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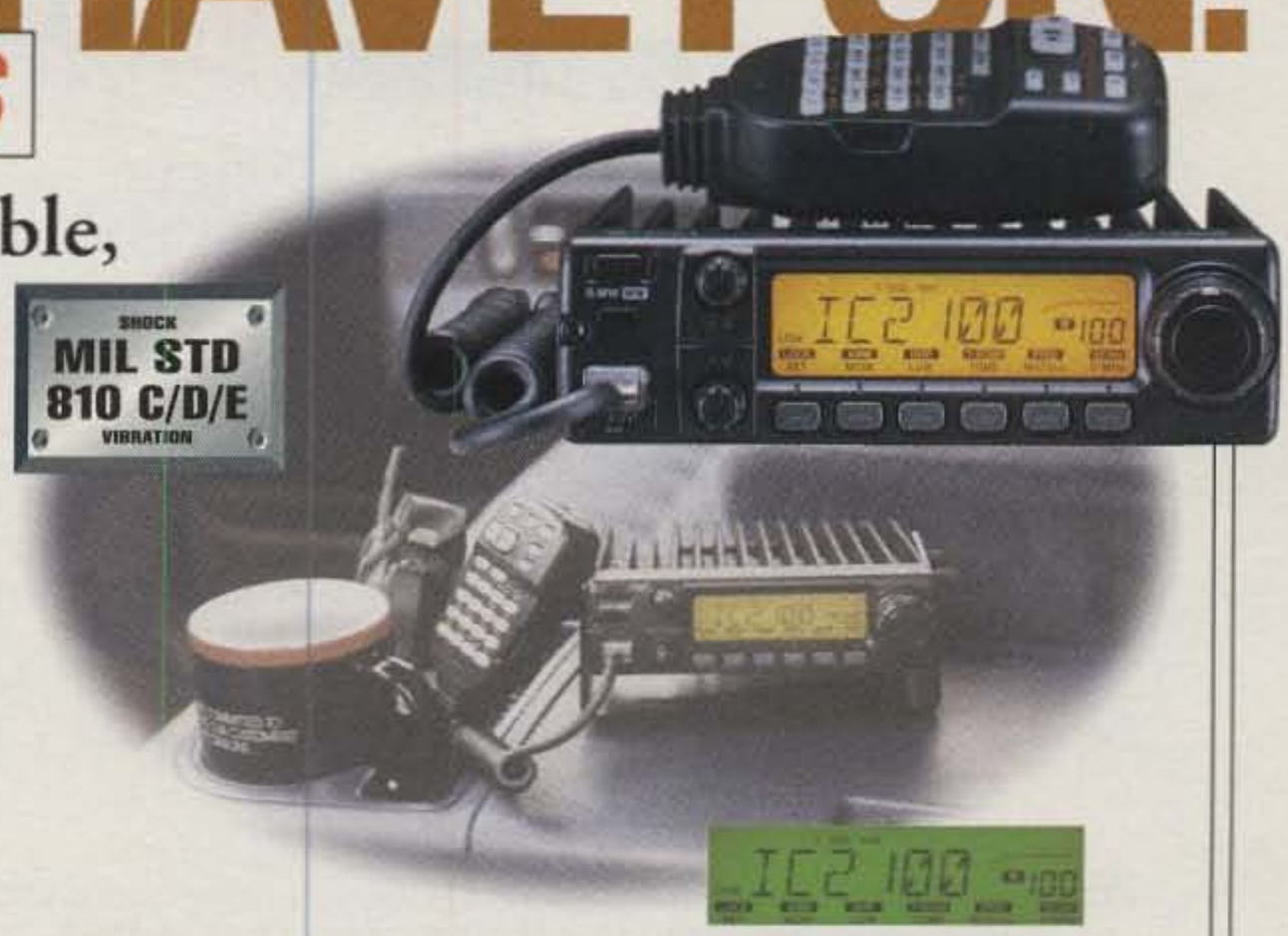

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Ham Radio News

From The CQ Newsroom

ARRL Seeks Permanent Code Credit for All Former Hams

The ARRL has asked the FCC to extend permanent code credit to any former ham who has previously passed a Morse code exam, rather than extending the privilege only to holders of expired Novice and Technician licenses. The request is part of a petition for partial reconsideration of the FCC's restructuring decision. The other part of that petition, as reported here last month, seeks to retain the distinction in the FCC's database between those Technicians who have and have not passed their 5 word-per-minute code test, rather than putting the burden on the licensee to show evidence of passing the exam.

DXer OH2BH Takes Top Dayton Honor

Finnish DXer Martti Laine, OH2BH—the only member of *both* the CQ DX Hall of Fame and the CQ Contest Hall of Fame—can add one more honor to his ham radio resumé: the Dayton Hamvention's Radio Amateur of the Year award. According to the Dayton Amateur Radio Association, Laine has been responsible for activating a variety of new DXCC countries, often while traveling under difficult and even dangerous conditions, and he is considered amateur radio's number one ambassador of international goodwill.

Other Dayton honorees this year are former FCC official A. Prose Walker, W4BW, receiving the Special Achievement Award for laying the groundwork that led to the allocation of additional HF ham bands in 1979; and SETI League Executive Director H. Paul Shuch, N6TX, is the Technical Achievement Award recipient, honored for his work on VHF+ receiver design in the 1970s and more recent for work designing amateur radio astronomy equipment.

RZ3DZR: Not Just Another Russian Ham

If you hear RZ3DZR on the air starting later this year (if things go according to schedule), don't point your antenna toward Russia. Point it up instead. That's the callsign that has been issued for the new ham station aboard the International Space Station (ISS), according to reports from Newsline and AMSAT. It has a Russian callsign because the station will be located in the Russian section of the station. This is the first time that a ham station aboard a manned spacecraft has been issued its own callsign. On all previous flights, individual operators have used their own calls. The license permits ISS crews to operate all ham bands and modes. Additional efforts are underway to secure licenses and callsigns from other participating countries, including the United States., and to assure that all licensed crew members will be able to operate from any "country"'s ISS ham station without concern about international third-party restrictions.

East Timor New DXCC Country

The former Indonesian territory of East Timor, now under United Nations administration, has been added to the ARRL's DXCC country list, with a 4W6 prefix assigned to hams there by the International Telecommunications Union. According to the "ARRL Letter," this prefix will be used by private amateur stations, while official UN stations will use the UN's traditional 4U1 prefix. This includes the UN Amateur Radio Club station there, 4U1ET.

Phase 3D May Fly in July

The international Phase 3D amateur satellite is tentatively scheduled to be launched this July, according to reports from both the ARRL and AMSAT. The "Provisional Ariane Launch Manifest" published in the February issue of the Arianespace newsletter shows P3D scheduled to be launched on Ariane 507, some time in late July, assuming that the schedule holds. AMSAT and the European Space Agency signed a contract several months ago to launch P3D on "the first suitable flight." The satellite is already at the ESA's South American launch complex (see last month's "Amateur Satellites" column), where it will remain in its shipping container until preparations for the launch begin.

Young Ham Nominations Sought

Do you know any outstanding young amateurs who have made notable contributions to ham radio or their communities? If so, you are encouraged to submit their names as nominees for the 2000 Newsline Young Ham of the Year award, co-sponsored by *CQ* magazine. Nominations must be submitted on official forms by May 30. Forms and complete rules are available by mail (please enclose SASE) from Newsline, 28197 Robin Ave., Santa Clarita, CA 91350; or on the Internet from the Newsline website, <http://www.arnewsline.org>, or the *CQ* website, <http://www.cq-amateur-radio.com>. The Young Ham of the Year award will be presented this August at the Huntsville Hamfest in Alabama.

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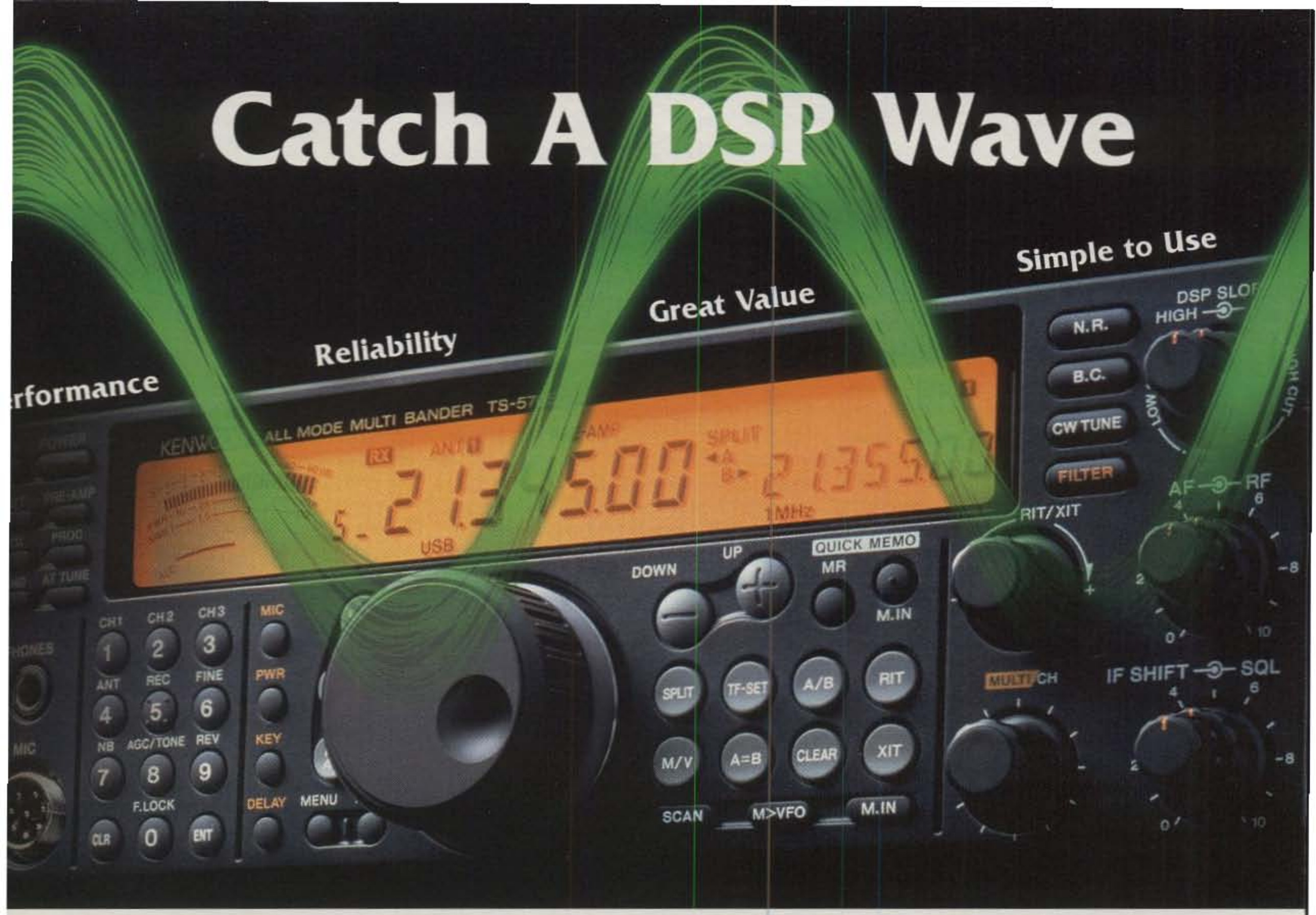

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Zero Bias

BY RICH MOSESON, W2VU

An Editorial

Diving into the Question Pool

This issue should reach you right after the new amateur radio licensing structure takes effect. Exams at test sessions now will be based on the newly revised question pools. As I'm writing this in early March, though, the changeover is still more than a month away, and W5YI's book *The New Pools!* just landed on my desk. It was my first real look at the new questions, and I was quite curious to see how they looked. Frankly, I was somewhat concerned—based on the tone of the FCC's restructuring decision—that the technical portion of the Technician exam might be so greatly de-emphasized that the essence of amateur radio as a technical hobby would be lost at the point of entry. After looking at the questions, I am pleased to say that my worries were unfounded.

A Technician candidate must still know the basics of radio propagation (with an appropriate emphasis on VHF/UHF propagation); what peak envelope power is; what type of meter to use for what type of measurement (and how to read the particular meter); basic electrical theory, including Ohm's Law; and more. In addition, there are questions related to activities a Technician might pursue with more experience, but without needing to upgrade, such as satellite and moonbounce communication.

Will it still be possible to pass the test just by memorizing the questions and answers? Absolutely. However, in doing so, you invariably learn something anyway. Plus, at least half of what you need to know for the exam requires no great depth of understanding. There's nothing to "understand" about band and power limits, for example. You just memorize them, and remember where to look them up when you need to know them in the future. In my view, knowing that you *need* to look, and knowing *where* to look, is more important than occupying a large portion of your mental RAM (active memory, for you non-computer types) with band plans and formulas. Personally, what I use regularly, I remember. For everything else, I know where to look or whom to ask. That's what counts.

Back to the question pools. Okay, so it's still pretty easy to pass your Technician exam, especially if you study. What about the Extra test? Are we "dumbing down" the top license class by dropping the code requirement to 5 words per minute? Will it result, as one ham put it, in "a lot of CBers on the Extra bands"?

Well, let's just say that if you've been an Extra for 20 years or longer and you haven't kept up with advancing technology (yes, I'm talking about *you!*), then you probably wouldn't want to take this exam without doing some serious studying beforehand. Let's see ...what do you know about remote and automatic control? Satellite operating? Technical standards for amateur television? Spread spectrum? Digital operating? Moonbounce? Transequatorial and auroral propagation? Interpreting spectrum analyzer displays? The time-base accuracy of frequency counters? Radio direction-finding? Parallel resonant circuits? Thevenin's Theorem? Photoconductivity? Get the idea yet?

Chances are many of you who already hold Extra Class licenses know at least something about at least some of these things (at least I hope so; after all, you know code at 20 wpm, so you *must* be an electronics expert). However, to get your Extra today, you need to know at least a little bit about *all* of these things (and I didn't print the whole list). Do you? Do you even know what all the things I mentioned *are*? Are you sure?

Okay, what controls the spreading sequence of an amateur spread-spectrum transmission? "Real" Extras know it's a binary linear-feedback shift register. Did you? I sure didn't. After reading these questions, I can say with confidence that if the Extra Class exam has been "dumbed down," then so have I. (Go ahead, agree. I can take it!)

Sawdust and Solder

For as long as I've been reading *CQ*, I read K2EEK's comments in this space about hamfests (particularly hamfest food). The May issue usually found Alan just back from the Charlotte Hamfest in North Carolina, and in recent years, he found it interesting to contrast the hamfest with the woodworking show that shares the same building at the same time. Alan was as devoted to woodworking as he was to ham radio, so it was a natural for him to attend both shows. It was always significant to him that the exhibitors at the woodworking show were much more focused on demonstrations and hands-on activities than the exhibitors at the hamfest. For some mysterious reason, he'd write, at the woodworking show there were always crowds at nearly every booth.

Now before we go any further, it's important to note that the Charlotte Hamfest is an excellent show, and both buyers and sellers seem to go home happy. This is good. However—and this was Alan's major point—it could all be so much better. As Alan's successor in this space, as well as at the Charlotte Hamfest, I felt an obligation to him to attend the woodworking show myself, and to see first-hand if the differences were really as marked as he presented them. Thus, with a hamfest hand stamp on my left hand and a woodworking show stamp on my right hand, I entered the unknown—and found myself in very familiar surroundings.

You very easily could have swapped the attendees at the two shows and not noticed much difference. Yes, the woodworking show was more crowded (on the other hand, the room was smaller), but by and large, the people were the same—mostly middle-aged men, some trailing wives and kids behind them, many of them carrying or towing loads of newly purchased goodies. As one exhibitor remarked when I said I'd come over from the ham show, "I'll bet there's a lot of crossover between hams and woodworkers. It's basically the same group of people."

There were differences, however. For starters, there were indeed crowds at nearly every booth at the woodworking show. Why? Because at nearly every booth someone was *demonstrating* something, *showing* people how the widget worked, and sometimes letting folks try it themselves. It was crowded, it was noisy, the smell of freshly cut wood was in the air, and there was lots of sawdust on the floor (except at the booth demonstrating the sawdust vacuum system).

The one booth that impressed me most was the DeWalt Tools booth. What really caught my attention there was *activity*. There were pleasant young people in bright yellow DeWalt "uniforms" busy measuring and cutting wood, driving nails and screws—*building things right there at the show!* One group was building a bench, another a bookcase.

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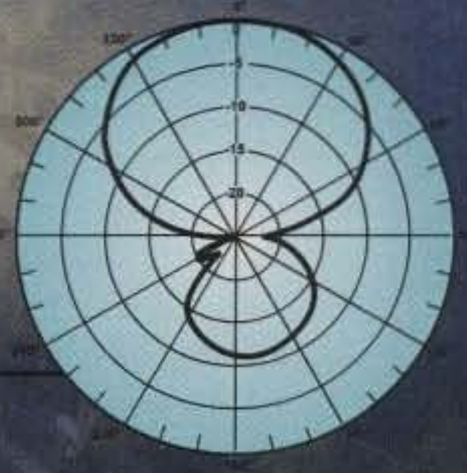

MA5B SPECIFICATIONS

FREQUENCY	10	12	15	17	20	Meters
ELEMENTS	2	1	2	1	2	per band
GAIN	5.3	1.0	4.8	1.0	3.6	dBi
FRONT TO BACK RATIO	10	0	12	0	22	dB
SIDELOBE ATTENUATION	25	25	25	25	25	dB
VSWR 2:1 BANDWIDTH	665	>110	255	>100	90	kHz
LONGEST ELEMENT	17.1ft (5.2m)					
TURNING RADIUS	8.8ft (2.7m)					
BOOM LENGTH	7.3ft (2.2m)					
BOOM DIAMETER	1.5in (3.8cm)					
MAX. WIND SURFACE AREA	3.22 ft² (3m²)					
MAX. POWER HANDLING	1.2 kw					
WEIGHT	26.5 lbs. (12 kg)					

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What *kept* my attention was the fact that on even a not-so-close inspection, it was clear these folks hadn't even *watched* home-repair gurus Bob Vila or Norm Abram very often, let alone ever come near them in person. Was this bad? No.

These projects clearly were being built by *amateurs,* and I was enthusiastically invited to help attach some molding. Having just cut new molding for my kitchen, keeping the wood-filler people in business for another year, I declined. However, I did take a few minutes to talk with the bookcase-builders, Heather and Jayson, who freely admitted to being complete novices at building things. It seems they both work in DeWalt's sales and marketing department, and part of their on-the-job training includes going out to shows and trying to build things, using the tools it's their job to sell. They know the tools very well, they told me, but actually using them to build things was another story. They clearly were enjoying the challenge. We talked for several minutes—about building things, about ham radio, and about using hands-on demonstrations to get people interested in trying new things. I didn't buy anything, but my local hardware superstore is one of their dealers, and I'm sure the positive impression I took home from the show will stay with me when I'm next in the market for a power tool.

Now let's leave the woodworking show and head back to the hamfest. This time, though, imagine it's a hamfest that resembles the wood show, where something is *being done* at nearly every booth and the smell of fresh solder is in the air. Your company sells radios? How about connecting an antenna to one and putting it on the air? Demonstrate it, or let people actually try it out (bonus points to ICOM, which has done this at the last two shows I've attended).

Your company sells antennas? Build a few while potential customers watch (or maybe build the same one over and over). Share some "tricks" of efficient antenna assembly. A lasting impression I have from an antenna test range at a VHF conference I attended some years back is of antenna maker Joe Reisert, W1JR, offering one of his beams of known gain as a reference antenna. He opened the box, removed the contents, and put the whole thing together in front of us in about five minutes, talking all the time about what he was doing, and how to keep track of all the elements and hardware. Do this at a hamfest booth and you've got people's attention.

Your company sells kits? How about assigning one of your employees to build one while people watch (perhaps, like the DeWalt folks, let a *new* kit-builder do it), explaining each step and showing how easy it is to follow your directions? Better yet, how about setting up part of your booth with tools, soldering irons, and test equipment, and giving customers a place—with expert help and supervision on hand—to actually build the kit they just bought from you? Imagine buying a kit and going home the same day with a finished, tested, working radio! That will not only generate excitement among your customers, but crowds will gather to watch the action. In case this escaped you in the past, crowds at your booth are good, both for your business and for ham radio.

This concept doesn't apply only to ham businesses. Hamfest sponsors can put stations on the air and book forum speakers who will do more than just talk. One speaker scheduled for a forum at Dayton is planning to build a kit while he talks. He's got the right approach. Let's *all* try to capture the excitement sparked by restructuring (and felt by the 250+ people who took tests at Charlotte's VE session), spread it around, and keep it alive. Putting some excitement into our hamfests is one important way to start.

More than just radios....

You probably know all about the great value of ***ADI*** brand transceivers, but **PRYME Radio Products** makes more than just radios. In fact, we manufacture a full line of aftermarket accessories for all kinds of radios, not just our own! Our line includes accessories for Kenwood, Icom, Yaesu, and many more! From Family Radios, to scanners, to amateur or commercial handheld radios, we have the right item for the job. Our accessories are reliable, innovative, and affordably priced.

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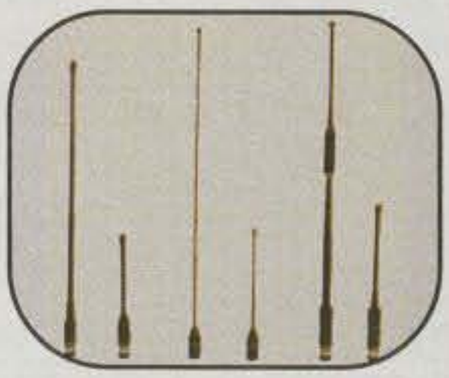

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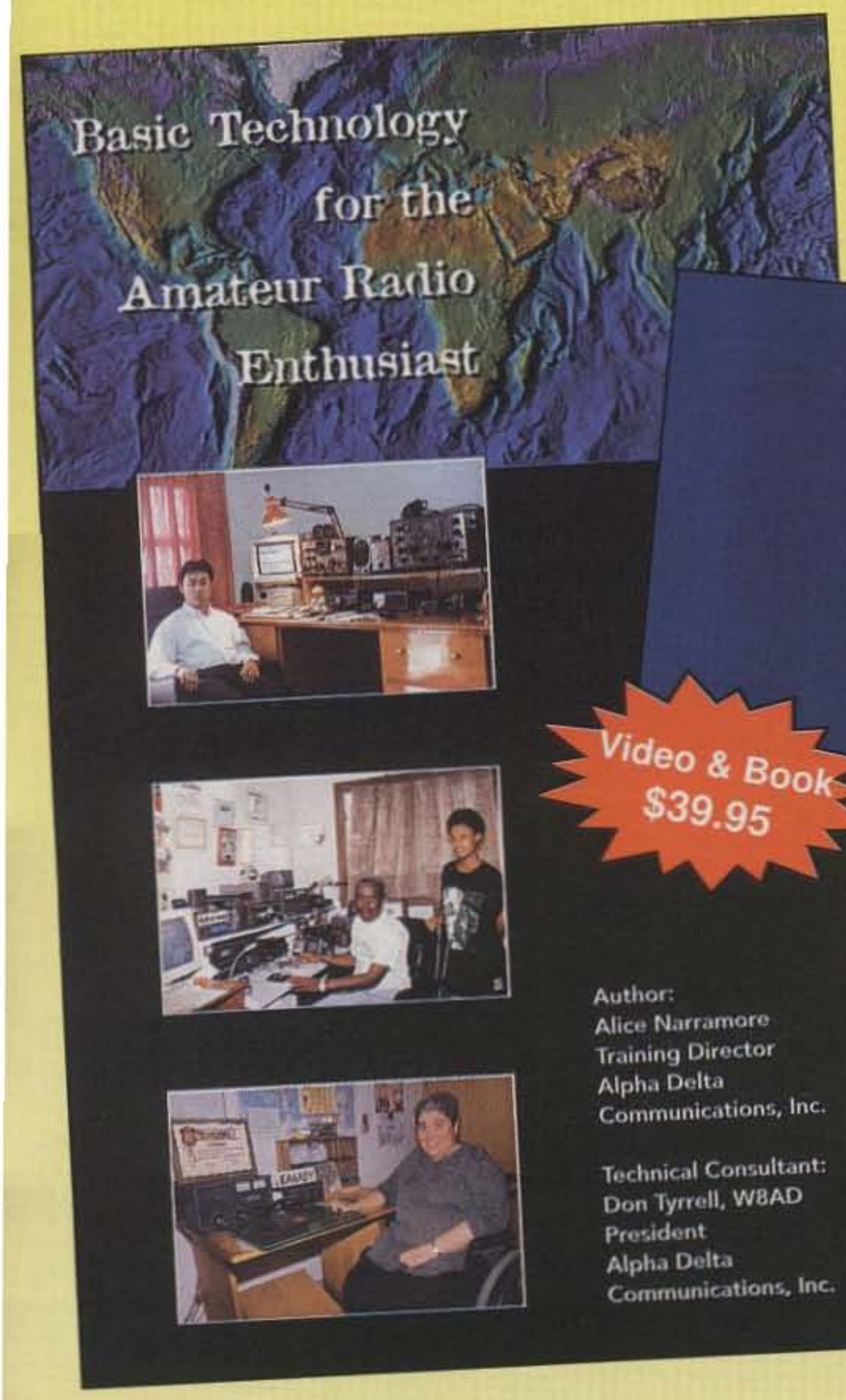

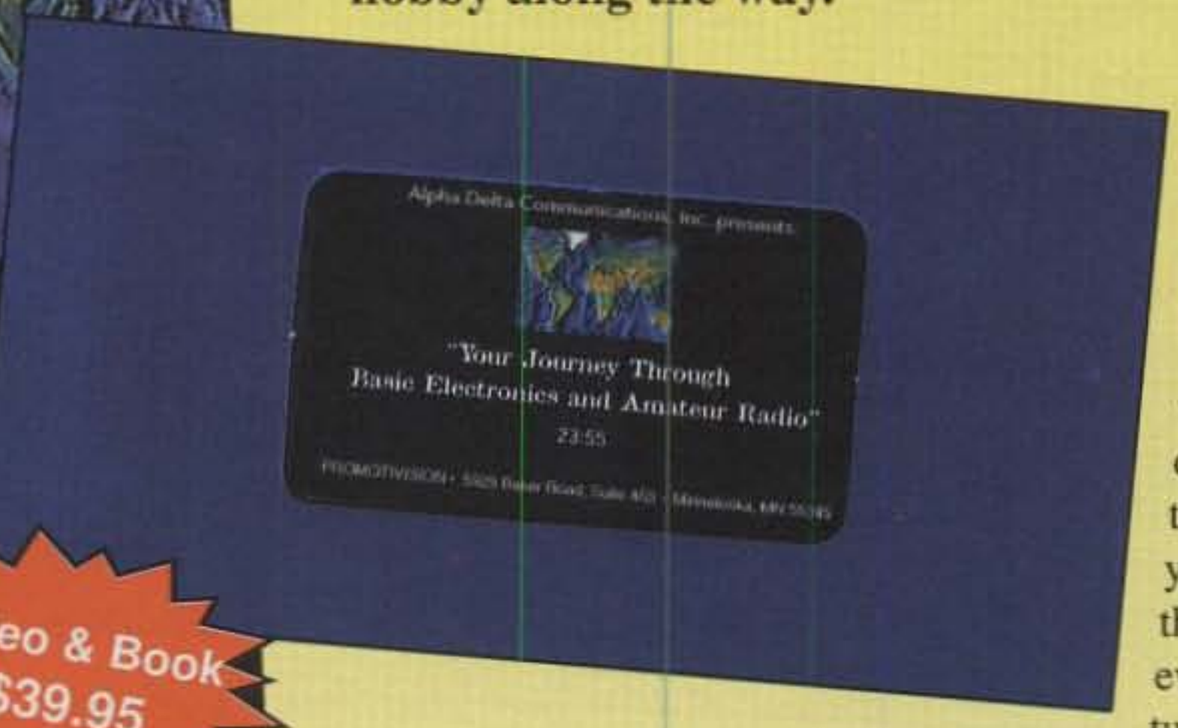

The Alpha Delta *video/book* production "Basic Technology for the Amateur Radio Enthusiast" is a simple straightforward program that takes you on this journey, explaining the wonderment of the hobby along the way.

• The ***video*** shows how radio waves are formed and how electrons move to do work, and explains terms like voltage, current, power, resistance and other terms you'll hear relating to the hobby. You will even go with a miniature **"tour guide"** on a walk through a receiver printed circuit board. He will show you how amplification, power supplies, radio frequency and audio amplifiers and other parts of a radio work. He will also explain what "semiconductors" are all about. Neither the video nor the book get into math or formulas--**we've kept it simple**

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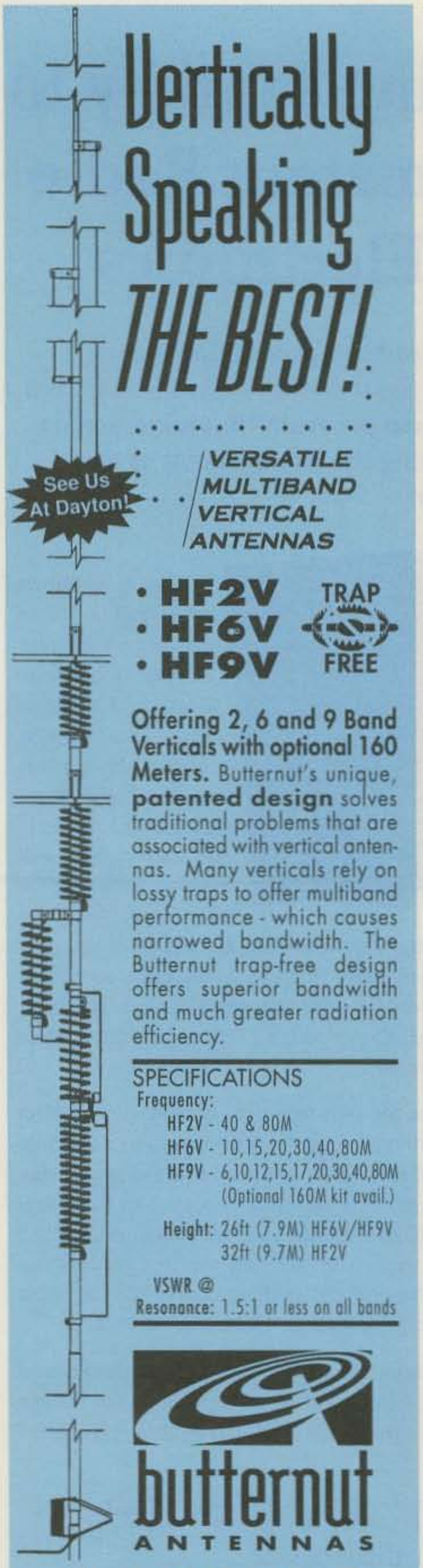

CIRCLE 42 ON READER SERVICE CARD

Announcements

• **Nevada QSO Party** – The 2000 Nevada QSO Party, sponsored by the Frontier ARS, will be held from 0000Z May 13 to 0600Z May 14 SSB, CW, RTTY, 6–160 meters. Suggested frequencies: CW 15 up, SSB 25 up, from the bottom of the General band; Novice/Tech/Tech-Plus 15–25 up from the bottom of the band. Exchange: Nevada county—RST; others—state, province, or DXCC country, RST. QSO points: one point SSB, 2 points CW and RTTY. Multiplier: Nevada counties × QSO points;. Nevada stations QSO points × states/province/DXCC countries. Certificates to winners. Mail logs to: Jim Frye, NW7O, 4120 Oakhill Ave., Las Vegas, NV 89121-6319 by June 15, 2000 (e-mail: <nw7o@anv.net>).

• **Exposition A Century of Radio Communication, Quebec, Canada** – This May 26–28 Y2K special event, sponsored by Club Radioamateur Sorel-Tracy VE2CBS in conjunction with other clubs and groups and held at the Tracy Cultural Center, will showcase typical ham stations of the century by decade. Included are military radios, kits, equipment by well-known manufacturers, homebrew projects, tubes, CW and telegraph keys, mics, etc. (more than 250 exhibits), plus photos and a video. For further information, contact Jacques Hamel, VE2DJQ, ARC Sorel-Tracy VE2CBS Inc., P.O. Box 533, Sorel, Quebec, Canada J3P 5N9 (e-mail: <creust@cegep-sorel-tracy.qc.ca>); or Denis Chouinard, VE2DSH, e-mail: <denischouinard@enter-net.com>.

• **The following Special Events are scheduled for May:**

W1ACT, from Gay Head Lighthouse, Martha's Vineyard Island, Massachusetts (IOTA NA-046); 1800Z May 5 to 2100Z May 7; on 14.260, 21.260, 28.460, 146.55 MHz. QSL with SASE to N1JOY.

W1FN, from Armed Forces Day celebration, White River Junction, Vermont; Twin State RC; 1600–2200Z May 20; on 28.360, 14.260, 7.260, 7.105 MHz, phone and CW plus VHF/UHF. QSL to Karl Zuege, KB1DSB, 2176 Drake Road, Bomoseen, VT 05732.

K2BSA, from 90th anniversary of Boy Scouts and Troop 1 Unadilla, New York; Chanango Valley ARA; 2200Z May 19 to 0200Z May 21; on 3.925, 7.275, 14.275, 21.375, 28.375 MHz. QSL to Raymond Darling, 695 Ives Settlement Rd, Bainbridge, NY 13733-3350.

N2UL, from Memorial Day commemoration, Nutley, New Jersey; Robert D. Grant United Labor ARA; 1200Z May 27 to 2300Z May 30; on 28.420, 52.525 MHz. For certificate send QSL and SASE to WA2VJA, RDGULARA, P.O. Box 716, Nutley, NJ 07110-0716.

3-land, Tea Party special event station, Centreville, Maryland; Kent ARS; 1400–2100Z May 27; on 7.040, 7.240, 14.240, 28.340 MHz. For certificate send 10 × 13 SASE to Paul Gerhardt, K3PG, 313 Chesterfield Avenue, Centreville, MD 21617.

W8YAF, from Memorial Day commemoration, Yankee Air Force Museum, Willow Run Airport, Belleville, Michigan; 1200–2000Z May 29; SSB 7.270 ±QRM. For certificate send QSL and 9 × 12 SASE to Frank A. Nagy, N8BIB, 24315 Waltz Rd., New Boston, MI 48164-9167.

• **These hamfests, etc., are slated for late April and May:**

April 29, **BCRO Hamfest 2000**, National Guard Armory, **Bentonville, Arkansas**. For more information e-mail: <jweiberg@leru.net>.

May 6, **Wexaukee ARC Amateur Radio & Computer Swap Meet**, Cadillac Junior High School, **Cadillac, Michigan**. Contact Wexaukee ARC, P.O. Box 163, Cadillac, MI 49601; or NU8L, 231-862-3774, e-mail: <amcconnell3@hotmail.com>. Talk-in 146.98. (Exams at 10:30 AM, must preregister; WA8LKV, 231-829-3433, e-mail: <avanant@netonecom.net>.)

May 6, **Pike's Peak RAA Ham Radio & Computer Hamfest**, Lewis-Palmer High School, **Monument, Colorado**. Contact Robert Ryals, KIØGF, 719-265-9950, e-mail: <rryals@ pcisys.net>. (Exams)

May 6, **Siloam Springs ARC Hamfest & Fleamarket**, St. Mary's Catholic Church, **Siloam Springs, Arkansas**. Contact Matt Hyde, N5UYK, 501-524-4797. Talk-in 146.67.

May 6, **2000 Owego Hamfest**, Tioga County's Marvin Park Fairgrounds; **Binghamton area, New York**; Binghamton ARA. Contact BARA, P.O. Box 853, Binghamton, NY 13902-0853; call Bill, N2BC, 607-748-5232; or e-mail: <rmess@binghamton. edu>. (Exams)

May 7, **Great Hagerstown Hamfest & Computer Show**, Hagerstown Community College Recreation Center, **Hagerstown, Maryland**; Antietam Radio Assn. Contact Tina Jones, KB8ZQM, 304-728-7769, e-mail: <kb8zqm@intrepid.net, fax 304-728-3024; ARA homepage: <www.qsl.net/w3cwc>. Talk-in 146.94 and 147.09. (Exams 8:30 AM, walk-ins okay, contact WA4VE, 540-772-4792, e-mail: <kuan@visuallink.com>.)

May 7, **Metro 70cm Network Computer and Electronic Fleamarket**, Lincoln High School, **Yonkers, New York**. Contact Metro 70cm Network, 53 Hayward St. Yonkers, NY 10704; or Otto Supliski, WB2SLQ, 914-969-1053. Talk-in 440.425 PL156.7, 223.760 PL67.0, 146.910, 443.350 PL156.7 MHz.

May 20, **Rhode Island Spring Fleamarket & Auction**, VFW Post 6342, **Forestdale, Rhode Island**; Rhode Island Amateur FM Repeater Service. Contact Rick Fairweather, K1KYI, 106 Chaplin St., Pawtucket, RI 02861 (e-mail: <k1kyi@arrl.net>; phone 401-725-7507 between 7–8 PM only.

May 21, **North Hills RC Swapmeet**, Bella Vista High School, **Fair Oaks, California**. Contact Earl Mead, K6ESM, 916-331-1115, e-mail: <nhrc@k6is.org>, web: <http://www.k6is.org>.

May 26–27, **Pascagoula Hamfest 2000**, Civic Center, Jackson County Fairgrounds, **Pascagoula, Mississippi**; Jackson County ARC. Contact Charles Kimmerly, N5XGI, 19000 Busby Road, Vancleave, MS 39565 (228-826-5811). For flyer e-mail: <montehat@datasync.com> or <irag@mindspring.com>. Talk-in 144.510, 145.110. (Exams at 11 AM Saturday.)

May 27–29, **Wyoming ARRL State Hamfest**, Radisson Inn, **Casper, Wyoming**; Casper ARC. Contact Dave Riegert, KB7WON, P.O. Box 2025, Mills, WY 82644 (307-473-2142); <http://w3.trib.com/~carc>. Talk-in 146.94.

May 28, **Maryland FM Assn. Hamfest**, Howard Co. Fairgrounds, **West Friendship, Maryland**. Contact Mike, WA3TID, P.O. Box 19, Anapolis Junction, MD 20701 (410-923-3829). Talk-in 146.76, 224.76, 444.00.

May 28, **Hamfest du Quebec 2000**, Town of Tracy Curling Club, **Tracy, Quebec, Canada**. Contact Noble Steadworthy, VE2HQT, P.O. Box 533, Sorel, QC, J3P 5N9 Canada (450-743-4387; e-mail: <noble.steadworthy@enter-net.com>); <http://www.hamfest.qc.ca>. Talk-in 145.370- (103.5 tone). (Exams) ■

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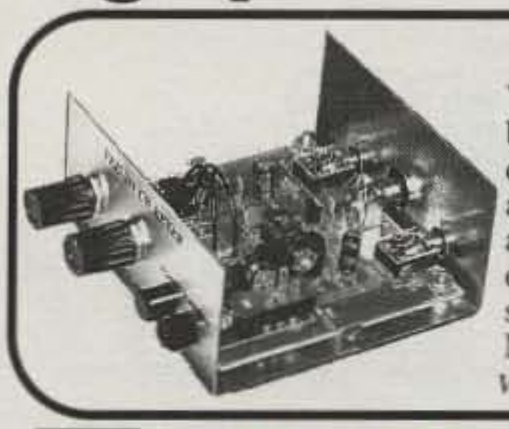

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CW Memory Keyer Kit stores 512 characters in four 128 character non-volatile EEPROM message memories. *Carry on entire QSOs by just pressing memory message buttons.* True sinewave sidetone with soft rise and fall time eliminates harsh keyclicks. Has all features of VEC-201K CW Keyer Kit. 1¾x 6¼x5¼ in. *Simple skill level.* Order **VEC-221K, $69.95.**

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High-performance 2 Meter Preamp Kit pulls weak signals out of noise. Solves three reception problems -- boosts signals using a 1-dB noise figure microwave transistor, provides razor-sharp bandpass filtering, eliminates unwanted electrical noises with built-in balun. Uses 9-14 volts DC. Tiny 1½x3x1 in. fits in any size box. *Intermediate skill level.* Order **VEC-1402DK, $59.95.**

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Great introduction to QRP, the hottest and fastest growing activities in ham radio. With this tiny *transceiver*, you'll discover what thousands of QRP enthusiasts already know -- you don't need a $1000 radio to get on the air and communicate worldwide. All it takes is some simple circuitry using less energy than a pen-light bulb! You get VXO frequency control, broad-banded transmitter circuitry, solid one Watt plus output, shaped keying, .3 uV sensitivity, direct conversion receiver. Includes crystal for popular QRP calling frequency. 1¾x4¾x5¼ in. *Intermediate skill level.* Order **VEC-1380K** (80 Meters), **VEC-1340K** (40 Meters), **VEC-1330K** (30 Meters), **VEC-1320K** (20 Meters) **$59.95 each.**

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2/6/10 Meter FM Receiver Kits let you tune into the world of ham radio. Catch all the action! Each covers the entire FM sub-band and runs off your 9 volt battery. Plug in speaker or headphones for loud clear reception. 1¾x4x3½ in. *Intermediate skill level.* Order **VEC-1002K** (2 Meters), **VEC-1006K** (6 Meters), **VEC-1010K** (10 Meters), **$34.95 each.**

Tunable SSB/CW Audio Filter Kit has sharp *four* pole peak and notch filters. Zero in with frequency control & adjust bandwidth for best response. Tune frequency from 300-3000 Hz. Notch is an outstanding 50 dB. 1 Watt amplifier. Speaker/Phone jacks. 12 VDC at 300 mA. 1¾x4¾x5¼ in. *Intermediate skill level.* Order **VEC-841K, $34.95.**

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Super CW Audio Filter Kit gives you three bandwidths: 80, 110, 180 Hz. Eight poles gives super steep skirts with no ringing. Pull CW QSOs out of terrible QRM! Plugs into phone jack to drive phones. QRM down 60 dB one octave from center frequency (750 Hz) for 80 Hz bandwidth. Improves S/N ratio 15 dB. Use 9V battery. 1¾x4x 3½ in. *Simple skill level.* Order **VEC-820K, $19.95.**

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AM Radio Transmitter Kit lets you set up your own AM station and broadcast crystal clear programming from your studio with *you* as the disc jockey or talk show host. Play music from CD player, tape deck or other source. Choose clear frequency from 530-1750 KHz. Standard line level or microphone input. Easy CD, tape deck or mike mixers connect. Audio level adjustment. 1¾x4x3½ inches. *Simple skill level.* Order **VEC-1290K, $29.95.**

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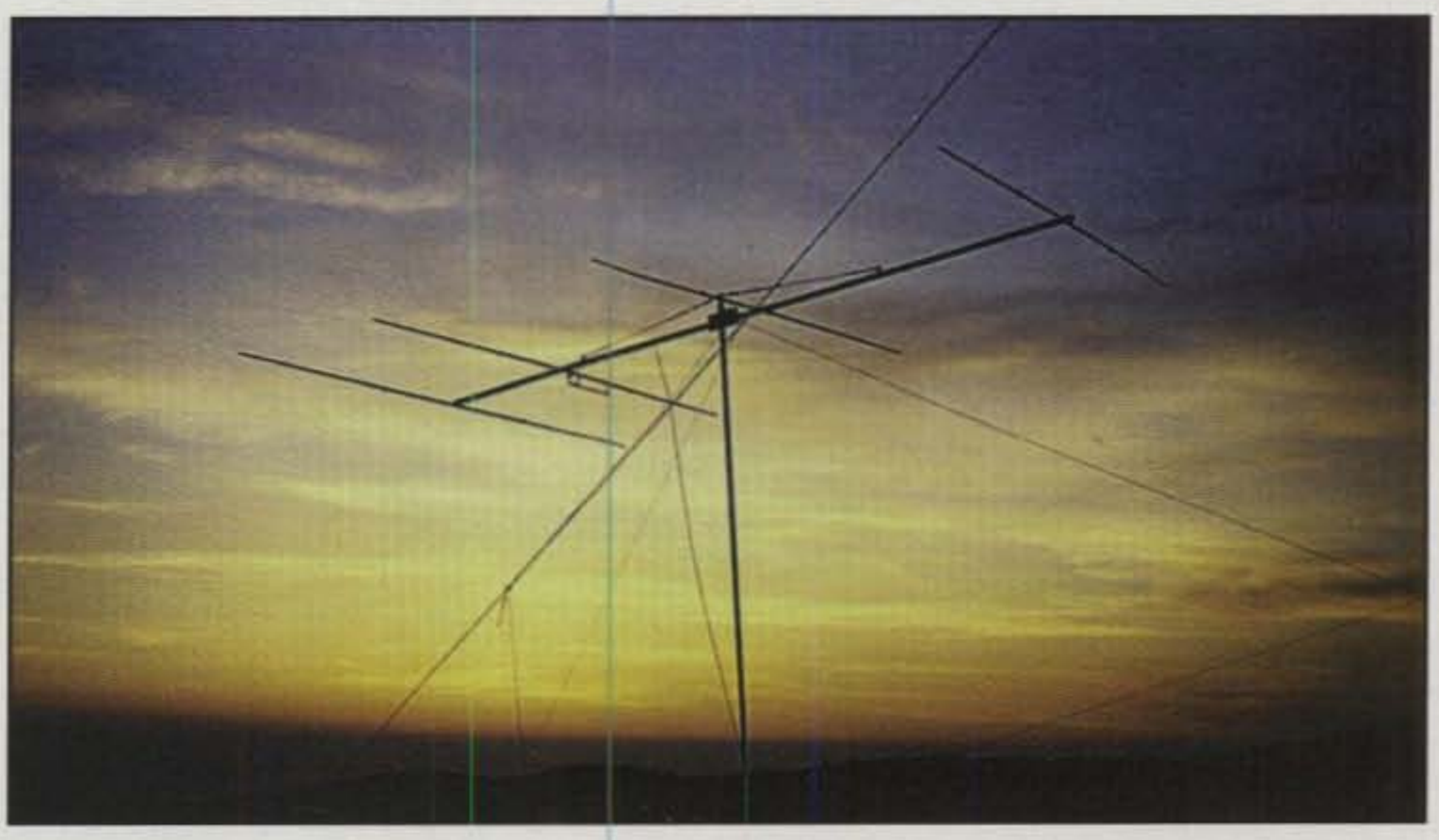
Results of the 1999 CQ WW WPX CW Contest

BY STEVE BOLIA,* N8BJQ

Absolutely fantastic conditions on 15 meters! These words reflect what many had to say after the 1999 CQ WPX CW Contest. Throughout most of the world 15 meters was open nearly around the clock. From here in the US, JA and EU were being worked at the same time for many hours at a time. Most of the high band records, which had been standing since the late 1980s, were broken. In all, there were five new world records, four US records, and 14 continental records established.



A nice sunset shot of the 4-element, 10 meter beam used by 9A6A. The QTH is Hvar Island, IOTA EU 016.

DX

CN8WW operated by DL6FBL was the new Single op all band champion. Ben edged out Jeff, N5TJ, at WP2Z by about 250 Q's for the title. Ben did not quite get the world record, but he did set a new African standard, as did WP2Z for North America. Ivo, C4A (5B4ADA), was not far behind in third, followed by ED8PP (EA3KU) and JM1CAX at JY9NX. P49V finished in the sixth spot, with US champ WW4T (W4AN) seventh, NT1N eighth, N6TJ at AM8ZS ninth, and KQ2M tenth.

Mats, SM7PKK, set a world record with his number one finish on 10 meters. Second went to 5NØMSV, with PP5BRV third, OD5SB (OK1MU) fourth with a new Asian record, and WP3A fifth with a North American record. A45XR edged out KH6ND (Oceania record) for the top spot on the "hot" band and a new 15 meter world record. ZF1A (W5ASP operating) was third with a North American record. Fourth place went to SU9ZZ operating low power. 9A3GW was fifth with a new European record. SN2B (SP2FAX) was the 20 meter champion, followed closely by 9A5W and HG3DX. US champion K3EST was fourth and NA5B (W5AO operating) was fifth. 9A9A led the 40 meter ops, with S57AL second, LY2IJ third, USA champion W3BGN fourth, and UT7IY fifth. OK2RZ topped the 80 meter box, followed by UPØL, GUØWWW (5B4WN op.), and C4ØM (5B4AFM). Riki, 4X4NJ, just beat 9A2AJ for top band honors, with VA1A (K3BU) third, OM5NU fourth, and UR7QC fifth.

George, N2GA, at VP5GA was the low power all band champion, with PY2YU second, USA winner N3RS third, Andy XJ9DX fourth, and VE7SZ (VE7NTT) fifth. Rounding out the top ten were WQ5L, N2BA, YB2UU, W2TZ, and T95A.

LU4FD was tops in the leader box on 10 meters, with LU9APM second and 9A6A third. SU9ZZ was the 15 meter champion, with TA3D second, North American leader CI7A (VE7SV) third, and YTØC (YU7CB) fourth. 9A7R edged out RJ9J for 20 meter honors, followed by Oceania leader VK2APK and EV6M. S54A was the 40 meter champ, followed by OK2ZC and S53F. C4ØM (5B4AFM) was the 80 meter winner, with S5ØD (S52RU) second and HAØKHT (HAØIL) third. Top band honors went to UT1FA, with T94YT second.

In the increasingly popular Tribander/Single Element category, JY9NX operated by JM1CAX topped the leader box, with Z32AU second, LY2BTA third, S5ØL (S59AA) fourth, and LY8X (LY2BIL) fifth, less than 700 points behind. 5X1Z used his tribander to not only win the 10 meter category, but to set a new world record. On 15 meters K6LL/7 topped G5G (GØLII) and NI3S/8 for 15 meter honors.

SK3LH (operated by SM3WMV) topped the Rookie entries with a very fine score. PW1S operated by PY1KS was not far behind in second and LZ1ABC finished third.

Frank, DL2CC, operated from WP3R and claimed the single op. assisted category with a very fine 9.5M effort. Roland, DK3GI, was second, with Goose, W8AV, in third; Daniel, EA5FV, fourth; and Andy, K2LE (KW2O), fifth. UT2IO was the low power assisted champion, followed by K3DI and EA8/9A4KK. S51AY was the 10 meter assisted winner, EA3AJW took the top spot on 15, F5LMJ was the 20 meter winner, JA1KVT the 40 meter champion, and OM3A (OM3GCN) the 80 meter winner.

USA

Scores were up somewhat in the US due in part to the great conditions and also the new scoring. WW4T, operated by W4AN, moved up from third in 1998 to take the top spot in the US in '99. Bill edged out NT1N by about 400K and KQ2M by about 700K for the US championship. NE6N (N6RT operating) turned in a very fine score from the west coast for fourth place, with NY4A fifth. K1XA (W1WEF op.) finished sixth, followed by Fred, K3ZO; Jeff, WC4E; Jim, N3BB; and Phil, KT3Y. All in all, the top 11 single ops bettered KQ2M's '98 winning score.

Bob, N4BP, edged out Richard, NN5AA (K5NA), and Jim, NE5D (K5RX), for the US 10 meter title. NU5A (K5GN) topped the 15 meter leader box with WW4RR (K4WX) second, N2IC/Ø third, N8II fourth, and K6LL/7 fifth. Bob, K3EST, just edged out Dave, NA5B (W5AO), for the 20 meter title with Lynn, W5FO, third; Mike, K5ZM, fourth; and Gennady, AB2AP, fifth, with the top low power score. W3BGN battled W4MYA for the 40 meter championship with Steve winning by just a very few Q's. Scott, WX4CW (W4SO), was third, with low power champion WB2DVU fourth and W6YJ fifth. W1MK was the 80 meter champion, followed by W8AEF. K4JYO was probably pretty lonely on 160, but did manage to work a few.

In one of several really close finishes, N3RS edged out WQ5L and N2BA for the top spot in the low power category. Just a few points behind in fourth was W2TZ, with WO4O finishing in fifth. There was less than 300K separating the top four finishers.

KN4Y had the top 10 meter score, with K7WP second and KQ1V third. On 15, N4TZ turned in a very nice effort to take the top spot, followed by K7ON and W9ILY. AB2AP was the 20 meter winner, with AB8RW second and W8UMR third. On 40 meters WB2DVU and W3CP had a nice battle, with Redd finishing first. W1MK was the 80 meter winner.

*7354 Thackery Road, Springfield, OH 45502
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WORLD TOP SCORES

SINGLE OPERATOR ALL BAND

CN8WW (DL6FBL)	13,140,434
WP2Z (N5TJ)	12,506,280
C4A (5B4ADA)	10,196,730
ED8PP (EA3KU)	9,699,456
JY9NX (JM1CAX)	8,642,799
P49V (AI6V)	8,217,440
WW4T (W4AN)	7,985,046
NT1N	7,752,030
AM8ZS (N6TJ)	7,520,856
KQ2M	7,274,568
NE6N (N6RT)	6,754,176
VE3EJ	6,746,904
YB1AQS	6,741,928
NY4A	6,431,360
HZ1AB (SMØCXU)	6,388,470
KX1A (W1WEF)	6,092,457
SP7GIQ	6,048,240
CN/DJ9RR	6,045,688
ZM1A (F2CW)	5,886,942
OK1RI	5,806,760

28 MHz

5X1Z (SM7PKK)	4,575,420
5NØMSV	2,867,292
PP5BRV	2,162,944
OD5SB (OK1MU)	1,986,610
WP3A	1,952,826
S5ØU	775,525
*LU4FD	760,772
N4BP	749,016
EO7V (UR7VA)	598,416
*LU9APM	561,118

21 MHz

A45XR	6,557,697
KH6ND	6,107,256
ZF1A (W5ASP)	5,330,129
*SU9ZZ	4,905,189
9A3GW	4,893,108
NU5A (K5GN)	4,411,299
SP5GRM	3,859,874
WW4RR (K4WX)	3,764,967
ZT6Z (ZS6EZ)	3,639,105
VF6JY (VE5MX)	3,581,772

14 MHz

SN2B (SP2FAX)	3,602,968
9A5W	3,470,746
HG3DX (HA3UU)	3,169,956
K3EST	2,486,380
NA5B (W5AO)	2,359,167
OH9DX	2,315,726
OH1F (OH1MDR)	2,278,105
*9A7R	2,273,262
RZ6FA	2,253,676
HA3NU	2,236,185

7 MHz

9A9A	2,838,132
S57AL	1,879,956
LY2IJ	1,241,638
W3BGN	1,191,840
UT7IY	1,132,404
W4MYA	1,107,185
*S54A	1,096,550
DJ9DZ	1,064,095
SQ6Z (SP3RBR)	1,031,261
*OK2ZC	847,912

3.5 MHz

OK2RZ	805,513
UPØL	686,964
GUØWWW (5B4WN)	645,301
*C4ØM (5B4AFM)	355,892
UA9JLJ	341,548
OH2W	302,356
SP5GH	232,775
HG3G	230,121
*S5ØD (S52RU)	203,696
*HAØKHT (HAØIL)	202,016

1.8 MHz

4X4NJ	157,014
9A2AJ	140,298
VA1A (K3BU)	103,680
OM5NU	89,846
UR7QC	66,440
*UT1FA	56,146
LY2OU	43,875
OH3BU	21,780
*T94YT	18,170
*UR4III	9,438

LOW POWER SINGLE OPERATOR ALL BAND

VP5GA (N2GA)	5,438,184
PY2YU	3,806,112
N3RS	3,464,076
XJ9DX	3,425,555
VE7SZ (VE7NTT)	3,354,390
WQ5L	3,289,814
N2BA	3,249,792
YB2UU	3,216,591
W2TZ	3,182,680
T95A	2,881,890
VE3OI	2,819,733
VA3UZ	2,697,496
WO4O	2,663,125
K1VUT	2,646,540
9A1O (9A5I)	2,537,964
HA1CW	2,471,720
K9QVB	2,409,456
EU1DX	2,291,328
RAØFF	2,199,600
PT1A (PY1NX)	2,154,816

28 MHz

LU4FD	760,772
LU9APM	561,118
9A6A	490,314
EA5DWS	363,810
VK4ICU	323,722

21 MHz

SU9ZZ	4,905,189
TA3D	3,494,813
CI7A (VE7SV)	2,729,540
YTØC (YU7CB)	2,079,506
EA8ASJ	1,871,352
UA4LL	1,860,550
JQ6NAW	1,721,760
9A3B	1,550,250
4Z5FW	1,503,280
Z31GX	1,376,830

14 MHz

9A7R	2,273,262
RJ9J (RA9JR)	2,112,200
VK2APK	1,851,100
EV6M	1,847,937
S58AL	1,756,891
T93Y	1,721,304
SN4PLJ	1,394,960
XV7SW	1,346,760
KP4AH (WP3C)	1,226,184
Z31CN	1,074,855

7 MHz

S54A	1,096,550
OK2ZC	847,912
S53F	784,449
SP2NA	745,963
T91AAW (T94IW)	698,005
F/OK1EE	697,109
YO2DFA	633,988
GØDEZ	601,215
OM4WW	488,312
DL4FN	445,176

3.5 MHz

C4ØM (5B4AFM)	355,892
S5ØD (S52RU)	203,696
HAØKHT (HAØIL)	202,016
9A3CY	200,142
SP7ELQ	199,520

1.8 MHz

UT1FA	56,146
T94YT	18,170
UR4III	9,438
OK2ZV	9,394
VY2MGY/3	8,034

TRIBANDER/SINGLE ELEMENT

JY9NX (JM1CAX)	A	8,642,799
Z32AU	A	5,119,005
LY2BTA	A	4,334,810
S5ØL (S59AA)	A	4,334,172
LY8X (LY2BIL)	A	4,311,523
UF3CWR	A	4,165,591
S53R	A	3,969,756
*PY2YU	A	3,806,112
VE2ZP	A	3,546,316
*XJ9DX	A	3,425,555
LY5W (LY1DR)	A	3,338,175
UU7J (UUØJM)	A	3,050,927
JA1YNE(JP1OGL)	A	3,031,984
*T95A	A	2,881,890
EU5A (EU1FC)	A	2,812,734
*VA3UZ	A	2,697,496
N5NU	A	2,645,461
RK3AD	A	2,597,535
JAØQWO	A	2,480,544
N1EU	A	2,444,375
5X1Z (SM7PKK)	28	4,575,420
K6LL/7	21	3,175,104
G5G (GØLII)	21	2,753,030
NI3S/8	21	2,125,890

ROOKIE

SK3LH(SM3WMV)	A	1,599,829
PW1S (PY1KS)	A	1,308,920
LZ1ABC	A	871,051
EA2BDS	A	613,440
KØIW	A	203,616
EA8AEI	28	56,952
AM7ASZ (EA7ASZ)	14	115,412

ASSISTED

WP3R (DL2CC)	A	9,532,019
DK3GI	A	5,108,220
W8AV	A	4,190,248
EA5FV	A	3,867,315
KW2O (K2LE)	A	3,837,435
OL6X (OK1DIG)	A	3,789,140
KF3P (K3MM)	A	3,713,580
K5KG	A	3,681,972
W3PP	A	3,641,100
WØGJ (AAØBY)	A	3,307,962
*UT2IO	A	1,076,400
*K3DI	A	639,468
*EA8/9A4KK	A	624,000
S51AY	28	450,835
*9A7P	28	187,616
JH1FSF	28	130,968
*EA3AJW	21	962,802
JH6QIL	21	462,057
*W6BSY	21	419,862
F5LMJ	14	433,884
*JA1KVT	7	76,260
*T97Y	7	33,054
OM3A (OM3CGN)	3.5	586,470

QRP/p

TI5N (NØKE)	A	1,523,097
ON6NR (ON4RU)	A	1,224,600
LY2FE	A	1,154,862
KX1M	A	1,138,176
WO9S	A	911,803
SM3CCT	A	891,796
VE1ZJ	A	883,998
RW4UU	A	868,428
N7IR	A	782,080
VE3KP	A	639,521
HA5BSW	28	122,820
LW7EIC	28	48,140
ES1CR	21	201,420
UR9MM	21	181,890
OK2PYA	14	240,093
LU6HI	14	219,876
YZ7ED	7	118,856
KU7Y	7	37,968
SP4GFG	3.5	114,190
HA8LUH	3.5	80,190
UAØQGQ/UT	1.8	7,018

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V26E	10,629,322
UA7A	9,886,184
HG1S	9,443,500
JY9QJ	9,313,532
RD3Q	8,559,611
K3WW	8,008,910
YL4U	7,510,272
9A7A	7,446,040
N4WW	7,365,848
IR4T	7,356,786
M5X	7,269,345
RF9C	6,900,043
OE4A	6,873,588

MULTI-OPERATOR MULTI-TRANSMITTER

HC8N	54,697,072
P3A	39,494,534
LT1F	20,364,960
RW2F	19,150,695
WL7E	18,257,208
S54W	16,405,930
HG5A	15,658,289
RM6A	15,204,986
HG6Y	14,979,843
NQ4I	14,867,020
EA4ML	13,002,444
NR4M	11,820,768
S56MM	11,235,180
JA3ZOH	10,863,720
LY7A	10,621,080

*Indicates Low Power.

The USA Tribander/Single Element race was very close. The difference between finishing first and fifth was about 280K. Jason, N5NU, came out on top, with N1EU and N2CU in a virtual tie for second. Yours truly and ND5S did the same for fourth. Dave, K6LL/7, not only won the USA, but also the world on 15 meters, with NI3S/8 second. K3VA was the USA 20 meter winner. The low power T/S race was even clos,er with WD5K squeaking by WD4AHZ by less than 2K. WK2G was third, WN6K fourth, and K9MMS fifth. KG5RM was the 10 meter winner and W9ILY the 15 meter winner.

Goose, W8AV, topped the USA single op. assisted category with his personal best effort. Andy, KW2O (K2LE), was right there for second and Tyler, KF3P (K3MM), was third. W3PP took fourth and AAØBY operated WØGJ's station to fifth place. K3DI was the top low power assisted station, followed by K1KU and WD4JNS.

Some very good scores were turned in by the QRP entrants. KX1M topped 1.1M to take the number one spot. WO9S was second with a little over 900K, followed by N7IR, N1TM, and W8QZA/6. WA6FGV was the 10 meter QRP winner, W7/JR1NKN topped the 15 meter list, and KG5U did likewise on 20. KU7Y did a nice job on 40 and W7DRA won on 80.

Multis

The big news in the multi-operator categories was HC8N. N5KO, K1EA, K6AW, K9ZO,

N6RT finished fourth in the US as NE6N from W6EEN's great station. Doug gave the guys on the east coast a run for their money.

KM3T, NØJK, and N6TV nearly doubled the multi-multi record. Their nearly 55 million points raised the standard by close to 25 million points. In second was the previous record holder, P3A, with over 39 million points, which also broke the old record and did break the Asian record. Third place went to LT1F, with EU record holder RW2F fourth and NA record holder WL7E fifth.

K4LT and K8RF operated CY9RF to the top spot in the multi-single category. Dan and Doug came up just a bit short in their quest for a world record, but did get the North American record. E4/OK5DX finished second, with V26E third, UA7A fourth, and HG1S in fifth.

In the USA, DL2NBU and DL6RAI stopped at K3WW's on the way home from Dayton and went home with the US multi-single championship and the US record. N4WW and KØLUZ finished second, with AJ4Y third, KM5G fourth, and WO8CC fifth. The gang at NQ4I (AA4LR, K2UFT, K4BAI, KS4Q, N1CC, N4VZ, NQ4I, W4DD, W7FB, WA4ILO) were the US multi-multi champions and new owners of the US record. NR4M finished second, KTØR third, NZ8O fourth, and KG6OK was fifth.

WPX SSB Results Corrections

KL7RA is the winner of the North American Multi-Multi trophy.

ZD88A is the winner of the World 28 MHz trophy and ZX5J the winner of the World Single Band trophy.

HJ3XPA was omitted from the results.

RJ9R operated by RA9JR was omitted from the results.

PY4BK's score is 1,953,946.

OH3BU should have been listed in the T/S class.

Corrected results will be posted at the WPX Web Site: <http://ourworld.compuserve.com/homepages/n8bjq>.

The Rest of the Story

The Combined Club competition was hot this year, with several clubs putting in huge efforts.

USA TOP SCORES

SINGLE OPERATOR ALL BAND

WW4T (W4AN)	7,985,046
NT1N	7,752,030
KQ2M	7,274,568
NE6N (N6RT)	6,754,176
NY4A	6,431,360
KX1A (W1WEF)	6,092,457
K3ZO	5,784,208
WC4E	5,577,216
N3BB	5,481,810
KT3Y	5,481,725
WV6C (N6IG)	5,323,981
AJ1I (K5ZD)	5,060,616
WØUA	4,906,161
WK6LA (K6LA)	4,403,575
KN7P (KL2A)	4,373,811
AA3B	4,048,268
KC7V	3,946,890
WØCG	3,899,148
WC1M	3,856,248
AA7A	3,595,627

28 MHz

N4BP	749,016
NN5AA (K5NA)	555,588
NE5D (K5RX)	377,664
*KN4Y	130,743
*K7WP	48,972

21 MHz

NU5A (K5GN)	4,411,299
WW4RR (K4WX)	3,764,967
N2IC/Ø	3,492,246
N8II	3,328,348
K6LL/7	3,175,104
NØNR	2,956,248
KS7O	2,566,993
N6MU	2,187,221
NI3S/8	2,125,890
N4PN	2,021,802

14 MHz

K3EST	2,486,380
NA5B (W5AO)	2,359,167
W5FO	1,330,665
K5ZM	656,502
*AB2AP	425,256

7 MHz

W3BGN	1,191,840
W4MYA	1,107,185
WX4CW (W4SO)	775,404
*WB2DVU	279,865
W6YJ	248,860

3.5 MHz

*W1MK	48,960
W8AEF	9,900

1.8 MHz

K4JYO	819

LOW POWER ALL BAND

N3RS	3,464,076
WQ5L	3,289,814
N2BA	3,249,792
W2TZ	3,182,680
WO4O	2,663,125
K1VUT	2,646,540
K9QVB	2,409,456
WD5K	1,903,068
WD4AHZ	1,901,830
KN7Y	1,677,512

28 MHz

KN4Y	130,743
K7WP	48,972
KQ1V	41,280
W3NO	40,959
WD6DX	7,056

21 MHz

N4TZ	1,251,432
K7ON	460,692
W9ILY	402,204
N4IG	366,860
KW7R	237,636

14 MHz

AB2AP	425,256
AB7RW	364,188
W8UMR	193,536

7 MHz

WB2DVU	279,865
W3CP	186,559
AE1B	42,680
KU6T	19,140
K4WW	16,590

3.5 MHz

W1MK	48,960

TRIBANDER/SINGLE ELEMENT

N5NU	A	2,645,461
N1EU	A	2,444,375
N2CU	A	2,427,005
N8BJQ	A	2,387,640
ND5S	A	2,352,431
N2ED	A	2,021,418
K2SX	A	1,942,464
NV4X (K2AV)	A	1,658,904
W6TK	A	1,478,586
W4YE	A	1,107,600
K2UOP/8	A	829,268
K6LL/7	21	3,175,104
NI3S/8	21	2,125,890
K3VA	14	47,168

TS LOW POWER

WD5K	A	1,903,068
WD4AHZ	A	1,901,830
WK2G	A	1,457,310
WN6K	A	1,015,151
K9MMS	A	563,030
KG5RM	28	5,916
W9ILY	21	402,204
KGØUA	21	206,934
K9CJ	7	15,340

ASSISTED

W8AV	A	4,190,248
KW2O (K2LE)	A	3,837,435
KF3P (K3MM)	A	3,713,580
K5KG	A	3,681,972
W3PP	A	3,641,100
WØGJ(AAØBY)	A	3,307,962
WF2B (K2ONP)	A	2,434,112
N5JR	A	1,988,802
KC1F	A	1,422,040
KD6WW	A	1,418,844

ASSISTED LOW POWER

K3DI	A	639,468
K1KU	A	355,792
WD4JNS	A	234,596
WE4ARC(AJ4Y)	A	71,604
W6BSY	21	419,862

QRP/p

KX1M	A	1,138,176
WO9S	A	911,803
N7IR	A	782,080
N1TM	A	592,852
W8QZA/6	A	451,672
W8DN	A	321,480
W5ON	A	303,992
WZ2T	A	279,310
N9CIQ	A	254,982
K3WWP	A	179,078
WA6FGV	28	22,700
W7/JR1NKN	21	26,795
KA8NRC/T	21	15,392
KG5U	14	182,268
K2CS	14	40,690
KU7Y	7	37,968
W7DRA	3.5	1,392

MULTI-OPERATOR SINGLE TRANSMITTER

K3WW	8,008,910
N4WW	7,365,848
AJ4Y	6,380,137
KM5G	5,714,410
WO8CC	5,038,660
NC7J	3,779,831
K6ZM	3,682,656
NR6R	3,058,425
NN5NN	3,084,587
WX6V	1,683,180

MULTI-OPERATOR MULTI-TRANSMITTER

NQ4I	14,867,020
NR4M	11,820,768
KTØR	10,464,531
NZ8O	9,935,266
KG6OK	7,930,772
WM1K	7,783,552
WR3L	6,616,122

**Indicates Low Power.*

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CIRCLE 54 ON READER SERVICE CARD

TROPHY WINNERS

SINGLE OPERATOR, ALL BAND

WORLD: Steve Bolia, N8BJQ Trophy. Won by: **Station CN8WW operated by Bernhard Buettner, DL6RAI.**
USA: Dennis Motschenbacher, K7BV Trophy. Won by: **Station WW4T operated by Bill Fisher, W4AN.**
EUROPE: Ivo Pezer, 5B4ADA/9A3A Trophy. Won by: **Sobon Krzysztof, SP7GIQ.**
OCEANIA: Tom Morton, K6CT Trophy. Won by: **Jorg Puchstein, YB1AQS.**
CANADA: Radio Amateurs of Canada (RAC) Trophy. Won by: **John Sluymer, VE3EJ.**
JAPAN: The DX Family Foundation Trophy. Won by: **Hajimu Matsumoto, JR3NZC.**
World Low Power: Steve Bolia, N8BJQ Trophy. Won by: **George Tranos, VP5GA (N2GA).**
USA Low Power: Ron Stark, KU7Y Trophy. Won by: **Ron Sigismonti Sr, N3RS.**
CANADA Low Power: Amateur Radio League of Alberta Trophy. Won by: **Station XJ9DX operated by Andy McLellan, VE9DX.**
Zone 3 High Power: Jim Pratt,N6IG Trophy. Won by: **Station NE6N operated by Doug Brandon, N6RT.**
USA QRP/p: CQ Magazine Trophy. Won by: **James J. Whelan, KX1M.**

SINGLE OPERATOR, SINGLE BAND

WORLD: Pedro Piza Sr, KP4ES Memorial Trophy. Won by: **K Dabrowski, A45XR (21 MHz).**
WORLD 7 MHz: William D. Johnson, KVØQ Trophy. Won by: **Zdravko Balen, 9A9A.**
WORLD 3.5 MHz: Lance Johnson Digital Graphics Trophy. Won by: **Jiri Kral, OK2RZ.**
OCEANIA: D. Craig Boyer, AH9B Trophy. Won by: **Michael Gibson, KH6ND (21 MHz).**
USA: Kansas City DX Club Trophy. Won by: **Station WW4RR operated by Don Binkley, K4WX.**
USA 28 MHz: Bernie Welch, W8IMZ Memorial Trophy. Won by: **Bob Patten, N4BP.**
USA 21 MHz: Wayne Carroll, W4MPY Trophy. Won by: **Station NU5A operated by David McCarty, K5GN.**

MULTI-OPERATOR, SINGLE TRANSMITTER

WORLD: Ron Blake, N4KE Trophy. Won by: **Station CY9RF operated by K4LT & K8RF.**
USA: Austin Regal, N4WW Trophy. Won by: **Station K3WW operated by DL2NBU, DL6RAI & K3WW.**

MULTI-OPERATOR, MULTI-TRANSMITTER

USA: Yankee Clipper Contest Club Trophy. Won by: **Station NQ4I operated by: AA4LR, K2UFT, K4BAI, KS4Q, N1CC, N4VZ, NQ4I, W4DD, W7FB, WA4ILO.**

CONTEST EXPEDITION

WORLD: Ed Roller, K4IA Trophy. Won by: **Station HC8N operated by N5KO, K1EA, K6AW, K9ZO, KM3T, NØJK, N6TV.**

COMBINED SSB/CW
SINGLE OPERATOR, ALL BAND

WORLD: Al Slater, G3FXB Memorial. Won by: **John Sluymer, VE3EJ (VF3EJ).**
EUROPE: Les Nouvelles DX Group Trophy. Won by: **Tine Brajnik, S50A (S56MM).**
USA: D. Craig Boyer, AH9B Trophy. Won by **Bob Shohet, KQ2M.**

Club (SSB & CW)

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

The Northern California Contest Club had 63 entries and racked up 211 million points to shatter the CCF record of 125 million set in 1998. The Slovenia Contest Club finished second with 188 million points (76 entries). In third place was the Bavarian Contest Club, followed by the Contest Club Finland, Potomac Valley Radio Club, and the Yankee Clipper Contest Club. The top six clubs all broke the '98 record.

