet not to be overlooked noise sources include damaged lightning arrestors, intermittent streetlights, and trash or small debris caught between power lines. Additional and non-power-grid-related sources of line noise include aquarium or fish-tank heater/thermostats and door-bell transformers.

Loose clamps, broken insulators, defective fuses, and damaged lightning arrestors usually produce their dreaded arcing or frying noise during hot and/or windy weather. They typically quiet down during rain, cool periods, and winter. Listen closely and you will notice the first drops of a (summer) rain usually escalate this noise. Then as the offending item(s) become thoroughly rain-soaked, the noise stops just like someone switched it off. Conversely, trash or

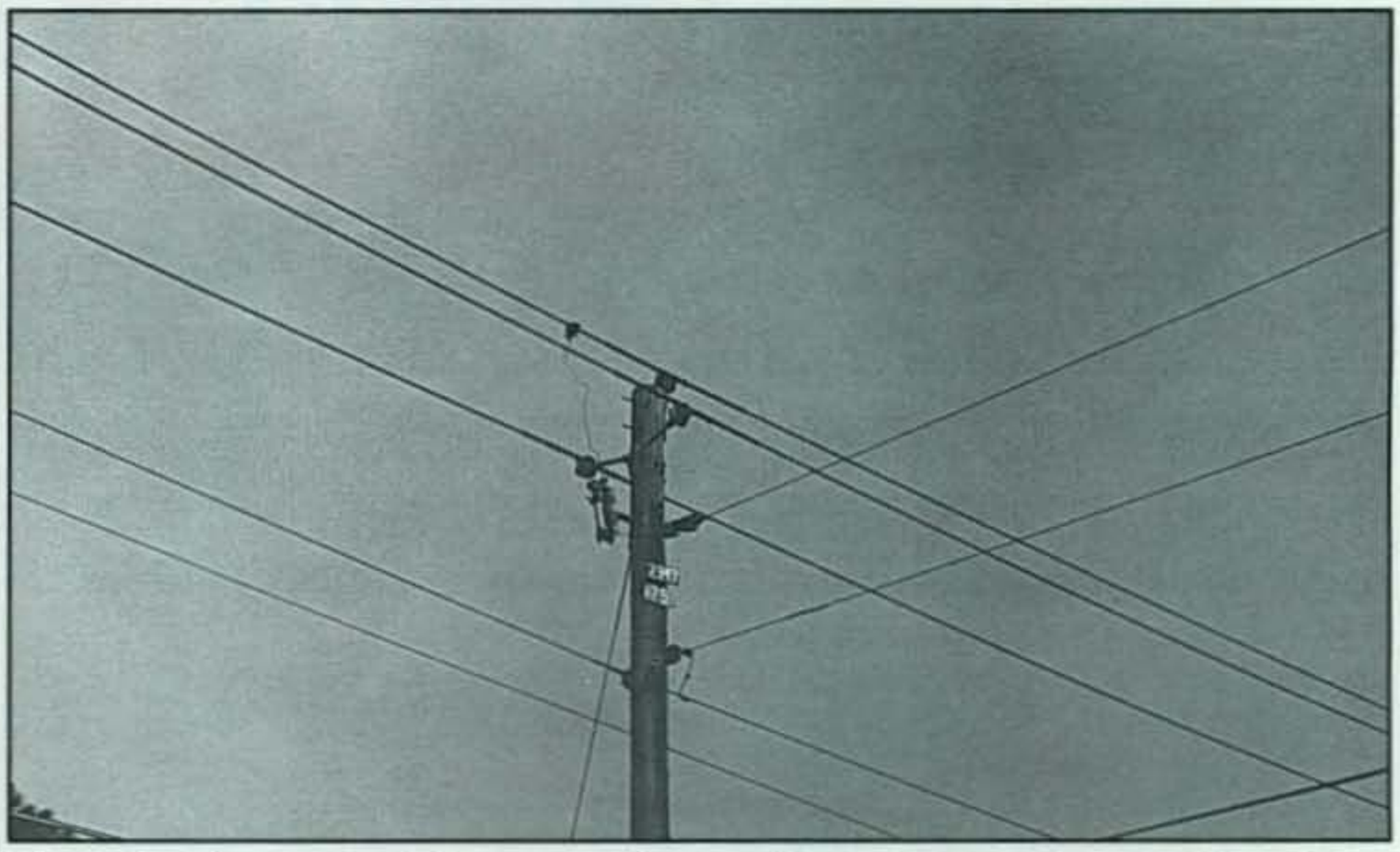

Photo B– Three potential sources of power-line noise are shown in this photograph: large insulators that may crack or break, a swing-out fuse that may develop an intermittent connection, and an aluminum clamp (on jumper attached to topmost line) that can expand and contract with ambient temperature. In the case of noise, the first suspected cause is the clamp (see text).

debris caught between power lines usually produces line noise during rain, but this quiets down during hot and/or dry weather. Sometimes this type of arcing is even visible to the naked eye at night. Intermittent street-light noise and even transformer noise usually are unaffected by weather: they are more "protected" and constant. ***Note: Never attempt to climb a power pole or fix power-line noise yourself. Just note the times and conditions relative to the noise, contact your local power company and leave the potentially hazardous work to them.***

If you have ever owned an aquarium or fish tank with a side-mounted heater and a slightly worn thermostat, you know (firsthand!) the agonizing noise produced by arcing contacts. These things are like a miniature spark-gap transmitter, and there is only one item worse (because it is so difficult to track down or find)—a defective doorbell transformer. The "signature" of these two noise sources (aquarium thermostats and doorbell transformers), incidentally, is an arcing sound just like power-line noise, but it continues regardless of weather or rain (it's protected from weather). Trying to find this type of line noise (indoor or outdoor generated) is also a major challenge unless you have the right gear for the hunt, and that brings us to our next topic.

The Hunt

Defining line noise according to time of day, season, and weather variations

Photo C– Tracking down sources of power-line noise can prove quite a challenge. The MFJ-852 Line Noise Meter, however, cuts the pursuit down to size. The self-contained unit has a very directive antenna, level meter, and headphone socket for simultaneously monitoring noise. (Discussion in text.)

Photo D– The final results and ultimate reward! Here two crews from a local power company replace aluminum clamps and a lightning arrestor on a "noisy pole"—and eliminate an S9 noise level located with an MFJ-852 Line Noise Meter.

can give you a fair idea of its cause, but hunting down its actual location can be quite a different matter. Noise can propagate noise one or two miles along power lines, so a seemingly nearby noise source may actually be some distance away. What to do? Follow a proven-successful plan, naturally!

A convenient starting point for localizing line noise is using your SSB/CW transceiver and rotary beam to determine its general direction. Just look for an S-meter peak toward the beam's front and/or a null from its side (the null, incidentally, may help you minimize the noise until corrections are made). If you have a mobile HF setup or battery-powered portable rig such as the FT-817, it then can be used to further hunt for the main noise "hot spot" in the indicated direction. If your investigative pursuits are fruitful, you may narrow down the noise source to an approximate quarter-mile area—maybe less. Assuming you then search the area on foot while using battery-powered gear with a very short antenna to restrict range, you may narrow the hunt to a two-block or six-power-pole area. Double check your investigations (with special emphasis on overlooked areas/sources), then relate your findings on location, associated power-pole numbers, sound, weather influence, etc., to the engineering department of your local power company. If you are fortunate, one or more of that department's employees will also be radio amateurs willing to help.

MFJ's Line-Noise Meter

Unquestionably, the most helpful device I have found for tracking down noise sources is the MFJ-852 AC Line Noise Meter shown in photo C. This unit is a battery-powered, 135 MHz AM receiver with built-in dipole antenna, and it works great for zeroing in on elusive noise sources. Furthermore, the unit's manual is filled with prime information on types, causes, idiosyncrasies, and corrective measures for finding and eliminating power-line noise. Every group, club, or amateur faced with electrical noise problems will find the MFJ-852 priceless.

Why 135 MHz? Unlike AM broadcast band and shortwave receivers that can receive noise from more than a mile away, a 135 MHz AM receiver primarily detects noise within a 900 to 1000 foot range. By retracting the MFJ-852's dipole whips, the range can be further reduced to 100 or 200 feet.

Once you localize a noisy area or general direction, just start walking or biking the area while watching the unit's meter and listening with an earphone. After plotting a trouble area, retract the antenna for "fine tracking" and start

Basic Steps to Locating and Correcting Power-Line Noise

- **Determine Nature of Noise**: Constant, intermittent, buzz, frying sound, etc.
- **Relate to Weather Conditions**: Hot, cold, windy, rainy, dry, etc.
- **Define Affected Area**: Street, block, power pole (or poles) and pole number, house address, etc.
- **Report Findings to Responsible Party(s)**: Illustrate or explain effects and how they can be detrimental to responsible party so they will be interested in cleaning up noise for their own benefit.
- **Follow Through Until Problem is Cleared Up:** Stay congenial and focused, and always maintain a "poison ivy" philosophy with respect to power lines—*look but do not touch!*

keeping an eye (and ear) open for obvious causes such as loose-hanging wires, arcing sounds, or sparking.

Finally, report your findings to the local power company as discussed earlier (photo D). Again, for both legal and safety's sake, I re-emphasize ***never tamper with power poles, power lines, or power equipment.*** Hot wires and/or arced/loose hardware may fall on you, or you may be held liable for damaged components. Play it safe and let power-company engineers do the pole banging!

Sometimes a search for electrical noise leads you to a commercial or residential dwelling rather than a power pole, and these situations should be approached quite tactfully. First, place yourself in the other person's shoes: Let him or her hear the noise and explain how it could be a potential fire hazard or cause interference to their own radio/TV equipment. I remember, for example, tracking a vicious noise to a house a block away. I introduced myself to the tenants and asked if they were experiencing TV interference. "Yes, in fact, it has been worse this past month than ever before," they said. At my suggestion, they interrupted each circuit breaker in step. Bingo—it stopped! Within a few minutes an extremely hot doorbell transformer in the attic was discovered, possibly before it ignited the whole house (photo E). Now the neighbors are glad (I repeat, glad!) to have a ham in their neighborhood. Oh, it does the old heart good to be appreciated!

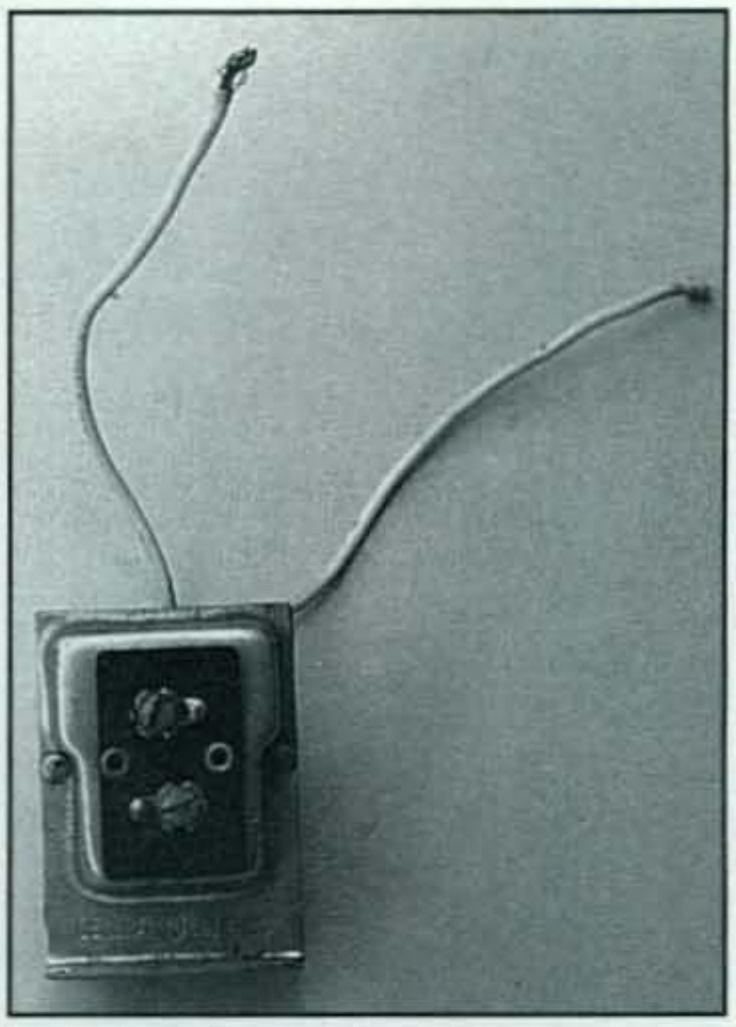

Photo E– This evil villain, a doorbell transformer hidden in an attic, produced a 10 dB over S9 noise level from a block away until it was tracked down with an MFJ-852 Noise Meter. Once the transformer was disconnected, the homeowner exclaimed, "Wow, our TV is working right again!"

Conclusion

Power-line noise need not stifle your on-the-air enjoyment of amateur radio. You can reduce it (slightly) with rig features such as attenuator, IF notch, and DSP, and you can minimize it (again slightly) with a null-positioned beam or dipole. The really good news, however, is you can track it down with simple equipment. Once defined in nature and localized in area, a power company (or individual) is usually congenial about getting it cleared up. Think positive and continue to enjoy our great hobby/service for many years to come!

73, Dave, K4TWJ

BY JOE LYNCH,* N6CL

Mini-Review: The 6 meter Hex Beam

It was in the April 2000 issue of *CQ* that the late Lew McCoy, W1ICP, reviewed the five-band version of the Hex Beam. Lew was impressed with its simplicity, light weight, and performance. Coming from a diehard quad man, that was quite a compliment.

Somehow I didn't see the article at the time, and I was totally unaware of the product line until last May, when I attended the Dayton Hamvention®. Because the Traffie Technology booth was near the CQ Communications booth, I couldn't help but notice the antennas. Without much difficulty I spied the 6 meter model.

As I became acquainted with these novel antennas, like Lew, I also became enamored with them. At first blush the antennas' appearance gives one the impression that they are some sort of omni-directional loops. However, in reality each is a compact two-element beam antenna with very close spacing on the ends and wide spacing at the tips of the "W" configuration.

According to the manufacturer, the antenna is designed "...with linear elements [that] are based on the phasing and coupling of widely spaced, diffused fields along a boom or other structure. The Hex Beam is based on the phasing and coupling of closely spaced, intense, flattened fields."

Considering the hexagonal design, the question is asked, "How can the Hex Beam be directional without a boom?" Their answer: "Its 'spacing' comes from the 'W' shape of its elements. For each 'slice' of the field in the driven element, there is a mirror image 'slice' of field in the reflector."

Size and weight are real positives for this antenna. The size makes it less than half the turning radius of a comparable three-element Yagi. In the case of the 6 meter Hex Beam, the weight is slightly over two pounds, which is well within the capacity of any light-duty TV antenna rotator.

The shape is another factor. Its hexagonal shape makes it almost impervious to windmilling to which a comparable Yagi or even a quad is subjected with the changing of wind directions.

These features—size, weight, and shape—make it ideal for limited-space or rover operations. The size is compact for ease of operation at rover locations.

e-mail: <n6cl@fuller.edu>

VHF Plus Calendar

Jan. 2	New Moon. Lowest Moon declination
Jan. 4	Predicted peak Quads meteor shower
Jan. 5	Poor EME conditions
Jan. 10	First Quarter Moon
Jan. 11	Moon apogee
Jan. 12	Poor EME conditions
Jan. 17	Highest Moon declination
Jan. 18	Full Moon
Jan. 18-20	ARRL VHF Sweepstakes
Jan. 19	Moderate EME conditions
Jan. 23	Moon perigee
Jan. 25	Last Quarter Moon
Jan. 26	Good EME conditions
Jan. 29	Lowest Moon declination

• *EME conditions courtesy W5LUU*

Photo 1– The 6 meter Hex Beam just out of the box.

Photo 2– The Hex Beam showing the bowed spreaders installed.

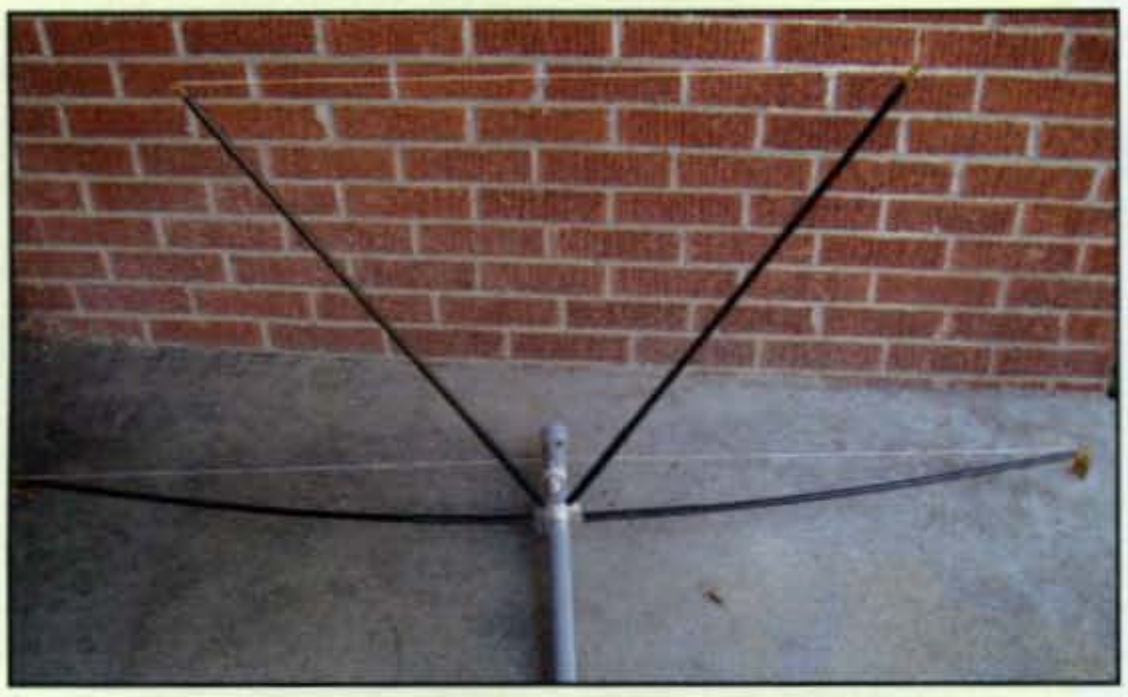

Photo 3– Four of the spreaders installed.

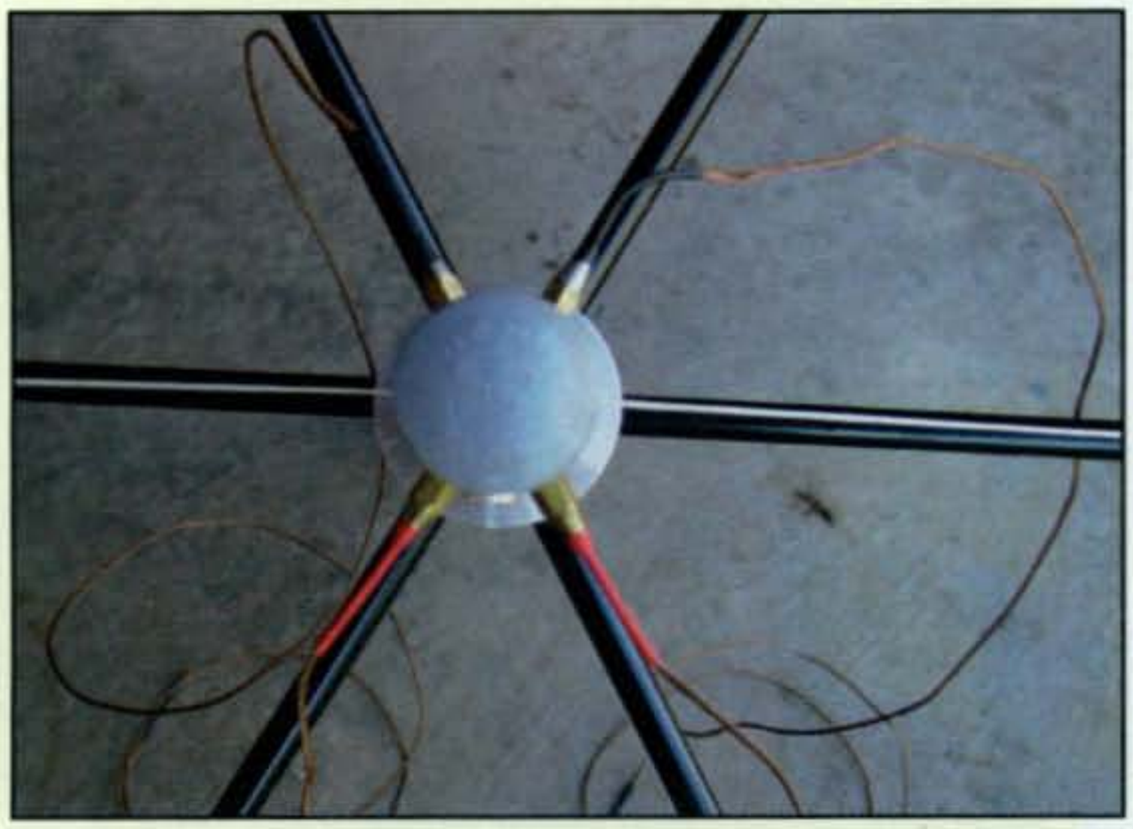

Photo 4– The element wires attached to the pole.

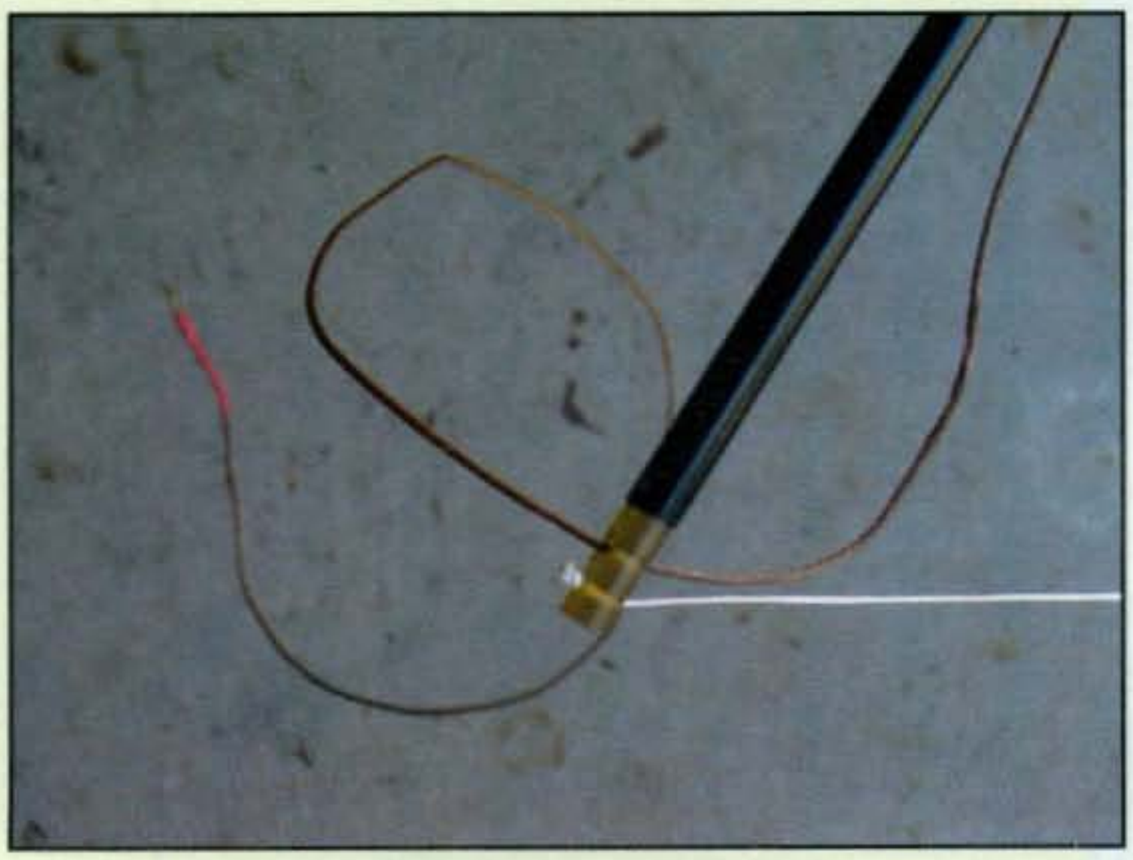

Photo 5– Partial assembly of the driven element.

The weight makes it easy to transport, and the shape makes it ideal for directional setting and forgetting. Again, absence of windmilling means that it will not rotate on you at the whim of the wind's direction while you are inside the rover vehicle. Pluis it's light enough that "armstrong" rotation (rotation by hand) is all that is needed to reset the antenna's direction.

For my 6 meter version, the HXL-6 model, it took about an hour frombeing in the box to being in the air, and that long only because I was shooting pictures and had to create a special coupling between the mast and a telescoping mast which I was using to mount it. Otherwise, as the manufacturer claims, it takes all of 15 to 20 minutes to get the antenna in the air.

Out of the box the antenna comes with two coils of wire, the poly rods, their respective sleeves, the center mast with the built-in hub, four terminal screws, and SO-239 coax connector, along with the necessary insulators for attaching the wires. Photo 1 shows the contents spread out on my back porch. Each set of poly rods is tied together with the center set tied to the center pole. I refer to these poly rods as the center set because each element is terminated at insulators tied to this center set of poles.

My first task was to put the sleeves on all of the rods, which is how they appear in photo 1. My next task was to insert the center poly rods into the hub. I had to bow the poly rods slightly in order to slip them into the hub. Photo 2 shows the bowed poly rods inserted into their corresponding holes on the center mast. Completing this task is about the hardest part of assembling the antenna.

The remaining poly rods are to be inserted into the remaining holes. Photo 3 shows two of the four remaining rods inserted into their respective holes. Once all four rods are in place, it is time to attach the wires. The wires are color coded with shrink tubing at their attachment to the brass fitting. Red is the driven element and black is the reflector. The red wires are screwed onto the screw terminals closest to the coax connector. Although not necessary, a dab of red paint near these terminals would simplify the attachment of these wires all that much more. Photo 4 shows the four wires attached to their respective terminals.

After attaching the wires, each one must be threaded through the hole at the end of the corresponding poly rod. Drawing the wire toward the end of the rod, I inserted the tip through the hole much like threading a needle. It is important to pay attention to the orientation of the hole and your insertion of the wire.

The hole needs to be oriented perpendicular to the center mast and twisted so that the knot of the twine attaching the two rods together is toward the center pole. Once oriented, insert the tip through the hole in the direction going toward the center rod. Photo 5 shows the wire properly inserted into the hole.

Once all four wires have been properly inserted, it's time to hook them to their respective insulators. This operation is a bit tricky both in setup and execution.

First, in the setup the proper insulator must be oriented to receive the proper wire. That is, there are to be no tangles of insulator around the twine coming from the mast. Next, loosen the screw enough for the tip to enter as deep as possible into the hole in the insulator. While holding the wire into the hole, tighten the screw with a sufficient amount of torque to be firm but not overly tight. You may have noticed that the tips are knurled so that they catch on the tip of the screw.

Repeat this operation with all four wires. You will notice that on the last wire it is necessary to bow the rod in the direction of the wire in order to complete the operation. This bowing will not harm the rod. Photo 6 shows the attachment of two of the wires to their respective insulators.

Once all of the wires are in place, the construction of your antenna is complete. All that remains is to get it into the air.

As designed, the mast is fitted for insertion into a rotator's mast clamps. However, for a rover operation, clamping the mast to another mast is a solution. For my installation I used a boom-to-

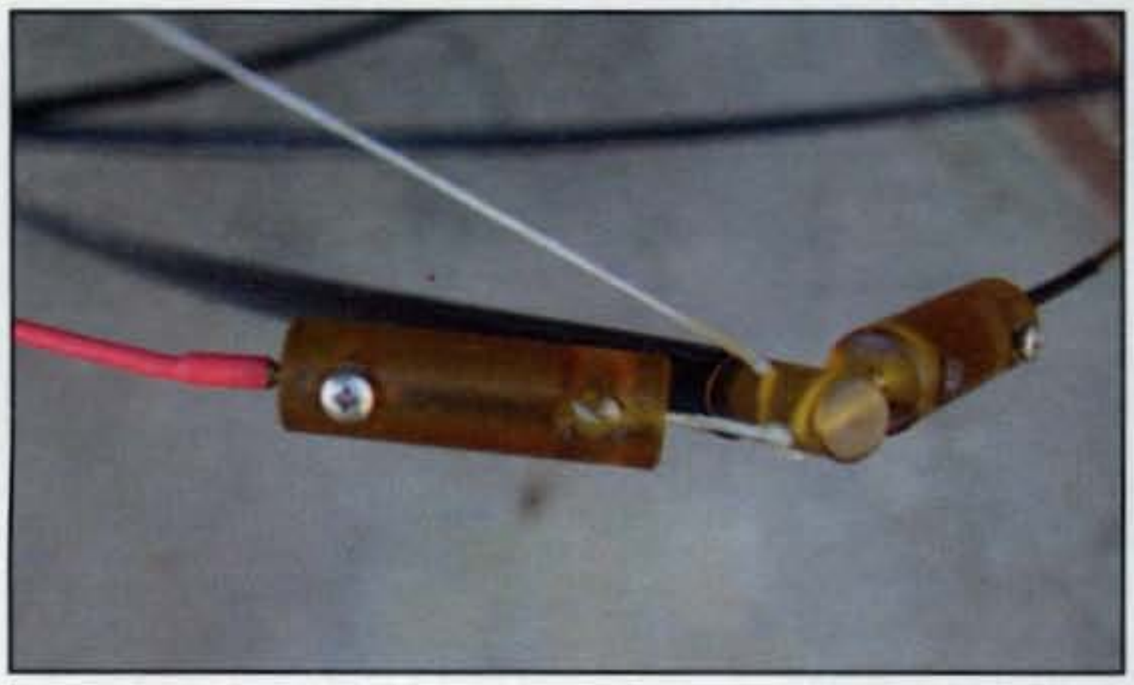

Photo 6– The element insulators.

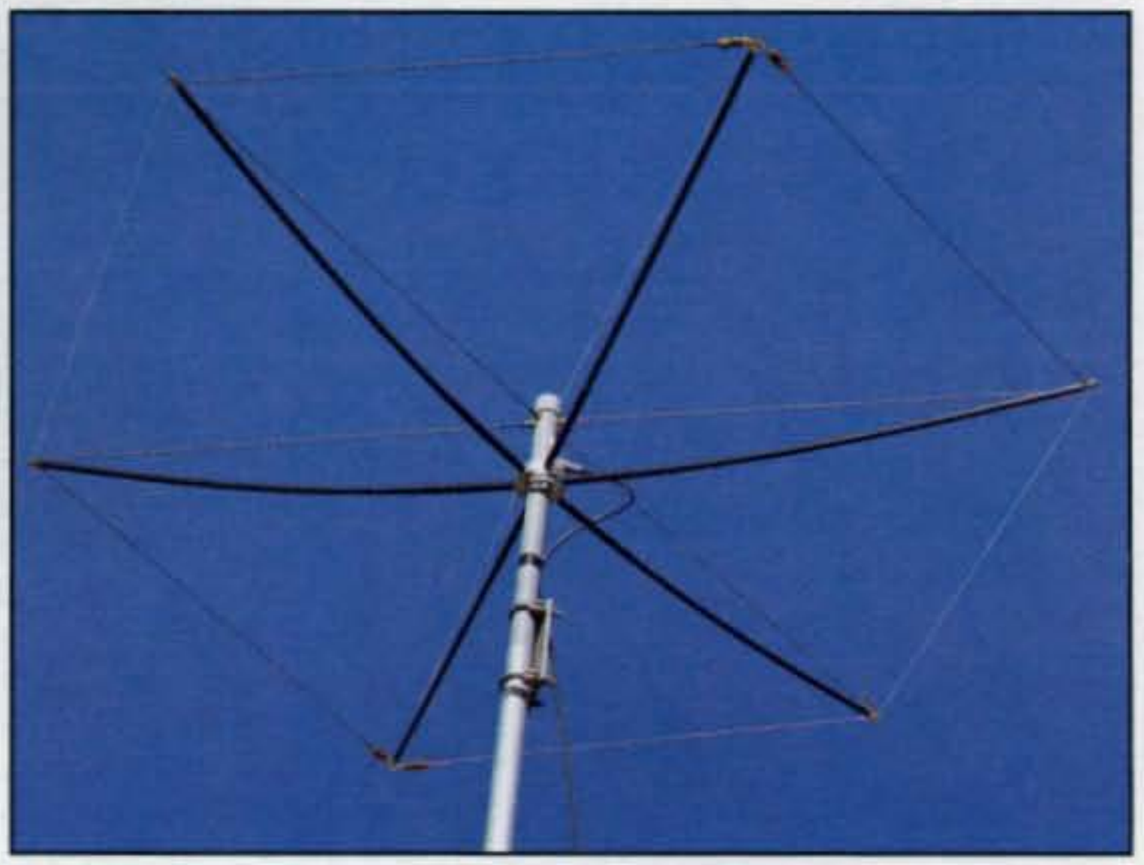

Photo 7– The 6 meter Hex Beam fully assembled and in the air.

mast plate and associated U-bolts to secure the two masts together. Photo 7 shows the antenna in the air.

What about performance? The following are claims made by the manufacturer. Users of the antenna give credibility to these claims, but I have not verified them.

"During line-of-sight evaluations, the average measured gain of the Hex Beam using calibrated equipment is 4.5 dB+ when compared to an actual dipole in the same position. Peak F/B exceeds 20 dB. At the time these tests were run (1992), initial modeling efforts predicted a marginal level of performance. In December 1995 an analysis using NEC 4 predicted a gain of 2.8 dBd with the maximum possible F/B of 17 dB for the Hex Beam. More recent models have shown free-space gains approaching 5 dBd and F/B ratios near 40 dB.

"During reflected (ionospheric) path communication the Hex Beam performs on par with larger conventional designs. Because no presently accepted evaluation standard or terms exist for expressing "on air" performance, the Hex Beam was evaluated at the receiving end(s) during actual communication. Because the Hex Beam performs substantially better than a res-

onant dipole at the same height, numerous actual beams of known and predictable performance were used as a reference to eliminate or at least minimize the potential error introduced by the inaccuracy or vagaries of unknown 'S' meters.

"Many A/B comparison tests with antennas having up to 5 elements were conducted at frequencies of 7–147 MHz. during an 8-year period. Also, though difficult to quantify, many Hex Beam users report a pronounced rejection of man-made noise as well as noticeable signal intactness and less fading when using the Hex Beam."

I installed my Hex Beam at my QTH just in time for the *Leonids* meteor shower. For my use it worked well, providing me with the ability to listen to the on-air activity during the shower. I can tell you preliminarily that it is a directive antenna. Rotating it caused considerable changes in the levels of the neighborhood noise sources. On the air I made about a half-dozen contacts without really trying during the duration of the shower.

For more feedback by users of the Hex Beam antennas, there is an independent users' group that can be found at <http://groups.yahoo.com/group/hex-beam/>. A listing of any of the Hex Beam products can be found at their URL: <http://www.hexbeam.com>.

The 6 meter Hex Beam is $159, plus shipping (If you are a Massachusetts resident add appropriate sales tax.). It can be ordered directly from the manufacturer by phone toll-free 888-599-2326, fax 978-386-7905, or by mail from: Traffie Technology, 421 Jones Hill Road, Ashby, MA 01431. Traffie is currently offering a 30-day moneyback guarantee; see the website for details.

Leonids Preliminary Report

For us in North America there was no storm. However, because so many anticipated one, there was plenty of activity, both on 6 and 2 meters, as indicated by the signals on the band and the postings on the 50 and 144 MHz Propagation Logger URL (<http://dxworld.com/50prop.html>, <http://dxworld.com/144prop.html>, respectively).

Regarding 50 MHz, my monitoring indicated almost continuous openings during the overnight period beginning in the early morning hours. However, that was not the case for 144 MHz. For that band there were moments of excitement, as strong burns would open propagation for upwards of 2–3 minutes at a time. Fortunately, many of the powerhouse stations spread out up from 144.200 MHz, thereby making it possible to make contacts that would not have taken place on the congested calling frequency.

Shelby Ennis, W8WN, sent the following preliminary report to me: "The overall conditions were not very good. There were lots of stations on, lots of completed contacts, but also lots of failures.

"The shower seemed to peak right on schedule at 1040 UTC. However, the main peak here lasted only 20 minutes or so. The burns became much more frequent and quite long. Even so, the long burns didn't last that long. Plus, almost all of them were weak. The calling frequency of 144.200 MHz had a lot of signals, but overall they were very weak. The shower was far below the big *Perseids* showers of a decade ago, and below the *Leonids* of the past few years. Several visual reports indicate a nice shower, but not the spectacular display hoped for. I very much doubt that there were any exceptional DX contacts made on this side of the Atlantic, for I heard nil from two 1100 mile skeds."

Next month will feature more coverage of the 2002 *Leonids* meteor shower.

AMSAT-NA: LEOs Lead Future

One of the main points of the 20th Space Symposium and AMSAT-NA Annual Meeting this past November was on the plans to focus on the Eagle and Echo low earth orbit (LEO) satellite projects. Presentations by Rick Hambly, W2GPS, and Dick Jansson, WD4FAB, focused on the near future of amateur satellite programs. For more in-depth coverage of the future plans, please see our sister publication, *CQ VHF*. Part 1 of the Echo project was published in the Summer 2002 issue and Part 2 is scheduled for publication in the Winter 2003 issue.

Of great concern within the leadership of AMSAT-NA is funding. President Robin Haighton, VE3FRH, emphasized this critical need at various opportunities during the symposium. Among Robin's points was that, as with so many organizations dependent upon contributions, AMSAT-NA has felt the loss in giving in the aftermath of the September 11, 2001 tragedy. Citing this event and the overall slowdown in the U.S. economy as reasons for this loss in revenue, Robin indicated that the Project Eagle satellite that was scheduled for 2004 has been rescheduled for some time in 2006. Robin further indicated that even this later date might be too optimistic unless each member of AMSAT-NA contributes $100 per year to the building fund. For more information on joining AMSAT-NA and/or contributing to their building fund, write to AMSAT-NA, P.O. Box 27, Washington, DC 20044.

On the Air

The following is from Andy Clarke, VA6SZ: "Here is a short report of the first 6 meter *F*-skip of the season. On Sunday, October 20 at approximately 2100 UTC, after calling for about five minutes I worked LU6DRV, LU9AEA, LU3ET, and LU8DIO in GF-05. Signals were 53–55. This grid was in the southern part of Argentina, so they were quite long contacts. The band did not remain open for long.

"On Sunday, November 3, I worked the following stations: VY0AAA, KP4EIT,

KP2BH, TI5KD, HR3/JA6WFM, TG9AJR, TG9IKE, HP2CWB, LU5VV, XE1BEF, VP2MJD, CO8DM, and K6MYC/J3. Except for VYØAAA, who was worked at 0323 UTC on aurora, all were *F*-skip propagation and worked between 1625 and 1826 UTC."

Current Contest

ARRL VHF Sweepstakes: This annual winter classic takes place 19–21 January, beginning at 1800 UTC 18 January and ending 0300 UTC 20 January. Exchange is your grid square. This is the only VHF contest that features club competition.

A summary of the complete rules appeared in December 2002 *QST*. Rules, plus log/summary sheets, are also available electronically from the League on their home page, <http://www.arrl.org>. As always, send or electronically file your log and summary sheets with the League.

Current Meteor Showers

The Quads: The *Quandrantids,* or *Quads,* is a brief, but very active meteor shower. According to OH5IY's meteor-scatter software, the expected peak is around 0000 UTC on 4 January. The actual peak can occur ±3 hours of the predicted peak. The best paths are north-south. Long-duration meteors can be expected about 1± hours after the predicted peak. As always, look to 3818 or 3843 kHz in the evening hours for opportunities for schedules.

And Finally . . .

Unlike the *Leonids* meteors, reported on above, the years seem to be whizzing by. Again we are starting a new year, the third of this new century. Advances in technology continue to challenge us both by our need to keep abreast of them and our need to protect our frequencies from encroachment by non-amateur users.

Perhaps a New Year's resolution for each of us is to become acquainted with some aspect of ham radio that is new to us and learn about how to use it in the practice of our hobby. Another New Year's resolution might be becoming a mentor to someone new to the hobby. Right now I am mentoring a young man who is planning on entering the ministry. I can tell you that there is nothing more fulfilling than working with someone enthusiastic about the same interest that you have. I am sure that you can think of other New Year's resolutions pertaining to our hobby that you might want to implement for yourself. If you have something unique to share, please let me know so that I can share it with the rest of us who are interested in making our niche of the hobby just that much better.

Until next month... 73, Joe, N6CL

Looking Ahead in CQ

Here's a look at some of the articles we're working on for upcoming issues of *CQ:*

"Restoring the Heathkit HW-202," by WB8VGE
"A Balloon-Supported Vertical Array for 160 Meters," by W3CRI, KØDI & KS4IS
"Ham Radio in The Azores," by SMØJHF

Plus ...

"CQ Market Survey—Handhelds," by WB6NOA
"CQ Millennium Award Wrapup," by W2VU

Do you have a ham radio story to tell? See our writers' guidelines on the CQ website: <http://www.cq-amateur-radio.com>.

On the Cover

If a plane crashed on the border ... between Sarasota and Manatee Counties in Florida, emergency management officials from both counties (including hams) would know how to respond, having practiced just such a scenario at the drill pictured on our cover this month. On the cover, Ron Wetjen, WD4AHZ, transmits live video back to the Sarasota Emergency Radio Club's communications trailer, where county RACES Officer Al Alviani, N4LML (inset), monitors the pictures and retransmits them at higher power back to the county's Emergency Operating Center (EOC). Sarasota County has just bought the group an ATV repeater, with which it is hoped that they will be able to provide video coverage back to the EOC from anywhere in the county. The county has also provided funding for outfitting two identical communications trailers plus two collapsible 100 foot towers for setting up at disaster scenes. The ARES/RACES group makes extensive use of amateur television in its emergency communications operations.

In addition to 434 MHz ATV equipment, each van is outfitted with HF, VHF, and UHF ham gear, along with radios for the county's 800 MHz trunked radio system plus emergency management, forestry, marine, and CB radios as well. Each van has a generator for its own power, plus a second generator to power the electric winch on each tower. For more on using amateur television in emergency and public service communications, see this month's "Public Service" column on page 56. (Cover photos by Larry Mulvehill,WB2ZPI)

dx

BY CARL SMITH,* N4AA

"Free Banding"

The contest season is upon us. The phone section of the CQ WW DX Contest is history, the ARRL Sweepstakes is running as I write this, and the CQ WW CW will be history in a few weeks, too. If you didn't notice, there were over 150 operations announced for the CQ WW SSB weekend. Probably at least that many will be announced prior to the CW running of this popular annual event. Where *do* all these people come from?

They come from all over the world and go to some interesting places for several days centered on the contest weekends. Without all these operations we still would have fun, but they sure do add something to the weekend. Some of these operations even offer special awards for working them on all bands, etc.—a contest within a contest for even more fun. I hope you were able to participate to some extent and enjoyed working all the good DX available.

Free Banding

Now on to another subject of interest to DXers, and especially DXpeditioners. The following appeared as the editorial in the November/December 2002 issue of *The DX Magazine*. It raises the subject of potential trouble for DXpeditioners by "Free Banders."

What the Heck is "Free Banding?"

Well, most of you know it as CB Radio. However, "Free Band" is an offshoot of CB and in some countries of the world it is considered "legal." Legal may not be the proper term, perhaps "tolerated" is more appropriate.

Actually, CB has an authorized segment of the radio spectrum. In the USA there are 40 channels in the 26–27 MHz range. Where "Free Band" comes in is the area between Channel 40 (27.405) and 28.000 MHz, as well as below Channel 1 (26.965) down to 26.000 MHz.

I looked on the internet for "Free Band" and found a large number of websites, mostly from outside the USA. Also, I've been told there are "DX groups," primarily in Europe, who actually conduct activities very similar to what the Amateur Radio DX community does—I mean, DXpeditions, even a "cluster" spotting network, etc.

I have seen reports on some of these Free Band DXpeditions to a number of countries/islands. I've also been told some of these Free Band DXpeditioners are licensed radio amateurs and have used the prestige of amateur radio to gain operating permission and then operated on these "Free Band" frequencies.

Now having said that, I hasten to add that in "some" countries this type of operation is allowed. It is not "illegal" and thus there is no problem. I was recently informed that in one island country of the Pacific the government is apparently only concerned about "Free Band" operation causing interference to other radio services. Also, there is little or no concern about transmitter power, again with their only concern being no interference.

There have been "Free Band" DXpeditions to islands where there was no permission given to be on the island by the governing body. The operators went to the island "illegally" and at some risk to their own safety. Obviously, if this had been an Amateur Radio trip, the operation would not have been accredited by DXCC. The "Free Banders" obviously have no such rules. They make contacts, provide QSL cards, and, if I understand correctly, they even have awards like our own DXCC. Whoever administers such awards apparently has no problem with these DXpeditioners making unauthorized/illegal trips to locations where we, as Radio Amateurs, cannot go.

People have asked if N4AA has a station, so here is proof that I really do. That's an FT-1000MP with a 12-year-old Ten-Tec Titan amplifier above it. I even get on the air from time to time!

The massive antenna system at N4AA—a 60 ft. wooden pole with a Cushcraft A4S at the top of the pole with the two-element Cushcraft for 40 meters 10 ft. above it. It doesn't hurt that this pole is at the top of a nice little hill (2500 ft. elevation) with a clear shot to the horizon over 360°, with a drop-off in all directions of about 150 to 200 ft. or so within a quarter mile. This makes the antennas effectively a few hundred feet above the valley below.

*P.O. Box DX, Leicester, NC 28748-0249
e-mail: <n4aa@cq-amateur-radio.com>

The WPX Program

SSB

2852 .....PT2HF

CW

3099.....YU1PC

Mixed

1909.....ON5GL

CW: 1100 K4IE. 1850 I2EAY. 1900 VE6BF. 3300 W4VQ.

SSB: 550 KL7FAB. 700 PT2HF. 800 G3TSZ. 1250 I2EAY.

MIXED: 700 KL7FAP. 800 ON5GL. 1700 K4IE. 2000 VE6BF. 2250 I2EAY. 2450 US8MM.

10 meters: VE3MQW
15 meters: VE3MQW, G3TSZ
20 meters: VE3MQW
160 meters: VE3MQW

Asia: VE3MQW
No. America: VE3MQW
Europe: VE3MQW

Award of Excellence Holders: N4MM, W4CRW, K5UR, K2VV, VE3XN, DL1MD, DJ7CX, DL3RK, WB4SIJ, DL7AA, ON4QX, 9A2AA, OK3EA, OK1MP, N4NO, ZL3GQ, W4BQY, I8JX, WA1JMP, KØJN, W4VQ, KF2O, W8CNL, W1JR, F9RM, W5UR, CT1FL, WA4QMQ, W8ILC, VE7DP, K9BG, W1CU, G4BUE, N3ED, LU3YL/W4, NN4Q, KA3A, VE7WJ, VE7IG, N2AC, W9NUF, N4NX, SMØDJZ, DK5AD, WD9IIC, W3ARK, LA7JO, VK4SS, I8YRK, SMØAJU, N5TV, W6OUL, WB8ZRL, WA8YM, SM6DHU, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, DK4SY, UR2QD, ABØP, FM5WD, I2DMK, SM6CST, VE1NG, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, HA8XX, K7LJ, SM3EVR, K2SHZ, UP1BZZ, EA7OH, K2POF, DJ4XA, IT9TQH, K2POA, N6JV, W2HG, ONL-4003, W5AWT, KBØG, HB9CSA, F6BVB, YU7SF, DF1SD, K7CU, I1PO, K9LNJ, YBØTK, K9QFR, 9A2NA, W4UW, NXØI, WB4RUA, I6DQE, I1EEW, I8RFD, I3CRW, VE3MC, NE4F, KC8PG, F1HWB, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, KC7EM, YU1AB, IK2ILH, DEØDAQ, I1WXY, LU1DOW, N1IR, IV4GME, VE9RJ, WX3N, HB9AUT, KC6X, N6IBP, W5ODD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, WØULU, K9XR, JAØSU, I5ZJK, I2EOW, IK2MRZ, KS4S, KA1CLV, KZ1R, CT4UW, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, OE1EMN, W9IL, S53EO, DF7GK, I7PXV, S57J, EA8BM, DL1EY, KØDEQ, KUØA, DJ1YH, OE6CLD, VR2UW, 9A9R, UAØFZ, DJ3JSW, HB9BIN, N1KC, SM5DAC, RW9SG, WA3GNW, S51U, W4MS, I2EAY, RAØFU, CT4NH, EA7TV, W9IAL, LY3BA, K1NU, W1TE, UA3AP, EA5AT, OK1DWC, KX1A, IZ5BAM, W4GP, K4LQ.

160 Meter Endorsement: N4MM, W4CRW, K5UR, VE3XN, DL3RK, OK1MP, N4NO, W4BQY, W4VQ, KF2O, W8CNL, W1JR, W5UR, W8RSW, W8ILC, G4BUE, LU3YL/W4, NN4Q, VE7WJ, VE7IG, W9NUF N4NX, SMØDJZ, DK3AD, W3ARK, LA7JO, SMØAJU, N5TV, W6OUL, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, UR1QD, AB9O, FM5WD, SM6CST, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, K7LJ, SM3EVR, UP1BZZ, K2POF, IT9TQH, N8JV, ONL-4003, W5AWT, KBØG, F6BVB, YU7SF, DF1SD, K7CU, I1POR, YBØTK, K9QFR, W4UW, NXØI, WB4RUA, I1EEW ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, YU1AB, IK4GME, WX3N, WBØDD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, K9XR, JAØSU, I5ZJK, I2EOW, KS4S, KA5CLV, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, S53EO, S57J, DL1EY, KØDEQ, DJ1YH, OE6CLE, HB9BIN, N1KC, SM5DAC, S51U, RAØFU, UAØFZ, CT4NH, W1CU, EA7TV, LY3BA, RW9SG, K1NU, W1TE, UA3AP, OK1DWC, KX1A, IZ5BAM, W4GP.

Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage if airmail desired) to "CQ WPX Awards," P.O. Box 593, Clovis, NM 88101 USA. ***NOTE:*** *WPX will not accept prefixes/calls which have been confirmed by computer-generated electronic means.*

Oscar Morales, Jr., CO2OJ, is shown here with a photograph of his late father, Oscar, Sr., CO2OM, whom the Cubans refer to with reverence as "Elmer" and the legendary Father of Cuban DX. (Photo courtesy Frank, AHØW)

Gottfried, DL1JGP, is a county hunter and also operates DAØSZB and DKØRMR. He's been a ham since November 1979 and likes 20 and 75 meter SSB in the winter. (Photo courtesy John, KDØJL)

So what do we have here? We have a situation where operation on these "Free Band" frequencies is more or less "legal" in some countries. If a real Amateur Radio DXpedition goes to one of these places, and operates on those "legal Free Band" frequencies in addition to the ham bands, should the whole operation be disqualified by our DXCC desk? Not really. If the country in question "allows" operation on "Free Band," then it isn't illegal.

As I see it, the only problem would be if a DXpedition used its Amateur Radio status to obtain permission to operate from a location which did not allow "Free Banding" and then operated on those illegal frequencies. This could jeopardize future Amateur Radio operation from possibly a rare country. It would have to be considered on a case by case basis and not add an additional burden on every DXpedition to "prove" anything else about their operation.

It seems we have a credibility problem. If "Free Banders" want to operate from some

The WAZ Program

12 Meter SSB

25 ..... UU2JQ

15 Meter SSB

588 ..... W8QZA (QRP) 589 ..... JA1ETN

17 Meter SSB

29 ..... UU2JQ

20 Meter SSB

1105 ..... JA1BTR

40 Meter SSB

99 ..... K5UR

12 Meter CW

35 ..... UU2JQ

17 Meter CW

44 ..... UU2JQ

30 Meter CW

54 ..... UU2JQ

6 Meters

56 ..... SM6FHZ (30 zones)

160 Meters

181 ..... ES1RA (all 40 zones)
174 ..... UU2JQ (endorsement 38 zones)

All Band WAZ SSB

4816	JAØPE	4822	W6LJS
4817	IZ8DQK	4823	PT2HF
4818	ZS6JM	4824	DS5SWL
4819	OK1MVD	4825	JFØEHX
4820	KØMFI	4826	JH3GFA
4821	WØEWM		

Mixed

8192	DJØGD (QRP)	8196	N7YX
8193	JA1BPN	8197	KB2DJJ
8194	W4WB	8198	JR7DXN
8195	WV6E		

All CW

335	S59ZZ	338	DL9GTK
336	WØIKD	339	JM3AVI
337	GMØVIT	340	HL1AV

RTTY

137 ..... PAØEHF

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>.

5 Band WAZ

As of November 15, 2002, 607 stations have attained the 200 zone level and 1298 stations have attained the 150 zone level.

New recipients of 5 Band WAZ with all 200 zones confirmed:
None

The top contenders for 5 Band WAZ (zones needed, 80 meters):

N4WW, 199 (26)	SM7BIP, 199 (31)
W4LI, 199 (26)	PY5EG, 199 (23)
K7UR, 199 (34)	SP5DVP, 199 (31 on 40)
WØPGI, 199 (26)	KY7M, 199 (34)
W2YY, 199 (26)	W8AEF, 199 (40)
VE7AHA, 199 (34)	W9NGA, 199 (26)
IK8BQE, 199 (31)	K8RR, 199 (26)
JA2IVK, 199 (34 on 40m)	UU5JR, 199 (4)
KL7Y, 199 (34)	EA5BCX, 198 (27, 39)
NN7X, 199 (34)	G3KDB, 198 (1, 12)
IK1AOD, 199 (1)	KG9N, 198 (18, 22)
DF3CB, 199 (1)	KØSR, 198 (22, 23)
F6CPO, 199 (1)	UA4PO, 198 (1, 2)
KC7V, 199 (34)	JA1DM, 198 (2, 40)
GM3YOR, 199 (31)	9A5I, 198 (1, 16)
VO1FB, 199 (19)	LA7FD, 198 (3, 4)
KZ4V, 199 (26)	K5PC, 198 (18, 23)
W6DN, 199 (17)	K4CN, 198 (23, 26)
W6SR, 199 (37)	KF2O, 198 (24, 26)
W3NO, 199 (26)	G3KMQ, 198 (1, 27)
K4UTE, 199 (18)	N2QT, 198 (23, 24)
HB9DDZ, 199 (31)	OK1DWC, 198 (6, 31)
RU3FM, 199 (1)	W4UM, 198 (18, 23)
HB9BGV, 199 (31)	US7MM,198 (2, 6)
N3UN, 199 (18)	K2TK, 198 (23, 24)
OH2VZ, 199 (31)	K3JGJ, 198 (24, 26)
K5MC, 199 (22)	W4DC, 198 (24, 26)
W1JZ, 199 (24)	N4XR, 198 (22, 27)
K2UU, 199 (26)	OE2BZL, 198 (1, 27)
W1WAI, 199 (24)	N4PQX, 198 (24, 26)
W1FZ, 199 (26)	RU3DX, 198 (1, 6)
UT4UZ, 199 (6)	

The following have qualified for the basic 5 Band WAZ Award:

Endorsements:

RU3DX (198 zones)	W6BCQ (200 zones)
K4MS (188 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>.

place, let them do so on the basis of their own credibility and not use Amateur Radio as a tool to gain access to locations where their operation would not be allowed.

A tough one to bring to light, but I hope I've covered the subject adequately.

73, Carl, N4AA

On the subject of using amateur radio status to gain access and then operate "Free Band," I have been told by people I trust that this *has* happened in at least two cases. They did operate some on the ham bands, but the primary focus of the operation apparently was "Free Band," where they made considerably more contacts than they did on amateur frequencies.

I urge our friends in Europe and the Pacific to consider the possible impact that "Free Banding" could have on amateur radio. If you want to operate on these frequencies, please don't use the Amateur Radio Service as a stepping stone to achieve your objectives. Your activities are being observed.

"Flying Horse" Grounded

The "Flying Horse" *Radio Amateur Callbook* is now history. Sadly, it is true

CQ DX Honor Roll

The CQ DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more ACTIVE countries. With few exceptions, the ARRL DXCC Countries List is used as the country standard. The CQ DX Award currently recognizes 335 countries. Honor Roll listing is automatic when an application is received and approved for 275 or more active countries. Deleted countries do not count and all totals are adjusted as deletions occur. To remain on the CQ DX Honor Roll, annual updates are required. All updates must be accompanied by an SASE if confirmation of total is required. The fee for endorsement stickers is $1.00 each plus SASE. Please make checks payable to the awards manager, Billy F. Williams. All updates should be mailed to P.O. Box 9673, Jacksonville, FL 32208.

CW

K2TQC 334	W4OEL 333	K4CN 332	K3JGJ 331	N5HB 329	K4JLD 326	KE5PO 322	HB9DDZ 314	F5OIU 302
K2FL 334	WB5MTV 333	KA7T 332	N4AH 331	K1HDO 328	OK1MP 325	W7IIT 322	N1HN 313	KH6CF 301
K9BWQ 334	W2FXA 333	W8XD 332	W2VJN 331	K7JS 328	W4LI 325	K6CU 321	CT1YH 313	KØHQW 299
K9MM 334	EA2IA 333	WØJLC 332	W2UE 330	K8PV 327	WA8DXA 325	N4OT 321	K9OW 313	WG7A 295
W7OM 334	W7CNL 333	K8LJG 332	N4CH 330	W4QB 327	I5XIM 325	HA5DA 321	PY4WS 313	W9IL 294
K2JLA 334	YU1HA 333	YU1AB 332	W6DN 330	W4UW 327	K5UO 325	VE7DX 320	N7WO 312	KD8IW 288
N7FU 334	PA5PQ 333	K5RT 332	W2UE 330	I1JQJ 327	IK2ILH 325	IKØADY 320	K9DDO 312	EA3BHK 282
K2OWE 334	DL3DXX 333	NØFW 331	I4LCK 330	YU1TR 327	N5FW 325	WG5G/QRPp 320	W3II 312	YC2OK 282
N4MM 334	IT9QDS 333	N5FG 331	VE7CNE 330	I4EAT 327	9A2AA 325	HA5NK 319	W6YQ 310	DJ1YH 281
F3TH 334	G4BWP 333	PT2TF 331	4N7ZZ 330	DL8CM 327	LA7JO 324	K1FK 319	YT1AT 310	UA9SG 279
F3AT 334	K4CEB 333	K6LEB 331	K7LAY 330	SM6CST 327	SM5HV/HK7 324	F6HMJ 319	KF8UN 308	XE1MD 278
DJ2PJ 334	K4IQJ 333	N4JF 331	WB4UBD 330	N4KG 327	W6SR 323	G3KMQ 317	IKØADY 307	EA2CIN 278
WA4IUM 334	WØHZ 333	VE3XN 331	K9IW 329	IT9TQH 326	9A2AJ 323	OZ5UR 317	YU7FW 306	I3ZSX 276
K2ENT 333	N7RO 332	W1WAI 331	G3KMQ 329	I2EOW 326	KUØS 322	K8JJC 315	LU3DSI 302	G3DPX 275
K3UA 333	K6GJ 332	K2JF 331	KZ4V 329	NC9T 326				

SSB

K6YRA 335	DU9RG 334	K8LJG 333	WA4WTG 331	W2FGY 329	K6BZ 327	LU5DV 322	VE3CKP 311	OA4EI 292
K2TQC 335	N7RO 334	K3UA 333	N4JF 331	CT1EEN 329	KE5K 327	WA4ZZ 322	CT1YH 311	N8SHZ 291
W6EUF 335	K2FL 334	K4JLD 333	EA1JG 331	W2FKF 329	W6SR 326	N3RX 321	YV5NWG 311	KØOZ 291
K2JLA 335	WØYDB 334	VE4ACY 333	K1UO 331	KE4VU 328	N4KG 326	XE1CI 321	LU3HBO 310	I3ZSX 290
K4MQG 335	W4UW 334	KØKG 333	W8KS 331	K1HDO 328	K7TCL 326	CT1ESO 321	SV3AQR 310	AC6WO 290
IK1GPG 335	K9BWQ 334	W4WX 333	YV5IVB 331	K5UO 328	W5LLU 326	YT1AT 321	HA6NF 310	W4PGC 288
K5OVC 335	W4NKI 334	VE2WY 333	KX5V 331	KF8UN 328	W9HRQ 326	EA8TE 321	HB9DDZ 310	YV5NWG 287
NØFW 335	WB4UBD 334	WB3DNA 333	I8LEL 331	EA3EQT 328	W4QB 326	W6MFC 321	WA5MLT 310	RW9SG 286
K9MM 335	W4UNP 334	K6GJ 333	K9OW 331	KB2MY 328	K8PV 326	K3LC 320	EA3BHK 307	VE7HAM 285
W6BCQ 335	W8AXI 334	W9SS 333	W2CC 331	WØULU 328	DL6KG 326	N4CSF 320	N1ALR 306	KKØDX 285
XE1AE 335	VE2GHZ 334	VE2PJ 332	K3JGJ 331	KZ4V 328	W4LI 326	N4HK 320	XE1MDX 305	VE7SMP 284
W7OM 335	OE2EGL 334	YV1KZ 332	N5ORT 331	XE1D 328	WR5Y 326	DL3DXX 320	EA5OL 305	F5RRS 284
KZ2P 335	WA4IUM 334	YV1AJ 332	VE7WJ 331	KD8IW 328	IKØIOL 325	KØFP 320	WB2AQC 305	CT1CFH 284
IK8CNT 335	K5RT 334	KSØZ 332	PT2TF 331	ZL1BOQ 328	K1EY 325	EA1JG 320	N1KC 305	WØIKD 283
VK4LC 335	K2ENT 333	N5ZM 332	W3AZD 331	I1EEW 327	K9IW 325	EA7TV 320	KE4SCY 304	EA3CYM 283
OE7SEL 335	N4CH 333	K9PP 332	W6DN 330	SV1ADG 327	WA4JTI 325	SV1RK 320	KC4FW 304	W9ACE 283
VE3MR 335	IØZV 333	W6SHY 332	K8CSG 330	DL8CM 327	NI5D 325	WA4DAN 319	K3BYV 303	KBØRNC 282
VE3MRS 335	N5FG 333	I8KCI 332	EA3KB 330	I1JQJ 327	KC4MJ 325	CE1YI 318	YC2OK 303	F5JSK 281
K4MZU 335	DJ9ZB 333	LU4DXU 332	YV1CLM 330	F9RM 327	K7HG 324	YV4VN 317	WB2NQT 303	WN6J 281
OZ5EV 335	EA2IA 333	W5RUK 332	LA7JO 330	XE1MD 327	AC7DX 324	WN9NBT 317	VK3IR 303	YU1TR 280
N7BK 335	4N7ZZ 333	W2FXA 332	AB4IQ 330	I4EAT 327	KØHQW 324	EA5GMB 317	W2GZI 302	KK5UY 280
K7LAY 335	KE5PO 333	VE4ROY 332	AE5DX 330	W3GG 327	W9IL 324	W5OXA 317	N5QDE 302	KA5OER 280
ZL3NS 335	PY4OY 333	W7FP 332	WS9V 329	AA6BB 327	EA3BKI 323	CT1AHU 316	KD4YT 302	EA3CWT 278
N4MM 335	VE1YX 333	K9HQM 332	I2EOW 329	SM6CST 327	K4JDJ 323	N5HSF 316	KK4TR 301	VE2DRN 277
OZ3SK 335	XE1VIC 333	CT1EEB 332	K2JF 329	WD8MGQ 327	EA3BMT 323	K6RO 316	YT7TY 300	XE2NLD 277
K7JS 335	IN3DEI 333	K4CN 332	ZL1AGO 329	CX4HS 327	WW1N 322	CP2DL 314	SV2CWY 300	9A9R 277
XE1L 335	I4LCK 333	W8ZET 332	N5FG 329	IØSGF 327	F6BFI 322	K9YY 313	4X6DK 300	W6UPI 276
YU1AB 335	VE3XN 333	DL9OH 331	W9OKL 329	IT9TQH 327	K6CF 322	NØMI 313	K6GFJ 299	VE2AJT 275
OE3WWB 335	W2JZK 333	N2VW 331	DU1KT 329	IT9TGO 327	LU7HJM 322	KD5ZD 313	WA1ECF 295	Z31JA 275
K5TVC 335	EA4DO 333	YZ7AA 331	4Z4DX 329	DK5WQ 327	K5NP 322	W5GZI 311	N5WYR 293	G4URW 275
WDØBNC 334	PA5PQ 333	YV1JV 331	VE7DX 329	UY5XE 327	PY2DBU 322	WZ3E 311	K7ZM 292	

RTTY

K2ENT 331	NI4H 321	W2JGR 316	KE5PO 297	I2EOW 291	EA5FKI 284	W4QB 280	YC2OK 280	PA5PQ 272
WB4UBD 329	K3UA 318	G4BWP 312	W4EEU 291	I1JQJ 289				

that the longest published callbook is no more. The last paper editions were printed in 1997, and the last CD ROM now has been issued.

For decades hams have relied on *the* Callbook for addresses to send QSL cards. It was always there, right up to date, especially for the overseas addresses. The Flying Horse was the best source for addresses in Europe, Japan, and other areas of the world. Who will fill this void? At the moment I don't know. Others have tried in the past to obtain those overseas databases for address information and had little or no luck. We can only hope that someone, somewhere will come forward with a product comparable to the now silent Flying Horse source. I personally can only say "thanks for the memories" and for many decades of service to the amateur radio community.