Just about half of your logs made it into the database for this contest. Over 42,000 different calls appeared, with slightly over 25,000 being "unique" calls and 16,000-plus considered common calls. In *CQ Contest* magazine (May/June issue) you will find a listing of the accuracy champions from the CW contest. These are stations who made more than 200 Q's per band or a total of 200 Q's all band. We've listed down to a UBN rate of 2%. It's surprising how good some of the logs are and disappointing how bad a few of them are. When you make several thousand Q's and have a UBN rate of 15%, that is really sloppy operating/logging and will get your score reduced a whole bunch or get you disqualified. Just a couple of extra seconds to confirm each call or serial number could make as much difference in your score as putting up another antenna. Guessing, or relying on, what you see on the packet screen does not always work in your favor.

Please keep the electronic logs coming. E-mail is the easiest, fastest, and usually the cheapest way to get your log here. If you don't have e-mail, perhaps you can get a friend to send your log, or perhaps your radio club or contest club could do it. It makes my life easier if you send your log as a file attachment instead of pasting it into an e-mail message, especially those who put an advertisement at the bottom of each page. All e-mail logs go to <n8bjq@erinet.com>. You should get a confirmation back within a couple of days of receipt.

Visit Our Web Site

If not, check with me before you resend.

Check the WPX Contest web site at **http://ourworld.compuserve.com/homepages/n8bjq/** for a listing of the logs received, rules, and other WPX Contest related items. If you would take a minute to check to make sure that I have your log in the right category, or that I even have your log, it could eliminate some errors later on. If you can't check it, please ask a friend to look for you.

Each year I, and the CQ Contest Committee, get several complaints of stations running too much power or not adhering to "band plans" or other types of violations. Unfortunately, these are nearly impossible to police, especially from beautiful downtown Thackery. Neither I, the Contest Committee, nor CQ have the resources to allow us to "drop in" to check for violations. After much discussion with K3EST, we have decided that if someone would like to fund us, Bob and I will be glad to "drop in" at various locales to perform spot checks. In all seriousness, though, it is up to the contest community (that's you, guys) to police these types of violations. If you think someone is running illegal power, or operating on 40 meters where you don't think they should, *just don't work them.*

As always, thanks to the folks who help me with this contest. Bob Rossi, NA2X, and Scott Lehman, N9AG, put in quite a bit of time with logs. EA3DU, OH1EH, and the French *CQ* office are collection points for logs. N6AA again worked his magic with the database. Without these guys, I'd have a much tougher time doing this. Work them in the contest and say hi and thanks. I must also thank my wife, Barb, who lets me continue to do this year after year.

The 2000 CW contest will be held on 27 and 28 May. If the trend continues, this year could be even better than 1999. Mark that weekend on your calendar and give the WPX a try. It's fun, there's lots of DX and good rate, and you get points for working everybody. Thanks to all who participate for making the WPX a fun contest. I'm looking forward to (and hoping to) work you in the 2000 contest.

73, Steve, N8BJQ

Random Comments

Three station setup with two manned most of the time. Who needed three with 10 meters dead? Thank you, Mike, WM1K for the use of your call . . . **WM1K**. Beat EU M/M record. Excellent condx. Some WX QRN on the second day and usual shortage of ops. Thanks for calling us . . . **RW2F**. First contest for the old NJ4F crew under new NR4M call. Conditions were super. Fifteen was the energizer bunny—just kept running and running . . . **NR4M**. This station was worked on a ham meeting in order to show visitors how a multi-op contest can be worked. Visitors also had the possibility to take part in the operation . . . **SK7BI**. Many thanks to Mrs Peggy Fraizier (KF6NIA) and Mr. Al Crespo (NH7A) for the opportunity to operate the K6ZM memorial station, for their support and hospitality . . . **K6ZM**. Thanks to Bob, N8NR, and his wife Debbie, KA8CFU, for hosting us again. More antennas are in the works for the N8NR semi-superstation . . . **WO8CC**. Conditions were excellent with 15m open to JA most of the day. Our first attempt at M/S, which would have been more fun without the 10 min. rule . . . **M5X**. A little bit less QSOs than last year, but still managed to make our annual update to the OH record . . . **OH2U**. First time in Multi-Single CW! . . . **IR4T**.

We started 6 hours late because of equipment problems and schedule conflicts. But conditions were great and chief op WX6V was like the energizer bunny; he just kept going and going . . . **WX6V**. My time was very limited. I spent only 14 hours in the contest. Conditions on the LF bands were poor here . . . **G4UOL**. Thank you very much for picking me up in spite of my wordy callsign. **W7/JR1NKN** . . . New

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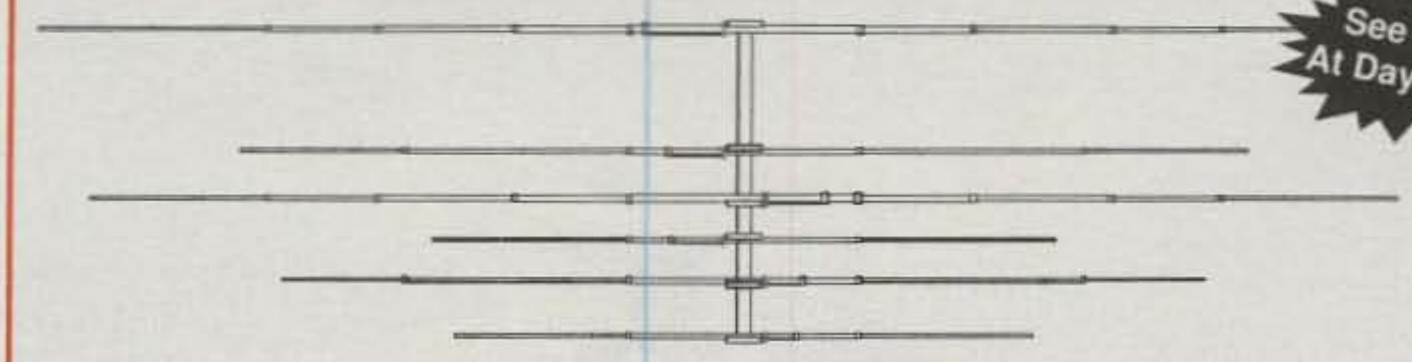

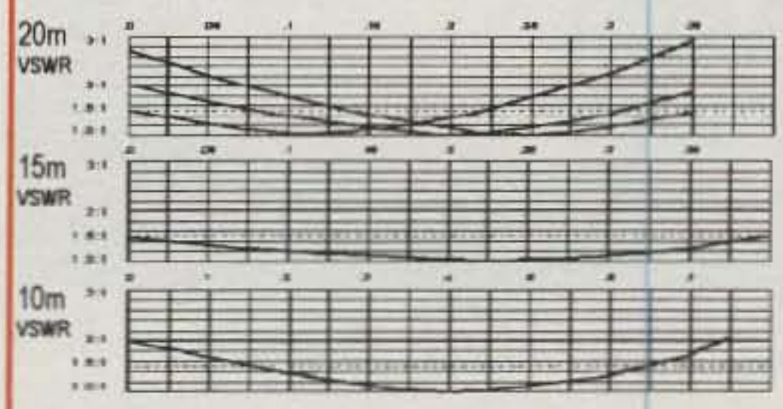

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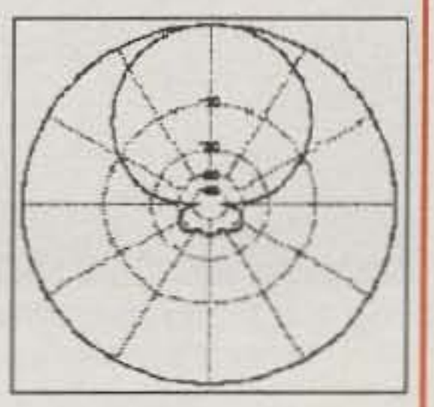

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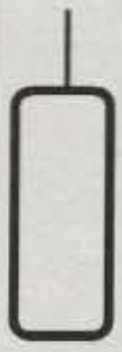

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* Why is the alphabet in that order? Is it because of that song?

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CIRCLE 59 ON READER SERVICE CARD

Doug, K4LT, and Dan, K8RF, took the top spot in the multi-single class from CY9RF (St. Paul Island) with just a tribander (shown) and a 1/4-wavelength, 40 meter vertical.

W9GR DSP-3 worked wonders! . . . **K8CV**. My first contest ever. Had a lot of fun. I wasn't able to work the whole 36 hours. I also learned why everyone says DC receivers are no good for contesting . . . **WT9S**. Operated just for fun for several hours. I lost all antennas in a thunderstorm just three days after the contest . . . **OE2S**. Came down with the flu just before the contest and spent most of the weekend in bed! There is always next year . . . **KU7Y**. Working under air-raid and really danger situation in my town, I decided to suspend contesting with batteries, because we don't have any electricity for few days . . . **YZ7ED**.

My XYL, Janet, brought me my meals, made up the couch for short naps, and brought me coffee. I hope that doesn't put me in Multi-Op! . . . **W8QZA/6**. It's amazing what QRP can do! Thanks to all the great operators with good ears out there! . . . **WA4SQM**. Super, again a new record with only 16 hrs working time! Much better condx than last year . . . **HB9XY**. First contest operation of the new QRP Cheeseheads ARC. Thanks to all for the great initiation . . . **NQ9RP**. Condx were generally good despite occasional QSB. The W stations had especially good ears . . . **PA7XG**. The conditions were poor from Seattle. I tried HC8N at least 100 times, and ZM1A and R1 heard me but could not get my call . . . **W7DRA**. Thunderstorms shut me down twice. Thanks to all the DX that managed to copy my 4 watt signal using the special Welsh prefix . . . **2CØVSW**. Taking part in this contest for the first time, with a special call, and I hope many DX got a new prefix. Many DX stations call CQ test, but never listen to weak signals . . . **ATØU**.

Always pleased to be a multiplier in big contests. They help me build my countries worked . . . **2UØARE**. Neighbors home—QRP diplomatic choice! A challenge, interesting, but patience is a virtue . . . **VE6BF**. Difficult to operate with all those big guns on 80 and 160 when using 5 watts QRP . . . **ON6NR**. Biggest thrill was being asked by HC8N to move down from 21 Mc to 14 Mc and worked right away . . . **2C3KJN**. Scotsmen may use the prefix 2S until end of June because of our new government (which may cost us a *bomb*). Many master.dta users found it hard to accept that I was not GM4SID. Many many logs will have me logged as JS4 because they had never heard of 2S before . . . **2S4SID**. Long-haul conditions were very poor. Medium distances—e.g., to Europe—were good, but there was relatively low activity compared

CW & SSB CLUB COMPETITION

CLUB	SCORE	ENTRIES
NORTHERN CALIFORNIA CONTEST CLUB	**211,120,595**	**63**
SLOVENIA CONTEST CLUB	188,053,910	76
BAVARIAN CONTEST CLUB	145,987,877	33
CONTEST CLUB FINLAND	139,106,151	51
POTOMAC VALLEY RADIO CLUB	**130,096,632**	**71**
YANKEE CLIPPER CONTEST CLUB	128,077,283	73
RUSSIAN CONTEST CLUB	99,456,388	15
FRANKFORD RADIO CLUB	81,298,589	25
RHEIN RUHR DX ASSOCIATION	76,521,058	32
ARAUCARIA DX GROUP	67,391,856	11
URAL CONTEST GROUP	63,216,446	12
MARCONI CONTEST CLUB	63,153,788	18
SOUTHERN CALIFORNIA CONTEST CLUB	53,581,118	21
MAD RIVER RADIO CLUB	47,068,824	8
FLORIDA CONTEST GROUP	43,750,991	17
CROATIAN CONTEST CLUB	42,463,385	22
KAUNAS UNIVERSITY OF TECHNOLOGY RC	40,358,361	23
NORTH TEXAS CONTEST CLUB	40,119,036	18
UKRAINIAN CONTEST CLUB	39,894,731	35
SOCIETY OF MIDWEST CONTESTERS	36,577,095	28
SOUTH EAST CONTEST CLUB	35,450,277	8
LES NOUVELLES DX GROUP	33,982,031	15
SP DX CLUB	32,382,263	27
URE	32,017,037	19
UA2 CONTEST CLUB	31,649,561	4
CZECH CONTEST CLUB	28,430,900	9
RADIO CLUB ROSARIO	27,512,820	5
NORTH COAST CONTESTERS	23,457,903	6
LITHUANIAN DX GROUP	23,191,789	13
HA DX CLUB	22,577,516	3
BADPOWER	22,314,612	3
FLORIDA CONTEST CLUB	21,598,456	3
SOUTHWEST OHIO DX ASSOCIATION	20,616,906	5
TENNESSEE CONTEST GROUP	19,293,635	20
MINNESOTA WIRELESS ASSOCIATION	18,355,963	6
TEXAS DX SOCIETY	16,635,383	10
TUPY DX GROUP	15,910,009	27
GRUPO ARGENTINO DE RADIOTELAGRAFIA (GACW)	16,315,243	9
CRIMEAN CONTEST CLUB	15,064,734	5
GRAND MESA CONTESTERS	13,702,939	11
MOSCOW CONTEST CLUB	13,561,537	3
CHILTERN DX CLUB	13,468,202	3
MT RF	13,138,139	3
CENTRAL ARIZONA DX ASSOCIATION	12,896,062	12
LIMA ALFA CONTEST CLUB	12,711,138	4

CLUB	SCORE	ENTRIES
NICOSIA CONTEST GROUP	11,970,561	4
OK DX FOUNDATION	11,775,886	3
PACIFIC RIM CONTEST CLUB	11,342,959	3
ROCHESTER DX ASSOCIATION	10,908,560	17
WILLAMETTE VALLEY DX CLUB	10,206,577	7
WESTERN WASHINGTON DX CLUB	9,355,021	14
POTOMAC VALLEY RADIO CLUB	9,046,504	4
FAR EAST ISLANDS DX CLUB	8,542,663	4
Z30M CONTEST TEAM	7,973,294	8
UTAH CONTEST CLUB	7,477,707	3
CENTRAL TEXAS DX & CONTEST CLUB	6,862,967	3
LOW LANDS CRAZY CONTESTERS	6,421,393	6
SARAJEVO CONTEST GROUP	6,326,084	8
U.F.T.	6,283,162	3
WESTERN NY DX ASSOCIATION	6,031,573	8
DISTANT COUNTRIES CLUB	5,632,386	4
CAROLINA DX ASSOCIATION	5,265,154	4
TOP OF EUROPE CONTESTERS	5,028,654	6
OKLAHOMA DX ASSOCIATION	4,983,428	5
KANSAS CITY DX CLUB	4,589,747	8
KORYAZHMA DX COMPANY	4,426,034	3
CALIFORNIA CENTRAL COAST DX CLUB	4,300,169	7
GUAYAQUIL RADIO CLUB	3,955,726	3
MARIANA ISLANDS DX ASSOCIATION	3,050,094	4
MISSISSIPPI VALLEY DX/CONTEST CLUB	2,716,239	3
CTRI CONTEST GROUP	2,621,932	4
DX CLUB CENTRAL SIBERIA	2,231,900	3
YEGUA VALLEY CONTEST CLUB	2,287,988	5
SP CONTEST CLUB	2,015,425	15
GADX	2,006,205	3
UR BARCELONA	1,843,507	3
TAGANROG CONTEST CLUB	1,780,277	3
ORDER OF BOILED OWLS	1,630,345	3
VOJVODINA CONTEST CLUB	1,494,740	3
NORTHERN ARIZONA DX ASSOCIATION	971,502	6
WORLDRADIO STAFF AMATEUR RADIO CLUB	855,976	3
GREAT SOUTH BAY ARC	748,289	3
MOTHER LODE DX/CONTEST CLUB	678,263	3
LYNX DX GROUP	624,992	4
YV DXPERTS TEAM	553,253	3
METRO DX CLUB	436,410	4
WEST PARK RADIOPS	414,507	5
NORTHROP GRUMMAN RADIO CLUB	314,524	3
GUARA DX GROUP	231,774	11
ORARI	177,096	3
NORTH FULTON AMATEUR RADIO LEAGUE	69,736	3

CONTINENTAL LEADERS

AFRICA

1.8	No Entry	
3.5	No Entry	
7	No Entry	
14	No Entry	
21	*SU9ZZ	4,905,189
28	5X1Z	4,575,420
AB	CN8WW	13,140,434

ASIA

1.8	4X4NJ	157,014
3.5	UPØL	686,964
7	JA5IP	41,151
14	*RJ9J	2,112,200
21	A45XR	6,557,697
28	OD5SB	1,986,610
AB	C4A	10,196,730

EUROPE

1.8	9A2AJ	140,298
3.5	OK2RZ	805,513
7	9A9A	2,838,132
14	SN2B	3,602,968
21	9A3GW	4,893,108
28	S50U	775,525
AB	SP7GIQ	6,048,240

NORTH AMERICA

1.8	VA1A	103,680
3.5	*W1MK	48,960
7	W3BGN	1,191,840
14	K3EST	2,486,380
21	ZF1A	5,330,129
28	WP3A	1,952,826
AB	WP2Z	12,506,280

OCEANIA

1.8	AH7R	660
3.5	No Entry	
7	No Entry	
14	*VK2AKP	1,851,100
21	KH6ND	6,107,256
28	*VK4ICU	323,722
AB	YB1AQS	6,741,928

SOUTH AMERICA

1.8	No Entry	
3.5	PT2HO	16,416
7	PY7CJN	5,104
14	No Entry	
21	ZY2DX	3,380,762
28	PP5BRV	2,162,944
AB	P49V	8,217,440

MULTI -OPERATOR SINGLE TRANSMITTER

AF	No Entry	
AS	E4/OK5DX	11,753,844
EU	HG1S	9,443,500
NA	CY9RF	13,651,000
OC	ZL6QC	5,199,510
SA	L50UG	5,724,225

MULTI-OPERATOR MULTI-TRANSMITTER

AF	No Entry	
AS	P3A	39,494,534
EU	RW2F	19,150,695
NA	WL7E	18,257,208
OC	No Entry	
SA	HC8N	54,697,072

Larry, AAØBY, operated WØGJ to sixth place in the US in the Assisted category.

to past years . . . **4X4NJ**. First time I didn't work with 9A1A antenna system. I worked first time from beautiful island Hvar (EU 016). Very nice contest location on 400m asl. From this point it is possible to enjoy a beautiful view to the Adriatic Sea and other Croatian islands . . . **9A6A**.

Wish more people could hear me calling CQ with my 80 watts. The new rules made a great contest even better. This score tops my previous personal record of 3.3M in 1997. There were many surprises this year relative to propagation and 15m was fantastic . . . **AA3B**. FB condx, except 10m only open N-S . . . **AA6EE**. Biggest thrill: having VR2BG come back to my CQ saying 'Hi, Don" . . . **AA6W**. I didn't start the contest until 1430Z on Saturday and so missed the fun on Friday night. I thought I had computer problems, but it was the power supply for the CW interface. Conditions were good; just wish I had found the power-supply problem quicker . . . **AD5A**. 95% H&P; lack of JA stations is getting to be a real problem! . . **AD6E**. 15m was incredible! High bands were so good that there was no activity on 160–40 . . . **AJ1I**. 24 hours condition on 15m, good opening. If only I could work more time . . . **BD4DW**. No serious effort this year. Just had enough time to put up an inverted-V for 80m . . . **C4ØM**.

Made some bad mistakes choosing bands—started on 20m, but could not produce good runnings (only 154Q/hr). Should have instead started on 15m (more Q's) or 40m (better value). Didn't force me hard enough to operate more 40m. Only 2 hours at a rate lower than 100 Q's/hr, but not one single hour over 200 Q's. This serial number thing slows down the rate *significantly*. I broke the old African record, but could not break the 5-year-old P4ØW score . . . **CN8WW**. Operated the special call, and put CW9 prefix for first. Thanks to the Uruguayan Radio Regulations Ministry D.N.C. for permit on short time use CW9, and I hope try again with the same call . . . **CW9A**. Too much antenna work to do before the contest, resulting in a very tired operator right from the beginning. Then PA T/R switching started to fail and some antenna problems took away another 2 hours. Finally overslept, and when I wanted to continue the PA had given up completely. That was when I gave up . . . **DF4SA**. What a contest: 10m was totally closed, only a few QSOs to USA, and no Japan. It seems the guys in southern Europe as well as Africa had much more luck DXing on 10m. I worked only the big guns from USA . . . **DK8FD**. Best score since 1994, when I took part in CQ WPX first time. Had a lot of local QRN and QRM, but filters and rig overall worked fine. I need to find better aerial . . . **F/OK1EE**.

Band conditions reasonable, except for extremely bad static on 160 and 80, which prevented me from hearing any DX . . . **G3HZL**. Best contest of the year with plenty to work. The bands were considerably better than last year, with most bands showing activity through the night. Good evidence of greyline DX. As usual, there were a small number who used a ridiculously fast CW speed and either ignored requests to reduce their speed or the other party did not consider their slower calling speed . . . **G3OOU**. As usual, the CQ WPX is great fun, and particularly so now that there are a few more sunspots around. In fact, there were some quite amazing openings during the contest with JA, KL7, and SA audible at most strange times on the HF bands. First SA QSOs on 10m were at 2 AM local. For me, HC8N definitely gets the prize for being by far the loudest and most consistent DX station across all the bands . . . **G3TXF**. First time I've entered under my own call, and boy did I miss my old contest group's linear and tribander. . . . **G4BJM**. My best ever score. Now 82 and very happy with IC756 doing some of the keying for me! Improved my number of QSOs per hour and enables me to keep a computer log and manual log in parallel . . . **G6QQ**.

A last-minute expedition to the Isle of Sark (EU114). Thanks to G3XTT for the first tip, GUØSUP for the second tip, and GU2FRO for his excellent hosting . . . **GUØWWW**. Conditions were great, especially on 15m. In spite of my son's school sports on Sunday, I managed to operate as a single op for 36 hours (hi). But I could not choose the best time for better rates. My best WPX CW score so far . . . **JA8RWU**. The new rule (same country QSO is 1 point) is very good for low band this season. When the old rule was applied, I was watching all night on 160m, but could not have DX QSO! . . . **JE1SPY**. I was so excited to establish the new JA record in SOABHP category . . . **JH4UYB**. My tower and antenna became ready just a day before the contest. The contesting is very different from ZS/3DA land. Extreeeemly fun! . . . **JY9NX**. Strange conditions but really good. Didn't spend much time on low bands because 15 and 20 were open most of the night both nights. Gave my new Force12 antenna a good smoke test and it performed better than expected . . . **KØOU**. Missed some great conditions. I was laid up with a case of Montezuma's revenge until Saturday nite! . . . **K2VV**.

Conditions on higher bands, especially 15m, outstanding. Lost amplifier for four hours. Spent that time S&Ping barefoot while N6CZG rebuilt the bandswitch for me and got the amplifier back on line. Terrible band conditions and other obligations slowed me down . . . **K4IE**. Like the new one-point rule. Livens things up and you don't need to check prefix before answering CQ. Should have done single 15m. My thanks to Ken, K7ZUM, for playing host . . . **K5ZM**. I had set a goal of 1M for myself, and thought it would be easy with the fact that on 40CW I could run JA's, not having to work split like the SSB weekend. I got that wrong! I guess conditions were so good on 15 and 20 that not many folks were on 40! . . . **K6GT**. Having A45XR come back to me first call using my dipole and 100W on 15Mm was a trip! . . . **K8EP**. Only had 20 hours to spend, but 15 was as hot as ever! The addition of 1 QSO point for same country QSOs gave activity a big boost in both modes. It's a winner! . . . **KF3P**. 15m seemed like it would never close! Was very surprised at how well I could run both US and DX with 100W and 25 ft. tribander . . . **KI9A**. Bad echo on 40 and 10 was very poor. No long all-day runs Stateside this year . . . **KL7RA**. Always a fun contest. It's nice to be a rare multiplier . . . **KQ1V**.

Best conditions since 1988. 15 was *fabulous*, but 20 was a struggle, 10 never quite opened to EU, and 40 and 80 signals were fluttery and auroral. Wonderful to hear many Asian/Pacific stations for the first time in years. Very special thanks to Dave, K1TTT, for his camaraderie, hard work, and hospitality in setting up and hosting my operation from his fine station . . . **KQ2M**. The new format certainly helped the West Coast and I may miss the Top Ten as a result. I may have spent too much time on 40 with 538 QSOs, since

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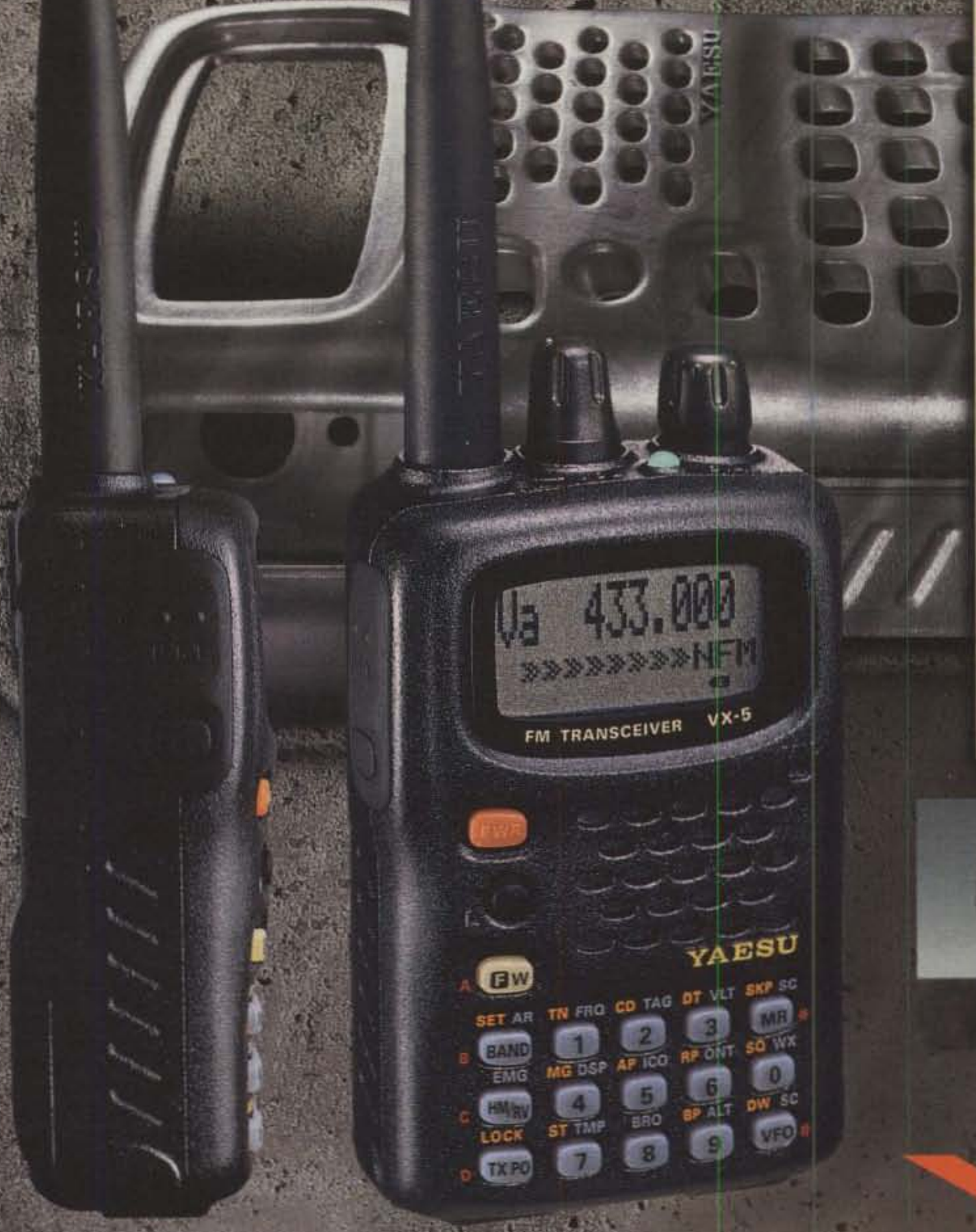

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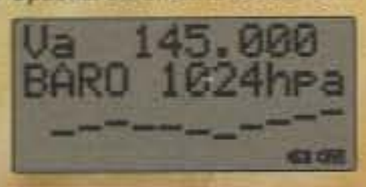

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Frank, DL2CC, operated WP3R to number one in the world in the Assisted category with an outstanding 9.5M points.

20 and 15 were moving fast . . . **KT3Y**. This was supposed to be a Multi/Multi effort, but first it shrunk to M/S and finally degenerated into a single op. 15 meters was a blast; in 45 years of contesting I've never heard 15 perform like that. At the end, I wished to have chosen single band 15m mode.10 was ugly and 40 was rather disappointing; perhaps everyone decided to stick to 15 and 20 . . . **KW2O**. WPX has the best of both worlds, SS and DX rolled into one! Really enjoyed it . . . **KX1A**. A WPX CW weekend: 50 watts in 80m band with thunderstorm, statics, line noise, and a new and very strong BCI. One leg of my dipole folded in the roof and finally helped to my wife with the installation of a new carpet in the bedroom. A perfect contest weekend! . . . **LS7D**.

First time I used new 4-ele beam at LY1PM QTH. It worked nice, but very little activity on 40 this year; on 7 JA worked! . . . **LY2IJ**. Exiting to work A45XR, JU1T, and CN8WW. Also exciting (briefly) to hear a 7Y2, until it turned into a ZY2 on second listen; what a difference a dit makes . . . **N3UMA**. I can never remember such good conditions for this or any summer contest. I'm sure 15 was open all night but too tired to check it out during the wee hours. Worked five HSØ's, two 9M2's, two BD4's, BA4, 9V1, VR2, 4F1, DU3, YBØ, BV7, and many, many Asiatic Russian prefixes. The only complaint was somewhat of a lack of activity from JA, SA, and Oceania (heard one VK). I split the difference between EU and JA with my Yagi Saturday morning and was able to run both for about an hour around 1230–1400Z . . . **N8II**. Propagation was great on the producing bands (15/20/40) for this contest. I really appreciate the TS category for stations on small lots. I'm glad I hung on to my issued call for the WPX . . . **ND5S**. Got the 10m beam up a half hour after start of the contest for a 10m single band try. Worked 18 EU long path, several scatter, and a few direct path. Heard lots of JA's via scatter working SA, but worked only four . . . **NE5D**. Worked the coolest callsign in a long time—YL4U. Many thanks to Dave, K1ZZ, for the use of his station . . . **NT1N**. What a burn-in experience for the new antenna! 15m was just so good that I couldn't stay away. Learned a lot about the capabilities of the Cushcraft ASL2010 Skylog. (Anyone got one and want to compare notes?) I'll be back full time next year with my antenna farm in full bloom . . . **NT4L**.

This was my first WPX CW in 20m single band. 15 was incredible. Run to JA very good on Saturday. Not so high rates but steady flow of Q's. On Sunday daytime (UTC) bands open but rates remained poor. Finally, thanks to Peter, OH5NQ, for letting me use his excellent station . . . **OH5NQ**. No Murphy this year again. Only Mother Nature with thunderstorms and horrible QRN. The only problem was between my keyboard and my chair again (me) . . . **OK2RZ**. A WPX weekend with temperatures up to 87F and two kids screaming to go to the beach—just 100 QSOs as *acte de presence*. I enjoyed the contest very much, and even with my small antennas, I was able to work some NA stations on 40 for some nice 6 point QSOs . . . **OZ1AA**. It is always a pleasure to join in this contest because it gives the opportunity to work new prefixes . . . **PA3BEJ**. Incredible score if you look at my antenna (dipole on 40m) and time on—15 hours! I can't wait to have all station working ok next few months, with 6 element Yagi 10-15-20 and 2 element for 40 meters! Excellent conditions on 15 meters. Have not heard USA on 15m at local morning for ages . . . **RA3XO**. Very nice pleasure to work both contest directors: N8BJQ (two times) and K3EST . . . **RA9AN**.

Nice contest, very strange conditions. Sorry we were not able to work M/S because the lightning destroyed rotors and antennas so we were on two bands only, S5ØU 28 Mc and me on 21 Mc. We had a lot of interference between both stations . . . **S5ØR**. Nice conditions but low activity on 40 from Japan and from EU too. Worked only 207 DX—128 NA, 44 AS (5 JA), 18 SA, 9 AF, and 8 PAC. Target was to make 1000 QSOs. Hope to do it next time . . . **S54A**. Propagation was bad, but contest was very good! Thanks for all who made it pleasure! . . . **UN7RBD**. Next time I'll turn on the 500 Hz filter *before* the contest . . . **V73ZZ**. What a noisy and lonely band this time of year; everybody was up on 15m. Ventured to VE1ZZ QTH again; managed to beat my 13-year-old NA record . . . **VA1A**. Congratulations to the other members of the Great Canadian 15m Horserace. Gus (VO1MP), you have me by a 2% nose! Todd (VF6JY-VE5MX), by a neck! Lali, (VA3RU), thanks for keeping me looking over my shoulder. You just kept closing the gap all day Sunday! . . . **VE3KZ**. This was my 489th contest . . . **VK2APK**. 10m conditions were good from VK, particularly the long path to Europe 21–23 UTC. I lost at least 9 hrs of valuable time when auto picked a bad time to break down, stranding me 80 kms from the QTH. I had fun anyway . . . **VK4UC**.

Weird multi-path signals from Europe in early morning time . . . **VK5GN**. Biggest thrill —working CN8WW. First CN8 in 36 years! . . . **VK6HG**. Enjoyed operating as DX for once. Had to run off emergency battery power for one hour after commercial mains failed . . . **VP5GA**. Operating from station KØRF signing my call was major fun. Thanks, Chuck! . . . **WØUA**. When WQ5L and I exchanged the same number with 2.5 hours to go, I knew it was a competitive contest . . . **W2TZ**. Sounds to me like CW is very much alive . . . **W4XD**. Great contest since it was my best effort to date! Band seemed to be on-again off-again Sunday morning. Mostly S&P, not the JA activity I was expecting. I actually worked more EU than JA; imagine that from the Left Coast!! Even had a short EU run going for a while; nearly beat the small JA run. Still waiting for 10m to really perk up . . . **W6TK**. It doesn't get any easier at age 81 and with severe loss of hearing, but can still enjoy the fun! . . . **W7HS**. Flux was

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150 but still didn't work any EU on 10m. When are the bands going to start acting like the last few solar cycles? . . . **WD6DX**. Outstanding conditions; 15 was open to all 6 continents at the same time in the evening . . . **WI9WI**. Band conditions were noisy throughout. NIR 10 helped a lot . . . **WT8P**.

Where were the JA's on 40? I spent too much time searching for 6 point QSOs, setting up my operating schedule accordingly, and got creamed. This was a high-band contest for sure. Congrats to N6RT for an excellent show! . . . **WV6C**. Without a doubt the best conditions I have ever seen on 15 to western Asia in 35 years on the air. Finally worked BY1DX for my 100th country with the DX suffix . . . **XJ9DX**. I dead my amplifier at 1200Z Sunday . . . **XR1X**. A magnificent power-cut 6 hours before the end of the contest took me off the air! . . . **XV7SW**. The condx were mixed—excellent runs on 10 and 15 into Europe during local night but terrible signal attenuation during daytime. The 15m openings into North America were mostly weak and provided mainly added value to the multiplier score. Nevertheless, some 320 NA stations made it into the log on 15m. At least I've beaten the old SOAB record for Oceania by more than 1 million points . . . **YB1AQS**. Better condx to EU if compared with last year. Many EU's heard, but I couldn't break the signal curtain here. On the second day, one end of my dipole bamboo posts broke down at midnight, but it still works. What a thrilling band! . . . **YCØLOW**.

I went to the mountain again. Top of hill is 1700 asl. Thanks to all for calling . . . **Z31GX**. The target: Oceania all-time record on all bands. The handicap—a vertical 40 to 10 meter installed the day before the contest. The result: *Great fun* and the record! . . . **ZM1A**. Great to finally get a real unique prefix for the WPX contest. Conditions weren't the greatest; barely 13 hours of propagation each day . . . **ZT6Z**.

Station Operators Multi-Op Multi-Transmitter

DF3CB: DF3CB, DL1ZIH, OH2TA. **EA4ML:** EA4AKQ, EA4AMO, EA4DRV, EA4ET, EA4KA, EA4MJ, EA4MS, EA4TX, EA4UA, EB4AKI, EC4AGN. **ES5Q:** ES5MC, ES5MG, ES5QA, ES5QX, ES5RN, ES5RY. **HC8N:** N5KO, K1EA, K6AW, K9ZO, KM3T, NØJK, N6TV. **HG5A:** HA1DDR, HA1VQ, HA1WD, HA1XO, HA1XU, HA1YA, HA1YU, HA1ZN, HA1ZZ, HA3UU, HA5CCC, HA5FM, HA5IW, HA5ML, HA5OM, HA6GK, HA6WX, HA7VB, HA8BE, HA8EK, HA8FM, HA8FW. **HG6Y:** HA3OV, HA6DX, HA6ND, HA6NY, HA6OB, HA6OI, HA6PX, YO5BRZ. **JA3ZOH:** JE3MAS, JI3OPA, JF4FUF, JR4ISF. **KG6OK:** KG6OK, N6HC, W1HIJ, AA6PW, AD6DO, KQ6ES. **KTØR:** WØAIH, K9BGL, NE9U, NØKK, KØEA, KØOB, K9WIE, AA9TK, KTØR. **LT1F:** CX6VM, LU1FKR, LU3FP, LU3FZW, LU5CW, LU5FF, LU5FHM, LU7AWP, LU8DW, LU9AY, LW1EXU. **LY7A:** LY1EE, LY2AO, LY2BMX, LY2CU, LY2FN, LY2KZ, LY2NK, LY2OA, LY3HD, LY4AA, LY3DA, LYR-346. **NQ4I:** AA4LR, K2UFT, K4BAI, KS4Q, N1CC, N4VZ, NQ4I, W4DD, W7FB, WA4ILO. **NR4M:** NR4M, K4EC, K1SE, WA4JUK, K4GMH, K4ZW, K7SV, Daisy.

OL7W: OK1DUT, OK1EP, OK1TA, OK1FDR, OK1FUT, OK1VBA. **P3A:** RA9JX, RZ9UA, UA3DPX, RZ3TX, UA3AB, I2VXJ, UA9CDV, RA9CMO, RW3QC, RX4HW, RU3DX, UT7QF, UN7FZ. **RM6A:** RA6AX, RA6CM, RA6CO, RN6BN, RA6YY. **RW2F:** RA2FA, RA2FBC, RN2FA, UA2FB, UA2FF, UA2FM, UA2FZ. **S54W:** S57NW, S57MW, S59A, S54W, S52EZ, S52ZW, S53O, S51RJ, S57O, S5ØS, S58A. **S56MM:** S5ØA, S51TA, S53CC, S53MM. **SK7BI:** SMØFSK, SM3UTZ, SM6AFH, SM6BGA, SM6CNP, SM6DYK, SM6FKF, SM6LJU, SM7BUA, SM7ENF, SM7RME, SM7SMS, SM7TJC, SM7UTP. **WL7E:** KL5E, KL5T, WA2GO, KL7Y, WL7KY, WL7E. **WM1K:** KB1H, NB1U, K1EBY, AA1CE, KB1DFB, N1XS, WM1K. **WR3L:** W2GG, WR3Z, AA3SC, K3FT, N3NT, WR3L.

Station Operators Multi-Op, Single Transmitter

4G1A: 4F1BYN, 4F1FZ, 4F1CJC, 4F1DMD, 4F1GYE, 4D1PMD, DU1NK. **5P1ER:** OZ8AE & OZ8RO. **9A7A:** 9A4RX, 9A4PA, 9A3OS, 9A3QA, 9A7V, 9A4IC, 9A8A. **AJ4Y:** AJ4Y, K4OJ, KS9O, N3NN, W1CW, W1YL. **CY9RF:** K8RF & K4LT. **DJ7AA:** DJ7AA, DK1BT, DL5LYM. **DKØHY:** DKØHY, DK2USP, DJ5OW, DL2VAH, DL4ML, DL5DXF. **DLØDX:** DL5KUT & DK2OY. **DL3KZA:** DL1KZA, DL3KZA, DL7UVO, DL9GFB, DL9GMN, DL9GRE. **DX1S:** CLUB GROUP. **E4/OK5DX:** OK1DTP, OK1CW, OK1TN, OK2GG. **EM4E:** UR5ECW, UR5EDX, UR5EFJ. **ES2X:** ES2RJ & ES2NA. **HA8KAZ:** HA5TI, HA8PG, HA8PW, HA8IB, HA8MT. **HG1S:** HA1TJ, HA1DAE, HA1DAC, HA1DAI. **HSØAC:** HS1CKC, HS1BZY, HSØVGC, HSØGBI, HS6NDK, E21EIC, E21ENF. **II1R:** I1HJT, I1NVU, IK1CLP, IK1LWL, IK1QBT. **II2K:** IK2BUF, IZ2AVK, IK2SGF. **IO2L:** I2OKW, IZ2ACZ, IK2MLV, IK2NCF, IK2PIG. **IR4T:** IK2QEI, IZ2AAJ, IK4MTF, IK4UPG. **IZ3ASA/3:** CLUB GROUP.

JA5BJC: CLUB GROUP. **JA7YAA:** JG7PSJ, JHØNZN, JE7HLZ, Nakagawa. JE2YHS: JA2OLJ, JR2JVR, JE2WWB, JG2NUD, JR2JPU, JI2XUT, JJ2CEE, JI2CPX. **JJ1ZXE:** 7L1FOH & JP1QGO. **JN4FEU:** JA4KGR, JH4UHW, JE4VVM, JG4CLV, JN4FEU. **JY9QJ:** JY9QJ & JY8SB. **K3WW:** DL2NBU, DL6RAI, K3WW. **K6ZM:** AD6GY, K2KW, K6WG, KE6ELS. **KJØG:** KJØG & KØSX. KM5G: KM5G & N5DX. **L5ØUG:** LU6UO, LU3UI, LU5UAI. **LA1ARK:** CLUB GROUP. **LA1K:** CLUB GROUP. **LA8W:** LA4DCA, LA8SDA, LA9HW. **LT5V:** LU8VCC, LU3VED, LU2YAX. LU8XW: CLUB GROUP. LY2VAD: LY1FZ & LYR-728. LZ9A: LZ2CJ, LZ2DF, LZ2EV, LA2HM, LZ2JE, LZ2PO, LZ2UU. **M4T:** GØVQR & G3VMY. **M5X:** GØIVZ & G4TSH. **MU2K:** ON4AVA, ON4CBV, ON4ON, ON6HH, ON7PQ. **N4WW:** N4WW & KØLUZ. **NC7J:** N7VM, NG7M, W7CT. **NN5NN:** NN5NN, AB5SE, K5OY. **NR6R:** N6KI, K6AM, KU7I.

OE4A: OE1EMS, OE1MCU, OE1SZW, OM3LA. **OH2U:** OH1JT, OH2HE, OH2JTE, OH2LUR, OH2XX, OH7JR. **OH3AT:** OH3FS, OH3NBJ, OH3DC. **OH7M:** OH4LYX, OH4YR, OH4XX, ON6LNI, OH7MHL. **OH8LQ:** OH8LQ & OH8MCT. **OK1KCF:** CLUB GROUP. **OK2KDS:** OK2VWB, OK2HIJ, OK2-22266. **OK3RKA:** OM5DP, OM5XX, OM5MZ, OM7YX, OM2SA. **OL3A:** OK1AY, OK1CM, OK1DX, OK1FCJ, OK1MR. **OL5DX:** CLUB GROUP. **OL5Q:** OK1HRA, OK1FFU, OK1AYE. **OL5T:** OK1MD, OK1FLM, OK1TC. **OM5M:** OM1KM, OM2RA, OM2TW, OM2KI, OM3BH, OM3RG, OM6NM. **OM7F:** OM7PY, OM7JG, OM7IR, OM7AQ, OM3WBC, OM7ARI, OM7ALC.

OT9U: ON4AFU, ON6QR, ON7PC, ON7TK. **OZ5WQ:** OZ1BIZ, OZ3ZW, OZ5WQ. **PA3HBB:** PA3HBB & DF5RF. **RD3Q:** RN3QO, UA3QOQ, RA3NZ, RN3QY, RW3QNZ, RX3QAK, UA3QDK. **RF9C:** RZ9CO, RA9CKQ, UA9CDT, UA9CIR. **RKØSXF:** RUØSN, RUØST, RAØSID. **RK1OWZ:** CLUB GROUP. **RK3QWM:** RU3QD, RA3OU, RA3QH, UA3QFY. **RK3UWA:** RA3UT, UA3UAW, UA3-123-444. **RK9CZO:** RX9CAZ, RZ9CX, RV9CDW. **RK9KWI:** UA9KJ & RA9KM. **RN4LP:** RA4LW, RA4LZ, RN4LP, RW4LE, RU4HP, UA4HTT, UA4LU. **RY9C:** UA9CGA, RW9CF, UA9CR, RA9DD. **RZ4AWR:** RZ4AN, UA4ALI, UA4AIY. **S5ØG:** S57AW & S56M. **S51A:** S51XO & S57PW. **S53DS:** CLUB GROUP. **S57M:** S57M & S59O. **S57XX:** S57XX, S57KM, S58MU. **TI1C:** TI2WGO & TI2CF. **TM4C:** F5NYQ, F5SDT, F5TLF, F6IMS, F6IFY. **TM5AKL:** F5AKL, F5WA, F6CEL, F6ENO. **TM9C:** F5IN, F5LGE, F6DZS, F6FVY. **UA7A:** RU9AN, RU9AZ, RW9MG, RZ9AZ, UA9AJ, UA9BA, UN4L. **UPØF:** UN8FM, UN7FK, UN9FD, UN9FB. **UR3IWA:** UR5IFB, US2IES, UY6IM, UR5IFX, UT3IZ, US1ITU, US2IKL. **UT7Z:** UT4ZO & UYØZG. **VE6SV:** VO1CV, VE6EX, VE6EPK, VE6AKY, VE7AV, VE6NTF, VE6NAP, VE6SV. **WØTT:** WØTT, NØZP, NØAJ, KØMS. **W1AF:** K1XQ, KO1O, K3UOC. **W1SRG:** N1XYR & KE4GI. **W6YRA:** WA6AYI & NK6N. **WO8CC:** N8NR, N9AG, KB8PVQ. **WT1T:** K1WD, WO1N, K1TWF. **WX6V:** WX6V, K6EP, AA6EG, KX7M. **YL4U:** YL2KL, YL3DW, YL2KA. **YP3A:** YO3ND & YO3FWC. **ZL6QH:** ZL1AZE & ZL2BSJ.

(Continued on page 123)

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CIRCLE 85 ON READER SERVICE CARD

CQ Reviews:

The Kenwood TM-D700A
Data-Ready Dual-Band Mobile Transceiver

BY GORDON WEST,* WB6NOA

If you want high-power mobile packet and APRS (Automatic Position Reporting System) hooked into your laptop on the front seat, you will be interested in the results we found with the brand-new Kenwood TM-D700A dual-band mobile transceiver. In addition, when your other half borrows the car, two simple keystrokes of the programmable memory button instantly may turn it into an 800 MHz traffic-watch scanner. Other licensed family members easily can go into the programmable memory selection and run it as a simple dual-bander with the built-in TNC and APRS software locked out—on second thought, maybe locked on in the beacon mode!

Major Features

You don't need to be into packet or APRS right off the bat to enjoy the dual-band capabilities of this radio. In the straightforward mode, it is a high-power 50 watt VHF, 40 watt UHF dual-band transceiver with built-in duplexer, and capabilities to run both bands into separate speakers plus simultaneous band receive for VV (VHF/VHF) and UU (UHF/UHF). Band A can tune 118–136 MHz aeronautical AM, plus 136–200 MHz FM with transmit on the 2 meter ham band. The sub-band can tune 200–470 MHz, with transceive on the 70 cm band and reception on 222 MHz. Band B can be 400–524 MHz FM, 136–175 MHz FM, or 2 meter or 70 cm transceive. The sub-bands can be 300–400 MHz military reception or 800–1300 MHz (cellular blocked) public safety reception, plus a listen in on the 23 cm ham band.

Yes, you can listen to two bands at once, says co-reviewer Julian Frost, N3JF, who notes that the D-700 has two speaker jacks so you can feed each band's audio to a separate speaker.

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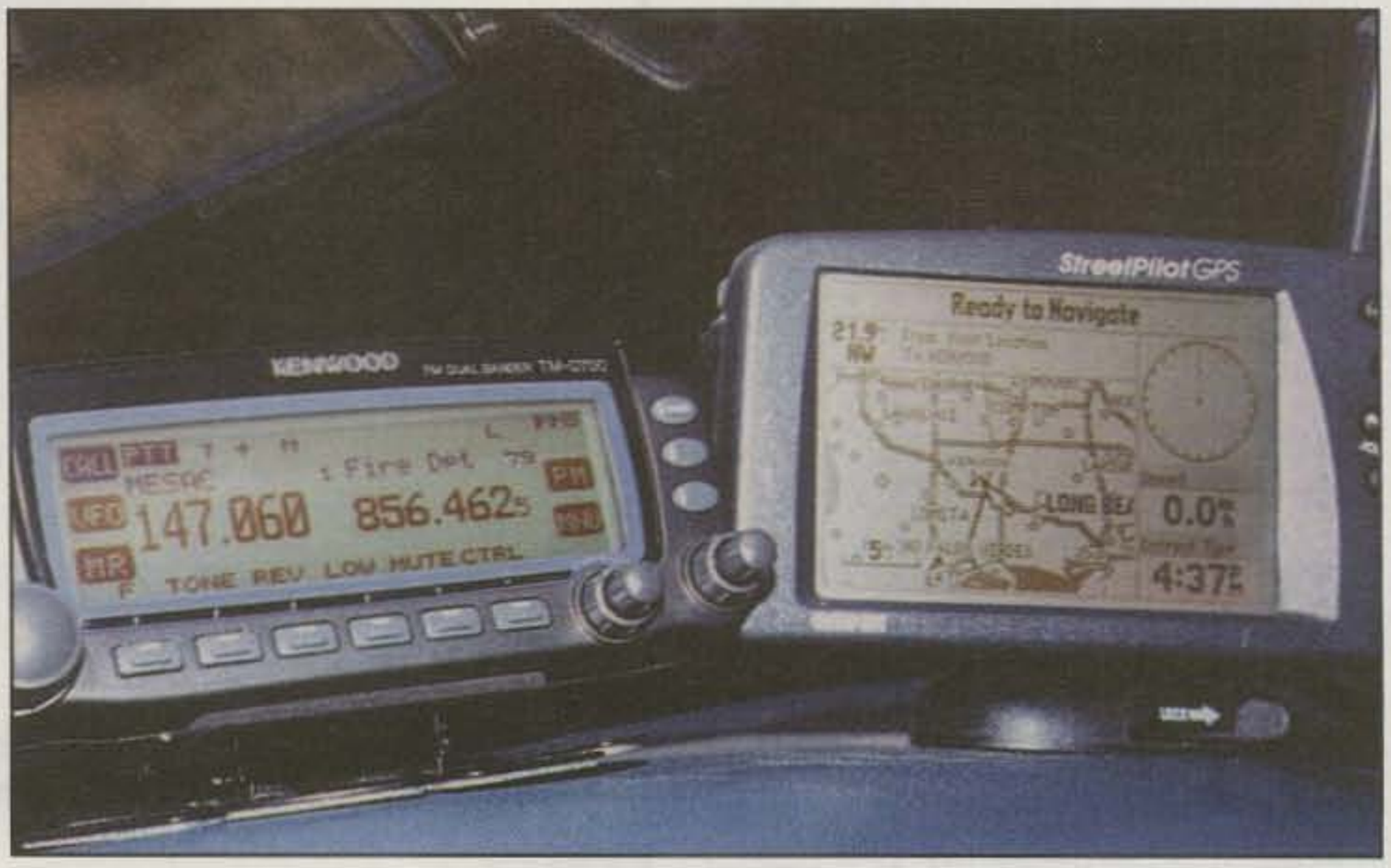
The new D700A has CTCSS (PL) encode and decode, along with digital tone-coded squelch for 104 different DSC tones. Although DSC-reverse is not supported, the radio can be set to scan for the CTCSS or DSC tone that is being used on the currently selected frequency.

The 700's head is fully remotable. In fact, the head *cannot* go onto the body, and a body-to-head separation cable is supplied as standard equipment. Factory-extended extension cable kits are available. However, when you see the telephone-type connections they are using, down at RadioShack you probably will find some very long cables that will work just as well! The Kenwood mic attaches to the body via a coiled cable. If you really need to extend the mic cable, give it an eyeball and you will see that alternate cables and female/female adapters would work well.

The radio body hides under the front seat. There is a single SO-239 antenna

Kenwood's TM-D700A is a full-featured dual-band FM mobile rig with a big plus—a built-in packet controller (TNC) and specialized software for APRS, the Automatic Position Reporting System. (Photo courtesy Kenwood Communications Corporation)



The TM-D700A's control head does not attach to the body of the radio and must be mounted separately. Here the 700 is teamed up with a GPS (Global Positioning System) receiver to plot APRS stations on a map. (WB6NOA photo)

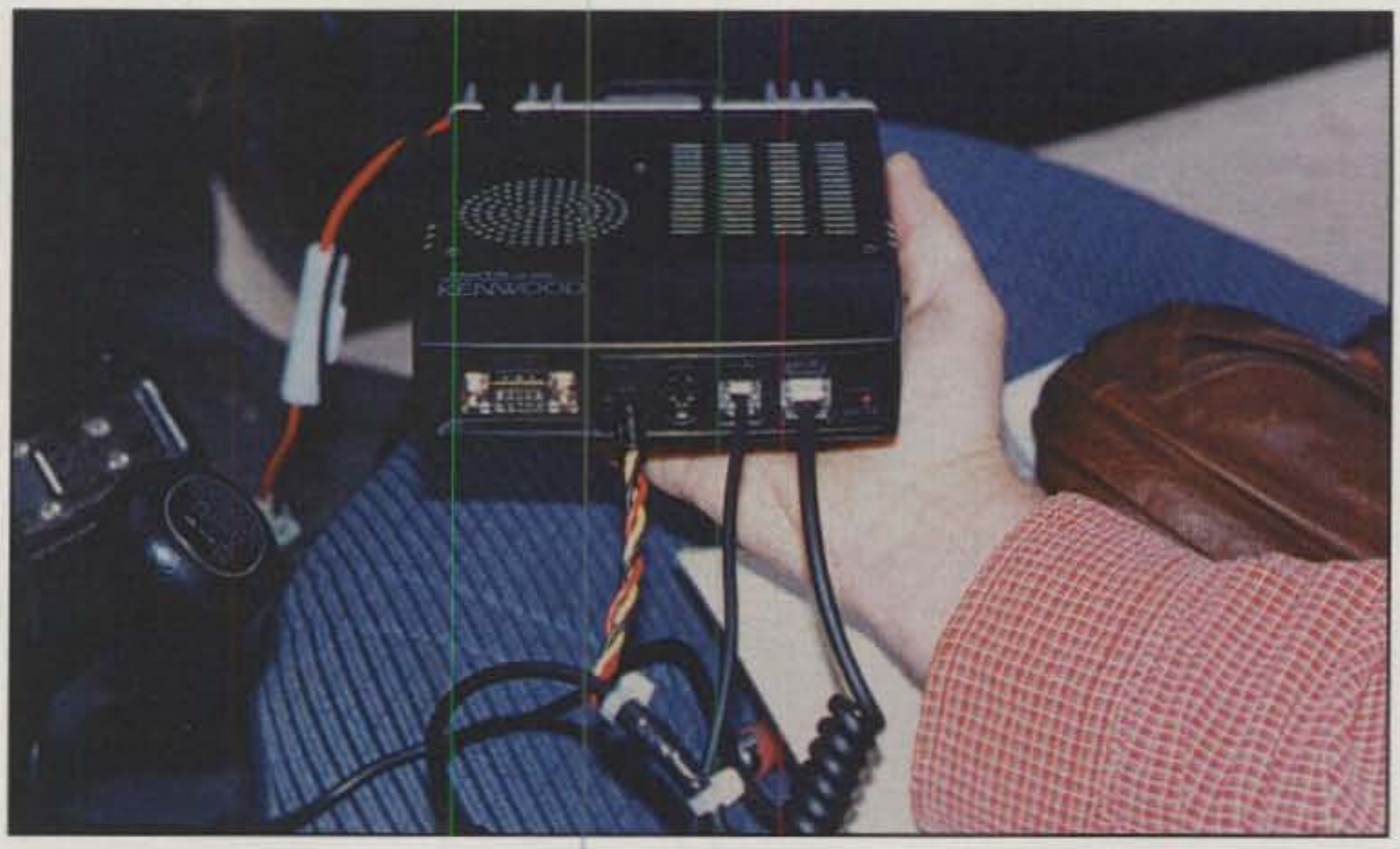
receptacle, thanks to the built-in duplexer. (If you want to use separate VHF and UHF antennas, you will need to get a diplexer to split the feeds.) The LCD display is amber with good 188 × 54 pixel resolution. Brightness and contrast are menu-adjustable, and the LCD panel is used to display a multitude of different pieces of information beyond just the two bands selected.

"I found only one of the buttons on the display head has a fixed function. All others change depending on how the radio is being used," explains Frost. "One of the menu functions allows the user to switch among three different key layouts—one best suited for APRS and two others for the more regular non-digital use," adds Frost.

The 700 has 200 memory channels, all of which are stored in one contiguous bank, much like the D7 handheld. All channels may be computer-loaded or hand-loaded with alphanumeric names of up to eight characters. The channels may hold consecutively any mix of frequencies and bands.

In the memory mode, we discovered the left and right bands will recall all of the memories that each band can receive, with the left band, band A, capable of transmit on 2 meters and 440 MHz. The left can receive aeronautical 118 MHz AM and 300 MHz FM. The right band, band B, can transmit on both 2 meters and 440 MHz, but can also receive on 300 MHz and from 800 to 1300 MHz. "Sub-band receive was not as hot as main-band reception," reports Frost, who says a Kenwood engineer from Japan recommended using band B to scan UHF frequencies and band A to scan VHF frequencies. In the scan mode, scan speed is lightning fast.

The squelch circuit can be automatic or manual, and there's a squelch delay capability of 500 milliseconds to keep it from clamping during data reception.



The body of the TM-D700A can be mounted under a seat or in the trunk. It is connected by cable to the remotely mounted control head. (WB6NOA photo)

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Power Ranges: 15/75W

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4 Position 800MHz Switch
Max Power: 2.5kW PEP/1kW CW
Conns: SO-239

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CIRCLE 45 ON READER SERVICE CARD

APRS messages appear on the main display of the TM-D700A. The voice synthesizer option speaks the callsign of each station received. (WB6NOA photo)

The full-featured mic is back-lit for making autopatch calls, and there are ten DTMF memories for storing phone numbers. The mic also doubles as alphanumeric key entry for memory naming and sending text messages if your computer is not hooked up.

"I liked the visual scan feature," comments Suzy West, N6GLF, who also got to check out the rig. "In the memory mode it showed us traffic on up to 91 of the memory channels graphically." You instantly can jump to any frequency, or change the center frequency for the scan, with just a keystroke.

Digital Features

Now let's talk digital. The built-in TNC (terminal node controller) operates at 1200 or 9600 baud and has regular CMD: mode as well as KISS mode. The TNC has multi-connect capability when using packet, can act as a digipeater, and has a small-scale BBS with 150K of message storage space. If the TNC ever needs updating, it can easily be removed from the inside with just four screws.

"Packet radio operators can connect to the built-in PBBS even while the D700A is in APRS mode," explains Frost. However, he points out there is no front-panel indication that messages are waiting in the PBBS, nor is there any way to retrieve PBBS messages without connecting a computer to the radio via the RS-232 port.

The front panel of the radio body has a male 9-pin RS-232 connector for packet operation via computer control. A 2.5 mm three-conductor plug is provided for GPS (Global Positioning System) input, and we discovered that our current D7A handheld GPS cable worked fine. A 6-pin mini DIN connector for an external TNC or Kenwood Visual Communicator is also provided, and with 9600 baud capabilities this radio can operate on Kenwood's proprietary "fast FM" Visual Communicator mode.

All APRS packets are sent out using MIC-E encoding. The D700A tries to minimize APRS packet duplication by using a mixture of callsign substitution, similar to a KPC3 or KAM, and also by storing a checksum of the last 64 packets received.

"If a new packet arrives that is identical to a packet already digipeated by the 700A or other digipeater less than a half minute ago, the packet will not be retransmitted," explains Frost." The TNC also supports WIDEN-N digipeating as well as SSID digipeating.

"SSID digipeating allows the APRS operator to specify the direction packets should take," adds Frost. The example is a packet that can be sent with the SSID set to –8, –9, –10, or –11, indicating north, south, east, and west, respectively. After the packet has been digipeated by the first digipeater, the SSID is removed. Using SSIDs of greater than 11 results in a packet being sent as "DX" in the specified direction; the SSID is not removed and the packet is digipeated in the specified direction *ad infinitum.*

"D7 handheld users will like the fact that the D700A display does *not* blink when new APRS information is received," points out Frost. "Instead, just a small, black triangle flashes. This makes the information much easier to read, and new station information is announced in CW with the letter N."

When APRS data is received, it can be displayed on a single page by pressing the DETAILS button. On the D7A handheld several pages would be required to display all of the information received. This is another great feature of the D700A, plus it can interface with a GPS receiver at up to 9600 baud, as compared to only 4800 baud on the D7A. The D700A can use several different waypoint formats, the default being nine characters.

"A great feature of the D700A is the ability to store up to five separate operating modes in programmable memories (PM)," points out Frost. When I finally got my hands on the equipment, I found that with PM off, it operates as a regular dual-band mobile transceiver without the TNC active. On PM-1 it is an APRS station that beacons once every 30 minutes. In PM-2 it turns into a mobile APRS station that beacons NMEA (GPS) data every 30 seconds. For PM-3, 4, and 5 I found that Julian reprogrammed much of the same information but on a display that was dimmed for nighttime driving.

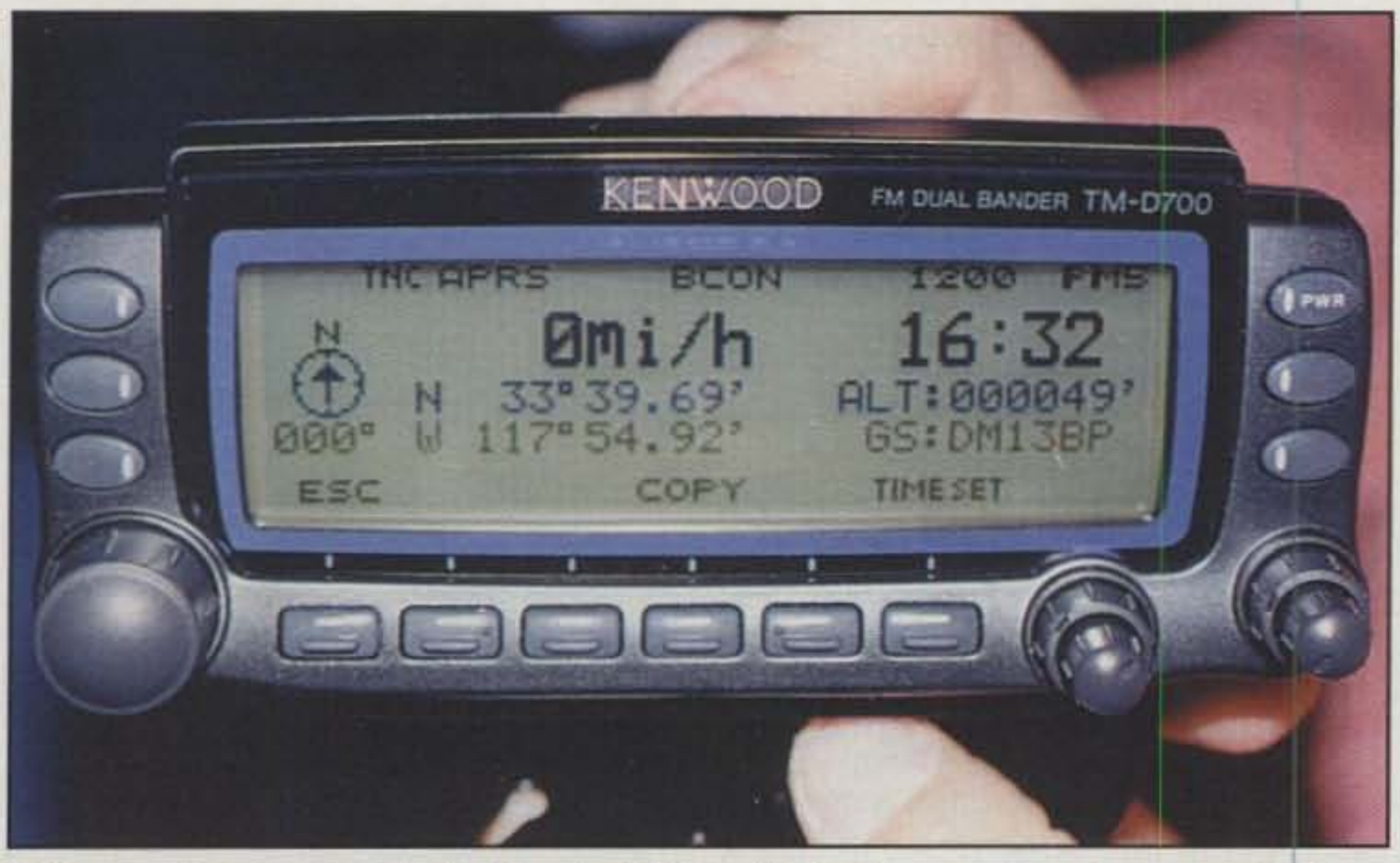
There are five memories for storing individual latitude and longitude positions. Each memory has an alphanumeric tag. All you need to do is recall the position and tell the D700A to use it, and it will beacon that position as frequently it has been told to do so, from every few seconds to 30 minutes.

"If you have a lot of equipment loaded in your vehicle and you don't want to give away your exact position, you can run the D700A to make the GPS coordinates less precise by not including the last one, two, three, or four digits after the decimal in the latitude and longitude data field," comments Jim Ford, N6JF, another active packet operator.

"No One Can Come To the Mic Right Now..."

The D700A takes messages, too! Well, sort of. "These are not messages the text of which you can physically change, but they are designated to mean something pre-arranged between parties. Custom 1 message could mean 'Bring home a pound of spaghetti,' and message 2 might be 'Get home and immediately mow the lawn,'" adds Frost.

The status text in the D700 has been increased to 28 characters, up from only 20 characters on the D7A handheld. The rate at which this status text is transmit-



When a GPS receiver is tied in, the D700 will display your location, speed, direction, and other information, including grid square (if your GPS receiver provides that data). (WB6NOA photo)

ted can now be user-selected from once each time a beacon is transmitted, to once for every eight beacons.

Hearing Voices

Everyone recommends installing the optional voice synthesizer, VS3, and optional plug-in board. It will speak out the callsign of the station sending you a message so you don't need to take your eyes off the road. Frost uncovered an undocumented feature in the ability to use some of the voice synthesizer's word-macros to make sentences of your own. For example, have someone send you an APRS message that says, "%i[7e]u[6b]144[7a]330[60]" (got that?). When you receive the packet exactly typed as indicated, it will say, "I call you on 144 point 330 megaHertz." We suppose there are many more macros available in both English and Japanese which can make up some other very interesting phrases.

A built-in packet monitor allows you to see the exact packet data that is being received. This shows all packets, not just APRS packets. Up to ten such pages are stored at a time, and you can scroll forward and backward through them. However, we suggest you pull over to the side of the road before you try this operation.

On-the-Air Tests

During our test we hooked up a laptop computer to the RS-232 serial connector on the radio and set the computer's baud rate to 9600. The D700A contains a full-featured TNC that retains its settings even when the radio is powered off. The TNC accepts most standard commands, such as "C" callsign, to connect to a station and can also be used in KISS mode. You can use any terminal program to communicate with the built-in TNC. For mobile use, a simple dumb terminal, such as an old Tandy unit with a 4- or 5-line LCD display, is ideal. If you accidentally pour coffee on it, you aren't out your new laptop.