DXpedition QSLing

I'm going to touch on the subject of DXpedition QSLing. I've talked about this subject before, but I would like to express my own opinion on one aspect of this. I won't name the operation, but there was at least one in recent memory for which the amount of your "donation" to the operation supposedly determined how soon you got your QSL card. I personally found this to be totally wrong. If you have enough money to be able to send the DXpedition $100 or $500 or more, why should that make you any different from the other guy who is struggling to make ends meet at home and can only afford to put a couple of dollars in the envelope? If you have enough money to support the DXpedition to the tune of several hundred dollars, I applaud you. There are thousands of others who are not as well blessed, and they should *not* be made to feel like "second-class citizens" because of that.

DXpeditioning has become a *very* expensive endeavor due to the places to which some of the operators travel and the equipment required when they get there. Most of these DXpeditions obtain the majority of their funds from team members and financial assistance from DX clubs and foundations established for that purpose. I personally do not believe it is appropriate that requests for QSLs be dependent

CQ DX Awards Program

SSB

2387 ..... CT2FUH
2388 ..... N3WD
2389 ..... K5RT

CW

1035 ..... K5RT

SSB Endorsements

320 ..... OZ3SK/335
320 ..... ZL3NS/335
320 ..... OZ5EV/335
320 ..... K9MM/335
320 ..... YU1AB/335
320 ..... N7BK/335
320 ..... N4MM/335
320 ..... K5TVC/335
300 ..... K5RT/334
320 ..... WB4UBD/334
320 ..... WA4IUM/334
320 ..... OE2EGL/334
320 ..... W4UNP/334
320 ..... W4WX/333
320 ..... W9SS/333
320 ..... WB3DNA/333
320 ..... VE2WY/333
320 ..... W7FP/332
320 ..... K9HQM/332
320 ..... W9OKL/329
320 ..... WØULU/328
320 ..... WR5Y/326
310 ..... WA5MLT/310
300 ..... KK4TR/301

CW Endorsements

320 ..... N7FU/334
320 ..... K9MM/334
320 ..... N4MM/334
320 ..... WA4IUM/334
320 ..... DJ2PJ/334
320 ..... WØHZ/333
320 ..... K4IQJ/333
320 ..... YU1AB/332
320 ..... K5RT/332
320 ..... WB4UBD/330
310 ..... OZ5UR/317
310 ..... PY4WS/313
310 ..... W6YQ/310

RTTY Endorsement

320 ..... WB4UBD/329

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.

upon the amount of the "donation" sent, nor is it in the spirit of amateur radio or DXing.

A New Year

We're beginning a new year. I'm sure many have made New Year's resolutions with all good intentions that will fade like the winter snow in springtime. More and more DXers are reaching the upper levels of achievement—i.e., Honor Roll and all that. More and more DXers seem to be striving to make those band/mode contacts for other awards that are offered these days, and I applaud your efforts to keep active with a goal in mind. A good friend told me recently that he just needed a handful of QRP contacts on 80 and 160 to reach his goal, then he intended to take down those antennas. I'll believe that when I see the antennas on the ground.

Until next time, have fun. There are a lot of interesting contests to keep you going between "new countries" for the next several months.

73, Carl, N4AA

Although Paul, K5RT, CQ's WAZ Award Manager, says his track record with the U.S. mail has been very good over a time period of three years and about 2500 applications received, this one from S59ZZ is certainly an exception, although the application fee was still inside the envelope! Evidently, this envelope became a snack for some sorting machine. (Photo via K5RT)

QSL Information

C21RH via VK4AAR
C21ZM via 5B4AGN
C31VQ via EA2NA
C53M via OH3RM
C56JHF via SMØJHF
C56RF via G3NKO
C6ALW via K3TKJ
C6ARB via W5UE
C98DC via DL7AFS
CAØYAM via CE1VLY
CJ2BY via VE3BY
CJ2KCE via VA2KCE
CJ2SRE via VE3SRE
CK3AT via VE3AT
CN2R via W7EJ
CN8MC via WB2AQC
CN8NK via EA5XX
CN8UIT via CN8MC
CO8HF via WØDM
CO8LY via EA7ADH
CP6XE via IK6SNR
CT/PA3HEN via PA3BLS
CT1DSC via CT1CJJ
CV5Y via EA5KB
CW60F via CX3FH
CX7CO via SMØKCO
D2BF via EA8EE
D44TD via CT1EKF
DAØGF via DL3OCH
DAØMF via DL3OCH
DAØZEA via DL3OCH
DU3NXE via W3HNK
DU9/NØNM via W4DR
DXØL via DU1MS
DX2VOA via W7KNT
DZ1MS via DU1MS
EA/PA3HEN via PA3BLS
EA8ZS via OH1JT
EA9/PA3HEN via PA3BLS
EI2VRN via DF2IY
EI9FN via G3YOG
EJ4GK via EI4GK
EM3W via WB2RAJ
EM5UIA via UR4LUG
ER1CW via W4FOA
ER4DX via UT7ND
ES6Q via ES5RY
EW1DM via W3HC
EW6AP via LZ1YE
EW8AM via EA3FQA
EX7ML via DL4YFF
EZ8AQ via UA3TT
EZ8CW via RU4SS
EZ8CW via KJ6OW
F/PA3HEN via PA3BLS
FG5XC via FD6HSI
FK8GJ via F6CXJ
FK8HW via VK4FW
FM5FJ via KU9C
FOØKAN via JA3EZJ
FOØSAI via JI1JKW
G4EXG via G4ZNN
GBØKJW via GØOWE
GB2FB via G4DFI
GB2IOM via GØPSE
GB4FI via G3SWH
GD6IA via GM3WOJ
GMØDHZ via GØDHZ
GM7V via MØCMK
H8A via DL6MYL
HC8N via W5UE
HG10MV via HA3HK
HI9X via W9AAZ
HJØQGL via NØJT
HK3JJH/1 via HK3JJH
HK8HIX via EA5KB
HK8RQS via EA5KB
HK8UUC via EA5KB
HP1BYS via HP1RCP
HR3/JA6WFM via JA6VU
HSØ/OZ1HET via OZ1ACB
HSØ/VK3DXI via DL4DBR
HSØZDR via W4FOA
IG9A via IT9GSF
IH9P via OK1MG
ISØ/IZ2DPX via IKØDUW
J28UN via F8UNF
J39BW via WB2RAJ
J43DIG via DJ8OT
J45DIG via DJ8OT
J49Z via IK8UND
J7/PA3GCV via PA5ET
J7/PA4WM via PA5ET
J8/AC4LN via UA4WHX
JA6WFM/HR3 via JA6VU
JT1FDI via K4YT
JT1FDK via UAØACG
JT1FYT via K4YT
JT1FZW via K4ZW
JT1JA via UAØACG
JWØHU via SP3WVL
JWØSU via SP3WVL
JW5E via JW5NM
JW5X via LA9DL
K4P via K7DID
K5C via K2FF
K8O via AH6HY
K8T via GWØANA
K9V via WF9V
KG4CQ via N4NOZ
KG4JY via W4WX
KG4PK via W4WX
KHØ/KF2XN via W2GR
KHØAA via JA5DQH
KH2/KF2XN via W2GR
KH2/N2NL via W2YC
KH7A via JA5DQH
KH7X via K2PF
KJ1C/KHØ via JI1CYX
KP4WW via W4DN

(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>.)

our readers say

Re: "Zero Bias" October 2002

Editor, *CQ*:

I just read with great interest your editorial in the October 2002 issue of *CQ* regarding the activity, or lack thereof, on 2 meters. The same thing you discussed is true here in the Midwest. I live in a small town in Indiana, where we have three 2 meter repeaters, along with several 440 machines, and all of them are idle 95% of the time. There are a few nets held from time to time on the 2 meter repeaters, but that is about all the activity you hear. There is also little or no activity on most of the popular simplex frequencies. I am retired and monitor the local repeaters along with several simplex channels and rarely ever hear anyone on them. I have given out calls on the repeaters and simplex and rarely get an answer.

Like you, I am concerned that if we don't use the band we will lose it!! At last count we have over 450 licensed amateurs in this county. Where are they?? They certainly are not on the air on 2 meters, 440, or HF. Just thought I would let you know that it is a problem all over the country.

73, Mike, W9AIR

Editor, *CQ*:

In reading your October editorial, I was struck by what you said. After having been away from ham radio for a few years, I bought a new, inexpensive 2 meter rig and installed it in my pickup. I regularly take part in my local club "drive time" QSOs, and I do listen during the day when I'm out and about. I can almost always find someone to talk to. However, an incident took place last evening as I was looking for directions in a town just south of my home in Austin, Texas. I was advised to go to a local repeater in that town to find my directions, and that there is tone on that repeater. Now, driving, it was literally impossible for me to set the tone on my rig for that one call. I stopped at a local gas station and got my directions. This brings me to my point. I truly believe that the reason that many people aren't on repeaters any more is because of those @#$$#@&%$$ tones. Tones are the bane of VHF mobile operation for the casual user.

I wonder how many lives could actually be lost or endangered because someone didn't have the tone for a local repeater while visiting in a strange town? Can you imagine being somewhere you've never been, being in trouble and having your trusty 2 meter rig to get help, and then not being able to contact anyone because the local repeater had a $#@^^%$ tone on it that you didn't know and had no way to find out?

I believe that tones are elitist and exclusionary, the exact opposite of the spirit of ham radio that I have known since I was first licensed in 1959. Yes, I understand that in crowded areas they may be necessary, but I also wonder why so many people have to put up so many different repeaters in the first place. I know that Austin isn't New York (thank GOD!), but most of us out here in the great expanse of the USA aren't in NY or LA. Sure people get mad and leave, but this "I'll take my ball and go start another game" attitude has got to stop. The reason you can't hear anybody in New York, I imagine, is because every ham has his own repeater and that's the only one they listen to! (An exaggeration, I know.)

Perhaps if local hams populated just two or three repeaters instead of twenty or thirty, the problem you describe would go away. And, to those of you who are thinking about putting yet another repeater in your area, or if you own one already that has a tone on it, consider leaving it "open." You just might have more than one QSO a week, have some fun, and you just might save a life!

73, Dick, K5MHF

Editor, *CQ*:

I was very surprised at your editorial in October *CQ* which mirrored the 2 meter situation out here. I live east of the Cascades, and atop 7000 foot Mission Ridge there's a 2 meter repeater. The coverage of this repeater, although not as great as the Pikes Peak repeater, is quite wide. Back in the early/mid '80s I can remember that one could hardly get in a word edgewise on Mission Ridge. The amount of activity was incredible. Guys out mobiling every day, truckers with ham tickets, plus casual ragchews kept the Mission Ridge repeater hopping.

Now it's 2002 and listen to Mission Ridge. Nothing!! Except for a rare ragchew, there's not a soul. Where'd everyone go? Our local repeater, which is 1000 feet above the valley floor (excellent coverage), is also dead as a doornail. So I put my rig on simplex (146.52). Anyone there? Nope, dead as a mackeral! I thought with all these people with newly minted licenses that 2 meters would be a-hoppin! But no, all these licensees must be out 'n about doing something else.

I was thinking about buying a new handheld to replace the ICOM IC2A that I bought back in May 1980 (it still works perfectly), but why should I get a new HT when there's so little activity on 2 meters? There's no one to talk to.

I'm better off getting on 20 CW and ragchewing with FISTS club folks! Give me a good reason and I'll spring for a new HT, but for now I'd rather spring for a new key. Again, thanks for the great editorial. At least I'm not alone.

73, Don, W7GB

awards

BY TED MELINOSKY,* K1BV

The Cost of Getting The Cards

New county hunters quickly run into the monetary facts of life when building their county card collection. In theory it seems very expensive at first, but in reality it's much more modest than you think.

For example, let's say you already have 350 counties from your QSL collection, so they're already in the bag. That leaves confirmations from 2727 more to get them all. At 37 cents for each outgoing letter, that cost is $1008.99 to get your card into the contacts' hands. You really should supply return postage to make sure you get the card back, so at 23 cents each at the postcard rate, that's another $627.21 to increase the likelihood of a reply. If your QSL cards themselves cost 8 cents each, you might as well add another $218.46. Don't forget blank envelopes for outgoing mail at 2 cents each, bringing that cost to $54.54. Add it all together and the total comes to an amazing $1909.20!

Well, it doesn't work out like that, because most of the time you'll find there's a core group of about 40 to 50 mobile stations who seem to make most of the contacts on the nets, and you'll work them in multiple counties as they move about the country. Mobile reply cards (MRCs) will hold five, six, seven, or more contacts per card. This really cuts the postage cost dramatically, since your first-class letter will pay the way for dozens of county confirmations from one station. In addition, many county hunters use one of the Mobile QSL bureaus. Like the ARRL Incoming QSL Bureau, it takes considerable time to get responses. However, if you're just starting out, I'd highly recommend use of a bureau because it really will keep your costs low.

Remember that your concept of cost will change as you work your way to the end of USA-CA. You will be more than willing to use Express Mail to get the final few cards, and it will seem well worth the money. Then when you get ready to start over for the second time around, you'll have a good grasp on the costs involved.

Jeff Reinhardt, AA6JR
USA-CA #1039

Jeff, AA6JR, author of *CQ*'s "Magic in the Sky" column and a new quarterly mobiling column beginning next month, attained USA-CA All Counties on March 4, 2002. Here is his story:

Just after becoming licensed, I saw Wilbur, WA6OTV's USA-CA All Counties plaque #116 during a visit to his home. "What a feat," I thought, but put thoughts of duplicating that accomplishment out of my mind for several years.

After having achieved other operating awards, including 75 meter Extra Class WAS and DXCC, I thought it was time for a new challenge. The good news was all those USA QSL cards I had collected would get me off to a good start on gathering counties. The bad news was I was in the southwestern corner of the country with very limited antenna possibilities and power limited to 100 watts.

Nevertheless, I began listening to the County Hunter's Net whenever I could and getting a county here or there. Some weekends would render a hundred or more counties. Other times band conditions and time restraints conspired to shut me out. Hearing of Australian and European stations "working them all" was an encouragement. If they could do it, why not me?

On the other hand, running a business and keeping clients happy, holding public office, and trying to keep up

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e-mail: <k1bv@cq-amateur-radio.com>

USA-CA Special Honor Roll

James A. Labo, KØZT
USA-CA All Counties #1051
September 25, 2002

Leslie E. Smallwood, KW4V
USA-CA All Counties #1052
September 27, 2002

George Tomlinson, N3ISH
USA-CA All Counties #1053
October 3, 2002

James R. Schmidt, WA4VOC
USA-CA All Counties #1054
October 22, 2002

USA-CA Honor Roll

500

KØZT	3206
WØQE	3207
KW4V	3208
N3ISH	3209
WA4VOC	3210
KB8OMG	3211

1000

KØZT	1604
WØQE	1605
KW4V	1606
WO7GI	1607
WO7HI	1608
N3ISH	1609
WA4VOC	1610

1500

KØZT	1342
WØQE	1343
KW4V	1344
N3ISH	1345
WA4VOC	1346

2000

KØZT	1241
KW4V	1242
N3ISH	1243
WA4VOC	1244

2500

KØZT	1161
KW4V	1162
G3LAS	1163
N3ISH	1164
WA4VOC	1165

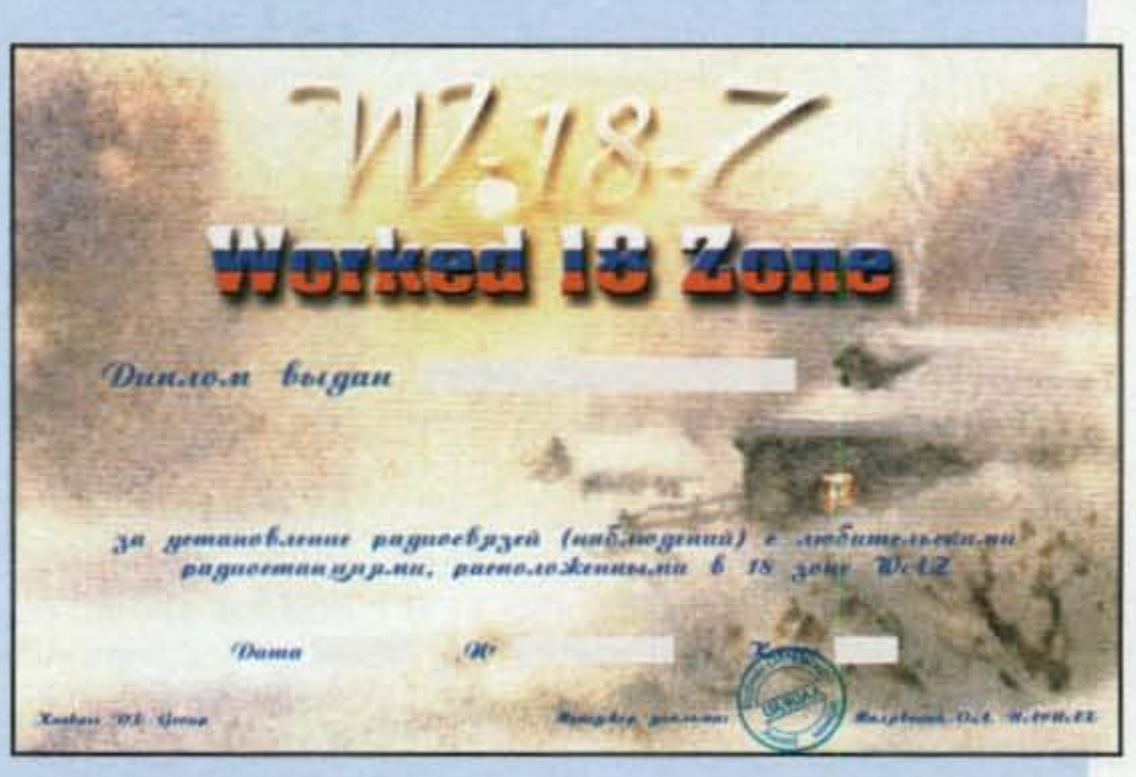
3000

KØZT	1072
KW4V	1073
N3ISH	1073
WA4VOC	1074

The total number of counties for credit for the United States of America Counties Award is 3077. The basic award fee for subscribers is $6.00. For nonsubscribers it is $12.00. To qualify for the special subscriber rate, please send a recent CQ mailing label with your application. Initial application may be submitted in the USA-CA Record Book, which may be obtained from CQ Magazine, 25 Newbridge Road, Hicksville, NY 11801 USA for $2.50, or by a PC-printed computer listing which is in alphabetical order by state and county within the state. To be eligible for the USA-CA Award, applicants must comply with the rules of the program as set forth in the revised USA-CA Rules and Program dated June 1, 2000. A complete copy of the rules may be obtained by sending an SASE to Ted Melinosky, K1BV, 12 Wells Woods Road, Columbia, CT 06237 USA. DX stations must include extra postage for airmail reply.

This award, issued in three classes, is sponsored by the Kurzwellenclub Schwalmtal e. V. for contacting maritime mobile stations.

The Multi-Band Emission DX Award is issued by JA1BWA for SSB and CW contacts with DXCC countries (included deleted ones) on all bands 160 to 6 meters, but it is necessary to include at least 50 contacts on each of the bands 80/75, 40, 20, 15, and 10 meters.



The W-18-Z Award is one of the Kuzbass DX Group award series and is issued for contacts with Russian oblasts in CQ zone 18.

with my wife and two energetic kids helps to keep my life in balance. Fortunately, all of the family are hams, so they understand my enjoyment of the radio arts. However, I must admit that while I was doing "official duties" I sometimes wondered if one of the last few counties I needed was on the air right then! As a county hunter you learn patience and how to maximize your opportunities.

County hunting becomes addictive. I have reveled in the success of others and often wished I was in some of the faraway, picturesque places I contacted.

It wasn't long before I added a mobile to the car and started putting out counties. I also started taking along a mobile HF rig when traveling for business or pleasure. It was fun to be on the other end of those pile-ups, especially from Hawaii!

Earning USA-CA All Counties is special to me. I am appreciative of the cooperation of my family and all those who go the distance to help make ham radio the enjoyable hobby it is. I don't think Wilbur ever knew what his award represented to me. To him it certainly was a mark of his achievement, but to me it stood out as a challenge.

I wish to thank all the county hunters, and particularly the net controls, for their enthusiasm and patience with this "little pistol" station. I've had the pleasure of meeting a few county hunters in person at the Dayton Hamvention® and elsewhere, and I would encourage you to join the fun with this fine group. They're "top shelf." —*Jeff, AA6JR*

DX Awards

The Maritime Diploma. Sometimes the bands are quiet and you think there is no decent propagation. Then a strong signal calls CQ with a callsign followed by /MM. Propagation is working for them in their part of the world! It's always

interesting to make the contact and learn the station's location. I did this when I was in the Navy, and was thrilled whenever I worked New England from my ship far away in the western Pacific.

There are a number of awards for contacting maritime mobile stations. This one, sponsored by the Kurzwellen-club Schwalmtal e. V., offers a moderate challenge in three levels, beginning with 30 contacts. It is not available for SWLs. All bands and modes accepted. Class 3 requires contacts with 30 maritime stations worldwide, Class 2 requires 50 contacts, and Class 1 requires 100. Each class has a different certificate. Send GCR list (certified by two witnesses) and fee of $US2 or 2 Euros to Holger Pflug, Schumacherstrasse 5, D-41334 Nettetal, Germany.

The Multi-Band Emission DX Award (MBEDX). This award, available from JA1BWA, provides a challenge for the versatile DXer who must prove contacts using a number of different bands and modes. If you are on 20 meters almost exclusively, you'll have to move the band switch for at least a token number of contacts. There are endorsements for earning up to 3000 points. Note that your award application (special form required) must be verified by holders of DXCC.

The award is available only to amateurs who have earned at least 1000 points for contacts after 27 August 1952. Contacts with DXCC countries (included deleted ones) on all bands 160 to 6 meters count for the award, and it is necessary to include at least 50 contacts on each of the bands 80/75, 40, 20, 15, and 10 meters. You *must* include contacts using both CW and SSB, while FM and RTTY may also be included. Each contact on a different band and mode with entities included in the ARRL DXCC list are worth one point. WARC bands are also okay. Endorsement stickers are issued at each 250 points level, with a special plaque for 3000 points.

A special application form is required and is available for an SASE sent to the award manager. GCR list must be verified by two amateurs who hold DXCC. Costs: MBEDX-1000 certificate 10 IRCs, or $US10; MBEDX-3000 plaque 40 IRCs, or $US40. Endorsement stickers are 2 IRCs, or $US2. Apply to: Toshio Takahashi, JA1BWA, P.O. Box 11, Funabashi-Higashi, Chiba, 274-8791 Japan.

Kuzbass DX Group Award Series. Oleg, UA9UAX, has done a great job of creating a professional design for the following award certificates. We all probably have worked special or commemorative Russian prefixes, and this is the perfect opportunity to use those QSL cards to earn a special award.

The WRSS Award, sponsored by the Kuzbass DX Group, is for contacting Russian special-prefix stations.

General Requirements: Log extract accepted. SWL okay. No restrictions for date, mode, and band. Award fee is $US1 or the equivalent for Russian amateurs; $US2, or 4 IRCs, for CIS amateurs; and $US10, 10 IRCs, or 10 Euros for the rest of world. Application and fee should be sent (via registered letter recommended) to: O. A. Maljavskij, Box 1, Topki, Kemerovskaja obl., 652300 Russia. For more details see: <http://home.concepts.nl/~kruistum/russian_awards.htm>; e-mail: <ua9uax@kuzbass.net>.

W-18-Z Award. Contact stations in the Russian oblasts situated in CQ zone 18: R9H (TO ex 158), R9O (NS ex 145), R9U (KE ex 130), R9Y (AL ex 99), R9Z (GA ex 100), RØA (KK ex 103), RØB (TM ex 105), RØH (EW ex 106), RØO (BU ex 85), RØS (IR ex 124), RØU (CT ex 166), RØW (HA ex 104), R8T (UO ex 174), R8V (AB ex 175). The award is available in three classes:

1st class—work 18 different stations in zone 18, with at least one station in each of the above oblasts.

2nd class—work 18 different stations from at least 7 different oblasts located in zone 18.

3rd class—work 10 different stations in zone 18.

(QSLs from SWLs located in zone 18 are valid for this award.)

WRSS Award. Contact Russian special-prefix stations. The award is available in three classes:

1st class—work 20 different stations (Russians need 40).

2nd class—work10 different stations (Russians need 20).

3rd class—work 5 different stations (Russians need 10).

Valid special prefixes include:

1. Those using the UE prefix.

2. Those using special callsigns during DXpeditions and contests (i.e., RM4W, RI3A, RU1A, R3HQ, etc).

3. Those belonging to amateur radio societies and clubs and using special callsigns (i.e., R1DIG, R9MWS, RS3A, R3RRC, etc.).

4. Those using callsigns during special events (i.e., RP3ZOR, RP9XUK, RH1C etc.).

5. QSOs with R1AN–, R1MV–, R1FJ, do not count for this award.

URL of the Month

The Belgian Radio Society, UBA, presents the rules for their handsome awards series accompanied by some large, attractive images at: <http://www.uba.be/UBA/awardEN.htm>. It's worth bookmarking.

Send me copies of your club or group's certificates. *CQ* offers the publicity and active award hunter readership base that is needed for successful promotion of awards.

73, Ted, K1BV

Contesting for Newcomers— Part II

BY JOHN DORR,* K1AR

contesting

January's Contest Tip of the Month

Do you keep your equipment manuals handy? You'd be surprised how a little bit of organization can save the day in a contest when your rotator sticks to the south and you don't know what to do, or the battery in your keyer finally gives up the ghost and you need to reprogram all the settings, or how about a little bit of troubleshooting on that switching setup you put together this past summer? If you haven't bought one of those cheap $50 file cabinets and gotten your organizational act in gear, now's the time. Your score will only go up when you're done.

If you read last month's column, you're off to a good start as a newcomer to contesting. One of the projects that I'd like to get to some day is writing a book on this subject, and that's probably what it would take to adequately cover the topic in detail. However, the purpose of this editorial coverage is to provide you with enough information to get started, so let's go.

Calendar of Events

Dec. 21	OK RTTY Contest
Dec. 21-22	Croatian CW Contest
Dec. 28	Canada Winter Contest
Dec. 28-29	Stu Perry Topband Distance Challenge
Jan. 1	ARRL Straight Key Night
Jan. 4	Kid's Day Contest
Jan. 4-5	ARRL RTTY Round-up
Jan. 11-12	North American QSO CW Party
Jan. 18	LZ Open Contest
Jan. 18-19	Hungarian DX Contest
Jan. 18-19	North American QSO SSB Party
Jan. 18-20	ARRL Jan. VHF Sweepstakes
Jan. 24-26	**CQ WW 160M CW Contest**
Jan. 25-26	REF CW Contest
Jan. 25-26	BARTG RTTY Sprint Contest
Jan. 25-26	UBA SSB DX Contest
Feb. 9	North American CW Sprint
Feb. 15-16	ARRL CW DX Contest
Feb. 21-23	**CQ WW 160M SSB Contest**

Getting Started

How do you get started? If you ask seasoned contesters about their first experiences in contest operating, they probably will tell you that they jumped feet first directly into the fray one day. That's one of the great things about contest operating. It's fundamentally about ham radio operating and getting on the air. If you're a new ham, you probably will have the same trepidation about operating a contest that you did when you made that first QSO by having a conversation with someone across town.

With a little experience under your belt, the art of contest operating will become as natural as getting on the air and working a little DX. When you net out all of the intricacies of the sport, contest operating boils down to the act of making a QSO with someone and exchanging some information such as a signal report and serial number (i.e., 59 001), logging the contacts as you would with any other QSO. If you're a typical person who "never reads the manual," it's not too difficult to listen to a typical contest and figure out what is needed for a valid QSO and then simply jump in and start calling stations. If you're really brave, you may even want to start calling CQ yourself and see what happens. Those of you who are planners by nature can take comfort in knowing that most contest sponsors publish the rules for their events. In most cases the rules are available on the internet, with URL links found on *CQ*'s website and many other places (see additional resources later in this column).

Picking a Contest

As you might imagine, there are many types of contests that appeal to the wide-ranging interests found in our hobby. For example, if VHF operating is your thing, there are many VHF contests from which to choose. Here's a small list of contest types to whet your whistle:

- SSB (i.e., CQ WW SSB)
- CW (i.e., CQ WW CW)
- RTTY (i.e., ARRL RTTY Roundup)
- VHF (i.e., ARRL VHF Sweepstakes)
- DX (i.e., ARRL DX Contest)
- USA (i.e., ARRL Sweepstakes)
- State specific (i.e., California QSO Party)
- Prefix hunting (i.e., CQ WW WPX)
- Country specific (i.e., Bulgarian DX Contest)
- Region specific (i.e., All-Asian DX Contest)
- Specialty (i.e., North American Sprint)

One of the strengths of contesting is that there is most certainly something there for you, perfectly aligning with your station strengths and personal interests. It's important to note that not everyone operates contests for the pure sport of the event itself. In many cases, contest operating is more of a means to an end. For example, many folks use contest operating to improve their DX country totals. Others use these events to work on certain awards or operating achievements. Whatever your motivation, the first step is to find an event that appeals to you and start operating!

Equipment

If you've ever talked about amateur radio to a non-ham, one of the questions that often comes up is "What kind of equipment do you need?" or "How much does it cost to purchase a ham station?" As you know, that question can apply to nearly any hobby. If I enjoy boating, I can use a canoe or a 42 foot sailboat. If I'm into computers, I can use an old Pentium 2 laptop, or a high-end Pentium 4 desktop with all the latest add-on components.

Naturally, the same is true for ham radio contesting. However, one of the great aspects of the sport is that you can play no matter what equipment and antennas you may have. Obviously, as in most competitive endeavors, high-end equipment does matter. Station owners with the biggest towers, amplifiers, the fastest computers, and great equipment will always lead the pack in the final results of any contest. However, it's important

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e-mail: <K1AR@contesting.com>

Contesting Loses an Ambassador
Dan Robbins, KL7Y, SK

Dan Robbins, KL7Y, a well-known contester,became a Silent Key on October 31 following a motorcycle accident in Hawaii. He was there as one of the operators at the KH7R contest station in the CQ WW DX SSB Contest. (Photo courrtesy Ken, W8LU)

Well-known contester Dan Robbins, KL7Y, of Wasilla, Alaska, died October 31 after losing control of his motorcycle during a ride in Hawaii. He was only 54 years old. According to a report in the *Honolulu Star-Bulletin,* Robbins drove into a lava field while riding his rented Harley-Davidson motorcycle in Kona, on the "Big Island" of Hawaii. Robbins, who was not wearing a helmet, suffered head and other injuries and was pronounced dead at a local hospital. At the time of the accident Dan was vacationing in Hawaii, where he had participated in the KH7R multi-multi operation for the CQ World-Wide DX SSB Contest the previous weekend with a large team of operators.

"We who knew him and enjoyed this last opportunity to radio contest with him are still in shock," said Kimo Chun, KH7U. "We all benefited from his presence and contributions. We all will miss you, for you left us far too soon." *(source: CQ Contest Reflector)*

For hams around the world, KL7Y was their first Alaskan QSO. I personally remember my first KL7 QSO on 160 meters with Dan, sitting in amazement as I copied his incredible signal literally booming into the East Coast. In addition, Dan had many on-the-air friends outside of contesting. As one of Alaska's best-known Elmers, Dan personally coached many new hams into our ranks. He was also a member of the First Class C.W. Operators' Club (FOC) where he was beloved by many.

If you wish, you may send your condolences via <wl7e@arrl.net>. Dan is survived by his mother, Arlene Robbins (2202 Lydia Ave., Zion, IL 60099-2038) and friend Linda McKinney (6204 235th Ave, Salem, WI 53168). Memorial donations can be sent to the Daniel K. Robbins Memorial fund, c/o Bridgeview Bank, 11411 W. Wadsworth Rd., Beach Park, IL 60099.

Rest in peace, friend. We'll miss you.

to keep in mind that the vast majority of contest stations are just like yours. In fact, I'd be willing to bet that a very high percentage of contest participants don't even have a beam in the air or own an amplifier. Thus, before you conclude that you are missing the minimum requirement to play, think again. Very few new contesters (or new hams, for that matter) "drive a Mercedes" as their first station.

As you might expect, there's a long list of items that have applicability to contest operating in particular. In addition, while you minimally need just a radio and an antenna, there are many station components that can add to the pleasure of operating a contest. Here's a short list (including a few that you may not have thought about):

- Transceiver (duh!)
- Antenna (duh, again!)
- Amplifier/Wattmeter
- Keyer (CW and voice)
- Computer(s)
- Headset
- Antenna switching (manual or automatic)
- Rotator
- Logging software
- Computer interface to radio and other station components
- Operating chair

Obviously, the best way to discover the "ins and outs" of contest-station design is to learn from others. Again, I refer you to some of the resources for more in formation given later on in in this column. There is so much information and experience in this area of radio that there's no need to re-invent the wheel from a beginner's point of view. While it may seem intimidating at first, help is on the way—if you only ask!

Knowing Your Limits

As with any competitive endeavor, you need to know your limits going in. Although an unlikely scenario for most of the hams I know (starting with myself), purchasing a pair of running shoes is not the key to winning the Boston Marathon. It's only the beginning. By purchasing your "shoes" (no matter how good they may be), "you've only just begun" in the immortal words of Karen Carpenter. More important, you may never be able to win. It's a matter of limits.

The same is true for contest operating. There are dozens of factors that contribute to a contest score, and they include:

- Station (equipment and antennas)
- Geographic location
- Operator experience
- Operator skill (regardless of experience)
- Propagation
- Activity
- Personal time availability
- Motivation/desire
- Luck

The key is to never become discouraged in what you're doing, but to set reasonable goals and beat them.

Where To Go for More Information

The good news is that there is a tremendous amount of information available to the new contester, and much of it can be found on the internet. Here are just a few suggestions:

- <http://www.contesting.com/>: includes nearly 500 links to other contest sites/information
- <http://yccc.org/Links/contestlinks.htm>: Good links to many resources
- <http://www.hornucopia.com/contestcal/>: Operating events/contest calendar
- <http://www.ncjweb.com>: *National Contest Journal*
- <http://cqww.com>: CQ WW Contest website
- <http://cq-amateur-radio.com/>: *CQ*'s website
- "Getting Started in Contesting" video available from CQ

There's really only one fundamental way to get involved in contesting and that's to "just do it!" Next month we'll close with some operating tips to help you get started.

Final Comments

Contest operating is whatever you want to make out of it. For some it's setting personal records from the comfort of your own shack using antennas that you built yourself. For others it's the thrill of operating out of the country and trying it from the "DX side." In my case, I've been privileged to experience contesting in a number of ways and in a wide range of venues. Next month I'll conclude this beginner's series and share what it was like operating at PJ2T in the CQ WW SSB Contest. "Cool?" you wonder. You bet!

That's it for this time. Have a successful 2003 in whatever you do!

73, John, K1AR

Good Propagation Expected for 2003

BY TOMAS HOOD,* NW7US

Conditions in October and November varied quite a bit from the predictions in the Last-Minute-Forecasts for those months. Unexpected coronal holes and surprisingly active sunspot groups with related solar-flare activity caused rapidly changing geomagnetic conditions. During the last half of October, for example, the solar wind climbed above normal and remained unusually elevated for many days, keeping the *Ap*-index higher than predicted.

The Last-Minute Forecast for each month is based on the conditions two to three 27-day periods prior to the month in question. With conditions in October and November fluctuating so widely, it will be interesting to see how accurate this month's forecast is.

Even with these surprises, however, propagation conditions during the CQ WW SSB Contest weekend of October 26–27, 2002 were as expected: High Normal conditions prevailed for most locations. No flares occurred, and geomagnetic conditions were fair.

The weekend kicked off with great conditions, much better than those of the 2001 event. Several HALO CMEs were observed October 24 and 25, but these did not cause much degradation. However, a large coronal hole rotated past the central solar meridian on October 22, causing a marked increase in the solar wind speed. From October 24 onwards, high-speed solar wind streams of up to 700 km per second originated from this coronal hole. As the weekend arrived, the interplanetary magnetic field was mildly southward, and then stayed primarily northward, while the solar wind speed slowly decreased below 550 km per second. This kept the *Kp*-index at an average of about 3 for most areas of the world, making for a full weekend of High Normal to Normal conditions. Geomagnetic conditions ranged between unsettled and minor geomagnetic storm levels.

The solar flux indices for the contest weekend were moderate, with 158 for October 26 and 157 for October 27. This is considerably lower than the 247 and 227 of 2001. The *Ap* was 32 for both days, with sunspot counts of 130 on the first day and 110 on the second. This made the higher bands more of a challenge, but overall the contest seemed to offer better results than last year's, since no flares or major storms occurred this time around.

Ace-HF Software Review

I've been reviewing the Ace-HF program offered by R. P. Buckner, P.E. Based on the very intense VOACAP program as a computational engine, the program is quite user-friendly. There is a complete tutorial help feature, as well as a website with reasonable support.

After installing the program from a CD-ROM and then starting it, I was presented with the "Getting Started" feature, which is also a menu item under HELP. I followed these directions, and found myself up and running in a very short time. Using the directions and then going through the tutorial pages, I became comfortable with the overall flow and utility of the program.

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LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for January 2003

	Expected Signal Quality			
Propagation Index.....	(4)	(3)	(2)	(1)
Above Normal: 2-3, 8, 10-11 13, 22, 29-30	A	A	B	C
High Normal: 1, 4-7, 9, 12, 18-21, 26-28, 31	A	B	C	C-D
Low Normal: 16-17, 23-25	B	C-B	C-D	D-E
Below Normal: 15	C	C-D	D-E	E
Disturbed: 14 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 January 1st, excellent on the 2nd and 3rd, good on the 4–7, etc.

One of the things that confused me in the past whenever dealing with IONCAP and VOACAP was that they expect the smoothed sunspot number for the month in question. Before I realized this requirement, I tried to enter the actual observed sunspot number of the day and found that results were way off. Some observed indices would not even be allowed, because they were too high. After reading the information that Ace-HF provides, I began to understand that the engine uses the smoothed numbers along with internal tables and algorithms to model what has been observed over a large number of months and years. VOACAP has undergone many revisions and updates, making it very accurate, so much so that the tables in this column were created using this engine.

I wanted to set up a schedule for working the South Pacific, perhaps Australia. I loaded in the various items that Ace-HF required, such as the smoothed sunspot number, the month of the analysis, and my antenna type. The antenna type may be modified to match your unique situation, or you may use one of the default selections (such as an isotropic or vertical antenna). I then clicked on the "Run Predictions" button, which took me to an interactive map where I could move the far end of a path to any QTH. I moved this point to Australia and was amazed to see the results (see fig. 1). This screen provides an interactive view at what bands are open at what times, and by what mode (*F2*-layer one hop, and so forth). Changing the time, you can see how the band conditions change (see fig. 2).

I decided that it would be helpful if I could pick a band, and thus see a "footprint" of possible openings

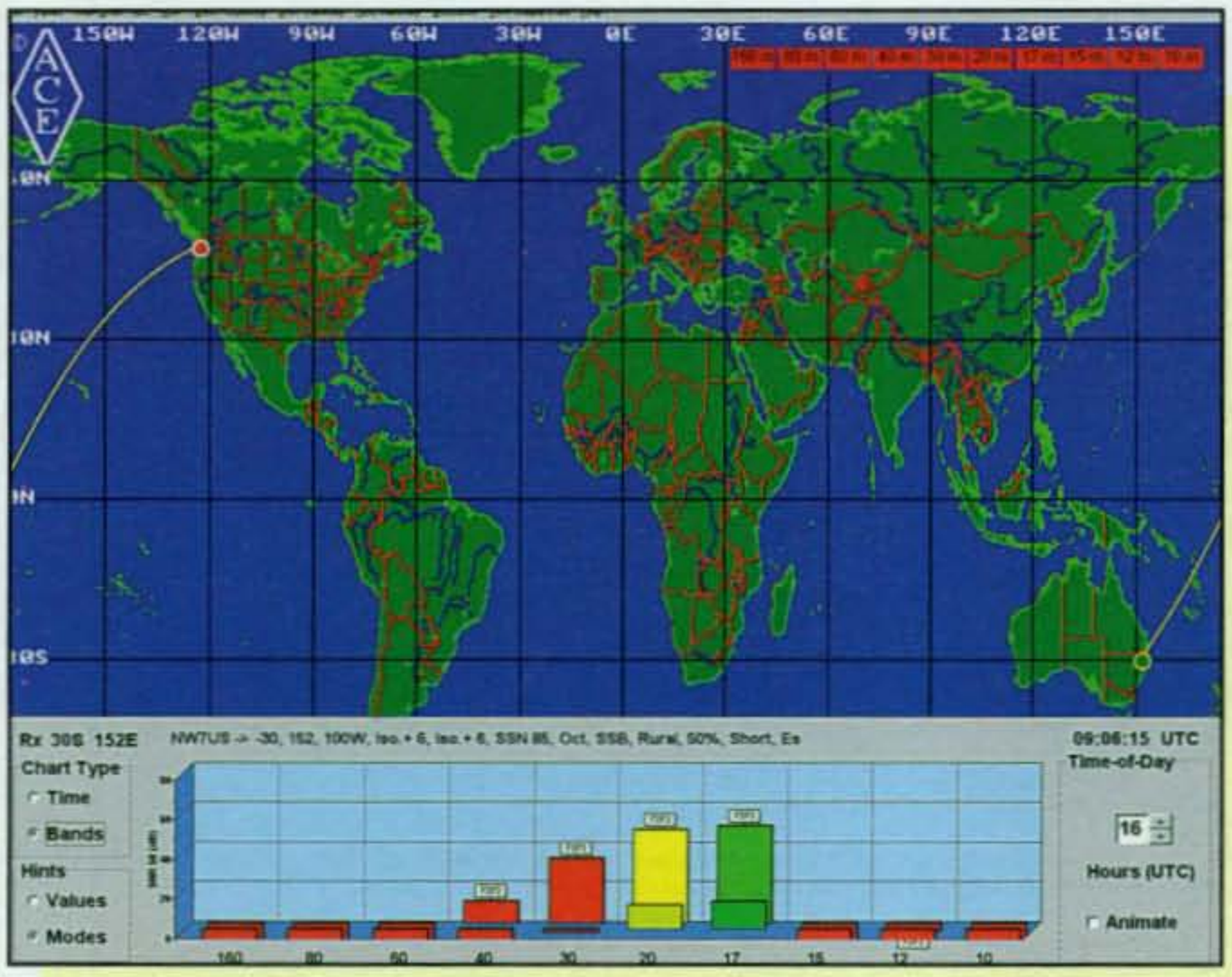

Fig. 1– Example of circuit analysis for path to Australia at 1600Z using Ace-HF.

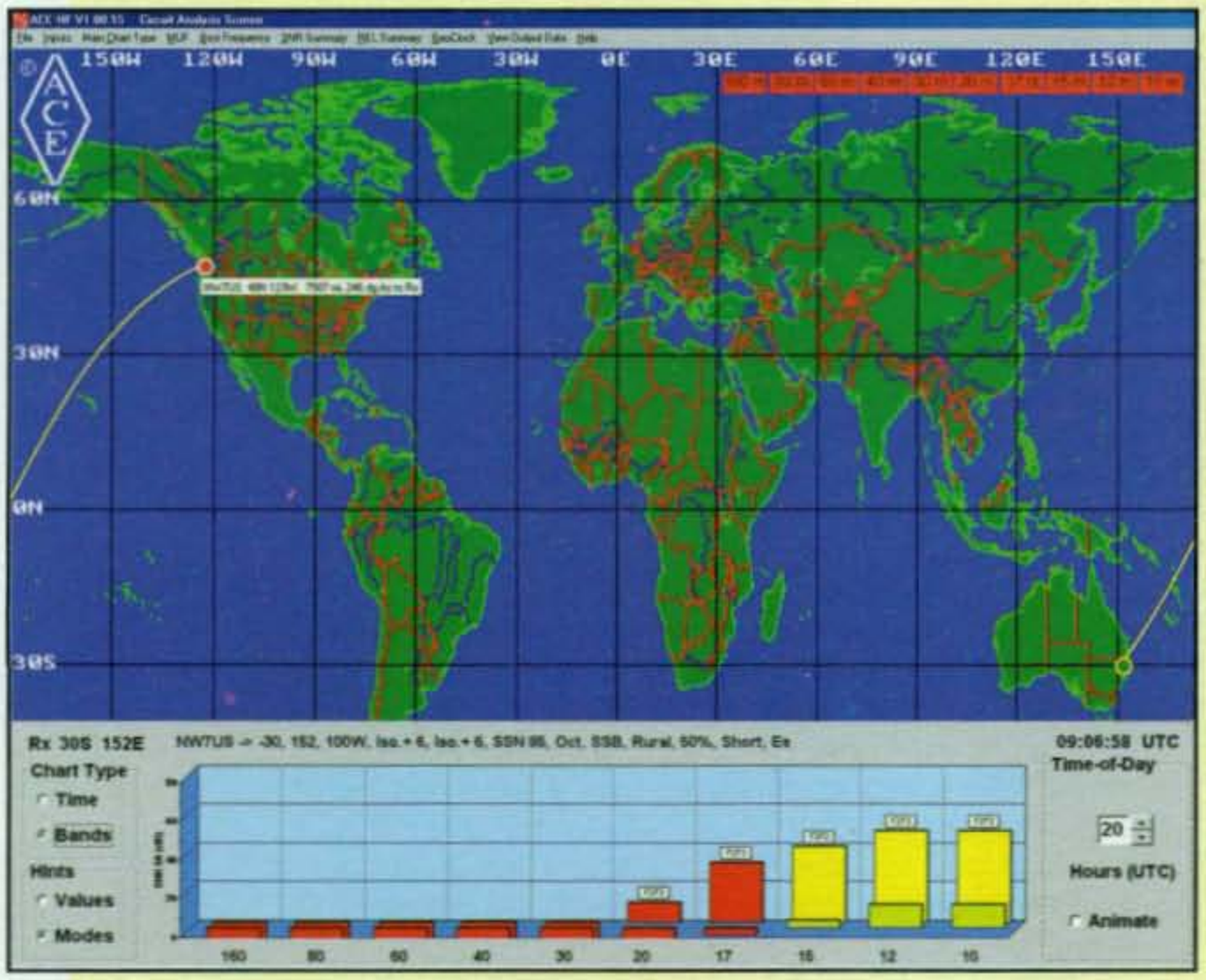

Fig. 2– Example of circuit analysis for path to Australia at 2000Z.

on 20 meters. Ace-HF provides a movie where a map is overlaid with such a footprint, and the footprint is changed for each hour. You can change any of these parameters (i.e., creating a movie of only three hours, or selecting a movie of one hour, but from one band to the next). Once you start the resulting movie, the footprint moves around the map, showing you an animated prediction of where your signal likely will be heard. This is a very powerful utility.

I have always wondered why it was so hard for me in the northwest corner of Washington State to work stations in various locations of the world. After I entered my antenna data, power level, smoothed and sunspot number, and created the movie options, I selected "Run Predictions" and the program churned away, preparing the mapping data. This took a while, as it had to calculate a large matrix of data. On my 400 MHz CPU it was nearly an hour or so to complete the animated movie.

It was well worth the wait (see fig. 3 for one frame of the movie). As the movie changed from hour to hour, it revealed to me the truth about my station's antenna and my limitations under the conditions of the month. I need to get a real antenna! Using a simple dipole, I have very little hope of working a large area of the world under less-than-optimal propagation conditions. When I recreated the movie using a better antenna, it vastly changed the results.

Ace-HF has one limitation that should not hinder most station operations: When you purchase the program, the installation uses a special key file that has your specific location (latitude and longitude, and so forth) encoded. The program will only work with this file, and all of the analysis of the program is hard-coded to your location. It becomes useless if someone else gets a copy of the program and wants to use it at his or her location. An analysis could only be created from your location. You may purchase additional locations from which you may run the program. This would be useful if you are planning a DX-pedition, or have a summer home elsewhere, for example.

The program has many features that allow you to explore and better understand this complex science and apply your results to everyday operation. One such feature is the MUF chart, as shown in fig. 4.

I highly recommend this program for those who have a reasonably fast computer (at least 400 MHz) with at least 512 Megabytes of memory. You also will want a monitor that can handle 800 by 600 screen resolution or better. It takes a lot of hard-drive space, especially if you make a lot of movies. For complete details, check out the Ace-HF website: <http://www.acehf.com>.

Sunspot Cycle 23 Progress

A monthly mean sunspot number of 98 was recorded for October 2002 by the Royal Observatory of Belgium, the world's official keeper of sunspot records. This is down from the 126 reported for October 2001. The low for the month was 58 on October 1. The high of 129 occurred on October 10.

October 2002's mean sunspot value of 98 results in a smoothed running sunspot number of 110 centered on April 2002. While this is several points higher than one year before, the cycle is certainly declining. April 2000 saw a smoothed number of 120, while the smoothed sunspot number for April 2001 was 108. Following the curve of cycle 23's decline, a smoothed sunspot level of between 75 and 88 is predicted for January 2003.

The Dominion Radio Astrophysical Observatory at Penticton, BC, Canada, reports a 10.7 cm observed monthly mean solar flux of 165 for October, down from September's 176. The twelve-month

HOW TO USE THE SHORT-SKIP CHARTS

1. In the Short-Skip Chart, the predicted times of openings can be found under the appropriate distance column of a particular meter band (10 through 160 meters) as shown in the left-hand column of the chart. For the Alaska and Hawaii Charts the predicted times of openings are found under the appropriate meter band column (15 through 80 meters) for a particular geographical region of the continental USA as shown in the left-hand column of the charts. An * indicates the best time to listen for 80 meter openings.

2. The propagation index is the number that appears in ( ) after the time of each predicted opening. On the Short-Skip Chart, where two numerals are shown within a single set of parentheses, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. The index indicates the number of days during the month on which the opening is expected to take place, as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual dates on which an opening with a specific propagation index is likely to occur, and the signal quality that can be expected.

3. Times shown in the charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 AM; 13 is 1 PM, etc. On the Short-Skip Chart appropriate *standard* time is used at the path midpoint. For example on a circuit between Maine and Florida, the time shown would be EST, on a circuit between New York and Texas, the time at the midpoint would be CST, etc. Times shown in the Hawaii Chart are in HST. To convert to standard time in other USA time zones add 2 hours in the PST zone; 3 hours in the MST zone; 4 hours in the CST zone; and 5 hours in the EST zone. Add 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 14 or 2 PM in Los Angeles; 17 or 5 PM in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *standard* time in other areas of the USA subtract 8 hours in the PST zone; 7 hours in the MST zone; 6 hours in the CST zone; and 5 hours in the EST zone. For example, at 20 GMT it is 15 or 3 PM in New York City.

4. The Short-Skip Chart is based upon a transmitted power of 75 watts CW or 300 watts PEP on sideband; the Alaska and Hawaii Charts are based upon a transmitter power of 250 watts CW or 1 kw PEP on sideband. A dipole antenna a quarter-wavelength above ground is assumed for 160 and 80 meters, a half-wave above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 dB gain above these reference levels, the *propagation index* will increase by one level; for each 10 dB loss, it will lower by one level.

5. Propagation data contained in the charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado 80302.

CQ Short-Skip Propagation Chart
January & February 2003
Local Standard Time at Path Mid-Point (24-Hour Time System)

Band (Meters)	Distance From Transmitter (Miles)			
	50-250	250-750	750-1300	1300-230
10	Nil	Nil	07-09 (0-1) 09-15 (0-2) 15-17 (0-1)	07-09 (1) 09-11 (2) 11-15 (2-3) 15-17 (1-2) 17-19 (0-1)
15	Nil	08-16 (0-2)	07*08 (0-1) 08-09 (2) 09-11 (2-3) 11-16 (2-4) 16-18 (0-2) 18-20 (0-1)	07-08 (1-2) 08-09 (2) 09-11 (3) 11-16 (4) 16-18 (2-3) 18-20 (1)
20	11-15 (0-1)	08-09 (0-2) 09-11 (0-3) 11-15 (1-4) 15-17 (0-2) 17-00 (0-1)	08-09 (2-3) 09-11 (3-4) 11-15 (4) 15-17 (2-4) 17-18 (1-4) 18-21 (1-2) 21-00 (1) 00-08 (0-1)	08-09 (3-4) 09-10 (4) 10-14 (4-3) 14-18 (4) 18-21 (2-3) 21-00 (1-2) 00-07 (1) 07-08 (1-2)
40	07-08 (0-1) 08-09 (1-3) 09-10 (2-4) 10-16 (4)	02-07 (0-1))07-08 (1-2) 08-09 (3) 09-11 (4-3)	07-08 (2) 08-11 (3-1) 11-15 (2-1) 15-17 (4-2)	07-08 (2-1) 08-15 (1-0) 15-17 (2) 17-19 (4-3)
80	07-08 (2-3) 08-09 (3-4) 09-20 (4) 20-22 (3-4) 22-03 (2-3) 03-07 (1-2)	07-08 (3) 08-09 (4-2) 09-16 (4-1) 16-18 (4-2) 18-22 (4) 22-03 (3-4) 03-07 (2-3)	07-08 (3-1) 08-09 (2-0) 09-16 (1-0) 16-18 (2-1) 18-20 (4-3) 20-03 (4) 03-05 (3) 05-07 (3-2)	07-08 (1) 08-16 (0) 16-18 (1-0) 18-20 (3-2) 20-02 (4) 02-03 (4-3) 03-05 (3-2) 05-07 (2-1)
160	09-17 (1-0) 17-19 (3-2) 19-05 (4) 05-07 (3-2) 07-09 (2-1)	17-19 (2-1) 19-21 (4-2) 21-04 (4) 04-05 (4-3) 05-07 (2-1) 07-09 (1-0)	17-18 (1-0) 18-19 (1) 19-21 (2-1) 21-04 (4-3) 04-05 (3-2) 05-06 (1) 06-08 (1-0)	18-20 (1-0) 20-21 (1) 21-01 (3-2) 01-03 (3) 03-04 (3-2) 04-05 (2-1) 05-07 (1-0)

ALASKA
January & February 2003
Openings Given In GMT#

To:	10 Meters	15 Meters	20 Meters	40/80 Meters
Eastern USA	18-20 (1) 20-22 (2) 20-23 (1)	17-19 (1) 19-20 (2) 20-22 (3) 22-23 (2) 23-01 (1)	11-16 (1) 16-18 (2) 18-21 (1) 21-22 (2) 22-00 (3) 00-01 (2) 01-03 (1)	04-13 (1) 07-12 (1)*
Central USA	18-20 (1) 20-23 (2) 23-01 (1)	16-19 (1) 19-21 (2) 21-00 (3) 00-01 (2) 01-03 (1)	11-17 (1) 17-19 (2) 19-21 (1) 21-23 (2) 23-01 (3) 01-02 (2) 02-04 (1)	03-14 (1) 07-12 (1)*
Western USA	18-21 (1) 21-00 (2) 00-02 (1)	17-19 (1) 19-21 (2) 21-00 (3) 00-02 (2) 02-04 (1)	11-17 (1) 17-20 (2) 20-21 (3) 21-00 (4) 00-01 (3) 01-03 (2) 03-05 (1)	04-05 (1) 05-12 (2) 12-15 (1) 15-16 (2) 16-17 (1) 05-12 (1)* 12-15 (2)* 15-17 (1)*

HAWAII
January & February 2003
Openings Given in Hawaiian Standard Time

To:	10 Meters	15 Meters	20 Meters	40/80 Meters
Eastern USA	07-08 (1) 08-11 (2) 11-13 (3) 13-14 (2) 14-15 (1)	06-07 (1) 07-10 (2) 10-12 (3) 12-14 (4) 14-15 (3) 15-16 (2) 16-17 (1)	12-15 (2) 15-17 (3) 17-20 (2) 20-02 (1) 02-04 (2) 04-12 (1)	17-19 (1) 19-21 (2) 21-00 (3) 00-03 (2) 03-04 (1) 19-21 (1)* 21-01 (2)* 01-03 (1)*
Central USA	07-08 (1) 08-10 (2) 10-14 (3) 14-16 (2) 16-17 (1)	06-07 (1) 07-08 (2) 08-13 (3) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	13-14 (3) 14-17 (4) 17-19 (3) 19-21 (2) 21-04 (1) 04-06 (2) 06-08 (3) 08-13 (2)	17-19 (1) 19-20 (2) 20-03 (3) 03-04 (2) 04-06 (1) 19-21 (1)* 21-03 (2)* 03-05 (1)*
Western USA	06-08 (1) 08-10 (2) 10-14 (3) 14-16 (2) 16-17 (1)	06-07 (1) 07-08 (2) 08-09 (3) 09-15 (4) 15-16 (3) 16-18 (2) 18-19 (1)	06-07 (2) 07-10 (4) 10-14 (3) 14-16 (4) 16-18 (3) 18-22 (2) 22-06 (1)	16-18 (1) 18-19 (2) 19-22 (4) 22-02 (3) 02-04 (2) 04-09 (1) 19-20 (1)* 20-22 (2)* 22-04 (3)* 04-05 (2)* 05-07 (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.*

***Indicates best times to listen for F-2 layer openings on 6 meters.*

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.

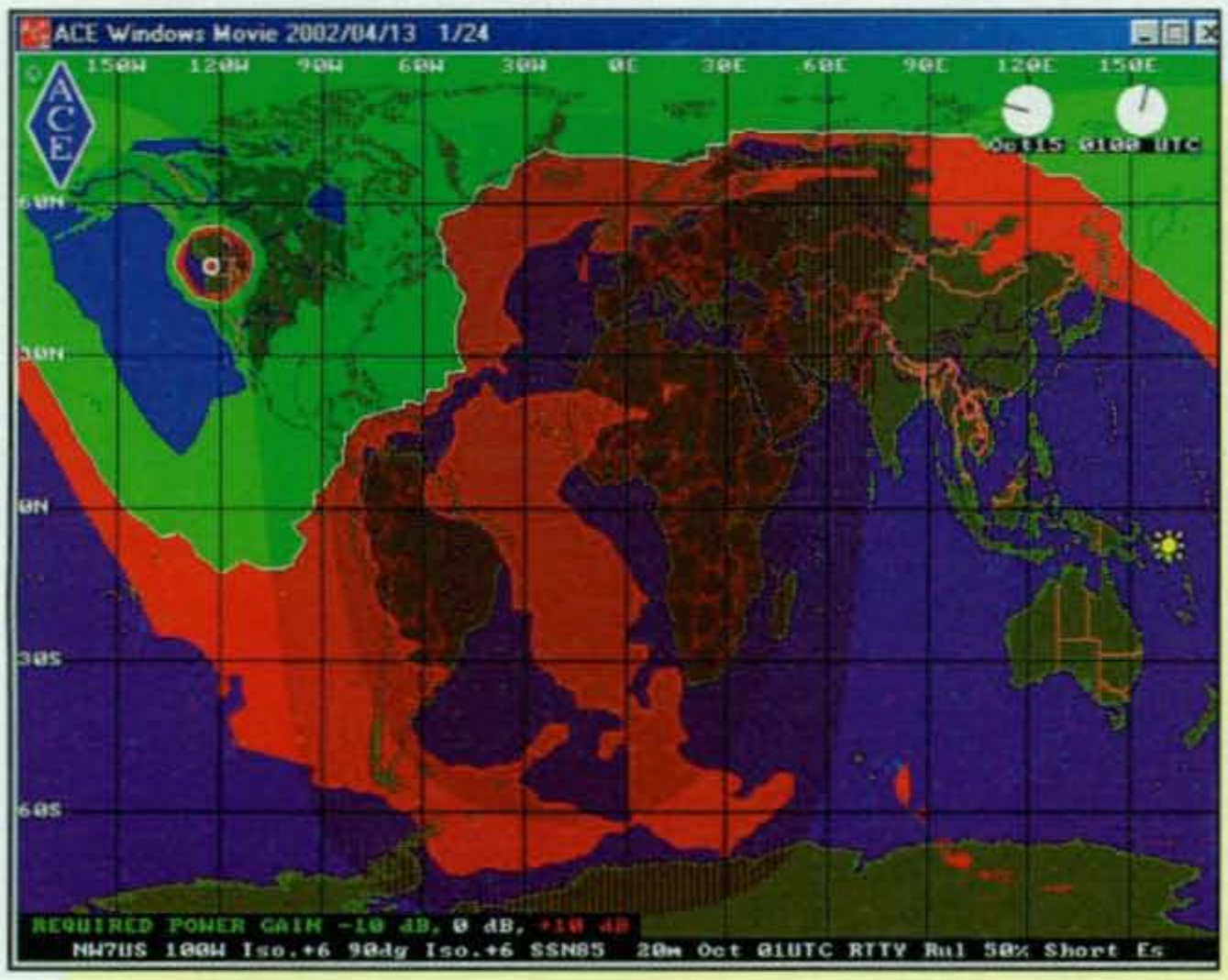

Fig. 3– One frame from the animated map showing required power gain "footprint" of a signal on 20 meters.

smoothed 10.7 cm flux centered on April 2002 is 192, down from March's 196.

The observed monthly mean planetary *A*-index (*Ap*) for October 2002 is 23, up quite a bit from an *Ap* of 14 for September. The twelve-month smoothed *Ap*-index centered on April 2002 is 13.

A smoothed 10.7 cm solar flux of about 131 is predicted for January 2003. Geomagnetic storming will be much the same as we had during October and November.

2003 Forecast

The level of sunspot activity expected during 2003 will decline from a Very High range (smoothed sunspot numbers ranging from 90 to 120) to High (60 to 90). Storming and disturbances will continue to be common during the first months of the year, but should slowly decrease in strength and frequency toward the end of the year. We can expect a decline in 6 meter *F2*-layer DX openings, a decline in 10 meter openings, and smaller windows on 17, 15, 12, and 20 meters when compared to the past two years. However, look for some surprising openings on 6 meters, and periods of hot DX on the higher HF bands. With a slight decrease in solar activity, the winter season on 160 and 80 should be improving. The current trend of the current solar cycle is shown at <http://www.sec.noaa.gov/SolarCycle/>.

Good Conditions Ahead

Here is an overview of expected propagation conditions for 2003 on each amateur band between 6 and 160 meters.

6 meters. *F2*-layer ionospheric DX openings to many areas of the world are still possible during the daylight hours of 2003, especially during the winter and equinox months. During the summer, improved short-skip openings are expected because of seasonal sporadic-*E* activity. Longer-range trans-equatorial (TE) openings are also possible later in the year.

10 meters. *Winter:* Excellent DX openings to all areas of the world are expected during daylight hours. Look for Europe, Africa, and the east before noon. Early-afternoon openings generally will be towards the south. The northwest and west will open up late in the afternoon and early evening, including openings into the South Pacific. Frequent short-skip openings are very likely right after sunrise through sunset. *Summer:* Fairly good daytime DX should be possible on north-south paths, especially into the southern hemisphere. Mornings will be rough, but conditions will improve during the afternoon. Considerable sporadic-*E* activity will make short-range communications possible.

15 meters. *Winter:* Excellent conditions are in store for 2003. Expect openings on 15 meters more often than on 10, to more areas of the world and for an hour or two longer, but with a bit more noise than on 10 meters. Openings should begin shortly after sunrise and last until past midnight in some areas, peaking toward Europe and the east before noon; towards Africa and South America in the early afternoon; and towards the Far East, the South Pacific, and areas in a westerly direction during the late afternoon and early evening. Short-skip will play a major role on 15 meters throughout the year. *Summer:* Fairly good DX openings are possible on most days from a few hours after sunrise until sunset. Afternoons will be the hottest time to look for the DX, while short-skip will keep the band active.

20 meters. *Winter:* This band is in its prime during periods of high solar activity. Expect excellent conditions during the daylight hours, with worldwide DX openings starting at sunrise, going through the hours of daylight, and lasting until a few hours past sunset. Openings on this band tend to peak for a few hours after local sunrise and again during the late afternoon, especially during peak periods. Daytime short-skip should range between 500 and 2300 miles. *Summer:* Expect 20 meters to remain open for DX well past midnight and occasionally throughout the entire period of darkness. It should peak for signals from most every part of the world for an hour or two after sunrise and again during the early evening. Short-skip during the day will range between 500 and 2300 miles, but during the night short-skip will range between 1000 to 2300 miles.

40, 80, and 160 meters. These are nighttime DX bands. Great worldwide DX should continue on 40 meters from about two hours before sunset to approximately two hours after sunrise during all seasons. DX openings on 80 and 160 meters should peak during the equinox and winter months.

January Conditions

It should be a toss-up among 10, 12, and 15 meters for DX propagation openings during the daylight hours. Solar activity is still high enough to support some strong and lengthy openings on the higher frequencies. These bands should open to most areas of the world, often with very strong signals. Ten meters may have a slight edge before noon, with 12 and 15 meters taking the lead after noon and becoming optimum DX bands during the late afternoon hours. Short-skip openings between distances of about 1200 and 2300 miles should be excellent during the daylight hours. Excellent short-skip openings are expected on 12, 15, and 17 meters from shortly after sunrise through the early evening hours for distances between 1000 and 2300 miles.

Twenty meters is expected to be a solid band with excellent around-the-clock openings for both DX and short-skip. DX conditions should peak during a window of an hour or so right after sunrise, and again during the late afternoon and early evening hours. On many days the band should remain open well past midnight. Short-skip openings between approximately 1300 and 2300 miles should be possible from just after sunrise to as late as midnight. Shorter distance openings should also be possible from mid-morning to mid-afternoon.