We also operated the equipment with the Kenwood Sky Command system using our other D7A handheld and the Kenwood TS-570D. However, we ran the mobile on lower power so as not to upset the gang on 2 meters with hearing a fast ID and then the high-frequency side of the conversation. (*The FCC is currently reviewing comments on the legality of using 2 meters as part of the Sky Command system.—ed.*)

A Hot Item at Hamfests

"The ease with which it is now possible to become active on APRS makes this radio a winner," concludes Frost. "I plan to use my D700A to send and receive messages to and from home using the APRS system, via e-mail, simply by sending an APRS message to EMAIL and putting in the e-mail address of the recipient on the first line of the message."

Frost continues, "Add a space after the e-mail address and continue with my brief message, and as soon as the message hits an I-gate, it automatically will enter into the internet and be delivered via e-mail, all from my new Kenwood TM-D700A."

For me, WB6NOA, I'll be happy just to run it as a powerful dual-band transceiver with all sorts of scanning capabilities, and give Julian something extra to do when he next jumps into the communications van and we head off for another hamfest doing HF and VHF/UHF demos. The new Kenwood is bound to be a hot item of discussion.

The TM-D700A is list priced at $779.95 and is a product of Kenwood Communications, 2201 E. Dominguez Street, Long Beach, CA 90801 (310-639-5300; <http://www.kenwood.net>). ■

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CIRCLE 101 ON READER SERVICE CARD

What's the right radio to bring with you on a summer vacation? WB2AMU presents an argument for 6 meters as a good balance between portability and DX potential.

A Vacation DXpedition

BY KEN NEUBECK,* WB2AMU

The idea of bringing a ham rig on a one- or two-week summer vacation is often an afterthought. After all, there are numerous other things to worry about—the travel arrangements, what to pack, and planning various activities. Perhaps you might be able to pack the 2 meter HT along with a repeater guide and make a few repeater contacts if time allows.

Unless you're heading out on a DXpedition, few people give much thought to bringing an HF radio because of the amount of equipment needed as well as the wire for antennas. Besides, conditions on the HF bands are not always that great during the summer. Yet with a little bit of planning and selecting the right frequencies as well as the right size radio, there is the possibility of having some real radio fun by making some long-range contacts from a place other than your home QTH!

HF Radio and Vacations

Bringing along an HF radio on summer vacation can be fun under the right circumstances, particularly for those who may not have been involved in DX-type expeditions. In May 1990 my wife and I were able to meet a lifelong goal—going to Hawaii. This was a big thing for me, and I wanted to bring an HF radio to see first hand what it is like to be one of those Hawaiian DX stations.

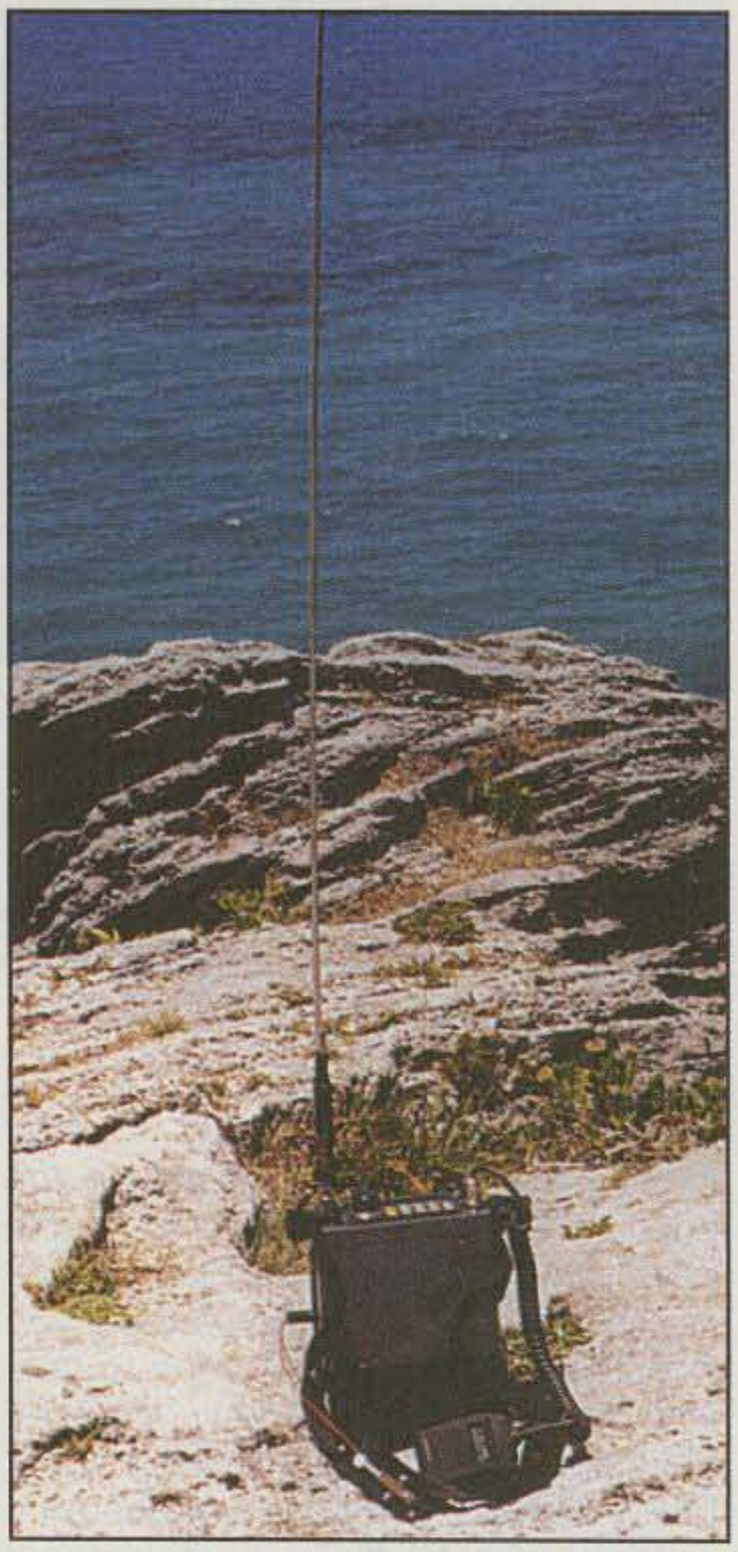
For this trip I packed an FT-440S and a power supply, plus wire for a 10 and 15 meter dipole. I carried the radio in a hard-shell case as part of carry-on luggage and put the power supply in the checked suitcase. The equipment and antenna setup required some work, and both the radio and 20 amp power supply were heavy to carry around. Nevertheless, I had some fun from Kona, on the big island, when I ran a number of QSO strings into Japan and Siberia, plus contacts with some DX expeditions in the Pacific Ocean and Asia. In all I made over 50 contacts during the quiet times of our trip. What was particularly good about the Hawaii trip was the availability of commercial 120 VAC power in the hotel room, along with wide enough balconies to string up a 15 meter dipole. With the advent of smaller radios, particularly those which can operate in a rental car, this type of trip has become much easier. Also, F2-type propagation was still around during the month of May to make long-range contacts seem easy.

Not all trips lend themselves so easily to a decent setup on HF. If you do plan to operate from a rental car, you will need some sort of vertical antenna to a mag-mount base, and this will take up some space in your packing arrangement. If you plan to operate from a hotel room, you will need to bring a power supply for the radio; this will increase the weight of your bags. The power supply in the suitcase on my trip to Hawaii brought a lot of groans from the baggage handlers and limousine drivers. Cruise-ship-type trips bring a different set of constraints when visiting DX islands, particularly if you do not have a rental car or a room on the island. Also, propagation is different on the HF bands as you get into the heart of the summer. (Operating from the cruise ship itself presents its own set of obstacles; mine are discussed below.) Most of all, you run the risk of packing too much gear and annoying the XYL with the amount of radio gear you are bringing. It is with all of these things in mind that I would like to make the case for hams to give serious thought about bringing 6 meters along on certain summer vacations.

The Case for 6 Meters

My wife and I had vacation plans for 1999 that involved a cruise to Bermuda in July. The trip would take a full week, with four days spent in Bermuda. I thought the easiest thing to do would be to take a 2 meter HT for checking in on the Bermuda repeater on 146.080. A friend, Joe, W1JN, had gone through the effort of getting a reciprocal license in Bermuda a few years earlier and found no activity on the repeater during his stay. Clearly, if I were bringing a radio, I would want to be able to make some contacts. Also, I wanted to be able to do this with the least amount of equlpment and effort possible.

The wheels in my head then started spinning. What about a possible 6 meter operation both from Bermuda and the cruise ship? As most 6 meter operators



Here is a low-octane DXpedition, the WB2AMU/VP setup at Tobacco Bay beach in St. George, Bermuda. Six meters was open when Ken arrived on this pile of rocks overlooking the ocean, and he was able to make several contacts in the northeastern US. (Photos by WB2AMU)

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in North America know, the month of July is right in the middle of the summertime sporadic-*E* season that begins in May and ends in August. For those of you who may not be that familiar with sporadic-*E* propagation on 10 and 6 meters, you can run QRP during a strong opening and do very well. Plus, 6 meter antennas are smaller than those for HF bands.

While VP9 is not a rare DX country on most of the HF bands, it is a sought-after contact on 6 meters, as there aren't too many hams on this island who are active on 6. Plus, the entire island is situated in grid FM72, which is also needed by a lot of VHF operators who chase grid squares. When I looked back in my own log, I saw that the last time I worked resident VP9 hams was back in 1991, when I worked VP9HE and VP9IB. Since then, I had only worked W3EP when he was operating there for a week in 1995. It would seem that Bermuda is needed by a lot of hams on 6 meters, more so than some of the other Caribbean islands such as Cuba, Puerto Rico, and the Bahamas.

The cruise to Bermuda would bring a unique set of obstacles for operating a radio either from the ship or on land. Obtaining permission to operate from the ship, the *Nordic Empress*, would be a very involved process. The boat was of Liberian registry and I would need a Liberian license (along with paid membership to a Liberian amateur radio club), along with permission from the ship's captain ahead of time. In addition to the legal obstacles, there were practical considerations. There was no possibility of operating from an interior cabin room that was several levels down from the top of the ship. Where could I string up an antenna? Even if I could set up an antenna on the top part of the ship, there were many radio systems and antennas in the same area that spelled interference problems on both sides. This was a disappointment to me, as the ship would be traveling through a dozen all-water grids from New York to Bermuda, all of which are eagerly sought after by many VHF operators.

It therefore was much easier to focus on operating from the island of Bermuda itself. This presented its own set of obstacles that had to be addressed, primarily involving logistics. I needed a radio that was self-contained with both a power supply and antenna, as I would not be operating from the ship or any readily available commercial power supply source. A portable radio that could operate from a car was out, as you cannot rent a car on Bermuda (just mopeds). Thus, I needed a self-contained radio in order to operate from open areas on the island that could meet all logistical obstacles, as well as having the ability to make some long-range contacts. The best approach was to operate a portable 6 meter radio, such as the FT-690, which has a 2.5 watt output battery pack along with a 1/4-wave whip antenna that connects directly to radio.

Getting permission to operate from Bermuda turned out to be a very straightforward process. Since Bermuda is part of the British Commonwealth, it is not covered by the recent CEPT agreement, so you have to apply directly to the Department of Telecommunications on the island for permission to operate. I was able to get the address for the Department of Telecommunications from the ARRL web page, and I sent a letter requesting a permit six months prior to my trip, in January 1999. I also found a link to an active Bermuda ham, Glen, VP9ID, who helped me track my permit request. (By the way, he has put together a very good web site that can answer all of your questions about Bermuda, and it has a link to the Bermuda radio club; look up <http://www.bermudashorts.bm>.)

In April I received in the mail a three-month permit (no charge) to operate using a reciprocal license. It is recommended that at least three months be allowed for the process of obtaining a license to operate in Bermuda. More time may be required for those of you seeking to operate from other DX islands.

I had some concerns as to how effective my 2.5 watt power setup would be. I had made some contacts over the years on 6 meters using the FT-690 battery pack/whip setup, but even during terrific openings I was never able to break into a pile-up. I even practiced on this radio during some strong openings in June, prior to my departure, to see if I would be able to work at least the strong-sounding stations. I didn't have much luck. However, Rich, W2VU, reminded me that things would be different in Bermuda, as I would be the DX station at the focal point of any pile-up! As we all know, being a rare DX station is worth at least one or two S-units! In any event, I was reluctant to make a really big announcement prior to the trip. I told a few hams, such as *QST*'s VHF Editor Emil Pocock, W3EP, about the trip, and I posted a short announce-

Update on VP9ID

As mentioned in the main article, I received a lot of help from Glen, VP9ID, during my trip to Bermuda. As he had expressed an interest in 6 meters, I ended up sending him an MFJ 9406 radio which I had lying around in the shack. He caught the tail end of the 1999 summertime sporadic-*E* season and worked KP4BZ and KP4EIT in August. However, the story does not end there.

One day when I checked in on the 6 meter liaison frequency on 10 meters (28.885 MHz), I found Larry, W5NZS, who was preparing for a trip to Bermuda. For this trip Larry was going to bring along his ICOM 706 and a 5-element 6 meter Yagi which he would be taking to Glen's QTH to operate. Larry was planning to donate the antenna to complement the MFJ radio. During Larry's visit to VP9ID's QTH, 10 meters was in good shape every day, but 6 was not opening up much.

On the final day of his visit Larry caught an opening during which he worked WA1OUB and W1RMA in New England and then caught Cecil, CT3FT, in Portugal via *F2* skip. As a final shot on 6, Larry used the ICOM 706 to work Glen himself, who was using the MFJ radio that I had sent him. An unplanned addition to Glen's station came up when Glen ended up buying the 706 from Larry. This, along with the 5-element beam, has dramatically improved Glen's 6 meter setup. With this improved setup, during the first part of November Glen was able to work W7RV, W3BTX, KC2TX, W7GZ, N5JHG, EH8BYR, EH7KW, and EH8BPX. Due to interference concerns, Glen is generally using lower power at 40 watts than the 100 maximum power available on the 706, with the exception of one pile-up where he boosted it up to full power to break through.

This story is meant to show how we can help out hams in other countries when we have extra equipment. This is especially important on the 6 meter band, where some countries need better representation. A number of radio organizations (notably SMIRK on 6 meters) have had programs like this in the past, but it only takes one or two hams to make an impact. I have also been getting informal requests from places such as Lebanon, where Gaby, OD5NJ, has a 6 meter antenna but is looking for a radio in "order to activate the Magic Band." If you have extra equipment, please keep this possibility in mind when visiting other countries or when talking to hams from these countries on the air. It really makes a difference, as the above story shows.

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Ken was lucky to find a rock big enough on which to set up. This view of Tobacco Bay beach shows some of his less desirable choices, plus Fort St. Catherine at the far right.

ment on the UK Six Meter Group bulletin board.

WB2AMU/VP9 at Last!

My wife, Fran, and I left New York City for Bermuda on Sunday afternoon, July 4th. In accordance to the number of bags that we were allowed to bring on our cruise, Fran packed a normal-size suitcase and one carry-on. I packed one bag for clothes and carried on a sports bag that contained my radio equipment and camera.

We had a lot of fun during the one-and-a-half day trip to Bermuda, as there are plenty of activities always going on on cruise ships. As I walked around the ship, I saw that it would have been very difficult to do any kind of radio operating, particularly on VHF. As the ship was made of metal, I would have to operate from the top deck and that was surrounded by massive metal structures. In addition, there were a lot of radar antennas, which would generate a lot of interference for any ham operation. I listened once or twice on 6 meters and as expected, I heard nothing. Still, I thought about what it would be like to operate from several all-water grids on 6 meters!

Our first stop in Bermuda was to the lovely resort area of St. George. It was a clear, hot day. We got there at 9:30 AM and did a little shopping together. Then my wife continued to do some souvenir shopping while I went to Tobacco Bay beach, a popular beach in this area. This was a ten-minute walk up several hills. I was carrying the sports bag with my camera, FT-690, 1/4-wave whip antenna (56 inches high), and four beach towels. Some portable DXpedition! At least I had a homemade miniature CW key that saved a little weight and space! The temperature was in the 90s and I was drinking a lot of water and getting a good workout.

As I walked up to Tobacco Bay, I was looking far ahead to scout for any potential operating positions. This is an old habit from my past 6 meter portable and rover operations. As I walked down the last hill, I saw the ideal spot to the side of the public beach—a large rock formation that overlooked the ocean. What was really great was nobody was on it!

I reached the rock at 11:30 AM local time (1430Z) and quickly set up the FT-690 with the whip antenna. As soon as I turned on the radio, I heard a very loud signal in the beacon section of the band. As I knew that there were no VP9 beacons on 6 meters, I was pleased to find out that it was the K2ZD CW beacon from grid square FN20 in New Jersey coming in at 599 plus. Also, I heard the W1RA beacon from Cape Cod. The band was open!

I started scanning the band and could hear quite a few CW signals in the lower part of the band, with maybe one or two stations in the SSB portion, including a station from FN33 who was ragchewing on the 50.125 MHz calling frequency. Then I heard Emil, W3EP, from Connecticut calling CQ on CW and I answered him. I got him on the second

Close-up view of WB2AMU's portable setup. The FT-690 has a self-contained battery and an antenna connector on the front panel. In front of the rig is Ken's homebrewed miniature key.

try; I think he was very surprised to hear me. He gave me a 529 report, which was fine for the setup I was using. Then I heard K2NG from FN13 in New York calling CQ DX on 50.098. I had always wanted to answer one of these CQ DX calls, and I think he was surprised to hear a response. I then ran a small pile-up on frequencies between 50.095 and 50.100 MHz. At one point I heard a wall of sound responding to my puny 2.5 watts. The band was strong, but unfortunately the opening lasted for only 20 minutes. I managed to work ten stations on CW from grids FN13, FN20, FN21, FN31, and FN41. The last station I worked was Mario, K2ZD, the owner of the beacon I'd first heard, and he was also coming into Bermuda at 599.

Now it was time to go back and meet my wife. This involved another ten-minute walk back into town, and after she said she had another hour of shopping to do, I walked back to Tobacco Bay beach with all of the equipment in hand. Unfortunately, the band had dropped out and I heard only the W4CHA beacon from EL88 in Florida. It was fun anyway to listen on 6 meters from such a great location overlooking the pretty blue waters of the Atlantic Ocean on a beautiful day. With the band dead, my wife and I concentrated on swimming in the clear blue waters of Bermuda. Later on during the evening, I still heard the W4CHA beacon along with KP4BZ on CW and KP4EIT on SSB, but signals were not strong enough for me to work anyone with my 2.5 watts.

When I looked back at this particular day, I realized I had benefitted by having not only a strong opening, but by the

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fact that there were a lot of CW stations on the band, something I had rarely seen before, even during VHF contests. (I had never worked ten CW stations on 6 meters in this short amount of time.) As it turned out, many of the CW stations were trying to work DX, as there was an opening at about the same time from the US East Coast into Spain, Portugal, and the Azores. Another factor that worked in my favor was many of these US stations had their beams pointed in a general easterly direction where they could hear me.

I was able to monitor 6 meters at various times during the next two-and-a-half days that I was in Bermuda, usually in the early morning hours and for an hour during the late afternoon prior to dinner. I heard another three openings, with all of the sporadic-*E* cloud formations taking place over the ocean. On the last day I was in Bermuda I heard the K2ZD beacon at 599 at 10:30 AM, but unlike the first day, there were no stations around to be worked. It was two hours before the boat was to leave, and as the battery was flashing low in need of a recharge, it seemed like an appropriate time to quit.

VP9 Operation Conclusions

From the four-day stay in Bermuda I could see that there were many sporadic-*E* openings in which the clouds were over the ocean and would have otherwise gone unnoticed. During my stay I observed five distinct openings of this nature to the US and the Caribbean. This confirmed an earlier suspicion of several years ago when I first observed the sporadic-*E* phenomenon: Many openings occurred over the ocean and often were missed.

One way in which 6 meter operators could spot such openings would be to place a low-power beacon on Bermuda. Such a beacon would be great in spotting many of the numerous sporadic-*E* openings that occur to the east of the US. However, this would only be half of the battle, as it would be even better to have an active operator on 6 meters. I heard no local activity on the band at all during my visit. The addition of operators for the 6 meter band in certain areas would certainly add to the excitement of summertime DXing on 6.

With this goal in mind I contacted Glen, VP9ID, who helped me with my reciprocal license request. I asked him if he would like to give 6 meters a try. I had an extra 6 meter rig, and I made arrangements for him to receive it before the end of the summertime sporadic-*E* season on 6 meters. He started listening on August 2, and finally on August 11 he heard some CW activity. After making a call, he was surprised to hear Tim, KP4BZ, come back to him with a 559 report. Glen also made a second 6 meter contact, this time with Carlos, KP4YA, with a 599 report. Other stations from the Caribbean were heard (VP5, V47), but signals were not strong enough. It is hoped that with Glen and other Bermuda hams becoming active on 6, many more contacts will be made from VP9 to the rest of the world on the band during future *F2* and sporadic-*E* seasons on the band.

I would like to suggest that hams with extra VHF gear consider loaning these rigs to hams in other countries where 6 meters needs representation—even in vacation paradises! The main thing is to stress patience, as it may be some time before stations are heard on 6, something that DX stations may not be used to, compared to what they hear on the HF bands.

It is very tough for most hams to combine both a DXpedition and family summer vacation in one trip. However, a small compromise can be reached if the ham carefully selects times for listening that don't interfere with normal vacation activity. I was able to listen on mornings before breakfast and when my wife was shopping. As far as I was concerned, working several stations from St. George made the trip complete for me, and it didn't matter that I didn't make any more contacts, although I did hear some beacon activity on the other days I was there.

Finally, I would like to point out that the Bermuda trip I made represented the worst-case scenario for a ham, as a light, self-powered portable setup was used in an open area. When you have your own car or a rental car during a vacation, the setup becomes much easier, as the car becomes the station and the antenna is attached by way of a mag-mount.

I would like to recommend that hams bring at least one radio with them during the family summer vacation and seriously consider 6 meters as the first choice, with 10 meters as a second choice. The summer months are better for sporadic-*E* propagation on these two bands. Six meters turns out to be a good choice if you are visiting a rare grid square or remote area that does not have many hams. This can include many parkland areas in the US! Even if the radio is low power, it does not mean that you are shut out from making contacts, because propagation such as sporadic-*E* is very efficient for QRP work, as shown by my Bermuda experience. As I also found out on this trip, operating from another DX country or from a rare grid is definitely worth at least two S-units! ■

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A Look at Amateur Radio Astronomy

BY PHILIP CHIEN,* KC4YER

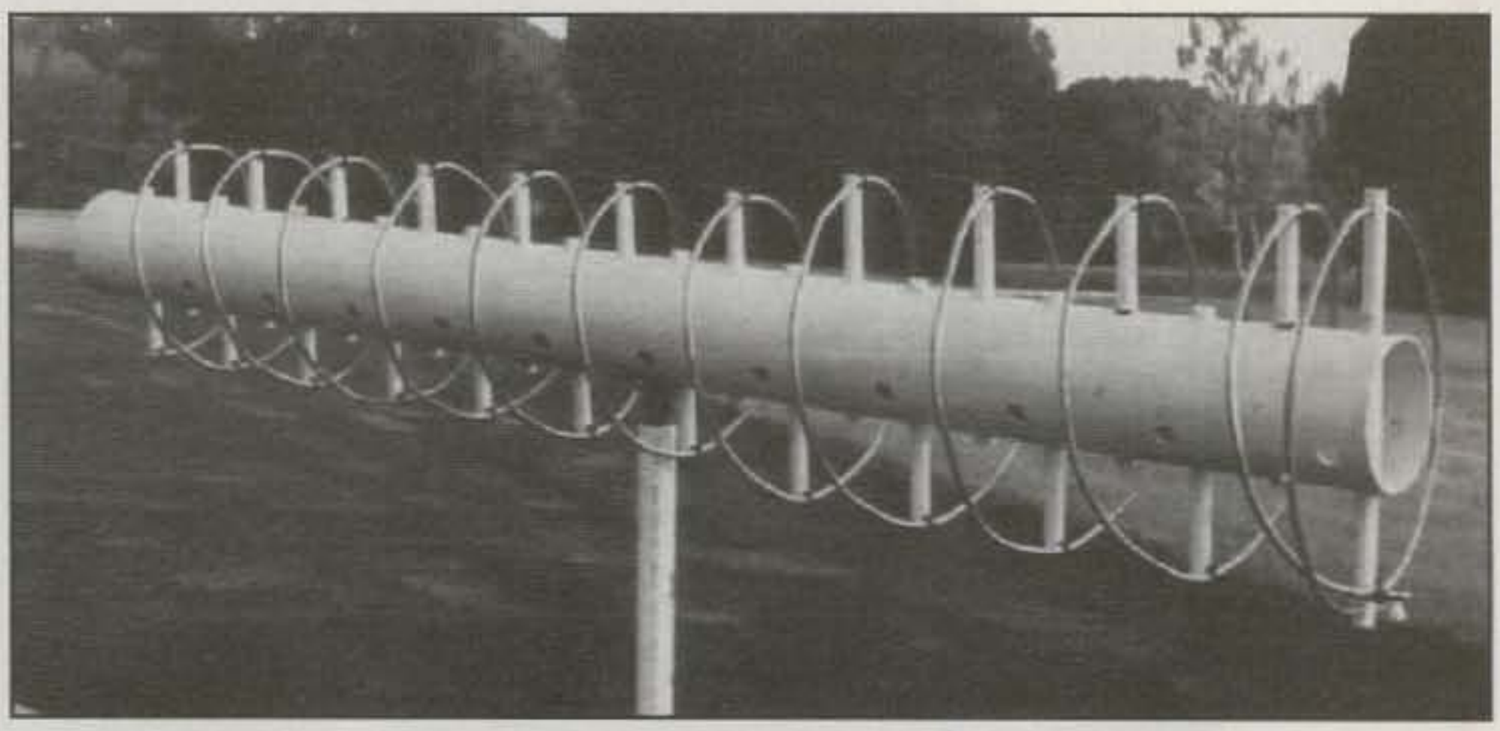
Many amateur radio operators are also amateur astronomers. Why not combine the two hobbies and enjoy both even more? Amateur radio astronomy, not surprisingly, combines many of the skills of amateur radio operators and amateur astronomers. You do not need a degree in electrical engineering or astrophysics to do useful radio astronomy! Some electronics knowledge and skills are highly desirable, though. Mechanical skills, especially if you want to assemble your own equipment, are also useful. Many of the techniques used for visual astronomy (calculating focal lengths, sidereal periods, etc.) are also used for radio astronomy. From a radio astronomer's point of view, every visual telescope—from binoculars through top-of-the-line Keck telescopes—is just a 600,000 GHz receiver (*like our eyes!—ed.*)!

As with many other scientific fields, much of the early work in radio astronomy was done only by amateurs—in this case, by amateur radio operators. Grote Reber, W9GFZ, is widely regarded as the father of radio astronomy. His original home-built dish is now on display at the National Radio Astronomy Observatory in West Virginia.

There are a couple of myths about radio astronomy. You do not need a large piece of property where you can put up a giant satellite dish. While large dishes are used for many types of radio astronomy, you can get by with the old rabbit ears which used to come with television sets. You do not need to be incredibly rich. Much of the equipment is off-the-shelf shortwave radios, computers, and other easy-to-obtain components. Of course, if you do have the skills, the land, and the budget, the sky's the limit. One of the best descriptions of a radio telescope is a satellite dish on steroids. A signal which is marginal with off-the-shelf equipment can be improved with a better antenna, amplifier, filter, or receiver.

While you can listen to your receiver's audio output, the preferable method is to use a computer to process the data. Contrary to Jodie Foster's character in the movie *Contact,* radio astronomers rarely "listen" to the signals they receive.

Home computers have incredible processing capabilities—more than the supercomputers of a generation ago. A typical analog-to-digital converter, the device which converts real-world signals into bytes of information the computer understands, costs about $100 to $500. However, you probably already have a suitable analog-to-digital converter in your computer, which is your $20 sound card. There are several excellent analysis programs available as shareware.



Mike Cook, AF9Y, has plans on his web page, <http://www.webcom.com/af9y/helix.htm>, for building this radiotelescope antenna out of PVC pipe and a copper coil from a refrigerator cooling system. (Photo courtesy AF9Y)

Randy Stegemeyer, W7HR, built this 5 meter dish to use as a radio telescope. For details, see his web site at <http://www.signalone.com/radioastronomy/telescope/>. (Photo courtesy W7HR)

**Satellite Editor, CQ, 779 Merritt Island Causeway, #880, Merritt Island, FL 32952*
e-mail: <kc4yer@cq-amateur-radio.com>

This enables hobbyists today to have equipment which was only available at high-end university observatories not too long ago. The "Resources" box lists several shareware sound-card programs which I've tried and Internet sites where they can be found. Access to the World Wide Web is desirable, but even if you aren't on the "net," there's information available through other sources.

As with visible astronomy, or amateur radio, it's best to start simple and gradually work your way up, adding more equipment and techniques as you gain experience. There are two excellent free guides to radio astronomy on the World Wide Web. The Goldstone Apple-Valley radio telescope is a former NASA Deep Space Network tracking dish which is now used for radio astronomy. It's available on the WWW at <http://www.jpl.nasa.gov/radioastronomy/>.

A high school in England has its own radio observatory. Its web site has "A Practical Guide to Radio Astronomy" by Trevor Hill. Check it out at <http://www.taunton.somerset.sch.uk/trao/radast/index.htm>.

Radio-Sky Publishing (<http://www.radiosky.com>) sells *Radio Astronomy Projects* (225 pages, $20.). Unfortunately, the book assumes that the reader already has a fair amount of experience, and for most readers with that much knowledge the projects would be fairly obvious.

Here are six forms of amateur radio astronomy ranging from fairly inexpensive, simple projects to extremely sophisticated radio telescopes:

Monitoring Meteors On Your TV

I couldn't believe how easy it is to monitor meteor storms on a television set until I tried it. Just hook up an antenna (not cable) to a television and tune it to an unused channel in your area between 2 and 6. Make sure the set's "blue screen" function is turned off (*That's the feature that turns your screen solid blue if there's no signal there.—ed.*). Normally you'll just see static, but meteors will reflect signals from distant television stations. With large meteors you may even see a viewable picture for a couple of seconds. It's an interesting way to count the number of meteors per hour without worrying about getting clouded out or even waiting for sunset.

At one point, meteor scatter (MS) was considered as a possible means of commercial long-distance communications, but was deemed too unreliable. That may change in the future, though, thanks once again to hams. Amateur MS communication using high-speed CW (HSCW) is showing that MS communications is indeed reliable at virtually any time of day; some 12 *billion* meteors enter our atmosphere every day. The combination of HSCW techniques and digital signal processing may force a re-examination of commercial use of MS, especially for data communication. *(For more on HSCW meteor scatter, see two articles by Jim McMasters, KM5PO, in*

And You Thought *Light* Pollution Was Bad

The table in this box shows the internationally protected radio astronomy frequencies. These are the bands where no artificial radio sources are permitted. Unfortunately, this protection is more theoretical than practical. Mother Nature didn't consult anybody when the universe was designed, and there are natural forms of radio throughout the radio spectrum. Some of these are the key frequencies monitored by radio astronomers, but other natural sources can interfere with the signal you're trying to monitor. Artificial radio transmitters are supposed to stay out of the radio astronomy bands, but any transmitter, no matter how well designed, emits some harmonics or sidelobes which can cause interference.

The massive increase in electronic communications in recent years—including pagers, cellular phones, and similar high-tech devices—has caused an extreme crunch on available frequencies, especially ones which have to be assigned on a worldwide basis. The International Telecommunications Union negotiates frequencies for worldwide use. In particular, the new low-altitude large constellation satellites, such as Iridium and Globalstar, are of concern to the radio astronomy community. The astronomical community expressed its concerns that certain critical frequencies remain pristine, but theirs were small voices in comparison to multi-national businesses hoping to catch a piece of the satellite communications market.

Iridium is authorized to operate from 1616 to 1626.5 MHz, just outside of the protected 1660–1670 MHz frequencies. Iridium is supposed to stay completely within its allocation, but there is some leakage. Iridium has reached a compromise agreement with the Arecibo radio observatory in Puerto Rico. The Iridium satellites shut off their transmitters when they pass over Arecibo (about 8 hours each day), and hopefully similar arrangements can be made with other observatories. It isn't a perfect solution, but in this case it's compromise or give up.

Iridium's competitor, Globalstar, has been assigned 1610 to 1626.5 MHz for its uplinks from user handsets to the satellites. This is less of a concern because the transmissions will be going from the ground up to space. Globalstar spokesperson John Cunningham stated, "Our agreement is to operate without interfering with radio astronomers. If they tell us that we're interfering with their observations, then we shut down our transmissions."

What's even more frustrating is one of the key violators of the international protocols was the U.S. government! The first-generation top-secret Navy White Cloud satellites often confused radio astronomers. According to an analysis by a Russian military officer, the satellites transmitted on 1427–1434 MHz. Many radio astronomers have been confused by these signals and more than once suspected a potential UFO before it was determined that the source was in orbit around the Earth in orbits which matched the White Cloud satellites.

It was suggested only half kiddingly that if nuclear war did break out, the first civilians to know would be the radio astronomers because all of their receivers would be swamped by classified satellites which would be used to coordinate strategic activities. Presumably, the military wouldn't consider violating international agreements to protect radio frequencies important during an all-out war!

In my view, the only real solution to protect radio astronomy from artificial transmissions, albeit a long-term solution, is to build a radio observatory on the far side of the moon where 7,000 million million million kilograms of rock will provide a better shield than anything possible on Earth.

Internationally Protected Radio Astronomy Frequencies

21.85–21.87 MHz
73.0–74.6 MHz
150–152 MHz
406–410 MHz
608–610 MHz
1400–1427 MHz (hydrogen line emission)
1660–1670 MHz (hydroxyl line emission)
2.67–2.70 GHz
4.95–5.00 GHz
10.60–10.70 GHz
15.35 –15.40 GHz
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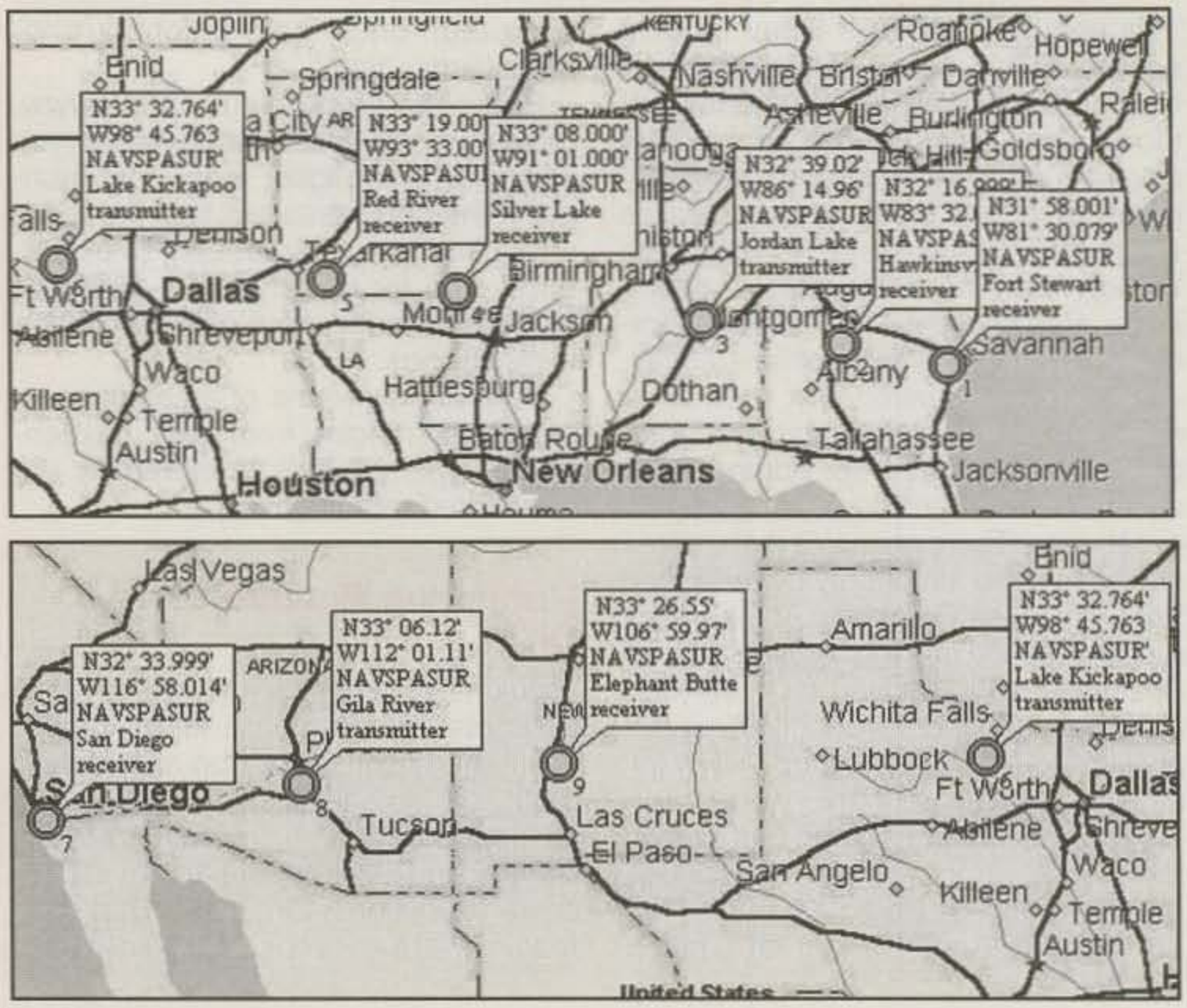

The locations of the NAVSPUR stations. Note that all of the stations are around 33 degrees north, creating a "fence" through which almost all satellites pass several times each day.

QST *[April 1998] and* CQ VHF *[September 1998].—ed.*)

Natural Radio Sources In the Solar System

The solar system's strongest radio sources are the Sun and Jupiter. For most amateur radio applications the sun is considered an annoyance. At solar maximum it causes unexpected skips where radio signals are received thousands of miles away from their transmitters. However, one person's noise is another person's signal. Some amateurs listen to very-low-frequency solar signals using off-the-shelf shortwave receivers.

Jupiter and its interaction with its satellite Io can also be monitored on shortwave from 14 to 38 MHz in AM mode with the greatest intensity from 18–24 MHz. Jupiter has a rather unusual sound; some folks have compared it to waves against a seashore or a "whooshing" sound. You'll need a decent antenna with some gain. While it's highly desirable to mount the antenna outdoors, I successfully have detected Jupiter with an indoor setup. A dipole antenna consists of two 11 foot (approximately) pieces of wire connected to a coax cable with an antenna connector. Directions for making an antenna are available on Radio-Sky Publishing's web site at <http://www.radiosky.com/jupant1.html>.

Another approach is to record the very-low-frequency emissions from objects in space. Just take a piece of wire about 10 feet (3 meters) long and hook it up to the tip of a mini plug (leave the ring unconnected). Plug it into a tape recorder's microphone jack and record. Actually, you're better off using the audio channel of a VCR or a PC with a SoundBlaster card as a digital recorder, since audio tape recorders aren't known for being very accurate. The recording won't have a strong signal—and it will sound like noise with some warbling—but it can be analyzed with a digital signal processing program. You should be able to see peaks at the frequencies where the cosmic object is emitting. In theory, you could plot a graph of frequency vs. intensity where various peaks are the important frequencies where key atoms emit radio signals.

How about listening to the moon on a handheld UHF scanner? Not natural signals from the moon, but reflections. The NAVSPUR radar network is a line of extremely high-power radar stations at 33 degrees latitude across the U.S. It's used to track artificial satellites, and the moon and meteors are just inciden-

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Tuning in "Sparklies" A Simple Radio Telescope

Here's a simple way of using a big satellite TVRO (television receive only) dish as a radio telescope.

For several weeks each year around the solistices, the Sun appears to cross through the "Clarke Belt"—a circle 22,300 miles above the equator where, as predicted by author Arthur C. Clarke, satellites orbit at the same speed as the Earth, making them appear to be stationary overhead. Virtually all commercial communication satellites occupy spots in the Clarke Belt. During those periods, just about *everybody* depending on satellites for TV pictures (as in cable, little dishes, broadcast stations using satellite feeds) will get a lot of "sparklies" in their pictures for a couple of minutes until the Sun moves on to the next satellite. In effect, your satellite dish is a solar radio telescope and those sparklies are "transmissions" from the Sun at 4 GHz trying to overpower that puny satellite in between the Sun and your dish. In theory, you could point the dish at the Sun between satellites (so all of that pesky programming doesn't interfere) and hook up a scanner to the 950–1450 MHz IF loop or 70 MHz secondary IF and "listen" to the Sun.

tal objects in the radar's beam. Twice each month the moon passes through the NAVSPUR "fence," and you'll hear "pings" on 216.98 MHz. The three transmitter sites are located at Jordan Lake, Alabama; Lake Kickapoo, Texas; and Gila River, Arizona. A NASA web site that describes how the *Leonids* were monitored via NAVSPUR is at <http://www.science.nasa.gov/newhome/headlines/ast22dec98_1.htm>.

When should you tune in? That depends on exactly where you're located. Use an EME (Earth-Moon-Earth) program which predicts the moon's location and calculates the geometry for two different locations. Set one location to your QTH and the other to the center NAVSPUR location, and the program should calculate the mutual visibility of the moon. There are several good EME programs available, including W5UN's "Skymoon" and "Moonbrat" programs (<http://web.wt.net/~w5un/>) and N1BUG's "Z-Track" (<http://www.qsl.net/n1bug/>), but I haven't used any of them often enough to recommend one in particular.

Listening to Spacecraft

Amateur visual astronomy includes looking at artificial satellites, so it seems appropriate that amateur radio astronomy should include detecting satellite transmissions as well (although watch-

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ing satellite television probably doesn't really count as a scientific hobby).

Listening to spacecraft in orbit is relatively simple. Many spacecrafts, including weather satellites and some scientific satellites, use unscrambled transmissions which are easily decoded. The HETE-2 (High Energy Transient Experiment) spacecraft, which was scheduled for launch in January, will only pass over its primary ground station once each orbit. To supplement real-time observations, the HETE project is setting up a network of secondary ground stations. Each of these stations includes off-the-shelf antennas and VHF radios connected to the Internet to distribute the data in real-time. Regrettably, HETE's orbit will have an extremely low inclination of just 5 degrees—better for the science, but worse for folks who want to listen to the real-time science beacon. Still, if you're within 25–30 degrees of the equator, it's worth a shot. Check out the HETE WWW page at <http://space.mit.edu/HETE/hete_sgs.html> for details on setting up a ground station.

The Lunar Prospector spacecraft transmitted on a frequency of 2.273 GHz. Its signal was strong enough to be received by fairly simple setups. The record for the least equipment consists of a 45 cm direct broadcast dish, a modified $25 wireless cable downconverter, a radio, and a computer with a sound card detecting the signal.

A bigger challenge is to monitor spacecraft traveling towards distant planets. The Mars Global Surveyor and Mars Climate Orbiter spacecraft tested their Mars Relay beacons after launch, with MGS transmitting on the 70 cm ham band. You need a fairly large antenna or extremely sophisticated techniques to receive the signals, but it's the challenge of detecting such a weak signal that makes it exciting. The web page of amateur radio operator Mike Cook, AF9Y <http://www.webcom.com/af9y/helix.htm> includes detailed instructions for building an antenna out of PVC pipe and a copper coil from a refrigerator cooling system.

High-End Amateur Radio Astronomy

If you have the mechanical skills and electronics knowledge, you can put up a fairly sophisticated radio telescope in your backyard to monitor the "hydrogen line" and bright radio sources. The hydrogen line is the resonant frequency of hydrogen atoms (approximately 1420 MHz) where there are supposed to be no earth-based transmissions (see Table of Internationally Protected Radio Astronomy Frequencies) and where it's speculated that extraterrestrial civilizations looking for company might transmit. Bright radio sources are stars and other celestial objects that emit strong radio signals. The good news is that 10 foot dishes are available for practically nothing in quite a few places. Many people who put up large satellite dishes have decided to convert to smaller direct-broadcast dishes. The old dishes usually are left in place and often are available for the asking, as long as you go to the effort to remove them. As a rule, a mesh dish can be used below its original design frequency. Most home dishes are optimized for 4 GHz (C-Band) reception and work well at the 1.42 GHz hydrogen frequency.

If you're in an antenna-restricted development, you may be able to disguise the dish as a fancy birdbath or something similar. A dish pointed straight up shouldn't cause many objections, but do check ahead of time! As an alternative, if you already have a large satellite dish you can mount a radio astronomy feedhorn next to your existing feedhorn. In receive-only mode it won't cause any interference to your television reception.

The preferred technique is to mount a weather-protected low-noise amplifier and downconverter on your feedhorn. The lower frequency signal is then transmitted into your home with conventional coax cable. A 1.42 GHz feedhorn can be made from an empty 2 lb. coffee can. Just drill a hole at the proper location and solder on a coax connector with the appropriate-length probe. (If the words "drill" and "solder" are alien to you, this probably isn't the route you should take.) Descriptions of a more sophisticated version are on the SETILeague's web site at <http://www.setileague.org/hardware/feedchok.htm>.Randy Stegemeyer, W7HR, who has a lot of mechanical and electrical skills, has put together a 5 meter dish he uses as a radio telescope. He has a web page at <http://www.signalone.com/radioastronomy/telescope/> showing what he's done and the signals he's recorded.

SETI With Your Backyard Satellite Dish

The ultimate accomplishment for any radio astronomer, amateur or professional, would be to receive a verified signal from extraterrestrial intelligence. The Search for Extraterrestrial Intelligence (SETI) has received a bad rap, both within and outside of the astronomical community due to some pretty bogus scams. More often than not, SETI unfortunately is linked with flying saucers. SETI is a legitimate form of radio astronomy, however.

The key thing to remember with SETI is that the odds are incredibly long, but even if you don't succeed, you'll have plenty to do and learn a lot in the process. If you put together a radio astronomy setup solely as a SETI station, you almost certainly will be disappointed. If you assemble a setup which will do SETI in addition to other forms of radio astronomy, though, you will gain a lot of enjoyment and knowledge, and maybe, just maybe, you will be lucky enough to be the person who receives an extraterrestrial signal.

To date, the only potential reception of a SETI signal is the famous "Wow!" signal received by Ohio State University's "Big Ear" radio observatory. Volunteer (now Ph.D. radio astronomer) Jerry Ehman looked at the printouts from the night of August 15, 1977 and saw something completely unexpected: In the middle of a bunch of typical low-intensity hits from the sky he saw an intense signal. He circled it with a red pen and wrote "Wow!" It perfectly matched what would be expected from a point-source signal from space. That innocuous signal has been studied for the past two decades for possible explanations. The "Wow!" signal even appeared in an *X-Files* episode. "Wow!" was clearly coming from outer space and did not match the orbital characteristics of any known satellite. No other plausible explanation has ever been given as to its origin. However, all of those negatives don't make it a successful SETI contact.

Unfortunately, the Big Ear was dismantled a couple of years ago because the land was more valuable as a golf course. Thus, instead of scientific education, Ohio now has a larger golf course. So it goes. Amateur radio telescopes today have the same sensitivity as the Big Ear did in 1977. The OSU Big Ear had a sensitivity of –204 dBm, which was excellent for the time. Advances in electronics, with GaAsFETs (Gallium Arsenide Field Effect Transistors) and MMICs (Monolithic Microwave Integrated Circuits) routinely used in consumer electronics, and the number-crunching capabilities of microcomputers have improved radio astronomy to the point where amateurs can perform sophisticated science. (Obviously, similar improvements have increased the performance of professional radio observatories, too.)

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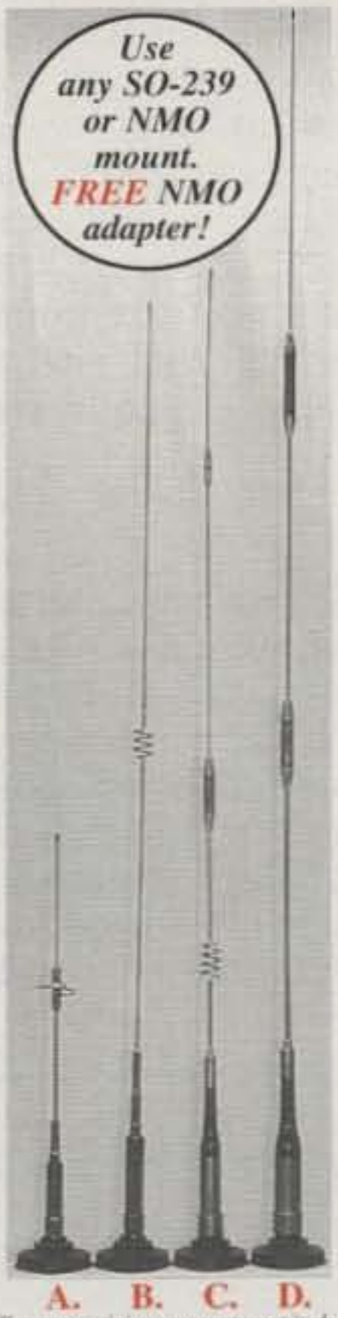

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They feature the finest quality construction using precision machined components. *RuffRiders*™ battle the elements, handle rugged rides and day-to-day highway abuse.

Stacked elements with high-Q phasing coils give you outstanding gain. Stay in solid contact!

Phased Radiators

Phased radiators flattens the radiation pattern and concentrates your power to give you *super gain.*

High-Q phasing coils are housed in weather proof high-tech plastic insulation. They're attached to stainless steel stacked radiators by solid metal end sections.

Heavy Duty Base

Rigid, heavy duty solid metal base reduces SWR flutter due to wind vibration. Two Allen set screws securely fastens radiator.

Specially treated center pin provides excellent electrical connection.

Quickly screws off -- helps prevents theft of your expensive rig.

Use SO-239 or NMO Mounts

RuffRiders™ have a PL-259 base mount for quick installation to your heavy duty SO-239 magnet, trunk/hatch, gutter or mirror mount.

A *free* NMO adapter is included for use with an NMO mount.

MFJ mounts are recommended.

All MFJ *RuffRiders*™ are dual band 144/440 MHz antennas and factory tuned for SWR less than 1.5:1 and have 50 Ohm impedance.

MFJ's *No Matter What*™ Warranty

All *RuffRider*™s are covered by MFJ's famous *No Matter What*™ one year limited warranty. MFJ will repair or replace (at our option) your antenna for one full year.

Choose from several different length and gain antennas . . .

A. ***RuffRider Junior*™.** Premium, short 16½" antenna fits in any garage on any auto. ¼ Wave on 2 Meters, ½ Wave, 3 dB gain on 440 MHz.100 Watts. No fold-over.
MFJ-1402 **$34.95** add s/h

B. ***RuffRider High Power*™.** Just 40" long handles full *200 Watts*. Great for high power mobile amp. ½ Wave, 3 dB gain on 2 Meters, ⅝ Wave, 5.5 dB gain on 440 MHz.
MFJ-1412 **$49.95** add s/h

C. ***RuffRider High Gain*™.** 41½" long antenna gives extra gain with little height increase. Handles 150 Watts. ½ Wave, 3.2 dB gain on 2 Meters, ⅝ Wave, 5.7 dB gain on 440 MHz.
MFJ-1422 **$49.95** add s/h

D. ***RuffRider Hyper Gain*™.** 62½" brute gives a whopping 5 dB gain on ⅞ Wave 2 Meters, ⅝ Wave, 7.6 dB gain on 440 MHz. Our highest gain antenna. Handles 150 Watts.
MFJ-1432 **$69.95** add s/h

144/440 MHz Antenna Tuner with *built-in SWR/Wattmeter*
Covers 136 to 175 MHz. Handles 150 Watts. Compact 4x2½x1½".
New! MFJ-922 **$79.95**

MFJ *RuffRider*™ super heavy duty Antenna Mounts

Trunk/Hatchback *Lip* Mount

MFJ-345 Lip Mount is shown mounted vertically to a mini-van's angled hatchback lip. Note extra-wide mount with reinforcing tab at right -- safely secures heavy antennas. Swivel mount is adjusted so antenna is near vertical away from mini-van to clear luggage rack.

MFJ-345 **$34.95** add s/h

MFJ's *RuffRider*™ super heavy duty solid steel Trunk/Hatchback *Lip* Mount mounts to any lip on your vehicle.

Extra-wide *four* inch lip and large reinforcing tabs on each side safely distributes the load over your vehicle's lip.

Two large set screws on each end of the mounting lip locks your mount in place. A scratch-proof rubber guard protects your vehicle's finish.

Secures large VHF, UHF and medium size HF antennas even at highway speeds.

Mounts on lips at any angle. Two axis of rotation lets you position your antenna vertically, horizontally or at any desired angle. Serrated swivel joints locks securely in place with huge 3/8 inch set screw.

Has SO-239 base mount. Use adapter for NMO. Includes low loss coax with PL-259 connector, Allen wrenches and protection caps for SO-239 and locking screw, One year MFJ *No Matter What*™ limited warranty.

Mirror/Luggage *Pipe Clamp* Mount

MFJ-340 Pipe Clamp Mount is shown clamped solidly to vertical mirror support rod on a pickup truck. Antenna is slightly swiveled to the left and positioned about 30 degrees from vertical to clear cab of the pickup truck.

MFJ-340 **$34.95** add s/h

MFJ's *RuffRider*™ Mirror/Luggage *Pipe Clamp* Mount mounts on support rod of mirror, luggage rack or spare tire carrier of your truck, van, RV or SUV. Mounts on any horizontal, vertical or angled rod or pipe up to 5/8 inches in diameter.

Secures VHF, UHF and medium size HF antennas even at highway speeds.

Two axis of rotation lets you position your antenna to any desired angle. Serrated swivel joints locks securely in place with huge 3/8 inch set screw.

Convenient *Thumb and Finger* turn knob makes fold-over operation quick and easy. Locks in twelve positions.

Fold down your antenna at night when pulling into your garage and quickly put it back up to its operating position in the morning.

Has SO-239 base mount. Use adapter for NMO. Includes low loss coax with PL-259 connector, Allen wrenches and protection caps for SO-239 base mount and locking screw, MFJ's famous One year *No Matter What*™ limited warranty.

MFJ's *MaxStrength*™ Hi-Flux Antenna Magnet Mounts

MFJ-333 **$14.95** add s/h
MFJ-335 **$19.95** add s/h

MFJ's *MaxStrength*™ high-flux magnet mounts give you maximum pull strength -- your antenna stays on top of your vehicle at highway speeds.

Base is *Euro-style*, black poly or chrome finish with a Mylar protective undersheet.

MFJ magnet mounts come with 17 feet of tough RG-58 coax with a PL-259 connector. Easily reaches operating position.

Choose your favorite antenna to go with these fabulous low-profile mounts for outstanding mobile performance.

MFJ-333 BS/BM, $14.95. Light to medium duty magnet mount. Low profile 3.5 inch diameter black base weighs 1½ lbs. For small to medium size antennas.

MFJ-335 BS/BM, $19.95. Medium to heavy duty magnet mount. Super strong 5 inch diameter *chrome* base weighs a husky 2½ pounds. For medium to large size antennas. It's perfect for MFJ's *RuffRider*™ High Gain mobile antennas.

Order BS for SO-239 connector.
Order BM for NMO connector.

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CIRCLE 98 ON READER SERVICE CARD

READER SERVICE CARD

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Antenna Software by W7EL
EZNEC ("Easy-NEC") captures the power of the NEC-2 calculating engine while offering the same friendly, easy-to-use operation that made ELNEC famous. **EZNEC** lets you analyze nearly any kind of antenna - including quads, long Yagis, and antennas within inches of the ground - *in its actual operating environment*. Press a key and see its pattern. Another, its gain, beamwidth, and front/back ratio. See the SWR, feedpoint impedance, a 3-D view of the antenna, and much, much more. With 500 segment capability, you can model extremely complex antennas and their surroundings. Includes true current source and transmission line models. Requires 80386 or higher **with coprocessor**, 486DX, or Pentium; 2Mb available extended RAM; and EGA/VGA/SVGA graphics.
ELNEC is a MININEC-based program with nearly all the features of EZNEC except transmission line models and a limitation of about 127 segments (6-8 total wavelengths of wire). Not recommended for quads, long Yagis, or antennas with horizontal wires lower than 0.2 wavelength; excellent results with other types. Runs on any PC-compatible with 640k RAM, CGA/EGA/VGA/Hercules graphics. Specify coprocessor or non-coprocessor type.
Both programs support Epson-compatible dot-matrix, and HP-compatible laser and ink jet printers.
Prices - U.S. & Canada - EZNEC $89, ELNEC $49, postpaid. Other countries, add $3. VISA AND MASTERCARD ACCEPTED.
Roy Lewallen, W7EL phone **503-646-2885**
P.O. Box 6658 fax **503-671-9046**
Beaverton, OR 97007 email **w7el@teleport.com**
CIRCLE 72 ON READER SERVICE CARD

While you *can* perform a SETI search on your own, the odds are improved with a coordinated effort. The SETILeague's Project Argus has a goal of setting up 5000 radio telescopes worldwide, each pointed toward a different point on the celestial sphere. There is only a handful of stations in operation at present, but the League's membership is growing and many have expressed an interest in setting up systems. If the SETILeague does succeed in setting up 5000 radio telescopes around the world, it would be the world's only omnidirectional radio telescope!

Unfortunately, the League's reputation, and SETI in general, were hurt a while back when hackers got into the League's mailing list and put out a bogus release claiming a positive contact. The SETILeague quickly put out a retraction and explained what happened, but the damage had already occurred. If you do decide to get involved with SETI, please practice good science and follow the Project Argus guidelines which are posted on the SETILeague web site at <http://www.setileague.org>. Even if you aren't interested in listening for aliens, the SETILeague has an excellent set of freeware radio astronomy spreadsheets available on its web site at <http://seti1.setileague.org/software/spreadsh.htm>.

Summary

Radio astronomy has as many different forms and approaches as amateur radio. This article only scratched the surface of some forms of amateur radio astronomy. If it piqued your interest, check out some of the web sites listed here and give it a try. Remember: You can start out very small, perhaps even with equipment you already have. Good DX! ■

Resources

Here is a listing of some shareware sound-card signal-analysis programs available on the World Wide Web:

FFTDSP—DOS program for pulling weak signals out of the noise <http://www.webcom.com/af9y/>.

WINScope—software two-channel oscilloscope <http://polly.phys.msu.su/~zeld/oscill.html>.

Several programs for determining audio frequency, plotting spectrograms, and other functions are available from the NASA Goddard Amateur Radio Club FTP site at <ftp://garc.gsfc.nasa.gov/pub/dsp/>.

The following site has links to many amateur radio sound applications. Many are quite useful for radio astronomy applications, too: <http://www.muenster.de/~welp/sb.htm>.

For more information on amateur radio astronomy, contact the following:

American Radio Relay League (ARRL), 225 Main St., Newington, CT 06111 (phone 860-594-0200; fax 860-594-0259; <http://www.arrl.org>). The ARRL's publications are oriented towards amateur radio bands, but all of the principles also apply to other radio activities, including radio astronomy. Suggested titles include *The ARRL Handbook* and *The Radio Amateur's Satellite Handbook*.

Radio-Sky Publishing, P.O. Box 3552, Louisville, KY 40201-3552 <http://www.radiosky.com/welcome.html>. A small-press publisher with several books on radio astronomy. Some free software is available on their web site.

An Introduction to Modern Astrophysics, Addison-Wesley Publishing Company Inc., Reading, MA. Only a small portion specifically about radio astronomy, but excellent theory and practical applications for astronomy in general. College level textbook which assumes calculus knowledge.

An Introduction to Radio Astronomy, Cambridge University Press Cambridge, United Kingdom, New York, NY. A fairly technical overview of radio astronomy. Mostly theory, no applications or projects. Good if you're interested in the science behind radio astronomy.

High-Sensitivity Radio Astronomy, Cambridge University Press Cambridge, United Kingdom, New York, NY. College graduate level technical papers on different aspects. Very technical.

SETILeague, Inc., 433 Liberty Street, P.O. Box 555, Little Ferry, NJ 07643 (phone 201-641-1770, 1-800-TAU-SETI; fax 201-641-1771; <http://www.setileague.org/>; <http://www.ac6v.com/pageaas.html>). An excellent web site with links to many different radio astronomy sites.

<http://www.bigear.org/6equj5.htm> explanation of the Wow signal.

<http://adc.gsfc.nasa.gov/mw/milkyway.html> A map of the Milky Way in several different bands, radio through gamma. A free poster is available by request.

<http://www.din.or.jp/~m-arai/ms/leonids/98leoe.htm> One amateur's (JN1GKZ) reception of the *Leonids.*

<http://www.naic.edu/> Arecibo, the world's largest parabolic dish, made famous in the movies *Goldeneye* and *Contact.*

<http://www.nrao.edu/> The National Radio Astronomy Observatory—links to many major NRAO telescopes, including the Very Large Array, also featured in *Contact.*

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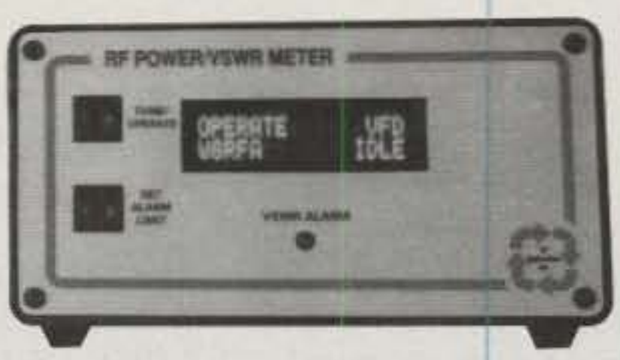
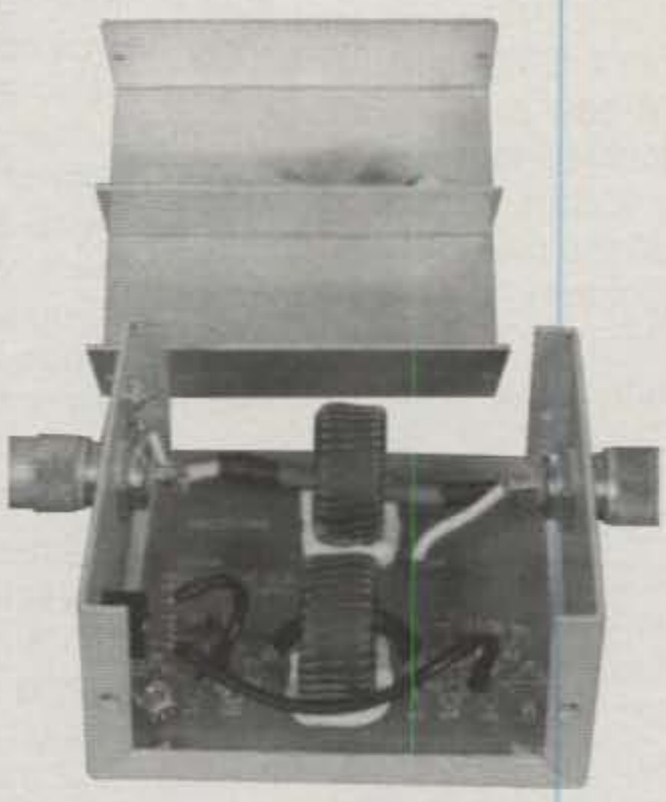
We can even *personalize* your wattmeter with your callsign (11 characters maximum). The Vanity Option is supplied as a separate chip (you keep the original), so your VFD can still be used by someone else!

Housed in a compact (5.75" by 3.0" by 2.0") enclosure, the VFD Series Wattmeters offer many features you cannot find anywhere else. The VFD Wattmeters use our "battle proven" remote sensor design being used around the world today. All this at a price you can afford.





ALARM INDICATION

You can set the VFD to tell you if your VSWR has exceeded a preset limit. A bright red LED tells you if you have exceeded 1.5:1, 2.0:1, 2.5:1 or 3.0:1 (the default). If you have installed the optional relay, you can disable your amplifier to prevent damage to your system.

THE BEST SENSOR

The VFD uses our P-3000-D sensor. Insertion loss and VSWR are minimal, and the sensor uses large cores that will not saturate, even above 1.5 kW. Network analyzer plots of the sensor's performance are available on request.

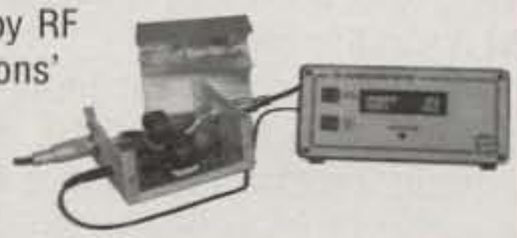
The VFD gives you a real time peak and hold display of your actual power and VSWR *every time you transmit*. This means that you'll always know that your system (exciter, amplifier, feed lines, antennas, etc.) are operating the way you intend them to. Tuning an amplifier has never been easier because the VFD's 65 element bar graph gives you better resolution than a meter. In addition, you can select a quick update for the displayed power (Tune Mode).

IS IT ACCURATE?

The VFD uses sophisticated technology that achieves remarkable accuracy in a low cost package. Compare it with your Bird™ or other accurate meter. You'll be amazed at this unit's performance.

WHAT YOU GET

The VFD is shipped with a display unit, the P-3000-D sensor and a 12 VDC power cable. This product is covered by RF Applications' standard two year warranty.



KEY SPECIFICATIONS

Frequency range:
1.8 to 30 MHz (60 MHz with recalibration)

Power:
5 - 2,955 watts (VSWR accuracy suffers below 20 watts)

Nominal impedance: 50 ohms

Accuracy:
Better than ±10% of the displayed reading

Operating power:
12 VDC at 130 mA average, 200 mA max

Connectors: SO-239 (2)

Signal cable length: 62" (24.4 cm)

Shipping weight: 3 pounds

COST AND OPTIONS

The VFD sells for $249.00, and the following options are available:

Vanity Option ($20.00)—You can special order a replacement chip for your VFD that can contain up to 11 characters of your choosing.

VSWR Alarm Relay Option ($20.00)—This option adds a reed relay output to the VFD that you can use to inhibit a radio or amplifier when your preset VSWR limit is exceeded.

Power Monitor Option ($35.00)—The Power Monitor Option allows your VFD to monitor your transmitted power and gives you relay contacts to let you know that you are applying RF to an antenna.

All options are available factory direct only.

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CIRCLE 74 ON READER SERVICE CARD

With the new millennium and a new award manager come some changes to CQ's prestigious WAZ Awards program.

The CQ WAZ Awards Program

BY PAUL BLUMHARDT, K5RT
CQ WAZ Award Manager

We've all owned something of vintage, be it a car, an airplane, or a piece of amateur radio gear. At some point we are faced with the decision of "restoring" it to original specifications, modifying it for "high performance," or just making some minor improvements that make it more pleasurable to use on a daily basis.

Here at *CQ,* we've reached this point with the Worked All Zones Award program. With the coming of new millennium and a new WAZ Award Manager, it was decided to give the program a bit of a "tune up" and add a new feature or two.

You will note several changes as you read the rules (effective June 1, 2000), including the WAZ application, map, and rules being available from the *CQ* web site in PDF format. We've also attempted to make the various types of WAZ awards more consistent with each other, as well as "increment" the level of difficulty associated with the various WAZ award types. We've instituted checking of 5B WAZ awards by the CQ Checkpoints team (check the rules carefully on this; there are some restrictions). The presentation of the rules has been changed to make the information easier to find. Also, in keeping with the advent of new digital modes, we've added a Digital WAZ to encourage activity on this expanding frontier.

We've done away with the redundancy of endorsing the CW/Phone WAZ award for a single mode. We've also discontinued the Novice WAZ award, since Novice activity is declining steadily these days. We've had to increase the award fees a bit, but we haven't changed them since 1980 and it's still a bargain!

We are optimistic that interest in the WAZ program will continue to grow, and that the changes we've introduced will maintain the challenges that the WAZ program provides for the active radio amateur. Keep an eye on the *CQ* web page, as we have more plans in store for the WAZ program that we're sure you'll like! *—73, Paul, K5RT*

Section 1. Introduction

The CQ Worked All Zones (WAZ) Award and its variations are issued to any licensed Radio Amateur presenting proof of contact with all 40 CQ zones. This proof consists of proper QSL cards, which in many cases may be checked by any of the authorized checkpoints or sent directly to the WAZ Award Manager. (The list of authorized CQ checkpoints is included at the end of these rules.)

The WAZ program is one of the longest running award programs in Amateur Radio, having been started prior to WW II.

The WAZ program, while it involves the use of "DX entities," does not rely on any particular entity's status as a country. The WAZ Award is geographically focused, which is where its challenge lies.

WAZ Award correspondence should be directed to the WAZ Award Manager: Paul Blumhardt, K5RT, 2805 Toler Road, Rowlett, TX 75089 USA (e-mail: <k5rt@cq-amateur-radio.com>), or it may be mailed directly to *CQ* magazine at: CQ Communications, Inc., 25 Newbridge Road, Hicksville, NY 11801 USA.

The WAZ application form, rules, and CQ Zone Map are available in .PDF format from the CQ Magazine WAZ Rules web page: <www.cq-amateur-radio.com/wazrules.html>. This information is also available from either the WAZ Award Manager or *CQ* magazine in hardcopy. Mail your request for WAZ information to either of the addresses shown above. Please include a business-size SAE with *two units* of postage (for US stations) or $2.00 with your request. Foreign stations should supply a return mailing label and 3 IRCs. Please indicate on the back of your envelope "WAZ Info Request" so we can spot your letter more easily and reply quickly.

Section 2. General Rules

All QSOs must be made by a licensed Amateur Radio operator, from a licensed Amateur Radio station, using only modes of emission and transmitter output power as permitted by the local licensing authority. QSOs with stations other than Radio Amateur (such as MARS, Commercial, or Military) are ineligible for the WAZ award.

All QSOs must be conducted within the radio spectrum as authorized for that licensee by the local licensing authority. Any WAZ applicant found to be operating outside the bounds of his or her license may be disqualified from the WAZ program.

All contacts must be made from within the same DXCC entity. QSOs made by the same applicant using previous callsigns from that same DXCC entity are acceptable. Proof of holding those previous callsigns may be requested.

The Official CQ WAZ Zone Map and the printed CQ zone list are used to determine the zone in which a station is located.

If a problem is found with your application or QSL cards, we will attempt to contact you via e-mail to inform you of the issue and attempt to resolve it with you. We *really* don't want to return your application if we don't have to.

The submission of any WAZ award application acknowledges consent to abide by the decisions of the CQ WAZ Manager and the CQ Awards Committee. Decisions of the CQ DX Advisory Committee on any matter pertaining to the administration of this award are final.

Section 3. QSOs and QSLs

All QSOs must be two-way with both stations using the same mode of emission.

QSL cards must include:

1. Callsigns of both stations
2. Date of QSO
3. Time of QSO (UTC preferred)
4. Band or frequency of QSO

5. Mode of QSO
6. The QTH of the station worked (country, state, city). Indication of the CQ zone is optional.

QSL cards not including the information above may be returned to the applicant for replacement and not credited towards the WAZ award.

Ineligible QSOs:
Cross-Band
Cross-Mode
Aeronautical Mobile
Maritime Mobile
Stations located on floating ice
Ships anchored in port

Any altered or forged confirmations submitted by an applicant for WAZ credit may result in permanent disqualification. The WAZ Manager may request the resubmission of certain confirmations. While a QSL card is normally accepted as proof of a contact, the final proof is an entry in the DX station's logbook for the listed QSO.

The failure to resubmit QSLs in a timely manner when requested by the WAZ Manager may result in the recall of the award in question.

Section 4. WAZ Award Types

WAZ By Mode

Mode	Bands	QSLs on or After	Field Checking	Notes
Mixed (any combination)	Any	14 Nov. 1945	Yes	See Note 1
AM	Any	14 Nov. 1945	Yes	—
SSB	Any	14 Nov. 1945	Yes	—
CW	Any	14 Nov. 1945	Yes	Revised QSL date
RTTY	Any	14 Nov. 1945	Yes	—
SSTV	Any	1 Jan. 1973	Yes	—
Digital	Any	1 Jan. 2000	No	New WAZ award–see Note 2

WAZ By Band

Band	Mode	QSLs on or After	Field Checking	Notes
160 m	Mixed Only	1 Jan. 1975	No	See Note 3
80,40,20, 15,10 m	Any Single Mode	1 Jan. 1973	Yes	No Mixed Mode
30 m	Any Single Mode	1 Jan. 1991	Yes	Rule Change No Mixed Mode
17 m	Any Single Mode	1 Jan. 1991	Yes	Rule Change No Mixed Mode
12 m	Any Single Mode	1 Jan. 1991	Yes	Rule Change No Mixed Mode
Satellite	Mixed Only	1 Jan. 1989	No	—

Note 1: The process of endorsing a CW/Phone WAZ award has been discontinued. The old CW/Phone WAZ Award is now named *Mixed Mode* WAZ. The existing CW/Phone WAZ award numbering sequence will be continued in support of this change.

Note 2: This is a new WAZ award designed to encourage activity and experimentation using any of the digital modes available to amateurs. This list includes, but is not limited to PSK-31, AMTOR, PACTOR, and Spread Spectrum. QSL cards must indicate the specific mode used for the QSO. RTTY does not count for this award, as it has its own award. This award will not be endorsed for any specific digital mode. You may elect to use a single digital mode or different digital modes in working toward this new WAZ award.

Note 3: The 160 Meter WAZ Award requires that the applicant submit QSL cards from at least 30 zones. Endorsement stickers are issued at the 36, 37, 38, 39, and 40 zone levels.

RTTY-1

The HAL RTTY-1 is an easy to use and very accurate tuning indicator. It may be used with virtually *any* FSK modem, TNC, multi-mode controller, demodulator, and receiver or transceiver. The crossed LED bars show correct tuning for all popular FSK modes including Baudot Teletype (RTTY), ASCII Teletype, AMTOR, SITOR, P-Mode*, and even HF Packet Radio. Just hook it to your receiver's audio output and you're in business, even with modems that do not include "scope" output connectors.

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Audio Input:	0.1 to 1.0V rms, 10K ohms
Filters:	2125 Hz (Mark), 2295 (Space)
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Special Endorsements

WAZ awards (except 5 Band, 160 Meter, and Digital WAZ) may be endorsed for unique situations, such as all QRP or all mobile, provided the QSL cards clearly indicate the situation.

5 Band WAZ

Applicants who succeed in presenting proof of contact with the 40 zones of the world on the 80, 40, 20, 15, and 10 meter bands (for a total of 200) receive a special certificate in recognition of this achievement.

Note: A prerequisite for 5 Band WAZ is that the applicant must already be a holder of any 40 zone WAZ. *The award type, number, and date must be indicated on the 5B WAZ application.*

The first plateau is a total of 150 zones across any combination of the 5 bands listed above. A certificate will be issued with a unique award number, indicating the initial number of zones confirmed. After reaching the 150 zone plateau, each 10 zones requires the submission of QSL cards and the application fee.

Upon reaching 200 zones confirmed, the applicant will be issued a 200 zones endorsement sticker to affix to his or her 5B WAZ certificate that was previously issued. *No other endorsement stickers are issued.*

Upon reaching the 200 zone level, the applicant may wish to purchase an engraved plaque to acknowledge the achievement.

The 5 Band WAZ award is available *Mixed Mode only*. It is not available for any single mode.

QSLs accepted: Contacts must have been made after 0000Z January 1, 1979.

Rule Change: Checking of 5 Band WAZ award applications by CQ checkpoints is available starting 1 June 2000 *for initial applications of 190 cards or less.* Initial applications of greater than 190 cards must be presented to the WAZ Award Manager. All QSLs to endorse a 5 Band WAZ award must be presented to the WAZ Award Manager.

Application Form: CQ form 1479 or a facsimile must be used. A separate application form is required for each band.

Note: For multi-band QSLs please include a summary sheet indicating the callsign and bands for each particular card. This will aid in the checking of QSL cards.

Section 5. Applying for the WAZ Award

Application Form: CQ form 1479 or a facsimile must be used for all submissions. This form must include the following:

1. Callsigns used by the applicant, as shown on the QSL cards
2. Name of applicant
3. Complete mailing address of applicant
4. Date of application
5. Type of WAZ Award being applied for (Mixed, SSB, Single Band)
6. Zone of contacted station
7. Callsign of contacted station
8. Date of QSO
9. Time of QSO
10. Band or frequency of QSO
11. Mode of QSO

Submitting the Application Form: Complete the application form using BLOCK LETTERS, or type the application. *The information must be legible.* Include your e-mail address (if you have one).

Submit for only *one* award per application. Each application must be accompanied by the appropriate application fee or it will not be processed (see the Processing Fee Schedule). If you are a *CQ* subscriber, include the mailing label (or photocopy) from your most recent issue of *CQ* magazine with your application.

QSL "credits" for use in other WAZ Award Applications: In order to save time and reduce postal expenses (and risk), an applicant may wish to include a note with the original submission indicating plans to apply for a future WAZ award. This intention must be clearly indicated by including a note with the original submission. The WAZ Award Manager will sign and date the completed application and return a photocopy to the applicant.

When the time arrives to submit the "future" application, this signed copy plus the new application and the balance of the QSL cards (as required for that award) must be supplied. In other words, we don't need to look at the same QSL cards from the same applicant provided we have the proof that we've seen them for a previous application.

Plaques and Certificates: WAZ certificates and plaques are mailed 60 to 90 days after processing of your application. Plaques and certificates are processed from *CQ*'s office in New York, not by the WAZ Award Manager or checkpoints. See the Processing Fee Schedule for expedited shipment costs.

Return Postage: Be sure to include sufficient return postage with your application. Suggestions for mailing from the USA are provided below:

Continent	First Class 40 Cards	First Class + Registered 40 Cards	Express Mail 40 Cards
North America	$1.50	$7.50	$12.00
Europe	$3.00	$9.00	$19.00
Asia	$3.75	$9.75	$19.00

Continent	First Class 200 Cards	First Class + Registered 200 Cards	Express Mail 200 Cards
North America	$ 3.50	$10.50	$15.00
Europe	$10.00	$16.00	$27.50
Asia	$15.00	$21.00	$27.50

If insufficient funds (or no funds) are provided, QSL cards will be returned by the appropriate route. This may mean that QSL cards will be returned via third-class mail or sea mail. It is up to the applicant to indicate the method of returning his or her QSL cards. It is the responsibility of the applicant to pack the QSL cards in such a way that they will not be damaged or lost in the mail. The WAZ Awards Manager is required to pack all returned QSLs in accordance with US Postal and US Customs Regulations.

Processing Fees: Fees may be paid by the following methods:

1. US currency
2. Cashiers check or money order (US or Canadian banks only, US funds only)
3. Bank draft (US or Canadian banks only, US funds only)
4. Personal checks (drawn on US banks only) made out to Paul Blumhardt (not to WAZ Awards Manager, or *CQ* magazine)
5. IRCs will be accepted at an exchange rate of $.50US per IRC

Processing Fee Schedule

Award	*CQ* Subscriber	Non-*CQ* Subscriber
Any "40 QSL" WAZ Award (including 160 meters)	$6.00	$12.00
"Basic 5BWAZ" application fee	$10.00	$15.00
5B WAZ endorsement application fee	$2.00	$5.00
160 Meter endorsement application fee	$2.00	$5.00
160 Meter endorsement stickers (35,36,37,38,39,40 zones)	$2.00 each	$2.00 each
WAZ Certificate Replacement (due to loss/damage)	$20.00	$30.00
WAZ Certificate Replacement (due to callsign change)	$40.00	$50.00
5B WAZ Plaque	$80.00	$80.00
5B WAZ Plaque with Air Shipment	$100.00	$100.00
Air shipping of WAZ Certificate	$5.00	$5.00

Section 6. WAZ Zone/Country List

Zone 1. *Northwestern Zone of North America:* KL (Alaska), VY1V/E8 Yukon, the Northwest Territories west of 102 degrees (includes the islands of Victoria Banks, Melville, and Prince Patrick).

Zone 2. *Northeastern Zone of North America:* V02 Labrador, the portion of VE2 Quebec north of the 50th parallel, the VE8 Northwest

Baffin, and the Melville and Boothia Peninsulas, excluding Akimiski Island).

Zone 3. *Western Zone of North America:* VE7, W6, and the W7 states of Arizona, Idaho, Nevada, Oregon, Utah, and Washington.

Zone 4. *Central Zone of North America:* VE3, VE4, VE5, VE6, VE8 Akimiski Island, and W7 states of Montana and Wyoming. W0, W9, W8 (except West Virginia), W5, and the W4 states of Alabama, Tennessee, and Kentucky.

Zone 5. *Eastern Zone of North America:* 4U1UN, CY9, CYØ, FP, VE1/VE9, VY2, VO1, and the portion of VE2 Quebec south of the 50th parallel. VP9, W1, W2, W3, and the W4 states of Florida, Georgia, South Carolina, North Carolina, Virginia, and the W8 state of West Virginia.

Zone 6. *Southern Zone of North America:* XE/XF, XF4 (Revilla Gigedo).

Zone 7. *Central American Zone:* FO (Clipperton), HKØ (San Andres), HP, HR. TG, TI, TI9, V3, YN, and YS.

Zone 8. *West Indies Zone:* C6, CO, FG, FJ, FM, FS, HH, HI, J3, J6, J7, J8, KG4 (Guantanamo), KP1, KP2, KP4, KP5, PJ (Saba, St. Maarten, St. Eustatius), V2, V4, VP2, VP5, YVØ (Aves Is.), ZF, 6Y, and 8P.

Zone 9. *Northern Zone of South America:* FY, HK, HKØ (Malpelo), P4, PJ (Bonaire, Curacao), PZ, YV, 8R, and 9Y.

Zone 10. *Western Zone of South America:* CP, HC, HC8, and OA.

Zone 11. *Central Zone of South America:* PY, PYØ, and ZP.

Zone 12. *Southwest Zone of South America:* 3Y (Peter I), CE, CEØ (Easter Is., Juan Fernandez Is. San Felix Is.), and some Antarctic stations (see notes below).

Zone 13. *Southeast Zone of South America:* CX, LU, VP8 Islands, and some Antarctic stations (see notes below).

Zone 14. *Western Zone of Europe:* C3, CT, CU, DL, EA, EA6, EI, F, G, GD, GI, GJ, GM, GU, GW, HB, HBØ, LA, LX, ON, OY, OZ, PA, SM, ZB, 3A, and 4U1ITU.

Zone 15. *Central European Zone:* ES (UR), HA, HV, I, ISØ, LY (UP), OE, OH, OHØ, OJØ, OK, OM, S5, SP, T7, T9, TK, UA2, YL (UQ), YU, ZA, 1AØ, Z3, 9A, 9H.

Zone 16. *Eastern Zone of Europe:* UR–UZ, EU–EW, ER, UA1, UA3, UA4, UA6, UA9 (S,W), US, UC, UO, and R1M (M. V. Island).

Zone 17. *Western Zone of Siberia:* EZ, EY, EX, UA9 (A, C, F, G, J, K, L, M, Q, X), UK, UN–UQ, UH, UI, and UJ–UM.

Zone 18. Central Siberian Zone: UA8 (T, V), UA9 (H, O, U, V, Y, Z), and UAØ (A, B, H, S, U, W).

Zone 19. *Eastern Siberian Zone:* UAØ (C, D, F, I, J, K, L, Q, X, Z).

Zone 20. *Balkan Zone:* E4, JY, LZ, OD, SV, TA. YK, YO, ZC4, 4X, 5B.

Zone 21. *Southwestern Zone of Asia:* 4J, 4K, 4L, A4, A6, A7, A9, AP, EK, EP, HZ, UD, UF, UG, YA, YI, 7O, and 9K.

Zone 22. *Southern Zone of Asia:* A5, S2, VU, VU (Laccadive Is.), 4S, 8Q, and 9N.

Zone 23. *Central Zone of Asia:* JT, UAØY, BY3G–L, BY9A–L, BY9T–Z, and BYØ.

Zone 24. *Eastern Zone of Asia:* BV, BY1, BY2, BY3A–F, BY3M–S, BY3T–Z, BY4, BY5, BY6, BY7, BY8, BY9M–S, VS6, VR, and XX.

Zone 25. *Japanese Zone:* HL, JA, and P5.

Zone 26. *Southeastern Zone of Asia:* HS, VU (Andaman and Nicobar Islands), XV (3W), XU, XW, XZ, and 1 S (Spratly Islands).

Zone 27. *Philippine Zone:* DU (Philippines), JD1 (Minami Torishima), JD1 (Ogasawara), T8 (KC6) (Palau), KH2 (Guam), KHØ (Marianas Is.), V6 (Fed. States of Micronesia), and BS7 (Scarborough Reef).

Zone 28. *Indonesian Zone:* H4, P2, V8, YB, 9M, and 9V.

Zone 29. *Western Zone of Australia:* VK6, VK8, VK9X (Christmas Is.), VK9Y (Cocos-Keeling Is.), and some Antarctic stations (see notes below).

Zone 30. *Eastern Zone of Australia:* VK1, VK5, VK7, VK9L (Lord Howe Is.), VK9 (Willis Is.), VK9 (Mellish Reef), VKØ (Macquarie Is.), and some Antarctic stations (see notes below).

Zone 31. *Central Pacific Zone:* C2, FO (Marquesas), KH1, KH3, KH4, KH5, KH6, KH7, KH9, T2, T3, V7, and ZK3.

Zone 32. *New Zealand Zone:* A3, FK, FO (except Marquesas and Clipperton). FW, H4Ø (Temotu), KH8, VK9 (Norfolk Is.), VP6, YJ, ZK1, ZK2, ZL, 3D2, 5W, and some Antarctic stations (see notes below).

Zone 33. *Northwestern Zone of Africa:* CN, CT3, EA8, EA9, IG9, IH9 (Pantelleria Is.), SØ, 3V, and 7X.

Zone 34. *Northeastern Zone of Africa:* ST, SU, and 5A.

Zone 35. *Central Zone of Africa:* C5, D4, EL J5, TU, TY, TZ, XT, 3X, 5N, 5T, 5U, 5V, 6W, 9G, and 9L.

Zone 36. *Equatorial Zone of Africa:* D2, TJ, TL, TN, S9, TR, TT, ZD7, ZD8, 3C, 9J, 9G, 9Q, 9U, and 9X.

Zone 37. *Eastern Zone of Africa:* C9, ET, E3, J2, T5, 5H, 5X, 5Z, 7O, and 7Q.

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FULL Range Dual Element

GOLDLINE

Studio Microphone

A new Dual Element Studio Microphone with full range, smooth, articulate response. Great for broadcast quality SSB, AM or FM. Wide 60 to 16kHz response with a +4dB peak at 2kHz – so important for well balanced articulation while at the same time producing a robust 'big bottom' low end.

The GOLDLINE is equipped with the new full range studio cartridge element plus your choice of the HC-4 DX DREAM MACHINE or the HC-5 Mid-Range element – switch selectable for tough or normal band conditions.

Features a new 'soft touch' PTT microswitch for smooth and reliable operation.

HEIL Model

GM-4 with Full Range/HC4 ..... $139.95

GM-5 with Full Range/HC5 ..... $139.95

GM-V **'VINTAGE GOLDLINE'** w/built-in matching transformer for use with those older hi-Z *'boatanchor'* inputs $159.95

CC-1 Connecting Cable for Icom, Kenwood, Yaesu or TenTec radios..... $29.95

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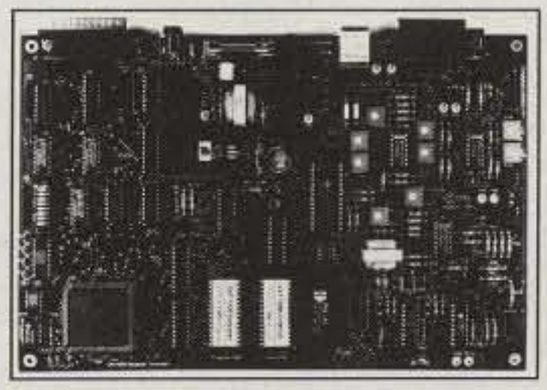
CIRCLE 66 ON READER SERVICE CARD

CAT-1000 Repeater Controller

Attention Repeater Owners!

The CAT-1000 is packed with features normally reserved for controllers costing a thousand dollars or more.

Features Include:



- *TI Voice Synthesizer*
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- *Grandfather Clock*
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- *Sixty-Four Control Functions*
- *Doug Hall RBI-1 Interface*
- *Forty Link Preset Frequencies*
- *DTMF Command Generator*
- *Link Serial Tuning*
- *TS440 HF Remote Base*
- *Ten Emergency Speed Dials*
- *Reverse Autopatch*
- *Autopatch Cover Tone*
- *Link Auto Disconnect*
- *Eight User Function Switches*
- *Forty Macro Strings*
- *Phone Number Read Back*
- *Eight Memory Saves*
- *Caller ID Suppression*
- *DTMF Repeater Access*
- *Sixty Position Scheduler*
- *Ten Programmable Courtesy Tones*
- *Three-Hundred User Speed Dials*
- *FT767GX HF Remote Base*
- *Phone Number Lock-Out*
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CAT-1000 Controller Board $679.00. Wired and Tested.

*Write or Call for a brochure describing the CAT-1000 Controller including schematic, voice word list, and control functions. Other Controllers with autopatch and TI voice synthesizer are available starting at **$299.00**.*

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CIRCLE 49 ON READER SERVICE CARD

Checkpoints for The CQ Awards Programs

These appointed CQ checkpoints can verify your QSL cards and sign the application for all CQ awards except 160 Meter WAZ, 5 Band WAZ endorsements, and new 5 Band WAZ applications with 190 or more zones. Please contact the checkpoint before mailing QSLs. All approved applications should be sent to the appropriate ward manager with the award fee. For WAZ Awards: Paul Blumhardt, K5RT, 2805 Toler Road, Rowlett, TX, 75089 USA.

Checkpoints in the U.S. and Canada

W1AM	Durham, NH	KD5ZD	Arlington, TX	K7CU	Bountiful, UT
W1DA	Sudbury, MA	N5HB/N5BV	San Antonio, TX	K7JS	Ogden, UT
K1RH	Woodbridge, CT	W5LLU	Houston, TX	WS7W	Casper, WY
WB2CJL	Tonowanda, NY	K8CSG	Houston, TX	W7XN	Portland, OR
W2RQ	Newton, NJ	WN5MBS	El Paso, TX	N7YL	Las Vegas, NV
K2FL	Palmyra, NJ	N5FG	Gulfport, MS	W8AH	Charleston, WV
AA2X	Long Beach, NY	W5HFZ	Baton Rouge, LA	N8BJQ	Beavercreek, OH
W3GG	Derwood, MD	NW5K	Napoleonville, LA	WB8LFO	Lorain, OH
WB3DNA	Harrisburg, PA	WN5N	Clovis, NM	K8LJG	Flint, MI
K3UA	Coraopolis, PA	K5TVC	Farmington, NM	K8BTH	Livonia, MI
K4SE	Jonesboro, TN	AK5PP	Mounds, OK	W8EG	Livonia, Mi
AA4DO	Mt. Juliet, TN	K5UR	Little Rock, AR	AA8R	Swartz Creek, MI
K4XO	Germantown, TN	KG6AR	San Gabriel, CA	AA9DX	Wood Dale, IL
W4DF	Lynchburg, VA	N6AW	Rancho Palos Verdes, CA	K9UWA	Leo, IN
W4FRU	Suffolk, VA	W6DPD	Fresno, CA	W5YH	Jeffersonville, IN
N4MM	Boyce, VA	K6NA	San Diego, CA	W9NT	Bemidji, MN
WA4PGM	Farmville, VA	W6RJ	Danville, CA	K9ZV	Salina, KS
W4ZYT	Virginia Beach, VA	K6BZ	Igo, CA	WØIJR/KAØCDN	Aurora, CO
K4UU	Bowling Green, KY	K6ZZ	California City, CA	KBØU	Overland Park, KS
N6AR	Windermere, FL	K3EST	Davis, CA	NGØW	Cedar Rapids, IA
N4UF	Jacksonville, FL	N7MQ	Eugene, OR	VE1RY	Kingston, NS
W2LZX	Delray Beach, FL	KC7V	Cave Creek, AZ	VE3GMT	Toronto, ON
W4WJ	Miami, FL	W7YS	Flagstaff, AZ	VE6HAM	Edmonton, AB
WA4YLD	Hollywood, FL	W7CNL	Boise, ID	V02AA	Labrador
WA4FFW	Burlington, NC	K7ABV	Great Falls, MI	KL7PJ	Anchorage, AK
N4NO	Huntsville, AL	WS7I	Spokane, WA	KP4L	Puerto Rico
WA4CLU	Mableton, GA	W70M	Seattle, WA	KP4P	Puerto Rico
				KH6DD	Honolulu, HI

Checkpoints Overseas

3A2LF	Monaco	HL5AP	Korea	SP5NOW	Poland
4S7DA	Sri Lanka	I2MQP	Italy	SVZYC	Greece
9H4H	Malta	JA1MKS	Japan (JARL)	TF3ACW	Iceland
A92BW	Bahrain	LA7JO	Norway	TI4SU	Costa Rica
CE3GN	Santiago, Chile	LU3BU	B.A. Argentina	VK1BH/VK4LC	Australia
CE6EW	Temuco, Chile	LU4AH	B.A. Argentina	VK3AKK	Victoria, Australia
CT4NH	Linda a Velha, Portugal	LU6DDF	Pergamino, Argentina	VK5IE	S. Australia
CX2CS	Uruguay	OA40	Peru	VK6JS	West Australia
CX4HS	Uruguay	OA4QV	Peru	VU2DVP	India
DJ80T	Velbert, Germany	OE1FQS	Austria	XE1AE	Mexico
DJ8SW	Bringhausen, Germany	OH2PQ	Finland	XE2FL	Mexico
DU1JZ	Philippines	OH3RM	Finland	YCØEBS	Jakarta, Indonesia
DU1SAN	Philippines	OK1MP	Czech Rep.	YC3HCM	Surabaya, Indonesia
EA3AJW	(Spanish *CQ*)	ON5KL	Belgium	YC7DF	Sanggau, Indonesia
F6HMJ	Saint-Paul, France	OZIDXX	Denmark	YL2MU	Latvia
G3FKM	England	PB7CW	Netherlands	YU1AB	Yugoslavia
GM3YTS	Scotland	PT2VE	Brazil	YV5IVB	Venezuela
HA5WA	Poyyyos, Hungary	UA3AB	Moscow	Z21JE	Zimbabwe
HA8UB	Tiszakecske, Hungary	UXØUN	Kiev (zone 16)	Z32KV	Rep. of Macedonia
HB9ATA	Switzerland	UA9CBO	Sverdlovsk (zone 17)	ZL2QK	New Zealand
HC1RF	Ecuador	RA9YD	Barnaul (zone 18)	ZS5DX	Bloemfontein, RSA
HK3DDD	Colombia	UWØMF	Vladivostok (zone 19)	ZS6EZ	Pretoria, RSA
HL1AS	Korea	S58MU	Slovenia	4X6UD	Israel
		SM6DEC	Sweden	9A9R	Croatia

Zone 38. *South African Zone:* A2, V5, ZD9, Z2, ZS1–ZS8, 3DA, 3Y (Bouvet Is.), 7P, and some Antarctic stations (see notes below).

Zone 39. *Madagascar Zone:* D6, FT–W, FT–X, FT–Z, FH, FR, S7, VKØ (Heard Is.), VQ9, 3B6/7, 3B8, 3B9, 5R8, and some Antarctic stations (see notes below).

Zone 40. *North Atlantic Zone:* JW, JX, OX, TF, and 4K2 (Franz Josef Land).

Antarctic notes:

The boundaries of CQ zones 12, 13, 29, 30, 32, 38, and 39 converge at the South Pole.

Stations KC4AAA and KC4USN are at the South Pole and will count for any one of the listed zones.

Most Antarctic stations indicate their zone on the QSL card.

A few stations and their zones are 4KIA 39, 4KIB 29, 4KIC 29, 4K1D 36, 4KIE 29, 4KIF 13, 4K1G 30, 4KIH 32, 4KIJ 13, 8J1RL 39, CE9 13, DPØ 36. FT–Y 30, HFØPOL 13, HL5BDS 13, KC4AAC 13, KC4AAD 13, KC4AAE 29, KC4USB 32, KC4USV 30, LU–Z 13, VKØGM 29, VP8ME 36, YB8ANT 36, and ZL5AA 30. The list changes frequently. Questions regarding the zone of a particular Antarctic station should be directed to the WAZ Manager.

Section 7. List of CQ Awards Field Checkers

These appointed CQ checkpoints can verify your QSL cards and sign the application for all CQ awards (WAZ, WPX, and CQDX).

Field checking is *not* available for 160 Meter WAZ, 5 Band WAZ endorsements, and initial (first) 5 Band WAZ applications with over 190 zones. Please contact the checkpoint before mailing QSLs.

All approved applications should be sent to the appropriate award manager with the award fee. For WAZ Awards: Paul Blumhardt, 2805 Toler Road, Rowlett, TX 75089 USA. ■

MFJ Contest Voice Keyer

Brand New design . . . Microprocessor controlled

Transformer-coupled -- No RFI, hum or feedback . . . 75 seconds total, 5-messages . . . Can be computer-controlled by CT, NA, etc . . . Records received audio . . .

Let this *new* microprocessor controlled MFJ *Contest Voice Keyer*™ call CQ, send your call and do contest exchanges for you in your own voice!

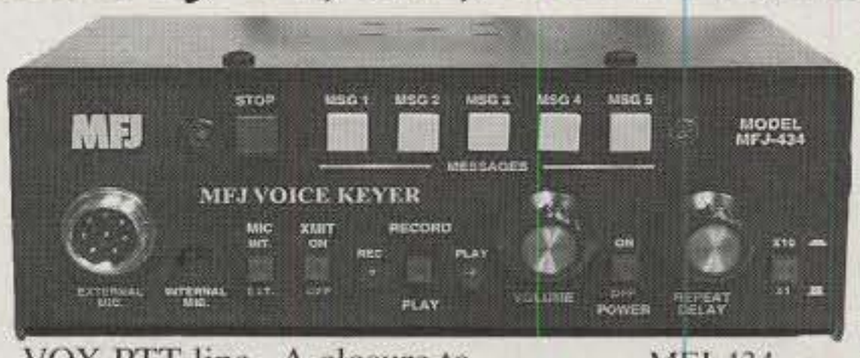
Store frequently used phrases like "CQ Contest this is AA5MT", "You're 59" . . . "Qth is Mississippi" and more! Contest by pressing a few buttons and save your voice.

You can record and play back five natural sounding messages in a total of 75 seconds. EEPROM technology keeps messages stored for up to 100 years -- no battery backup needed.

Repeat messages continuously and vary the repeat delay from 3 to 500 seconds. Makes calling CQ so easy and it's also a great voice beacon.

A receive audio jack lets you record and play back off-the-air signals -- great help if you didn't get it right the first time! No more "*Please repeat*".

A playing message can be halted by pressing the *Stop Button*, your PTT mic button or by your VOX PTT line. A closure to ground via remote control or computer can also halt messages.



MFJ-434
$179.95
plus s&h

Has jack for remote or computer control (using CT, NA or other program and its interface). Lets you select, play and cancel messages.

The MFJ-434 is transparent to your microphone -- your mic's audio characteristics do not change when your MFJ-434 is installed. Dual controls make it easy to tailor audio level to match your voice.

All audio lines are RF filtered to eliminate RFI, audio feedback and distortion. An audio isolation transformer totally eliminates hum and distortion caused by ground loops.

It's easy to use -- just plug in your 8 pin microphone cable and plug the MFJ-434 shielded cable into your transceiver's mic connector. Internal jumpers let you customize it to Kenwood, Icom, Yaesu, Alinco or Radio Shack rigs. Use your station or built-in microphone for recording.

Built-in speaker-amplifier lets you monitor stored messages. 3.5 mm speaker/headphone jack. SMT technology. Use 9 Volt battery, 9-15 VDC or 110 VAC with optional MFJ-1312B, $14.95. 6½Wx2½Hx6½D inches.

MFJ-73, $29.95. Remote Control Head with cable for MFJ-434.

MFJ *Professional grade* Boom Mic Headphones

For marathon contesting, DXing, traffic nets, ragchewing . . . These lightweight, fully padded Boom Mic Headphones make operating superbly comfortable! Flexible gooseneck microphone boom and speech frequency tailored microphone cuts through noise and QRM!

This *professional grade* MFJ Boom-Mic Headphones set is designed for contesting, DXing and traffic nets. Features *total comfort* design with leatherette padding for operating long hours.

Superb 3/4 inch thick padding on each ear and headband lets you wear your headset all day long! So super lightweight, you won't even know they're there! Headband adjusts for a perfect fit to keep out external noise.

The headphones' frequency response is enhnanced for communications to bring out speech fidelity that you never knew existed. Signals never sounded so crystal clear.

The flexible microphone boom lets you position the mic comfortably at an optimum distance to minimize silibant sounds.

MFJ's frequency tailored microphone element lets you bust through noise and QRM!

Extra-long 9⅔ feet of cable lets you move about your ham shack!

Has standard 1/4 inch jack for headphones and 3.5 mm jack for microphone. Build your own adaptor or use MFJ's pre-wired adaptors to match your transceiver. **Order** MFJ-5396 Y/K/I (YAESU, KENWOOD, ICOM respectively). $15.95 each.

Even casual operators will appreciate the advantages of MFJ's superbly crafted Boom-Mic headphones for *hands-free* operating at an incredibly low price.

MFJ-392, $19.95. Communication Headphones only. Great for ham radio, shortwave listening -- all modes, SSB/FM/AM/ Data/CW.

Each phone has individual volume and speech enhancement control. Superb leatherette padding.

Both MFJ-392 and MFJ-396 have MFJ *No Matter What*™ one year limited warranty.

MFJ Communications Speaker

SSB, FM, AM, and CW never sounded so crystal clear! Plug in this MFJ-281 *ClearTone*™ speaker and bring out communication speech fidelity that you never knew existed. Restores the smooth sinewave sound that CW naturally generates and makes copying easier. It was carefully designed to improve intelligibility of speech in the frequency range of 600 to 4000 Hz while reducing undesirable noise, static and hum. A top grade 3" Mylar cone speaker is mounted in a well designed baffle. Its fine mesh metal grille allows sound to radiate without muffling. 8 Watts, 8 Ohms. Six foot cord. 3.5 mm mono plug. 3¾x3x2¼ inches.

MFJ-281
$12.95
Ship Code A

MFJ 12/24 Hour *DXers Watch*

MFJ-181
$39.95
plus $6 s&h

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CIRCLE 116 ON READER SERVICE CARD

CQ World-Wide WPX CW Contest All-Time Records

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

WORLD RECORD HOLDERS

Single Operator

1.8	IH9/OL5Y('98)	341,068	182
3.5	EA8/OH2KI ('96)	1,358,852	347
7.0	LU1IV('97)	7,671,456	702
14	EA9LZ('98)	5,708,498	758
21	A45XR('99)	6,557,697	843
28	5X1Z('99)	4,575,420	666
AB	P4ØW('94)	14,168,115	845

Multi-Operator Single Transmitter

	HSØA('98)	13,729,156	868

Multi-Operator Multi-Transmitter

	HC8N('99)	54,697,072	1264

U.S.A. RECORD HOLDERS

Single Operator

1.8	K1ZM('95)	40,446	107
3.5	K1ZM('93)	406,080	288
7.0	KI1G('96)	2,573,408	587
14	KI1G('95)	3,330,088	788
21	NU5A('99)	4,411,299	789
28	N4BP('99)	749,016	412
AB	WW4T('99)	7,985,046	821

Multi-Operator Single Transmitter

	K3WW('99)	8,008,910	845

Multi-Operator Multi-Transmitter

	WL7E('99)	18,257,208	1048

CLUB RECORD

Northern California Contest Club ('99) 211,120,595

QRPp RECORD

P40W('97) 4,018,208

WPX (Prefix) RECORD

HC8N('99) 1264

CONTINENTAL RECORD HOLDERS

AFRICA

1.8	IH9/OL5Y('98)	341,068	182
3.5	EA8/OH2KI('96)	1,358,852	347
7.0	AM9TY('92)	2,007,990	404
14	EA9LZ('98)	5,708,498	758
21	ZD8LII('91)	5,118,527	743
28	5X1Z('99)	4,575,420	666
AB	CN8WW('99)	13,140,434	898

ASIA

1.8	4X4NJ('96)	259,420	170
3.5	UP2NK/UF('85)	701,012	221
7.0	9K2ZZ('94)	3,383,676	487
14	4Z6DX('91)	4,614,030	743
21	A45XR('99)	6,557,697	843
28	OD5SB('99)	1,986,610	514
AB	P31A('92)	10,293,858	762

EUROPE

1.8	SP5GRM('97)	249,516	261
3.5	LY2BTA('96)	967,974	399
7.0	UA6LAM('96)	3,760,164	701
14	CT2A('95)	4,231,598	826
21	9A3GW('99)	4,893,108	836
28	9H1EL('88)	805,552	398
AB	GIØKOW('97)	6,325,953	813

NORTH AMERICA

1.8	VE3BMV('86)	43,428	77
3.5	FM5BH('97)	833,490	315
7.0	V26BA('97)	6,227,550	659
14	FM5BH('98)	4,642,866	762
21	ZF1A('99)	5,330,129	799
28	WP3A('99)	1,952,826	542
AB	WP2Z('99)	12,506,280	890

OCEANIA

1.8	KX6DC('88)	12,240	45
3.5	KX6DC('89)	258,258	143
7.0	ZM1A('98)	5,144,480	592
14	N6VI/KH7('95)	3,103,932	606
21	KH6ND('99)	6,107,256	813
28	KG6DX('81)	1,238,806	334
AB	YB1AQS('99)	6,741,928	712

SOUTH AMERICA

1.8	YV1OB('86)	11,550	35
3.5	YX3A('89)	1,004,060	305
7.0	LU1IV('97)	7,671,456	702
14	YW1A('91)	4,617,456	732
21	ZP5XF('97)	5,023,872	712
28	CE3DNP('89)	2,857,038	582
AB	P4ØW('94)	14,168,115	845

MULTI-OP SINGLE TRANSMITTER

AF	CQ3X('95)	13,254,620	790
AS	H20A('98)	13,729,156	868
EU	R6L('93)	9,194,688	939
NA	CY9RF('99)	13,651,000	850
OC	AG9A/AH2('91)	9,005,641	787
SA	8R30K('96)	12,302,226	837

MULTI-OP MULTI-TRANSMITTER

AF	6V6U('97)	9,938,896	758
AS	P3A('99)	39,494,534	1174
EU	RW2F('99)	19,150,659	1161
NA	NQ4I('99)	14,867,020	1031
OC	KH7R('97)	11,760,354	822
SA	HC8N('99)	54,697,072	1264

QRPp

AF	5Y4FO('92)	649,057	311
AS	4X4UH('82)	1,028,904	344
EU	ON6NR('99)	1,224,600	520
NA	VP2MU('91)	1,554,735	469
OC	FO8JP('86)	572,131	259
SA	P40W('97)	4,018,208	632

Kantronics HF & Packet Modems

A Tradition of Quality and Innovation

Remember "THE INTERFACE," the UTU, KPC-1, KPC-2, and the KAM? They were all Kantronics innovations.

The CW and RTTY programs written for the VIC-20, C-64, TI-99, and other computers, were embedded inside the UTU using a custom microcomputer. This made it possible for any computer with a serial communications program to run CW or RTTY. Since that time, we've provided Pactor (1993) and G-TOR (1994) with our HF modems.

We also pioneered personal packet mailboxes, amateur paging (1996), and incorporated advanced digipeating for APRS (1998) in our packet modems.

Here's the latest Kantronics lineup—the KPC-3 Plus, the KPC-9612 Plus, and the KAM'98—all descendants of those legendary products. These units feature the HC11 Motorola processor, more EPROM memory space, more RAM, digital drive control, and A/D inputs!

KPC-3 Plus This compact, low current TNC has become the work horse of packet radio today. It features multiple packet connects, digipeating for APRS operations, WEFAX reception, a GPS mode for tracking, personal packet mailbox, and more.

KPC-9612 Plus This TNC is the rapid delivery model, supporting 9600 baud and featuring both 1200 and 9600 packet ports, advanced APRS digipeating (APRS is a trademark of Bob Bruninga), optional (K-Net) networking, amateur beeper (paging), and more.

KAM'98 This great-grandson of the UTU features numerous outstanding modes and functions including CW, RTTY, AMTOR, Pactor, and G-TOR for HF digital operations. It also provides programmable MARK and SPACE tones, bargraph tuning for HF ops, packet operation at both 300 and 1200 baud and a mailbox similar to the KPC-3 Plus. It's a great fit with the new 160M to 2M rigs, and it supports GPS operations.

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CQ Reviews:

The Heil Sound GM-V Vintage Goldline Microphone

BY JOE VERAS,* N4QB

It's all about equalization. I recall hearing stories from the early days of rock and roll about recording engineers mixing 45 rpm singles to sound best on the typical teenager's record player. AM broadcast stations playing the same music were said to have tailored their signals to sound good pouring from the speaker of a car radio. While the FCC disapproves of our playing music on the ham bands, amateur radio operators share certain of the recording engineers' and broadcasters' goals.

Whichever of the voice modes we use, most of us want to communicate effectively and sound reasonably good while doing so. Communications audio is far from high-fidelity, generally employing a bandwidth of no more than 3000 Hertz. Filtering systems common to single sideband may restrict it more than that. Contesters and DXers are fond of using the narrowest voice bandwidths consistent with good intelligibility, swapping a more natural-sounding signal for one that delivers maximum punch. No matter which goal an individual amateur chooses, success in achieving it is largely dependent on making the best use of the equipment available.

It is helpful to think of the communications process, from beginning to end, as a *system*. The starting point, or input part of the system, is the transmitting ham's microphone. The system's output is the receiving operator's speaker or headphones. The transmitting and receiving apparatus, as well as some accessories, play a role in the middle part of the process. One or more components in the system may leave something to be desired as far as good or effective communications audio is concerned. Equalization compensates for this shortcoming.

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e-mail: <n4qb@cq-amateur-radio.com>

The Heil Sound GM-V Vintage Goldline microphone is as pleasing to the eye as it is to the ear. (Photo by Joe Veras, N4QB)

The GM-V (Vintage Goldline) is a recent addition to Heil Sound's Goldline series of microphones. It is specifically designed to work into the high-impedance input of rigs from the classic era, and sound great while doing so. Many serious audiophiles swear by the sound of tube gear, an opinion shared by a number of amateurs, as well. In keeping with the things already discussed, if one is to take advantage of a transmitter's built-in good sound, it helps to put good audio into the microphone jack. The GM-V accomplishes that in an interesting way.

The GM-V's microphone element has a full-range, high-fidelity response, being 3 dB down at both 30 Hz and 15 kHz and virtually flat between 70 Hz and 8 kHz. The nominally low-impedance element is matched to the high-impedance vintage rig's input through a transformer of Bob Heil's own design. Dissatisfied with transformers available on the market, Heil went to great lengths to perfect a device that would mirror the response

of the mic element when attached to a Hi-Z load.

The heart of the GM-V and the key to its superb communications audio is the built-in *passive* equalization circuit. With the flip of a switch, one can go from the mic's full range to a response curve that rolls off the bottom octave-and-a-half and accentuates the mid-range with a 4 dB boost at 2 kHz. Numbers and response curves are for reading, though. How does it sound on the air?

During the time the GM-V was plugged into my Collins S-Line, Drake TR-4, and Viking Ranger, I received nothing but "Great Audio" reports from the stations I worked. Nearly all of these comments were made without inquiry or solicitation on my part. In addition to the Goldline, two other microphones were used in these QSOs: an Astatic 10-D and D-104. They were identified only as mics A, B, or C during the contacts. Nearly everyone preferred the sound of the GM-V with the passive EQ switched in, the Astatic 10-D claiming second place.

Another difference between the Heil mic and my others was its lower output. This proved to be no problem, merely requiring the mic gain on the transmitter to be turned higher. The GM-V also does its best when "worked close," within a couple of inches of one's mouth. Actually, speaking close to the mic and using only enough gain to produce adequate ALC action is good operating practice with any microphone. Excess room reverb and the sound of the XYL (or the OM!) vacuuming beneath your feet add nothing to the intelligibility of the signal.

In addition to the EQ switch, there is a light-touch PTT button on the GM-V. Since the Audio on the mic is not switched, it may also be used in the VOX mode. The CC-1C cable is required to connect the microphone to the transmitter and is terminated in the 3/16 inch plug common to Collins and Drake gear. The CC-1C also includes a 1/4 inch phone jack into which a foot switch can be plugged.

Two additional accessories are available to complete a deluxe setup. The LX-1 Balanced Studio Boom clamps to any surface up to 2 1/2 inches thick and allows the mic to be positioned conveniently for operation, or swung out of the way when not in use. The SM-1 shock mount attaches to the end of the boom and provides an 8-point elastic suspension that decouples the mic acoustically from the operating desk.

The GM-V is as pleasing to the eye as it is to the ear. The shiny, black lacquer finish of the microphone body contrasts nicely with the gold color of the windscreen assembly. Using the boom/shock mount/microphone setup is a pleasant way to operate, particularly for ragchews or nets. It makes one question the wisdom of having bent over a desk mic all these years. For contesting, however, I still prefer to use my headset; it offers flexibility in operating style and dispenses with some hardware.

With many used vintage microphones bringing top dollar these days, the Goldline makes good economic sense as well. This is particularly true when one factors in three or four decades of hamshack use or storage under less-than-ideal conditions for the used mics. The GM-V sells for $159.99; its CC-1C cable is an additional $32.99. Prices for the other accessories are: LX-1 Boom, $94.99; SM-1 Shock Mount, $50.00; and FS-1 Footswitch, $29.99. ■

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This, our 49th year, will be the first time the Dayton Hamvention will host the ARRL National Convention!

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CIRCLE 53 ON READER SERVICE CARD

World Of Ideas

BY DAVE INGRAM, K4TWJ

A Look At The World Around Us

A "Restructured" Amateur's Guide to HF Action

Have you checked out the HF bands recently? More precisely, have you investigated the wide variety of activities in our 3 to 30 MHz range since sunspots increased and license restructuring went into effect? These famed "low bands" truly represent the bright lights and glamour side of amateur radio, and they hold unlimited appeal for every interest and lifestyle. HF pursuits include, for example, all types of global voice and video communications, worldwide packeting, long-range mobiling, blowout contesting, and much more. Yes, and the good news is you can explore much of this action almost as conveniently as you work 2 meters from your home or car.

Doesn't working the HF bands call for a room full of gear and a lavish antenna system? Not really. Those photos of super stations and killer antennas you see on magazine covers are actually the exception rather than the rule. The average setup (if such really exists!) is simpler, smaller, less expensive, and more conventional—for example, a transceiver, power supply, microphone, key, vertical antenna, and maybe a TNC and a computer. Say your time to pursue HF operations is quite limited? Consider setting up a basic "transceiver and power supply" type station in the den, as illustrated in photo A. That type of arrangement lets you chase DX or jump into contest fun any time you have a couple of spare moments for hamming. You'll like it. Honest!

Speaking as one who has experienced the ups and downs of several sunspot cycles, I can state accurately that these are the good times, the times when every SSB, CW, FM, PSK, packet, SSTV, and classic AM QSO is a memorable event. The bands are blowing wide open with DXcitement, and signal propagation is better than it has been in many years. Get on the air soon and join the fun!

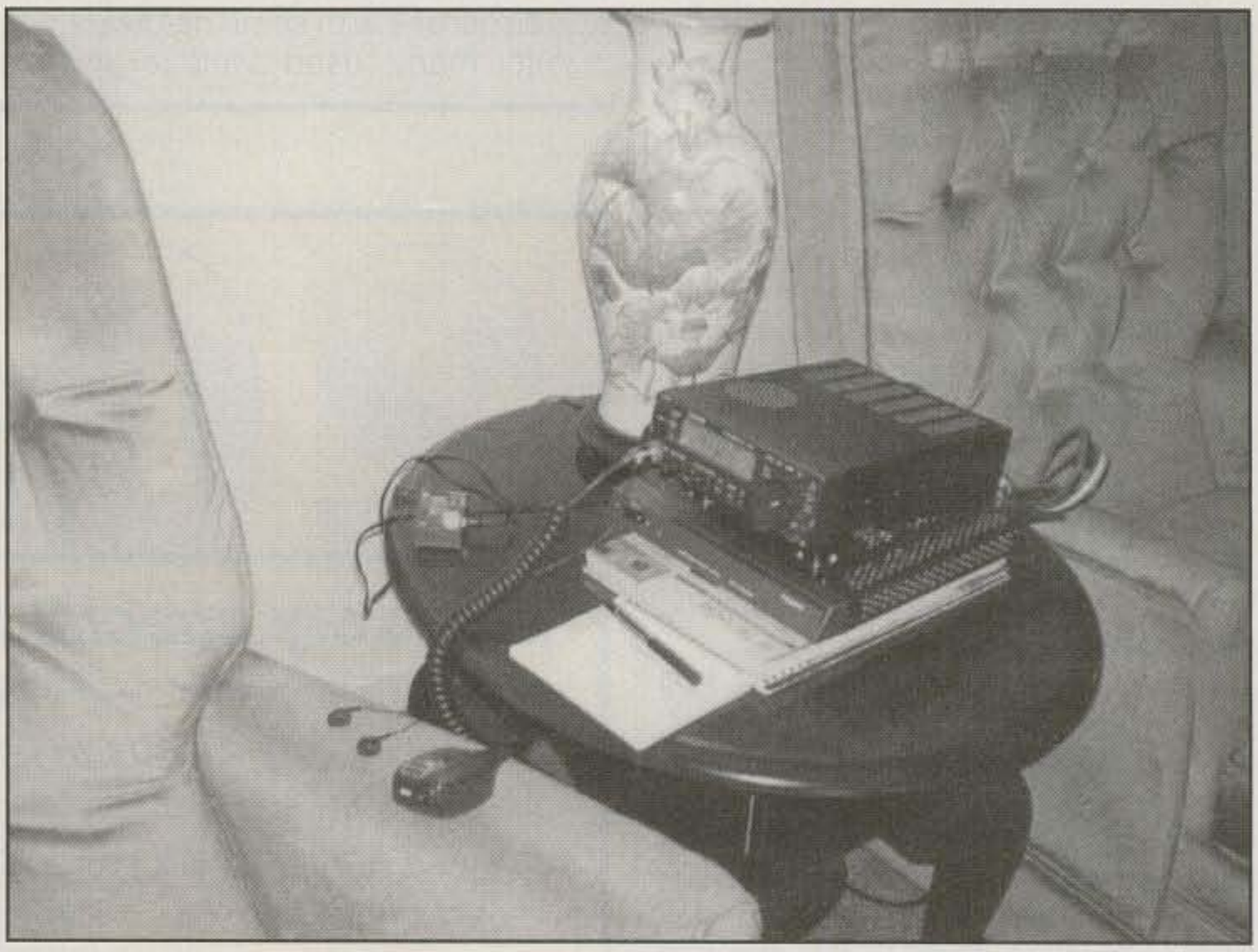

Photo A– Limited time for hamming? Consider setting up a small second station in a den for more convenient use. Such mild-mannered setups result in more on-the-air time and more good DX QSOs.

Dave's "Getcha Going Guides"

As an extra nudge and a convenient starting point for discussing our HF bands, I compiled a few hands-on frequency guides (figs. 1, 2, 3, and 4). Place them beside your rig or clip them to your car's sun visor for quick reference and then personalize them with special notes or frequencies of interest.

Study the guides for a few minutes, and you will notice that both amateur radio bands and international shortwave broadcast bands are located in specific, almost adjacent frequency ranges throughout the HF spectrum. In between these ranges you also find international aircraft and maritime channels; utility, government, and military allocated frequencies; and much more. Looking closer, note that signals in the approximate 3 to 10 MHz range bounce off, or are reflected by, the Earth's ionosphere best during nighttime hours, while signals in the 15 to 30 MHz range "skip" better during daytime hours. How well the ionosphere acts as a passive reflector of radio signals (or how much it absorbs them) is what we call "good" or "poor" band conditions. They are also forecast very accurately each month here in *CQ*'s "Propagation" column by George Jacobs, W3ASK. Just follow George's calendar and you will enjoy some really good HF DXing.

DXing and Contesting

Undeniably, the greatest attraction of amateur radio is communicating over very long distances without the use of telephone lines, the internet, satellites, or repeaters. Indeed, the sheer thrill and camaraderie of working DX and competing in contests will always be major attractions in our world of person-to-person communications. There simply is nothing like it, as evidenced by the many international contests held each month plus the variety of DX achievement awards such as DXCC, CQDX, CQ WPX, etc. Indeed, many amateurs find chasing DX and cracking pile-ups over seldom-heard countries or "rare ones" simply irresistible. It is also a pursuit (addiction?) that "gets into your

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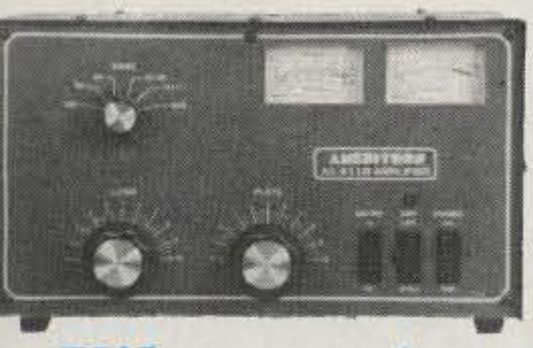

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You also get efficient full size heavy duty tank coils, full height computer grade capacitors, heavy duty high silicon core power transformer, slug tuned input coils, operate/standby switch, transmit LED, ALC, dual meters, QSK compatibility with QSK-5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

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

Kilowatt Amplifier

AL-80B
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Full kilowatt PEP output from a whisper quiet compact desktop linear. Only 8½x14x15½ inches. Plugs into nearest 120 VAC outlet. All bands 160-15 Meters, 1000 Watts out on SSB, 850 watts out on CW, genuine Amperex 3-500ZG tube has graphite plate, nearly 70% efficiency, inrush current protection, multi-voltage transformer.

Near Legal Limit™ Amp

AL-572
$1395
Suggested Retail

New class of *Near Legal Limit*™ amplifier gives you 1300 Watt PEP SSB power output for *65%* of price of full legal limit amps! Four rugged *Svetlana* Russian 572B tubes. Instant 3-second warm-up. Plugs into 120 VAC. Compact 8½Hx15½Dx14½W. 160-15 Meters. 1000 Watt CW output. Tuned input, instantaneous RF Bias, dynamic ALC, parasitic killer, inrush protection, two lighted Cross-Needle meters, multi-voltage transformer.

AMERITRON HF Linear Amps with Eimac™ 3CX800A7

AL-800H
$2395
Two tubes
1500 Watts plus

Suggested Retail

AL-800
$1695
Single tube
1250 Watts

AMERITRON's new 800/H amplifiers cover 160-15 Meters including WARC bands. The AL-800 has a single Eimac™ 3CX800A7 tube and produces 1250 Watts PEP. The AL-800H has two 3CX800A7s giving 1500 Watts plus.

Both amps have an adjustable slug tuned input circuit, grid protection, ALC control that is front panel adjustable,vernier reduction drives, heavy duty 32 pound grain oriented silicone steel core transformers and high capacitance computer grade filter capacitors.

These amplifiers have multi-voltage operation (14 user selectable AC line voltage from 90-140; 200-250 VAC), quiet pressurized ventilation systems, dual illuminated Cross-Needle meters that read peak forward and reflected power, SWR, high voltage, grid current and plate current.

Vernier reduction drives make tuning adjustments smooth and easy Ameritron's exclusive *Step-Start Inrush Protection*™ stops damage to your amplifier from inrush current. Ameritron amps feature an attractive Lexan front panel decal and superior, all metal construction -- it's built to last! Ultra compact desktop size is perfect for your operating station. 8½ x16½ x14¼".

AMERITRON no tune Solid State Amplifiers

Ameritron ALS-500M Mobile no tune Solid State Amp has 500W out, covers 1.5-22 MHz

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Ideal Mobile amplifier -- uses 13.8 Vdc mobile electrical system, very compact 3½x9x15 in., extremely quiet, 500W output, 1.5-22 MHz coverage, instant bandswitching, no tuning, no warm up, no tubes, SWR protected.

Ameritron ALS-600 no tune Solid State base amp includes heavy duty power supply, 600 Watts out

ALS-600
$1299
Suggested Retail

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

AMERITRON offers the best selection of legal limit amplifiers

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

Ameritron's most powerful Linear

AL-1500
$2845
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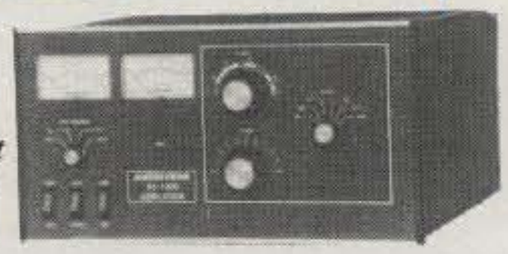
Ameritron's super powerful amplifier uses the herculean Eimac® 8877 ceramic tube. It's so powerful that 65 watts drive gives you the full legal output -- and it's just loafing because the power supply is capable of 2500 Watts PEP.

Ameritron's 3CX1200A7 linear Amp

AL-1200
$2395
Suggested Retail



Get ham radio's *toughest* tube with the Ameritron AL-1200 -- the Eimac 3CX1200A7. It has a 50 watt control grid dissipation. What makes the Ameritron AL-1200 stand out from other legal limit amplifiers? The answer: A super heavy duty power supply that loafs at full legal power -- it can deliver the power of more than 2500 watts PEP two tone output for a half hour.

Ameritron's dual 3-500 linear

AL-82
$2295
Suggested Retail

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

AMERITRON brings you the finest high power accessories!

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

Replace 5 coax feedlines with a single coax. 1.2 SWR at 250 MHz. seable to 450 MHz. 1kW at 50 MHz. **RCS-4, $139..** 4 position remote HF switch.

ADL-1500 Dummy Load with oil . . . $59.95

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

ICP-120/240-$79

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

ATR-15 Legal Limit Antenna Tuner . . . $399

Designed for legal limit amplifiers! Covers 1.8-30 MHz, peak reading SWR/Wattmeter, 6 pos. antenna switch, 1:1 or 4:1 balun.

ARB-700/702 amp-to-radio interface . . 39.95

Protects your costly transceiver from damage by *keying line transients*, steady state current and excessive voltages.

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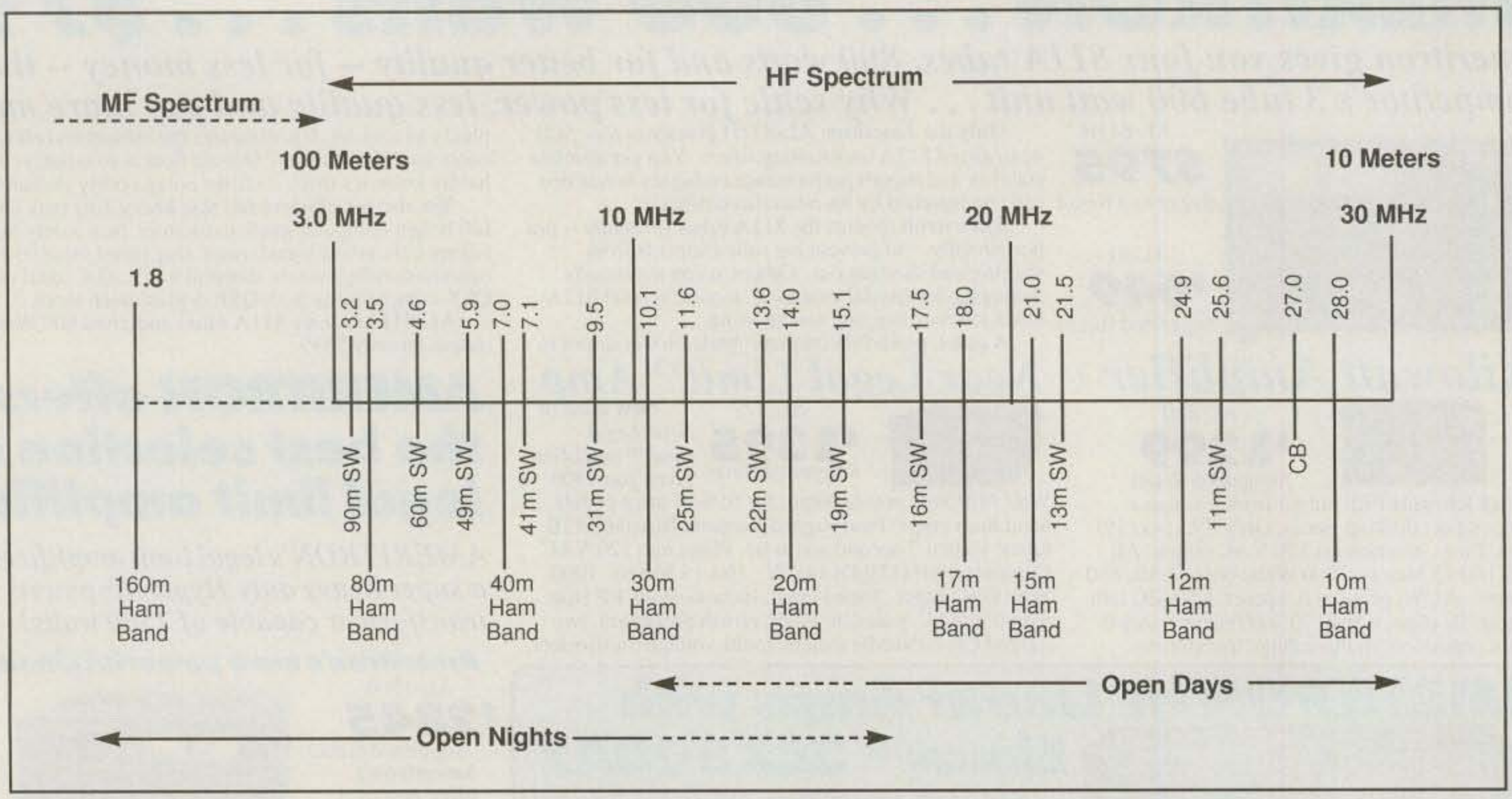

Fig. 1– A brief overview of the full HF spectrum of 3 to 30 MHz showing the amateur and international shortwave bands plus approximate hours each is "open."

blood" and one which you can join in or drop out of as time permits (although tuning away is much easier said than done!). A special DX contact or contest QSO may take only a few seconds, but memories of the chase and the catch will stay with you forever. DXing is a gas!

Want to enjoy a fast blast of all-out hamming fun or prove exactly what that new transceiver or mobile setup can do in a short time? Like to add a few new countries to your DXCC/CQDX total or maybe catch an elusive CQ zone for WAZ? This is when jumping into weekend contest action not to compete or win, but just to focus on an operating award or test your capabilities holds merit. Several years ago, for example, I worked all continents in 25 minutes during a DX contest. In late 1999 I compared my setup and operating expertise by working all continents in only 15 minutes. I also "ran a string" of 30 contacts in 30 minutes and found one third of the folks replied to my brief call with "K4TWJ. Is this Dave Ingram?" (the ultimate compliment; bless you all!). During another contest I filled a log page with great 20 meter DX contacts while mobile for only 30 minutes (photo B). I also have tried three times to work all states in a couple of hours while running QRP in the Sweepstakes, but thus far I have not been successful. (There apparently is a limit or short between my headphones.) What else can I say except that brief DXing ventures and contest operating stints are an ideal way to evaluate what you can or cannot accomplish and determine where your limitations are most noticeable. Don't just take my word for that, friends. Try it with your own setup and see for yourself. You'll have a ball in the process!

New Frontiers Beckon!

Say you thrive on pioneering new frontiers and checking out new modes of communications? The HF bands offer a kaleidoscope of broad opportunities with pursuits such as SSTV, PSK-31, 10 meter FMing, SWLing, and more awaiting your investigation. Yes, and getting started in "special interests" is usually less expensive than buying a new transceiver. In addition, you can homebrew and/or trade special-interest gear to break even or even make money while having fun and learning at the same time. Now that's a good deal from any standpoint!

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Photo B– Working DX from the car is easy if your operating times coincide with an international DX contest and you have a big mobile antenna. This one is an all-band "Stealth" on a custom mount, both made by Jim Blankenship, KN4TV, of Fortex Enterprises.

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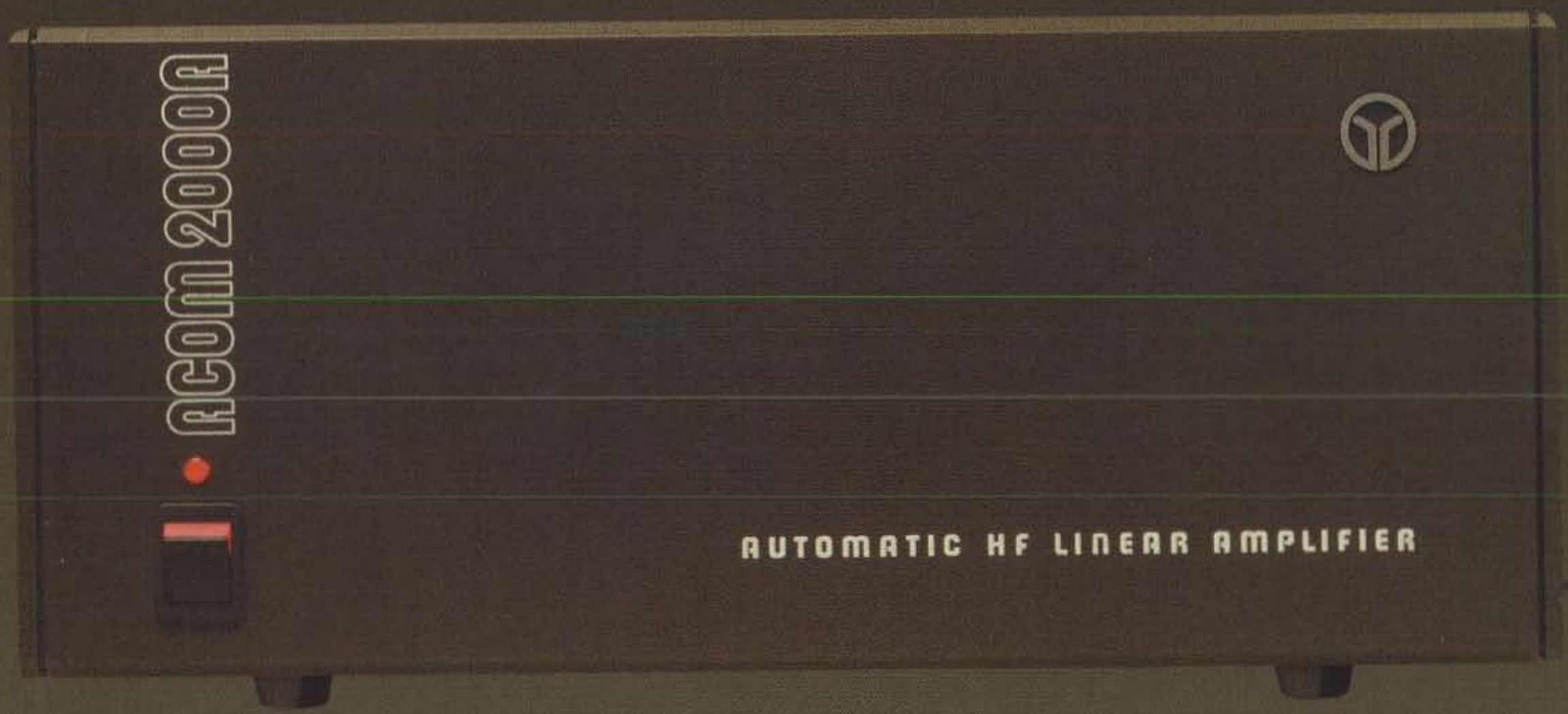

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HF Band Chart

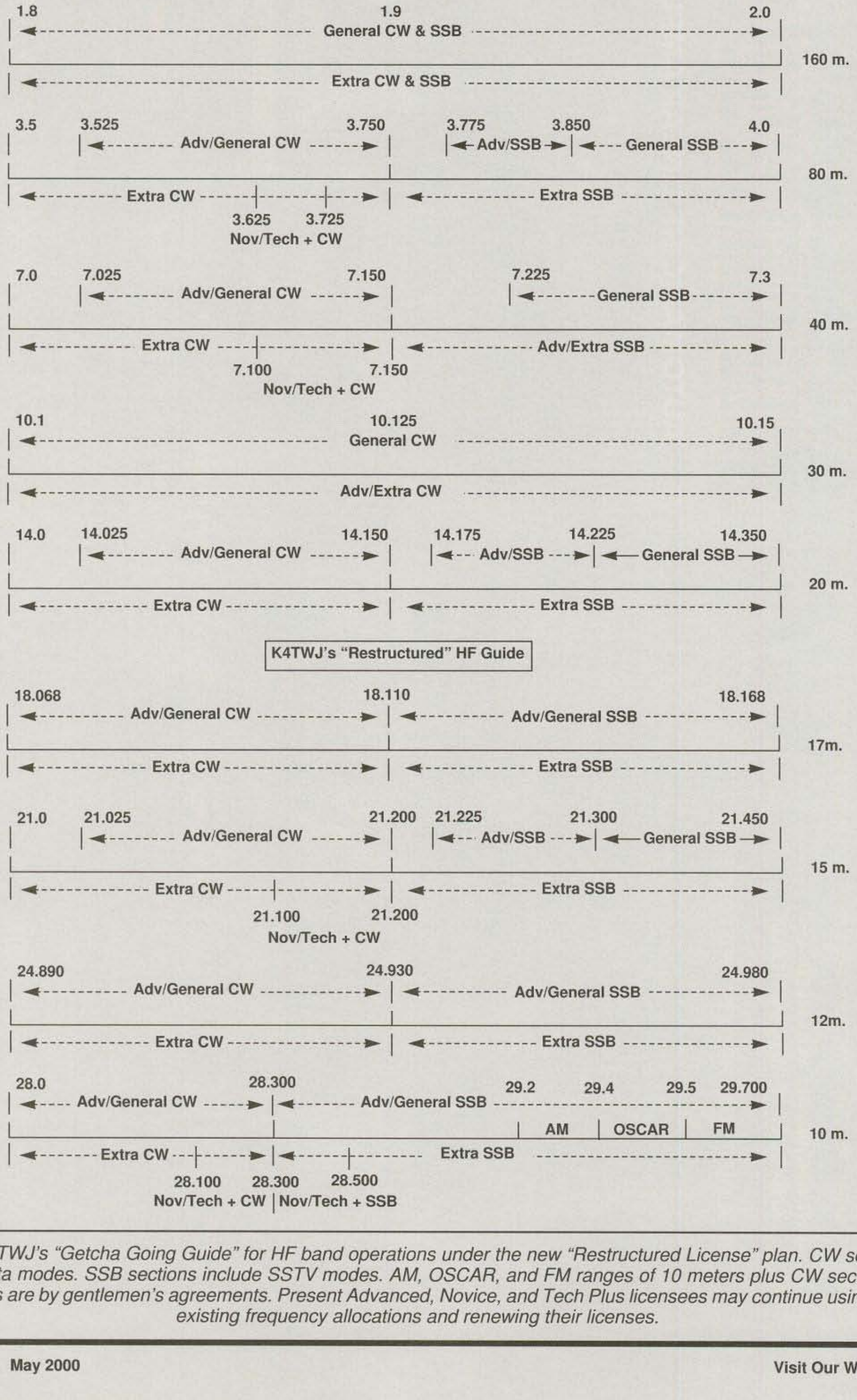

Fig. 2– K4TWJ's "Getcha Going Guide" for HF band operations under the new "Restructured License" plan. CW sections include data modes. SSB sections include SSTV modes. AM, OSCAR, and FM ranges of 10 meters plus CW section on 160 meters are by gentlemen's agreements. Present Advanced, Novice, and Tech Plus licensees may continue using their existing frequency allocations and renewing their licenses.

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SSTV format when it is going over the airwaves. Digital processing and scan converting slow it down and speed it up by a factor of 1000, so operators on "each side" of a QSO view it as regular Fast Scan TV. Color SSTV now has become commonplace, but other aspects such as high-definition, 3D, and special applications are still open to creative-minded operators. Are you up to the challenge? Listen around 14.230 MHz and check out SSTV action!

PSK-31 is a new printed mode of communications similar to AMTOR and packet, but it sounds different (like a single tone with multi-path) and does not require a TNC for interfacing with a transceiver. Interconnections are via a computer's sound card and a rig's speaker and microphone sockets (with resistor attenuators to match impedances and bring audio levels within adjustment range of both the sound card and your radio; see fig. 5).