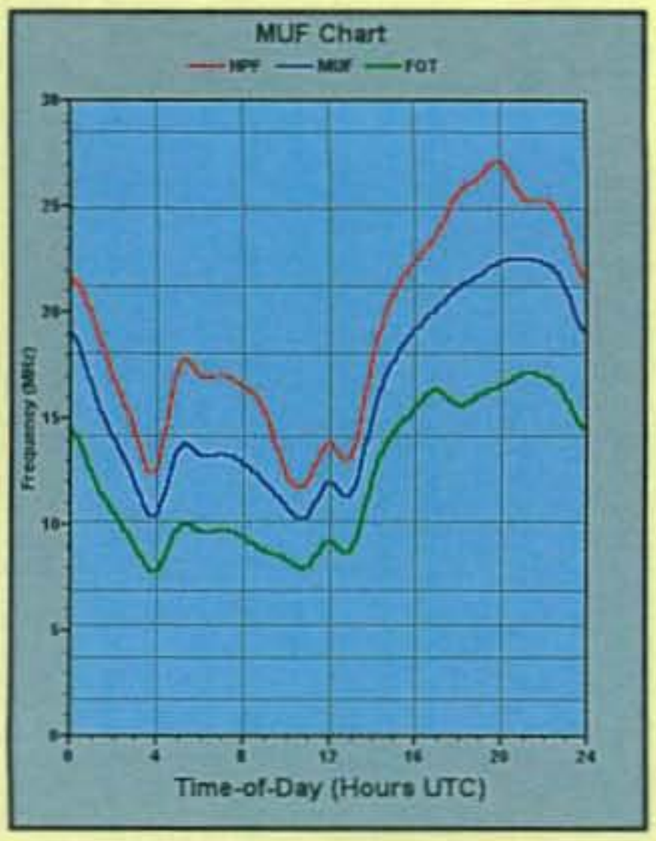

Fig. 4– MUF between NW7US and Pennsylvania.

The optimum band for DX conditions during the hours of darkness should be 40 meters. Expect openings to most areas of the world from shortly before sundown, through the hours of darkness, and until shortly after sunrise. Signal levels may be exceptionally strong at times. During the daylight hours, short-skip conditions should be optimum for openings between approximately 100 and 600 miles. Skip will lengthen during the late afternoon, and by nightfall short-skip conditions should be optimum for openings between 800 and 2300 miles.

Atmospheric noise levels will be at seasonally minimum levels in the northern hemisphere during January. This should result in peak conditions on both 80 and 160 meters. Expect good openings to many parts of the world on 80 during the hours of darkness and the sunrise period. Short-skip openings between distances of 50 and 250 miles should be optimum on 80 meters during the daylight hours. During the later afternoon and early evening hours short-skip openings should increase to between 250 and 1500 miles, and by nightfall openings up to and beyond 2300 miles should be possible.

With the 2003 CQ 160 Meter CW Contest starting at 0000Z January 25 and continuing until 2359Z January 26, there is a good opportunity for you to make great progress toward working all states or grabbing a new country on 160 meters. Remember to look for DX an hour or so before sunrise. See <http://solar.spacew.com/www/160pred.html> for up-to-the-minute forecasts during the contest.

VHF Outlook

There has been an interesting trend every year right at the end of December and the beginning of January. In the last few years some rather strong and exciting long-range VHF DX openings have occurred.

During these surprising openings signals have been received from over 2000 miles or more via *F2*-layer propagation. It is very possible this year that the solar activity will be high enough, whether due to a high sunspot activity or well-place coronal-hole mass ejections (CMEs) and other streaming plasma, to provide VHF openings. It is highly possible that intense CME as well as solar flare activity will occur during late December and throughout January. Will they happen at the right time so as to form the ionization needed for VHF signal propagation? Use the 27-day solar rotation as a guide and check the daily sunspot and solar flux values from the previous months of November and December. Also, keep an ear open on 10 meters for high amounts of *F2*-layer activity as a guide for possible 6 meter *F2* openings.

Sporadic-*E* (*Es*) activity is possible in January. A good time to check is during the ARRL VHF contest on January 18–20. A surprise one- or two-hour opening has been known to occur during the contest period in the past, and this has led to increased multiplier counts for contest efforts.

Aurora openings that are caused by high geomagnetic activity are possible this mont, although not usually with any great duration or number as based on both amateur radio observations and scientific data. Watch the *Kp*-index. If it is rising above 4, get ready. When it exceeds 5, openings are very likely.

The *Quantrantids* meteor shower is the major shower for January, and it can appear any time during the first week of January. This sometimes can be quite intense, so it may be a good idea for setting up some 2 and 6 meter schedules. Morning (after midnight) meteor openings may be the best bet during this month.

In Closing

Don't forget to visit my propagation center on the internet at <http://prop.hfradio.org/>, or using a WAP device (for example, a WAP cell phone) go to <http://wap.hfradio.org>.

Thank you for the many e-mails and other communication. Your feedback has been helpful, and the questions challenging. Let me know how the Last-Minute Forecast holds up in the real world. I hope to hear you on the air!

73, Tomas, NW7US

WPX SSB Results *(from page 19)*

Number groups after call letters denote following: Band (A = all), Final Score, Number of QSOs, and Prefixes. An asterisk (*) before a call indicates low power. Certificate winners are listed in boldface. (Note that the country names and groupings reflect the DXCC list at the time of the contest.)

SSB RESULTS
QRP/p

S54AA	**A**	**1,681,295**	**1234**	**605**
HG5Z	**A**	**1,507,650**	**1239**	**575**
		(Op: HA1CW)		
ON6NL	**A**	**1,384,440**	**1040**	**556**
TM4K	**A**	**1,320,576**	**1024**	**543**
		(Op: F5BEG)		
Z31GX	**A**	**1,312,460**	**1232**	**548**
NØKE	**A**	**996,996**	**900**	**462**
LZ7X	**A**	**817,719**	**871**	**483**
VA3TTT	**A**	**494,270**	**574**	**322**
KKØQ	**A**	**379,824**	**486**	**328**
W1AMF	**A**	**322,300**	**439**	**293**
DL1DQY	**A**	**253,814**	**379**	**278**
AN1GT	**A**	**233,511**	**424**	**277**
SP9RQH	**A**	**218,337**	**378**	**259**
AM5FWW	*	209,001	329	233
UA4YJ	**A**	**196,040**	**373**	**260**
N9IJ	**A**	**192,480**	**337**	**240**
YU1LM	**A**	**187,636**	**385**	**244**
VA3JFF	*	175,471	289	227
PA3EXS	**A**	**159,840**	**342**	**240**
UR5NNG	**A**	**138,020**	**314**	**206**
KBØMZG	*	123,624	244	202
G3FNM	**A**	**120,546**	**294**	**222**
W1CEK	**A**	**115,746**	**258**	**191**
YO6ADW	**A**	**108,970**	**263**	**170**
KC8LTL	**A**	**97,559**	**235**	**181**
K6TV	**A**	**89,280**	**229**	**180**
VE6BF	**A**	**75,922**	**186**	**154**
MU3DHI	**A**	**68,400**	**214**	**180**
LY2LF	**A**	**60,102**	**208**	**159**
LY1DT	*	53,244	199	153
K9FOH	*	53,064	144	132
PA9TT	*	51,480	219	156
RV3YR	*	46,332	157	132
OK2VWB	**A**	**45,859**	**162**	**121**
DJ3GE	*	41,760	141	120
RA4AUH	*	38,750	158	125
K8CV	*	27,930	111	95
W3MGL	**A**	**26,433**	**107**	**89**
W2JEK	**A**	**26,390**	**110**	**91**
P82FG	*	24,024	118	91
SP6AYP	*	23,958	100	99
DL1CWI	*	22,890	132	109
UR5NX	*	17,340	122	102
LY3BY	*	17,014	114	94
USØYA	*	14,076	76	69
JR1WYV	**A**	**12,395**	**71**	**67**
KIØII	*	12,006	78	69
W4TDB	**A**	**9,971**	**69**	**59**
VE3IGJ	*	5,586	56	49
PAØRBO	*	5,457	53	51
RN3AQ	*	3,157	43	41
UU9JQ	*	2,030	37	35
GWØVSW	**A**	**1,664**	**27**	**26**
W5KWB	*	138	12	10
JR3RWB	**28**	**467,313**	**501**	**357**
LW7DQW	**28**	**314,080**	**396**	**302**
LR7E	*	308,708	399	284
		(Op: LW3DX)		
RZ6BU	**28**	**199,548**	**358**	**241**
RZ9IB	**28**	**86,592**	**214**	**164**
JR1NKN	*	74,576	192	158
JL3SBE	*	45,880	136	124
UR5FAI	**28**	**40,252**	**149**	**116**
AA8UP	**28**	**19,908**	**89**	**79**
OK1KZE	**28**	**18,403**	**91**	**77**
		(Op: OK1XYZ)		
UR5FCM	*	6,708	61	52
ES2SW	**28**	**3,052**	**37**	**28**
OK1AIJ	*	2,580	32	30
SM5KQS	**28**	**495**	**15**	**15**
RZ3TYL	*	32	4	4
RAØJJ	**21**	**751,744**	**926**	**448**
RA9UAD	**21**	**601,290**	**621**	**393**
RZ6HX	**21**	**304,480**	**480**	**346**
K2WY	**21**	**158,010**	**264**	**229**
T94OM	**21**	**149,572**	**345**	**244**
EA3ALV	**21**	**110,510**	**240**	**215**
N3XT	**21**	**91,256**	**225**	**187**
KQ5U	**21**	**78,260**	**205**	**172**
RN6FO	*	54,912	198	156
WB7OCV	*	44,820	147	135
W1CTN	**21**	**39,780**	**139**	**130**
WA6FGV	**21**	**24,295**	**134**	**113**
JR9NVB	**21**	**20,574**	**88**	**81**
VK3FNP	**21**	**7,038**	**54**	**51**
7M3CBF	*	5,456	50	44
UA9SCX	**14**	**99,994**	**222**	**173**
W3SE	**14**	**55,245**	**165**	**145**
W6CN	**14**	**51,546**	**157**	**142**
OK1UHZ	**14**	**37,800**	**178**	**150**
DK7IH	**14**	**32,544**	**164**	**144**
OM2ZZ	**14**	**31,416**	**146**	**132**
YO3III	**14**	**21,120**	**102**	**96**
SQ5BPM	**14**	**18,018**	**116**	**99**
F5NBK	**14**	**576**	**24**	**24**
W6QU	**7**	**14,144**	**82**	**68**
		(Op: W8QZA)		
SP9BMH	**7**	**1,652**	**30**	**28**
YT1VP	**3.7**	**84,042**	**234**	**174**
SP3J	**3.7**	**3,999**	**49**	**43**
		(Op: SP3NGB)		

NORTH AMERICA
UNITED STATES

KM3T	**A**	**11,394,493**	**3903**	**1067**
KQ2M	**A**	**11,256,036**	**3854**	**1076**
NJ1F	**A**	**8,575,770**	**3276**	**970**
		(Op: S51TA)		
KR1G	*	7,883,216	3142	953
NB1B	*	7,865,715	3003	965
KZ1K	*	2,581,416	1428	684
KC1F	*	1,730,664	1222	559
W1UR	*	973,497	744	453
K1CN	*	803,712	765	448
K1YA	*	770,307	801	433
WA1RR	*	761,074	736	443
		(Op: N1HRA)		
AB1R	*	355,116	452	293
N1BCL	*	243,294	361	258
NT1N	**28**	**1,058,480**	**787**	**505**
AA1BU	**3.7**	**832,870**	**588**	**370**
***K8EP**	**A**	**2,005,254**	**1270**	**606**
***WS1A**	**A**	**1,641,520**	**1079**	**568**
***WA1Z**	**A**	**993,102**	**816**	**451**
*KX1X	*	639,804	669	393
*KA1EKR	*	583,856	576	364
*KB1LN	*	418,560	483	327
*KA1OEO	*	222,768	371	252
*N1LW	*	213,642	334	249
*W1DAD	*	212,675	345	235
*W1TO	*	197,298	320	226
*N1IST	*	147,890	284	230
*WN1OTV	*	110,591	246	181
*AB1BX	*	99,616	233	176
*KY1B	*	86,673	212	167
*K1VU	*	59,584	153	152
*K1YZ	*	55,704	162	132
*W1LZ	*	30,144	110	96
*K1SWG	*	26,784	107	93
*K1MOM	*	504	14	14
***WE1USA**	**21**	**2,408,868**	**1424**	**711**
		(Op: WA1LNP)		
N2XD	**A**	**3,034,651**	**1703**	**661**
N2GC	**A**	**1,681,595**	**1209**	**589**
K2BF	**A**	**952,690**	**871**	**470**
WA4ATJ	*	603,295	596	385
K5ZD	*	587,683	558	359
N2FF	*	576,905	608	371
NA2NA	*	369,818	473	298
		(Op: KX2A)		
KF2O	*	181,139	288	229
W2FUI	*	174,660	271	213
W3BW	*	148,512	268	204
N2SQW	*	112,992	232	176
KD2HE	**21**	**53,818**	**162**	**142**
W2MF	**1.8**	**39,546**	**192**	**117**
***K2LV**	**A**	**1,653,136**	**1087**	**554**
***K2SZ**	**A**	**684,772**	**640**	**394**
***NA2A**	**A**	**654,024**	**652**	**408**
*N2MUN	*	585,234	613	369
*KC2DTJ	*	385,951	469	311
*N2CK	*	292,284	416	276
*K2PH	*	220,997	343	241
*K2YSY	*	200,032	311	224
*W2WB	*	178,563	288	231
*N2LQQ	*	145,808	286	208
*WB2SXY	*	135,198	276	203
*WA2IAU	*	122,485	239	187
*W2TZ	*	90,958	190	146
*N2BZP	*	88,389	207	161
*N2LK	*	69,293	175	133
*W2PI	*	59,770	178	139
*N2MTG	*	43,750	157	125
*WB2HWI	*	39,445	145	115
*KV2M	*	34,875	145	125
*KR2Q	*	32,742	115	102
*K2MK	*	23,672	96	88
***KS2G**	**28**	**554,280**	**584**	**372**
***WB2BXO**	**21**	**30,590**	**125**	**115**
***N2KX**	**7**	**51,490**	**111**	**95**
*WQ2M	*	34,354	103	89
K3ZO	**A**	**8,740,950**	**3384**	**950**
N3HXQ	**A**	**3,685,040**	**1927**	**730**
4U1WB	**A**	**1,175,346**	**964**	**501**
W2BZR/3	*	547,584	653	384
N3FX	*	328,328	407	286
K3KO	*	91,656	177	171
W3AP	*	61,155	151	151
N3HBX	**21**	**3,546,628**	**1817**	**769**
K3NM	**21**	**3,502,670**	**1752**	**785**
WY3T	**14**	**397,750**	**464**	**370**
***W3UJ**	**A**	**794,385**	**721**	**417**
***W3LL**	**A**	**549,984**	**565**	**337**
***N3AIU**	**A**	**416,988**	**551**	**324**
*WN3VAW	*	234,864	335	233
*W3RT	*	113,960	252	185
*N3FNE	*	92,225	223	175
*AD8J	*	69,580	175	142
*WX3M	*	46,492	148	118
*W3BYX	*	44,888	133	124
*W3HDH	*	44,486	138	118
*KT3D	*	38,727	131	117
*W3FQE	*	25,317	104	87
***KT3RR**	**28**	**756,370**	**728**	**430**
***W3CP**	**28**	**65,860**	**167**	**148**
*N3VQP	*	19,120	88	80
*K3GW	*	10,230	64	62
*K3YJP	*	945	23	21
***WA3AAN**	**21**	**119,067**	**243**	**213**
WK4R	**A**	**11,019,862**	**4082**	**1094**
		(Op: K4XS)		
WE9V	**A**	**10,678,624**	**3854**	**1012**
KN1DX	**A**	**10,340,508**	**3813**	**1011**
		(Op: K4ZW)		
WC4E	*	7,893,920	3418	958
NS4W	*	7,358,338	3385	962
WZ4F	*	6,052,275	2784	925
		(Op: K4AB)		
K4BAI	*	2,750,658	1603	718
WW4RR	*	2,551,724	1660	658
		(Op: N4ZZ)		
KG4FPK	*	1,868,932	1179	566
WB2QLP	*	1,103,739	978	507
N4SEA	*	812,004	730	431
WO4O	*	633,766	701	406
		(Op: KØEJ)		
KA4RRU	*	507,350	587	365
N4MM	*	496,976	512	349
AA4V	*	475,756	517	332
WT4X	*	443,226	500	346
		(Op: W4JAM)		
KU4FP	*	346,885	432	265
NC4MI	*	324,836	429	289
W7QF	*	192,905	289	205
W4YDY	*	151,900	269	196
W4MPJ	*	72,278	184	142
N4TL	*	3,104	33	32
KW4DA	*	2,457	21	21
AI4AA	**28**	**4,081,104**	**2057**	**804**
		(Op: K4WI)		
N4BP	**28**	**2,753,946**	**1638**	**702**
NJ4U	**28**	**2,647,152**	**1419**	**744**
		(Op: K4EA)		
W6AAN	*	1,954,194	1177	638
AG4W	*	937,358	757	478
WW4KY	*	44,226	147	117
		(Op: K4WW)		
AA3VA	*	7,896	59	47
W4WTB	**21**	**3,070,416**	**1567**	**752**
W4OGG	*	8,816	60	58
***N4IG**	**A**	**1,381,776**	**1007**	**528**
***N4YDU**	**A**	**1,292,856**	**958**	**523**
***W4SAA**	**A**	**1,036,450**	**836**	**475**
*KR4TG	*	980,120	762	458
*K4BEV	*	866,578	813	446
*NJ2F	*	760,984	766	428
*N4JED	*	678,385	669	391
*KG4NEP	*	418,803	490	343
*K4JAF	*	410,803	433	337
*KK4RV	*	384,514	459	299
*K4EU	*	379,337	418	329
*KK4TA	*	379,138	487	326
*W4YE	*	358,020	434	306
*K4IE	*	343,824	452	304
*W4GP	*	293,304	388	264
*K3MZ	*	285,033	399	277
*KT4ZB	*	263,676	392	258
*NQ4S	*	178,266	348	219
*W4NTI	*	175,724	299	223
*KE4KMG	*	160,446	309	221
*N4WSM	*	134,128	248	202
*K4OOO	*	130,284	263	198
*WA4JA	*	128,641	295	197
*K4BP	*	107,010	244	174
*NN4DF	*	96,444	226	188
*WA4VEK	*	95,804	199	172
*K4KML	*	86,000	206	172
*KB4N	*	77,345	194	155
*AF4UU	*	70,800	189	150
*KS4AA	*	59,184	147	137
*WB4JMO	*	55,000	155	125
*AG4PM	*	50,697	161	131
*WR4BSA	*	50,690	159	137
		(Op: W4EBA)		
*WS4NC	*	50,457	169	139
		(Op: N4VHK)		
*K8FK	*	45,124	150	116
*K4AHC	*	40,767	129	107
*KS4JB	*	32,232	120	102
*AE4EC	*	31,800	119	106
*WD4OAY	*	30,067	122	107
*KA1DWX	*	24,605	112	95
*KV4DJ	*	8,201	68	59
*KTØP	*	7,367	55	53
*W4JZZ	*	7,168	63	56
*W4AUI	*	3,185	37	35
***K6EID**	**28**	**304,507**	**384**	**287**
***WN4DX**	**28**	**43,296**	**135**	**123**
*W4JH	*	42,126	132	118
*WA2SRY	*	21,296	93	88
*WQ4U	*	11,502	74	71
		(Op: N4PK)		
*W9CNF/M	*	4,600	51	46
***N4MO**	**21**	**1,123,070**	**843**	**530**
*W4LC	*	189,776	285	232
*KG4OJT	*	23,387	100	91
***KX2J**	**14**	**183,162**	**437**	**267**
*W4IDX	*	2,720	37	34
N6NF	**A**	**642,130**	**811**	**409**
N5DD	**A**	**210,490**	**321**	**217**
N6ZZ	*	201,360	307	240
NA4M	*	190,585	333	235
K5YAA	*	139,518	271	207
NN5P	**28**	**4,856,072**	**2446**	**881**
		(Op: W5PR)		
KD5JAA	*	56,364	149	132
N5KC	**21**	**1,214,565**	**1176**	**561**
		(Op: W5ASP)		
***K5TR**	**A**	**3,328,284**	**2150**	**778**
***KI5DR**	**A**	**947,139**	**973**	**491**
***K5PI**	**A**	**232,440**	**380**	**260**
*N5PU	*	162,140	298	220
*N5PYQ	*	120,705	267	195
*N5OHL	*	112,530	253	186
*N5VMF	*	85,140	229	172
*NØRQ	*	82,250	226	175
*KC5JSO	*	39,100	137	115
*WM2Z/5	*	30,464	135	112
*WD5JNC	*	25,755	111	101
***WM5R**	**21**	**15,106**	**107**	**91**
***NN5Z**	**14**	**316,575**	**492**	**335**
		(Op: K5PX)		
WT6V	**A**	**7,713,070**	**3224**	**1003**
		(Op: N6IG)		
KT6RU	**A**	**4,708,445**	**2348**	**805**
		(Op: K6IF)		
KZ6D	**A**	**4,176,177**	**2122**	**789**
		(Op: W6NL)		
W6TK	*	1,562,904	1206	588
AD6WL	*	1,433,600	1239	560
AE6Y	*	1,330,352	1150	536
		(Op: W6IXP)		
AI6V	*	1,009,800	1034	495
		(Op: K6GT)		
AG6RT	*	958,368	965	447
WY6K	*	767,844	1016	462
		(Op: K6RB)		
K6TIM	*	615,009	639	389
NW6P	*	526,620	702	402
		(Op: K6RIM)		
W6FRH	*	486,048	630	366
K6XX	*	401,166	488	342
KE6ZSN	*	374,400	582	325
W7CB	*	276,000	366	300
N6ZFO	*	214,711	371	259
K6LRN	*	198,250	325	250
AA6W	*	188,976	415	254
AJ6V	*	170,646	370	239
WA6PY	*	128,077	298	211
AD6E	*	104,528	240	188
W4NJK	*	50,646	189	138
KU6J	*	47,740	173	140
K6ST	*	36,226	148	118
KE6OUA	*	6,048	65	56
AE6AI	*	1,829	31	31
W6AFA	**28**	**540,270**	**645**	**405**
W6BSY	**28**	**411,180**	**563**	**356**
WB6NFO	*	43,099	165	131
K6HNZ	**21**	**1,430,784**	**1212**	**576**
N6WIN	**21**	**1,408,264**	**1186**	**572**
NY6Y	*	384	12	12
***NX6T**	**A**	**1,473,524**	**1404**	**559**
		(Op: K6AM)		
***AA6PW**	**A**	**801,229**	**930**	**431**
***WK6I**	**A**	**768,904**	**748**	**446**
*WN6K	*	682,299	838	423
*K6UM	*	379,404	503	324
*NN6XX	*	278,553	389	253
*N6EM	*	260,973	419	271
*WR6WR	*	187,636	404	244
*N6NG	*	94,620	211	166
*K6OWL	*	91,970	247	170
*K6BIR	*	61,612	203	146
*KD6POF	*	61,347	203	143
*K6XV	*	57,524	200	146
*W6NRJ	*	54,990	149	130
*KF6RIP	*	54,896	193	146
*WB6NL	*	47,291	182	131
*AD6G	*	45,326	159	131
*AA6EE	*	37,842	144	119
*WT6TT	*	18,800	106	94
		(Op: N6NZ)		
*KB6RHM	*	14,013	95	81
*W6ZZZ	*	13,944	95	83
*K6CSL	*	12,525	78	75
*AK6DV	*	11,780	84	62
*KE6GFI	*	6,672	59	48
*N6BXO	*	3,196	36	34
*AE6CW	*	3,150	38	35
*NC6P	*	2,208	37	32
*K6LDX	*	2,091	43	41
*WB6MLI	*	242	11	11
*WS6G	*	21	3	3
***WA7BNM**	**28**	**48,816**	**148**	**144**
***W6YJ**	**21**	**186,354**	**322**	**261**
***KU6T**	**7**	**14,850**	**75**	**66**
K7ZZ	**A**	**3,064,132**	**1896**	**743**
N7GYD	**A**	**1,844,228**	**1284**	**629**
N7TT	**A**	**1,503,660**	**1219**	**570**
WR7HE	*	1,300,320	1203	560
K7UAZ	*	1,297,227	1193	543
		(Op: N4OGW)		
KO7X	*	1,052,694	886	466
WX7P	*	786,240	835	455
KI7Y	*	443,119	561	347
NF7T	*	301,790	400	293
KS7T	*	229,075	386	275
KC7UP	*	173,201	296	227
WG7X	*	161,138	335	226
NC7M	*	81,648	199	168
K7MZ	*	15,048	74	72
W7FP	**28**	**110,772**	**226**	**181**
W7AYY	*	2,820	32	30
***KD7ORP**	**A**	**1,859,208**	**1399**	**606**
			(Op: KL9A)	
***K7TR**	**A**	**679,250**	**777**	**418**
***KD7GGZ**	**A**	**550,440**	**765**	**396**
*WS7V	*	398,288	519	341
*K7VI	*	378,002	507	331
*W7QN	*	295,000	457	295
*WA7YAZ	*	287,504	458	272
*W7GTO	*	153,647	323	223
*WI7F	*	142,128	321	216
*AC7LX	*	85,822	224	166
*W7YVK	*	44,861	142	113
*KA7SOL	*	44,550	177	135
*KD7JEG	*	26,592	128	96
*K7IIJ	*	6,096	48	48
*KU6T	*	14,850	75	66
*WG7Y	*	198,940	336	245
NI8L	**A**	**2,629,368**	**1609**	**658**
			(Op: N8KM)	
WB8TLI	**A**	**1,965,319**	**1199**	**599**
AA8PA	**A**	**1,716,834**	**1271**	**574**
KT8X	**28**	**2,067,000**	**1305**	**650**
K8OQL	*	344,840	430	296
KX8R	**14**	**3,128,840**	**1674**	**715**
			(Op: K8DX)	
***K5IID**	**A**	**1,310,675**	**991**	**515**
***N8DXR**	**A**	**734,448**	**738**	**428**
***KI8IZ**	**A**	**621,720**	**651**	**396**
*K8GL	*	524,335	557	355
*K8KHZ	*	310,185	425	305
*AC8W	*	297,045	397	287
*AK8B	*	191,540	330	244
*K8IA	*	160,272	312	212
*N8BV	*	154,585	293	215
*N4GXP/8	*	122,040	253	180
*K8VUS	*	114,304	242	188
*AF8C	*	113,125	256	181
*N8KIE	*	102,030	226	179
*WD8NVN	*	60,952	156	152
*N8NX	*	37,968	130	113
*W8CK	*	29,100	131	100
*KC8PEA	*	10,653	79	67
***KT8O**	**21**	**391,875**	**514**	**375**
*W8NGO	*	10,860	67	60
WB9Z	**A**	**8,352,795**	**3267**	**1023**
K9ZO	**A**	**4,719,680**	**2355**	**860**
			(Op: KB9UWU)	
NX9T	**A**	**1,374,290**	**988**	**530**
WI9WI	*	989,614	897	479
WT9U	*	386,460	566	342
WA1MKE	*	347,215	522	295
K9NW	**28**	**3,334,519**	**1682**	**787**
KG9N	*	93,408	226	168
N9LCR	**21**	**1,100,408**	**892**	**536**
W9SE	**7**	**99,220**	**224**	**164**
WO9S	**1.8**	**2,448**	**44**	**36**
***KK9A**	**A**	**4,547,760**	**2067**	**840**
***KS9K**	**A**	**2,575,320**	**1477**	**660**
			(Op: N4TZ)	
***AI9U**	**A**	**1,475,986**	**1136**	**569**
			(Op: K9JLS)	
*KA9F	*	782,988	695	426
*N9KT	*	343,520	456	304
*W9WI	*	170,856	291	226
*KW9N	*	147,735	274	201
*K9JIG	*	121,000	250	200
*N9TF	*	91,956	207	158
*KE9S	*	85,188	266	186
*W9LYA	*	56,800	189	142
*W9LYN	*	28,756	105	91
*N9KO	*	6,240	58	52
*N9IHW	*	4,576	47	44
*KD9XP	*	3,600	36	36
*KJ9C	*	2,343	37	33
*KB9WQJ	*	1,488	26	24
***KI9DX**	**28**	**52,801**	**155**	**133**
***W9VQ**	**21**	**42,312**	**136**	**129**
***K9OP**	**14**	**224,616**	**382**	**284**
*WD9DJD	*	22,900	111	100
***KX9DX**	**7**	**68,093**	**262**	**149**
NRØX	**A**	**3,641,820**	**1794**	**780**
KØDG	**A**	**798,721**	**772**	**451**
KØGAS	**A**	**766,920**	**786**	**420**
KBØENE	*	459,006	535	339
WØPPF	*	209,737	365	253
KØIH	*	74,120	196	170
WØAJ	*	8,835	73	57
KKØSS	**28**	**865,347**	**724**	**463**
NØUU	**28**	**456,120**	**479**	**360**
WØTM	*	185,719	321	229
KØDAT	**21**	**94,671**	**202**	**201**
***ACØW**	**A**	**2,432,380**	**1613**	**703**
***NØYYO**	**A**	**525,624**	**639**	**362**
***KCØJVG**	**A**	**475,416**	**616**	**372**
*NØWY	*	436,948	551	349
*WBØTRA	*	423,600	583	353
*WØETT	*	391,419	515	327
*KØVM	*	162,121	314	223
*WØMDS	*	100,956	229	188
*WØCBH	*	28,294	108	94
*WBØULX	*	26,980	101	95
*NUØC	*	23,030	100	94

*KMØR	*	21,360	100	89
*KAØEIC	*	15,132	84	78
*KØXE	*	14,620	76	68
*KCØIDI	*	1,035	23	23
***WA5SWN**	**28**	**20,320**	**88**	**80**
***AAØNW**	**21**	**1,424,944**	**1112**	**592**
			(Op: WØAH)	
*WNØL	*	101,136	223	196

JAMAICA

***6Y4Y**	**A**	**701,100**	**665**	**410**

BARBADOS

8P6EX	**A**	**2,138,448**	**1421**	**596**
***8P2K**	**21**	**4,149,360**	**2086**	**816**
			(Op: 8P6SH)	

CUBA

***CO2TK**	**28**	**1,008,599**	**897**	**457**

MARTINIQUE

FM5BH	**A**	**1,781,136**	**1202**	**513**

DOMINICAN REPUBLIC

T93M/HI9	**A**	**15,812,348**	**5422**	**1082**

PANAMA

HO1A	**28**	**4,223,470**	**2273**	**755**

HONDURAS

HR3J	**A**	**5,385,702**	**2671**	**794**
			(Op: JA6WFM)	
***WQ7R/HR9**	**A**	**2,135,250**	**1526**	**585**

GRENADA

***J37LR**	**A**	**1,009,970**	**1001**	**442**
			(Op: VE3EBN)	

ST LUCIA

***J69EN**	**A**	**254,546**	**372**	**274**

ST. VINCENT

***J8/N8WK**	**A**	**407,960**	**531**	**310**

US VIRGIN IS.

***KP2BH**	**A**	**637,376**	**677**	**368**

PUERTO RICO

***WP3C**	**A**	**4,142,768**	**2101**	**752**
***WP4LNY**	**A**	**1,353,787**	**1118**	**499**
*WP4BV	*	814,030	870	406
*WP3GW	*	228,366	307	284
***NP3P**	**28**	**1,809,438**	**1329**	**582**
			(Op: NP3E)	

COSTA RICA

W5AA/TI8	**A**	**2,084,843**	**1369**	**617**
***TE2M**	**A**	**139,105**	**240**	**215**
*TI2KAC	*	1,235	22	19

ST KITTS

V47KP	**A**	**4,180,130**	**2183**	**734**
			(Op: W2OX)	

CANADA

VC6R	**A**	**8,552,736**	**3130**	**1026**
			(Op: VE5MX)	
VE3AT	**A**	**7,868,610**	**3069**	**906**
VE3NE	*	5,023,215	2125	785
VO1TA	**A**	**4,318,930**	**2156**	**710**
VA6SZ	**A**	**2,124,126**	**1488**	**597**
VE9MY	**A**	**1,191,624**	**842**	**492**
VE9FX	*	791,982	670	414
VE4YU	**A**	**600,363**	**607**	**369**
VE7VR	**A**	**336,657**	**456**	**293**
VE5CPU	*	216,381	350	249
VE7XO	*	212,472	320	234
VA3IX	*	82,368	217	144
VO1MP	**28**	**2,442,960**	**1522**	**648**
VE3PN	**28**	**549,621**	**617**	**353**
VE3ANX	**21**	**5,258,040**	**2237**	**860**
VA7RR	**14**	**3,755,889**	**1926**	**801**
VE7AV	*	3,162,920	1647	739
VE6FI	**7**	**459,654**	**428**	**249**
			(Op: VE6AQ)	
VY2ZM	**1.8**	**157,644**	**247**	**151**
VA3KA	**1.8**	**53,010**	**152**	**95**
***VA3UZ**	**A**	**5,352,670**	**2224**	**830**
*VE3MQW	*	1,365,351	989	507
*VE3BUC	*	1,288,418	985	499
***VE2AWR**	**A**	**1,072,292**	**857**	**442**
***VE7FO**	**A**	**953,534**	**848**	**437**
*VE3AGC	*	818,349	768	399
*VY2MGY/3	*	683,606	642	386
*VE7UQ	*	665,968	682	389
***VE5SF**	**A**	**528,528**	**617**	**363**
***VO1ONE**	**A**	**461,340**	**593**	**330**
*VE3KP	*	436,662	494	306
*VE3YQY	*	207,656	361	257
*VE3STT	*	202,304	307	218
*VA3SX	*	161,975	280	209
*VO1HE	*	154,800	260	225
*VE2LHP	*	153,920	279	208
***VE4HAZ**	**A**	**119,784**	**262**	**186**
*VE2OWL	*	116,614	231	199
*VE7IO/W7	*	53,430	185	137
*VE3UOT	*	32,144	115	98
			(Op: VE3GD)	
*VE2BWQ	*	23,585	95	89
*VA3PL	*	16,920	85	72
*VA7LC	*	13,320	83	72
*VE2AZJ	*	1,560	24	24
***VE1ASJ**	**28**	**537,540**	**580**	**372**
***VE9DXR**	**28**	**56,980**	**150**	**140**
***VE7IN**	**21**	**454,132**	**553**	**331**
***VA3FP**	**21**	**248,920**	**360**	**254**
***VE3RCN**	**21**	**74,060**	**180**	**161**
***VA3XRZ**	**7**	**5,214**	**34**	**33**

TURKS & CAICOS

***VP5V**	**A**	**10,134,240**	**4256**	**982**
			(Op: W5AO)	

MEXICO

XE1ZOI	**A**	**375,804**	**508**	**292**
XE2AC	**21**	**621,675**	**658**	**405**
***XE2AUB**	**A**	**1,571,817**	**1244**	**533**
***XE1BEF**	**A**	**552,090**	**608**	**385**
*XE1MEX	*	494,200	526	350
***XE1CT**	**28**	**242,250**	**417**	**250**

NICARAGUA

***H6C**	**28**	**756,391**	**806**	**415**
			(Op: YN4SU)	

CAYMAN IS.