What is the big attraction here? Let's assume you and/or a computer programmer friend can modify PSK-31 software to work in conjunction with a word-processing program such as Microsoft Word. Furthermore, assume Dragon "Naturally Speaking" or similar word-recognition software is used with Word. Then you could talk rather than type messages. Add voice synthesization as a next step, and we have a new ultra-narrowband medium for voice communications that will allow our HF bands to handle five times the present number of amateurs. Integrate language translation at the Microsoft Word level, and all operators can intercommunicate in their native tongues—no language barriers. What an opportunity for serving mankind and attaining radio fame! Tune in PSK-31 around 14.070 MHz. It sounds like a single warbling tone.

Band (meters)	Frequency Range (MHz)	
90	3.200–3.400	↑
60	4.600–5.100	↑
49	5.950–6.200	open nights
41	7.100–7.300	↑
31	9.500–9.900	↓
25	11.650–12.050	↓
22	13600–13.800	↓
19	15.100–15.600	↓
16	17.550–17.900	open days
13	21.450–21.850	↓
11	25.600–26.100	↓

Fig. 3– International HF shortwave AM broadcast bands.

10 meter FM is yet another captivating pursuit open to investigation and creative application. Its general concept is similar to 2 meter FM activity, except both "direct" and "via repeater" range is nationwide and worldwide. Innovative-minded amateurs can even use a pair of VOX circuits to produce a crossband repeating remote base or remote mobile setup. Access range can be limited by using low 2 meter power and a small 2 meter antenna. A General or higher class licensee must serve as a control operator. Overall, it is still a clever idea.

SWLing also deserves mention here, although you really do not need a license of any class for listening to various international shortwave bands, and that coverage is included in most HF transceivers. Indeed, tuning in direct from the source news (even while mobile) and comparing reports with similar broadcasts from known-neutral countries gives you good insight into world affairs during times of international unrest (fig. 3). Listen when tensions are high, and you may even hear modern equivalents of Tokyo Rose; propaganda is still alive and well, both nationally and internationally. Karl Thurber, W8FX, presented a great in-

Repeater Input (MHz)	Repeater Output (MHz)
29.520	29.620
29.540	29.640
29.560	29.660
29.580	29.680
International "Direct" Frequency	29.600

Fig. 4– Ten meter FM bandplan.

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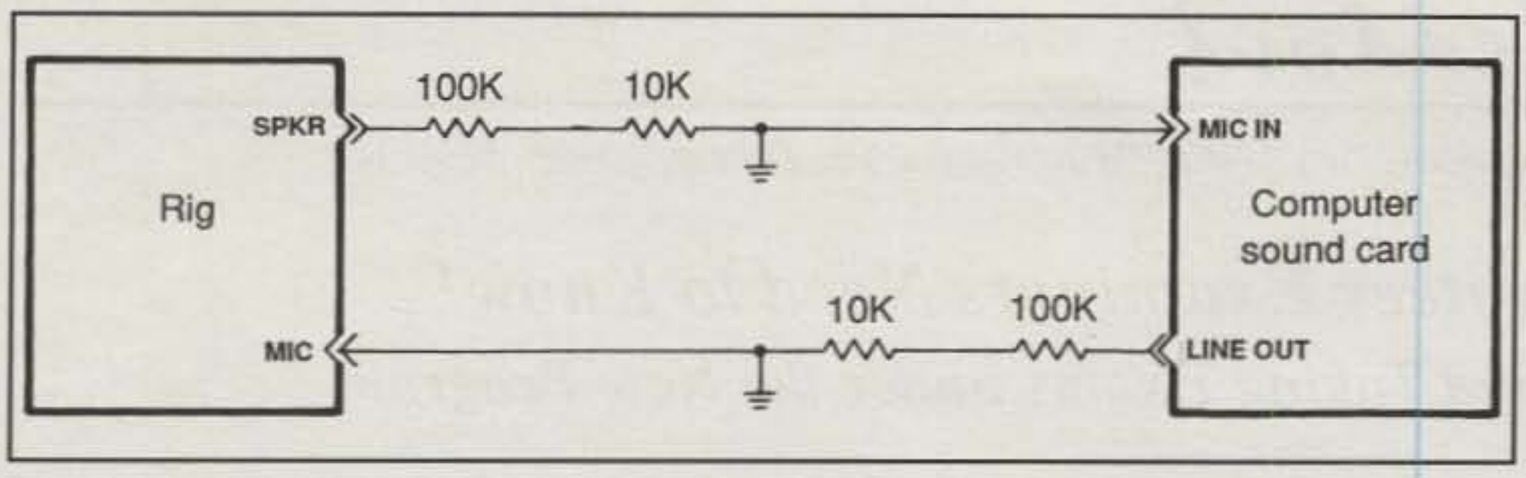

Fig. 5– This simple resistor network provides an impedance match for connections between your radio and computer sound card and reduces audio levels into adjustable ranges for each.

troduction to SWLing in the February and March issues of *CQ*. Check it out!

An Overview of the Bands

Let's now take a quick tour of various HF bands, visualize their similarities and differences, and consider what each offers today's "restructured" amateurs. We will move fast, so refer to fig. 2 and pay close attention!

If traditional-style hamming and/or chatting with other amateurs around the country and occasionally overseas is your main interest, the ever-popular 160, 80, and 40 meter bands will fill your needs admirably. They have a friendly, "laid back" air (except during contests!) and are a perfect medium for staying in touch with friends up to several hundred miles away. These are primarily nighttime bands. However, 40 meters also supports communications up to 300 or 600 miles during daytime hours. A large number of emergency nets meet regularly on 80/75 meters. Knowing the time and frequency your state's net (and adjacent states' nets) meet is a priceless asset during adverse weather or times of crisis.

Looking for something beyond the ordinary in your radio pursuits? There is a high probability you will find it on 10, 12, 15, 17, 20, or 30 meters. Ten meters is an excellent band for mobiling and/or working the world with a barefoot transceiver and vertical antenna. Typically, you can reach out 600 miles and farther and your signal "skips over" distances closer to your QTH. The wide frequency range of 10 meters gives everyone "elbow room," and it also supports numerous activities such as global FMing in the 29.510 to 29.700 MHz range (fig. 4). Ten meters is generally a daytime band, but it often stays open until 7 or 8 PM your local time in the summer months.

Twenty meters is unquestionably the heart of year-round DX action, special interest nets, SSTV operations, printed-mode communications, and more. Big pile-ups over rare DX plus high-power signals are abundant on this band. It is also a band that is "open" to one or more areas in the world almost 24 hours a day. Low-power stations also work their fair share of DX and stateside QSOs on 20, especially if they have an Extra Class license. The ability to operate in the 14.150 to 14.225 MHz range and the 14.000 to 14.025 MHz range is comparable to a 10 dB boost in your communications capabilities. Go for that "Extra" license soon!

Meanwhile, take a closer look at the 15, 17, 12, and 30 meter bands. Fifteen meters offers DXcitement similar to 20 meters, but high-power signals are less and the General license frequency range is slightly wider. Seventeen and 12 meters are similar to 20 or 15 and 15 and 10 meters respectively in range, plus General Class licensees can operate anywhere in the band and "barefoot" setups are more the rule than the exception. They are ideal for "restructured Generals."

Finally, 30 meters is a QRPer's haven. It is a CW-only band with a 200 watt power limit. If you like CW, you will love 30 meters.

One final note: Peter O'Dell, WB2D, described several easy-brew HF antennas for getting started on HF in his February 2000 *CQ* "Beginner's Corner" column. Check it out.

Conclusion

This month's column presented only a brief glimpse of all the delightful pursuits and activities awaiting today's "restructured" amateurs on our HF bands. The full area is vast—endless! Want to read about more in this column, maybe consider how to set up a great mobile station or a low-cost, high-performance home station? Drop me a note. Include an SASE if you wish a personal reply, and keep reading this column for more special-interest notes. 73 and may the force of good signals be with you.

73, Dave, K4TWJ

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CIRCLE 82 ON READER SERVICE CARD

Washington Readout

Regulatory News In The World Of Amateur Radio

BY FREDERICK O. MAIA, W5YI

What Volunteer Examiners Need to Know!

Administering and Taking Exams under the New Program

About the time you get this issue, the new U.S. Amateur Radio licensing program will be coming on line. Effective April 15th, just about everything changes in the ham radio operator license exam room. Volunteer examiners will be administering different, more streamlined examinations, upgrading amateurs without even testing them, and handling the paperwork quite differently. Here is what VEs and examinees can expect at examination sessions held after April 14th; that's the last day of the "old amateur radio." One thing for sure, VEs are going to be busy, as are their VECs (VE Coordinators), who must electronically file the license applications. Thousands of applications will start pouring into VECs right after April 15th.

When the FCC announced the new Amateur Service restructuring at the end of last year, they also set off a frenzy as amateurs rushed to get upgraded on or after April 15th without taking a high-speed Morse code examination. What the FCC said was that any amateur who passed the old examinations —the ones that end on April 14th— could be issued a credit certificate (known as a Certificate of Successful Completion of Examination [CSCE]) that could be used later as credit for the new examinations.

This was a stroke of genius, since it also purged the publishing pipeline of study manuals used under the old system that was coming to an end. This was something that the VECs Question Pool Committee was concerned about, since the QPC had told the publishers and dealers that the General Class exam would remain current until June 30, 2002. Many had printed or purchased large quantities of study guides based on the four-year revision cycle that had been the norm. The impact on the Advanced Class and Extra Class was not as much, since the QPC in 1998 placed a moratorium on the revision of any further question pools until the FCC decision on restructuring the service was known. The Advanced and Extra Class question pools were not revised as scheduled in 1998 and 1999.

Effective April 15th only three written examinations, instead of five, will be administered. The Novice and Advanced written examinations are discontinued, as are the higher speed (13 and 20 wpm) CW exams. What the FCC said was that passing the old General Class written examination, Element 3(B), could be used as credit toward the new General Class Element 3, and the old Extra Class (Element 4B) could be used as credit toward the new Extra Class Element 4.

This caused a mad scramble by holders of the Technician Plus and Advanced Class (who had already passed a Morse code exam) to pass the old Element 3(B) or 4(B) so they could get credit towards the new Element 3 or 4. The credit certificate meant that they would be fully qualified for the General or Extra Class on April 15th without further examination. General Class amateurs could pass Element 4(A) and 4(B) (the old Advanced and Extra written test) and use their CSCEs to get an Extra Class ticket. In any event, the pipeline has essentially been purged of the old study manuals.

Judging by the quantity of General, Advanced, and Extra Class study manuals that were sold and the examinations for Elements 3(B), 4(A), and 4(B) that were administered during January, February, and March, there could be tens of thousands of amateurs upgrading in April without taking another examination! Another interesting statistic is the number of "no code" Technicians who passed the 5 wpm code test in January and February. That figure is more than double that of last year. They too are looking to upgrade their license.

Any amateur who has already passed the old examinations also gets credit toward the new ones, and that includes some cases where the applicant has let his or her license lapse years, or even decades ago. For example, anyone who has ever held a Novice license, even if the license has been expired for 20 years, still retains permanent examination credit for the 5 wpm code. That concept is brand new.

A Technician Class operator who was licensed before March 21, 1987 also retains permanent credit for both the code and Element 3 (General Class) even if they have let their license lapse many years ago. Strangely, however, only currently licensed Technicians or those within the two-year grace period for renewal get Element 2 (Technician) examination credit.

Any Technician Class amateur with an expired license—even beyond the grace period—who was first licensed prior to February 14, 1991 also retains permanent code credit. February 14, 1991 marks the beginning of the codeless Technician ticket. As you can see, examination credit for the Technician Class operators is complex. To make it easier on VEs and applicants alike, we have put together a chart which shows the exam credit available and upgrade path that various groups of amateurs may take (se Table I).You can expect applicants to start appearing at examination sessions on April 15th and afterward in droves with licenses and credit certificates in hand wanting to upgrade under the new system. Some of the licenses will be current licenses, some will be old expired licenses, and some applicants will have both. All will have the same objective: to upgrade their ticket under the new streamlined rules. It is up to the applicant, not the VE or VEC, to prove that he or she qualifies for the examination credit .

All VECs (including the ARRL/VEC and W5YI-VEC, who coordinate most of the VE sessions) will be accepting any reasonable evidence that an applicant was licensed as required to obtain the exam credit. This proof can even be a photocopy of an old *Callbook* page. The 1987 and 1991 books are particularly useful for this purpose. The W5YI-VEC is also able to help you research your old licensing information if you need help (call 817-461-6443). There is a small charge for this service.

Fred Lloyd, AA7BQ, of Scottsdale, Arizona, has placed a copy of the March 1993 QRZ CD-ROM amateur census online at <http//www.qrz.com/

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Specific Groups of Amateurs	Examination Credit Received	Upgrade to Technician	Upgrade to Technician w/code credit	Upgrade to General Class	Upgrade to Amateur Extra Class
	ELEMENTS NEEDED TO PASS TO UPGRADE				
Currently or previously licensed (now expired) Novice Class operator. (License may be expired more than two years.)	Element 1	—	Element 2	Elements 2 & 3	Elements 2, 3, & 4
Currently licensed (or license expired less than 5 years) FCC-issued Commercial Radiotelegraph operator.	Element 1	—	Element 2	Elements 2 & 3	Elements 2, 3, & 4
Currently licensed Technician operator (or license expired less than two years) and licensed after 2/14/91.	Element 2	—	Element 1	Elements 1 & 3	Elements 1, 3 & 4
Currently licensed (or within the 2-year grace period for renewal) Technician Class operator and licensed between 3/22/87 and 2/14/91.	Elements 1 & 2	—	—	Element 3	Elements 3 & 4
Technician with expired license (more than 2 years) and licensed between 3/22/87 and 2/14/91.	Element 1	—	Element 2	Elements 2 & 3	Elements 2, 3 & 4
Currently licensed Technician Plus operator (or license expired less than two years) and licensed after 2/14/91.	Elements 1 & 2	—	—	Element 3	Elements 3 & 4
Currently licensed (or license expired less than two years) Technician Class operator and licensed as Technician on/before March 21,1987.	Elements 1, 2 & 3	—	—	Now Qualified	Element 4
Previously licensed (now expired more than 2 years) Technician Class operator licensed on/before 3/21/87.	Elements 1 & 3	—	—	Element 2	Elements 2 & 4
Currently licensed General or Advanced Class operator (or license expired less than two years.)	Elements 1, 2 & 3	—	—	—	Element 4
Previous Tech Plus, General, or Advanced Class	No credit	Element 2	Elements 1 & 2	Elements 1, 2 & 3	Elements 1, 2, 3 & 4

Note: *Element 1 = 5 wpm Morse code exam, Element 2 = Technician written exam, Element 3 = General written exam, and Element 4 = Extra written exam. All applicants must be able to prove that they are currently licensed or were licensed as of the specific date indicated above. Any reasonable evidence will be accepted.*

Table I– Examination credit and upgrade path.

search1993.html>. This database contains over 195,000 licenses issued between 1983 and 1987and may be used to prove Technician license status.

To locate examination opportunities in your area, contact your local club, VE group, one of the 14 VECs, or check out the online listings on the web: <http://www.w5yi.org/vol-exam.htm> or <http://www.arrl.org/arrlvec/examsearch.phtml>. It seems that most VE teams will indeed be holding an exam session on Saturday, April 15th so that you can turn in your CSCEs and license copies.

It will be interesting to see what happens to the amateur breakdown by license class in the coming months and years. Right now (March 1st) there are 679,115 currently licensed radio amateurs: 71,140 are Extra Class (about 11% of the total), 103,633 are Advanced (15%), 110,386 are General (16%), 133,567 are Tech Plus (20%), 204,000 are Technician (30%), and 51,299 are Novice (8%). This is certain to change drastically, since no new Novice and Advanced Class operators will be licensed after April 14th, and Tech Plus operators will have their licenses renewed as Technician (with 5 wpm code credit). With so many Tech Plus and Advanced Class operators using their CSCEs to upgrade, it won't be long before the percentage of Technicians, Generals, and Extras skyrockets. We predict that a year from now the amateur census will not look anything like it does today!

It is especially important that VE teams do not file late any new or upgraded applications for the Novice, Tech Plus, or Advanced Class license. By rule, a VE team has ten days to get the license applications to their VEC, and the VEC has ten days in which to electronically (computer-to-computer) input the application into the FCC's database. The FCC has said they will not accept any Novice, Tech Plus, or Advanced applications from VECs after May 4th.

By the way, there is no change in the "Vanity" callsign program. All six license classes will stay in the database, although the Novice, Tech Plus, and Advanced Classes will continually shrink in size. A Novice operator still qualifies only for a Group "D" (2-by-3 format) "Vanity" callsign. Technician, Tech Plus, and General Class amateurs may obtain any available Group C (1-by-3) or D callsign. The Advanced Class still qualifies for Group B (2-by-2), C, or D, and Extra may choose any available Group A (1-by-2, 2-by-1, and AA-by-2), B, C, or D call.

The New Examinations

As mentioned last month, the VEC Question Pool Committee has now released the new questions complete with multiple choices and answers identified to the public. The biggest change is in the number of different written examinations and questions on each exam.

There will be fewer. Study guides for the new exams are also starting to appear in the publishing marketplace.

All VECs have now prepared and distributed new written examinations to their VE teams. The Technician and General Class exams contain 35 questions, and there are 50 questions in the Extra Class exam. Passing score is 26 answered correctly on the Tech and General exams, and 37 on the Extra exam. In addition, several VECs (the W5YI-VEC among them) will be distributing special examination software that properly selects the correct number of questions from each grouping and topic.

You really will not notice much difference in either the written or the telegraphy examinations. The questions contained in the new examinations are, for the most part, the exact same ones that were on the previous tests. There are just less of them—about one third less (1450 questions total versus nearly 2300 in the previous pools). A few (less than 10%) revised and new questions have been added, but for the most part, they are exactly the same—something of which most amateurs do not seem to be aware. A copy of these question pools complete with answers is available from the W5YI Group (see advertisement elsewhere in this issue).

The Telegraphy Examination

The 5 wpm Morse code exam consists of sending a short "QSO-type" message (about 5 minutes long) and then giving the examinee two chances to pass the test. Examinees who transcribe one minute solid copy (25 characters in a row) are immediately passed. A ten-question multiple-choice or fill-in-the-blank format quiz is administered to those who do not. You pass if you get seven answers correct.

VE teams generally are provided by their VEC with several examinations on an audio cassette tape, or the VE team may elect to prepare its own examinations. Each examination must contain all 43 characters—the 26 letters, numerals 0–9, punctuation (period, comma, question mark, and slant bar), and the operating prosigns, AR, BT, and SK.

The "Farnsworth" character spacing in the code examination may be selected by the VE team. Most VECs provide audio Morse code exams where the characters are spaced at between 15 and 18 words per minute. Some VEs will even customize your code exam to a spacing speed that the examinee wishes. Just as long as the net speed is 5 wpm, it is a legal exam. Farnsworth spaced (faster characters with proportionately longer spaces in between) examinations generally are easier to pass.

Waivers of the 13 and 20 wpm code exams are, of course, no longer necessary, since the top speed in amateur radio is now 5 wpm. However, the VEs will still "accommodate" applicants who, because of some sort of handicap, are unable to pass 5 wpm code.

For deaf people, these accommodations include sending the dots and dashes to a vibrating surface or flashing light, or writing the examinee's dictation for a blind applicant. VE teams will also allow hearing disabled people to hand send the message rather than receive it. In cases where the applicant is seriously disabled, VEs will pause in sending the message after each sentence, each phrase, each word, or in extreme cases they will pause the exam message character-by-character to allow the examinee additional time to absorb, to interpret, or even to speak out what was sent. These accommodations are available only to examinees who are legitimately incapacitated in some way. A slight hearing abnormality does not qualify. A note from your doctor about the need for special handling is helpful.

What is a NCVEC Form 605?

The FCC Form 605 is mentioned in the Part 97 rules, but it can't be used at examination sessions, since it does not request information needed by the administering VEs. There is no place on the FCC's version of the Form 605 to certify that an examinee has passed the needed examinations to get a license, or even for which license class the applicant is qualified.

For this reason, the FCC permits the VECs to develop their own form, which is patterned on the previous FCC Form 610. They call it the NCVEC (for National Conference of VECs) Form 605. It is available from the various VE teams at their examination location. You can also obtain it from any VEC.

The NCVEC Form 605 also can be used to renew, modify (change your address, name, or sequential callsign), or reinstate your license if it has been expired less than two years. It must, however, be returned to a VEC (and not the FCC), who electronically files the application directly into the FCC's Amateur Service data base. The FCC's version of the Form 605 may be used to routinely renew or modify your license or to request a replacement license document, but not where an examination or a change in license class is involved. The FCC Form 605 must be returned to the FCC in Gettysburg, Pennsylvania.

The FCC is now in the process of accepting applications for Amateur Service "Club Station Call Sign Administrators." The NCVEC Form 605 will also be the document used when applying for or renewing a club callsign or military recreation station once the administrators have been appointed.

Effective April 15th, RACES station callsigns may not be renewed. However, the NCVEC Form 605 can be used to modify RACES station information until the ten-year license term is up.

The current version of the NCVEC Form 605 Application for Amateur Operator/Primary Station license is dated April 2000, but the previous version (August 1999) may be used until stocks are depleted.

73, Fred, W5YI

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CIRCLE 119 ON READER SERVICE CARD

VHF Plus

BY JOE LYNCH, N6CL

All About The World Above HF

The Sandwich Month

This is an odd title for a topic in a VHF column. It was selected for a particular purpose, though. Last month saw the inauguration of the new license class regulations. Next month provides several operating opportunities for the weak-signal VHF operator. This makes this month, sandwiched in between last and next, a critical opportunity month.

Heretofore many hams who obtained the Tech license have not been joining anything. For the most part, as surveys done by both *CQ* and the League have indicated, while these hams have been joining our ranks, they have not been joining the rest of us—that is, by way of joining our clubs. The big question that all of us in the industry who are concerned with our growth continue to ask is why.

I would like to propose a partial answer to this question. It is this: We are doing an extremely poor job of recruitment! All too often we are closed to newcomers. We have set up barriers of entry that preclude others from getting in. What am I talking about? It is the mindset that says, "Unless you got your license the old-fashioned way, you're not a real ham."

Let's face it: Just because someone became a ham via a different set of rules than you or I did, that does not diminish him or her as an individual of worth and character. If you've got that attitude, you are a major contributor to the problem of the lack of growth in the hobby. Things are never going to be just like they were in the 1950s or 1960s, or in whatever era you came into the hobby. It just isn't going to happen.

Right now within the electronics industry there is an acute shortage of RF engineers and technicians. The industry has far more digital engineers and technicians than RF guys. Because of the growing interest in satellite and wireless communications, both for computers and cellular telephone, there is an immediate need for the engineers and techs to handle this growth. With the increasing need for such personnel, guess where the most likely pool of potential candidates exists? If you guessed that new young ham or that kid next door, you are right on target.

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VHF Plus Calendar

May 3	New Moon.
May 5	Moon perigee.
May 6	902 MHz and above Sprint, 6 AM to 1 PM local time. (See last month's column for details.)
May 7	Poor EME conditions.
May 8	Highest Moon declination.
May 10	First quarter Moon.
May 13-14	50 MHz Sprint, 2300 UTC Sat. to 0300 UTC Sun. (See last month for details.)
May 14	Moderate EME conditions.
May 18	Full Moon.
May 19-21	Dayton Hamvention. (See text for details.)
May 21	Moon apogee. Very poor EME conditions.
May 22	Lowest Moon declination.
May 26	Last quarter Moon.
May 28	Moderate EME conditions.

— EME conditions courtesy W5LUU.

We in the weak-signal community are precisely positioned to provide the open door for such development of these potential employees. We weak-signal people are doing work in areas that will be job specific for many of these people. Now if we go after these people, we can help them along their career path plus we gain a side benefit of having them loyal to their hobby. Think about it: Almost all of us who have been licensed since our teenage years or a bit later are loyal to our hobby. What will be so different about the new crop of hams?

I opened this piece with the title "Sandwich Month" because this month, sandwiched between last month's historic licensing event and next month's contesting opportunities, is critical for you and your club when it comes to recruitment. Here is the incentive: Three out of four weekends next month provide contest opportunities for us in the weak-signal arena. First there is the June VHF QSO Party. Next is the SMIRK 6 meter contest. Finally, there is Field Day. Each of these activities provides unique VHF experiences. The VHF QSO Party is a general, get-acquainted-with-propagation type of contest.The SMIRK contest is a band-specific event. Field Day provides incentives that include satellite communications.

With these opportunities to give our potential new members something into which they can sink their teeth, what can we do to get them in the door? Here are ten sure-fire ideas that will do just that and keep them coming back.

1. Plan some sort of program for your next club meeting that will be enticing and centered on weak-signal VHF communications. This presentation has to have some pizzazz. Showing a video of a previous contest or a Power Point presentation of whatever will liven up things quite a bit.

2. Have a simple activity in mind, such as a 10 GHz FM transceiver construction project. Such a project will give these new hams some hands-on experience plus equip them with a radio on a band that they probably don't have—and a radio that they can use in two of the three June activities. Another project could be the construction of a 2-element, 6 meter quad. Some of the more popular HF radios include 6 meters. Without an antenna, it isn't much use. Show your new hams how to build one.

3. Get on the local repeaters and talk up your next club meeting.

4. Send out a mailing to all the hams in your local area. You can access QRZ.com to compile your database. If "all of the hams" is too much of a field, then narrow it down to newly licensed Technicians.

5. Provide an atmosphere at the club meeting that is welcoming. Have plenty of refreshments and people poised to greet the guests. When we go to a club meeting, we have a tendency to gravitate toward our pals. Resist that temptation. Don't sit in your self-assigned seat. Go to someone who is new and sit with that person. Don't let any of these new people sit by themselves.

6. Have a sign-in sheet and pass it around, making sure to make an effort to get everyone's name and callsign on it at the very minimum. E-mail addresses and mailing addresses plus phone numbers are also preferred. Better yet, pass out preprinted index cards that ask the following questions: name, call, address, telephone number, e-mail address, bands operated, and equipment, including antennas. This provides you with an idea of what your new people have in the way of equipment and what they are lacking.

7. Make sure your meeting room has an atmosphere inviting to visitors.

Among the items to be checked are sufficient lighting and an ample number of chairs.

8. Have some sort of handout prepared to give to your visitors. This handout should have information about the club, including, at the minimum, meeting times and a greeting from the club president. If you don't want to bother with a special handout, give your visitors a copy of the current club newsletter.

9. Follow up each person's visit with a personal contact. Ask the visitor what he or she liked and did not like about the club meeting. Also ask what he or she would like to see for a future program. Finally, invite the person to the next club meeting.

10. Do a survey of your new members. Ask them two questions:

A. The first two times you visited our club, which of the following best describes the atmosphere?

1. extremely warm and friendly
2. friendly
3. pleasant but somewhat distant
4. cold and aloof

B. The first two times you visited our club, which of the following best describes what happened?

1. You were left standing or sitting alone while members talked among themselves.
2. A few people spoke in a courteous way but left you to break into circles of conversation on your own.
3. One or two people went out of their way to include you, but the others acted as if you were not there.
4. Everyone included you in conversational circles as if you had been a member forever.

With the data gathered from the surveys of new members you will have a better understanding of what you need to improve in order to make the social atmosphere more inviting to potential members.

These ten ideas are by no means exhaustive. You can form a membership committee that can have brainstorming sessions to come up with even more creative ideas. All of this will take lots of work. However, it will be worth the effort with increased attendance and participation in your club, as well as in watching that spark of enthusiasm take hold in these new members' lives.

It is up to you. I wish you success in your plans to increase membership in your club.

Phase 3D Tentative Launch

The following is from the AMSAT News Service:

AMSAT-DL's Peter Guelzow, DB2OS, broke the exciting Phase 3D news on February 29th, telling the amateur radio satellite community (via the AMSAT-BB mailing list) that "it's official." The Phase 3D next-generation amateur radio satellite has been tentatively scheduled for launch in late July!

The launch information is included in the Provisional Ariane Launch Manifest for February through July of this year. The manifest appears in the February edition of the Arianespace newsletter. The ARRL reports that if the schedule holds, the Phase 3D satellite would be sent aloft on Ariane 507, flight V132.

AMSAT-NA President Keith Baker, KB1SF, was delighted with the news: "slowly but surely, Phase 3-D is moving ever closer to a launch. To finally see it listed on a launch manifest is a major milestone. Needless to say, we're most grateful for all the outstanding support we've been getting from the fine people at Arianespace!"

Former AMSAT-NA President Bill Tynan, W3XO, echoed the statements, adding, "the recent news that Phase 3D has been designated for launch on AR-507 was indeed gratifying to all who have waited so long to hear such tidings. As the president of AMSAT-NA during much of the time the spacecraft was being constructed at our Orlando facility, I am especially pleased that the hard work of so many, for so long, is now coming to fruition. I look forward to meeting many of my friends on Phase 3D once it becomes operational.

The Arianespace manifest identifies the other possible payloads aboard flight 507 as

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the PAS-1R (Europe Star) package and the STRV-1C/1D package. A launch contract accepting Phase 3D as a payload for the first suitable Ariane 5 launch vehicle was signed last October. The satellite is now at the European Spaceport in Kourou, French Guiana.

More information about the launch can be found at <http://www.arianespace.com/news_espace.html>.

CSVHF Society Conference And Final Call for Papers

The following is from the Central States VHF Society:

The 34th Annual Central States VHF Society Conference will be held in Winnipeg, Manitoba, Canada from July 20–22, 2000. This is the first-ever CSVHF conference to be held outside the USA, and the conference team is working hard to make the millennium edition something special.

The conference will be held at the Canad Inn Ft. Garry, conveniently located in the south central part of Winnipeg, and easily accessible by highway from any direction, and by taxi or shuttle bus from the airport. The hotel is very modern with a waterslide, swimming pool, on-site dinner theater and piano bar, and excellent restaurant.

We have arranged a block of rooms at a special conference rate of $85 CDN (approximately $60 US) for single and double occupancy. Right next door the Canad Inn Express hotel offers standard rooms for a conference rate of $65 CDN (approximately $46 US).

Reservations for the Canad Inn Ft. Garry can be made at 888-332-2632, directly at 204-261-7450 or on-line at <http://www.canadinns.com>. This web site provides further information. Please quote the Central States VHF conference group number 338.

Arrangements have been made for discount air fares with Northwest Airlines and its partner Continental Airlines. The discounts are up to 17% if tickets are bought more than 60 days in advance and 12% for less than 60 days. When ordering tickets contact the Meeting Services Reservations Desk at 1-800-328-1111 M–F 07:30 to 19:30 Central time. Refer to the WorldFile/Ticket designator of "NYMCM." These discounts are only valid for travel between July 17 and July 25, 2000.

Arrangements have also been made for discount air fares with Air Canada and its partner United Airlines. Discounts are 10% or more if tickets are bought more than 60 days in advance and 5% or more for less than 60 days. When ordering tickets contact Air Canada at 1-800-268-0024 M–F 08:00 to 08:00 Eastern Time. Refer to the Event Registration number CV920452.

Antenna gain measurements are scheduled for Friday morning and noise figure measurements will be held Friday evening along with the flea market.

Jim Roik, VE4AQ, is in charge of the family program, which includes visits to historical sites, one of which includes a ham radio museum.

Barry Malowanchuk, VE4MA, is in charge of the technical program and the proceedings. If you are interested in presenting a talk, please contact him as soon as possible by e-mail at <ve4ma@csvhfs.org>, by phone at 204-254-4178, or by mail at 54 Boisselle Bay, Winnipeg, Manitoba Canada R3X 1M4. Also consider preparing a submission for the proceedings, which will again be published by the ARRL. The deadline for camera-ready submissions of finished papers is May 1, 2000.

The speakers and topics confirmed thus far: KBØHH, "Tower Construction"; K6MIO, "Solar Physics & VHF Propagation"; N6TX, "Practical SETI Installations"; VE7BQH, "2m EME"; W3EP, "Aurora Propagation"; WØPHD, "Narrow Band Data on Weak Signal VHF/UHF"; WØUC, "How to Be Competitive in VHF/UHF Contests"; W3EP, "Tropospheric Propagation Prediction"; W5IU, "Update on New Satellites"; W5LUA, "Receiver Dynamic Range"; WA5TKU, "Power/VSWR Measurement Methods for HF/VHF/UHF"; W5UC, "High Speed Meteor Scatter"; WA8WZG, "Practical Tower, Antenna & Cable Installations"; and W9FZ, "Roving, A New Experience Every Time!"

Central States VHF Society members are requested to submit nominations for the Chambers and Wilson Awards. Nominations for both may be sent to Kent Britain, WA5VJB, at <wa5vjb@csvhfs.org>. The Chambers Award honors those who have made outstanding technical contributions to the VHF/UHF/microwave art. The Wilson Award

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Encourage other VHFers in your area to join the CSVHF Society. They may join by sending $5.00 dues to the Treasurer, Bruce, W9FZ. This will ensure they receive the registration mailing in June. Also be sure to check the CSVHF Society web page at <www.csvhfs.org> for up-to-date conference news.

Because the conference will be held in Canada, there are a few pointers that U.S. and citizens of other countries should keep in mind. They can be found in a paper prepared by Jim Roik, VE4AQ, located on the Central States VHF Society URL: <http://www.csvhfs.org/asvhf00c.html>.

For more information, contact Barry Malowanchuk, VE4MA, 2000 CSVHFS President, at <ve4ma@csvhf.org>.

Current Conference

Dayton Hamvention Weak Signal Forums: The Dayton Hamvention will be held on May 19–21, 2000. The following forums will be of particular interest to the weak- signal VHFer: Friday, Room 3, 2:15–3:00, Tropo Ducting with GPS by Gordon West, WB6NOA; Saturday, Room 2, 12:15–2:30, AMSAT, hosted by AMSAT President Keith Baker, KB1SF; Saturday, Meadowdale High School, Room 2, 8:30–10:30, VHF/UHF Microwave, hosted by Merle Rummel, W9LCE; and 1:00–3:00, ATV, hosted by Bill Parker, W8DMR. Unofficial activities include the following:

AMSAT Banquet: The AMSAT Banquet will be held on Friday, May 19, 7:30 PM at Elinor's Amber Rose, 1400 Valley St., Dayton, OH (in old north Dayton). Maps to Amber Rose will be available at the AMSAT Booth.Happy hour will be at 6 PM prior to the banquet. Reservations are definitely required as they have limited seating. The $20 price includes meal, tax, and tip. A cash bar is available. Make plans to attend soon by contacting Edward Collins at <n8nuy@amsat.org>.

SETI Breakfast Meeting: An informal gathering of amateurs interested in SETI will meet for breakfast at the Dayton Marriott on I-75 South, exit 51, on Saturday, May 20th at 7 AM.

Paul Shuch, N6TX, To be Honored at Dayton

Once again the Dayton Hamvention will honor a well-known weak-signal VHFer. This year the convention will present its Technical Excellence Award to H. Paul Shuch, N6TX. Shuch is being honored for his pioneering work in the 1970s in VHF, UHF, and microwave receiver design and for his recent design of amateur radio astronomy equipment for the 21 cm hydrogen line region.

Shuch, who is the executive director of the Search for Extra Terrestrial Intelligence (SETI) League, was honored last year by the ARRL Atlantic Division as its 1999 Technical Award winner. Shuch has authored more than 200 articles, about half of them in amateur radio publications. He was the 1996 Dayton Hamvention banquet speaker. *(Information courtesy the "ARRL Letter.")*

Current Contests

The 902 MHz and 50 MHz Spring Sprints are scheduled for this month. The 902 MHz Sprint is on May 6, from 6 AM and 1 PM local time. The 50 MHz Sprint is on Saturday, May 13, from 2300 to 0300 UTC (Sunday). For more information, see last month's column.

New Solar Predictor Method Developed

The following is from NASA via its press-release service:

A week's advance warning of potential bad weather in space is now possible thanks to the Solar and Heliospheric Observatory (SOHO) spacecraft. With a technique that uses ripples on the Sun's visible surface to probe its interior, SOHO scientists have, for the first time, imaged solar storm regions on the far side of the Sun, the side facing away from the Earth.

Like the unanticipated arrival of hurricanes before the advent of weather satellites, a group of previously hidden solar storm regions can rotate suddenly into view as the Sun turns, blazing away with explosive eruptions. The new technique, which uses the Michelson Doppler Imager (MDI) instrument on SOHO, gives a warning by creating a window to the far side of the Sun.

"We've known for ten years that in theory we could make the Sun transparent all the way to the far side," according to Dr. Charles Lindsey of Solar Physics Research Corp., Tucson, AZ, and Dr. Douglas Braun of NorthWest Research Associates, Boulder, CO, authors of a paper describing the research to be published in the journal Science on March 10. "But we needed observations of exceptional quality. In the end we got them, from MDI on SOHO."

Storm areas on the Sun, called active regions, are much larger than the Earth and consist of strong magnetic fields on the Sun's surface. Active regions produce explosions, called flares, and eruptions of plasma (hot, electrically charged gas), called coronal

mass ejections. The radiation and plasma from these events sweep past the Earth, sometimes affecting spacecraft, power systems, and disrupting radio communications. Understanding and forecasting solar eruptions and their consequences is a relatively new science called space weather.

For more than 100 years, scientists have been aware that sunspots (groups of dark areas on the Sun's visible face) are often the scene of flares and other eruptions. Now they watch the Sun more closely than ever, because modern systems are much more vulnerable to solar disturbances than old technology. The experts can still be taken by surprise because the Sun rotates, bringing the effects of hidden active regions to bear on Earth. With a far-side preview of sunspots, nasty surprises for the space weather experts may now be avoidable.

Ripples on the Sun's surface used to image the interior are caused by sound waves reverberating through the Sun. Analysis of solar sound waves is the science of helioseismology, and it opened the Sun's gaseous interior to investigation in much the same way as seismologists learned to explore the Earth's rocky interior with earthquake waves.

The MDI instrument is the most elaborate of three helioseismic instruments on SOHO. It measures rhythmic motions at a million points across the Sun's visible surface. Computers can interpret the motions in terms of sound waves travelling through the Sun. The waves are affected by the various layers of gas and different motions that they encounter. The MDI has already revealed many unknown features of the solar interior, including hidden jet streams circling the Sun's poles.

The technique of helioseismic holography used by Lindsey and Braun examines a wide ring of sound waves that emanate from a small region on the far side and reach the near side by rebounding internally from the solar surface. An active region reveals itself because it possesses very strong magnetic fields that speed up the sound waves. Waves that pass through an active region have a round-trip travel time about 12 seconds shorter than the average of six hours. The difference becomes evident when sound waves shuttling back and forth get out of step with one another.

MDI data for March 28–29, 1998 revealed on the far side a sunspot group that was not plainly visible on the near side until ten days later. Observations for 24 hours were more than sufficient to detect the sunspots, which means that routine monitoring is a realistic possibility.

SOHO is a cooperative project between the European Space Agency (ESA) and NASA. The spacecraft was built in Europe for ESA and equipped with instruments by teams of scientists in Europe and the USA. The National Science Foundation and NASA funded the far-side helioseismology research. Images and additional information

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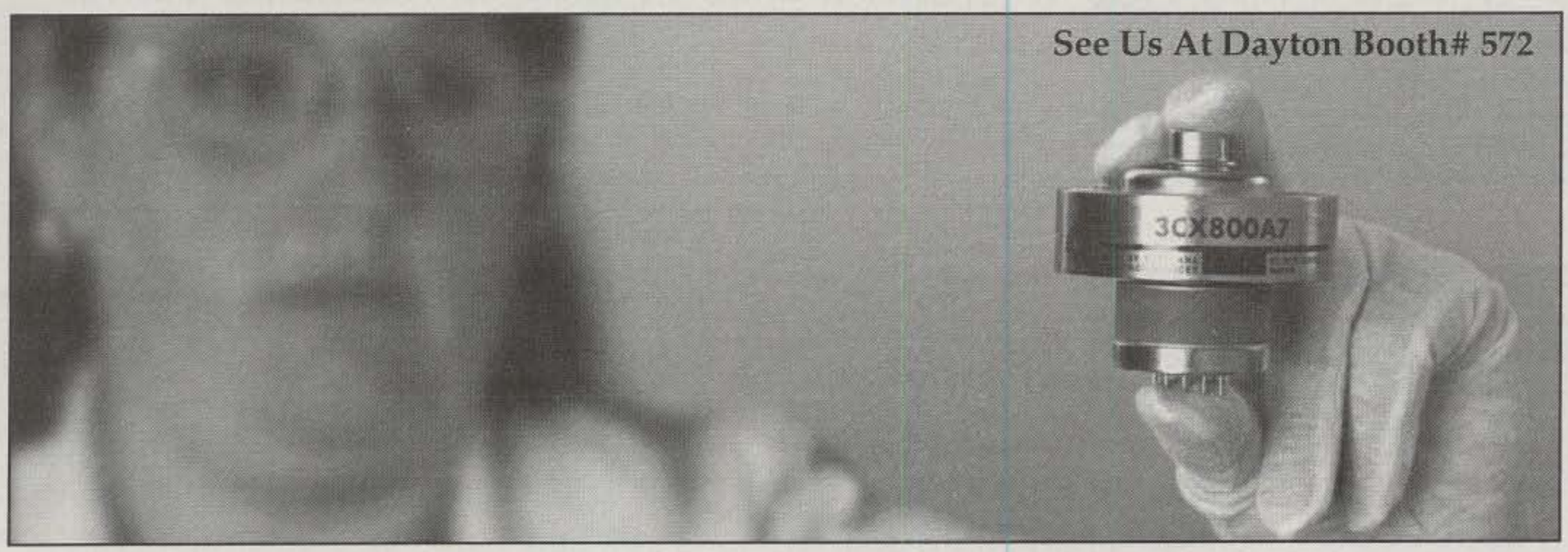

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are available at: <http://pao.gsfc.nasa.gov/gsfc/spacesci/sunearth.htm#soho>.

New Beacons on the Air

Steve, KØUO (EM07), now has a beacon on 144.279 MHz. Todd, W6TOD (DM15), has two beacons; one is on 144.277 MHz and the other is on 222.055 MHz. Both Steve and Todd would appreciate reception reports when you hear them.

And Finally . . .

This month I began this column with the focus on bringing in new members. I have tried to instill interest in recruiting the nonmember ham into the weak-signal VHF arena. One thing I haven't pointed out is that each of us has a story about how we arrived on the weak-signal VHF ham bands. One method of recruiting can be by members sharing their stories.

Here is my story: My exposure to the VHF Plus frequencies goes back to my early days in ham radio, when I spent many nights hanging around the shack of Bert Adams, K6BTO, in Bonita, California. Bert had every imaginable piece of equipment from every radio surplus store in San Diego County. I remember how much it meant to him to be able to modify a piece of gear so he could talk clear across town. I remember the smell of that surplus equipment as the components baked from the heat of those old tubes. I remember the constant hiss of the 1296 MHz receiver (an old APX-6) with its gain kept wide open so as not to miss a call (and the high-pitched buzz of the Navy shipboard radars as they swept across the front end of the receiver). I also remember Bert's dreams of being able to talk just a little bit farther on those incredibly high frequencies.

I asked him why he bothered operating on the high frequencies when he could get on the low bands any time he wanted and talk anywhere in the world. Bert replied that wasn't always the case. He said that in ham radio's early days radio operators couldn't talk very far because they didn't know how. Eventually they found a way to increase their range, and now it was up to him and other radio pioneers to discover how to use these higher frequencies effectively. I told him it seemed an incredible amount of work just to find out how to communicate across town, and maybe there just wasn't any way to work anyone much farther away. Bert brushed off my negative comments. Instead he regaled me with tales of bouncing signals off the Moon, or talking to other stations on 2 meter meteor scatter, or seeing a fellow ham on amateur television. As a newly licensed amateur, I could never quite understand the intrigue such ethereal forms of ham radio communication held for him.

As I became acquainted with more and more ham radio operators, I found that the 6 meter ham band held a fascination for some of them. When a ham got a Technician class license, he or she would invariably get on 6 meters. In those days the Technician didn't have Novice privileges unless he or she held a Novice license simultaneously (similar to today's straight Technician class licensee who hasn't taken the code test), so 6 meters was the only band that provided long-distance communications with any regularity for this license class.

I also noticed something rather peculiar about the Technicians active on 6 meters. They actually enjoyed it there! Then I noticed something else. Some Technicians who upgraded to the General class license stayed on 6 meters. It seemed there was some mystical charm to communications on that band.

Finally, I observed the excitement of 2 meter operators who found they could hear Los Angeles and sometimes Santa Barbara stations very clearly in San Diego on certain nights at certain times of the year. I marveled at my feelings of indifference toward such seemingly trivial forms of communications.

Over the years I've discovered that there is, indeed, something almost mystical about communications on those higher frequencies. There's something unique about being able to capture snatches of communications with distant stations on frequencies that normally aren't conducive to long-distance propagation. I think that this fascination is held by most, if not all, of us who operate weak-signal VHF. We use cutting-edge technology to reach out just a bit further—to push the envelope of the possible into what is (or has been) considered impossible. In so doing, we discover something new and some things about ourselves—namely our creativity and our desire to reach beyond the norm.

If you are reading this column for the first time and wonder what this weak-signal VHF stuff is all about, then I urge you to look into this arena of ham radio activity. In so doing, you will discover new doors opening into fun and exciting aspects of our hobby that will never cease to challenge you. When you do, you too will have a story to tell. Pease let me hear from you, because I look forward to your story of discovery on the weak-signal VHF bands.

Until next month...73, Joe, N6CL

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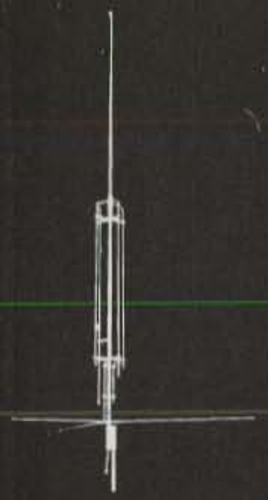
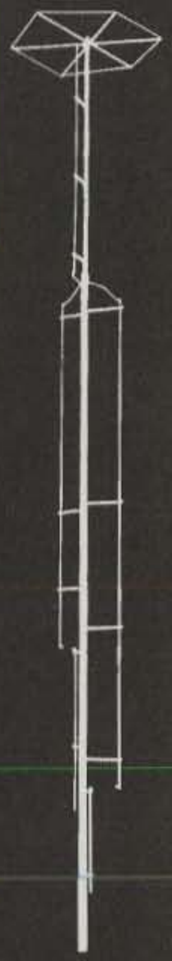
GAP: THE PERFECT ANTENNA

We at GAP realize there isn't a perfect antenna. No singular antenna will scream DX on 80 and be the best for local nets on 10. If anyone tells you there is, beware! The perfect antenna does not exist, but the right one for you may. If you want something to bust the pile on the low bands, then consider the Voyager. Just starting out in ham radio and need a great general coverage antenna, the Challenger is easy to assemble and for little effort will yield superior performance, especially on DX. Maybe you knowingly or unknowingly moved into one of those "restricted areas" where the Eagle's limited visibility, but unlimited ability is desired.



Eagle DX

Challenger DX



Voyager DX

This chart helps you select the right GAP antenna. When comparing GAPs, bandwidth is not a concern. With few exceptions, a GAP yields continuous coverage under 2:1 for the **ENTIRE BAND**.

All antennas utilize a GAP elevated asymmetric feed. A major benefit is the virtual elimination of the earth loss, so more RF radiates into the air instead of the ground. This feed is why a GAP requires **NO RADIALS**. Just as elevating a GAP offers no significant improvement to its performance, adding radials won't either, making set up a breeze.

A GAP antenna has no traps, coils or transformers. This is important. The greatest sources of failure in multiband antennas are these devices. Perhaps you heard someone discuss a trap that had melted, arced or became full of water. Improvements to these inherent problems are the focus of the antenna manufacturer, while the basic design of the antenna remains unchanged. **GAP improved the trap by eliminating it!** Removing these devices means they don't have to be tuned and, more importantly, won't be detuned by the first ice or rain. The absence of these devices improves antenna reliability, stability and increases bandwidth.

Another major advantage to a GAP antenna is its NO tune feature. Screws are simply inserted into predrilled holes with a supplied nutdriver.

The secret is out and people in the know say:

CQ–"The GAP consistently outperformed base-fed antennas...and was quieter."

73–"This is a real DX antenna, much quieter than other verticals."

RF–"To say this antenna is effective would be a real understatement. Switching back and forth on 40m between another multiband HF vertical and the GAP, there was no comparison. Signals were always stronger on the GAP, sometimes by S units, not just DB's."

Worldradio – "These guys have solved the problem associated with verticals. That is, an awful lot of RF is wallowing around and dropping into the dirt instead of going outward bound. A half-wave vertical does need radials if it is end fed (at the bottom). But the same half-wave vertical does not (as much, hardly at all) if is fed in the center."

IEEE–"Near field and power density analyses show another advantage of this antenna (asymmetric vertical dipole): it decreases the power density close to the ground, and so avoids power dissipation in the soil below it. The input impedance is very stable and almost independent of ground conductivity. This antenna can operate with high radiation efficiency in the MF AM standard broadcast band, without the classical buried ground plane, so as to yield easier installation and maintenance."

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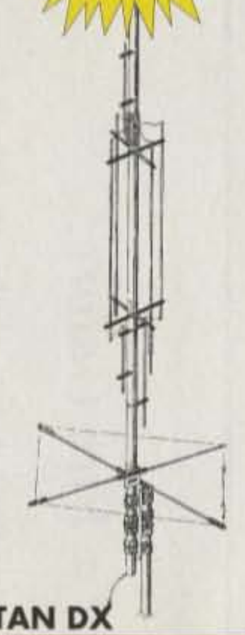

TITAN DX

This all purpose antenna is designed to operate 10m-80m, WARC bands included. It sits on a 1-1/4" pipe and can be mounted close to the ground or up on a roof. Its bandwidth and no tune feature make it an ideal antenna for the limited space environment as well as a terrific addition to the antenna farm.

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How It Works

BY DAVE INGRAM, K4TWJ

Theory 'n Practice

Sunsat + FM + QRP = Fun Galore!

Okay, friends, we have been delving into some fairly heavy electronic theory (and some great information!) during the last few "How It Works" columns. Now it is time for another horizon-expanding fun break. We have just the ticket lined up for you: communicating nationwide via the new SO35 satellite "QRP style" with your 2 meter/70 cm FM handheld talkie. Think about the thrills of that endeavor for a couple of minutes, gang, and you will surely agree it is downright exciting.

Using only a handheld talkie—that same little rig you carry to hamfests and occasionally use for chatting on local repeaters—you can direct-access an orbiting satellite and reach out thousands of miles. Further, there is minimum guesswork concerning when the satellite is in range of your QTH and available for operation. Everything is predictable and included in satellite bulletins from AMSAT or Sunsat. You just switch on your talkie a couple of minutes before "pass time," make a few good contacts during that 12 or 14 minute period, then switch off your rig and return to your usual routine. Now that's a Star Trek-type treat of the best kind!

Do I sense some folks asking if FM via OSCAR satellites is not taboo and others saying they remember reading a similar "OSCAR Fun on a Budget" story in my November and December 1998 *CQ VHF* "How It Works" column? Yes and yes, but this one has a different twist. Unlike many other OSCARS, SO35 carries a single-channel FM repeater that relays one signal at a time, rather than a broadband linear transponder that relays several CW and SSB signals simultaneously. FM on transponder-type satellites will always be a no-no, because it requires excessive bandwidth and overtaxes on-board power allocations. Conversely, AO27 (which was featured in my previously mentioned *CQ VHF* columns of 1998 and is still going strong) and SO35 are especially designed to be FM repeaters. They both necessarily are limited to operating during set time slots. Limiting satellite "on" time, incidentally, is necessary to hold power demands within the 15 to 30 watt range of SO35's rechargeable batteries.

4941 Scenic View Drive, Birmingham, AL 35210

SO35: Another Unique OSCAR

Sunsat, or SO35, is what we call a microsatellite, basically because it is smaller and less expensive than a "big bird," such as our upcoming Phase IIID satellite. Sunsat measures only 24"H × 18"W × 18"D, for example, and it is packed with both commercial and amateur-radio related equipment. The satellite was designed and built almost entirely by post-graduate students and technicians from the Department of Electrical and Electronic Engineering at the University of Stellenbosch in Matieland, South Africa. The group did an out-

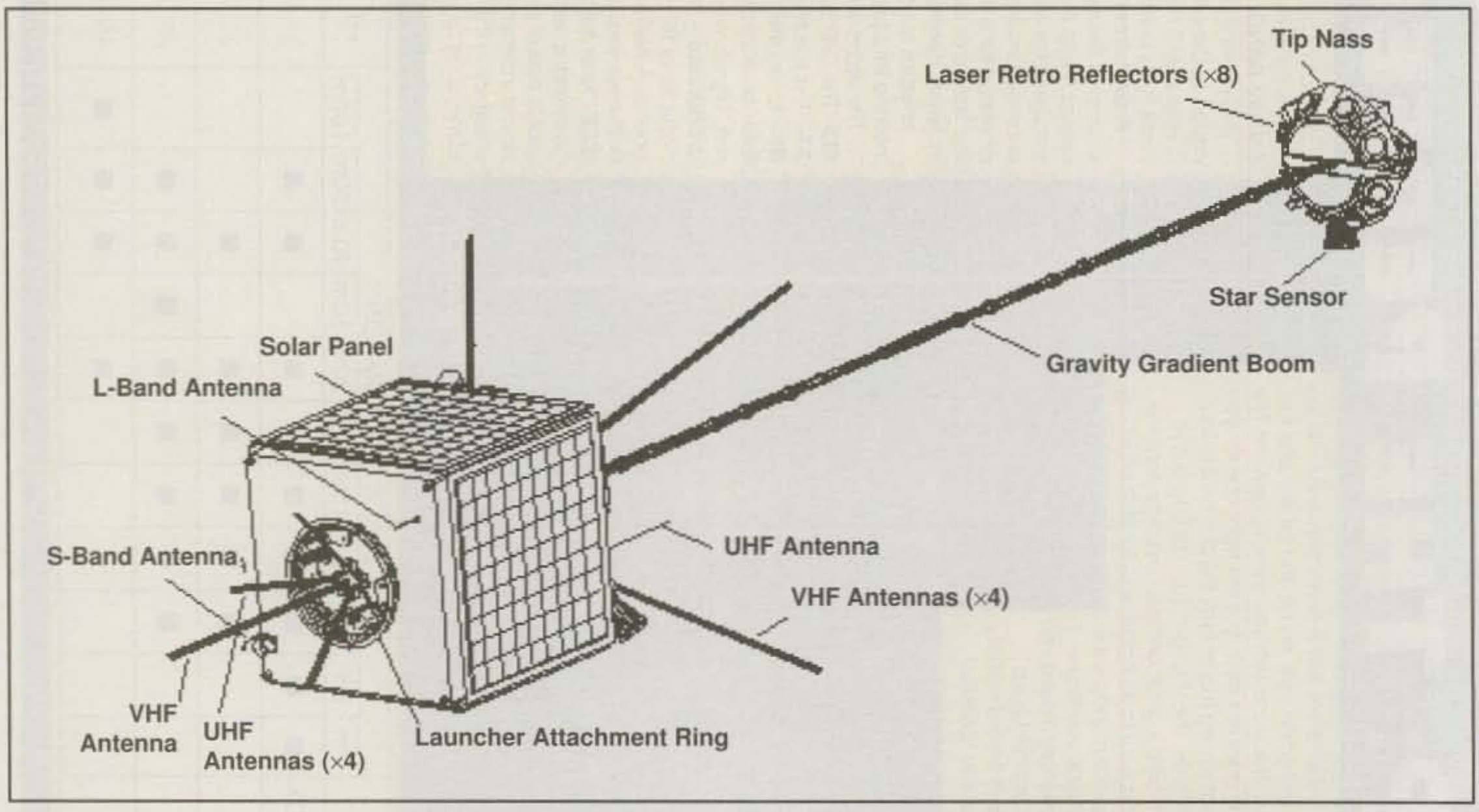

Fig. 1– Artist's sketch of Sunsat in operation. The little satellite carries a miniature high-resolution camera, GPS receiver, complementing laser reflector, plus transmitters and receivers for S band, L band, and VHF and UHF operations. (Sketch courtesy Project Sunsat)

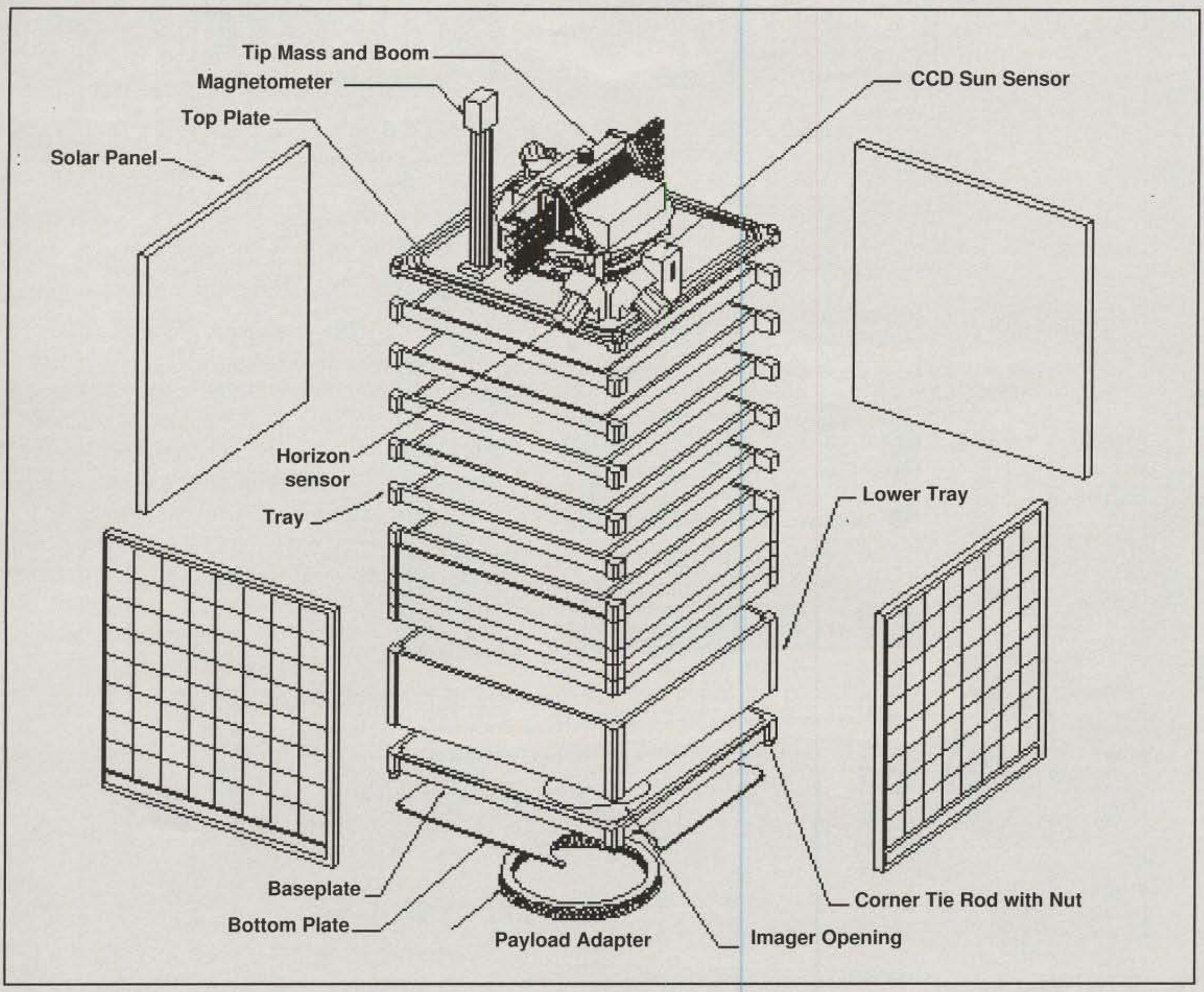

Fig. 2– Structural view of Sunsat showing general location of on-board electronics. A total of eleven trays hold the Earth-viewing camera, two rechargeable batteries, voltage regulator, VHF and UHF, S and L band gear, GPS receiver command systems, computers, and 64MB mailbox. The outer perimeter is covered in solar panels. (Sketch courtesy Project Sunsat)

standing job building the satellite and they can be justifiably proud of their achievement. Congratulations, gang!

Sketches of SO35 are shown in figs. 1 and 2. It carries a high-resolution camera for studying types and density of vegetation on the Earth's surface, a GPS receiver and a laser reflector for pinpointing ground locations, and a 64Mb digital store-and-forward mailbox system. It also has two on-board computers, 2.4 and 1.2 GHz gear for control links, plus 2 meter and 70 cm receivers and transmitters—and that's where we/amateur radio FM repeater activities come into the picture. The 2 meter and 70 cm units may be operated in crossband repeat mode, or as a single-frequency parrot repeater. The latter function has not yet been switched "on," but it promises to be a most captivating attraction when eventually called up for action.

Comparing AO27 and SO35

As previously mentioned, AO27 and SO35 are similar in that both are flying/orbiting FM repeaters. The two differ, however, in their bands/frequencies of operation. AO27 receives on 145.850 MHz and transmits on 436.795 MHz, while SO35 receives on 436.290 MHz and transmits back to Earth on 145.825 MHz (± Doppler shift in both cases). In other words, SO35's bands of operation are a reverse copy of AO27's bands of operation. That is assuming SO35's parrot repeater is not operational. Although unconfirmed, I understand the parrot will be on 145.825 MHz when it is activated.

Another difference between AO27 and SO35 is performance from the QRP standpoint. SO35's uplink sensitivity is greater than AO27, and its downlink signal is noticeably stronger than AO27's. This satellite is really oriented toward low-power operations. Finally, there are some minor variations in orbital details and repeater "on times" that we will discuss after considering rig requirements and operating techniques. Read on!

Getting Started with SO35

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What is a Parrot Repeater?

Most FM repeaters receive or input on one frequency and transmit or output on a different frequency. This permits relaying signals in real time. Crossband repeaters simultaneously receive on one band (such as 2 meters or 70 cm) and transmit on the other band (70 cm or 2 meters). By comparison, a parrot repeater receives for a short time (such as 8 to 10 seconds) and then transmits any signal it copied, all on one frequency. In other words, the "parrot" digitally records a received signal and retransmits it with a shift in time rather than a shift in frequency.

Parrot repeater setups are dandy for checking out new bands and new ideas, as they require only a single-band transceiver for operation. You can even quickly assemble a parrot repeater at home by connecting a new MFJ-662 "simplex pocket repeater" to your VHF or UHF FM mobile or handheld rig. The "pocket repeater" connects to speaker and microphone sockets on your transceiver, records an incoming signal on the transceiver's selected frequency, and then activates the rig's push to talk line and transmits its recording.

As of this writing (mid-February), SO35's parrot repeater was awaiting callup for operation. Check with AMSAT or Sunsat as mentioned in this article for late-breaking news.

Typical array of equipment for working SO35 "QRP style." Items shown include Alinco DJ-580 full duplex 2 meter/70 cm talkie with extended transmit range mod, MFJ-1717 extended length antenna, and pocket recorder for no-fumble logging.

SO35 launch. The satellite, also known as Sunsat, provides another FM repeater in space for hams. (Photo courtesy Sunsat)

requirements and then discussing operating techniques.

Rig-wise, you need a 2 meter/70 cm FM talkie capable of simultaneously receiving on one band while transmitting on the other. This full-duplex operation will allow you to hear all on-frequency activity while transmitting so you will know when you are "getting into the satellite" or being "covered up" by other signals, plus let you evaluate how your downlink signal sounds to others. Lacking that ability, you are "shooting at an invisible target." You have no idea which way to angle your talkie's antenna to produce the best downlink signal, when to correct for Doppler-shifted frequencies, or when to transmit and when to receive to avoid QRM. Also, you need a pair of (or a single) earbud 'phones to prevent audio feedback when transmitting and for solidly copying the satellite's downlink signal.

Next, an extended-length dual-band antenna is necessary for maximum effectiveness in radiating all of your rig's output power (a QRP secret revealed!). Handheld beams are also good, but short "duckies" just fall too short in performance for satellite'n.

Finally, your dual-band talkie must be capable of transmitting in the 436.0 MHz range, or "European band." This usually requires a simple extended transmit mod or "MARS mod." Check with the manufacturer or dealer of your particular talkie for specific details on that mod.

In order to communicate via SO35, you must know what transmit and receive frequencies to use, when the satellite is in range of your QTH, and when its repeater is operational. Addressing that first requirement is my "getcha going" frequency guide with Doppler-shift corrections for each approximate 3 minutes of a pass (fig. 3). If your talkie will store frequencies for both bands in individual memories, you are in luck. Otherwise, rubber band a copy of the guide to your rig's front and practice fast 5 kHz frequency shifts on both bands. It is a fun exercise. Just remember: *70 cm is your transmit band and 2 meters is your receive band.*

Most "seasoned" OSCAR ops use a simple satellite tracking program loaded with Keplerian data obtained from AMSAT bulletins or satellite websites for following satellite orbits and knowing when a satellite is in range of their QTH. One good source of tracking programs is the AMSAT Software Exchange, P.O. Box 27, Washington, DC 20044 or <http://www.amsat.org>. You may also find a freeware tracking program from K8CG at <www://satnet.com/winorbit>, if it is still available. Keplerian data is also available on the AMSAT Net that meets weekly at 1900 UTC on 14.282 MHz.

In case you do not yet have satellite tracking software, I included a projection of pass times for SO35 in fig. 4 for your "getting started" convenience. Larry Brown, W7LB, and I assembled this projection during early February 2000. It was based on data available at that time, and could unexpectedly change by May. SO35's repeater may

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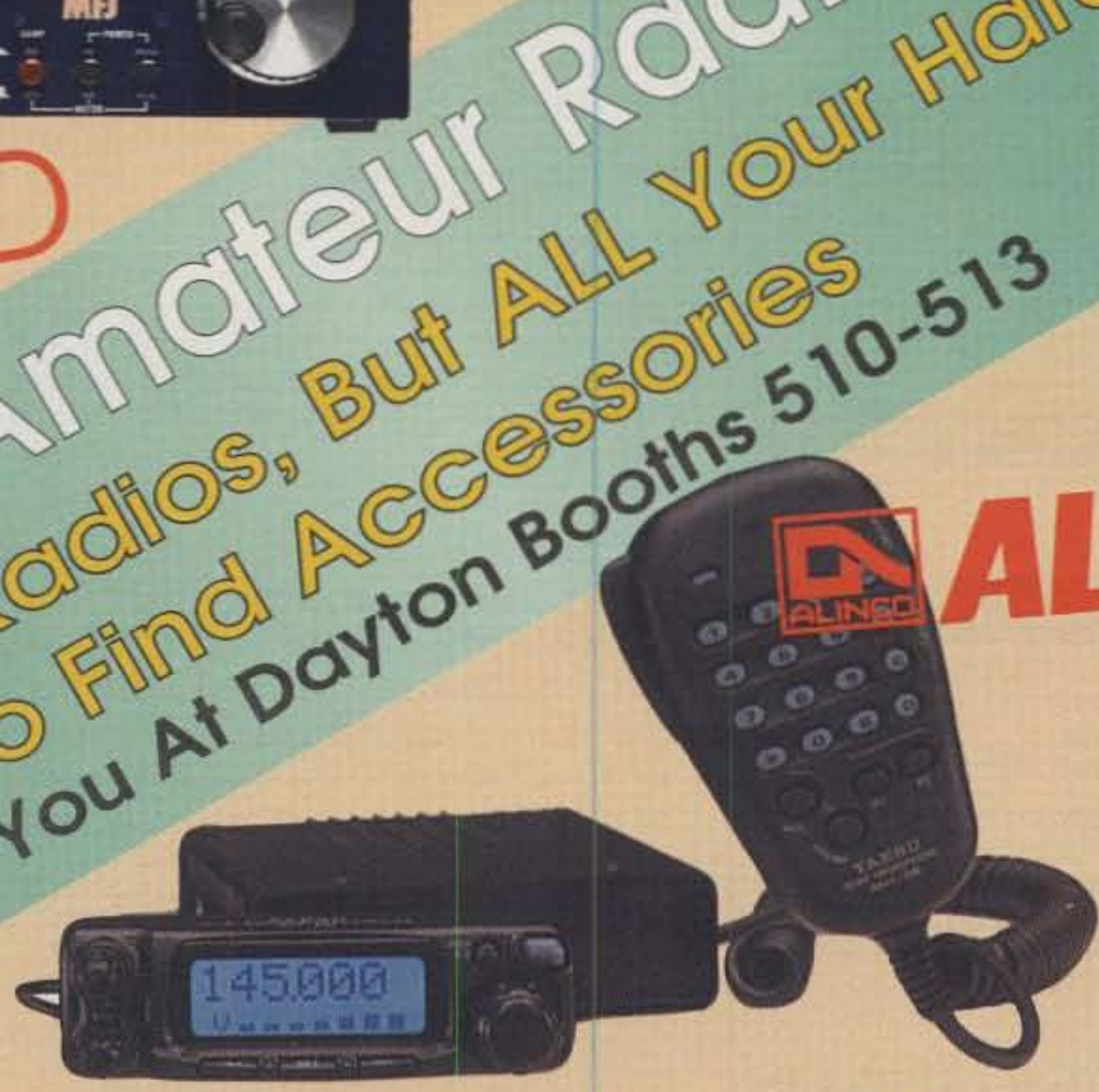

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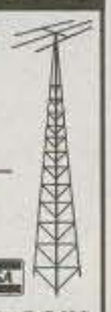

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	145.825	436.285	
Middle of Pass	145.825	436.290	Middle of Pass
	145.825	436.295	
Stop	145.820	436.300	LOS

Fig. 3– K4TWJ's "getcha going" frequency guide with Doppler-shift corrections for each approximate 3 minutes in an SO35 pass.

	AOS		LOS
May 6:	13:50	–	14:10
May 7:	13:11	–	13:30
May 13:	14:08	–	14:29
May 14:	13:29	–	13:49
May 20:	12:46	–	13:07
May 21:	13:45	–	14:07
May 27:	13:04	–	13:25
May 28:	14:03	–	14:25

Note: All times are in UTC with 3 minute "before" and "after" pass buffers at AOS and LOS. AOS (acquisition of signal) designates the start of a "pass," while LOS (loss of signal) designates its ending time.

Fig. 4– Estimated times for SO35 near mid-U.S. passes with its repeater "on" for May 2000. This data was compiled by Larry Brown, W7LB, and yours truly, K4TWJ, in February 2000 and is a projection based on Sunsat data available at that time (details in text). Our special thanks to W7LB for assistance. He is a real "can do" guy, and AMSAT is fortunate to have him on their side.

be on a pass earlier or later, for example, or its parrot repeater may be operational. Check with AMSAT or Sunsat at <http://sunsat.eesun.ac.za> for the latest news, and then switch on your gear a minute or two before pass time and join the fun!

Special Tips for Success

We have discussed the ground-floor facts and covered the basics of communicating via SO35; now let's fine-tune our techniques for maximum success.

First, compare notes on pass times and frequencies with other OSCAR operators either locally or via the AMSAT Net. This will give you a reference on what to expect, so to speak. Double check to ensure your talkie is working properly and its added-on/extended height antenna "outworks" a regular ducky by tuning in a fringe area repeater

- Reversed transmit and receive frequencies
- Listening on your transmit band
- Unoptimized whip position (Can you hear your own downlink signal?).
- Unable to transmit in 436MHz range (modify your rig).
- Incorrect pass times
- Repeater not switched "on" (Have you checked AMSAT or Sunsat data lately?)
- Low transmit power/dead talkie battery.
- (Easy to overlook in the excitement!).

Fig. 5– The most common (and avoidable) pitfalls resulting in "no luck" communicating via FM repeating satellites. Avoid these errors and your success is eminent.

on 2 meters. Use that fringe-area signal as a reference for rechecking reception on your setup right before each "pass time." Use your wristwatch for keeping track of 3 minute increments in pass times and shift your transmit/receive frequencies accordingly. These frequency shifts continue occurring regardless of whether or not you hear the satellite. Shifting your transmit and receive frequencies every 2 or 3 minutes while also making satellite contacts will keep you hopping, so leave the 2 meter squelch on your rig open and its 70 cm volume down to avoid the old "wrong band" syndrome. Remember, the satellite's signal may change in popularity as it progresses from south to north in the skies near your QTH. Continuously check/reposition your talkie's antenna as necessary to produce the most readable downlink signal from the satellite.

Keep your transmissions brief (3 or 4 seconds is a good length to avoid being QRMed) and strive to copy calls accurately the first time heard. Know your grid square; many satellite operators collect rare grid squares for awards like VUCC. Rainy days and/or overcast skies can refract or unexpectedly duct VHF and/or UHF signals. Remember

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that fact if for some unknown reason you cannot "work into SO35" as well as usual. Also strive to avoid operating near cell-phone sites; resultant intermod will drive you wacky. The previous notes (and a few more!) are summarized in fig. 5.

Finally, do not become discouraged if/when the higher power boys "walk over you." Remember, the operator rather than the rig makes the big difference with QRP. Congratulate yourself when you outwit the multitude and wrangle some good satellite QSOs. That is a noteworthy achievement! Should you consider switching over to a higher power rig for more success? Banish the thought! Life in the QRP lane may not flourish with QSOs, but every one is infinitely more rewarding. Enjoy!

Conclusion

Our discussion of FM repeating satellites obviously could continue many more pages, but we have once again reached the closing wire and must bow out for another month. Let's thus wrap up with a couple of quick final notes. First, as of February 2000 SO35 was switched "on" for only one near-mid U.S. pass on Saturdays and one near-mid U.S. pass on Sundays. We are unsure of exactly what Sunsat considers a near-mid U.S. pass, so details for calculating "before and after" orbits follow. SO35 circles the Earth in a fixed position orbit while the Earth slowly rotates insides that orbit (see fig. 6). Since we are standing on the Earth, each orbit seems shifted in position. In reality, however, the orbit's position remains fixed and only the Earth shifts.

According to Keplerian data, the mean motion of SO35 is 14.410. That equates to 14.410 orbits in 24 hours. The Earth is a sphere ,so if we divide 360 degrees by 14.410, we see that each SO35 orbit appears 24.9 degrees of longitude west of the previous orbit. If we likewise divide 24 hours by 14.410, we see each SO35 orbit appears 1.665 hours, or 99.9 minutes, later than the last one. If you know the time and position of a near-mid U.S. pass (as in fig. 4), you can thus estimate data for a previous/more easterly or subsequent/more westerly pass. Think about that and start estimating pass times if you do not hear SO35 when expected.

73, and may the force of good signals be with you!

Dave, K4TWJ

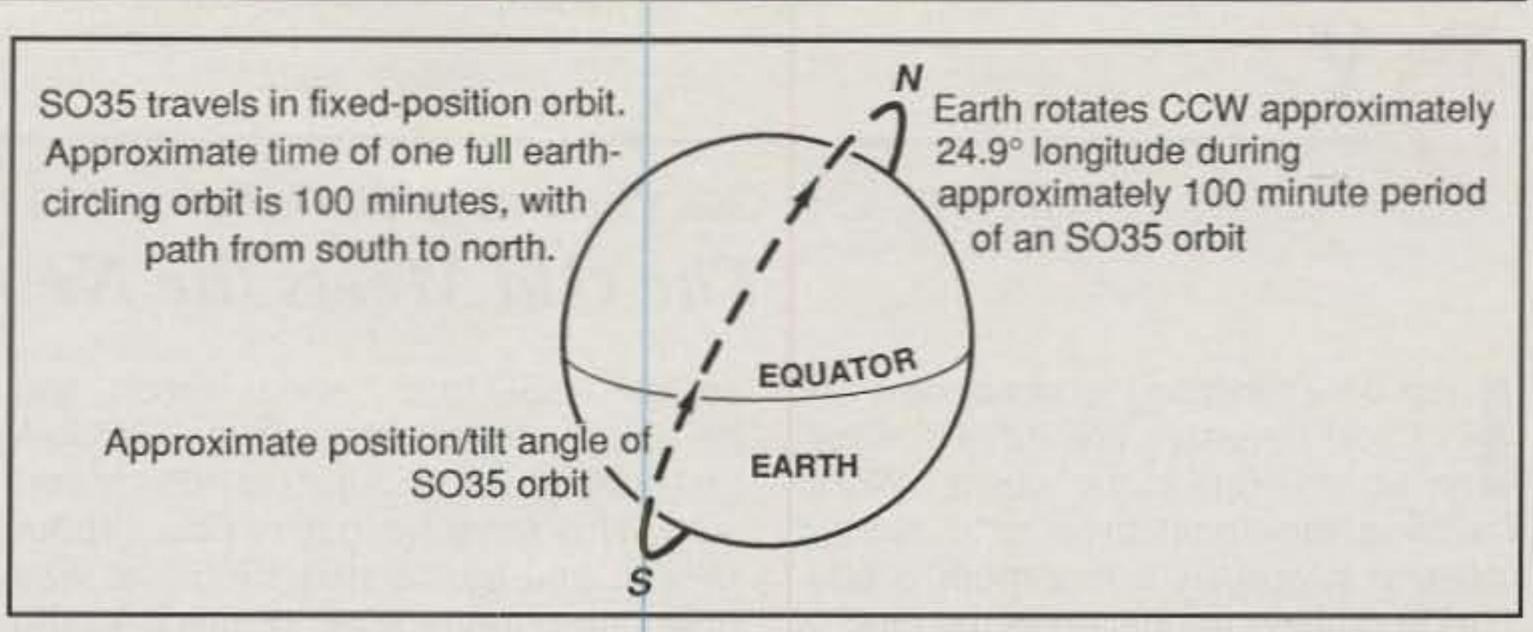

Fig. 6– Outline of a satellite's orbital concept and how the Earth's rotation appears to shift each orbit's position. (Discussion in text.)

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News Of Communication Around The World

The Old Meets the New

I had an interesting experience back in mid-February. We have a small group of DXers in the western North Carolina mountain area who started meeting informally a few months ago. This is nothing to challenge the big DX groups, but is rather just to give us a chance to sit down and have dinner, brag a bit about our own DXing, and get to know each other a little better.

It seems that Ed, W2HTI (from Franklin, North Carolina), had invited an old friend of his to come and meet with us. The old friend just happened to be Urb, W2DEC. Well, friends, if you have been a visitor, or a regular, on the Internet DX Reflector, that name/callsign should ring a bell. Urb is the guy who takes care of that system. During the course of the evening I discovered that Urb has been around the DXing game for a long time and has led an interesting life among DXers in the north Jersey area.

Urb goes way back to the late 1940s and has held the same call (W2DEC) since 1949, when he was only 14 years old. Those were the days before the Novice class license, but Urb got his Class A license in 1950. Urb says he had DXCC before he went into the Army. While in the military, he operated as KA8SD from Sendai, Japan, and he also operated some from KA2USA just outside Tokyo. After his military service, Urb says he got serious about DXing, and by the mid-1960s he was only one country short of being at the top of the Honor Roll. That country was Heard Island.

Although primarily a CW operator, Urb holds WAZ #17 on phone. Just for fun he worked 5 Band WAS with only 50 operators, all of whom had 1×2 callsigns.

Now for the "old meeting the new." Along the road to his retirement, Urb was the DX column editor for *CQ* in the 1959–1967 time period. We had some fun discussing DXing of those days versus current DXing. Urb remembers Dick Spencely, KV4AA, and Don, W4KVX, writing the column before he did, but he couldn't remember who followed him *(that was John Attaway, K4IIF—ed.)*.

Some interesting background on Urb and the NJDXA came up during our conversation. It seems that back in the mid-1950s, the W2 QSL Bureau was being run by an individual and the volume of cards overwhelmed that individual. Urb started an effort to form a group of DXers to handle the bureau task. It took some work, but Urb and his friends finally convinced the ARRL that they could, and would, be able to handle the job as the W2 QSL Bureau. Thus, the North Jersey DX Association (NJDXA) was formed and apparently the idea worked, because the NJDXA still has the job over 40 years later.

For many years the NJDXA limited its membership to 25 and met in private homes. Urb says they now have about 60 members—Regular, Senior, and Associate members.

Some statistics on the DX Reflector provided by Urb show there are approximately 1800 "subscribers" in about 100 countries. Urb says, "It blew my mind when a JT1 subscribed."

It was quite an experience for me to sit and listen to Urb and Ed talk about old times when they chased DX in New Jersey. I laughed until it hurt, and they were still going strong. I've been chasing DX for 45 years myself, and these two gentlemen brought back a lot of memories of my own early DXing days.

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

Clipperton, FOØAAA

As I started to write this column I was listening to the "silence" on 14195 as the multitudes awaited the beginning of this scheduled one-week operation. After several days at sea, the team arrived at the island and were hit with heavy rain and wind, which delayed their setting up the equipment. I could almost *feel* the hundreds of stations listening to 14195 and/or the other announced operating frequencies.

Harry Mead, VK4DHM/VK2BJL, shown here operating 1S1DX from Barque Canada Reef in April 1979. Harry was a frequent DXpeditioner over the years. We just recently learned that Harry passed away in late December 1999.

Jacky, 3B8CF, is very active from Mauritius. You can expect to hear him on any band, usually on CW, although he does sometimes use a microphone.

The WPX Program

SSB

2738 .....VE7SMP 2740 .....AD6DK
2739.....JR1DHD

CW

3031 .....K7ENA 3033 .....JHØLME
3032 .....WO3Z 3034 .....ON5UE

Mixed

1853 .....IV3BKH 1855 .....ON5UE
1854 .....DK4SY

CW: 350 K7ENA, WO3Z, EA7TV, JK1VSL, ON5UE. 400 K7ENA, WO3Z, EA7V, JK1VSL, ON5UE. 450 K7ENA, WO3Z, EA7TV, JK1VSL, ON5UE. 500 AI9L, K7ENA, WO3Z, EA7TV, JK1VSL, ON5UE. 550 AI9L, K7ENA, EA7TV, JK1VSL, ON5UE. 600 AI9L, K7ENA, EA7TV. 650 AI9L, K7ENA, WA2VQV, JK1VSL. 700 WD6CKT, K7ENA. 750 K7ENA. 800 K7ENA. 850 K7ENA. 900 K7ENA. 950 K7ENA. 1300 K9GWH, EA6AA. 1350 K9GWH, EA6AA. 1400 EA6AA. 1450 EA6AA. 2250 G3VQO. 2300 G3VQO. 2400 W8UMR.

SSB: 350 VE7SMP. 650 W8UMR. 1000 EA7TV. 1700 W9JDX. 2550 W8UMR. 2950 EA8AKN. 3000 EA8AKN. 3800 F6DZU. 3850 F6DZU.

MIXED: 450 IV3BKH, DK4SY, ON5UE. 500 IV3BKH, DK4SY, ON5UE. 550 US7MM, IK3BKH, DK4SY, ON5UE. 600 US7MM, IV3BKH, DK4SY, ON5UE. 650 US7MM, DK4SY. 700 US7MM, DK4SY. 750 US7MM, DK4SY. 800 US7MM, DK4SY. 850 US7MM, DK4SY. 900 US7MM, DK4SY. 950 US7MM, DK4SY. 1000 US7MM, DK4SY, EA7TV. 1050 US7MM, DK4SY. 1100 US7MM, DK4SY. 1150 US7MM, DK4SY. 1200 US7MM, WD6CKT, DK4SY. 1250 US7MM, DK4SY. 1300 US7MM, DK4SY. 1350 US7MM, DK4SY, K9GWH. 1400 US7MM, DK4SY. 1450 US7MM, DK4SY. 1500 US7MM, DK4SY. 1550 US7MM, DK4SY. 1600 US7MM, DK4SY. 1650 US7MM, AA1KS, DK4SY. 1700 US7MM, DK4SY, AA1KS. 1750 US7MM, DK4SY. 1800 US7MM, DK4SY. 1850 US7MM, DK4SY. 1900 US7MM, DK4SY. 1950 US7MM, DK4SY. 2000 US7MM, DK4SY. 2050 US7MM, DK4SY. 2300 DK4SY. 2350 DK4SY. 2400 DK4SY. 2450 DK4SY. 2500 DK4SY. 2550 DK4SY. 2600 DK4SY. 2650 DK4SY. 2700 DK4SY. 2750 DK4SY. 2800 DK4SY. 2850 DK4SY. 2900 DK4SY. 2950 DK4SY. 3000 KS4F, DK4SY.

20 meters: JK1VSL, ON5UE
40 meters: JK1VSL
160 meters: DK4SY, EA7TV

Asia: EA7TV, ON5UE
N. America: WO3Z
Europe: EA7TV, JK1VSL, ON5UE
Oceania: JK1VSL

Award of Excellence Holders: K6JG, N4MM, W4CRW, K5UR, K2VV, VE3XN, DL1MD, DJ7CX, DL3RK, WB4SIJ, DL7AA, ON4QX, 9A2AA, OK3EA, OK1MP, N4NO, ZL3GQ, W4BQY, I0JX, WA1JMP KØJN, W4VQ, KF2O, W8CNL, W1JR, F9RM, W5UR, CT1FL, W8RSW, 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, KB0G, NB9CSA, 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, DEØ-DAQ, 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.

Award of Excellence with 160 meter Endorsement: K6JG, N4MM, W4CR2, N5UR, 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, KØDE1, DJ1YH, OE6CLE, HB9BIN, N1KC, SM5DAC, S51U, RAØFU, UAØFZ, CT4NH, W1CU.

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.

This smiling face belongs to Marc, ON4CEX. That big grin must come from the fun he has had working 256 countries since he first hit the airwaves in 1997. Unfortunately, Marc reports that he only has 141 of those confirmed.

As I suspected, many of the DXpedition frequencies sprang to life at around 0015Z, March 2 as FOØAAA came on several bands almost simultaneously. It was total chaos at the beginning, but the team managed to keep things under control and continued for hours on end, working stations at the rate of several hundred per hour. In the first 96 hours of operation they had over 50,000 QSOs and were looking for 70,000 or more before they wrapped up on March 8—quite an achievement from this isolated island.

Chesterfield Islands, TXØDX

This brand new one should already be in your log if everything went as planned, since they were scheduled to become active at the end of March, just in time for the CQ WPX SSB Contest. A sizeable team was scheduled to operate several stations, giving everyone a chance at yet another new one created by the DXCC distance rule change.

Pratas, BV9P

If all goes as planned, there will another operation from BV9P during April. Unfortunately, at the time this was written, few details were available.

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5 Band WAZ

As of 1 March 2000, 513 stations have attained the 200 Zone level and 1125 stations have attained the 150 Zone level.

New recipients of 5 Band WAZ with all 200 Zones confirmed:
DU1KT VK3EW

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

N4WW, 199 (26)
W4LI (AA4KY), 199 (26)
K7UR, 199 (34)
WØPGI, 199 (26)
W2YY, 199 (26)
VE7AHA, 199 (34)
IK8BQE, 199 (31)
JA2IVK, 199 (34 on 40m)
K1ST, 199 (26)
ABØP, 199 (23)
KL7Y, 199 (34)
NN7X, 199 (34)
OE6MKG, 199 (31)
HA8IB, 199 (2 on 15)
IK1AOD, 199 (1)
DF3CB, 199 (1)
F6CPO, 199 (1)
W6SR, 199 (37)
W3UR, 199 (23)
KC7V, 199 (34)
GM3YOR, 199 (31)
VO1FB, 199 (19)
KZ4V, 199 (26)
N4CH, 199 (18 on 10)
OE1ZL, 199 (1)
W6DN, 199 (17)
W3NO, 199 (26)
K4UTE, 199 (18)
K4PI, 199 (23)
HB9DDZ, 199 (31)
N3UN, 199 (18)
NØTN, 199 (6 on 40)
UA3AGW, 198 (1,12)
EA5BCK, 198 (27,39)
G3KDB, 198 (1,12)
KG9N, 198 (18,22)
KØSR, 198 (22,23)
K3NW, 198 (23,26)
UA4PO, 198 (1,2)
JA1DM, 198 (2,40)
9A5I, 198 (1,16)
K4ZW, 198 (18,23)
OH2VZ, 198 (1,31)
RAØFA, 198 (2 on 10,15)
LA7FD, 198 (3,4)
K5PC, 198 (18,23)
NT5C, 198 (18,23 on 40)
VE3XO, 198 (23,23 on40)
K4CN, 198 (23,26)
KF2O, 198 (24,26)

The following have qualified for the basic 5 Band WAZ Award:
None

Endorsements:
DKØEE, 200 zones
F6CUK, 200 zones

****Please note: Cost of the 5 Band WAZ Plaque is $80 ($100 if airmail shipping is requested).**

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award, CQ Magazine, 25 Newbridge Road, Hicksville, NY 11801. The processing fee for all *CQ* awards is $4.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $10.00 for nonsubscribers. Please make all checks payable to the CQ WAZ Award. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. The WAZ Award Manager is Paul Blumhardt, K5RT, 2805 Toler Road, Rowlett, TX 75088; e-mail: <k5rt@cq-amateur-radio.com>.

Mount Athos

I received the following from Monk Apollo, through Veronica, IK3ZAW. I hope you enjoy hearing from him as much as I did.

SY2A, Mount Athos
My Ten Years of Activity on the Band

Time passes by and it never comes back, and we cannot do otherwise but to let it run its course. Almost without realizing it, ten years have swiftly elapsed since the 2nd of November 1990 when I first found myself sitting in front of an HF transceiver proceeding to have my very first QSO.

To hear an Athonite (Aghiorite) monk calling CQ from Mount Athos, known to us as "the Garden of the Virgin Mary," on the amateur radio frequencies for the first time ever must have surprised many listening that day. It was even more unusual to me, facing the big, worldwide ham radio fraternity whose members were all equal and friends, regardless of their different cultural and national backgrounds. This was a thrilling and exciting beginning, as I started to communicate and get acquainted with people from all over the world, although I didn't know foreign languages apart from some English I had

The WAZ Program

Single Band WAZ

10 Meter SSB
496 .....DF7HX 497 .....KC7V

10 Meter CW
154 .....K9IW

12 Meter Mixed
22 .....K9FD

15 Meter SSB
530 .....JH7NTW

15 Meter CW
279 .....KG1V

20 Meter SSB
1057 .....VE2BCS

20 Meter CW
504 .....K4WA

30 Meter CW
35 .....KØDEQ

40 Meter CW
204 .....KØDEQ

80 Meter SSB
74 .....VK3EW

160 Meters
148 .....N4XX (30 zones)

All Band WAZ

RTTY
118 .....JA4DGG

All CW

153	K6SRZ	158	KP3W
154	N1KC	159	KA3S
155	IK2NUX	160	JA3KZV
156	JHØSJJ	161	GØTYV
157	I5KHX		

SSB

4532	K9FZ	4538	KA4VGE
4533	N5WYR	4539	W4LLX
4534	IK6SNR	4540	SM7WDS
4535	EA4LH	4541	IK8FYZ
4536	W9JDX	4542	HL5BJU
4537	N8WEL		

CW/Phone

7915	N8GGI	7920	N5KM
7916	IØGKP	7921	W4PGC
7917	JH8MWW	7922	K8NIA
7918	EW2AA	7923	EU1TT
7919	F6DWX	7924	OH2MO

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, CQ Magazine, 25 Newbridge Road, Hicksville, NY 11801. The processing fee for all *CQ* awards is $4.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $10.00 for nonsubscribers. Please make all checks payable to the CQ WAZ Award. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. The WAZ Award Manager is Paul Blumhardt, K5RT, 2805 Toler Road, Rowlett, TX 75088; e-mail: <k5rt@cq-amateur-radio.com>.

CQ DX Honor Roll

The CQ DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more ACTIVE countries. With few exceptions, the ARRL DXCC Countries List is used as the country standard. The CQ DX Award currently recognizes 331 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 sticker s 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 331	W2FXA 331	K2JLA 329	I4LCK 327	I5XIM 325	K8LJG 324	G3KMQ 317	K1FK 311	K9FYZ 297
K2FL 331	N4MM 331	K4CN 329	N5FG 327	WA8DXA 325	I2EOW 324	K7JS 317	OZ5UR 311	F6HMJ 296
K6JG 331	W2UE 330	K6GJ 329	I4EAT 327	N5FW 325	W6SR 323	LA7JO 316	HB9DDZ 307	WG7A 295
N4JF 331	W6DN 330	W7CNL 329	DL8CM 327	IK2ILH 325	K7LAY 323	N5HB 316	WG5G/QRPp 307	N7WO 285
K9BWQ 331	G4BWP 330	K9IW 329	SM6CST 327	9A2AA 325	9A2AJ 323	K4JLD 316	W6YQ 305	EA3BHK 282
K2ENT 331	EA2IA 330	WB5MTV 329	N4KG 327	OK1MP 325	N4AH 322	YU1TR 316	W7IIT 305	YC2OK 280
K6LEB 331	W7OM 330	PAØXPQ 328	WØJLC 327	W4LI 325	KUØS 322	K8JJC 315	KE5PO 304	XE1MD 278
N7FU 331	WØHZ 330	K4IQJ 328	NC9T 326	K3JGJ 325	HA5DA 321	IKØADY 315	LU3DSI 302	EA2CIN 278
K3UA 331	W8XD 330	W1WAI 328	IT9TQH 326	K1HDO 325	K6CU 321	N1HN 313	PY4WS 302	I3ZSX 276
YU1HA 331	F3TH 330	DJ2PJ 328	4N7ZZ 326	K5UO 325	HA5NK 319	CT1YH 313	YU7FW 301	G3DPX 275
K9MM 331	N7RO 330	WØIZ 327	VE7CNE 326	DL3DXX 324	NØFW 317	W4UW 313	KH6CF 300	W9IL 275
WA4IUM 331	KZ4V 329	K8PV 327	K2JF 326	N4CH 324	SM5HV/HK7 317	K9DDO 312	KØHQW 299	KD8IW 275
K2OWE 331	K4CEB 329	W4QB 327	KA7T 326	WB4UBD 324	YU1AB 317	W3II 312	KF8UN 299	
F3AT 331	W4OEL 329	I1JQJ 327						

SSB

K4MZU 331	K7JS 331	KØKG 330	K4CN 329	WD8MGQ 327	W8KS 325	AE5DX 320	W4WX 310	SV1RK 295
K2TQC 331	DU9RG 331	WØYDB 330	PAØXPQ 328	I1EEW 327	VE3GMT 325	KB1HC 320	N1ALR 309	4X6DK 295
K2FL 331	VE3XN 331	WA4IUM 330	VE2WY 328	IØZV 327	KC4MJ 325	IØSGF 319	EA3BHK 307	YT1AT 294
EA2IA 331	K9MM 331	YV1KZ 330	VE2PJ 328	SV1ADG 327	K3JGJ 324	F6BFI 319	WZ3E 306	KØOZ 291
W6EUF 331	W4UNP 331	YV1AJ 330	W2JZK 328	DL8CM 327	IØSGF 324	N6RJY 319	WR5Y 306	EA5GMB 287
K2JLA 331	PY4OY 331	W4NKI 330	LA7JO 328	KE4VU 327	AC7DX 324	CT1EEN 319	XE1MDX 305	KK4TR 286
K6JG 331	W7BOK 331	I4LCK 330	YV1JV 328	I1JQJ 327	KØHQW 324	WA4DAN 319	EA5OL 305	VE7HAM 285
K6GJ 331	N7RO 331	4N7ZZ 330	KZ4V 328	K9PP 327	EA3BKI 323	PY2DBU 319	WB2AQC 305	F5RRS 284
K2ENT 331	ZL3NS 331	IK8CNT 330	WDØBNC 328	XE1MD 327	K6BZ 323	CE1YI 318	K6CF 304	WØIKD 283
N4JF 331	I8LEL 331	W4UW 330	K1HDO 328	VE2GHZ 327	I8KCI 323	K4JDJ 318	KC4FW 304	K7HG 283
VE1YX 331	OE3WWB 331	YV1CLM 330	VE4ACY 328	KF8UN 327	VE4ROY 323	ZL1BOQ 318	EA5GMB 304	K7ZM 282
K5TVC 331	IK8CNT 331	K8CSG 330	K5UO 328	W2CC 327	W2FKF 323	W9IL 317	YC2OK 303	WN6J 281
K6YRA 331	DL9OH 331	W2FXA 330	N5ZM 328	W4QB 326	K4JDJ 323	EA1JG 317	WB2NQT 303	CP2DL 281
YU1AB 331	N4MM 331	VE7WJ 330	I4EAT 327	K8PV 326	WW1N 322	WS9V 316	VK3IR 303	YU1TR 280
W7OM 331	W6DN 330	WS9V 329	CT1EEB 327	W6SR 326	W3AZD 322	CT1AHU 316	W5GZI 302	OA4EI 280
K4MQG 331	XE1L 330	W7FP 329	W9OKL 327	W4LI 326	LU7HJM 322	N5HSF 316	N5QDE 302	EA3CWT 278
VE3MR 331	EA4DO 330	N5FG 329	F9RM 327	OE7SEL 326	K5NP 322	K6RO 316	KD4YT 302	N1KC 278
K7LAY 331	ZL3NS 330	W8ZET 329	VE7DX 327	DL6KG 326	NI5D 322	K7TCL 315	SV3AQR 302	9A9R 277
IK1GPG 331	XE1VIC 330	OE2EGL 329	AA6BB 327	W5RUK 326	YZ7AA 321	WB8ZRV 314	LU3HBO 301	VE2DR 277
K5OVC 331	K9FYZ 330	K4JLD 329	SM6CST 327	WA4WTG 325	W6MFC 321	K9YY 313	YT7TY 300	SV2CWY 276
DJ9ZB 331	XE1AE 330	I2EOW 329	W3GG 327	KE5PO 325	EA8TE 321	NØMI 313	W5OXA 300	W6UPI 276
NØFW 331	VK4LC 330	K2JF 329	OZ3SK 327	N2VW 325	XE1CI 321	KD5ZD 312	K3LC 300	KE4SCY 275
KZ2P 331	WB4UBD 330	WB3DNA 329	CX4HS 327	IKØIOL 325	KØFP 320	VE3CKP 311	WA4ZZ 300	VE2AJT 275
K1UO 331	K3UA 330	ZL1AGO 329	KX5V 327	YV5AIP 325	N4CSF 320	CT1YH 311	LU5DV 300	Z31JA 275
OZ5EV 331	K9BWQ 330	I8KCI 329	IT9TQH 327	K9IW 325	N4HK 320	HA6NF 310	SV2CWY 300	KA5OER 275
W6BCQ 331	VE3MRS 330	4Z4DX 329	IT9TGO 327	WA4JTI 325	DL3DXX 320	K3LC 310	K6GFJ 299	
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RTTY

K2ENT 327	W2JGR 316	NI4H 305	G4BWP 287	W4EEU 284	YC2OK 280	I2EOW 278	KE5PO 274	PAØXPQ 272
WB4UBD 320	K3UA 310	I1JQJ 289	EA5FKI 284	W4QB 280				

learned at school a long time ago. This was my main problem.

Let me confess what happened to me when, for the very first time, I got on the air alone. In the beginning some radio amateur friends of mine from the nearest city of Thessaloniki offered to help and show me how to QSO. Thanks to their generosity and expertise, things seemed to proceed well. Yet when they left, and I suddenly found myself alone facing the first contacts, it all started to get more and more complicated. As soon as I started with my beginner's CQ call many stations answered. I panicked and I kept persistently issuing to one of them "7-9" as the signal report! I soon realized that some others were trying to correct me. Scared as I was, and on top of that firmly convinced that I had given the right report, I kept repeating the same "7-9," "7-9" again and again. Then I heard someone say in-between transmissions, "The guy here doesn't know anything else but 7-9!" I switched my transceiver off, trying to understand where I had made the mistake. I checked the dictionary and found out why.

Since that time, with the help of God, I have tried to dedicate as much of my very

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limited time as I can to amateur radio, in order to satisfy ham radio operators waiting for a contact, or for a QSL, from Mount Athos for a long time. Wishing to delight my radio amateur friends some more, in the accomplishment of the tenth anniversary of my activity on the bands, as the only Athonite Monk radio amateur, I have applied for and obtained the special call sign SY2A. You can expect to hear me on the bands from October 1, 2000 until December 31, 2000. With God's help I will try to work all bands and modes, as long as propagation allows. I have applied for a three-month license in order to QSO with as many stations as possible, as the time I can spend on the radio is always brief. I will try to issue some more announcements for those who want to learn about "the strange Athonite monk radio amateur" and his QTH.

With the hope of bringing some happiness to the world of amateur radio and looking forward to meeting you all on the band, I wish you all the very best from the Holy Mountain. May God bless all of you.

Monk Apollo, SV2ASP/A
Iera Moni Docheiariou
GR-63087, DAFNI
Mount Athos - Greece

See You at Dayton

I am really looking forward to meeting a lot of you at Dayton this year. I'll be spending most of my time at Booth 313, but I'll also find time to be around the *CQ* booth area, as well as at the Crowne Plaza DXer gatherings. Future columns will bring stories and photos from Visalia and Dayton, and I look forward to featuring some of you in those columns.

73 and Good DXing, Carl, N4AA

QSL Information

3A2MD to 3A2MD	**4X/OK1TN** to OK1TN
3B8/I5JHW to I5JHW	**5H3US** to WA8JOC
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3B9FR to 3B9FR	**5R8ET** to K1WY
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(The table of QSL Managers is courtesy of John Shelton, K1XN, editor of "The Go List," P.O. Box 3071, Paris, TN 38242; phone 901-641-0109; e-mail:<golist@wk.net>.)

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CIRCLE 73 ON READER SERVICE CARD

Beginner's Corner

BY PETER O'DELL, WB2D

For the Newcomer to Ham Radio

Making SSB Contacts—Part II

Last month we began our look at SSB operation for newcomers. Let's continue. We've already looked at RIT (receiver incremental tuning) and how it makes life easier. You will find several other controls on an average transceiver that can also make life easier. By the way, I'm using a Kenwood 440S. The names of the controls may differ slightly on other rigs, or they may function slightly differently. In general, however, most modern rigs have similar controls with similar names.

Receiver Controls

One of the most critical features on your transceiver is the receiver bandwidth. Some rigs have more than one filter from which to select, some offer optional filters that can be installed, and some give you no choice at all. Where bandwidth is concerned, there is a tradeoff. A broadband filter (say, 3 kHz) gives you good tonal qualities (well, as good as it gets on SSB, anyway), but you tend to hear more interfering signals. Under crowded conditions, copy can become very difficult. Thus, you might choose a narrow-band voice filter of, say, 2.2 kHz. This will serve to eliminate "some to much" of the interference, but the audio characteristics suffer dramatically.

If you have only one choice of filter for SSB operation, I would suggest staying with the 3.0-kHz-range filter. It is a good all-around filter. If you already have this filter and have the capacity to add a second optional filter, then I would recommend something in the 2.2–2.5 kHz range. That basically will give you the ability to switch between good sound and good rejection of nearby signals.

On some top-of-the-line rigs you will find a *bandwidth* control (sometimes called passband tuning). Here you are dealing with a process that involves using sharp filters in two different stages and tweaking the injection frequency of the second IF. This is all very complicated from an engineering standpoint, but the result is a more or less linear control that lets you adjust your bandwidth. If your rig has this control, play

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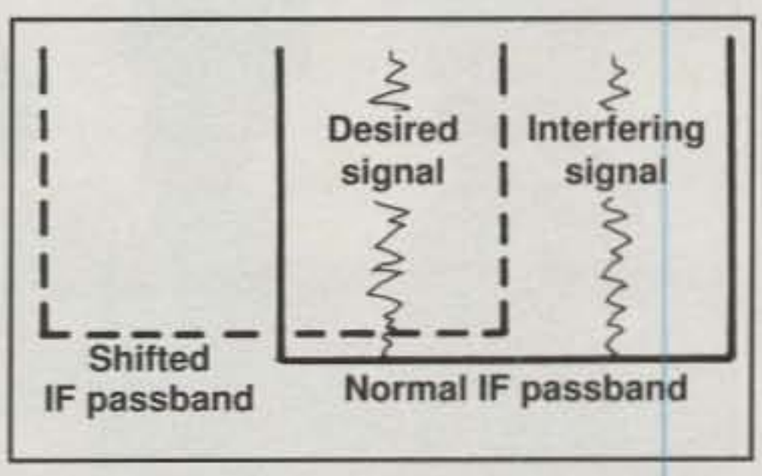

Fig. 1– IF shift lets you move the center of your receiver's passband to try to eliminate interference from a nearby signal. Some radios also let you vary the bandwidth (the size of the passband) to squeeze out interference.

with it until you get the hang of using it. I promise, you will love it.

A poor cousin of the bandwidth control is the *IF shift* control. With this control, the bandwidth of the IF does not change. By moving around the center frequency of the IF, however, you can sometimes move an interfering signal outside the IF passband with this control, leaving the signal that you want to receive in the clear. Again, if you have this control, you probably will learn to love it and depend on it.

Another useful tool found on most rigs is a *notch filter*. This filter does pretty much what its name suggests. A deep notch is cut into the passband, which means it is used to reduce or eliminate heterodyne or CW type signals. A notch filter is not effective against interference from SSB, AM, or FM signals. The filter usually consists of an on/off switch and a rotating knob. Once the filter is turned on, the knob is rotated until the interfering signal drops out. Some distortion as a result of this process is inevitable, but it is usually far less objectionable than trying to listen with a heterodyne or CW signal present. The exact range of the notch filter will vary from one rig to another. On the 440S, it is spec'd (specified) at 400–2600 Hz.

Most rigs also have a built-in *noise blanker*. This is another circuit that eliminates one very specific type of interference—the noise pulse or spike. It does not work on CW or heterodyne type signals, nor does it have any positive effect on voice signals—and in some cases it can even worsen the received signal when it becomes modulated by it. However, if you are dealing with ignition noise or some other pulse source, it can be a lifesaver. Use it sparingly, but do use it when it is called for.

Some of the top-of-the-line rigs now include DSP, *digital signal processing*. Also, there are several external units on the market that can be added on to any transceiver. Here the audio signal is converted to digital, and then the digital signal is processed using a computer program. DSP can be made to mimic most of the other controls that I have mentioned so far. It is primarily limited only by the sampling scheme employed and the imagination of the programmer.

SSB signals on HF have a tendency to fade in and out at times. That can mean constantly adjusting the AF (volume) control. An Automatic Gain Control (AGC) circuit can eliminate much of the need for constant adjustments. Usually, AGC can be set for fast or slow. The normal setting is slow, but if the signal is fading in and out rapidly (or you are operating high-speed CW), then you may want to opt for the fast setting.

Some receivers are better than others in the face of very strong adjacent channel signals. This typically is specified as the *dynamic range* of the receiver—the bigger the number, the better the receiver. Even if your receiver doesn't have the best dynamic range, there are some things that can help you operate enjoyably in the face of strong signals on the band. Most rigs now come with an attenuator, which is really nothing more than a resistive circuit added to the signal path in the front end of the receiver. It reduces the signal level coming into the front end across the board. Thus, your desired signal, as well as that of the interfering signals, will be reduced. This can be a very good thing for your receiver—unless you are attempting to work a very weak signal.

A similar effect can be produced by simply reducing the *RF Gain* control. Normally, the RF Gain control is set to full scale (full clockwise on the 440). Reducing the RF Gain can make it easier to copy medium-strength signals in the face of strong adjacent channel signals. One thing that you will notice when

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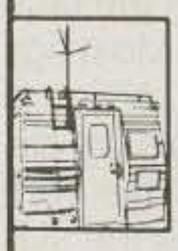

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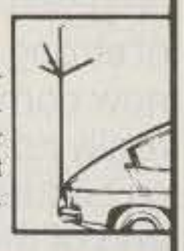

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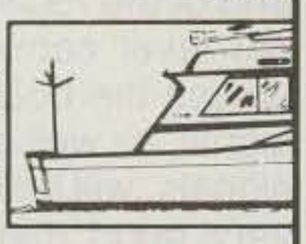

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This CEØAA QSL featuring the famous Moais volcanic stones is from the February 1999 DXpedition to Easter Island. (For details see the February issue of CQ, page 20.) When you decide to go after DX, listen to find out how the DX operator is working the stations calling him. Some detective work and a little thinking could make the difference between satisfaction and frustration, between strained vocal cords and a new QSL to hang on your wall.

doing this is that it messes up the functioning of the S-meter.

What About the Transmitter?

Everything I have talked about so far has been on the receiving side—not surprising, since the receiver in many ways is far more important than the transmitter in any ham station. There is an old saw that says, "You can't work 'em if you can't hear 'em." Well, there are also some circuits that can help out on the output side. Most transceivers now include a *speech processor*; usually it is little more than an audio compressor. A compressor is not to be dismissed lightly, however. A compressor basically allows your transmitter to put out a higher *average* level of power by compressing the voice peaks without introducing objectionable distortion.

You can also add external processors of different types as well as special microphones. Some of these processors split your voice into three or more "bands" and provide separate amplifiers for each band. Then the "bands" are recombined to form a composite signal that gives your voice more "punch."

On the Air: Operating "Split"

Sooner or later most hams try their hands at chasing DX or contesting. Certainly, not all hams continue with these pursuits, but most do try it at least once or twice. One of the operating patterns that you will come across is "split" operation. You should know what this is and the reasons behind it.

As I write this column, there is a DXpedition underway on Clipperton Island, an uninhabited rock 1500 miles off the coast of southern California. Before this operation, Clipperton ranked number 36 on the "Most Wanted" list of active DXers. That is not super high on the list, but there are a lot of hams out there who need this QSL for various awards, or just to say they have it. The DXpedition was only going to be there for a few days, as it costs a lot of money to get a ham station there, not to mention the risk to life and property. If you needed Clipperton, this was your only chance for a few years.

This meant that a whole bunch of hams were highly motivated to make a contact. Therefore, if the Clipperton station tried to come on the air and conduct a normal conversation, he didn't have a chance. As soon as he gave his callsign, a couple of hundred people were screaming into their microphones. Within a couple of minutes, two or three thousand hams were attracted to his frequency and started screaming into their microphones. The announcements went out on the packet clusters, too. Thus, within about three minutes, about 50,000 hams were screaming into their microphones—all right on the

same frequency as the Clipperton operator. No one ever heard him again. Obviously, this doesn't work.

The Clipperton operation (like quite a bit of rare DX) was *split frequency*. What this means is that the Clipperton station came up on some frequency and announced that he was listening on some range of frequencies away from where he was transmitting. For instance, maybe he was transmitting on 14.165 MHz and listening from 14.200 to 14.250 MHz. Theoretically, there should have been no one else transmitting on 14.165, so everyone should have been able to hear him. (Of course, there is always someone who doesn't understand what is happening and calls on 14.165. This brings out the valiant frequency police, always on vigil to save hamdom from lids by being even bigger lids than the original culprit. So it goes.) Also theoretically, the Clipperton station left his transmitter set on 14.165 and tuned his receiver up and down between 14.200 and 14.250. That is split operation, and that is why almost all transceivers have dual "VFOs."

So how would you have worked Clipperton given the chance? Simple. You would have set your receiver on 14.165 and transmited somewhere between 14.200 and 14.250. Of course, the question is where you set your transmitter. You could have just randomly picked a spot and hoped the operator on Clipperton happened across your frequency and heard you. Or you could have flipped back and forth between listening to 14.165 and tuning the window trying to find the station that Clipperton was working at the time. What should you have done once you found him? You could have parked your transmitter there and hoped that he heard you, or you could have listened a little bit more. People are creatures of habit, and that even applies to those peculiar individuals who mount an expedition to a rock such as Clipperton.

This means the Clipperton operator probably had some set pattern that he followed. If he stayed on one frequency very long, the pile-up would have made it impossible for him to hear the station he wanted to work. Maybe he worked three stations on a frequency and then moved up 3 kHz. Or maybe he only worked one or two stations before moving. Maybe he moved down 5 kHz, not up 3. A few minutes of detective work would have given you his pattern. All you had to do next is figure out when he was going to move and to where he was moving, and you would have been there calling him just before he showed up.

Sound complicated? Not really. It works. Several years ago when Albania first came on the air after decades of absence, it was at the top of the DXers' "Most Wanted" list. On the second day of the initial operation, I listened for 10 minutes and then worked him on my first call. If I had just parked on a frequency and called him, I might eventually have worked him, but almost certainly it would not have been on the first call.

When you decide to go after DX, listen to find out how the DX operator is working the stations calling him. Ten minutes of detective work and a little thinking could make the difference between satisfaction and frustration, between strained vocal cords and a new QSL card to hang on your wall. The new QSL is a good thing.

SSB is fun, but it ain't your grandma's radio.

—73, Pete, WB2D

Call for Photos and Stories

We'd like to hear from you about your experiences as a newcomer. If you have questions, we'll try to incorporate them into future columns. If you have photos (color prints or slides okay) of your station or antennas, please send them along and we'll publish the best ones. If you have a solution to a common problem that new hams experience, we'd like to hear about it so we can pass it along. You can contact me at <wb2d@cq-amateur-radio.com> or Peter O'Dell, WB2D, Beginner's Corner, 123 NW 13th St., Suite 313, Boca Raton, FL 33432.

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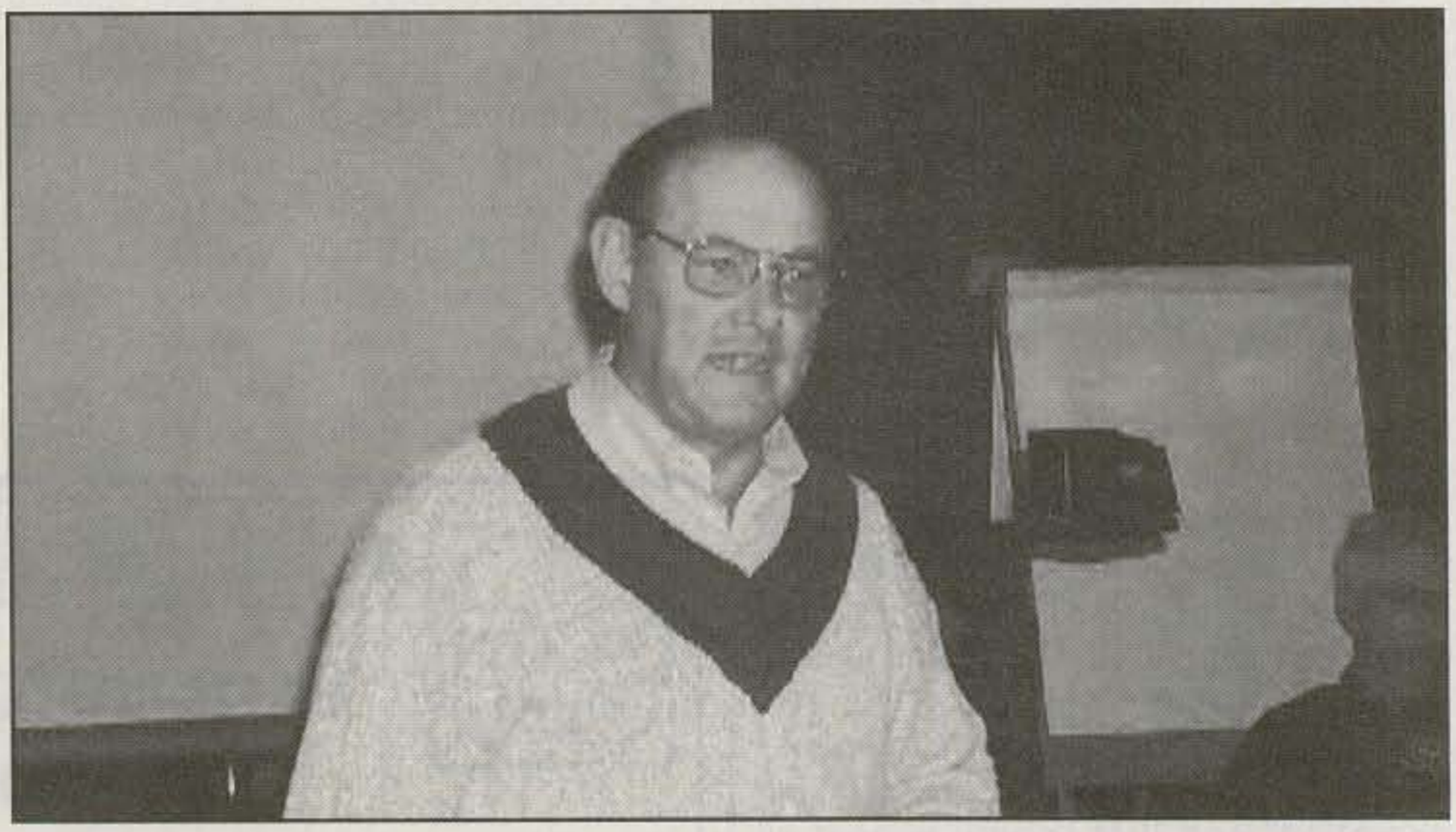
Public Service and Emergency Communications

Hams are Prepared for Weather Emergencies

Weather. We all talk about it. As hams we can even do something about it—respond to severe weather situations by providing valuable communications. This month we take a look at a couple of ways hams responded to recent severe weather situations here in the United States and in South Africa. We'll also look at how hams got involved with coordinated weather spotting and at some lessons that were learned.

In late February many areas of northern South Africa experienced continuous rainfall. This is close to Mozambique, which was in world headlines due to heavy rains and massive flooding. In Gauteng and Mpumalanga, South Africa, rivers were overflowing their banks. According to Hamnet, the South African equivalent of the Amateur Radio Emergency Service, there was widespread flooding, property damage, motor accidents, and road closures, and many fatalities. According to reports, members of Hamnet provided some relief to emergency services workers. Hamnet monitoring stations collected a wide range of reports from mobile stations, and they were able to plot problem and potential problem areas and pass this data to the operation centers set up by the emergency services. More rain was expected, and all amateurs were asked to report any situations where flooding could result in property damage, dangerous road conditions, and other life-threatening circumstances.



Don Stevens, Emergency Services Director for the Georgia American Red Cross, addresses a meeting of the Georgia ARES. (Photo by Charles Griffin, WB4UVW)

Georgia Hams Assist with Cleanup

Closer to home, amateur radio operators responded in force after tornadoes struck rural southwestern Georgia in February, killing at least 18 and injuring about 100 others. The storms wiped out nearly 200 homes. In the "ARRL Letter," Georgia Section Emergency Coordinator Tom Rogers, KR4OL, reported that amateur radio operators from nearby communities, including Moultrie and Albany, turned out to help.

Twisters generating winds in excess of 150 mph leveled a housing development in the town of Camilla, in Mitchell County. The town was one of the worst hit areas. The storm also tore roofs from houses and flattened mobile homes. It caught many by surprise, since warnings were not issued until after most residents had retired for the night.

Georgia Governor Roy Barnes declared a state of emergency in four counties. The Salvation Army and the Red Cross assisted in the recovery effort. "Shelters are open, and the Georgia Baptist Hams are setting up feeding locations and assisting with the clean-up," Rogers said. An HF emergency net was established on 75 meters to coordinate activities, but the need for emergency communication was minimal ,since the telecommunications infrastructure was still intact.

The Skywarn Story

Today the term *Skywarn* is as much a part of the ham vocabulary as radios and antennas. Many amateurs are introduced to public-service communications by becoming active in the Skywarn program. Skywarn is the National Weather Service (NWS) program of trained volunteer severe-weather spotters. Skywarn Spotters support their local community and government by providing the NWS and their local emergency managers with timely and accurate severe weather reports. These reports, when integrated with modern NWS technology, are used to inform communities of the proper actions to take as severe weather threatens.

During the past ten years tornadoes, severe thunderstorms, and flash floods have killed about 3000 people and injured thousands of others. While this figure may appear staggering, a case can be made that many thousands of lives have been *saved* by reports from storm spotters, such as Skywarn-trained ham radio operators.

Today hams routinely talk about wall clouds and tornadoes. However, this wasn't always the case, although the use of volunteers as weather spotters goes back 150 years. In 1849 the Smithsonian Institution used volunteers in a national weather observing system (*No, hams were not involved at this point!—ed.*). This observation network came under the administration of the U.S. Signal Corps in 1871. Tornado forecasts began in 1884, but special instructions were given not to mention the word *tornado* for fear of panicking the public. From 1887 until 1938 official use of the word *tornado* was banned. Volunteer spotters were only allowed to use the word to alert disaster officials. Finally, in 1952, the Weather Bureau began to issue public forecasts of tornadoes.

The first recorded use of ham radio in weather spotting was in the 1950s in the St. Louis area. Spotting at that time was

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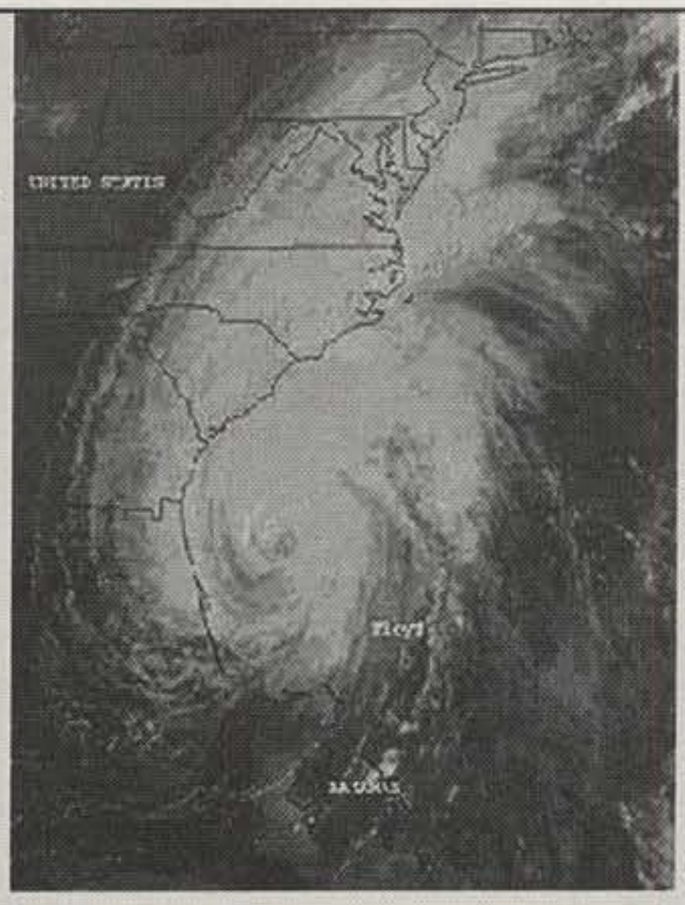
One of the things we strive for in the Amateur Radio Emergency Service is preparedness. Each ARES member station is challenged with maintaining a high degree of readiness of both his or her station equipment and operating techniques. One method of training we use for this purpose is practicing simulated disasters where we can realistically simulate conditions that would require amateur radio communications assistance. For years we have considered one particular scenario our "worst case" scenario. In this scenario, we simulate a large hurricane making landfall along the Georgia Coast. This past September, our worst case scenario was coming to life, it was named Hurricane Floyd.



SATELLITE PHOTO OF HURRICANE FLOYD

Floyd wasn't the kind of hurricane that suddenly appears at your doorstep. We had been watching Hurricane Floyd for many days as it developed in the Caribbean. As the storm approached the Bahamas Islands, it suddenly became front page news as it was declared a category 5 hurri-

(Continued on page 2)

Hurricane Floyd was the type of storm for which Georgia hams practiced. (Georgia ARES Newsletter)

done by the Ground Observer Corps, which was some sort of military auxiliary group initially trained to search for enemy aircraft. There was a "filter center" where the reports were "filtered" for relay to The Weather Bureau. Relay was done on the 6 meter amateur band. In the late 1950s callouts could be heard on AM radio stations for "All Ground Observer Corps members in [list of counties] report to your posts. Tornado alert is in effect until [time]." The GOC was disbanded on January 31, 1959, just ten days before a major tornado hit St. Louis. This tornado was reported to be on the ground some 50 to 75 miles southwest of St. Louis, but there was no formal operation to track or report it. It hit St. Louis at around 2:15 AM.

Skywarn gradually took shape following the Palm Sunday tornado outbreak in April 1965, when 51 tornadoes ripped through the Midwest, killing 256 people in six states. A survey team appointed by the chief of the Weather Bureau found disturbing inadequacies

Camilla, Georgia: A resident salvages what he can of his home ravaged by a tornado early on February 14. (Photo by Liz Rol, FEMA News Photo)

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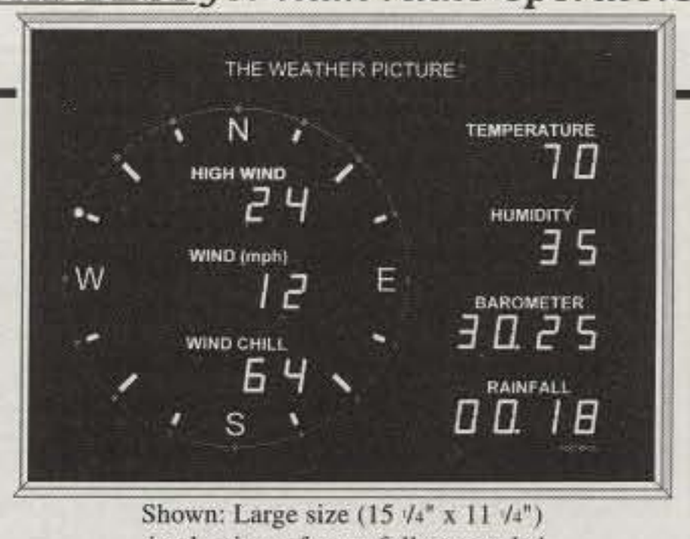

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Business Management Tools and Ham Radio

Last month we described how a group of hams developed and used a project plan to secure funding for a communications van. Several months earlier, in *CQ VHF,* we showed how Integrated Process Management provided the tools for amateurs of all license classes and levels of experience to work together to solve a common problem. We highlighted how a pilot of an aircraft with over 20 years of experience worked with fairly new flight attendants on how to prepare for an emergency landing which none had experienced before.

At the Georgia conference, Ed Roller, N4ZRA, President of the Athens Amateur Radio Club, discussed the application of the science of *risk communications* to amateur radio and specifically to ARES. Risk communications is a science-based study of communications during situations of high concern, with four key theories: Mental Noise Theory, Risk Perception Theory, Trust Determination Theory, and Negative Dominance Theory. His comments were based on the premise that communicators often feel tension, what he terms "mental noise," and that how one handles that tension can affect how well you perform your task.

Roller presented the following scenario: You are NCS for your local Skywarn net and receive a report of tornado damage at the local school. Your wife works there, and your children attend the school. What do you do?

"This is a classic scenario where the mental noise theory comes into play," says Roller. Essentially, people who are upset have difficulty hearing and processing information. He said this can reduce communication effectiveness by up to 80%. *(The equivalent of missing 8 out of every 10 words. Maybe all you heard out of the previous sentence was "8 missing."—WA3PZO)*

Communication was described as the two-way exchange of information *with responses by both parties to clarify the message and remove errors* [emphasis added]. This was contrasted with just disseminating information.

With regard to amateur radio operations, Roller says we can overcome mental noise by doing the following:

- Using a concise, limited number of messages (3 key messages, 7 to 12 words maximum)
- Using clear, simple language (4th–6th grade level, avoid jargon)
- Being brief, using time limitations. He explains that you have10 minutes before a person's attention span drops. You can overcome limited attention spans by requesting clarifications, asking questions, and working quickly.

According to the Risk Perception Theory, people respond to risks as they perceive them. Facts become how they are perceived. That is, perception equals reality. Amateurs can gain control to reveal reality by:

- Using a calm voice (this comes with practice)
- Make informed decisions (know your fellow hams)
- Practice voluntary acceptance (comes with volunteering)

Trust Determination Theory states that people who are upset are most likely to believe those who are trustworthy and credible. Credibility can be established by:

- Being caring and showing empathy
- Demonstrating dedication and commitment
- Establishing competence and demonstrating expertise
- Maintaining honesty and openness

ARES members can apply these techniques by being regular net control operators and upgrading their amateur radio licenses. It is important for amateurs to recognize this normal hierarchy of credibility, which includes respected local citizens, the media, and government officials.

The final theory that Ed discussed is called Negative Dominance Theory. Basically, people who are upset tend to think negatively.

- 1 negative = 3 positives; it takes 4 positives to overcome 1 negative.
- repetition of a negative, even when refuted, results in reinforcement and reaffirmation of the negative.

As amateur radio operators, we should avoid negative information whenever possible, according to Roller. For example, GEMA shows up at your disaster site with search dogs. The State Operations Center calls looking for the search dogs. Do you say,

a) "GEMA arrived a few minutes ago" -*or-*

b) "GEMA just showed up with their search dogs and are looking for bodies now"?

Roller reviewed ARES operating principles and demonstrated how they have their basis in Risk Communication theory:

- *Keep QRM down*
- Mental Noise Theory
- Risk Perception Theory
- *Monitor established disaster frequencies*
- Mental Noise Theory
- Risk Perception Theory
- Trust Determination Theory
- Negative Dominance Theory
- *Avoid spreading rumors*
- Mental Noise Theory
- Risk Perception Theory
- Trust Determination Theory
- Negative Dominance Theory
- *Strive for efficiency*
- Mental Noise Theory
- Trust Determination Theory
- *Use all communication channels wisely*
- Trust Determination Theory
- Negative Dominance Theory
- *Don't broadcast*
- Mental Noise Theory
- *Within the disaster area itself, ARES is primarily responsible for communications support*
- Trust Determination Theory

Take some time to review each theory with the examples given. It may help streamline your operation or help with your training program.

in communications, public awareness, severe-storm spotting networks, and radar coverage. On recommendations of this survey team, NADWARN (National Disaster Warning System) was born. One phase of this program aided communities in developing preparedness plans designed to ensure coordinated action by warning services, local officials, law enforcement, and the news media. Skywarn was developed as a tornado preparedness program including public education about severe weather and tornadoes and safety measures. The term *Skywarn* has come to refer to the coordinated action among the NWS, government emergency management agencies, and trained volunteer spotter networks; and the public information program.

Today the National Weather Service (NWS) collaborates with amateur radio organizations and others to put together training programs. The NWS brings its weather knowledge and the Amateur Radio Service brings its expertise in emergency communications. Together they work with local government, the Red Cross, and other relief agencies. The amateur radio operators' participation in the Skywarn program is formally acknowledged and encouraged in a Memorandum of Understanding (MOU) between the ARRL and the NWS. This agreement indicates that the ARRL will encourage its local volunteer groups

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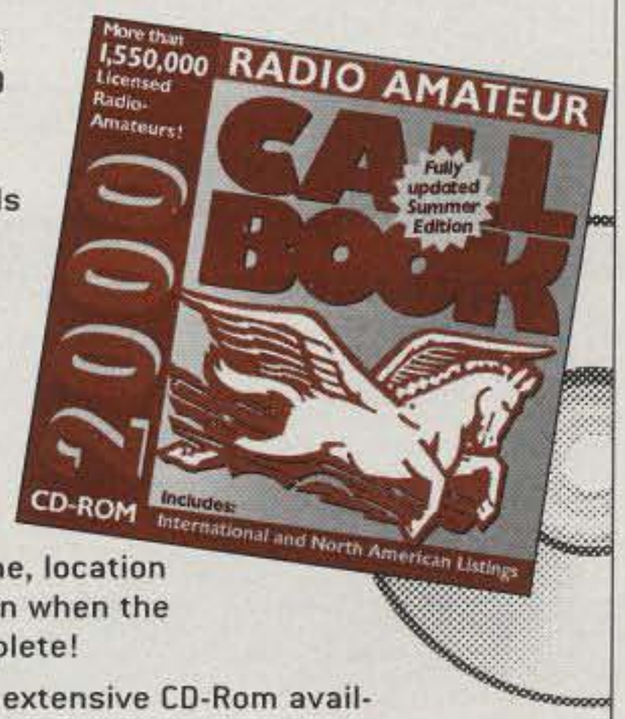

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operating as the Amateur Radio Emergency Services (ARES) to provide the NWS with spotters and communicators as requested by the NWS during times of severe weather.

Preparing for the Worst

Each year amateurs participate in a wide variety of emergency preparedness exercises to practice providing emergency communications when their services are required. Many of these drills simulate "when the big one hits." In Georgia, hams prepared for their "worst case" scenario, which involved a large hurricane making landfall along the Georgia coast. Last September the scenario came to life in the form of Hurricane Floyd.

At the annual meeting of the Georgia Amateur Radio Emergency Service, representatives of various emergency management agencies reviewed their roll in the emergency and their working relationships with ham radio operators.

Don Stevens, Emergency Services Director for the Georgia American Red Cross, opened his presentation with a recap of Hurricane Floyd and the great success of the joint response of the ARC and ARES. He said that when a disaster occurs, there are two agencies the ARC can count on: the ARRL and GEMA (Georgia Emergency Management Agency). According to Stevens, he has yet to see the amateur radio operators fail to show up to serve whenever there is a disaster. Floyd was an historic event. It affected the U.S. East Coast all the way from south Florida to Massachusetts and prompted the largest single peacetime evacuation in U.S. history. Stevens reported that in Georgia alone:

- 84 shelters were opened
- 20,000+ persons were sheltered
- Over 84,000 meals were served
- 485 persons volunteered (with the Red Cross)
- Mission was accomplished within a 48 hour period!
- Total costs (to operate the shelters) were estimated at $298,000
- People from Florida, Alabama, and South Carolina were also evacuated into Georgia

Stevens said one of the biggest problems the Red Cross has had in the shelter program is educating people about the difference between evacuation shelters and recovery shelters. Don indicated that the purpose of an *evac-*

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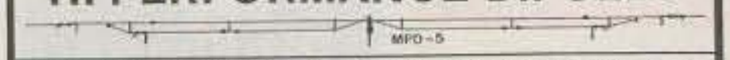

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uation shelter is to provide shelter for mass evacuees from a disaster or impending disaster. They typically do not have the resources of recovery shelters because it is impossible to predict how many people will go to a particular shelter. They tend to remain open only for a couple of days. A *recovery shelter* houses fewer people, but often for longer periods. Damage assessments help to identify the resources needed, and there tend to be more comfort resources (cots, hot meals, etc.).

One thing Stevens wants to see: "Any time there's a shelter open anywhere in the state, I want to ensure that there's an amateur operator there. . . . I appreciate what you do and I appreciate the relationships that we've made."

Northern Hills Club Demonstrates Skills

The Northern Hills Amateur Radio Club is the official communications auxiliary of the City of Lead, South Dakota and is assigned to the Lead Fire Department /Emergency Management. The "Club House" is located in the city's Emergency Operations Center (EOC). NHARC is responsible for the operation of the EOC, including, but not limited to, phone, fax, internet, and local public-safety communications equipment; amateur HF, VHF, and UHF communications; and local, regional, and worldwide "wireless" data communications. NHARC also owns and maintains the only EMWIN (Emergency Managers Weather Information Network) currently in South Dakota. EMWIN is a satellite-fed data system that allows an information feed directly to the Lead Fire Department. The data includes the latest National Weather Service forecasts, watches, warning, and images.

"We are downloading, in real time, the very latest information from the Weather Service, allowing us to keep track of quickly changing weather conditions either in an emergency situation or during weather conditions that could, all by itself, cause an emergency situation," Assistant Fire Chief Jerome Harvey, NØZBR, told Scott Randolph, a reporter for the *Black Hills Pioneer* newspaper. "Although the weather information from the Weather Service is important, nothing can beat knowing exactly what atmospheric conditions are doing right here, the moment they happen," said Harvey. A packet radio system is already in place at the Communications Center at the Fire Hall. With amateur radio operators providing the crucial link in severe emergencies when other means of communication go down, this will allow even more information to be shared throughout the region and with operators working directly with professional emergency personnel in a crisis, explained Harvey.

On the Cover

As you might have gathered from the photo on the cover, Dan Street, K1TO, takes his HF operating seriously. Dan, of Myakka City (a suburb of Sarasota), Florida, is a contester first and foremost. He's been a ham since age 12, was on the winning team in the 1996 World Radiosport Team Championship (WRTC) competition in San Francisco, and will be traveling to Slovenia this summer to compete in WRTC 2000. His favorite contest is the CQ WW DX CW, in which he operated last November from Barbados.

Above Dan's head on the 87 foot tower are seven beam antennas, including a stack of three homebrewed 10 meter Yagis; a 4-over-4 pair on 20 meters; a 2-element beam on 40 meters; and at the very top, a 4-element 15 meter beam. In addition, the tower supports an 80 meter inverted-V and a 160 meter inverted-L. Only the antennas above the top of the tower rotate; those below the 87 foot level (two of the 10 meter beams and one of the 20s) are fixed in specific directions, depending on which contest is coming up next. Dan climbs the tower and manually points the beams east toward Europe for DX contests and north for domestic ones.

Next time you're on the air in a contest and hear K1TO sounding like he's right in your backyard (no matter where you happen to be), now you know why! (Photo by Larry Mulvehill, WB2ZPI)

With Thanks

We would like to thank Hamnet; Mike Boatright, KO4WX; Charles Griffin, WB4UVW; the *Georgia ARES Newsletter,* and the Northern Hills Amateur Radio Club for providing information for this month's column. Are you doing something of interest in public-service communications? Drop me a note at <wa3pzo@cq-amateur-radio.com>.

73, Bob, WA3PZO

References

Skywarn: Galaway, Joseph G. "The Evolution of Severe Thunderstorm Criteria within the Weather Service," Weather and Forecasting, Vol. 4, pp. 585–592, 1989.

Risk Communications: Wojtecki, Joe, "High Concern Changes the Rules."

Integrated Process Management: contact Bob Josuweit, <wa3pzo@cq-amateur-radio.com>. ■

Packet User's Notebook

BY BUCK ROGERS, K4ABT

Connecting You And Packet Radio In The Real World

Building the 2212 EEPROM Personality

So you're planning for a fun time at Dayton. It's supposed to be the granddaddy of them all, as the Dayton Hamvention Committee has gone all out for the New Millennium Hamvention.

It's always a sure thing that spring has arrived when you see the ham community digging out the radio relics to take to Dayton as "swap fodder" or to sell for a pittance to gather funds for "reinvesting" in other ham gear. I am no exception to this rule, as I too like to pursue the "good deals" in the boneyard at Dayton (or any hamfest, for that matter). There I find acres and acres of "wall to wall" ham gear that to some is considered obsolete, while to others it is a treasure. This kind of activity brings to life the true meaning of "One man's trash is another man's treasure."

When you get to the Hamvention, look up Bill Glahn, AD4YY, of New London Technologies. Bill buys a lot of the surplus conventional radio systems and has an almost unlimited supply of radios for hams, dealers, and users who service and maintain conventional radio systems. He'll have the DELTAs, RANGRs, and other GE™ and ComNET-Ericsson™ units that we've been talking about in recent months. He'll be "under the big tent" at booths 204 and 205. Bill also will have some of the interface drawings and other information that I've provided in some of my columns.

For your records, New London Technologies' address is 752 Alum Springs Road, Forest, VA 24551 (telephone 804-525-4171; fax 804-525-0078).To check out their web site go to <www.newlondontech.com>.

You'll also need some issues of *CQ*, such as February, March, and April 2000 for the conversions and mods for the DELTA and RANGR, and May, June, and July 1999 for the RANGR mods. All the conversions are found in the "Packet User's Notebook" column.

For those who are looking for a specific version of the DELTA at Dayton, I have provided Table I to help identify some of the versions. This table may even give some insight into the RANGR of choice.