ZF2AF	**A**	**13,232,968**	**4989**	**1064**
			(Op: AE6Y)	
ZF2AH	**21**	**5,335,770**	**2603**	**851**

AFRICA

AFRICAN ITALY

IH9/OL5Y	**28**	**6,920,654**	**2510**	**923**
			(Op: OK1FUA)	
IH9/OL7N	**21**	**5,065,728**	**2182**	**776**
			(Op: OK1DUO)	

TUNISIA

***3V8CB**	**A**	**3,902,720**	**1888**	**640**
			(Op: JH4RHF)	

MADAGASCAR

5R8FU	**28**	**1,319,700**	**894**	**498**

GHANA

***9G5MD**	**A**	**2,894,228**	**1491**	**652**
			(Op: F5VCR)	

MOROCCO

CN2R	**A**	**15,722,875**	**4863**	**1057**
			(Op: W7EJ)	
***CN8NK**	**A**	**5,822,553**	**2327**	**803**

MADEIRA IS.

CT3HF	**A**	**334,452**	**398**	**282**

CAPE VERDE

D44AC	**28**	**15,707,401**	**4671**	**1123**
			(Op: 4L5A)	

CANARY IS.

EA8ZS	**A**	**165,540**	**229**	**155**
EA8AH	**21**	**8,797,155**	**2977**	**989**
			(Op: OH1MA)	
EA8BVX	**21**	**2,779,738**	**1439**	**646**
EC8ABT	*	820,440	714	387
AN8AH	**7**	**6,537,860**	**1639**	**670**
			(Op: OH1RY)	
***EA8ARG**	**A**	**2,295**	**29**	**27**
*EA8AM	*	133	7	7
***EA8AG**	**21**	**1,423,647**	**956**	**499**
*EA8AD	*	22,113	91	81

CEUTA AND MELILLA

***EA9CD**	**A**	**2,183,040**	**1186**	**576**

ETHIOPIA

***ET3PMW**	**28**	**1,602,594**	**1131**	**474**
			(Op: W4PFM)	

TRISTAN DA CUNHA

ZD9IR	**A**	**831,820**	**737**	**380**

SOUTH AFRICA

ZS6IR	**A**	**1,249,172**	**830**	**508**
ZS6RAE	*	24,795	97	87
***ZS9P**	**A**	**324,318**	**399**	**283**
			(Op: ZS6PHD)	
***ZS9Z**	**28**	**497,991**	**495**	**339**
			(Op: ZS1/UA3HK)	

ASIA

ISRAEL

4XØJ	**A**	**6,772,914**	**2703**	**834**
			(Op: 4X4FJ)	
*4X2Z	*	234,939	344	213
***4X/ES2RR**	**28**	**1,681,130**	**1134**	**527**
***4Z5JQ**	**28**	**928,186**	**816**	**397**

CYPRUS

5B4/R3CC	**A**	**13,713,554**	**4111**	**1126**
			(Op: RW3QC)	
5B4/ UA9UHD	**28**	**3,910,304**	**2056**	**712**
H22H	**21**	**6,475,296**	**2644**	**888**
			(Op: 5B4MF)	

MALDIVE IS.

***8Q7OA**	**A**	**32,973**	**132**	**87**

KUWAIT

9K2ZZ	**28**	**6,297,330**	**2596**	**871**

SINGAPORE

9V1UV	**A**	**353,584**	**554**	**308**

CHINA

***BD5RI**	**28**	**1,125,135**	**997**	**495**

KYRGYZSTAN

EX8O	**A**	**2,490,000**	**1412**	**625**
***EX8AA**	**21**	**1,896,041**	**1243**	**617**
*EX7ML	*	422,765	483	329

TURKMENISTAN

***EZ3A**	**A**	**3,600**	**42**	**36**
			(Op: EZ8CW)	
***EZ8CW**	**28**	**19,952**	**98**	**86**

SOUTH KOREA

***HL3AHQ**	**A**	**110,425**	**240**	**175**
*HL3AMO	*	14,460	67	60

THAILAND

E21EIC	**A**	**1,609,920**	**1280**	**576**
HSØ/ G3NOM	**28**	**1,176,822**	**1002**	**513**
***HSØZDR**	**21**	**9,577**	**67**	**61**
			(Op: N4CT)	

JAPAN

JH7LRS	**A**	**7,064,640**	**2819**	**880**
JR6EZE	**A**	**6,320,160**	**2607**	**864**
JA6GCE	**A**	**5,746,188**	**2496**	**804**
JA7NVF	*	5,386,125	2367	813
JH1EAQ	*	4,178,175	2020	725
JM1XCW	*	3,651,382	1835	703
JA2BNN	*	2,212,113	1342	591
JK1OLT	*	1,766,190	1093	565
JA2FSM	*	1,751,120	1117	560
JAØQWO	*	1,388,424	1004	498
JA2BQX	*	380,464	488	301
JN4FNZ	*	281,336	380	253
JL6HKJ	*	131,461	259	187
7J1ABD	*	87,531	196	163
			(Op: WA6URY)	
7N4JZK	*	62,775	171	135
JA8TEZ	*	35,298	121	106
JJ2PUG	*	33,176	115	104
JK7ESY	*	5,412	48	412
JN3MUC	*	770	20	14
7J2YAF	**28**	**5,119,280**	**2176**	**890**
			(Op: JA1KSO)	
JN4FEU	**28**	**4,210,080**	**1936**	**784**
JG4AKL	**28**	**1,407,617**	**957**	**527**
JJ1RDX	*	824,040	706	436
JA5APU	*	722,515	631	415
JI3OPA	**21**	**5,963,688**	**2337**	**904**
JA7BJS	**21**	**1,236,384**	**906**	**486**
JS1PWV	*	56,892	167	132
JE2HVC	**14**	**123,716**	**234**	**197**
JA5IP	**7**	**6,624**	**39**	**36**
***JR7OMD/2**	**A**	**1,005,700**	**803**	**445**
***7K4GUR**	**A**	**518,658**	**500**	**371**
***JM1GHT**	**A**	**467,840**	**495**	**340**
*JAØBMS	*	445,544	516	332
*JE3UHV	*	283,630	392	251
*JHØNEC	*	276,896	383	272
*JA3YPL	*	257,823	383	243
			(Op: JJ3TBB)	
*JG1OWV	*	229,950	344	225
*JA7DNO	*	215,495	339	235
*JA1ALX/9	*	156,672	294	204
*JR1SGU	*	152,388	272	204
*JK2VOC	*	148,992	294	192
*JA1GYO	*	144,992	270	197
*JA2GHP	*	137,280	268	195
*JR1MRG	*	121,844	266	166
*JA3MVI/1	*	118,218	235	183
*JA1CP	*	105,625	237	169
*JA3PYC	*	104,248	219	166
*JN1NOP	*	101,400	236	169
*JA1KK	*	93,225	203	165
*JJ6WYS	*	77,562	212	139
*JA1BPN	*	73,640	184	140
*JL7XBN	*	63,648	162	144
*JA3AOP	*	59,185	173	133
*JA1IZ	*	51,786	145	126
*JI1EFP	*	47,573	147	113
*JH1SBE	*	29,986	121	94
			(Op: KM6F)	
*JE7DOT	*	29,016	110	93
*JA1XUY	*	23,478	99	86
*JE8KKX	*	23,306	99	86
*JR3NDM	*	20,000	96	80
*JA4BAA	*	19,703	150	113
*JA9NOF	*	14,457	81	61
*JG1FGL	*	6,157	47	47
*JI2VLM	*	4,578	47	42
*JN7FPB	*	4,095	43	39
*JA9EJG	*	2,666	32	31
*JA2TKO	*	220	10	10
***JF3BFS**	**28**	**1,317,292**	**936**	**509**
***JAØIAA/Ø**	**28**	**414,732**	**480**	**321**
***JL1ARF**	**28**	**345,488**	**430**	**286**
*JA1SWB	*	325,745	413	287
*JHØNVX/1	*	287,625	385	295
*JI1HFJ	*	206,322	310	251
*JA6EFT	*	203,252	318	244
*JR3CVO	*	140,553	235	207
*JA1BUI	*	137,388	244	214
*7N2UQC	*	121,638	243	194
*JA6QDU	*	98,264	210	173
*JA1RRA	*	82,502	189	166
*JA7KM	*	82,080	189	160
*JA9TQY	*	72,240	213	172
*JJ3OOZ	*	30,992	116	104
*JA3LKE	*	22,088	91	88
*JA6CYL/6	*	20,667	89	83
*JH7CJM	*	19,662	89	87
*JH1OLB	*	14,606	78	67
*JG5VIA	*	12,880	70	70
*JA1EEG	*	6,600	55	50
*7K2PBB	*	5,781	55	47
*JA2CXF	*	2,937	33	33
*JJ6VXY/9	*	2,871	36	33
*JE1PJR	*	2,352	30	28
*JA1AAT	*	551	19	19
*JH1TUX	*	336	12	12
*JA2YKA/1	*	27	3	3
***JL3VUL/3**	**21**	**2,161,737**	**1243**	**639**
***JR3RIY**	**21**	**920,034**	**715**	**474**
*JJØJML	*	143,325	257	195
*JQ1AHZ/2	*	139,941	247	213
*JA4AQR	*	91,863	193	173
*JQ1COB	*	56,700	156	135
*7K2GMJ	*	40,131	131	117
*JI8BUR/8	*	26,220	104	95
*JA3BBG	*	20,898	92	81
*JK6ISK	*	18,640	85	80
*JK1BII	*	16,340	85	76
*JA6PL	*	6,615	51	49
*JR3KAH	*	4,773	47	43
*JA1LBZ	*	2,697	31	31
*JH4KHY	*	2,320	30	29
*JA7ADV	*	1,760	69	22
*JG1GCO	*	1,700	26	25
*JA1JLP	*	1,408	22	22
*JEØVFV	*	646	18	17
*JF2FKJ	*	555	15	15
*JK8HOS	*	341	11	11
*JJ1VTE	*	184	9	8
*JO7EGJ/1	*	60	6	6
*JK8FRL	*	48	4	4
*JK3AHS	*	21	3	3
***JH1UUT**	**14**	**54,536**	**149**	**136**
***JE1SPY**	**3.7**	**2,208**	**25**	**24**

OGASAWARA

***JD1BIA**	**A**	**38,216**	**384**	**170**

JORDAN

JY9NX	**A**	**13,919,586**	**4600**	**991**
			(Op: JM1CAX)	

LEBANON

OD5/OK1MU	**21**	**5,315,907**	**2311**	**831**

TURKEY (ASIATIC)

TA3BM	**A**	**4,212**	**42**	**36**
TA3DD	**28**	**200,810**	**396**	**215**
TA3EL	*	4,859	43	43
TA2DS	**14**	**799,596**	**684**	**399**
***TA3BN**	**A**	**338,935**	**463**	**265**
*TA3EU	*	602	14	14
***TA3YJ**	**28**	**93,555**	**203**	**165**
***TA3AK**	**14**	**237,456**	**315**	**272**
***TA3EM**	**7**	**15,052**	**55**	**53**
***TA3J**	**1.8**	**267,699**	**257**	**181**

ASIATIC RUSSIA

UA9CDV	**A**	**7,072,560**	**2625**	**836**
UA9CLB	**A**	**6,512,872**	**2444**	**796**
RW9UP	**A**	**4,011,728**	**1986**	**784**
RZ9SR	*	3,100,032	1579	624
UA9JDP	*	2,807,250	1605	591
RV9BB	*	1,897,758	1004	558
UA9HR	*	737,642	711	382
UA9KM	*	671,970	627	390
UA9FM	*	588,777	569	371
RA9ST	*	522,399	547	339
RU9BB	*	75,517	187	157
RV9SV	*	32,361	161	67
UA9CRX	*	24,462	98	81
RK9AY	*	5,969	47	47
UA9YAB	**28**	**3,412,376**	**1795**	**748**
UA9KJ	**28**	**1,040,388**	**844**	**479**
UA9JPK	*	304,790	413	290
RJ9J	**14**	**3,007,744**	**1484**	**758**
			(Op: RA9JR)	
UA9CI	**7**	**1,400,256**	**714**	**374**
***RM9A**	**A**	**1,412,424**	**961**	**468**
			(Op: UA9ACJ)	
***UA9MC**	**A**	**967,930**	**802**	**430**
***RA9AU**	**A**	**614,016**	**611**	**384**
*RW9QA	*	472,473	490	307
*RU9UG	*	401,940	513	315
*UA9ORQ	*	310,716	407	274
*RU9AC	*	304,706	385	262
*RZ9UGN	*	290,496	394	272
*RK9XX	*	176,393	285	223
*UA9QFF	*	165,345	293	219
*UA9OSV	*	140,650	299	194
*UA9AX	*	83,424	177	158
*UA9XF	*	29,211	115	107
***RV9JR**	**28**	**1,023,165**	**889**	**477**
***RV9WZ**	**28**	**414,018**	**502**	**297**
***UA9LAU**	**28**	**355,500**	**499**	**300**
*UA9XOJ	*	301,560	443	280
*RV9UF	*	219,020	364	235
*UA9OA	*	68,250	199	150
*UA9XRV	*	4,300	50	43
***UA9JLL**	**21**	**564,978**	**563**	**382**
***UA9MQR**	**21**	**337,737**	**409**	**309**
***UA9LCY**	**14**	**324,806**	**392**	**307**
*RA9XF	*	71,145	179	153
*RX9CEL	*	53,704	146	137
*RW9TN	*	49,920	146	130
UAØAGI	**A**	**155,364**	**289**	**214**
UAØJDD	*	9,891	74	63
RAØFU	**28**	**1,530,987**	**1037**	**537**
UAØSR	*	180,048	328	248
RUØAT	*	46,920	145	120
RSØF	**21**	**3,997,840**	**2038**	**826**
RAØBA	**14**	**1,493,796**	**988**	**562**
***UAØACG**	**A**	**843,625**	**767**	**425**
*RWØLBE	*	45,087	150	113
***UAØWW**	**28**	**702,856**	**687**	**392**
*RAØFN	*	52,932	147	132
***RWØBG**	**21**	**346,336**	**430**	**316**
*RUØBB	*	152,096	281	224
*RUØAE	*	25,300	103	92

UZBEKISTAN

***UK8IT**	**28**	**432**	**12**	**12**

KAZAKHSTAN

UQ1D	**A**	**607,698**	**598**	**371**
***UP6P**	**A**	**1,287,616**	**910**	**472**
*UN6G	*	149,035	276	205
***UN4PG**	**21**	**295,412**	**374**	**299**
*UO7DG	*	58,241	177	139
***UN9LN**	**14**	**61,486**	**169**	**142**

INDIA

***ATØD**	**14**	**97,825**	**209**	**175**
			(Op: VU3DJQ)	

MACAU

XX9TRR	**A**	**6,852,638**	**3305**	**898**
			(Op: OH2PM)	
***XX9AU**	**21**	**5,568**	**74**	**58**

UK BASES ON CYPRUS

***ZC4BS**	**A**	**3,550,112**	**2016**	**608**

EUROPE

CROATIA

9A4X	**14**	**4,820,030**	**2422**	**905**
9A5E	**7**	**3,130,550**	**1503**	**635**
***9A7ZZ**	**A**	**438,592**	**587**	**352**
*9A/OE1EMS	*	244,256	376	272
*9A6AJK	*	73,968	212	184
***9A5V**	**28**	**1,151,520**	**925**	**480**
***9A4VV**	**21**	**196,639**	**443**	**269**
***9A4RV**	**14**	**172,534**	**404**	**281**

MALTA

9H3M	**A**	**1,261,995**	**1392**	**595**
9HØA	**28**	**6,656,650**	**2920**	**1001**
			(Op: 9H1EL)	
***9H3K**	**A**	**18,531**	**98**	**87**

ANDORRA

***C31LJ**	**A**	**1,088,912**	**1103**	**538**

PORTUGAL

CS7GPQ	**A**	**5,542,642**	**3097**	**938**
CQ2H	**28**	**3,055,680**	**1876**	**720**
CT1ESO	**3.7**	**265,307**	**345**	**251**
***CT1CJJ**	**A**	**1,908,284**	**1307**	**646**
***CT2FUR**	**A**	**341,440**	**609**	**320**
*CT1GFK	*	315,084	449	308
***CT1FNT**	**28**	**68,475**	**245**	**165**
***CT1CAD**	**7**	**111,696**	**219**	**179**

GERMANY

DL1NEO	**A**	**1,544,874**	**1152**	**591**
DL7AYM	**A**	**1,005,960**	**851**	**498**
DL9DYL	**A**	**889,770**	**818**	**446**
DL7FER	*	815,384	759	449
DL8NFU	*	473,063	592	367
DL1PT	*	379,200	490	320
DL1WA	*	293,314	406	287
DK6QW	*	263,700	409	300
DH3MAY	*	140,448	307	224
DF6WE	*	49,588	319	200
DJ9AO	*	29,718	150	117
DF5AU	*	17,750	88	71
DK2OY	**21**	**3,594,624**	**1840**	**759**
DL3BQA	**14**	**402,192**	**634**	**392**
DN1MA	*	10,935	97	81
DL3LAB	**3.7**	**378,768**	**553**	**312**
***DL4MCF**	**A**	**2,486,940**	**1575**	**687**
***DF7YU**	**A**	**2,213,900**	**1450**	**650**
***DF3KV**	**A**	**1,960,560**	**1323**	**630**
*DL5SEU	*	1,048,544	964	496
*DH8AF	*	952,049	839	491
*DH2MA	*	749,812	782	439
*DK3GI	*	328,624	432	304
*DH5AO	*	315,596	458	307
*DK6BT	*	279,146	418	314
*DJ2IE	*	239,148	440	273
*DL8SDC	*	199,082	333	247
*DK6AY	*	197,577	380	261

*DL2ANM	*	189,250	341	250
*DL8HCO	*	174,840	324	235
*DL6KAC	*	151,866	306	234
*DL6RBH	*	149,952	294	213
*DJ1AD	*	124,696	271	218
*DL3YEI	*	106,118	247	194
*DL2VB	*	105,984	251	192
*DL2YCA	*	92,964	240	183
*DJ2UB	*	86,652	219	166
*DJ3JD	*	82,450	195	170
*DL1OFD	*	49,446	171	134
*DK7ZH	*	43,276		
*DJ4MH	*	39,882	158	138
*DJ2QV	*	28,290	131	115
*DJ5IW	*	10,787	73	67
*DK7MCX	*	9,238	68	62
*DL8SDI	*	8,478	62	54
*DM3XI	*	5,740	48	41
*DL2RTJ	*	3,952	38	38
***DHØGDS**	**28**	**160,714**	**274**	**214**
***DL7UIO**	**28**	**123,354**	**237**	**198**
*DK3KD	*	108,232	234	166
*DL7VTL	*	57,684	157	132
*DH8WE	*	2,574	42	26
*DL7LZ	*	549	24	9
***DL3BRA**	**21**	**129,504**	**270**	**213**
*DL2SDQ	*	43,164	149	132
***DL2MIH**	**14**	**35,378**	**150**	**133**
*DL4JYT	*	6,348	50	46

SPAIN

AM1DDO	**A**	**2,957,475**	**1798**	**705**
			(Op: EA1DDO)	
EA3ELZ	**A**	**2,767,765**	**1660**	**715**
EA5BY	*	337,512	406	294
EA1JO	*	263,646	418	302
EA3RE	*	109,752	241	204
AN1JJ	**28**	**1,425,375**	**1229**	**525**
EF5AMK	**21**	**333,081**	**683**	**357**
***AN3FCQ**	**A**	**2,158,464**	**1534**	**672**
			(Op: EA3FCQ)	
***ED1WS**	**A**	**1,577,604**	**1331**	**588**
***AM3DUW**	**A**	**1,473,820**	**1446**	**590**
*AN7GTF	*	1,000,830	973	457
*AM1FD	*	852,825	739	415
*EC5CPL	*	503,052	874	412
*AM1AUM	*	473,008	680	376
*AN1OT	*	392,232	604	354
*EA3NA	*	279,128	445	296
*EA7CD	*	192,052	331	266
*AN1FFC	*	164,500	270	235
*EA7EWX	*	154,037	334	221
*AN4JW	*	148,000	346	250
*EA5XC	*	115,960	286	223
*ED1DDN	*	92,232	230	183
			(Op: EA1DDN)	
*EA1JW	*	87,892	212	172
*AN4CUN	*	76,960	243	185
*EA1BLO	*	59,714	228	146
*AM5TS	*	57,531	159	151
			(Op: EA5TS)	
*EA4EJR	*	52,848	178	144
*EA3EYD	*	51,102	178	153
*EA3ACA	*	46,440	156	129
*EA1SH	*	34,194	140	123
*EA2AVM	*	32,373	129	109
*EA4CU	*	18,330	107	94
*EA3AAW	*	13,984	90	76
*EA3FHP	*	6,900	60	60
*EA1DBC	*	5,896	47	44
*EA4UB	*	4,800	46	40
*EA7FIQ	*	2,886	39	39
*EA7DWJ	*	2,822	34	34
*EA7CA	*	1,560	27	24
*EA2CHL	*	624	49	16
***AM7FTR**	**28**	**1,636,800**	**1378**	**600**
***AN5DF**	**28**	**1,251,872**	**1040**	**551**
***AM7IA**	**28**	**670,104**	**692**	**454**
*EA1AJV	*	611,508	716	393
*AM5AAJ	*	312,393	409	303
*AN1CBX	*	109,005	263	169
*EA4AES	*	85,086	203	174
*EA1BZP	*	69,768	200	171
*EA1BXJ	*	29,694	120	101
***AM7HBP**	**21**	**1,450,260**	**1408**	**630**
***EA5FIV**	**21**	**646,947**	**759**	**489**
***EA7DVE**	**21**	**611,310**	**722**	**410**
*EA1DAX	*	432,693	585	393
*EC3CJN	*	390,158	742	373
*EF1DMQ	*	159,077	457	271
			(Op: EC1DMQ)	
*EC4DFA	*	81,055	295	215
*EA7HE	*	28,544	151	128
*EA5TN	*	23,199	119	111
*EC3CFO	*	21,160	127	115
*EC1CSV	*	21,000	126	105
*EC1ALY	*	4,559	47	47
*EA5FEJ	*	2,982	45	42
***EA5EOR**	**14**	**292,365**	**489**	**365**
***AM1AVO**	**14**	**173,754**	**353**	**294**
			(Op: EA1AVO)	
*EA7FRX	*	120,050	298	245
*EA3QP	*	102,726	307	234
***AN1QA**	**7**	**62,376**	**165**	**138**
***EA1AUT**	**3.7**	**16,800**	**104**	**84**

BALEARIC IS.

AN6TC	**A**	**2,264,521**	**2033**	**707**
			(Op: EA6TC)	
***ED6DD**	**A**	**1,972,464**	**1394**	**654**
			(Op: EA6DD)	
*EC6TO	*	79,785	315	197
*EA6ACZ	*	20,114	101	89

IRELAND

EI4DW	**A**	**652,096**	**738**	**443**
***EI4CF**	**28**	**301,000**	**400**	**301**
*EI9HQ	*	42,312	156	123

MOLDOVA

***ER5DX**	**A**	**1,461,309**	**1221**	**589**

ESTONIA

ES5GI	**28**	**1,077,890**	**939**	**478**
ES6CO	*	102,432	220	176
ES1FB	**21**	**1,272,240**	**1022**	**513**
***ES1BH**	**A**	**204,022**	**387**	**247**
*ES6KW	*	135,676	266	214
***ES5TX**	**28**	**148,390**	**288**	**209**
*ES8DH	*	2,059	31	29
***ES7NY**	**21**	**176,588**	**341**	**262**
*ES1CN	*	164,193	317	239
*ES6MT	*	77,088	208	176
***ES2EZ**	**14**	**74,772**	**228**	**201**
***ES2NA**	**7**	**95,407**	**214**	**179**

BELARUS

EU1SA	**A**	**1,359,195**	**1117**	**555**
EW8DX	*	789,910	896	430
***EW1CQ**	**A**	**259,826**	**422**	**277**
*EU6NN	*	13,330	106	86
***EW1ABF**	**28**	**25,830**	**122**	**90**
***EW1GA**	**21**	**163,795**	**333**	**235**
***EU6FF**	**14**	**147,384**	**336**	**267**

FRANCE

TM2Y	**A**	**6,531,404**	**2559**	**869**
F5VHJ	**A**	**6,240,220**	**2806**	**841**
F5BBD	**A**	**1,518,465**	**1183**	**599**
F2AR	*	971,774	867	478
F6KDF	**21**	**3,078,742**	**1689**	**746**
TM1H	**21**	**1,988,176**	**1302**	**626**
			(Op: F6GWV)	
F2EE	**14**	**3,005,856**	**1840**	**784**
TM8C	**14**	**2,869,116**	**1792**	**746**
***F8AAN**	**A**	**859,456**	**816**	**416**
***F6FTB**	**A**	**346,785**	**474**	**305**
*F6DZD	*	69,044	210	164
*F2RO	*	41,496	140	133
***F5AJG**	**28**	**238,209**	**343**	**271**
***TM1P**	**21**	**1,104,840**	**1018**	**540**
			(Op: F8BON)	
*F8AKS	*	304,764	452	327

ENGLAND

G5W	**A**	**2,961,395**	**1774**	**695**
			(Op: GØWAT)	
MØWAA	**A**	**1,144,637**	**1039**	**521**
M6Q	*	334,084	442	289
G3UFY	*	104,328	209	207
***G3VAO**	**A**	**1,508,790**	**1151**	**570**
***G5X**	**A**	**1,160,934**	**938**	**543**
			(Op: MØBRK)	
***G4GOY**	**A**	**311,553**	**486**	**297**
*G4NXG/M	*	269,920	412	280
*GØ/N9LYE	*	254,840	448	277
*G3JJZ	*	207,740	347	260
*MØDAL	*	117,110	249	245
***GØAEV**	**28**	**901,152**	**778**	**447**
*GØWMW	*	342,828	424	321
*M7W	*	213,655	361	247
			(Op: G4IIY)	
***M4T**	**14**	**252,414**	**502**	**333**
			(Op: GØVQR)	
***G4VGO**	**1.8**	**47,684**	**173**	**131**

ISLE OF MAN

***GD4GWQ**	**A**	**84,272**	**238**	**184**

NORTHERN IRELAND

***GIØOUM**	**A**	**27,832**	**116**	**98**

SCOTLAND

GMØLYM	**A**	**32,034**	**132**	**114**
GM7V	**28**	**4,592,265**	**2231**	**885**
			(Op: GM4YXI)	
***GM3BCL**	**A**	**472,689**	**576**	**369**
*GMØFGI	*	189,222	367	282

GUERNSEY

***MUØFAL**	**A**	**183,040**	**374**	**260**

WALES

GW4BLE	**A**	**614,196**	**610**	**396**
GW7X	*	70,620	202	165
			(Op: GW3NJW)	
GWØANA	**28**	**71,455**	**181**	**155**

HUNGARY

HA8JV	**A**	**7,019,595**	**2886**	**957**
HA3LI	*	442,534	489	346
HG8W	**28**	**836,400**	**768**	**408**
HG9X	**14**	**4,098,464**	**2094**	**844**
***HA3OU**	**A**	**241,500**	**408**	**276**
***HA3FT**	**28**	**199,103**	**325**	**237**

SWITZERLAND

HB9CQS	**A**	**18,696**	**90**	**82**
***HB9AYZ**	**A**	**85,575**	**231**	**175**
*HB9AON	*	55,545	197	161
***HB9ARF**	**28**	**268,548**	**374**	**278**

ITALY

IR4B	**A**	**603,141**	**643**	**373**
			(Op: IK4AUY)	
IK4QIM	**A**	**478,040**	**614**	**380**
IQ4B	**A**	**360,253**	**490**	**337**
			(Op: IK4QJH)	
IZ6CLN	*	355,042	566	334
II3L	*	272,436	431	292
I2SVA	*	22,473	99	99
IZ2EID	*	12,285	69	65
IQ3X	*	7,752	71	68
IZ0BPI	*	2,822	37	34
I8VKB	*	266	11	7
IU2P	**28**	**4,024,020**	**2036**	**770**
			(Op: I2PJA)	
IO2C	**28**	**1,099,646**	**876**	**487**
			(Op: IK2WZV)	
IZ1EGV	*	236,320	352	280
I5FCK	**7**	**1,617,475**	**961**	**485**
I4AVG	**3.7**	**1,177,689**	**921**	**457**
***IU3A**	**A**	**1,351,196**	**1149**	**574**
			(Op: IV3HAX)	
***IR3Z**	**A**	**1,339,328**	**1066**	**544**
			(Op: IN3XUG)	
***IK5/**				
DJ1AA/P	**A**	**904,806**	**982**	**501**
*IK8UND	*	847,952	741	469
*IQ8Y	*	505,362	625	418
*IK7RVY	*	269,392	437	298
*IZ6EGX	*	231,575	489	295
*IK2ZJN	*	191,979	318	249
*IZ2BKA	*	170,885	306	239
*IZ2ABN	*	158,337	285	219
*IO4T	*	155,445	296	215
*IKØYVV	*	150,059	305	221
*IK2ULM	*	135,876	276	201
*IK3OII	*	109,208	226	187
*IK3SCB	*	87,740	278	205
*IZ8DPN	*	86,581	243	187
*IZ2ACG	*	69,300	181	154
*IZØBNR	*	68,355	184	147
*IC8/IN3XUG	*	51,792	232	166
*IK2WYI	*	49,060	152	110
*IK7WUE	*	47,244	172	127
*IK8IFW	*	3,784	46	43
*IK8NBL	*	3,266	48	37
***IU2C**	**28**	**1,697,190**	**1158**	**555**
***IV3RCH**	**28**	**174,724**	**281**	**242**
*IZ8EFD	*	122,808	242	204
*IK2WZQ	*	51,750	140	125
*IK7WPD	*	24,728	99	88
*IV3ZUU	*	21,449	95	89
***IZØBVU**	**21**	**157,884**	**385**	**236**
***IV3WMS**	**14**	**80,256**	**224**	**192**
*IZ2ABI	*	35,640	144	135

SARDINIA

***ISØLLJ**	**A**	**8,694**	**62**	**54**

SICILY IS.