115 Luenburg Drive, Evington, VA 24550
e-mail: <K4ABT@PacketRadio.com>

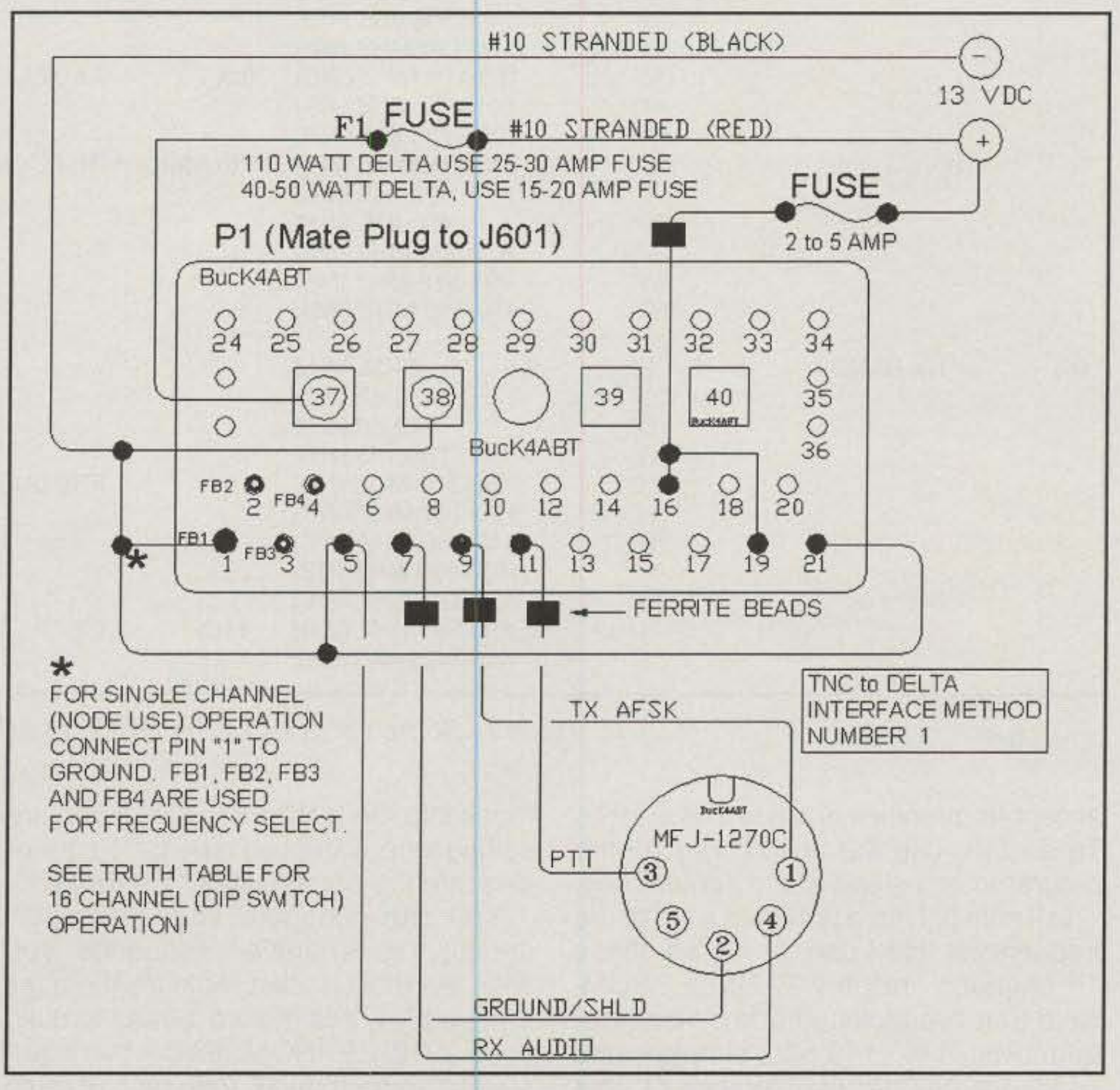


Fig. 1– Use this drawing to build a single-frequency or DIP-switched, 16- channel version of the DELTA or RANGR. Additional frequency switching information is available on the web at <www.PacketRadio.com/parts.html>.

First check the radio to ensure that you have a "working" one. Then see if you can locate an LBI (maintenance manual) for the radio. It's not absolutely necessary, but it will sure help to have one handy. The LBI numbers that I use for modifying the DELTAs and RANGRs are found in the issues of *CQ* that I just mentioned.

New London Technologies can supply the accessories if you have a need for them. However, if you are performing the modifications shown in the May, June, and July 1999 and the February, March, and April 2000 *CQ* articles, you will *not* need to purchase the accessories for the DELTA and/or RANGR. Use the drawing at fig. 1 to build a single-frequency or DIP-switched, 16-channel version of the DELTA or RANGR. You can use fig. 2 to build a complete "mini-control" head for either of these radios. This drawing enables you to have the best of both worlds —packet radio and voice operation.

To help save you some time, I'll recap the two major items that will be necessary to make the modifications to the DELTAs and RANGRs.

Addressing The EEPROM

At socket U706 is the IC 2212 EEPROM. This is where the "personality" of the DELTA is stored. If you have a friend who has the GE "suitcase" programmer, you can obtain the 2212 EEPROM and have the friend burn the 16 channels (frequencies of your choice into it.

When making the program selection in the "suitcase programmer," I use the "high-split" (152–174) version selection. We can force the radio (EEPROM) to

GE & ComNET-ERICSSON DELTA

NB = Narrow Band = S/SX WB = Wide Band = SX

DIGIT							
1st & 2nd	MODEL	"N3"				"U"	450-470 MHZ
						"V"	470-494 MHZ (NB)
						"W"	494-512 MHZ (NB)
						"S"	410-430 MHZ (WB)
3rd	TX BAND	"B"	29-36 MHZ	**5th**	CHANNEL SPACING	"1"	30 KHZ
		"C"	36-42 MHZ			"2"	25 KHZ
		"D"	42-50 MHZ			"3"	20 KHZ
		"G"	136-153 MHZ			"4"	12.5 KHZ
		"H"	150-174 MHZ (NB)				
		"H"	150-174 MHZ (WB)	**6th**	RADIO TYPE	"N"	NARROW BAND
		"R"	403-430 MHZ (NB)			"W"	WIDE BAND
		"R"	403-423 MHZ (WB)				
		"S"	410-430 MHZ (WB)	**7th - 9th**	RF POWER	"035"	35 WATTS
		"T"	420-440 MHZ			"040"	40 WATTS
		"U"	450-470 MHZ			"050"	50 WATTS
		"V"	470-494 MHZ (NB)			"060"	60 WATTS
		"W"	494-512 MHZ (NB)			"065"	65 WATTS
		"S"	410-430 MHZ (WB)			"075"	75 WATTS
						"080"	80 WATTS
4th	RX BAND	"B"	29-36 MHZ			"090"	90 WATTS
		"C"	36-42 MHZ			"100"	100 WATTS
		"D"	42-50 MHZ			"110"	110 WATTS
		"G"	136-153 MHZ				
		"H"	150-174 MHZ (NB)	**10th**	FREQUENCY CAP	"S"	USE G8 OPTION
		"H"	150-174 MHZ (WB)			"T"	16 CHANNEL
		"P"	440-460 MHZ (WB)			"Y"	USE G8 OPTION
		"R"	403-430 MHZ (NB)			"Z"	USE BZ OPTION
		"R"	403-423 MHZ (WB)				
		"S"	410-430 MHZ (WB)	**11th**	OSCILLATOR STAB	"A"	USE EA OPTION
		"T"	420-440 MHZ			"B"	5 PPM

Table I– Some versions of the DELTA radios.

accept frequencies down to 144.5 MHz. To do this, use the "insert" key on the programmer instead of the <enter> key.

In Table II, I have provided a set of the frequencies that I use. I program these 16 channels into my 2212 EEPROM. Note that I've included a few voice frequencies—i.e., 146.520 simplex and space for another two choices of your own. Don't forget to set the transmit tones into the 2212 EEPROM if you are setting tone-accessed repeater frequencies into the personality of the radio.

You can configure your radio personality in whatever sequence you wish. As most packet radio frequencies are simplex, this makes it easy to build your 2212 EEPROM. Since there are several more than 16 VHF packet radio frequencies, I've added the extra IC socket to the radios, which enables the use of 32 frequencies—in both the DELTA and RANGR radios.

In past columns I've talked about *how* to program or configure the 2212 EEPROM. Now it's time to look at a method of building the 2212 EEPROM personality for our DELTAs and other radios that use the 2212 EEPROM.

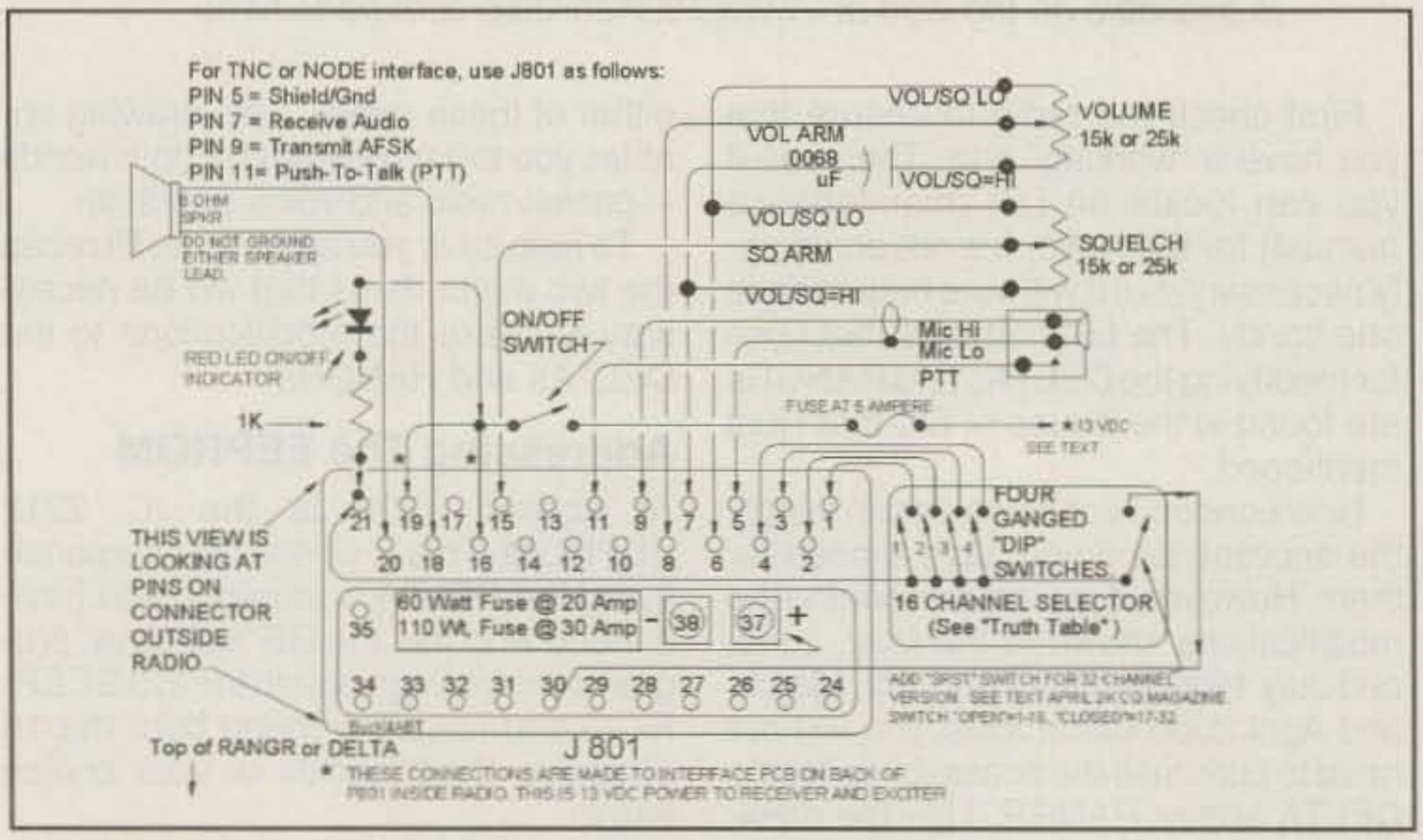


Fig. 2– The drawing above allows you to build a complete "mini-control" head for either of the radios mentioned in the text. You'll also find that the mini-control head enables you to have the best of both worlds—packet and voice operation.

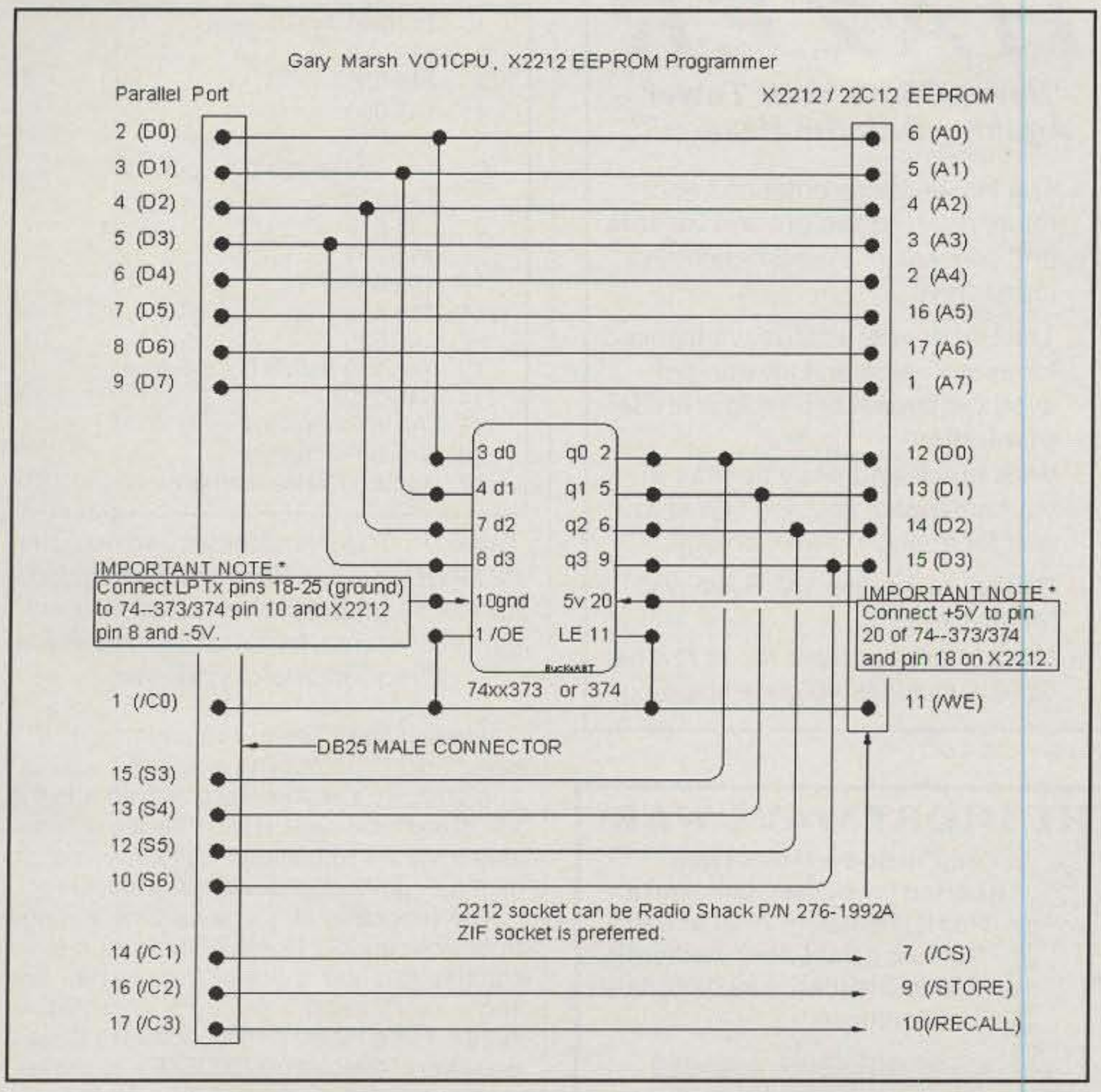
Enter Gary Marsh, VO1CPU

With Gary's permission, I'm including his text for the description of his parallel port 2212 EEPROM programmer for the PC and compatibles. I have redrawn the schematic of the programmer in AutoCad, since the original version he sent me was in an ASCII text format (see fig. 3). Here is his description of his programmer, in his own words:

The X2212 programmer attaches to a parallel port, and blasts a binary image into a X2212 NVRAM chip. The programmer isn't radio specific, and should be able to program any GE radio you can find a ROM image for.

Interface

The programmer is simple to build, if you're handy with a soldering iron. All the parts that you need can be picked up at a RadioShack store. You'll need a 74xx373 flip-flop or a 74xx374 latch chip, a cable, male DB25 connector for your parallel port,



← Fig. 3– The programmer is simple to build, if you're handy with a soldering iron. All the parts you need can be picked up at a Radio Shack store. You'll need a 74xx373 flip-flop or a 74xx374 latch chip, a cable, male DB25 connector for your parallel port, and an 18-pin ZIF socket, or use the Radio Shack P/N 276-1992A. You'll also need a 5 volt supply to power the circuit.

etc. You'll also need a 5 volt supply to power the circuit.

It's not in the schematic, but I'd also suggest bypassing the 5 volt supply with a 0.01 µF capacitor in parallel with a 10 µF capacitor. This might also solve some weird programming problems.

Software

The software is an outdated hack of BASIC programs, but they work well enough. New software is in the works now, but that might take a while to do.

To run these programs, either haul out your DOS 5 or 6.xx disks and use QBasic, or get your hands on QuickBasic 4.5. QuickBasic 4.5 is commercial software, and Microsoft still sells it even though it was produced from 1985–1988.

The Programs

newprog.bas: Programs a chip from an image file.

newread.bas: Reads the contents of a chip into an image file.

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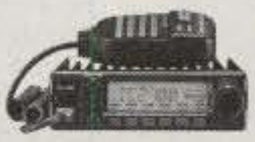
IC-2100H
2 meters

IC-207H
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IC-T81A
2m/6m/440/1.2ghz

TH-D7A
2m/440mhz

VC-H1
SSTV

TH-G71A
2m/440mhz

IC-W32A
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10.	145.650
11.	145.670
12.	145.690
13.	145.730 (some DX Spotters)
14.	145.770
15.	Voice Frequency
16.	Voice Frequency
17.	146.520 Voice Simplex

Table II– The frequencies I set into my 2212 EEPROM. Note that I've included the 146.520 simplex voice frequency, plus space for another two voice frequencies of your own.

newtest.bas: Tests your interface; if it says "Error!", something is wrong.

x2212.zip: The three above files and the ASCII text schematic in a ZIP file are all available from my web site at <http://www.engr.mun.ca/~gmarsh/phoenix/x2212.htm>.

The programs only copy a binary image to or from an X2212 chip. There's no functionality to enter a list of frequencies and such. You'll need a program to create an image. Niles Radio's PRG software does a good job of this; grab PRG.EXE and the editor for your radio.

They've also got a wonderful product that can program just about any GE radio you can think of. If you're planning on programming hundreds of radios, S9x0 control heads, or more obscure radios, I'd suggest their PRG Programmer.

FYI, the X2212 is a 256 × 4 chip. The image files these programs use are 256 bytes long and are in ASCII format.

After you build your programmer and after you download the software, try running newtest.bas (make sure there is *not* a chip in the programmer.) If you get "Error!" either your DELAY setting is too low, or something is physically wrong with the programmer. Experiment until you get a good DELAY setting, then use this setting in the other programs.

If you're having no success at all and everything seems to be wired up correctly, try using the program on different parallel ports and/or try a different 74x chip.

Good luck, and 73 de Gary VO1CPU

For a source of most of the "hard-to-find" parts for these conversions, see one of my web pages at: <http://www.packetradio.com/parts.html>.

My thanks to Ben Jones, KB4MPX, Bill Glahn, AD4YY, and Pete Lascell, W4WWQ, for their contributions to this month's "Packet User's Notebook."

Until next month, HavFun Packeting!

de BucK4ABT
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What's New

BY KARL T. THURBER, JR., W8FX

A New Column for A New Century

In case you missed last month, the "Digital Dipole" column has a new name, as we expand the column's scope. We'll no longer focus strictly on antennas, antenna accessories, software, computers, and books. Instead, we'll tackle a broad array of exciting products and other items of interest, as we examine "what's new" in amateur radio today.

This month we'll focus on antenna and other accessories for the radio shack, portable and mobile goodies, software and computers, new things on the Internet, and still more useful items. Welcome to "What's New"!

Accessories for the Shack

Paddlette™ Sub-Miniature Paddle Keys. Bob Hammond, KI7VY, of Paddlette Co., offers several compact paddle keys for the discriminating CW enthusiast.

The basic Paddlette is a precision-built, rugged, miniature iambic paddle key with knee mount that serves equally well in base station, mobile, or QRP backpacking operations. It has a very small footprint, is lightweight, and has a variable torque system that maintains the desired gap adjustment without lock nuts. It's $42.50, postpaid. A similar model is the Paddlette BP, a subminiature key designed especially for backpacking which includes a knee mount and carrying case, for $54.50, postpaid.

Recently, Bob introduced the Paddlette Models KP-1 and KP-3. These compact units combine a subminiature paddle key with an electronic keyer in a tiny (1.5" × 2") enclosure that weighs only 1.7 oz., less the knee mount. The KP-1 (at $72) has seven available operating functions, or modes, while the KP-3 (at $82) has ten functions. Each also can be ordered with knee mount, for $79.95 and $89.95, respectively. Shipping/handling is $3.75 via first-class mail.

For more info, contact Paddlette Co., P.O. Box 6036, Edmonds, WA 98026 (425-743-1429; e-mail: <bham379627@aol.com>; <http://home.att.net/ ~goodroe/paddlette>).

Antennas and Accessories

EZ Hang. Most of us know that "hanging" wire antennas—especially long and high ones—can be a pain, one which often involves climbing trees or ladders, or using bows and arrows or throw strings. A new product, EZ Hang, reduces some of that pain, claiming to be "the perfect tool if you want to put up a wire antenna easily and quickly."

You can use the new slingshot-like device to "throw" a line over a tree or other object to over 100 feet. Its basic construction is of steel attached to a reel that is made of corrosion-resistant plastic and stainless steel. The reel comes with 300 feet of 10-pound-test monofilament line installed, a quick-disconnect clip to release the weight, and an easy-to-see, bright-yellow-colored 1 ounce lead weight.

EZ Hang is $49.95 plus $5.95 s/h. In addition to replacement parts, several other related products are offered, including the EZ-Winder™ intermediate line dispenser ($12.95) and the do-it-all EZ Hang Toolbox™ at $99.95. The latter is said to include "everything you will need to hang your next antenna."

*289 Poplar Drive, Millbrook, AL 35054-1674
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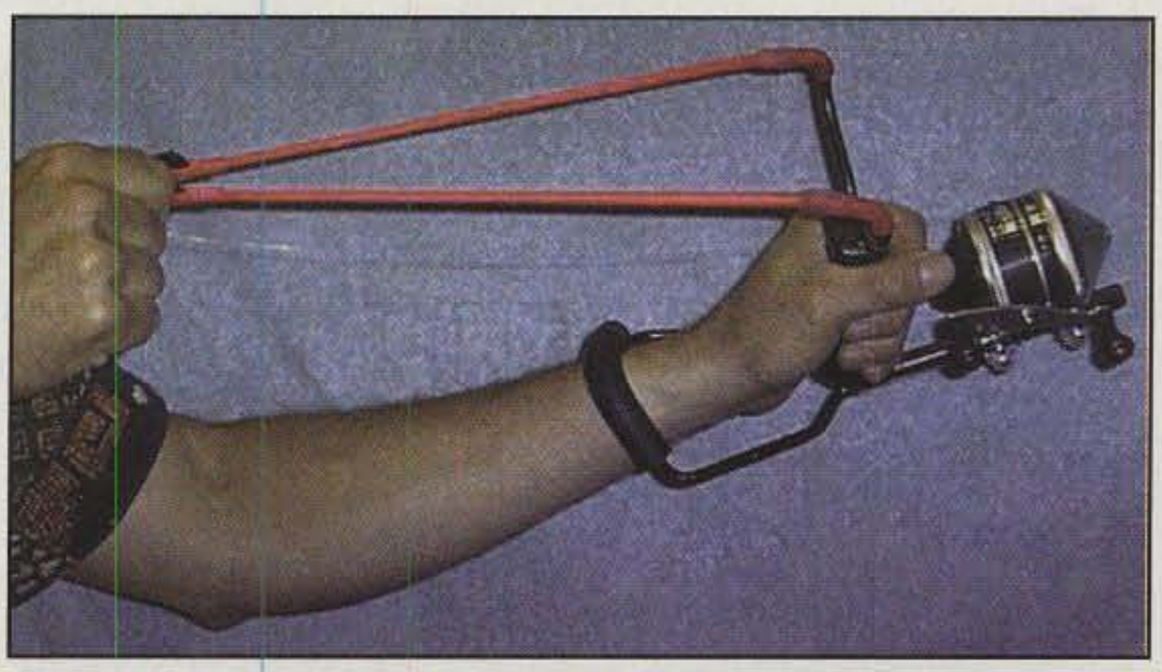

EZ Hang's basic construction is of steel attached to a reel that is made of corrosion-resistant plastic and stainless steel. The reel comes with 300 feet of 10-pound-test monofilament line installed, a quick-disconnect clip to release the weight, and an easy-to-see, bright-yellow-colored 1 ounce lead weight. You can use EZ Hang to "throw" a line over a tree or other object to over 100 feet. Two cautions are offered by the manufacturer. First, since EZ Hang is a slingshot device, you should check your local laws regarding possession and/or use of a slingshot. Also, the manufacturer assumes no liability or responsibility for any damage caused by using the product.

Two cautions are offered by the manufacturer. First, since EZ Hang is a slingshot device, you should check your local laws regarding possession and/or use of a slingshot. Also, the manufacturer assumes no liability or responsibility for any damage caused by using the product. Fair enough.

For more information, contact EZ Hang, Inc., 8645 Tower Drive, Laurel, MD 20723 (540-286-0176; e-mail: <ezhang@ezhang.com>; web: <http:// www.ezhang.com>)

Portable and Mobile Goodies

Am-Com ClearSpeech™ Speaker. The ClearSpeech Speaker is getting good reviews in the amateur community, as well as among car and truck fleet owners, emergency-vehicle operators, and marine communities. The reason is the speaker addresses one of the most common complaints about mobile communications, that of background noise.

In case you haven't seen or heard it, the ClearSpeech Speaker is a mobile external speaker with built-in DSP (digital signal processing) noise reduction. The DSP capability reportedly removes up to 95% of the background noise from the receive side of any two-radio communication (SSB, AM, FM, or CW).

The noise cancellation characteristics work over the range 300 Hz to 3400 Hz; single-tone noise reduction is greater than 50 dB, while white (background) noise reduction is greater than 12 dB. The unit also has a rear audio jack so you can connect your own external speaker to its internal DSP circuitry. The speaker is priced at $129.95 plus $8.95 s/h.

Developed by Noise Cancellation Technology, the ClearSpeech Speaker is distributed exclusively by Am-Com, P.O. Box 356, Lakeside, MT 59922 (telephone 1-888-

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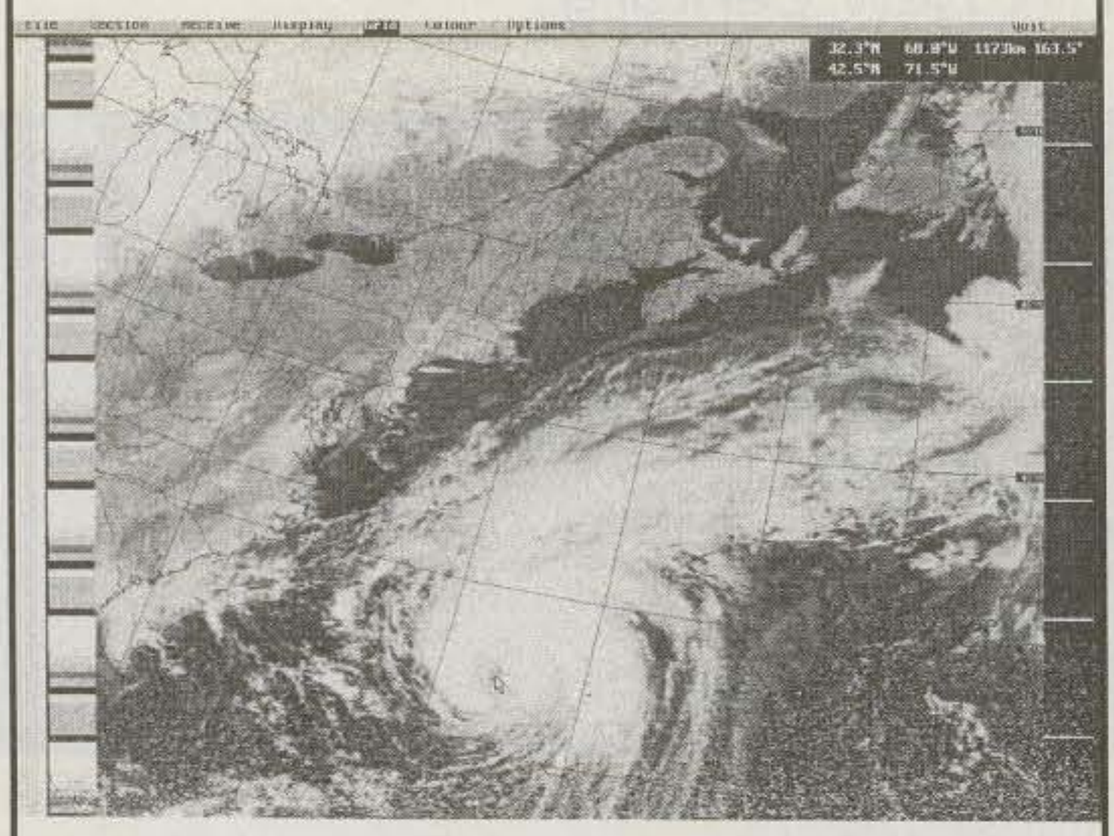

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Looking Ahead in CQ

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

- *"CQ* Reviews: Ten-Tec Pegasus," by N7NB
- *"CQ* Market Survey: Handhelds," by WB6NOA
- "Global Optimization of Yagis," by K6STI
- "An Earth-Moon-Earth Primer" by WB2AMU

Plus...
- "A Skeleton Sleeve-Fed Monopole," by K6MHE
- "Turn the Tower, Hold the Antenna," by W8CM
- "Identify That Feedline," by KA4LBE
- "A 20-Meter Bootlegger 'Fesses Up'," by K4IJS

803-5823; e-mail: <amcom@digisys.net>; web: <http://www.amateurcommunications.com>).

The KC2BHO Antenna Adapter. Stephen Guylas, KC2BHO, has introduced a handy accessory gizmo, the SMA-to-BNC Rubber Covered Antenna Adapter. In his words, it's designed to be "a safer way to quick change your HT antenna."

The new adapter is intended to prevent expensive, difficult- to-repair damage to radios that use an SMA-style antenna connection. Such damage often occurs over time as a result of repeatedly changing antennas, such as required when alternating between portable, mobile, and base operation. The adapter takes all the wear and tear, instead of the radio's chassis connector.

The low-profile adapter fits all BNC connectors, adding only one-half to five-eighths inch to overall antenna length, depending on radio model. The adapter has gold contacts with a black neoprene rubber covering; the rubber base seals against moisture and dirt while providing firm antenna support.

The adapter is $11.95 plus $1.50 s/h from Stephen G. Guylas, KC2BHO, 706 Lalor St., Trenton, NJ 08610 (609-393-6476; e-mail: <guylas@netzero.net>). You need to specify your radio's brand and model number when ordering. According to Stephen, the adapter also is available at Ham Radio Outlet's Delaware store.

Software and Computers

W4RNL Antenna Modeling Files. L.B. Cebik, W4RNL, a respected antenna expert and longtime correspondent, has updated us on some of his recent activities.

As a dedicated antenna modeler, LB recently decided to make available a disk of some 400 personal modeling files in .EZ and .NEC format, along with descriptions of the modeling files. Via the AntenneX website he has made these exemplary files available to other antenna modelers as an aid to their developing and improving their modeling skills.

The collection is subdivided into eight individual sets of over 50 models each in various antenna categories, including HF Yagis and quads, log periodics, horizontal phased and parasitic arrays, HF horizontal wire antennas and arrays, HF vertical antennas and arrays, 10 meter antennas, and VHF/UHF antennas. The selling price at AntenneX is in the $10 class per individual set, or about $60 for all eight sets, plus s/h (if the sets are not purchased via direct download from AntenneX's website). Go to <http: //www.antennex.com> for the files.

I'd like also to mention LB's personal "Service and Education" website at <http://www.cebik.com>. The site covers a variety of historical notes; general, HF, VHF, and UHF antenna topics; HF antenna modeling aids; transmission lines and impedance coupling; and links to other websites specializing in antennas. LB says his site has been visited over 100,000 times in something over 2 1/2 years of operation, with some material translated for local print into a half-dozen languages.

Contact L. B. Cebik, 1434 High Mesa Drive, Knoxville, TN 37938-4443 (425- 938-6335; e-mail: <cebik@utk.edu>; web: <http://www.cebik.com>). (As we mentioned above, for the modeling files go directly to <http://www.antennex. com>.)

DeLorme 3-D TopoQuads™. Over the past several years we have profiled a number of excellent mapping and navigation software packages from DeLorme. These include Street Atlas USA®, the first consumer mapping software; AAA Map'n'Go®; EARTHA™ Global Explorer®; Phone Search

USA®; and several others. Delorme also publishes the popular "Atlas & Gazetteer"® series of recreational atlases for all 50 US states.

One of the hottest aspects of mapping technology today is three-dimensional (3-D) topographical mapping. To this end, and to the special interest of outdoorsmen and mapping enthusiasts, as well as mountaintopper and hiking amateurs, in February and December 1999 we profiled DeLorme's Topo USA™. It represented the firm's full-scale entry into customizable topographic maps on CD-ROM and DVD.

If you liked Topo USA, you'll likely love a new and even more comprehensive and professional-quality product, 3-D Topo Quads. The powerful mapping software gives you all major Geographical Information Systems (GIS) functions in an easy-to-use, intuitive interface. Designed more for business and professional interests, 3-D Topo Quads provides seamless, digital USGS 7.5-minute quadrangular raster maps, at a 1:24,000 scale. The maps are broken down state-by-state in CD-ROM format.

The new product lets you see any region in the state using instant, realistic 2-D or 3-D views, and print out customized maps of any region. Draw tools are provided which let you customize and annotate the maps, and which enable measurement of distances and areas. The product also is compatible with Global Positioning System (GPS) receivers and handheld computers.

The professional nature of the product means that 3-D Topo Quads is rather expensive for casual use ($149 list price per state). Nevertheless, DeLorme offers some specials on the product, such as an attractive software/ hardware package deal that includes its popular Earthmate™ GPS receiver.

Contact DeLorme, Two DeLorme Drive, P.O. Box 298, Yarmouth, ME 04096 (1-800-452-5931; e-mail: <info @delorme.com>; web: <http://www. delorme.com>.

New on the Net

vTuner. Basically, we amateurs are used to communicating with each other over the air, and we sometimes listen to one-way shortwave (SW) or other one-way radio broadcasts. In recent years, however, many broadcasters have taken to the Internet to distribute their signals far and wide—sans QRM, QRN, fading, and the like. You might call this form of listening "Internet DXing," for lack of a better term.

Many of these stations broadcast in the popular Real Player™ format. This means that if you possess Real Player or Real Player Plus (the basic Real Player is a free download from <http:// www.real.com>), you can click on a station's website and then hear (and sometimes even see) their broadcasts via your PC. The main problem simply has been finding these myriad Internet- based stations and organizing them in a convenient way.

There are several products that help you find and enjoy these online broadcasters. A particularly nice one is vTuner, which my colleague Eric Force profiled in his "Radio & the Internet" column in last December's *Popular Communications*, a *CQ* sister publication. As Eric noted, vTuner—a free download—comes with a massive station database, which includes stations from over 100 countries. It makes Internet DXing easy.

The good news is that the basic vTuner is a totally free download that displays some advertising banners with which you can easily live. An upscale vTuner Plus is available for $29.95. The latter sports several enhancements, such as the ability to save your personal favorite station lists.

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The products are offered by vTuner.com, 126 Fifth Ave., Suite 3D, New York, NY 10011 (212-414-1836; web: <http://www.vtuner.com>). But you can get everything you need, including the program download, by simply going directly to the vTuner website.

Online Frequency Allocation Chart. As radio amateurs, most of us are aware of what the electromagnetic (EM) spectrum is all about. As a refresher, let's recall that the EM spectrum is an array of radiant energies—types of EM radiation—usually classified by wavelength. In order of decreasing wavelength and increasing frequency, these radiant energies are radio waves, microwaves, infrared radiation, visible light, ultraviolet radiation, x-rays, and gamma radiation.

As radio amateurs and hobbyists, we're most concerned with the *radio and microwave spectrum,* a subset of the overall EM spectrum. It extends from a few hertz (Hz) to more than 300 gigahertz (GHz). By way of review, in the lowest frequency range are the ultra low frequencies (ULF), from about zero to 3 Hz. Above ULF are the extremely low frequencies (ELF), 3 Hz to 3 kHz. Above that, from 3 to 30 kHz, are the very low frequencies (VLF). Next are low frequencies (LF), from 30 to 300 kHz. The medium frequencies (MF) are from 300 to 3000 kHz (3 MHz).

From 3 MHz to 30 MHz are the high frequencies (HF). Above are the very high frequencies (VHF), from 30 to 300 MHz. The ultra high frequencies (UHF) run from 300 to 3000 MHz, or 3 GHz. From 3 GHz to 30 GHz are the super high frequencies (SHF), and from 30 GHz to 300 GHz are the extremely high frequencies (EHF).

Where am I going with this? Having said all that for background, I'll direct your attention to a highly detailed and very attractive reference source for a good chunk of the EM spectrum. The best part is that you can get it for free.

The freebie I'm leading up to is the online download of the spectrum wall chart prepared by the National Telecommunications and Information Administration (NTIA), part of the Department of Commerce. It depicts the spectrum allocations to United States radio services, over the range 9 kHz to 300 GHz, divided into more than 450 frequency bands.

You can download the frequency allocation chart for free from NTIA at <http://www.ntia.doc.gov/osmhome/allochrt.html>, with an interesting background paper which discusses U.S. spectrum allocations and the chart itself.

The NTIA chart is offered in the popular Adobe Portable Document Format (PDF). Thus, to download it and print it out, you need to have a copy of the Adobe Acrobat Reader on your computer—no big deal, as the reader is also a freebie, at <http://www.adobe.com/products/acrobat/readstep.html>. You can even download the Adobe reader via a link from the NTIA website.

You also can order a large (30" × 40") hardcopy that makes use of distinctive colors to distinguish allocations for the 30 different radio services depicted. The hardcopy isn't free, but you can order it online from the NTIA website, by phone, or by mail. You need to specify the "1996 Spectrum Wall Chart," stock No. 003-000-00652-2, price $5.50.

If you order the wall chart by mail or phone, contact the U.S. Government Printing Office, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954 (202- 512-1800).

G3SEK Triode Board

Replacing high-power triodes is sure to damage your pocketbook. The G3SEK Triode Board presents a new solution to the problem of control and protection of expensive triode power amplifiers. You might think of it as a sort of universal control unit designed for what its developer, Ian White, G3SEK, refers to as "key-down forever" reliability.

The G3SEK Triode Board is configurable to use with almost any amateur-size grounded-grid amplifier, and it has been tested on a wide range of triodes. The board includes grid and anode current metering with overload protection, status outputs for four LEDs, a precision-regulated variable cathode bias supply, a transmit/receive relay, and a 12V or 24V relay supply.

The easy-to-build kit includes a double-sided PC board with printed component locations, all components for the board, and a 38-page user's manual. Experienced constructors can buy only the bare board and the manual, which includes a complete parts list.

For more information, including pricing and ordering details, contact Ian F. White, G3SEK, at IFW Technical Services, 52 Abingdon Rd., Drayton, Abingdon, Oxon, OX14 4HP, UK; e-mail: <boards@IFWtech.demon.co.uk>; web: <http://www.ifwtech.demon.co.uk/g3sek>. Ian says that you also can contact Down East Microwave, Inc. at 908-996-3584.

New West License Manuals

Now that the license restructuring has

taken effect, Gordon West, WB6NOA, has announced the availability of his three new license manuals for Element 2 Technician class, Element 3 General class, and Element 4 Extra class. Also new is a six cassette tape Morse Code set specifically for the 5 wpm Element 1 exam.

The Technician class Element 2 book covers all 394 questions and answers, with explanations, and provides the new ham with VHF/UHF references and band plans. In addition, several chapters cover the restructured amateur service, plus there is a chapter on how to learn the code via the Farnsworth method. The 192-page book is valid April 15, 2000 through June 30, 2003.

The General class Element 3 book of 385 questions, answers, and explanations includes a 16-page pullout section that focuses on recent changes in the General class licensing requirements. This 160-page book is valid April 15, 2000 through June 30, 2004.

The Extra class Element 4 book at 240 pages has all technical formulas worked out in great detail so that "anyone can follow the math," West says, plus some shortcuts are given. There are also detailed pages on frequency privileges for all classes of license. This book is valid April 15, 2000 through June 30, 2002 and contains all of the 676 Element 4 question pool.

The Gordon West license manuals are copyright Master Publishing, Inc., and are sold by RadioShack stores, ham radio dealers, and the W5YI distributor (800-669-9594).

Wrap-Up

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

Overheard: What does the new millennium hold for each of us? I don't claim to know, but I *do* know one good way to predict the future is to try to exercise some control over shaping it.

73, Karl, W8FX

February Issue

Nil-Jon Correction

In the February "Digital Dipole" column we mentioned Nil-Jon's line of antennas. The contact information given was incorrect, however. They can be contacted via Paul Branszet, KI8HO, Nil-Jon Sales Director, P.O. Box 764, Amherst, OH 44001 (phone 1-440-989-2295); web: <http://www.Nil-JonAntennas.com/>. Thanks to KC8LAT for the update.

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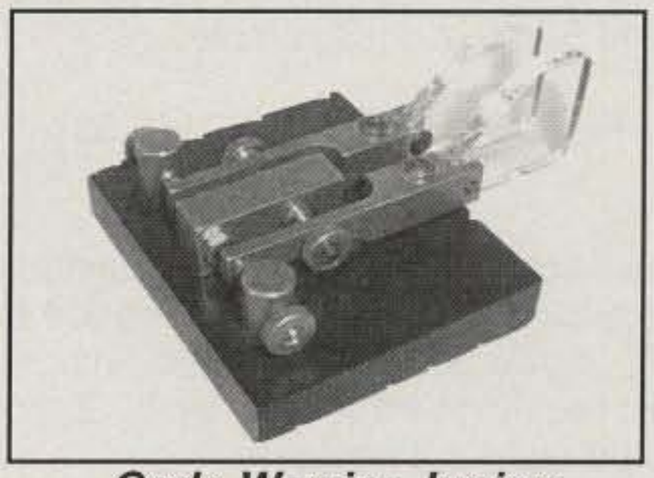

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Math's Notes

What's New And How To Use It

BY IRWIN MATH, WA2NDM

Another Receiver-on-a-Chip

Regular readers of this column will recall a feature we did on a single-chip receiver usable over the 300 to 440 MHz UHF range and manufactured by MICREL, Inc. Well, MICREL has done it again with a device designed for the 140 to 200 MHz range. This device is "made for" 2 meters and will be our subject this month.

The MICRF004 "QuickRadio™" is a single-chip VHF receiver that normally is intended for remote-control applications such as garage-door openers, keyless entry devices, and RF-tag ID systems. As a result, it is very inexpensive and requires a minimum of external components for operation. Fig. 1 is a schematic diagram of the basic 150 MHz circuit. It is intended primarily for digital applications, and if this is your need, then you are set. If you want to use this for analog (voice) applications on 2 meters, however, read on.

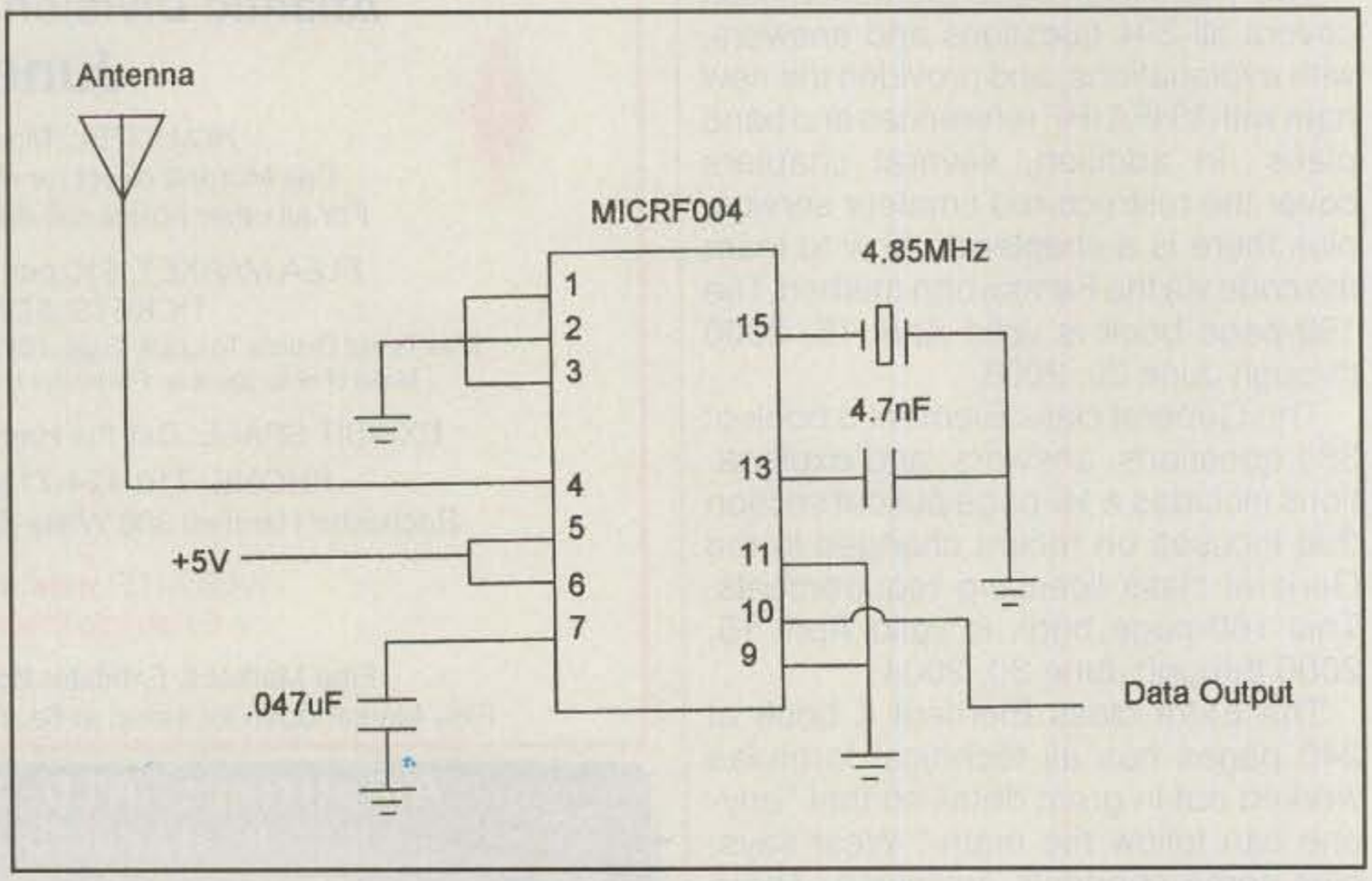

Fig. 1– Basic application schematic.

You will note that there are no external tuned circuits in the circuit. The input RF amplifier is broadly tuned, and selectivity is accomplished by a couple of on-chip IF bandpass filters. Fig. 2 is a simplified block diagram of the chip. The unit is basically a super-heterodyne receiver with a 0.85 MHz IF and a local oscillator composed of a programmable synthesizer. The frequency of the local oscillator is determined by the following formula:

$$Flo = \frac{Fr + 0.787Fr}{150}$$

where *Flo* is the local oscillator frequency and *Fr* is the desired receiving frequency (all in MHz). Once this value is calculated, the crystal required is found by dividing by 32.5. For operation at 146.52 MHz, for example,

$$Flo = \frac{146.52 + (0.787)146.52}{150}$$

which equals 147.288 MHz. Dividing this by 32.5 yields a crystal value of 4.53 MHz. If you simply divide the final desired receiving frequency by 32.2, you should be in the ballpark.

Once the local oscillator signal is set to the proper frequency, you can then choose one of four IF selectivity settings. This is accomplished by connecting pins 1 and 14 to either Vcc or Gnd in accordance with the following:

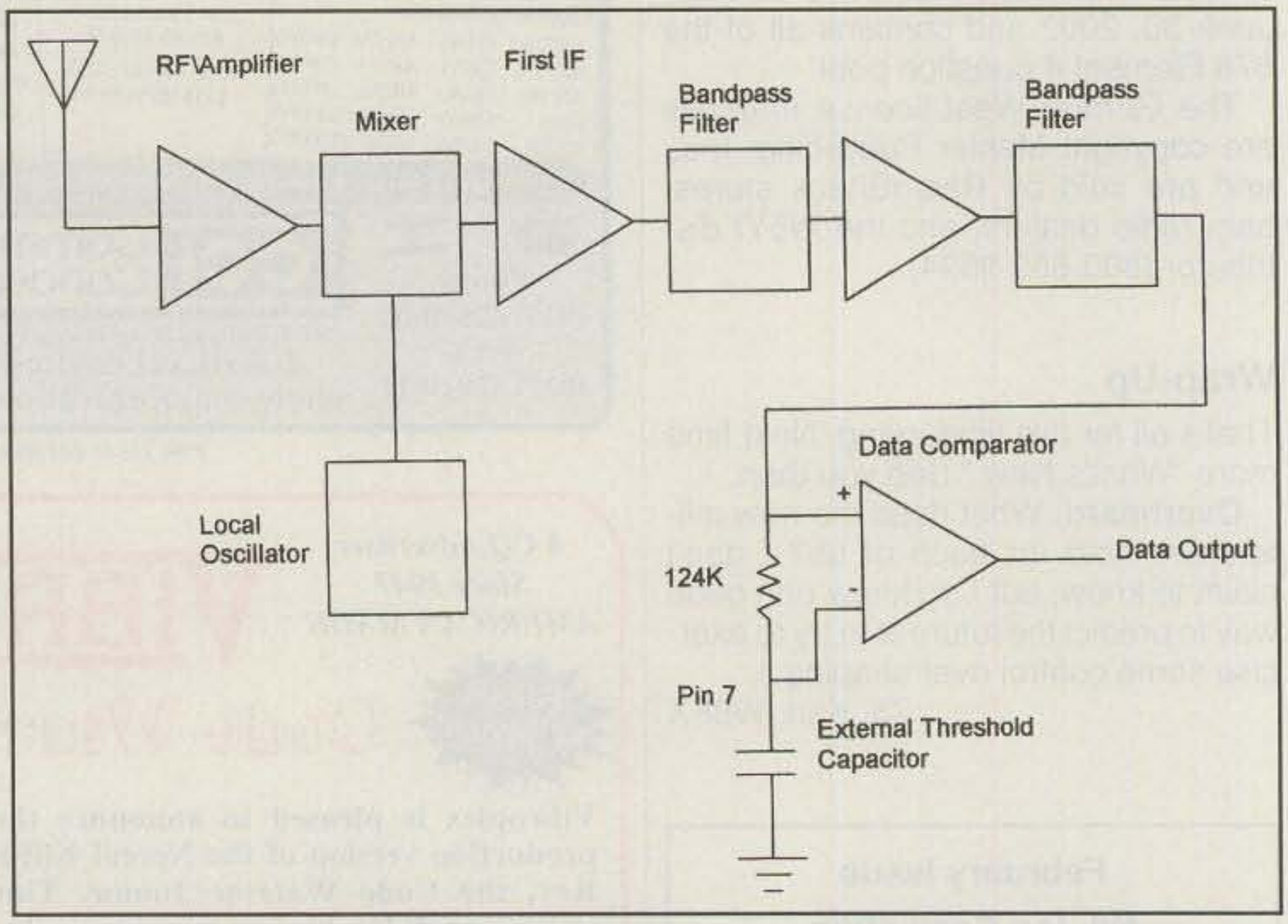

Fig. 2– Simplified block diagram of the MICRF004.

IF Bandwidth	Pin 1	Pin 14
8.8 kHz	Vcc	Vcc
4.4 kHz	Gnd	Vcc
2.2 kHz	Vcc	Gnd
1.1 kHz	Gnd	Gnd

You will now note that a comparator is added to the end of the receiving chain to square up the data and provide

c/o CQ magazine

a usable digital output for additional processing circuitry. For analog applications this block must be defeated. This is accomplished by using pin 7 in a manner not normally intended. For digital operation pin 7 has a capacitor that charges to a level suitable for triggering the comparator to properly recover the data. Omitting this capacitor allows the analog signal to appear at pin 7, but through an impedance of about 124K. This means a high-input impedance audio amplifier will be needed. As an alternative, the comparator stage may possibly be converted to an amplifier, but I have not tried this.

When all is said and done, the MICRF004 is an ideal device for the heart of a simple-to-implement, low-cost, medium-sensitivity 2 meter receiver, and I would love to hear from readers who have done so. For further information and additional details on other features of the chip, contact MICREL at 1894 Fortune Drive, San Jose, CA 95131, or visit their web site at <http://www.micrel.com>.

Good luck with your receiver!

73, Irwin, WA2NDM

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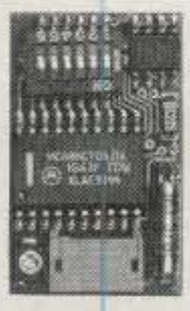

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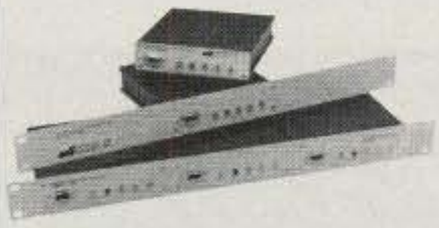

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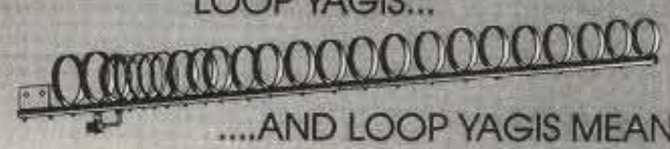

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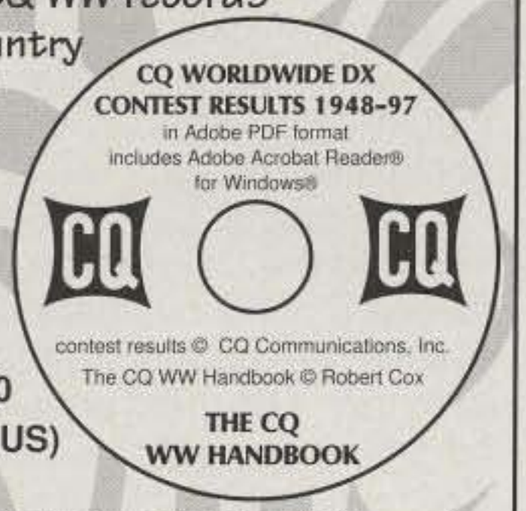

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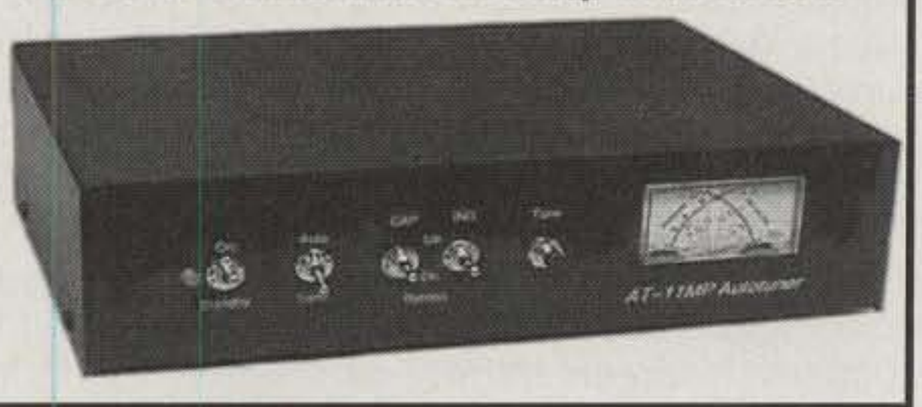

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CIRCLE 71 ON READER SERVICE CARD

Radio Classics

BY JOE VERAS, N4QB

Vintage Gear and Its History

Collins: The Man, The Company, The Equipment

The library of human achievement has a special section devoted to volumes recounting the accomplishments of those who began their journeys not drifting with the current, but instead swimming upstream. The pioneering amateur radio manufacturers in the previous "Radio Classics" column (February issue) offered only receivers in their initial product lines, not surprising considering that most amateurs of the era using a commercial receiver generally paired it with a homebrew transmitter. Collins Radio's first product was a transmitter; in fact, it was not until a decade and a half later that the company produced its first amateur receiver.

Several chapters of the Collins story had already been written by the time that first transmitter was sold. The biography of Arthur A. Collins is as entertaining and instructional as that of any of the more widely known icons of American commerce. His story is well-documented elsewhere, so I will not re-plow much of that already furrowed ground. A thumbnail sketch of the boy and the man, and a glimpse at his early commercial gear occupy this month's column space. Summing up such a life in a few, or a few thousand, words is a difficult task. It is safe to say, however, that he was precocious, innovative, and forward thinking. Most important of all, he was one of us.

Photo A– The 30W transmitter generally is regarded as the first Collins product to emerge from Arthur's basement "factory." (Photo by Joe Veras, N4QB)

Art Collins could serve as the Uncle Sam of the ham radio recruiting poster. Boyhood experiments with crystal sets generated a lifelong fascination with communications. Arthur passed his amateur exam at age 14, and within a couple of years his on-the-air exploits were being written up in the pages of the *Cedar Rapids Gazette* and, indeed, newspapers across the country. The 15-year-old amateur was able to maintain communication with the Macmillan expedition to Greenland when the official station on the East Coast failed. After receiving a message from the Macmillan station, Arthur bicycled to the Western Union office. From there the message was cabled to the Washington, D.C. headquarters of the National Geographic Society, the expedition's sponsor. The Collins name would be connected with other expeditions in the future, including the one that landed the first man on the moon in 1969.

By 1926 Arthur had turned from being written about to authoring articles himself. His first effort, a technical piece, appeared in the May issue of *Radio Age* that year. Many other articles followed, and his name appeared regularly in ham, hobby, and technical publications. Later years would find Art Collins once again in print, this time the subject of articles in publications including *Forbes* magazine and *The Wall Street Journal*.

Arthur was a native of Kingfisher, Oklahoma (born September 9, 1909), but he is more generally regarded as one of Cedar Rapids, Iowa's favorite sons. It is where he grew up, the place he started his company. His father's business was what brought the family to Cedar Rapids from Oklahoma in the first place. M. H. Collins, a visionary in his own right, believed that innovations in agriculture could produce food much like other manufactured products. The fertile, flat expanses of Iowa farmland seemed the ideal place to do that. He believed in the economy of scale; at its peak, Collins Farms had more than 60,000 acres under cultivation. The magnitude of the operation can be illustrated graphically in another way: This is an area four times the size of Manhattan. This lesson in thinking big was not lost on his son.

Even though Collins Farms later fell victim to the Depression, the successful years of his business enabled M.H. to subsidize his teenage son's radio adventures. The great equalizer of parental skepticism was as common to the Collins household as it was to those in which many of us grew up. While the tangle of wires, and rooms dominated by bread-boarded layouts, may never have become a thing of beauty to M. H., he did develop an appreciation for Arthur's keen interest. The generous support of his son's endeavors would be repaid in a way the father could hardly imagine at the time.

P.O. Box 1041, Birmingham, AL 35201
e-mail: <n4qb@cq-amateur-radio.com>

Collins Transmitters

Sheet 10A

TYPE 10A CRYSTAL CONTROL UNIT

SCHEMATIC DIAGRAM

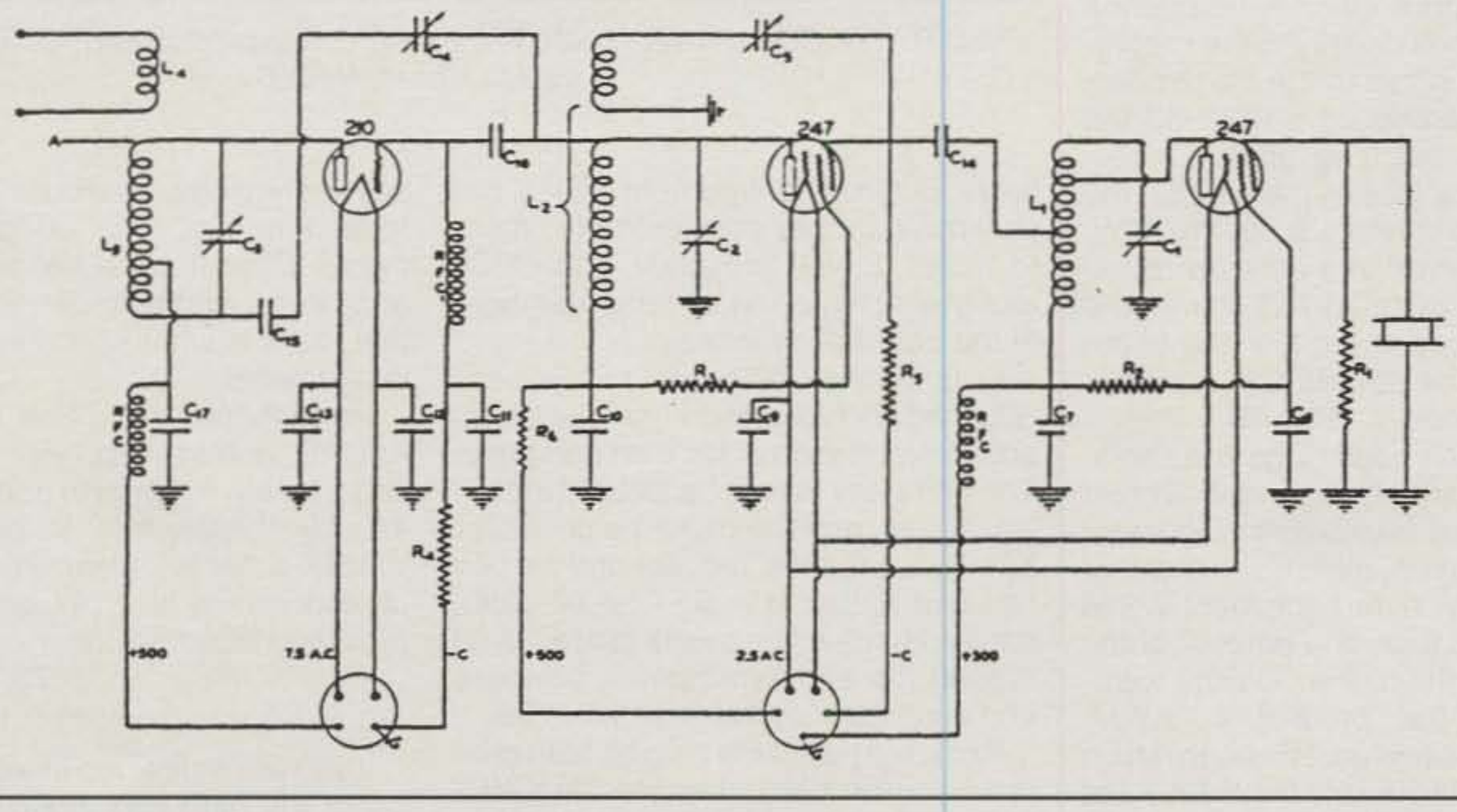

Fig. 1– The schematic of the RF portion of the 30W transmitter.

After graduating from high school, Arthur left home for Amherst College in Massachusetts. The following year he returned to Cedar Rapids, where he attended Coe College before transferring to the University of Iowa. His formal education ended short of achieving a bachelor's degree.

With college behind him, and a new bride to support, Collins was confronted with the slim prospects offered by the 1931 job market. Creating his own job seemed to be the best route to employment. In a 1968 interview, Arthur told *Forbes* magazine, "I picked what I was interested in and looked for a way to make a living." Amateur radio was his area of interest, and the first product to bear the Collins name was an amateur transmitter.

By the end of 1931, Arthur was producing transmitter kits in the basement of a house which had once belonged to his grandparents. The three-tube crystal-controlled sets sold for between $37.25 and $47.25, depending on the output tube. A small, January 1932 *QST* ad identified the manufacturer as *Arthur A. Collins Radio Laboratories*. Two months later, the name in the ad changed to *Collins Radio Transmitters.* In October of 1932, Arthur ended this uncharacteristic period of indecisiveness, settling on the name *Collins Radio Company*.

While the fortunes of Arthur's company rose, Collins Farms had fallen on hard times and been sold. When Collins Radio incorporated in September of 1933, M. H. Collins became vice-president of the firm. The investment in his son's hobby experiments years earlier had earned a handsome return.

The year 1933 brought other changes to Collins Radio. With business on the increase, Arthur found it necessary to move the company out of the basement into larger quarters. The Chicago World's Fair showcased an exhibit of Collins technology, including a working amateur station, on occasion operated by Arthur himself. Late in the year, an expedition headed by Rear Admiral Richard Byrd departed for Antarctica. Aboard his ship, the *Jacob Ruppert,* were several Collins transmitters.

No success story is complete without a fight against overwhelming odds. The Arthur Collins saga contains a good one. In 1920, the Radio Corporation of America obtained the rights to American Telephone and Telegraph's radio inventions, including the vacuum-tube designs of Lee De Forest and Edwin Armstrong. RCA company policy prohibited the licensing of others to manufacture radio transmitters. It also controlled the marketplace by restricting the availability of tubes. Arthur decided that if he couldn't buy the tubes he needed, he would make his own. That action was sufficient to attract RCA's attention.

RCA filed suit against Collins, and in 1936, David took on Goliath. Arthur's patent attorney discovered a vacuum-tube patent pre-dating those issued to De Forest and Armstrong. Although better known for his work with rockets, Robert Goddard had obtained a patent for an oscillator tube in 1915. After a personal visit by Arthur, Dr. Goddard agreed to lend his assistance in the fight against the conglomerate. Collins prevailed, and RCA agreed to supply tubes and grant the manufacturing licenses.

The 30W transmitter (photo A) generally is regarded as the first Collins prod-

uct to emerge from Arthur's basement "factory" at 514 Fairview Drive. The schematic of the RF portion of the transmitter is shown in fig. 1. It is an interesting comparison to fold out the schematic diagram from the owner's manual of any current-day equipment and place it next to that of the early Collins rig.

The 30W transmitter consists of a Model 10A RF deck and Type 500 BX power supply. The 10A employs a pair of 247 tubes in a crystal oscillator/buffer combination to drive a 210, 510, or 530 to 30 watts output. Open-wire antenna feedline attaches directly to the insulated terminals on top of the transmitter. The 30W was produced in 1932–33 and sold for $125, including tubes.

Another early Collins transmitter, the 4A, is pictured in photo B. As the 30W, a CW rig, evolved into other transmitters that also included AM phone, the 4A took its place at the low end of the Collins line. The 20-watt CW transmitter was produced in 1933–34.

Collins Radio's beginnings in the amateur business quickly expanded to other fields, including broadcasting, government, commercial, military, and avionics. Eventually, ham equipment would represent less than one percent of the company's bottom line. Collins introduced its last ham product, the KWM-380, more than two decades ago. Much Collins gear, particularly the S-Line and 380 series, remains in active use on the amateur bands. It is prized by collectors here and abroad, both for its quality and undeniable Collins mystique.

Although no longer in the amateur radio business, the company which began in that little basement workshop and the Collins name survive as part of Rockwell-Collins. After fighting off a takeover attempt by H. Ross Perot in 1969, the Collins company's financial situation forced it into a merger with North American Rockwell in mid-1971. Rockwell's original intention was to leave Collins management intact, but continuing money woes prompted them to name a new president and CEO, along with replacing several members of the board of directors.

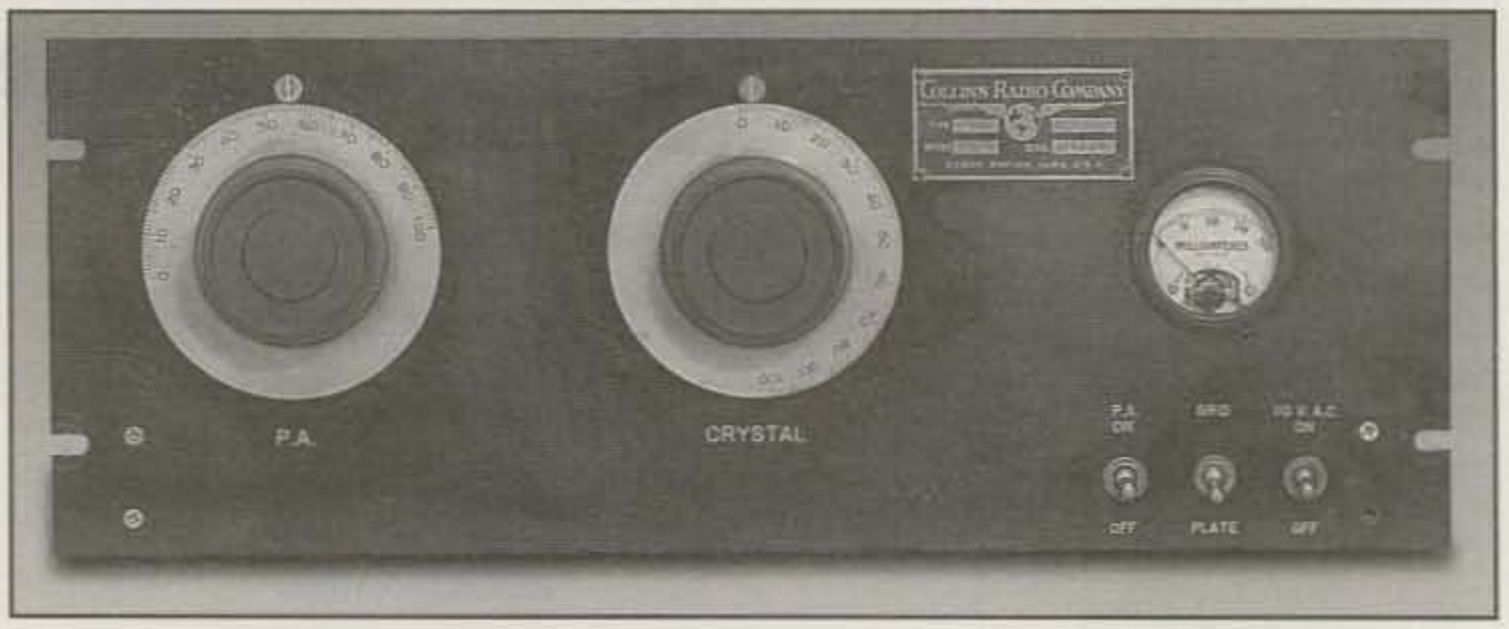

Photo B– The Collins 4A 20-watt CW transmitter was produced in 1933–34. (Photo by Joe Veras, N4QB)

In January of 1972, Arthur Collins announced his resignation from the board and the formation of his own company. The company was to be located in Dallas, Texas, and the name he chose for it, *Arthur A. Collins, Inc.*, echoed the one he used in that first *QST* ad 40 years earlier. His new firm's work still revolved around the communications business and continued until his death in 1987.

Rockwell pulled the plug on ham gear production in 1986 when the last KWM-380 rolled off the line. For the first time in more than half a century, there was no new Collins equipment to dream about, to desire. I cannot think of a single other amateur manufacturer with so much of its 20-, 30-, and 40-year-old equipment in daily operation, though. It remains a testament to the company's founder, and to all the people who built that equipment.