IT9VCE	**21**	**716,454**	**920**	**477**
***II9P**	**A**	**181,332**	**410**	**276**
***IT9DTU**	**28**	**44,880**	**154**	**132**
***IT9ICS**	**14**	**973,749**	**1107**	**521**

NORWAY

LA1VKA	**A**	**32,373**	**114**	**109**
LA8GK	*	6,419	54	49
LA9HW	**7**	**2,157,680**	**1436**	**560**
LA6EIA	**3.7**	**273,996**	**411**	**258**
***LA1PHA**	**A**	**273,888**	**415**	**288**
***LB9YE**	**A**	**220,008**	**371**	**309**
*LB9XE	*	76,167	220	189
***LA2WIA**	**28**	**56,280**	**164**	**134**

LUXEMBOURG

LX1NO	**28**	**404,432**	**528**	**314**

LITHUANIA

LY1FW	**28**	**956,968**	**815**	**488**
LY6A	**21**	**2,631,600**	**1509**	**688**
			(Op: LY2BM)	
LY3BH	**21**	**2,089,776**	**1347**	**624**
LY9A	**14**	**3,009,604**	**1878**	**806**
			(Op: LY3BA)	
LY5A	**7**	**2,369,440**	**1350**	**590**
			(Op: LY2PAJ)	
LY2BW	**1.8**	**230,944**	**460**	**224**
***LY2DX**	**A**	**798,000**	**860**	**456**
***LY3CY**	**A**	**168,525**	**338**	**225**
*LY2BBF	*	74,240	200	160
*LY2BET	*	9,912	64	56
*LY2OO	*	9,702	75	66
***LY2DM**	**28**	**431,775**	**543**	**303**
***LY2FN**	**28**	**259,305**	**381**	**295**
*LY2AT	*	50,020	160	122

BULGARIA

LZ2PL	**A**	**83,304**	**210**	**156**
LZ1NG	**28**	**2,403,408**	**1500**	**644**
LZ2JA	*	609,279	623	407
LZ1ABC	**14**	**4,587,510**	**2403**	**870**
LZ8T	**3.7**	**789,488**	**834**	**392**
***LZ2L**	**A**	**96,820**	**231**	**188**
***LZ2UZ**	**A**	**73,017**	**212**	**171**
*LZ4UU	*	51,013	148	139
*LZ4BU	*	12,110	75	70
***LZ1CF**	**28**	**127,065**	**260**	**187**
***LZ1DM**	**3.7**	**80,850**	**211**	**165**

AUSTRIA

OE8CIQ	**A**	**1,111,040**	**969**	**512**
OE5CWL/5	**A**	**518,756**	**617**	**382**
OE3I	**28**	**1,852,964**	**1205**	**596**
			(Op: OE1JNB)	
***OE5OHO**	**A**	**161,931**	**327**	**231**

FINLAND

OH5B	**A**	**4,295,655**	**2240**	**819**
			(Op: OH5BM)	
OH2RA	**A**	**669,406**	**658**	**394**
OH5TT	*	356,976	489	333
OH2ME	*	221,428	400	281
OH6NJ	**28**	**678,198**	**711**	**366**
OH7C	**21**	**1,999,080**	**1323**	**648**
			(Op: OH7HDU)	
OH2BCD	*	821,742	778	453
OH4A	**14**	**2,968,202**	**1857**	**802**
OH8L	**14**	**2,691,445**	**1783**	**779**
			(Op: OH8LQ)	
OH1BOI	**3.7**	**3,731**	**46**	**41**
***OI6AY**	**A**	**1,400,672**	**1198**	**592**
			(Op: OH4II)	
***OH2BPA**	**A**	**292,896**	**450**	**324**
*OH4YT	*	129,280	272	202
*OH4OD/P	*	59,210	196	155
*OH2BLI	*	27,972	132	111
*OH7TO	*	16,198	104	89
*OH5HCK	*	13,612	94	82
***OH1BV**	**28**	**50,612**	**160**	**132**
*OH6RC	*	11,859	75	67
***OH4TY**	**21**	**298,616**	**442**	**326**

ALAND IS.

OHØA	**28**	**1,708,770**	**1248**	**553**
			(Op: OH4XX)	
OHØV	**21**	**3,947,592**	**2012**	**787**
			(Op: OH6LI)	

CZECH REPBULIC

OK1EP	**A**	**2,881,684**	**1662**	**734**
OK1FPS	**28**	**782,298**	**690**	**439**
OK1ARI	**28**	**588,208**	**590**	**379**
OK2ABU	*	337,938	429	302
OK1AOV	**14**	**157,472**	**286**	**266**
OK1IE	**7**	**277,704**	**367**	**261**
OK1WF	**3.7**	**461,083**	**649**	**331**
***OK2WTM**	**A**	**1,517,740**	**1178**	**586**
***OK2MBP**	**A**	**940,900**	**861**	**485**
***OK2SGY**	**A**	**882,354**	**782**	**461**
*OK1FXX	*	487,620	592	378
*OK1VD	*	269,890	397	274
*OK1HGM	*	269,760	392	281
*OK2PDT	*	216,468	365	252
*OK1SMU	*	177,500	350	250
*OK2TCW	*	168,345	325	215
*OK1DVK	*	160,527	291	219
*OK1DKO	*	159,996	284	201
*OK2BDF	*	155,940	311	226
*OK1DSX	*	127,920	257	208
*OK1MJA	*	124,435	274	205
*OK1FKV	*	86,141	254	191
*OK1CYC	*	69,391	199	161
*OK1TFH	*	65,410	192	155
*OK1SI	*	62,329	185	157
*OK2CJM	*	31,450	104	85
*OK1AOU	*	28,072	117	88
*OK1SRD	*	27,720	118	105
***OK1KDT**	**28**	**798,798**	**715**	**418**
			(Op: OK1MAL)	
***OL5Z**	**28**	**669,930**	**630**	**411**
			(Op: OK1CDJ)	
*OK1TRM	*	98,112	214	168
*OK1LO	*	64,070	166	149
*OK1XC	*	13,144	72	62
*OK1DP	*	11,895	67	65
*OK2BHE	*	8,745	57	53
***OK1DKA**	**21**	**135,880**	**268**	**215**
***OK1MMN**	**21**	**105,198**	**242**	**197**
*OK5SAZ	*	52,398	165	142
***OK1BA**	**14**	**66,794**	**213**	**182**
*OK1CAZ	*	17,622	100	89
***OK1DCF**	**7**	**245,125**	**380**	**265**
***OK2EQ**	**7**	**144,690**	**290**	**210**
*OK2PPM	*	90,479	198	173
***OL4W**	**3.7**	**43,066**	**180**	**122**
			(Op: OK1IF)	
***OK2SNX**	**1.8**	**70,668**	**227**	**156**

SLOVAKIA

OM7ZZ	**28**	**1,978,344**	**1295**	**568**
OMØM	**21**	**3,928,276**	**1992**	**803**
			(Op: OMØWR)	
***OM6T**	**A**	**2,258,440**	**1411**	**655**
***OM4DN**	**A**	**652,668**	**735**	**397**
*OM7JG	*	531,000	614	375
*OM3YK	*	255,168	434	288
*OM3CDZ	*	219,239	430	271
*OM8HG	*	115,400	276	200
*OM4DA	*	43,740	181	135
*OM7VF	*	600	16	15
***OM7YC**	**21**	**88,247**	**221**	**179**
***OM6RM**	**14**	**300,330**	**504**	**355**
*OM4TX	*	29,125	139	125

BELGIUM

OT2Z	**28**	**1,283,598**	**949**	**522**
			(Op: ON4AMX)	
ON5GQ	**28**	**564,928**	**554**	**388**
***ON4XG**	**A**	**494,710**	**547**	**351**
***ON7DQ**	**A**	**247,050**	**389**	**270**
*ON5JD	*	95,518	222	163
*ON4KVA	*	6,018	60	59

FAROE IS.

***OY1A**	**28**	**14,790**	**106**	**85**

DENMARK

OZ5EV	**A**	**981,180**	**778**	**540**
OZ2ZZZ	**3.7**	**128,535**	**280**	**205**
OZ3SK	**1.8**	**221,806**	**416**	**247**
***OZ1ACB**	**A**	**592,974**	**641**	**417**
***OZ5LH**	**A**	**116,186**	**244**	**193**
*OZ1GDI	*	30,709	124	107

THE NETHERLANDS

PAØJNH	**A**	**730,972**	**706**	**449**
PAØCOR	*	93,390	230	165
PI4TUE	**28**	**1,264,977**	**985**	**483**
			(Op: PE1PRG)	
PAØIJM	**21**	**219,661**	**373**	**277**
***PA3FGJ**	**A**	**740,715**	**813**	**437**
***PA5AT**	**A**	**492,375**	**627**	**375**
*PAØJED	*	161,472	313	232
*PA2PDN	*	86,278	225	179
*PAØLSK	*	71,360	204	160
*PA8MO	*	69,966	188	169
*PAØRBS	*	10,354	67	62
***PAØMIR**	**28**	**300,656**	**395**	**304**
***PAØRRS**	**28**	**124,460**	**243**	**196**
*PAØCYW	*	59,940	152	135
***PA1TT**	**21**	**424,708**	**507**	**356**

SLOVENIA

S5ØA	**A**	**8,028,776**	**3084**	**922**
S53O	**A**	**4,747,410**	**2274**	**810**
S59KW	**A**	**3,674,619**	**2067**	**783**
S57CQ	*	3,330,844	1875	748
S58RU	*	458,654	610	362
S5ØC	**28**	**3,633,525**	**1829**	**769**
			(Op: S53RM)	
S57MW	**21**	**3,365,235**	**1773**	**765**
S53M	**14**	**3,168,895**	**1761**	**743**
			(Op: S51ZO)	
S51CK	**14**	**3,103,595**	**1779**	**773**
S59CAB	**3.7**	**940,008**	**791**	**424**
			(Op: S53MM)	
S57M	**1.8**	**285,152**	**476**	**268**
***S52ZW**	**A**	**2,806,475**	**1596**	**725**
***S57IIO**	**A**	**2,328,750**	**1445**	**690**
***S51F**	**A**	**1,781,934**	**1233**	**627**
*S53DX	*	269,630	444	295
***S52OP**	**28**	**909,667**	**791**	**451**
***S54A**	**7**	**420,133**	**500**	**329**
***S53F**	**3.7**	**442,216**	**580**	**334**
***S52W**	**3.7**	**320,910**	**498**	**285**

SWEDEN

7S2E	**A**	**3,257,371**	**1902**	**757**
			(Op: SM2DMU)	
SM7CQY	**A**	**585,800**	**652**	**404**
SM6IQD	*	159,960	316	248
SM2IXM	**21**	**169,708**	**332**	**266**
8S5A	*	69,237	195	157
			(Op: SM5AJV)	
SM6CDG	**14**	**14,850**	**101**	**90**
***8SØF**	**A**	**570,876**	**762**	**421**
			(Op: SMØOGQ)	
***7S6J**	**A**	**342,792**	**530**	**324**
			(Op: SMØJSM)	
***SM6NET**	**A**	**338,904**	**487**	**324**
*SM5U	*	186,204	298	236
			(Op: SM5UGC)	
*SM6FJY	*	154,960	280	260
*SMØFM	*	50,697	163	131
*SM4XIH	*	26,670	122	105
*SM3EAE	*	8,625	76	69
*7S3A	*	6,480	50	45
			(Op: SM3CER)	
*SM5AJV	*	560	14	14
*SM6IXX	*	372	13	12
***SK7IJ**	**28**	**150,518**	**286**	**233**
			(Op: SM7SMS)	
***SK4UW**	**28**	**85,576**	**215**	**152**
			(Op: SM4JHK)	
*SM7DXQ	*	47,754	139	126
*SM7TKR	*	13,720	76	70
*SM7FTG	*	1,541	25	23
*SM1HPV	*	816	19	16
***SM5DYC**	**21**	**50,827**	**173**	**137**
*SM7HSP	*	6,477	57	51
*SMØKV	*	5,405	50	47
***SM7VZX**	**14**	**68,904**	**200**	**174**
***SM2EKA**	**14**	**41,223**	**177**	**151**
*SM6AHU	*	25,134	125	118
*SM7E	*	19,570	128	103
			(Op: SM7BHM)	
*SM3T	*	12,350	102	95
			(Op: SM3RUJ)	

POLAND

SP7VC	**A**	**5,021,240**	**2283**	**790**
SP9QMP	**A**	**1,892,348**	**1221**	**614**
SP9HZF	*	517,244	617	377
SQ4CUX	*	186,582	378	257

SP4DGN	**28**	**166,430**	**339**	**178**
SP4ZO	**1.8**	**7,448**	**64**	**56**
***SP1DID**	**A**	**1,654,290**	**1288**	**594**
***SP4DEU**	**A**	**1,360,520**	**1043**	**565**
***SQ1BVG**	**A**	**614,592**	**746**	**388**
*SQ9MZ	*	587,673	652	391
*SP2AYC	*	518,128	607	376
*SP9HQC	*	427,125	545	335
*SP6IEQ	*	423,846	569	334
*SP2DNI	*	394,100	553	350
*SQ8FEW	*	377,175	513	321
*SP9LLN	*	298,998	426	294
*SP9MRQ	*	247,950	440	290
*SP1DMD	*	210,156	358	249
*SP6FJ	*	188,244	292	252
*SP3GHK	*	186,264	333	234
*SP9MZU	*	139,432	278	232
*SP9NFB	*	133,348	289	212
*SP9LAS	*	122,873	284	223
*SP6CPF	*	122,175	254	181
*SP6NVK	*	112,462	301	203
*SP1MVG	*	97,200	250	180
*SP9SOU	*	93,100	259	190
*SP6AXW	*	77,765	191	151
*SP8TDE	*	76,958	193	161
*SP5GMM	*	73,625	197	155
*SP9XUE	*	64,960	191	145
*SP9KJU	*	43,215	166	129
		(Op: SP9MDY)		
*SP3BVI	*	42,826	148	133
*SP9CTW	*	32,032	126	104
*SP2GCE	*	31,024	130	112
*SP4CQU	*	23,698	96	82
*SP9RPW	*	20,664	92	72
*SP9DEM	*	17,925	84	75
*SP3BLT	*	15,470	84	65
*SP9IKN	*	13,780	82	80
*SP6DHD	*	12,638	76	71
*SQ5ABG	*	9,088	82	71
*SP6EWB/9	*	1,885	38	29
***SP3KEY**	**28**	**1,272,272**	**934**	**524**
		(Op: SP3DWQ)		
***SP4DM**	**28**	**193,224**	**298**	**249**
***SQ6ELV**	**28**	**152,048**	**261**	**208**
*SQ9IDE	*	108,192	226	184
*SQ8GHY	*	81,438	210	147
*SP4DC	*	61,438	172	139
*SP6TGI	*	58,121	174	133
*SP9OJQ	*	54,180	154	129
*SP8OOB	*	24,300	106	90
*SP3FYX	*	3,600	36	36
*SP2FTL	*	3,135	35	33
***SQ9PM**	**21**	**321,642**	**454**	**321**
***SP2FWC**	**21**	**112,424**	**254**	**188**
*SQ9FMU	*	78,408	208	162
*SQ9AOR	*	15,808	88	76
***SP5ICS**	**14**	**159,026**	**340**	**259**
***SP9EWO**	**14**	**83,426**	**242**	**202**
*SP3EAX	*	58,375	253	125
*SP9EML	*	11,857	93	71
*SP4HHI	*	4,230	81	30
***SQ3HMM**	**3.7**	**62,624**	**201**	**152**
***SP6IHE**	**1.8**	**30,360**	**132**	**110**

GREECE

SV1DKR	**A**	**630,500**	**779**	**388**
***SV1DZB**	**14**	**363,264**	**650**	**384**

BOSNIA-HERZEGOVINA

T97M	**21**	**3,642,912**	**1940**	**819**
***T94YT**	**A**	**163,333**	**325**	**233**
*T95A	*	12,432	80	74
***T94DO**	**7**	**237,110**	**390**	**262**
***T93Y**	**3.7**	**460,350**	**595**	**341**

TURKEY (EUROPEAN)

TA1FA	**21**	**453,960**	**888**	**388**

ICELAND

TF3IRA	**A**	**130,979**	**351**	**227**
		(Op: TF3AO)		
***TF3MA**	**21**	**26,676**	**130**	**117**
*TF3VS	*	11,020	83	76

EUROPEAN RUSSIA

RM4W	**A**	**5,141,488**	**2559**	**892**
		(Op: RW4WR)		
RD4M	**A**	**4,195,962**	**2385**	**878**
		(Op: UA4LU)		
RK4FF	**A**	**4,155,531**	**2404**	**867**
RA3AJ	*	4,143,825	2156	877
RK4FD	*	4,103,568	2386	828
RV3FF	*	3,211,346	2043	823
RN4WA	*	1,224,002	1265	526
RA3NN	*	968,112	1053	486
UA3BM	*	476,010	540	387
RA1AG	*	445,571	551	371
RA3XO	*	433,152	557	384
RU3DX	*	311,663	431	319
RV1CC	*	220,409	355	259
RA3VR	*	146,320	327	236
RU3FS	*	144,894	339	246
RN6CD	*	74,690	221	154
RN1AW	*	63,150	195	150
UA4NC	*	26,400	116	100
RZ6BR	*	21,252	89	84
RQ4L	**28**	**3,427,733**	**2005**	**809**
		(Op: UA4LCQ)		
UA3AGW	**28**	**698,892**	**680**	**419**
RA3FC	*	157,520	294	220
UA3TT	*	24	4	3
RN6AL	**21**	**721,272**	**888**	**492**
RM3C	**14**	**1,519,644**	**1212**	**687**
		(Op: RA3CW)		
RA3WA	**3.7**	**377,055**	**530**	**315**
RZ3QU	**3.7**	**369,056**	**548**	**304**
RK6BZ	*	74,682	204	162
RW3XX	**1.8**	**28,866**	**130**	**102**
RK6AIQ	*	7,239	63	57
***UA4FER**	**A**	**2,335,647**	**1723**	**697**
***UA3SAQ**	**A**	**1,182,584**	**1061**	**548**
***RN3RQ**	**A**	**775,808**	**840**	**464**
*RA3DNC	*	632,055	744	435
*UA3LHL	*	574,180	719	380
*UA1CKC	*	511,683	656	381
*UA1ANA	*	510,900	603	390
*RW3VZ	*	464,464	602	364
*UA6JD	*	433,053	663	387
*UA1AFZ	*	391,380	585	330
*RW4WZ	*	360,448	480	352
*RU3DVR	*	311,850	449	330
*RU6FA	*	294,336	475	292
*UA3BZ	*	246,881	402	271
*UA4ACP	*	190,848	413	284
*RU1AB	*	189,720	357	255
*RZ3VA	*	178,573	310	283
*RA3AF	*	133,952	255	208
*RN1AO	*	125,656	302	226
*RX3AEX	*	123,768	308	216
*RA1AW	*	123,384	260	194
*RA3DAH	*	102,900	230	175
*UA6YEF	*	90,396	220	186
*RA1QX	*	72,128	210	161
*RA3TT	*	64,356	212	173
*RA3MB	*	51,724	172	134
*RU4WE	*	50,400	190	144
*RZ4AG	*	47,005	145	119
*UA3DK	*	46,843	142	139
*RW6AH	*	44,671	160	131
*UA3UNP	*	42,770	148	130
*RZ1AZ	*	41,745	140	115
*RW3SU	*	34,036	146	127
*RA6YJ	*	30,690	108	99
*RU3WR	*	28,776	142	109
*UA6YW	*	25,080	141	120
*RA3FH	*	24,600	114	100
*RA1AR	*	16,744	92	92
*RW3PN	*	16,643	107	89
*UA1ATZ	*	16,544	106	88
*RV3QH	*	6,157	51	47
*RW3DY	*	5,760	55	45
*RW4LC	*	5,346	62	54
***RU3DM**	**28**	**224,812**	**358**	**259**
***RV3APM**	**28**	**53,856**	**156**	**136**
*RX3MM	*	16,206	80	73
*RU3XB	*	5,831	53	49
*UA3MOC	*	5,418	52	43
*RZ3TWW	*	96	8	8
		(Op: RA3-1223)		
***RV6AMI**	**14**	**42,458**	**143**	**142**
***RA3XEV**	**14**	**41,850**	**171**	**150**
*UA4ASE	*	23,868	128	117
*UA6YAG	*	12,403	85	79
*UA6JAD	*	6,298	70	67
***UA6AKD**	**3.7**	**22,000**	**107**	**88**

KALININGRADSK

***UA2FZ**	**A**	**77,894**	**202**	**158**
***RA2FW**	**A**	**77,440**	**214**	**176**
*RN2FA	*	1,425	25	25

UKRAINE

UV7D	**A**	**3,420,000**	**1893**	**750**
		(Op: UT7DX)		
UY4F	**A**	**2,595,050**	**1743**	**710**
		(Op: UR5FEL)		
UY4I	**A**	**1,598,310**	**1346**	**602**
		(Op: US3IZ)		
UY5ZZ	*	1,370,014	1182	589
UV5U	*	996,435	938	495
		(Op: UX1UA)		
UR5E	*	782,136	805	426
		(Op: UR5EDX)		
UR7EU	*	667,128	661	399
UW7M	*	545,775	693	383
		(Op: UR3MP)		
UT4MW	*	76,825	203	175
US1MM	*	72,750	192	150
UT5EPJ	*	56,736	182	144
UU9CW	*	52,969	204	161
USØLW	*	43,200	146	120
UU5YL	*	12,276	72	66
UY2UF	*	60	5	4
UT2IJ	**28**	**2,694,896**	**1651**	**688**
UT2ID	**28**	**729,750**	**744**	**417**
UR1V	*	563,170	579	398
UT7QL	*	458,892	550	378
UT7QF	**21**	**4,637,127**	**2281**	**913**
UXØIB	**21**	**1,028,160**	**1112**	**540**
UW5Q	**14**	**4,889,925**	**2477**	**927**
		(Op: UR3QCW)		
UU7J	**14**	**4,119,774**	**2249**	**925**
		(Op: UUØJM)		
UT7MD	*	52,800	174	165
UZ8M	*	45,152	170	136
		(Op: USØMR)		
UR6F	**7**	**1,137,930**	**884**	**457**
UX5I	**3.7**	**301,392**	**477**	**273**
		(Op: UT5IZ)		
*UX2MF	*	1,382,535	1227	513
*UY2UA	*	784,637	854	469
*UR5IFB	*	589,680	755	420
*UT8IT	*	429,242	603	358
*UY5TE	*	312,430	526	314
*UY2ZA	*	232,624	394	268
*UU5SP	*	132,133	331	229
*UY7C	*	69,046	199	158
		(Op: UR3CMA)		
*UT5UBJ	*	53,360	158	115
*UR4EI	*	38,220	162	130
*UX1IL	*	15,228	98	81
*UU2JA	*	7,800	64	60
*UR5HJR	*	6,250	55	50
*UU4YA	*	5,772	52	52
***UR3QFB**	**28**	**191,142**	**348**	**246**
*UYØMF	*	66,576	192	152
*UT5UML	*	8,580	58	55
*UR5GKV	*	5,662	96	57
***US7IGF**	**21**	**732,033**	**833**	**489**
***US5MTJ**	**21**	**562,392**	**772**	**438**
*UR7IKV	*	265,352	513	328
*US9QA	*	167,936	354	256
***UV8M**	**14**	**1,561,611**	**1347**	**633**
		(Op: UX3MR)		
*UR6IJ	*	422,873	569	407
*UR8QR	*	74,844	226	189
***USØHZ**	**7**	**214,490**	**353**	**241**
*UT4PZ	*	21,449	99	89
***UX5NQ**	**1.8**	**151,368**	**399**	**204**
*UR5ETN	*	30,688	126	112
*US5ISV	*	24,030	109	90
*UR2E	*	23,750	116	95
*UR5EAW	*	5,100	55	51

LATVIA

YL2KO	**A**	**4,594,791**	**2193**	**859**
YL2SM	**28**	**1,217,430**	**962**	**501**
***YL/RZ3BY**	**A**	**3,054,124**	**1761**	**746**
***YL2TW**	**A**	**775,698**	**759**	**438**
*YL2PN	*	516,520	691	370
*YL5M	*	288,535	464	299
		(Op: YL2UZ)		
*YL2PA	*	206,658	344	267
***YL5W**	**21**	**325,205**	**477**	**337**
***YL3FP**	**1.8**	**28,770**	**136**	**105**

ROMANIA

YO2BEH	**A**	**1,477,698**	**1124**	**582**
YO7BGA	**A**	**471,099**	**633**	**373**
YO9CXE	*	117,696	233	192
YP8A	**28**	**1,293,810**	**1000**	**505**
		(Op: YO8WW)		
YO3KPA	**21**	**2,452,527**	**1671**	**693**
YP3A	**7**	**797,176**	**776**	**397**
		(Op: YO3GRE)		
***YR4R**	**A**	**508,992**	**568**	**352**
***YO6QT**	**A**	**187,989**	**384**	**281**
***YO9FYP**	**A**	**137,925**	**314**	**225**
*YO7ARY	*	73,920	211	165
*YO3KYO	*	34,452	151	108
*YO6MP	*	32,968	117	104
***YO6BHN**	**28**	**207,570**	**306**	**255**
***YO8KGT**	**28**	**189,618**	**334**	**221**
*YO7CKP	*	136,956	258	202
*YO3AIL	*	83,424	200	158
*YO3FLQ	*	69,825	189	147
*YO7LTQ	*	26,790	109	94
*YO7LDT	*	12,152	80	62

YUGOSLAVIA

YU8/9XØA	**A**	**1,008,254**	**1003**	**494**
YU8/LZ1BJ	**A**	**587,512**	**737**	**412**
YU1HFG	*	345,856	590	386
YU8/OK1CRM	*	311,928	568	317
YTØA	**28**	**4,547,568**	**2119**	**816**
		(Op: YU1AO)		
YZ1AU	**28**	**4,438,980**	**2116**	**813**
YZ9A	**28**	**3,158,082**	**1744**	**699**
		(Op: YU1NW)		
YU7SF	*	91,863	203	173
YZ7AA	**21**	**2,402,386**	**1510**	**707**
YU1NR	**21**	**1,950,914**	**1353**	**662**
YT1RA	**21**	**1,370,540**	**1155**	**556**
YU7KWX	*	1,108,640	986	520
YT9X	**14**	**1,606,668**	**1302**	**617**
4N1N	**14**	**1,465,455**	**1445**	**647**
		(Op: 4N1JA)		
YT7A	**7**	**1,766,448**	**1074**	**522**
YTØT	**3.7**	**784,176**	**747**	**408**
		(Op: YU1YV)		
YT6A	**1.8**	**376,992**	**521**	**308**
***YT1LT**	**A**	**738,675**	**830**	**441**
***YU7HI**	**A**	**558,328**	**634**	**404**
*YU7AM	*	105,984	255	192
***4N1SM**	**28**	**1,715,905**	**1179**	**565**
*YU7YZ	*	269,104	360	278
*YU7KM	*	109,068	228	183
***YZ1V**	**21**	**390,804**	**605**	**348**
		(Op: YZ1ZV)		
*YU1AFR	*	88,350	271	190
***YU1AAV**	**7**	**27,048**	**110**	**98**
		(Op: YT1HA)		
***4NØB**	**3.7**	**329,220**	**506**	**295**
		(Op: 4N1KW)		
***YT1R**	**1.8**	**60,494**	**192**	**149**
***4N1A**	**1.8**	**34,155**	**147**	**115**

MACEDONIA

Z35M	**A**	**671,790**	**792**	**457**
Z39Z	**3.7**	**815,634**	**783**	**401**
		(Op: Z32AF)		
***Z36W**	**A**	**739,200**	**788**	**440**
***Z33AA**	**28**	**1,054,134**	**895**	**486**
*Z31MM	*	304,677	427	291
***Z34A**	**14**	**1,697,520**	**1424**	**660**
*Z32UC	*	384	12	12
***Z33A**	**1.8**	**4,888**	**51**	**47**

OCEANIA

EAST TIMOR

***4W6MM**	**A**	**1,188,963**	**1001**	**409**
		(Op: TF3MM)		
*CU3FT/4W	*	72,065	184	145

EAST MALAYSIA

9M6A	**A**	**1,613,210**	**1150**	**457**
		(Op: JK7TKE)		
9M6BG	**28**	**3,299,307**	**1679**	**671**
*9M6JU	*	108,550	222	167

THE PHILIPPINES

4I9RG	**A**	**4,402,302**	**2077**	**699**
		(Op: DU9RG)		
*DZ1BP	*	956,154	920	354
***DU1SAN**	**28**	**20,325**	**91**	**75**
***DU1DX**	**21**	**39,567**	**135**	**109**
***DU9AXJ**	**7**	**57,036**	**126**	**84**

FRENCH POLYNESIA

***FO8DX**	**A**	**1,523,154**	**1107**	**431**
		(Op: JF1SQC)		

SAIPAN

KHØCE	**A**	**799,032**	**818**	**338**

HAWAII

WH7O	**14**	**55,770**	**151**	**130**
***KH6GMP**	**A**	**346,724**	**483**	**244**
***WH6H**	**28**	**1,286,019**	**975**	**447**

REPUBLIC OF PALAU

T88RA	**A**	**47,940**	**196**	**85**
		(Op: JH1RMH)		

AUSTRALIA

VK5GN	**A**	**5,547,783**	**2243**	**843**
VK4UC	**A**	**4,232,865**	**1942**	**735**
VK2FHN	**A**	**683,791**	**737**	**323**
VK6KKD	**A**	**1,464**	**31**	**24**
VK8AA	**7**	**185,184**	**232**	**144**
		(Op: VK2CZ)		
***VK3DBQ**	**A**	**94,752**	**198**	**168**
***VK2AAC**	**A**	**65,178**	**153**	**142**
***VK4NEF**	**28**	**649,951**	**597**	**383**
***VK4FJ**	**21**	**29,502**	**108**	**99**
***VK4DX**	**14**	**2,389,860**	**1274**	**639**

INDONESIA

YB2LAB	**28**	**176,185**	**281**	**211**
YBØAI	**7**	**118,272**	**162**	**128**
***YB2ERL**	**A**	**569,862**	**533**	**366**
*YC2VTO	*	39,140	128	103
***YBØHD**	**28**	**22,876**	**94**	**86**
***YC1GTS**	**21**	**43,650**	**222**	**97**
***YBØAZ**	**14**	**2,308,284**	**1224**	**638**

NEW ZEALAND

ZL1ANJ	**A**	**2,548,070**	**1361**	**623**
ZL1ALZ	*	84,409	199	151
***ZL2AL**	**A**	**620,217**	**579**	**351**
***ZL3GA**	**28**	**167,692**	**283**	**212**

SOUTH AMERICA

TRINIDAD & TOBAGO

***9Y4LDK**	**14**	**484,617**	**497**	**329**

CHILE

CE8EIO	**A**	**4,358,247**	**1919**	**761**
XQ4EM	**28**	**335,072**	**398**	**283**
***3G5A**	**A**	**2,421,276**	**1461**	**572**
		(Op: XQ5SM)		
***XQ1ZW**	**28**	**390,600**	**504**	**300**
***CA2WUI**	**28**	**366,865**	**439**	**307**
*CE2SQE	*	201,116	276	274

URUGUAY

CX5BW	**21**	**4,964,991**	**2081**	**813**
***CX7BY**	**A**	**589,426**	**553**	**382**
***CV4Y**	**28**	**5,165,090**	**2155**	**830**
		(Op: CX1TG)		
*CX7CAJ	*	818,307	695	419
*CX2TG	*	10,292	62	62

FRENCH GUIANA

FY5FU	**28**	**4,643,562**	**2126**	**759**
***FY5FY**	**A**	**10,633,812**	**3552**	**994**

ECUADOR

***HC1OT**	**A**	**4,312,830**	**2047**	**699**
***HC1JQ**	**21**	**52,224**	**144**	**136**

GALAPAGOS

***HC8GR**	**21**	**180**	**10**	**10**

COLOMBIA

***HK3JJH**	**21**	**2,407,951**	**1329**	**611**

ARGENTINA

LO7H	**A**	**6,264,864**	**2495**	**864**
LT7H	**A**	**2,748,116**	**1355**	**686**
LU2HI	*	31,722	121	102
LU1HF	**28**	**8,561,514**	**2908**	**1007**
LW1EGD	**28**	**1,504,886**	**1003**	**526**
LU1HI	*	176,056	280	236
LV5V	**21**	**5,673,024**	**2238**	**864**
		(Op: LU5VV)		
LU6FAZ	**3.7**	**37,179**	**95**	**81**
LU2DVI/H	**1.8**	**60**	**8**	**6**
***AY8A**	**A**	**2,832,498**	**1477**	**666**
		(Op: LU8ADX)		
***LV7H**	**A**	**2,569,600**	**1409**	**640**
***LU1FF**	**A**	**1,463,816**	**971**	**536**
*LU1BJW	*	856,713	717	429
*L20E	*	792,396	709	396
		(Op: LU5EVK)		
*LU5ER	*	687,655	605	415
*LU2FDN	*	29,694	112	101
***LU4DX**	**28**	**3,919,764**	**1766**	**771**
***LU3HIP**	**28**	**3,014,550**	**1512**	**693**
***LU2EC**	**28**	**1,004,850**	**793**	**450**
*LW1HDJ	*	922,246	738	449
*LW8DXJ	*	829,669	725	401
*LU7FCV	*	280,618	398	251
*LU4HXJ	*	265,080	356	282
*LT1D	*	200,010	313	226
		(Op: LU4DJC)		
*LU7HDB	*	178,888	294	236
*LU3OJZ	*	28,381	103	101
*LU1AXR	*	4,284	44	42
*L99D	*	108	10	9
***L44DX**	**21**	**1,960,046**	**1154**	**583**
		(Op: LW1DTZ)		
*LU3ES	*	261,560	358	260
***LU7CC**	**14**	**63,936**	**164**	**144**

PERU

OA4BA	**A**	**314,600**	**417**	**286**

ARUBA

P43E	**A**	**7,134,120**	**2708**	**855**
P49MR	**21**	**3,753,501**	**1789**	**727**
		(Op: VE3MR)		

NETHERLANDS ANTILLES

PJ2H	**7**	**3,031,776**	**1066**	**484**
		(Op: WØCG)		
***PJ2T**	**28**	**7,829,447**	**3033**	**881**
		(Op: N8BJQ)		
***PJ2/K6JAT**	**21**	**31,415**	**115**	**103**

BRAZIL

ZX5J	**A**	**14,624,642**	**4132**	**1154**
		(Op: PP5UA)		
PY2NY	**A**	**7,174,056**	**2681**	**887**
PV2M	**A**	**1,506,428**	**1017**	**511**
		(Op: PT2ADM)		
PY5XT	*	22,044	74	66
PY1AFS	*	6,150	61	50
PR7CP	*	2,523	29	29
ZV2V	**28**	**9,745,408**	**3263**	**1024**
		(Op: PY2LED)		
PY2QW	*	35,636	134	118
PY2OZF	**21**	**40,567**	**131**	**113**
***ZX2B**	**A**	**7,284,722**	**2707**	**922**
		(Op: PY2MNL)		
***PY2NDX**	**A**	**5,242,084**	**2134**	**844**
***PY2NA**	**A**	**1,375,584**	**990**	**483**
*PP2RON	*	1,005,095	795	455
*PS8NF	*	900,995	799	395
*PR7FN	*	561,735	575	365
*PP7ZZ	*	442,176	476	329
*PY7IQ	*	154,294	260	206
*PR7AB	*	34,450	121	106
*PY3CAL	*	29,478	122	102
*PY7EG	*	22,873	100	89
*PY2MYS	*	6,912	58	54
*PR7ZZ	*	5,450	53	50
***PX2W**	**28**	**5,812,625**	**2291**	**875**
		(Op: PY2YU)		
***PS5S**	**28**	**3,697,468**	**1761**	**724**
***PY2SBY**	**28**	**1,453,725**	**985**	**525**
*PR8RZJ	*	1,382,100	954	510
*PY4DBU	*	1,286,766	902	507
*PY2BT	*	662,480	608	392
*PY7VI	*	384,605	447	305
*PU2RFA	*	357,885	437	297
*PT2FE	*	205,500	340	250
*PU7EEL	*	173,460	289	236
*PT2MP	*	56,090	175	142
*PY3MT	*	42,735	145	111
*PS8ET	*	40,920	144	124
*PY5DC	*	24,035	12	95
*PU2TES	*	19,201	100	91
*PU4EYE	*	12,628	80	77
*PT2JS	*	6,384	60	57
*PY7BTO	*	3,784	50	44
*PY2SAA	*	1,863	27	27
*PY3MSS	*	1,708	31	28
*PY3OS	*	546	15	14
*PY7IM	*	228	13	12
***PS3F**	**21**	**3,395,220**	**1634**	**710**
		(Op: PY3FOX)		
*PY2GA	*	168,498	286	207
*PY3MFC	*	147,084	268	206
*PT2GE	*	145,860	261	204
*PY3AJB	*	10,370	86	61
***PY2XAT**	**14**	**594,320**	**561**	**368**
*PR7QI	*	370,734	429	294
*PY2APQ	*	65,250	162	150

*PY3KK	7	7,137	44	39
*PY3YY	*	369	9	9
*PY7ZY	3.7	10,296	46	44

VENEZUELA

YV6DBW	28	651,960	627	360
YV5LIX	3.7	444,444	354	222
YV1CP	1.8	3,952	27	26
*YV6DBX	A	887,288	804	394
*YW3B	A	658,398	578	367
*YV7QP	*	111,060	219	180
*YY5OAN	*	106,582	194	161
*4M5E	28	258,154	344	277
		(Op: YV5NWG)		
*YV4EWW	*	138,237	265	213
*YY5JMM	*	50,292	167	132
*YY5JRU	*	46,580	162	137

TRIBANDER/ SINGLE ELEMENT

UNITED STATES

N2XD	A	3,034,651	1703	661
K4BAI	A	2,750,658	1603	718
WB8TLI	A	1,965,319	1199	599
N2GC	*	1,681,595	1209	589
W6TK	A	1,562,904	1206	588
NX9T	A	1,374,290	988	530
4U1WB	A	1,175,346	964	501
W1UR	A	973,497	744	453
K2BF	*	952,690	871	470
K1CN	*	803,712	765	448
K1YA	*	770,307	801	433
WY6K	*	767,844	1016	462
			(Op: K6RB)	
WA4ATJ	*	603,295	596	385
N4MM	*	496,976	512	349
W6FRH	*	486,048	630	366
WT9U	*	386,460	566	342
KE6ZSN	*	374,400	582	325
KU4FP	*	346,885	432	265
N3FX	*	328,328	407	286
N1BCL	*	243,294	361	258
KS7T	A	229,075	386	275
N5DD	A	210,490	321	217
WØPPF	A	209,737	365	253
AA6W	*	188,976	415	254
WA6PY	*	128,077	298	211
KØIH	*	74,120	196	170
KU6J	*	47,740	173	140
NT1N	28	1,058,480	787	505
WB6NFO	28	43,099	165	131
W7AYY	28	2,820	32	30
*KD7ORP	A	1,859,208	1399	606
			(Op: KL9A)	
*K2LV	A	1,653,136	1087	554
*AI9U	A	1,475,986	1136	569
			(Op: K9JLS)	
*NX6T	A	1,473,524	1404	559
			(Op: K6AM)	
*W4SAA	A	1,036,450	836	475
*K4BEV	*	866,578	813	446
*NJ2F	*	760,984	766	428
*N8DXR	A	734,448	738	428
*WN6K	*	682,299	838	423
*K7TR	*	679,250	777	418
*KA1EKR	A	583,856	576	364
*W3LL	A	549,984	565	337
*NØYYO	A	525,624	639	362
*KB1LN	*	418,560	483	327
*WS7V	*	398,288	519	341
*K6UM	*	379,404	503	324
*K4EU	*	379,337	418	329
*W7QN	*	295,000	457	295
*KA1OEO	*	222,768	371	252
*N5PU	A	162,140	298	220
*KW9N	*	147,735	274	201
*AF8C	*	113,125	256	181
*N8KIE	*	102,030	226	179
*WA4VEK	*	95,804	199	172
*K6OWL	*	91,970	247	170
*W2TZ	*	90,958	190	146
*KY1B	*	86,673	212	167
*AC7LX	*	85,822	224	166
*N5VMF	*	85,140	229	172
*AF4UU	*	70,800	189	150
*WD8NVN	*	60,952	156	152
*W2PI	*	59,770	178	139
*W9LYA	*	56,800	189	142
*K1YZ	*	55,704	162	132
*WB4JMO	*	55,000	155	125
*AG4PM	*	50,697	161	131
*W7YVK	*	44,861	142	113
*WB2HWI	*	39,445	145	115
*W8CK	*	29,100	131	100
*WD5JNC	*	25,755	111	101
*W3FQE	*	25,317	104	87
*NUØC	*	23,030	100	94
*W6ZZZ	*	13,944	95	83
*K6CSL	*	12,525	78	75
*AE6CW	*	3,150	38	35
*K6LDX	*	2,091	43	41
*WB6MLI	*	242	11	11
*W7UPF	28	250,562	366	299
*WA5SWN	28	20,320	88	80
*WA3AAN	21	119,067	243	213
*WM5R	21	15,106	107	91
*KX2J	14	318,912	470	302
*NN5Z	14	316,575	492	335
			(Op: K5PX)	

DX

T93M/HI9	A	15,812,348	5422	1082
JY9NX	A	13,919,586	4600	991
		(Op: JM1CAX)		
ZF2AF	A	13,232,968	4989	1064
		(Op: AE5Y)		
HA8JV	A	7,019,595	2886	957
XX9TRR	A	6,852,638	3305	898
		(Op: OH2PM)		
JA7NVF	A	5,386,125	2367	813
HR3J	A	5,385,702	2671	794
		(Op: JA6WFM)		
CE8EIO	A	4,358,247	1919	761
VO1TA	A	4,318,930	2156	710
RA3AJ	A	4,143,825	2156	877
S59KW	A	3,674,619	2067	783
S57CQ	*	3,330,844	1875	748
G5W	A	2,961,395	1774	695
		(Op: GØWAT)		
AM1DDO	A	2,957,475	1798	705
		(Op: EA1DDO)		
LT7H	A	2,748,116	1355	686
ZL1ANJ	A	2,548,070	1361	623
EX8O	A	2,490,000	1412	625
DL1NEO	A	1,544,874	1152	591
UY5ZZ	A	1,370,014	1182	589
EU1SA	A	1,359,195	1117	555
MØWAA	*	1,144,637	1039	521
OE8CIQ	A	1,111,040	969	512
UV5U	*	996,435	938	495
		(Op: UX1UA)		
OZ5EV	A	981,180	778	540
PAØJNH	A	730,972	706	449
EI4DW	A	652,096	738	443
VE4YU	A	600,363	607	369
YU8/LZ1BJ	A	587,512	737	412
OE5CWL/5	*	518,756	617	382
OH5TT	A	356,976	489	333
OA4BA	A	314,600	417	286
RV1CC	*	220,409	355	259
VE5CPU	A	216,381	350	249
JL6HKJ	*	131,461	259	187
G3UFY	*	104,328	209	207
T88RA	A	47,940	196	85
		(Op: JH1RMH)		
GMØLYM	A	32,034	132	114
ZS6RAE	A	24,795	97	87
PY5XT	A	22,044	74	66
DF5AU	*	17,750	88	71
UY2UF	*	60	5	4
HSØ/ G3NOM	28	1,176,822	1002	513
OH6NJ	28	678,198	711	366
YV6DBW	28	651,960	627	360
ON5GQ	28	564,928	554	388
VE3ANX	21	5,258,040	2237	860
8S5A	21	69,237	195	157
		(Op: SM5AJV)		
PY2OZF	21	40,567	131	113
TA2DS	14	799,596	684	399
OZ2ZZZ	3.7	128,535	280	205
*VA3UZ	A	5,352,670	2224	830
*3V8CB	A	3,902,720	1888	640
		(Op: JH4RHF)		
*3G5A	A	2,421,276	1461	572
		(Op: XQ5SM)		
*DF7YU	A	2,213,900	1450	650
*ED6DD	A	1,972,464	1394	654
		(Op: EA6DD)		
*S51F	A	1,781,934	1233	627
*FO8DX	A	1,523,154	1107	431
		(Op: JF1SQC)		
*G3VAO	A	1,508,790	1151	570
*LU1FF	A	1,463,816	971	536
*RM9A	A	1,412,424	961	468
		(Op: UA9ACJ)		
*VE3MQW	*	1,365,351	989	507
*IR3Z	A	1,339,328	1066	544
*VE3BUC	*	1,288,418	985	499
*G5X	*	1,160,934	938	543
		(Op: MØBRK)		
*J37LR	A	1,009,970	1001	442
		(Op: VE3EBN)		
*PP2RON	A	1,005,095	795	455
*DH8AF	*	952,049	839	491
*YV6DBX	A	887,288	804	394
*LU1BJW	*	856,713	717	429
*PA3FGJ	A	740,715	813	437
*VE7UQ	A	665,968	682	389
*RA3DNC	A	632,055	744	435
*CX7BY	A	589,426	553	382
*UA3LHL	*	574,180	719	380
*YB2ERL	A	569,862	533	366
*OM7JG	A	531,000	614	375
*UA1ANA	*	510,900	603	390
*PA5AT	*	492,375	627	375
*GM3BCL	A	472,689	576	369
*VE3KP	*	436,662	494	306
*UA1AFZ	*	391,380	585	330
*KH6GMP	A	346,724	483	244
*TA3BN	A	338,935	463	265
*RU3DVR	*	311,850	449	330
*G4GOY	*	311,553	486	297
*EA3NA	A	279,128	445	296
*JHØNEC	A	276,896	383	272
*LA1PHA	A	273,888	415	288
*JA3YPL	*	257,823	383	243
			(Op: JJ3TBB)	
*GØ/N9LYE	*	254,840	448	277
*ON7DQ	A	247,050	389	270
*DJ2IE	*	239,148	440	273
*4X2Z	A	234,939	344	213
*IZ6EGX	*	231,575	489	295
*JG1OWV	*	229,950	344	225
*OM3CDZ	*	219,239	430	271
*SP1DMD	A	210,156	358	249
*DL8SDC	*	199,082	333	247
*DK6AY	*	197,577	380	261
*PAØJED	*	161,472	313	232
*OK1DVK	A	160,527	291	219
*SM6FJY	A	154,960	280	260
*PY7IQ	*	154,294	260	206
*EA7EWX	*	154,037	334	221
*JA1GYO	*	144,992	270	197
*TE2M	A	139,105	240	215
*ES6KW	A	135,676	266	214
*JR1MRG	*	121,844	266	166
*VE4HAZ	*	119,784	262	186
*OZ5LH	A	116,186	244	193
*OM8HG	*	115,400	276	200
*IK3OII	*	109,208	226	187
*SP1MVG	*	97,200	250	180
*JA1KK	*	93,225	203	165
*PA2PDN	*	86,278	225	179
*JJ6WYS	*	77,562	212	139
*PAØLSK	*	71,360	204	160
*PA8MO	*	69,966	188	169
*UY7C	A	69,046	199	158
		(Op: UR3CMA)		
*IC8/IN3XUG	*	51,792	232	166
*JA1IZ	*	51,786	145	126
*IK7WUE	*	47,244	172	127
*JD1BIA	A	38,216	384	170
*SP9CTW	*	32,032	126	104
*OZ1GDI	*	30,709	124	107
*DJ2QV	*	28,290	131	115
*GIØOUM	A	27,832	116	98
*OK1SRD	*	27,720	118	105
*JA4BAA	*	19,703	150	113
*EA4CU	*	18,330	107	94
*JA9NOF	*	14,457	81	61
*SP6DHD	*	12,638	76	71
*SM3EAE	*	8,625	76	69
*EA3FHP	*	6,900	60	60
*JG1FGL	*	6,157	47	47
*PR7ZZ	*	5,450	53	50
*EA4UB	*	4,800	46	40
*SP6EWB/9	*	1,885	38	29
*TI2KAC	*	1,235	22	19
*4X/ES2RR	28	1,681,130	1134	527
*H6C	28	756,391	806	415
		(Op: YN4SU)		
*EA1AJV	28	611,508	716	393
*PAØMIR	28	300,656	395	304
*M7W	28	213,655	361	247
		(Op: G4IIY)		
*ZL3GA	28	167,692	283	212
*SK7IJ	28	150,518	286	233
		(Op: SM7SMS)		
*YV4EWW	28	138,237	265	213
*AN1CBX	*	109,005	263	169
*JA3LKE	28	22,088	91	88
*SM7TKR	*	13,720	76	70
*JA1EEG	*	6,600	55	50
*TM1P	21	1,104,840	1018	540
		(Op: F8BON)		
*PA1TT	21	424,708	507	356
*F8AKS	*	304,764	452	327
*VE3RCN	21	74,060	180	161
*OK5SAZ	21	52,398	165	142
*EA5TN	21	23,199	119	111
*HSØZDR	21	9,577	67	61
			(Op: N4CT)	
*SM7HSP	21	6,477	57	51
*HC8GR	21	180	10	10
*9Y4LDK	14	484,617	497	329
*JH1UUT	14	54,536	149	136
*OM4TX	14	29,125	139	125

ROOKIE

AD6WL	A	1,433,600	1239	560
YU8/OK1CRM	A	311,928	568	317
IZ2EID	A	12,285	69	65
JK7ESY	A	5,412	48	412
JN3MUC	*	770	20	14
IZ1EGV	28	236,320	352	280
4N1N	14	1,465,455	1445	647
		(Op: 4N1JA)		
*EA9CD	A	2,183,040	1186	576
*VE3AGC	A	818,349	768	399
*YT1LT	A	738,675	830	441
*SQ9MZ	A	587,673	652	391
*KD7GGZ	A	550,440	765	396
*KCØJVG	A	475,416	616	372
*K8KHZ	A	310,185	425	305
*J69EN	A	254,546	372	274
*RU1AB	A	189,720	357	255
*SM5U	A	186,204	298	236
		(Op: SM5UGC)		
*NO4S	A	178,266	348	219
*OK1SMU	A	177,500	350	250
*UA9QFF	A	165,345	293	219
*ES6KW	A	135,676	266	214
*N4WSM	*	134,128	248	202
*YY5OAN	A	106,582	194	161
*IZ8DPN	A	86,581	243	187
*LB9XE	A	76,167	220	189
*UT5UBJ	A	53,350	158	115
*DL1OFD	A	49,446	171	134
*YO3KYO	A	34,452	151	108
*SM4XIH	*	26,670	122	105
*W6ZZZ	A	13,944	95	83
*AE6CW	*	3,150	38	35
*KB9WQJ	A	1,488	26	24
*KCØIDI	*	1,035	23	23
*WB6MLI	*	242	11	11
*WS6G	*	21	3	3
*UA9LAU	28	355,500	499	300
*SQ8GHY	28	81,438	210	147
*YY5JMM	28	50,292	167	132
*YY5JRU	*	46,580	162	137
*PU4EYE	28	12,628	80	77
*PT2JS	*	6,384	60	57
*UA3MOC	28	5,418	52	43
*PY2SAA	*	1,863	27	27
*EA5FIV	21	646,947	759	489
*YU1AFR	21	88,350	271	190
*WB2BXO	21	30,590	125	115
*KG4OJT	21	23,387	100	91
*EC1CSV	*	21,000	126	105
*AM1AVO	14	173,754	353	294
		(Op: EA1AVO)		
*PY3KK	7	7,137	44	39

BAND RESTRICTED

*S57IIO	A	2,328,750	1445	690
*EC5CPL	A	503,052	874	412
*ES6KW	A	135,676	266	214
*DJ1AD	A	124,696	271	218
*OK1MJA	A	124,435	274	205
*YY5OAN	A	106,582	194	161
*EC6TO	A	79,785	315	197
*JL7XBN	A	63,648	162	144
*LY2BET	A	9,912	64	56
*RU3DM	28	224,812	358	259
*RV3APM	*	53,856	156	136
*YY5JMM	28	50,292	167	132
*EI9HQ	28	42,312	156	123
*EC3CJN	21	390,158	742	373
*EF1DMQ	*	159,077	457	271
		(Op: EC1DMQ)		
*JR3KAH	21	4,773	47	43
*M4T	14	252,414	502	333
		(Op: GØVQR)		
*RX9CEL	14	53,704	146	137

SINGLE OP ASSISTED

UNITED STATES

NV4X	A	7,331,832	2815	948
		(Op: K4MA)		
KI1G	A	3,362,256	1669	724
K2PLF	A	3,215,669	1647	731
WZ7ZR	A	2,654,085	1791	735
		(Op: W7ZR)		
WZ6Z	A	2,616,480	1580	711
WN9O	A	2,574,379	1658	709
		(Op: W9IU)		
N2BJ	*	1,731,645	1118	635
N1RK	*	1,588,818	1046	543
W2YC	A	1,569,952	959	568
W7OM	*	1,018,656	850	486
N2KPB	*	954,720	773	480
KD3TB	*	751,856	687	392
W2YR	*	728,325	611	415
KQ6LQ	*	714,850	718	425
			(Op: K6III)	
K1JN	*	648,340	600	385
WØTT	A	570,259	554	419
K2ONP	*	566,280	573	363
W3YD	*	557,190	612	369
N6CCL	*	549,408	635	388
W6QEU	*	544,640	629	368
W3UL	*	429,990	514	330
K5TWJ	A	404,544	539	344
K3WA	*	366,242	428	298
ND8L	A	356,500	418	310
K5KG	*	343,375	445	335
K7XZ	*	274,428	374	252
			(Op: K1MY)	
K9UQN	*	256,795	383	253
KR5DX	*	244,189	388	281
			(Op: K5NZ)	
K1TH	*	185,094	295	226
KE1KD	*	179,792	308	272
NF9V	*	172,704	337	257
NØAT	*	140,367	228	213
N9IO	*	130,326	259	203
N2USB	*	115,635	242	195
N4GG	*	113,970	222	174
K8YC	*	49,500	144	125
KØCOP	*	41,745	132	115
AA3B	*	38,841	120	107
KF9YR	*	17,920	91	80
W6OAT	*	13,896	85	72
KO4MR	28	88,184	197	151
N5MT	28	77,087	176	157
N3PUR	21	1,129,888	876	536
W6RKC	21	6,860	51	49
AA4MM	3.7	272,844	343	234
*AB2E	A	544,072	594	376
*WD9GMK	A	368,946	490	309
*K9PG	*	362,480	394	394
*NEØP	A	312,440	490	292
*W2GG	*	294,030	438	297
*N3MK	A	214,446	336	206
*K2PF	*	201,708	328	234
*N9LF	*	200,203	331	257
*AE1D	A	154,800	264	200
*KØUK	*	146,740	245	220
*N3KAK	*	145,905	280	213
*KCØCZI	*	142,943	294	223
*KØXD	*	136,784	270	206
*N3KR	*	59,930	162	130
*KM9M	*	47,628	186	126
*K6ACZ	A	40,984	137	109
*N3MX	*	22,962	100	89
*W2QOB	*	21,406	102	77
*K9OR	*	8,532	58	54
*K3FH	*	7,367	60	53
*KCØKSA	*	6,996	60	53
*KE4USA	*	3,094	34	34
*WW3S	28	698,544	657	432
*K5WW	28	92,964	215	183
*K9GY	28	30,498	111	102
*KK1H	21	510,542	536	397

DX

UA9AM	A	7,144,004	2720	889
RN3QO	A	6,959,953	2999	1001
EA5DFV	A	6,684,938	2967	962
S57DX	A	6,256,224	2733	864
OT2T	A	6,214,302	2464	939
		(Op: DL2CC)		
UZ7U	A	4,169,478	2240	843
		(Op: UT3UA)		
OH6NIO	A	3,820,026	1971	798
AM3NY	*	3,217,250	1683	850
		(Op: EA3NY)		
OH7M	A	2,224,827	1539	681
		(Op: OH4JFN)		
HGSØRT	A	2,175,992	1617	637
OH3BU	*	2,053,072	1434	644
LY8X	A	1,921,052	1278	628
		(Op: LY2BIL)		
YBØAVK	A	1,809,534	1088	573
VK4ADC	A	1,283,241	929	479
VK4WPX	*	699,309	633	387
DLØDX	A	585,522	616	378
		(Op: DL5JS)		
RAØAM	A	467,016	504	348
EA5FID	*	377,357	450	353
DM3ML	A	302,784	406	304
OH6QU	*	193,980	318	212
S51DX	*	148,480	364	232
SM3X	A	34,368	122	96
		(Op: SM3CVM)		
OE1TKW	A	10,251	71	67
EA1FBJ	*	7,344	76	36
JA1ZGP	A	6,794	51	43
ZW5B	28	10,598,952	3338	1092
		(Op: PY5EG)		
HG5C	28	2,546,875	1499	625
		(Op: HA5WE)		
DF2LH	28	265,694	363	286
UU2JZ	28	262,624	424	283
AM5YJ	21	1,484,190	1302	621
		(Op: EA5YJ)		
ON7LX	21	941,688	784	492
JQ1NGT	21	340,231	435	313
HG3M	14	3,603,714	2033	834
		(Op: HA3MY)		
UT5UGR	14	1,257,876	1348	613
YL1ZF	3.7	577,280	704	352
YZ1W	1.8	720	20	18
*S58M	A	1,518,846	1156	602
*ON6CQ	A	1,390,464	1085	568
*LW8DLB	A	854,112	698	434
*ON4CAS	*	471,344	540	356
*SP5AIA	A	334,776	446	312
*PA9ZZ	A	327,474	494	322
*JM1LPN	A	294,680	385	278
*JF2SKV	*	249,994	380	239
*PAØKHS	*	201,302	360	251
*7L4IOU	*	178,084	290	211
*TG9AJR	A	171,430	317	217
*GØMTN	A	160,650	344	238
*RU3AT	A	117,105	235	211
*EA1GL	A	76,956	192	159
*USØKW	A	55,461	165	133
*JG2REJ	*	44,776	122	116
*RW3DU	*	43,260	177	140
*VE2DC	A	42,601	126	113
*JH5OXF	*	40,404	136	111
*TA3BQ	A	31,458	120	98
*VE6LB	A	23,751	104	91
*ZY2W	28	791,517	685	439
		(Op: PT2ND)		
*EA5ASF	28	162,042	294	239
*OM7PY	28	108,560	212	184
*EA5AER	21	2,123,496	1467	696
*IT9IQQ	21	207,320	388	284
*EA8BYM	21	95,088	192	168
*AM3FF	14	75,888	267	204
*LU3DR	3.7	480	18	16
*II8A	1.8	15,795	100	81
		(Op: IC8JAH)		

MULTI-OPERATOR SINGLE TRANSMITTER

UNITED STATES

NF4A	11,568,480	4154	1155
NX5M	7,811,598	3393	1086
NI2W	6,522,731	2621	943
AA5NT	6,437,394	2794	1006
NZ1U	5,041,047	2154	883
KX7M	4,988,724	2498	849
NT6K	4,045,658	2207	839
KC7V	3,787,590	1959	753

K3WW	**3,348,453**	**1675**	**771**
KS3F	3,100,048	1680	712
NZ6Q	2,988,333	1756	711
W2YE	2,709,408	1507	676
NN6NN	2,352,000	1586	672
NN6X	2,161,520	1625	659
KTØR	**1,526,096**	**1086**	**598**
WV2LI	1,262,304	978	487
NS2P	1,246,450	1015	514
WK3X	1,237,181	964	517
NP2N/AGØ	1,221,451	997	547
K3DSP	1,107,315	872	495
WB3BSA	878,060	741	430
K6VO	815,223	815	439
WM6A	749,760	802	426
KØUH	410,352	508	332
K7UQT	391,468	524	341
W6UE	379,132	576	317
W3LRC	296,670	427	290
KC9ARR	**295,948**	**402**	**307**
W6YRA	295,659	462	273
KF8UN	**167,860**	**347**	**220**
WB2JSM	96,048	209	174
W4GAC	31,815	119	101

AFRICA

D44TD	**33,443,856**	**7852**	**1332**
CT9M	**24,857,664**	**5899**	**1299**
3V8BB	**23,243,061**	**5758**	**1227**

ASIA

A61AJ	**23,610,785**	**6339**	**1243**
9K9K	**14,885,578**	**4751**	**1031**
RF9C	**14,366,775**	**4148**	**1115**
UPØL	**14,301,890**	**4193**	**1090**
RT9W	11,419,500	3543	993
UP9L	8,068,740	3182	890
RW9OWD	6,003,250	2677	814
JI2ZJS	**4,604,810**	**2051**	**785**
VU2SWS	**4,010,976**	**2106**	**684**
JI2ZEY	3,041,448	1582	706
RKØAXX	**2,358,000**	**1326**	**655**
VR2MY	**1,663,584**	**1282**	**559**
UN7LT	980,287	803	439
RZ9UWZ	804,468	766	427
JA4YHX	616,948	610	356

EUROPE

9A7A	**19,034,950**	**5430**	**1306**
TM5C	**18,729,585**	**5149**	**1295**
HG1S	**13,566,944**	**4232**	**1228**
OM7M	**12,694,953**	**4112**	**1189**
DL6RAI	**12,574,968**	**3970**	**1176**
OE2S	**11,534,776**	**3822**	**1112**
RM6A	**10,989,048**	**4263**	**1192**
9A1P	10,918,232	3864	1108
DL2ARD	10,717,508	3804	1084
DH1TW	10,131,745	3493	1105
RL3A	10,117,690	3930	1133
EA1EEY	**9,932,986**	**3751**	**1106**
LY7Z	**8,732,759**	**3254**	**1051**
OH1F	**8,266,554**	**3182**	**1059**
LX5A	**7,849,062**	**2977**	**1053**
LY1YK	7,729,673	2965	1043
OL7W	**7,541,976**	**2714**	**1051**
OT2C	**7,062,216**	**2662**	**1016**
OL5Q	7,017,362	2712	986
RF3A	6,026,020	2940	980
SP9LJD	**5,750,514**	**2603**	**891**
9A5D	5,703,256	2766	899
OT2P	5,324,870	2398	890
ED1WWE	5,273,666	2855	881
EU5F	**5,162,211**	**2667**	**909**
RW2F	**5,054,842**	**2173**	**866**
OL7D	4,895,520	2410	840
AN1COZ	4,860,300	2347	850
EA3RKG	4,779,216	2280	897
EA7UU	4,499,428	2567	811
EI3HB	**4,443,626**	**2314**	**814**
M5ZAP	**4,327,680**	**2338**	**805**
9A8M	4,144,536	2151	792
DLØMB	4,018,794	1905	871
OZ5ESB	**3,989,700**	**2027**	**780**
M8C	3,830,382	2131	797
IO2L	**3,589,960**	**1936**	**796**
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RK4WWA	3,228,786	2320	759
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ON6CK	2,604,644	1579	679
EMØU	**2,495,664**	**1792**	**654**
EA3AR	2,263,200	1519	656
ER3R	**2,209,845**	**1597**	**649**
SPØPZK	1,791,324	1284	612
MW2Z	**1,664,534**	**1468**	**626**
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RK3QWM	1,336,340	1164	545
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ED5GCT	1,004,344	1060	452
OT2H	946,241	825	487
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F6KFI	37,389	143	103
SK6DG	29,682	124	102
YU1INO	21,204	102	93
UU5A	1,364	24	22

NORTH AMERICA

FM5GU	**21,920,715**	**6459**	**1245**
WP2Z	**15,339,850**	**5175**	**1150**
AL1G	**12,472,702**	**3851**	**1126**
KL7RA	9,975,450	3440	1095
VE6SV	**8,383,200**	**2944**	**1050**
VE3RM	**7,957,148**	**2918**	**958**
VE7SV	**7,292,027**	**2734**	**887**
VE7GL	4,416,322	1905	713
VE6AO	2,653,056	1642	658
VE7UF	1,422,850	958	550
VE6PYJ	136,000	306	200

OCEANIA

YBØZDD	**3,214,701**	**1622**	**657**
KH6RS	**2,353,617**	**1423**	**567**
VK6ANC	**63,480**	**157**	**138**

SOUTH AMERICA

HC8N	**28,998,277**	**6885**	**1309**
P4ØV	**24,910,758**	**6504**	**1234**
LRØN	**13,138,760**	**3795**	**1135**
PQ2Q	**12,101,751**	**3636**	**1129**
OA4O	**10,528,100**	**3270**	**935**
CB4A	**7,988,224**	**2965**	**928**
PT7YV	7,948,554	2868	894
LU7FJ	3,920,080	1777	760
LU6FE	950,676	760	454
R1ANC	**166,026**	**280**	**201**

MULTI-OPERATOR MULTI-TRANSMITTER

UNITED STATES

W4MYA	**17,339,252**	**5698**	**1241**
NR6O	**16,948,256**	**6398**	**1244**
N2VV	**14,844,112**	**4732**	**1136**
AE9B	**11,792,144**	**4760**	**1183**
WX5S	**10,425,657**	**4470**	**1067**
AI7B	**7,970,992**	**3450**	**976**
NG6O	5,593,200	2553	885
K3DI	**1,937,331**	**1158**	**593**
WR3L	1,842,912	1162	632
NJ2BB	1,788,248	1166	616
NK7U	1,784,076	1228	634
AK3Z	1,494,951	1050	547
KR7O	748,192	812	412
KJ7BP	70,152	201	158

ASIA

JA1YPA	**6,494,832**	**2606**	**888**
RK9CZO	**4,651,830**	**1972**	**810**
JA3ZML	283,195	395	271

EUROPE

OT2A	**36,494,276**	**9472**	**1498**
ES9C	**24,549,374**	**7491**	**1354**
LY7A	**15,780,447**	**5497**	**1227**
YZ7A	**12,632,636**	**4863**	**1124**
EA4URE	**11,792,664**	**4484**	**1118**
OL5T	**11,671,128**	**4305**	**1162**
DAØAA	**11,100,746**	**4326**	**1117**
ED7VG	**10,580,416**	**4234**	**1064**
DL1EK	10,500,288	4256	1088
J41K	**7,858,851**	**3965**	**1001**
RI4M	**7,630,035**	**3876**	**1029**
SP4KEV	**5,345,093**	**2768**	**923**
OL7R	4,300,104	2052	834
SK6D	**4,129,612**	**2451**	**811**
SK5EW	2,368,518	1515	681
OH2K	**1,789,008**	**1254**	**611**
DN1EB	346,120	483	340

NORTH AMERICA

J6DX	**17,427,839**	**5775**	**1177**
VE5RI	**10,073,070**	**3699**	**1062**
VE7SCC	**4,196,720**	**2061**	**760**

OCEANIA

KH7R	**32,806,032**	**7750**	**1304**
4E9D	**894,000**	**984**	**300**

SOUTH AMERICA

YW4M	**42,707,630**	**9178**	**1379**
L75FM	**34,522,992**	**7955**	**1392**
LT1F	24,144,930	5926	1290
PY3MHZ	**3,472,221**	**1651**	**733**
ZX3S	2,173,824	1284	592
ZW2T	534,540	547	354

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