Is Collins equipment perfect? No. Nothing born within sight of marketplace reality is. Compromises are inherent in the engineering and production of any technology, particularly if it must meet time-frame or budget requirements. Even if perfection is an illusive goal, it is a worthy target. Striving to hit that mark is what keeps making good things better.

Many thanks go to Rod Blocksome, KØDAS, and the Rockwell-Collins museum for allowing me to photograph the 4A. My thanks also to Brian Harris, WA5UEK, for his hospitality and help in photographing his 30W, as well as for providing its schematic.

73, Joe, N4QB

If you are interested in learning more about the ham end of Collins Radio's business, I highly recommend the excellent book *A Pictorial History of Collins Amateur Equipment*, by Jay Miller, KK5IM. Its 176 pages are filled with pictures and text that tell the Collins story in a fashion commensurate with the quality of the equipment itself. The book can be ordered with Visa/Mastercard ($39.95 + $4.00 s/h) by calling 800-233-0484; or from Trinity Graphics Systems, 5402 1/2 Morningside Avenue, Dallas, TX 75206 with a check or money order in the same amount. Additional information is available on the web at <www.colcol.org>.

Those who operate with or collect Collins equipment of any vintage might be interested in joining the Collins Collectors Association. The group is involved in a number of on-the-air and in-person activities and provides a great resource for the repair and restoration of Collins gear. Information on the CCA can be found on the web at <www.collinsradio.org>, or by writing to P.O. Box 10459, Phoenix, AZ 85064-0459. Better yet, drop by one of the nets: 2000 UTC Sunday, 14.263 MHz; 8 PM CST Tuesday, 3.805; 8 PM CST Thursday, 3.875; and 8 PM PST Friday on 3.895 for the West Coasters. ■

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CIRCLE 50 ON READER SERVICE CARD

Contesting

BY JOHN DORR, K1AR

News/Views Of On-The-Air Competition

A Poor Man's Contesting

May Contest Tip of the Month

An old trick that I've used for years is monitoring overseas broadcast stations to give me an indicator of what conditions are like on a given band. The best example is to listen above 15 meters. If you're interested in learning whether the band is about to open, there's no better way than to let a 100 KW broadcast station give you the answer. Take the time to discover broadcasters that are appropriate for your QTH and get a free heads-up on the competition.

You may recall that in the March issue I covered the subject of whether or not you had to be wealthy to be a successful contester. As a rule, when writing my column month after month I never really know when I'm going to hit a hot button with *CQ* readers. However, if e-mail response is a good indicator, you certainly resonated with that month's topic. In your responses, many of you indicated a desire to probe this subject a bit further, focussing on what can be done in contesting with a limited budget. With that input in hand, let's dive in.

Let's face it: If someone were to go out and build a large multi-multi contest station from scratch with all new components, it would probably cost over $100K. Just imagine the look on the face of the salesman at the local radio store when you tell him that you want 10 transceivers, 10 amplifiers, 500 feet of Rohn 45, 10,000 feet of RG213, headsets, keyers, switches, computers, etc. Once you're done with him, it's off to the furniture store to order tables, chairs, lighting fixtures, and so on. Then there's the home construction contractor who will finish your basement to house it all. You're probably thinking what I'm thinking: $100K is a conservative number. I'm sure we all know of someone who could write a check for that amount of money and just go do it, but then there are the rest of us!

The reality is that there are many ways to enjoy contesting without spending $100K. Most of the major contests have created categories that consider that fact, with the CQ WW WPX being one of the best examples. Now that a tribander category exists, competitors can compete more easily with their peers and not be demoralized when being "pounded" in the final results by the usual large stations from the northeast.

What else can we do, you ask? More and more contesters are operating barefoot in contests. If you doubt the claim, take a look at the results of many popular contests. Without doing the analysis, I would guess that half of all participants in the ARRL Sweepstakes operate with "A" power. The same is probably true in the CQ WW and other contests. By focusing on 100 watt power levels, you've just removed a huge expense in contesting—a linear amplifier—and the competition is just as intense.

With the solar cycle at its peak right now (more or less), there's no better time to have fun in contesting with wire antennas. Even as I write this month's column, I have a TELNET window open on my computer. Yes, 3W50K was just spotted on 15 meters, and yes, I just worked him on one call with a dipole in the trees. If you're the type who can't put up a big tower, you should learn what fellows such as Phil, KT3Y, have done with wire beams. Phil has consistently been making top scores in contests without a stitch of aluminum or steel. Another way to maximize this strategy is to pick a single band and focus exclusively on it. A few strategically placed wire Yagis (or other antenna types) can make for a lot of contesting fun on a budget.

Still others are taking advantage of the natural towers that exist in their backyards—trees. It may sound silly at first, but you can put up a very nice array with a large ladder and a couple of well-placed pine trees in your "back 40." Erecting a 4/4 stack on 10 meters is a piece of cake and can allow you to really have fun without breaking the bank.

Finally, one of the e-mails I recently received summarizes this month's theme the best. Sam Moore, K7SAM, of Flaxville, Montana sent me the following note, which I want to share with you. It epitomizes the creativity of hams and shows how we truly can enjoy our passion for contesting while staying on a budget. Sam tells us:

> Although I am not a "real" contester, I do manage to do some contesting. Most of it is a bit lower key than the type you had in mind in your March column, I'm sure. I do Field Day, the Air Force QSO Party, November Sweeptakes, etc.—fairly low key by most standards. I do, however, enjoy them and have put together a station to have fun and do as well as I can.
>
> This station has come together over the course of seven years and in pretty much the manner you described in your column. At my location I have a 50 foot tower with a VHF/UHF dual-band vertical at 58 feet, a homemade 5-element 6-meter beam at 53 feet, and a 40 meter and 80 meter dipole at 45 feet. The second tower is 30 feet with a 10-foot pipe extension and an R7 vertical on top. The last tower is another 50-footer with a TH6DXX 6-element tribander for 10-15-20 meters. Other than the dual-bander, which I did buy new, everything else was acquired at hamfests or by hearing about something from a friend of a friend, or by just plain keeping my eyes open. There has been a tremendous amount of plain old hard work and elbow grease to make all this come together and happen. Like most, however, I enjoyed every minute and was proud of the finished product.
>
> How well did everything work? Last fall we had a wind storm with winds over 70 miles per hour. The new metal roof of my house, which was installed by a contractor one year prior, departed the area and had to be re-

Calendar of Events

Apr. 29-30	Florida QSO Party
Apr. 29-30	Ontario QSO Party
Apr. 29-30	Nebraska QSO Party
Apr. 29-30	MARAC SSB County Hunter's Contest
Apr. 29-30	NA High Speed Meteor Scatter Contest
May 6-7	ARI Int'l DX Contest
May 6-7	MARAC County Hunter's Contest
May 6-7	Connecticut QSO Party
May 6-7	Massachusetts QSO Party
May 6-7	Indiana QSO Party
May 13-14	Nevada QSO Party
May 13-14	CQ-M DX Contest
May 13-14	A. Volta RTTY DX Contest
May 20-21	Baltic Contest
May 27-28	**CQ WW WPX CW Contest**
June 3-4	IARU Region 1 Field Day
June 10-11	ANARTS WW RTTY Contest
June 10-12	ARRL June VHF QSO Party
June 11	Asia-Pacific Sprint
June 17-18	All Asian CW DX Contest
June 24-25	ARRL Field Day
July 1	Canada Day Contest

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e-mail: <K1AR@contesting.com>

placed, but all the antennas were in place, intact, and erect the next morning.

I just finished working the ARRL DX contest, not as a contestant, but just as someone trying to pass out Montana for those who needed it and picking up some new countries myself. Was I pleased? You bet. I added 55 new countries to the log, including Clipperton Island, Pitcarin Island, Eastern Kiribati Island, Fernando de Noronha Island, Senegal, Tanzania, and Mt. Athos, to name a few. This was done with the above antennas, living in the bottom of a valley and using a Kenwood TS-570S(G) and a Kenwood TS-120—nothing really fancy, just a good station put together over time. Like the towers, the only new piece of equipment is the TS-570. The TS-120 came from a hamfest, the computer is an old 386 laptop, etc. You get the idea. *– 73, K7SAM*

We've only scratched the surface of this topic, but I hope I've made you think a bit differently about contesting this month. It's easy to focus on the "rich and famous" in contesting circles and take the attitude that contesting cannot be fun unless you're amongst the elite. The reality is that thousands of competitors are regularly enjoying contest operating on a lean and mean budget, building up their resources over time, and enjoying the results in the process. A little creativity—one of ham radio's hallmarks—can yield impressive results. Keep sending me your creative accomplishments. I'll be glad to share them with the rest of *CQ*'s readers!

Final Comments

That's it for this month. Please remember to provide any submissions for the August column to me by June 1. More and more of you are catching on, but as you can imagine, you can really help my workload (and accuracy!) by submitting your contest announcements via electronic mail.

73, John, K1AR

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CIRCLE 77 ON READER SERVICE CARD

ARI International DX Contest
2000Z Sat., May 6 to 2000Z Sun., May 7

This is the annual edition of the Associazione Radioamatori Italiani's International DX Contest. The ARI DX Contest is managed by veteran contester I2UIY and should offer a significant amount of activity. Stations are allowed to work each other worldwide.

Classes: Single Operator SSB, CW, or RTTY; Single Operator Mixed; Multi-Single Mixed; and SWL Mixed.

Frequencies: 160 through 10 meters (no WARC bands) according to the IARU band plans (RTTY is 80–10 meters). All stations (including single operator) must adhere to the standard 10-minute rule.

Exchange: Italians send RS(T) and province; all others RS(T) and serial number.

Points: QSOs within your own country count only for multiplier credit. Count 1 point for QSOs inside your own continent, 3 points for QSOs outside your continent, and 10 points for Italian QSOs. Stations can be worked once per band and mode (e.g., 15 CW, SSB, and RTTY).

Multiplier: Italian provinces (103) and DXCC countries (not I or ISØ). Credit multipliers only once per band.

Scoring: Final score is sum of QSO points times the sum of multipliers.

Awards: A plaque will be offered to the highest scoring station in each class. In addition, a certificate will be awarded to the top two to five placing stations as well as the leading scorers in each DXCC country.

Special Award: Two very attractive, large plaques will be awarded by the Santa Barbara Contesters in memory of IN3ANE. They will be assigned to the best OM score under 21 years of age and the best SWL score under 18 years old.

Free logging software is available for the ARI Contest directly from the contest manager ($5 or 10 IRCs for expenses). Entries may be submitted on diskette (including a printed summary sheet) in N6TR, K1EA, EI5DI, or ASCII format or via e-mail to: <ari@contesting.com>. You will receive an acknowledgement of receipt of your electronic log within 48 hours. Logs must be mailed 30 days from the end of the contest and addressed to: ARI Contest Manager, I2UIY, P.O. Box 14, I-27043 Broni (PV) Italy.

Indiana QSO Party
1400Z Sat., May 6 to 2300Z Sun., May 7

Sponsored by the Land of Lakes Amateur Radio Club, this party is open to all amateurs worldwide. All modes of operation are encouraged, with fixed stations being worked once per mode on each band. Mobiles may be worked once per mode on each band every time they change counties. Repeaters may be used for contact coordination but not for point credit.

Exchange: Indiana stations send signal report and county; others send signal report, state/province/country.

Scoring: Phone contacts are worth 2 points; other modes credit 3 points. Indiana stations multiply total QSO points by the total of Indiana counties, states, provinces, and countries worked. All others use Indiana counties as their multiplier.

Frequencies: CW—3539, 3739, 7035, 7115, 14045, 21045, 28045, 28120 kHz; SS—1860, 3890, 7280, 14285, 21385, 28400, 50140, 144125, 432120 kHz.

Awards: Certificates will be awarded for the first, second, and third place in each category in each state, province, and country. A participation award will be issued to every station making at least 20 Indiana contacts. Prizes will be awarded to the top three overall scorers in and outside of Indiana.

Send logs with an SASE no later than June 11 to: Sharon Brown, 905 W. Parkway Drive, Pleasant Lake, IN 46779. Questions or comments may be directed to Larry Wheeler, W9QR, <lwwheeler@mindspring.com>.

MARAC County Hunters CW Contest
0000Z Sat., May 6 to 2400Z Sun., May 7

The Mobile Amateur Radio Awards Club is sponsoring the 34th Annual County Hunters CW contest. Mobile, portable, and fixed operation from every county in the US is welcomed and operation from less active counties is encouraged. Fixed stations may be worked only once on each band. Mobiles and portable (identified by signing /M or /P after call) may be worked each time they change county or band; and when operating on county lines they count as one QSO, but the receiving station may count each county as a separate multiplier. To be eligible for an award, a station must not operate more than one transmitter at one time.

Exchange: Signal report, county, and state for U.S. stations. Signal report, province (Canada) or country for other stations.

Scoring: QSOs with fixed U.S./Canadian stations are worth 1 point; mobiles and portables are worth 15 points. US/Canadian contacts with DX are worth 5 points. Contacts with stations operating under a "Net Control" are invalid for contest purposes. Final score is total QSOs times the total number of U.S. counties worked. Mobiles and portables changing states during the contest should calculate their scores for: (1) individual state certificates and (2) total score for the over-

all plaque. Total overall score must not take credit for a county as a multiplier more than once regardless of the county or band.

Frequencies: 3.575, 7.040, 14.050, 21.050, 28.050. Fixed stations should operate above the suggested frequencies and allow low-power mobiles to operate below the suggested frequencies.

Awards: MARAC contest certificates will be sent to winning stations as follows: first-place fixed in each state, province, and country; first-place mobile in each state; first- place portable in each state. MARAC contest plaques will go to winning stations as follows: first- and second-place mobile in the U.S., first-place portable in the U.S., first- and second-place U.S. fixed station, first-place Canadian station, and first-place DX station. For contest purposes, DX is any country other than the U.S., Canada, and Mexico.

Send completed logs and summary sheet by June 9, 1999 to Norm Beavers, W3DYA, 3320 McMillan Drive, Tyler, TX 75701-8239.

Massachusetts QSO Party

1800Z Sat., May 6 to 0400Z Sun., May 7
1100Z to 2100Z Sun., May 7

Work Massachusetts in this popular QSO party sponsored by the Framingham Amateur Radio Association. Stations in Massachusetts may work any station. All others may work only Massachusetts stations. Fixed stations may be worked once per band per mode. Mobile or portable stations may be worked once per Massachusetts county/state. Permitted modes are phone and non-phone (CW, RTTY, ASCII, AMTOR, GTOR, PACTOR, CLOVER, SSTV/ATV, and Packet), digipeater node, land-based ATV repeater, and amateur satellite transponder operation. Land-based repeater contacts are not permitted.

Classes: Non-Massachusetts stations, Massachusetts Single Operator Unassisted (single operator performs all transmitting, receiving, and logging), Massachusetts Multi -Operator (single or multi-transmitter) —all transmitters located within a 300 meter diameter circle, Massachusetts Mobile/Portable, and Massachusetts Teams (up to five single operator members).

Exchange: Massachusetts stations send signal report and county, Non-Massachusetts stations send signal report and US state, Canadian province, or DXCC country.

Frequencies: CW—1.810, 3.550, 7.050, 14.050, 21.050, 28.050, 144.070, and 432.090 MHz; SSB—1.850, 3.890, 7.290, 14.270, 21.390, 28.390, 144.220 (SSB), 146.550 (FM), 432.150 (SSB), and 446.000 (FM) MHz; Novices—3705, 7130, 21130, 28130, and 30 kHz up from the band edge.

Scoring: One point per phone QSO; two points per non-phone QSO. Multipliers are: Massachusetts stations—total number of Massachusetts counties, US states (excluding MA), Canadian provinces, and DXCC countries (excluding US, Canada, Alaska, and Hawaii) worked on each band. Non-Massachusetts stations—total number of Massachusetts counties worked on each band (maximum 14 per band). Washington, DC contacts shall be counted as a Maryland QSO. Final score is total QSO points multiplied by the sum total of all multipliers worked.

Awards: Certificates will be awarded for the highest score in each of the five entry categories—US state, Canadian province/territory and DXCC country, Massachusetts club entry, Novice/Technician entry in each category from the state of Massachusetts, single operator entry from each Massachusetts county. Certificates will also be awarded to entrants working all 14 Massachusetts counties. Additional certificates may be awarded at the discretion of the organizers.

Electronic and printed entries are permitted. Electronic entries should be in either ASCII (example ARRL format) or CT.bin file format. Electronic entries should be sent to <n1tyh@aol.com>. Printed entries must be postmarked no later than 30 days after the end of the contest and should be sent to: Massachusetts QSO Party, c/o Framingham Amateur Radio Association, P.O. Box 3005, Framingham, MA 01701.

Connecticut QSO Party

2000Z Sat., May 6 to 2000Z Sun., May 7
Rest Period: 0400–1200Z, May 7

This annual event is sponsored again by the Candlewood Amateur Radio Association and is opened to all amateurs. The object is to work as many Connecticut stations as possible on 160–2 meters.

Classes: Single Operator—Fixed, Mobile, Novice, QRP (5W); Multi-Single; Multi-Multi; and Connecticut Club competition.

Exchange: Single report and county or state/province/DXCC country.

Frequencies: CW—40 kHz up from lower band edges; Novices operate 25 kHz up from lower band edges. SSB—1860, 3915, 7280, 14280, 21380, 28380 kHz. VHF—50150, 144200, 146580 kHz. RTTY—normal operating frequencies.

Scoring: Credit one point per phone QSO, two points for CW/RTTY. QSOs with club station W1QI and ARRL HQ station W1AW count for 5 points. Final score is total QSO points times the number of stations/provinces/DX (DX only counts as a single multiplier) worked. Others use Connecticut counties as the multiplier.

Awards: Plaques and certificates (100-point minimum) will be awarded to category winners. A special certificate will be sent to those working all eight Connecticut counties.

Send results no later than June 2 to: CARA, P.O. Box 3441, Danbury, CT 06813-3441.

2000 VHF/UHF Spring Sprints

In an effort to promote weak-signal VHF/UHF activity, the East Tennessee DX Association (ETDXA) has assumed sponsorship of the Spring Sprints. The format is similar to the 1999 Sprints, and ETDXA is offering certificates for the top three scores in each sprint, plus a plaque for the station

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http://www.erols.com/pvander
e-mail: NJ4F@erols.com

CIRCLE 56 ON READER SERVICE CARD

who submits the highest cumulative score total from all yearly sprints. It's too late this year for the 2 meter and 222 MHz sprints, but you should get this in time for the 432, 902+, and 50 MHz events.

Object: To work as many amateur stations in as many 2 degree by 1 degree grid squares as possible using authorized amateur frequencies on the 50, 144, 222, 432, 902, and above bands.

Contest Periods:

144 MHz Sprint: 7–11 PM local time, Monday, April 10.

222 MHz Sprint: 7–11 PM local time, Tuesday, April 18.

432 MHz Sprint: 7–11 PM local time, Wednesday, April 26.

902 MHz and above Sprint: 6 AM to 1 PM local time, Saturday, May 6.

50 MHz Sprint: 2300Z Saturday to 0300Z Sunday, May 13–14.

Exchange: Grid-square locator; signal report is optional.

Scoring: QSO points—count one point for each complete QSO. Multiplier—the total number of different grid squares worked; each 2 degree by 1 degree grid square counts as one multiplier.

Final Score: Multiply QSO points by multipliers. Each Sprint is scored separately.

Logs must be submitted no later than four weeks after the end of each event. Only submitted logs are eligible for awards. Certificates will go to the top three finishers in each Sprint.

E-mail complete logs to <vhfdx@etdxa.org> or mail to: East Tennessee DX Assn., NJ4I, c/o H. Rollen, Jr., 1620 Hidden Hills Dr., Clinton, TN 37716.

CQ-M International DX Contest
2100Z Sat., May 13 to 2100Z Sun., May 14

The Krenkel Central Radio Club of Russia invites radio amateurs of the world to participate in the 44th CQ-M ("Peace to the World") International DX Contest. Operation is permitted on all amateur bands (no WARC activity) on CW, SSB, and SSTV.

Classes: (1) Single Operator, single or multi-band (CW only, SSB only, Mixed mode, Satellites); (2) QRP Mixed (CW and SSB), output power limit 5 watts; (3) Multi-Operator—multi-band, single transmitter, mixed (CW and SSB); (4) SWL—multi-band, mixed (CW and SSB); (5) World War II veteran—single operator, multi-band, mixed (CW and SSB); (6) SSTV—single or multi-operator, multi-band, SSTV only. All multi-band categories must remain on the same band for at least 10 minutes after the first QSO has been made. All mixed-mode categories can make only one QSO with the same station on that band. For example, if a QSO with a station is made on a band by using CW, a second SSB QSO on the same band gives neither points nor multipliers.

Exchange: RS(T) and QSO serial number, starting from 001.

Scoring: QSO with own "P-150-C" country, 1 point; QSO with another "P-150-C" country, in the same continent, 2 points; QSO with other continent, 3 points. Each country in the "P-150-C" award country list counts as a multiplier only once on each band. SWLs have no multipliers. Final score is the sum of QSO points on all bands, multiplied by the sum of multipliers on all bands.

Awards: Special trophies will be awarded to the world's top-scoring stations in the major categories. Medals will be awarded to each top-scoring station in each continent in the major categories. Certificates will be awarded to the world's top ten scoring stations, a continent's top three, and each country's winner in each category.

Send logs to: CQ-M Contest Committee, Krenkel Central Radio Club of Russia, P.O. Box 88, Moscow, Russia, no later than July 1, 2000. Electronic logs may be submitted via the Internet to <cqm00@mai.ru>. Only ready-to-print ASCII data (ARRL-suggested format, N6TR.dat, etc.) placed in the body of a message will be accepted. Do not send binary files. A confirmation will be sent to each entrant within a week. If you do not receive a confirmation, send a query to <rw3fo@qsl.net>. In case of no reply, send a printed copy of the logs by airmail.

Baltic Contest
2100Z Sat., May 20 to 0200Z Sun., May 21

The Lithuanian Radio Sports Federation invites radio amateurs from around the world to enter the Baltic Contest 2000.

Classes: Single Operator Mixed Mode/SSB/CW; Multi-Single; SWL.

Exchange: RS(T) and serial number. Stations may be worked once per band and mode.

Frequencies: CW 3510 to 3600 kHz; SSB 3600 to 3650 and 3700 to 3750 kHz.

Scoring: For Estonia, Latvia, and Lithuania stations, contacts with Europe count as one point; all other continents are two points. European stations may take 10 points for Baltic QSOs; the rest of the world can credit 20 points per QSO for Baltic contacts. Final score is total QSO points (no multiplier).

Awards: Certificates will be awarded to the leading stations of each section for every county (DXCC) in accordance with the number of participants. In addition, a number of trophies are available

Logs may be sent no later than July 1, 2000 via e-mail to <kturc@rc.ktu.lt> or via diskette in ASCII format to P.O. Box 210, LT3000, Kaunas, Lithuania.

CQ WPX CW Contest
0000Z May 27 to 2400Z May 38

Complete rules for the CQ WW WPX CW Contest were in the January issue of *CQ*. Rules and summary/log sheets may be obtained from CQ Communications, 25 Newbridge Rd., Hicksville, NY 11801. Check the rules for the current trophy list. As with all *CQ* contests, be sure to indicate the mode of operation on your envelope when you mail your logs. Results of the 1999 contest are elsewhere in this issue. ■

Visit Our Web Site

Awards

BY TED MELINOSKY, K1BV

News Of Certificate And Award Collecting

This month we start out the column with a piece by VK4BS about county hunting in Australia and New Zealand.

County Hunting Down Under

By Jim Cunningham, VK4BS

Like any DX country with a large time zone difference with the US, Australia and New Zealand have limited windows on 14336. This is especially so when you consider 14336 is largely a daytime operation in the States. It follows, then, that chasing the USA-CA from this part of the world is very much a long-term effort compared to operating from the continental US. Some would see this as a disadvantage. There are, however, some benefits. Included among these are the continued search for ways and means to improve equipment capability and operating skills, and the long-term friendships that are made. We even get to learn another language—American!

The county hunting population in this part of the world has jumped dramatically in the last five years, largely due to a suggestion from Jay, K6RLS, that we form our own net. Thus, the " Down Under County Hunting net" (DUCH net) was born, settling after a few changes on 14.225. It was designed to catch the late-night US operators, the insomniacs, at a time better suited to us—our afternoons. In all there were roughly 12 ZLs and 8 VKs joining in. A later move to 14.336 proved even more successful, with the big rigs giving out many new counties, but unfortunately, particularly for the ZLs, the sunspot cycle moved on, making the afternoon 20 meter operation almost impossible. The VKs were able to take advantage of an opening in the late evenings, your mornings, enabling us to join in on the regular net. There is a two hour difference between VK and ZL, leaving them with a not really practical operating time of between 2 and 4 AM. During our summer months a long-path window from 2000Z to 2200Z occurs. VK6, 5, 3s (in that order) get the most benefit. Even VK4 gets through on occasions, so spare a thought, folks. Turn your beam occasionally.

Three ZLs have made it all the way to complete USA-CA, whereas only two VKs have gotten up, and one of these before the award was started. Most of the current regulars should make it in the not too distant future. VK5AQZ, Graham, will be for the second time; Rex ,VK3MW, is now down to 120; Alan, VK4AAR, and myself roughly 250 each; and the rest closing in rapidly. Ask any county hunter, and I think they'll agree we're a pretty dedicated bunch (for controllers, read pesky or persistent).

I was told recently that somewhere below the 300 mark you'd run into a brick wall. Were they ever so right? It's like taking drugs; you break out in a cold sweat when you miss the daily fix. So would you all, fixed or mobile, look up the needs list occasionally, and if you can help, give a shout by e-mail or let net control know you'd like to take us off frequency. I think I speak for all the others when I ask you not to make special trips on our behalf. Just let us know if you are going to be in the right place in the normal course of affairs, or if an excuse is needed for an outing we're ready. The general consensus here is that Georgia is our worst state at this stage, and in my case, it's followed closely by Missouri. At one stage Texas might as well have been on another planet, but thanks to Fred, K5CWR, who made some very long and costly trips on our behalf, we now have largely completed there. Thanks, mate!

As all serious DXers know, to be successful they must put in much time and effort in improving their station setup, honing operating skills, and not the least, doing lots of listening. This applies more so to DX county hunting than any other activity I know. Even a modest station can eventually get up the DXCC ladder.

Our small group can boast of two large log periodic arrays, two five-element trapless beams, and a TH7, and John, VK6NZ, a multi-wavelength rhombic up 100 ft. As far as I'm aware, Cliff, VK3CB, and myself are the only ones not running linear amplifiers. Hopefully, my homebrew effort will come to fruition soon.

With one exception, all of us live in rural settings. John, as just mentioned, has a large forest at his disposal; Alan sits on high ground with a good run off to the States; June, VK4SJ, is not far from the sea in the sunshine coast hinterland; and Cliff and Rex live on farms. In the best situation of them all, I'm on a sub-tropical island just off the Queensland coast overlooking the sea towards the US.

One big disadvantage faced by all DX county hunters is the cost in monetary terms. I really have lost track of what I've spent in propping up postal authorities in the last twenty years chasing those sometimes elusive QSLs. This is a not too subtle hint for *CQ* to consider electronic confirmations. Apart from the more obvious benefit, it largely prevents the situation that arises from having a last county certificate issued, then finding a county previously worked does not, for whatever reason, get confirmed. It's happened twice to me! It's in the nature of things for us DX that there's a considerable time lapse between worked and confirmed. (I hasten to add this is not the fault of our respective stateside managers). To have a confirmation within short order would be a tremendous help. At the time of writing I have 200 awaiting confirmation. From past experience not all of these will send the card. To a lesser extent all the above must apply to those in the US. I have a feeling that with electronic conformation more hams would continue to be county hunters, rather than drop out when they realize the expense involved. Maybe there would be more mobiles, maybe more subscribers to *CQ*. Hi!

On hehalf of all down under, I'd like to publicly thank those who lend so much support and encouragement to us, from all net controllers, particularly Jim and Percy, who are active during the window, to all the mobiles who look out for us (far too many to single out), to the CW gang, and last but not least to our respective QSL managers, Bob KC6AWX, and Jay, K6RLS, without whom we'd be nowhere.

Remember, it's not so much the piece of paper at the end of the chase that's important, but rather it's the friends you make and the nice people you meet on the way that really count.
—73, Jim, VK4BS

65 Glebe Road, Spofford, NH 03462-4411
e-mail: <k1bv@cq-amateur-radio.com>

USA-CA Special Honor Roll

Donald F. X. Lynch, KA1YZV
USA-CA All Counties #994
February 9, 2000

Josephine E. McCuaig, VE7JMC
USA-CA All Counties #995
February 23, 2000

USA-CA Honor Roll

500		2000	
KA1YZV	3110	KA1YZV	1181
VE7JMC	3111	VE7JMC	1182
1000		**2500**	
KA1YZV	1541	KA1YZV	1108
VE7JMC	1542	VE7JMC	1109
1500		**3000**	
KA1YZV	1282	KA1YZV	1012
VE7JMC	1283	VE7JMC	1013

The total number of counties for credit for the United States of America Counties Award is 3076. The basic award fee for subscribers is $4.00. For nonsubscribers it is $10.00. 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 March 1, 1997. A complete copy of the rules may be obtained by sending an SASE to Ted Melinosky, K1BV, 65 Glebe Road, Spofford, NH 03462-4411 USA. DX stations must include extra postage for airmail reply.

ZL2000 Summary

We've provided New Year's publicity for this station for several years. Their annual activity culminated with the Year 2000 celebration this past January. Total contacts made for 2000 were 1382—945 phone (SSB), 421 CW, 8 FM, 3 AM, and 5 SWL. Custodian ZL2RIC says that he had a terrific response from US stations this year on the HF bands, and thanks to all for participating. Did you work them?

Australia Sydney Gold Award

Keep this one in mind for your operating interest from June to December 2000, during the time period when the Olympic Games will be held in Australia. You will be looking for stations in the Sydney, Australia area, and keep in mind that you need to get their postal code to be able to apply for the award.

Islands of the West Dvina River Award.

The Alexander the Great Award.

The Sydney Gold Gathering of Nations Award is a new award created by a group of DX-oriented Sydney amateurs under the name "VK DX Association." The award aims to encourage contacts with amateurs in the Sydney region during the year of the 2000 Olympic Games. The award is available to all licensed amateurs and SWLs during the last six months of 2000.

Requirements: Overseas stations (except ZL) must contact a total of 15 Sydney region stations on one band or a total of 15 on any number of bands. VK and ZL stations must contact 30 Sydney region stations. The award will be issued in three levels: Gold for contacts on three or more bands, Silver for contacts on two bands, and Bronze for contacts on one band.

Stations making contact with Sydney amateurs for the purpose of this award are required to log the relevant postcode along with normal signal reports for each contact. Sydney amateurs are requested to give their postcodes to stations contacting them. Sydney post codes are 2000 to 2249, 2560 to 2570 and 2745 to 2770.

No crossband contacts. Repeat QSOs on same band and mode are permitted, but must be made more than 24 hours apart. All bands including WARC bands are okay, as are all modes. Maritime and aeronautical contacts are not allowed.

Apply with a GCR log showing station worked, date, time, band, mode, signal report sent and received, and residential postcode of the VK2 stations. SWL okay, but their application must show whom the VK2 station was in contact with at the time. Awards will be issued after 1-1-2001. Applications not accepted after 12-31-2004. For VK and ZL's the fee is $A10; all others $US10. IRCs not desired. Apply to: VKDX Assn., John Saunders, VK2DEJ, P.O. Box 299, RYDE. NSW 2680 Australia. E-mail: John Martin, VK2EJM, at <vk2ejm@bigpond.com>. WWW: <http://www.qsl.net/anars/yeaward.htm>.

Belarus Islands of the West Dvina River Award

Talk about specialization in the IOTA area! I never heard of the Dvina River of Belarus, let alone the *West* Dvina. However, it exists, and there's an award for

The RUS Award sponsored by UA6YW.

contacting stations on various islands. As the rules say, the islands are likely to be activated during the summer as a mini-DXpedition combined with a camping trip. Check out their website at: <http://www.qsl.net/eu6tv/iwdr/iwda.html>.

Contact stations on four different island locations on the West Dvina River since 1 January 1998. All bands and modes okay; may be endorsed for single band or mode. Look for activity by a group every weekend during the summer. Send GCR list and fee of $US5 or 10 IRCs to: EW6BN, P.O. Box 61, Novopolotsk-6, 211440 Belarus.

List of eligible Islands: WDØ Ostrovets, WD1 Rubanovski 1st, WD2 Rubanovski 2nd, WD3 Holy, WD4 Is of Stephan B, WD5 Dorozhkovski 1st, WD6 Dorozhkovski 2nd, WD7 Baran, WD8 Hrebyor, WD9 Kiy, WD10 Churilovski, WD11 Pereslov, WD12 Novik, WD13 Vyatski, WD14 Druiski.

Alexander The Great Award

The Contest Team of Northern Greece sponsors this handsome gold/bronze-colored certificate. Pavlidis, SV2AEL, offers a special CD-ROM outlining the life and activities of Alexander the Great free for all those earning Level 2 of the award. These are mostly "hard" DXCC countries, so it will be a challenge. Website: <http://www.qsl.net/sv2ael/award.htm>.

This award is available to all hams and SWLs for confirming contacts or reports with three SV2 stations and the required number of the following countries which are included in ex-empire of Alexander the Great on two different levels:

Prefixes of countries which are valid for G.A. Award: SV2 Macedonia, Greece; TA Turkey; 4X/4Z Israel; SU Egypt; EP Iran; YI Iraq; EK Armenia; EY Tajikistan; EZ Turkmenistan; UK Uzbekistan; OD5 Lebanon; YK Syria; 9K2 Kuwait; JY Jordan; AP Pakistan; YA Afghanistan; VU India.

Level 1 requires 3 SV2 stations plus 10 countries listed above. Level 2 requires 3 SV2 stations plus 16 countries listed above.

One QSO or report with any special prefix SZ2, SX2, SW2, or J42 = 3 SV2 stations. No time, band, or mode limitations. Cross band okay. Send GCR list and fee of $US10, DM15, or 16 IRCs to: Award Manager Pavlidis Savas, SV2AEL, P.O. Box 22013, Thessaloniki 55310, Greece.

Russia RUS Series

Prior to the breakup of the old USSR, oblast hunting was a popular activity among DXers who sought numerous rare oblasts. Many of those regions are now part of the separate countries formed since 1991 and are no longer valid for the Russian Central Radio Club award for contacting oblasts. In the spirit of the new Russia, Aly, UA6YW, has developed the RUS series, which is based on administrative territories used by the Russian State Auto Inspection system. The entities include Republics, Krai, oblasts, autonomous oblasts, autonomous districts, and the individual cities of Moscow and St. Petersburg. There are 94 such entities, and the list may be obtained from the sponsor or this columnist for an SASE or an e-mail message. The RUS system is only partially accepted by Russian amateurs, many of whom continue to use the old OBL designation.

Contact regions of Russia on or after 12 June 1991. All bands (except WARC) and modes okay. GCR list must list calls by RUS number. SWL okay. GCR list and fee of 10 IRCs for each award to: Aly N. Kuisokov, P.O.B. 45, Maikop 352700, Russia.

RUS Award: Contact at least 50 of the 92 regions.

RUS-5 Award: Contact at least 50 of the 92 regions on each of 5 bands: 3.5, 7, 14, 21, 28 MHz.

RUS-ALL Award: Contact each of the 92 regions. Earning this award automatically gives you membership in club "RUS."

73, Ted, K1BV

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SS-10	7	10	1⅛ x 6 x 9	3.2
SS-12	10	12	1⅜ x 6 x 9	3.4
SS-18	15	18	1⅜ x 6 x 9	3.6
SS-25	20	25	2⅛ x 7 x 9⅜	4.2
SS-30	25	30	3¼ x 7 x 9⅜	5.0

MODEL SS-25M

DESKTOP SWITCHING POWER SUPPLIES WITH VOLT AND AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SS-25M*	20	25	2⅛ x 7 x 9⅜	4.2
SS-30M*	25	30	3¼ x 7 x 9⅜	5.0

MODEL SRM-30

RACKMOUNT SWITCHING POWER SUPPLIES

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25	20	25	3½ x 19 x 9⅜	6.5
SRM-30	25	30	3½ x 19 x 9⅜	7.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M	20	25	3½ x 19 x 9⅜	6.5
SRM-30M	25	30	3½ x 19 x 9⅜	7.0

MODEL SRM-30M-2

2 ea SWITCHING POWER SUPPLIES ON ONE RACK PANEL

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25-2	20	25	3½ x 19 x 9⅜	10.5
SRM-30-2	25	30	3½ x 19 x 9⅜	11.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M-2	20	25	3½ x 19 x 9⅜	10.5
SRM-30M-2	25	30	3½ x 19 x 9⅜	11.0

MODEL SS-12SM/GTX

MODEL SS-10EFJ-98

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EF JOHNSON GT-ML83
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GE MARC SERIES
GE MONOGRAM SERIES & MAXON SM-4000 SERIES
ICOM IC-F11020 & IC-F2020
KENWOOD TK760, 762, 840, 860, 940, 941
KENWOOD TK760H, 762H
MOTOROLA LOW POWER SM50, SM120, & GTX
MOTOROLA HIGH POWER SM50, SM120, & GTX
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MOTOROLA RADIUS & GM 300
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VERTEX — FTL-1011, FT-1011, FT-2011, FT-7011

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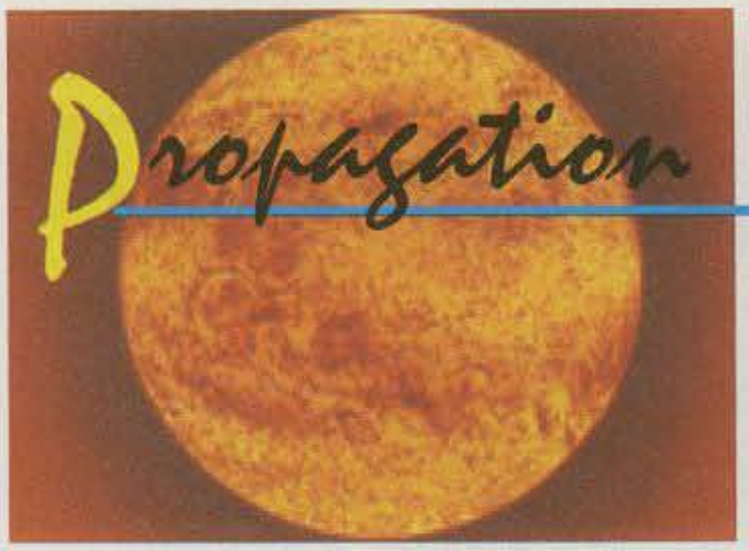
SS-10TK
SS-12TK OR SS-18TK
SS-10SM/GTX
SS-10SM/GTX, SS-12SM/GTX, SS-18SM/GTX
SS-10RA
SS-12RA
SS-18RA
SS-10SMU, SS-12SMU, SS-18SMU
SS-10V, SS-12V, SS-18V

*ICS – Intermittent Communication Service



Propagation

BY GEORGE JACOBS, W3ASK

The Science Of Predicting Radio Conditions

Sunspot Cycle 23 Progress

Cycle 23 continues to inch up slowly towards its maximum level. May HF propagation conditions are expected to be at their best levels in almost ten years. The latest 12-month running smoothed sunspot number is 94 centered on July 1999. This is an increase of one unit from the level of the previous month.

The Royal Observatory of Belgium, the world's official keeper of sunspot records, reports a monthly mean sunspot number of 90.2 for January 2000. A daily high of 166 was reported for January 16th, with a low daily count of 48 observed on both the 1st and 2nd. A smoothed sunspot number of approximately 111 is forecast for May 2000. Sunspot cycle 23 continues to rise slowly but steadily towards its peak.

The Dominion Radio Astrophysical Observatory of Canada, located at Penticton, BC, reports a 10.7 cm solar flux level of 158 during January. Solar flux, which is RF energy emitted from the sun, is measured with carefully calibrated radio receivers and is an alternative method for determining solar activity. While it is a more accurate, objective method than telescopically viewing the sun's surface, daily records are available only for the past 50 years or so, while an unbroken chain of daily telescopic records dates from the mid 18th century.

January's reported level results in a 12-month running smoothed solar flux number of 155 centered on July 1999. This is a one-point increase from the previous month, closely paralleling the rise in the cycle based on telescopic sunspot counts.

LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for May 2000

	Expected Signal Quality			
Propagation Index.....	(4)	(3)	(2)	(1)
Above Normal: 6, 9, 22, 27	A	A	B	C
High Normal: 5, 7-8, 12, 20-21 23	A	B	C	C-D
Low Normal: 1-2. 4. 10, 13 16-19, 25-26, 28-29	B	C-B	C-D	D-E
Below Normal: 3, 11, 15, 24 31	C	C-D	D-E	E
Disturbed: 14, 30	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 fair to good (C-B) on May 1st and 2nd, fair to poor (C-D) on the 3rd, fair to good (C-B) on the 4th, good (B) on the 5th, etc.

QSL

Mark Thompson, WB9QZB (e-mail: <markthompson@compuserve.com>), writes:

I have enjoyed reading your propagation column in CQ for many years. The length of time you have consistently written your column is truly amazing. I'm 43 years old, so you were at this for several years before I was born in 1957. I have a couple of questions to ask you.

1. Was there any unusual or above normal solar activity during the period August 9–14, 1999?

2. I've heard that there have been studies implicating higher incidences of heart attacks with increased solar activity. Is this true?

3. I've also heard that changes in solar activity are being investigated as a cause of major climatic shifts on the Earth, such as glaciation and prolonged periods of warming. It's fascinating stuff.

Many thanks for the kind words, Mark. They are very much appreciated. As to your questions:

1. I have checked several observatories worldwide. Nothing special, either geomagnetic or solar, seems to have occurred during the period August 9–14. There were no solar flares of any significance and no sudden commencement solar storms. The geomagnetic field was mostly quiet. The sunspot count took a small dive during that period and varied between 57 and 74, but this is not uncommon. Everything looks pretty normal for August 9–14, 1999.

2. I understand that medical studies are being conducted to correlate the occurrence of skin cancers with changes in the solar cycle. This is a likely correlation, since greater amounts of ultraviolet radiation strike the Earth as the sunspot counts rise. I am not aware of any studies that correlate solar activity with the occurrence of heart attacks. Query the medical web sites on this one.

3. Since the sunspot count is a measurement of the level of energy being radiated from the sun, and since this energy is responsible for controlling many climatic conditions, I do believe that there is a close correlation between sunspot counts and climatic changes. There is much evidence that the jet streams shift their paths with changes in solar activity, and this could result in major changes in weather patterns. It is also well known that the spacing between tree rings correlates well with the intensity of sunspot cycles, and might be an indication of the general effects of solar-cycle changes on vegetation and growing cycles. As you say, this is a very fascinating field. I suggest you seek more information from the web.

An e-mail from Joe Curlott, W4CTG (e-mail: <w4ctg@nccoast.net>), dated February 8, 2000 reports:

Several of us 80 meter DXers noticed that for the last six or eight weeks there has been an unusual atmospheric noise on the band. It is about S8 in the early evening to the northeast and rises to about the same level towards the northwest later in the evening. When we

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beam southeast or southwest, the level drops on the order of 15 to 20 dB on the S-meter. We all are using 4-square phased verticals and are located over a wide area, including NC, FL, PA, SC, DC, and Iowa. I have lived in Alaska and I know what the northern lights (aurora) sound like. This noise is about the same sound only with more of a steady white noise sort of sound rather than the crackle sound I noticed in Alaska. I believe that it is polar related, but this is the first winter in the last 20 years that I have been operating from North Carolina that I have noticed it. Any ideas on this event? Your comments will be welcome. Tnx es 73, Joe

Joe, it sure does sound like auroral noise. The directions are correct, and auroral activity usually has a secondary peak during December and early January. Auroras are also more numerous during peak periods of a sunspot cycle, as is now taking place. During the winter night hours, the distance from the noise source to North Carolina is such that propagation of the noise is very likely to peak on the 80 meter band, although it may also have been heard on 40 meters in some areas, but I have no reports of that. I cannot account for why you did not hear this noise during previous years. The Swedish Institute of Space Physics is conducting studies on auroral noise; you may want to check their web page at: <http://members.tripod.com/~auroralsounds/#tin>. You may also want to check the "Aurora Page" at: <http://www.geo.mtu.edu/weather/aurora>.

May Propagation

The days are getting longer and the nights shorter. This should result in somewhat reduced maximum daytime frequencies, but with daytime bands remaining open for longer periods than during the winter and early spring months. Nighttime maximum frequencies will be somewhat higher during May than earlier this year, but the bands will remain open for shorter periods of time. A seasonal increase in static levels should be noticeable on all bands.

During the daytime hours, from just after sunrise and continuing through sunset, expect DX conditions to most areas of the world on the 10, 12, 15, 17, and 20 meter bands. Twenty meters should be optimum for a two to three hour period following sunrise. Fifteen and 17 meters should take over as best DX bands during the late morning and early afternoon hours. During the late afternoon all five bands should be at their best for DX propagation.

From sundown to midnight 20 meters is expected to be the optimum band for DX, with strong signal openings possible to most areas of the world. Good DX conditions are also expected on 15 and 17 meters for openings towards Latin America, the South Pacific, Asia, and the Far East, and on 30, 40, and 80 meters towards Europe, Africa, and Latin America.

From midnight to sunrise DX honors are expected to be shared among 20, 30, and 40 meters, with some good openings also possible on 80 meters. Seasonally higher static levels and the longer hours of daylight are expected to reduce considerably chances for DX openings on the 160 meter band, but some may be possible during the hours of darkness towards the Caribbean and Central American areas.

For specific times of DX openings refer to the DX Propagation Charts which appeared in last month's column. This month's column contains a Short-Skip Propagation Chart valid for both May and June, as well as charts centered on Alaska and Hawaii. The Short-Skip Chart contains propagation forecasts for openings varying in distance between approximately 50 and 2300 miles. For day-to-day variations expected in propagation conditions during May, see the Last-Minute Forecast at the beginning of this column.

VHF Ionospheric Openings

I'd like to start this month's discussion with e-mail that I received from a long-time friend and reader, John Butrovich III, W5UBW (<w5ubw@aol.com>).

George, kudos for your upcoming 50 years as Propagation Editor for CQ. Having been licensed since 1949, you can be sure that I have read your columns for most of that time.

FYI: In case you haven't yet heard through the grapevine, I had two sporadic-E QSOs on 222 MHz during the rare opening on 14 February (UTC). I was working ZLs between 2132 and 2345 UTC on 6 meters. At 2304 I noticed that there was sporadic-E between my Texas QTH and California, so I moved the antenna and worked a string of W6s. The TV monitor in the shack showed signs of co-channel interference on Channel 3 at 2345 UTC and rapidly moved up to Channel 6 at 0100 UTC (the 14th now). At 0115 I started making noise on 2 meters, which popped open at 0127. I worked ten stations in lower California on 2 meters until 0149 UTC, when the MUF dropped down.

Among the string of W6s that I worked was N6HKF at 0134 UTC, who I moved up to 222.1 MHz. We had instant success in establishing a new distance record! Next I had a partial QSO with K6IBY on 222.1 MHz at 0139 UTC. He could not copy my report due to local QRM. Then I worked W6QIW at 0140 to further extend the distance record. N6HKF is about 1230 miles from me and W6QIW is close to 1364 miles away. George, the critical frequency had to be around 40.75 MHz! Whew! The old record was set during the June contest in 1987 down at 220.1 MHz between K5UGM (Dallas) and W5HUQ/4 in northern Florida, a distance of about 980 miles.

Nothing special here for equipment—225 watts into 11 elements at 56 feet.

73, John, W5UBW, LCDR USN ret.)

Many thanks, John, for the nice e-mail. Yes, we have been in communication with each other for almost as long as I have been writing this column. However, it seems to me that the kudos and congratulations should really be going your way for establishing the new distance record on 222.1 MHz.

May should be a good month for ionospheric openings on the VHF bands resulting from the high level of solar activity, increased sporadic-*E* propagation, meteor showers, trans-equatorial propagation, and auroral activity.

Solar activity is now high enough that some *F*-layer DX openings should be possible on the 6 meter band during the daylight hours. Conditions are best for transcontinental openings, openings between the western states and Hawaii, and openings toward the Caribbean and Central and South America. The best time to look for these openings is during the afternoon hours, particularly when conditions are High Normal or better.

Sporadic-*E* ionization is expected to increase considerably during May, and fairly frequent 6 meter short-skip openings should be possible. These are most likely to occur over distances of approximately 1000 to 1400 miles. Although sporadic-*E* openings can take place at just about any time, the best time to check is between 10 AM and 2 PM, and again between 6 and 10 PM local daylight time.

During periods of intense and widespread sporadic-*E* ionization, two-hop openings considerably beyond 1400 miles should be possible on 6 meters,

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 (10 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. In the Short-Skip Chart, where two numerals are shown within a single set of parentheses, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. The index indicates the number of *days* during the month on which the opening is expected to take place, as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last-Minute Forecast" at the beginning of this column for the actual dates on which an opening with a specific *propagation index* is likely to occur, and the signal quality that can be expected.

3. Times shown in the charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 AM; 13 is 1 PM, etc. On the Short-Skip Chart appropriate *daylight* time is used at the path midpoint. For example on a circuit between Maine and Florida, the time shown would be EDT, on a circuit between New York and Texas, the time at the midpoint would be CDT, etc. Times shown in the Hawaii Chart are in HST. To convert to daylight time in other USA time zones add 3 hours in the PDT zone; 4 hours in the MDT zone; 5 hours in the CDT zone; and 6 hours in the EDT zone. Add 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 15 or 3 PM in Los Angeles; 18 or 6 PM in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *daylight* time in other areas of the USA subtract 7 hours in the PDT zone; 6 hours in the MDT zone; 5 hours in the CDT zone; and 4 hours in the EDT zone. For example, at 20 GMT it is 16 or 4 PM in New York City.

4. The Short-Skip Chart is based upon a transmitted power of 75 watts CW or 300 watts PEP on sideband; the Alaska and Hawaii Charts are based upon a transmitter power of 250 watts CW or 1 KW PEP on sideband. A dipole antenna a quarter-wavelength above ground is assumed for 160 and 80 meters, a half-wave above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 dB gain above these reference levels, the *propagation index* will increase by one level; for each 10 dB loss, it will lower by one level.

5. Propagation data contained in the charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado 80302.

CQ Short-Skip Propagation Chart
May & June 2000
Local Daylight Time
At Path Midpoint

Band (meters)	*50-250*	*Distance Between Stations (miles) 250-750*	*750-1300*	*1300-2300*
10	Nil	08-10 (0-1) 10-14 (0-2) 14-18 (0-1) 18-22 (0-2) 22-00 (0-1)	08-10 (1-2) 10-14 (2-3) 14-18 (1-2) 18-22 (2) 22-00 (1) 00-08 (0-1)	08-10 (2-0) 10-14 (3-1) 14-16 (2-1) 16-19 (2) 19-22 (2-0) 22-08 (1-0)
15	Nil	07-10 (0-2) 10-14 (0-3) 14-18 (0-2) 18-20 (0-3) 20-00 (0-2) 00-07 (0-1)	07-10 (2) 10-14 (3) 14-18 (2-4) 18-20 (3-4) 20-22 (2-3) 22-00 (2) 00-07 (1)	07-10 (2-1) 10-14 (3-2) 14-16 (4-3) 16-20 (4) 20-23 (3-2) 22-00 (2) 00-07 (1-0)
20	10-13 (0-1) 13-19 (0-2) 19-01 (0-1)	07-10 (0-2) 10-13 (1-3) 13-19 (2-4) 19-21 (1-3) 21-01 (1-2) 01-07 (0-2)	07-10 (2-3) 10-13 (3-4) 13-19 (4) 19-21 (3-4) 21-23 (2-4) 23-01 (2-3) 01-07 (2)	07-10 (3) 10-16 (4-3) 16-23 (4) 23-01 (3-4) 01-03 (2-3) 03-07 (2)
40	07-09 (1-2) 09-12 (2-4) 12-20 (3-4) 20-22 (2-3) 22-01 (1-2) 01-07 (0-1)	07-09 (2-4) 09-10 (4-3) 10-16 (4-2) 16-18 (4-3) 18-22 (4) 22-01 (2-3) 01-07 (1-3)	07-09 (4-3) 09-10 (3) 10-16 (2-1) 16-18 (3-1) 18-20 (4-2) 20-22 (4) 22-07 (3-4)	08-10 (3-1) 10-18 (1-0) 18-20 (2-1) 20-22 (4-3) 22-06 (4) 06-07 (4-3) 07-08 (3)
80	08-11 (4) 11-19 (4-3) 19-23 (4) 23-08 (3-4)	08-11 (4-1) 11-17 (3-0) 17-19 (3-1) 19-21 (4-2) 21-06 (4) 06-08 (4-3)	08-09 (1) 09-11 (1-0) 11-17 (0) 17-19 (1-0) 19-21 (2-1) 21-23 (4-3) 23-06 (4) 06-08 (3-2)	08-09 (1-0) 09-19 (0) 19-21 (1-0) 21-23 (3-2) 23-04 (4-3) 04-06 (4-2) 06-08 (2-1)
160	06-09 (4-1) 09-10 (2-0) 10-19 (1-0) 19-21 (3-1) 21-23 (4-2) 23-06 (4-3)	06-09 (1) 09-19 (0) 19-21 (1-0) 21-23 (2-1) 23-01 (3-2) 01-04 (3) 04-06 (3-2)	08-09 (1-0) 09-21 (0) 21-23 (1) 23-01 (2-1) 01-04 (3-2) 04-06 (2) 06-08 (1)	08-21 (0) 21-01 (1) 01-04 (2) 04-06 (2-1) 06-07 (1) 07-08 (1-0)

HAWAII
May & June 2000
Openings Given in
Hawaiian Standard Time

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80* Meters*
Eastern USA	15-17 (1)	07-12 (1) 12-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	07-15 (1) 15-18 (2) 18-20 (3) 20-22 (4) 22-00 (3) 00-02 (2) 02-04 (3) 04-07 (2)	19-20 (1) 20-23 (3) 23-02 (1) 20-21 (1)* 21-23 (2)* 23-01 (1)*
Central USA	12-15 (1) 15-17 (2) 17-18 (1)	05-07 (1) 07-12 (2) 12-16 (3) 16-18 (4) 18-20 (3) 20-22 (2) 22-00 (1)	08-12 (1) 12-16 (2) 16-18 (2) 18-22 (4) 22-00 (3) 00-02 (2) 02-06 (3) 06-08 (2)	19-20 (1) 20-21 (2) 21-01 (4) 01-02 (2) 02-04 (1) 20-21 (1)* 21-00 (2)* 00-03 (1)*
Western USA	09-12 (1) 12-17 (2) 17-19 (1)	06-08 (1) 08-10 (2) 10-12 (3) 12-17 (4) 17-19 (3) 19-22 (2) 22-00 (1)	06-08 (4) 08-16 (3) 16-22 (4) 22-02 (3) 02-06 (2)	18-19 (1) 19-20 (2) 20-02 (4) 02-04 (3) 04-05 (2) 05-07 (1) 19-20 (1)* 20-21 (2)* 21-03 (3)* 03-04 (2)* 04-05 (1)*

ALASKA
May & June 2000
Openings Given in GMT

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80* Meters*
Eastern USA	20-22 (1)	18-20 (1) 22-02 (2) 22-01 (1) 01-03 (2) 03-05 (1)	20-22 (1) 22-02 (2) 02-06 (3) 06-08 (2) 08-10 (1) 10-14 (2) 14-16 (1)	05-10 (1)
Central USA	21-23 (1)	18-21 (1) 21-23 (2) 23-01 (1) 01-04 (1)	02-08 (3) 08-14 (2) 14-22 (1) 22-02 (2)	05-07 (1) 07-10 (2) 10-12 (1)
Western	00-03 (1)	18-20 (1) 20-23 (2) 23-02 (3) 02-05 (2) 05-07 (1)	02-04 (3) 04-08 (4) 08-14 (3) 14-18 (4) 18-20 (3) 20-02 (2)	04-06 (1) 06-08 (2) 18-12 (3) 12-15 (2) 15-16 (1) 08-12 (1)*

#See explanation in "How To Use Short-Skip Charts" in this column.
*Indicates best time 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.
Note: The Alaska and Hawaii Propagation charts are intended for distances *greater* than 1300 miles. For shorter distances use the preceding Short-Skip Propagation Chart.
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.

and short-skip openings between approximately 1200 and 1400 miles may also be possible on 2 meters.

From most locations in the continental United States 1300 mile *Es* openings should extend into both Canada and Mexico. From the southern third of the country, it should also be possible to work a rather large number of countries in Central America and the West Indies during 15, 10, and 6 meter sporadic-*E* openings. Long-distance (DX) television reception also improves considerably during the summer months as a result of sporadic-*E* ionization. Signals from low-band VHF TV stations (Channels 2–5), which normally cannot be received more than 75 or 100 miles away, suddenly are propagated up to 1300 miles, often with very strong signal levels.

A seasonal decline in trans-equatorial propagation (TE) conditions is expected during May, but an occasional opening may still be possible on the 6 meter band towards South America from the southern tier states and the Caribbean area. The best time to check for 6 meter TE openings is between 9 and 11 PM local daylight time on north-south paths which will cross the geomagnetic equator at an approximate right angle.

The *Eta Aquarids,* a major meteor shower, is expected May 4–6. It should peak with a count of approximately 20 meteors an hour during the afternoon of May 5th. Meteor activity should be intense enough during this shower to support meteor-burst short-skip openings on the 6 and 2 meter bands.

Some auroral activity may be possible during May, resulting in short-skip auroral-scatter-type openings on VHF. Such activity is most likely to occur during periods of ionospheric storminess. Check the Last-Minute Forecast at the beginning of this column for those days likely to be Below Normal or Disturbed during May. 73, George, W3ASK

Visit Our Web Site

Contest Results (*Continued from page 23*)

Number groups after call letters denote following: Band (A = all), Final Score, Number of QSOs, and Prefixes. An asterisk (*) before a call indicates low power. Certificate winners are listed in boldface. (Note that the country names and groupings reflect the DXCC list at the time of the contest.)

CW RESULTS
QRP/p SECTION

WORLDWIDE

TI5N	**A**	**1,523,097**	**1,093**	**513**
		(Op: NØKE)		
ON6NR	**A**	**1,224,600**	**1,076**	**520**
		(Op: ON4RU)		
LY2FE	**A**	**1,154,862**	**1,068**	**498**
KX1M	**A**	**1,138,176**	**964**	**456**
WO9S	**A**	**911,803**	**844**	**439**
SM3CCT	**A**	**891,796**	**924**	**452**
VE1ZJ	**A**	**883,998**	**723**	**402**
RW4UU	**A**	**868,428**	**858**	**459**
N7IR	**A**	**782,080**	**684**	**416**
VE3KP	**A**	**639,521**	**629**	**347**
N1TM	*	592,852	617	338
VE6BF	**A**	**572,000**	**578**	**352**
RZ6HX	*	489,585	633	381
S53MA	**A**	**463,464**	**641**	**349**
W8QZA/6	**A**	**451,672**	**611**	**344**
JR4DAH	**A**	**427,871**	**495**	**313**
EA7AAW	**A**	**398,907**	**600**	**349**
DL5CL	**A**	**388,620**	**573**	**340**
OE2S	**A**	**373,372**	**505**	**347**
W8DN	**A**	**321,480**	**438**	**282**
W5ON	**A**	**303,992**	**408**	**296**
		(Op: K5LG)		
HP1AC	**A**	**280,878**	**383**	**277**
WZ2T	**A**	**279,310**	**466**	**265**
G4UOL	**A**	**275,420**	**486**	**293**
LU1FNH	**A**	**265,290**	**375**	**239**
N9CIQ	*	254,982	358	273
9A2EY	**A**	**208,572**	**400**	**273**
RA9SO	**A**	**184,701**	**274**	**193**
K3WWP	**A**	**179,078**	**304**	**229**
UAØKCL	**A**	**156,832**	**282**	**232**
YO4AAC	**A**	**135,561**	**332**	**219**
K8CV	*	114,660	228	182
UA3AD	*	106,769	250	191
DL1YFK	*	101,500	300	203
RX3ABN	*	85,337	213	167
HB9XY	**A**	**78,498**	**242**	**178**
PAØADT	**A**	**71,896**	**274**	**209**
ON7CC	*	63,436	210	161
DH2UL	*	60,775	153	125
AF9J	*	41,629	174	133
VE2ABO	**A**	**39,897**	**132**	**117**
NQ9RP	*	38,772	121	108
		(Op: N9AW)		
NX9T	*	37,185	130	111
OK1AIJ	**A**	**35,160**	**144**	**120**
JH1XUZ	*	31,096	117	104
KX7L	*	29,298	137	114
LZ5QZ	**A**	**27,346**	**160**	**121**
WA4SQM	**A**	**27,300**	**112**	**91**
SP4TBM	**A**	**20,700**	**100**	**92**
HB9AYZ	*	18,690	108	89
SP5FKW	*	17,425	108	85
ZZ4WAS	**A**	**16,117**	**76**	**71**
HA8MT	**A**	**8,236**	**64**	**58**
2UØARE	**A**	**5,472**	**64**	**57**
K5OI	*	5,130	59	54
AB8DF	*	4,446	39	38
W9PNE	*	4,240	40	40
OH2DT	**A**	**3,612**	**42**	**42**
HA5BSW	**28**	**122,820**	**313**	**230**
LW7EIC	**28**	**48,140**	**143**	**116**
HAØGK	*	22,989	107	97
WA6FGV	**28**	**22,700**	**122**	**100**
9A3GU	**28**	**17,424**	**111**	**99**
YO5BEU	**28**	**4,410**	**51**	**45**
4X1VF	**28**	**2,580**	**30**	**30**
ES1CR	**21**	**201,420**	**328**	**270**
UR9MM	**21**	**181,890**	**325**	**258**
ATØU	**21**	**92,491**	**201**	**181**
		(Op: VU2UR)		
SQ4GXO	**21**	**44,588**	**160**	**142**
W7/JR1NKN	**21**	**26,795**	**152**	**115**
KA8NRC/T	**21**	**15,392**	**83**	**74**
WA8GHZ	*	6,206	61	58
HB9LDO	**21**	**2,370**	**33**	**30**
DL2TM	**21**	**1,575**	**25**	**21**
WT9S	**21**	**952**	**30**	**28**
OK2PYA	**14**	**240,093**	**449**	**309**
LU6HI	**14**	**219,876**	**300**	**251**
RA3FO	**14**	**210,236**	**409**	**311**
KG5U	**14**	**182,268**	**303**	**249**
DAØBUG	**14**	**169,260**	**338**	**273**
		(Op: DL6MHW)		
S59AV	**14**	**59,786**	**202**	**179**
2CØVSW	**14**	**56,270**	**201**	**170**
		(Op: GWØVSW)		
DL1DQY	**14**	**48,336**	**160**	**152**
K2CS	**14**	**40,690**	**154**	**130**
PA7XG	**14**	**32,805**	**171**	**135**
YO4GHW	**14**	**1,932**	**46**	**42**
DLØVLT	*	147	7	7
YZ7ED	**7**	**118,856**	**218**	**179**
KU7Y	**7**	**37,968**	**151**	**113**
JA2HUN	**7**	**29,274**	**90**	**82**
JA5CDL	*	10,670	63	55
JF2LTH	*	2,016	27	18
OZ7NB/P	**7**	**162**	**9**	**9**
OZ1BXM	*	8	2	2
SP4GFG	**3.5**	**114,190**	**278**	**190**
HA8LUH	**3.5**	**80,190**	**236**	**165**
EW6CU	**3.5**	**78,490**	**222**	**167**
SP3J	*	16,748	109	79
		(Op: SP3NGB)		
W7DRA	**3.5**	**1,392**	**32**	**24**
UAØQGQ/UT	**1.8**	**7,018**	**65**	**58**

SINGLE OPERATOR
NORTH AMERICA

UNITED STATES

NT1N	**A**	**7,752,030**	**3193**	**834**
KX1A	**A**	**6,092,457**	**2729**	**777**
		(Op: W1WEF)		
AJ1I	**A**	**5,060,616**	**2412**	**696**
		(Op: K5ZD)		
WC1M	*	3,856,248	1992	648
KR1G	*	2,992,053	1688	613
W1CU	*	822,393	659	429
WA1KKM	*	815,600	654	400
K1TS	*	132,591	260	193
KIKI	*	81,249	207	159
N4XR	*	4,875	41	39
***K1VUT**	**A**	**2,646,540**	**1549**	**585**
***K1HT**	**A**	**1,251,639**	**917**	**453**
*AA1SU	*	850,780	912	412
*K1XM	*	776,552	722	392
*W1TO	*	637,972	611	349
*AB1BX	*	293,940	438	276
*WA1S	*	139,956	281	214
*W3TB	*	59,869	170	137
***KQ1V**	**28**	**41,280**	**148**	**129**
*KA1VMG/T	*	490	14	14
***K1VSJ**	**21**	**18,879**	**101**	**93**
***AE1B**	**7**	**42,680**	**107**	**97**
***W1MK**	**3.5**	**48,960**	**129**	**96**
KQ2M	**A**	**7,274,568**	**2982**	**817**
N2CU	**A**	**2,427,005**	**1345**	**595**
N1EU	**A**	**2,444,375**	**1345**	**625**
N2ED	*	2,021,418	1338	549
K2SX	*	1,942,464	1310	536
W2HCA	*	621,918	621	349
W2ZU	*	599,760	600	360
N2FF	*	253,341	332	297
W2EZ	*	163,566	300	233
N2WK	*	153,162	235	201
W2FUI	*	114,070	241	187
WF2V	*	62,964	185	159
WB2YQH	**21**	**296,455**	**400**	**281**
N2UN	**7**	**193,596**	**267**	**219**
***N2BA**	**A**	**3,249,792**	**1791**	**624**
***W2TZ**	**A**	**3,182,680**	**1818**	**634**
***WK2G**	**A**	**1,457,310**	**1205**	**465**
*K2UF	*	984,492	846	414
*AE2T	*	686,880	685	405
*WA2EYA	*	371,184	463	304
*KM2L	*	340,180	448	292
*WA2VQV	*	246,185	372	265
*KA2NDX	*	137,241	249	207
*KG2BI	*	100,647	232	159
*KX2H	*	50,318	142	139
***AB2AP**	**14**	**425,256**	**486**	**348**
***WB2DVU**	**7**	**279,865**	**334**	**251**
K3ZO	**A**	**5,784,208**	**2539**	**718**
AA3B	**A**	**4,048,268**	**2095**	**652**
W3AZ	*	828,294	681	381
K3NW	*	119,880	251	185
W3KLG	**21**	**111,384**	**208**	**182**
		(Op: K3ND)		
K3VA	**14**	**47,168**	**145**	**134**
W3BGN	**7**	**1,191,840**	**735**	**390**
***N3RS**	**A**	**3,464,076**	**1779**	**652**
***N1WR**	**A**	**1,289,130**	**907**	**485**
*K3WU	*	830,126	725	389
*N3UMA	*	175,400	287	200
*KB3AFT	*	104,536	257	179
*N4LF	*	100,968	220	168
*N3YEA	*	34,047	146	117
*N3WK	*	31,283	120	109
***W3NO**	**28**	**40,959**	**148**	**123**
***AI3Q**	**21**	**6,909**	**50**	**49**
*W3FQE	*	2,132	28	26
***W3CP**	**7**	**186,559**	**244**	**197**
*AD8J	*	11,316	50	46
WW4T	**A**	**7,985,046**	**3226**	**821**
		(Op: W4AN)		
NY4A	**A**	**6,431,360**	**2868**	**773**
WC4E	**A**	**5,577,216**	**2696**	**768**
KT3Y	*	5,481,725	2445	725
K4RO	*	2,598,420	1674	620
NW6S	*	2,188,710	1400	586
NV4X	*	1,658,904	1183	507
			(Op: K2AV)	
W4YE	*	1,107,600	852	426
NT4L	*	895,552	845	448
			(Op: K1KY)	
W4PA	*	340,659	470	279
KGØZ	*	211,744	321	208
			(Op: W4ZW)	
K4VV	*	127,397	245	191
W4VC	*	118,080	251	192
K4OGG	*	110,252	233	172
N4MM	*	26,820	102	90
W4OGG	*	21,120	100	80
N4BP	**28**	**749,016**	**891**	**412**
WW4RR	**21**	**3,764,967**	**2035**	**717**
			(Op: K4WX)	
KS7O	**21**	**2,566,993**	**1566**	**619**
N4PN	**21**	**2,021,802**	**1291**	**633**
K0EJ	*	1,737,344	1213	554
K4OAQ	*	1,420,440	1036	534
WA4QDM	*	1,117,152	938	432
W4MYA	**7**	**1,107,185**	**692**	**395**
WX4CW	**7**	**775,404**	**595**	**357**
			(Op: W4SO)	
K4JYO	**1.8**	**819**	**25**	**21**
***WO4O**	**A**	**2,663,125**	**1523**	**625**
***WD4AHZ**	**A**	**1,901,830**	**1408**	**538**
***WJ9B**	**A**	**809,187**	**762**	**402**
*NA4K	*	705,103	705	383
*N8LM	*	620,736	609	366
*N4GJ	*	556,140	609	390
*K4IE	*	390,768	458	336
*K4BAM	*	330,752	420	272
*K4FPF	*	321,677	400	271
*KS4XG	*	265,320	390	268
*N4UH	*	260,750	346	250
*K4UVT	*	256,357	345	269
*K4QPL	*	245,248	421	256
*K5VG	*	149,100	287	213
*W4XD	*	147,705	325	215
*W4TYU	*	123,156	270	198
*AA4KD	*	112,898	283	198
*W4NTI	*	106,622	230	178
*K4BEV	*	103,880	228	196
*N4CW	*	92,682	191	171
*KF4OAD	*	90,720	226	162
*KG4BIG	*	48,470	152	131
*W4SD	*	37,960	126	104
*W4AUI	*	37,490	138	115
*K6ETM	*	19,106	90	82
*K4UK	*	5,456	45	44
***KN4Y**	**28**	**130,743**	**360**	**219**
***N4IG**	**21**	**366,860**	**428**	**340**
***K4WW**	**7**	**16,590**	**70**	**70**
N3BB	**A**	**5,481,810**	**2630**	**771**
KQ5DX	**A**	**3,050,709**	**1871**	**673**
			(Op: K5OT)	
N5NU	**A**	**2,645,461**	**1629**	**637**
KZ5D	*	2,397,600	1534	600
AD5A	*	1,339,088	1104	508
KR5DX	*	1,087,170	954	465
K5HP	*	865,436	826	442
KY5N	*	710,360	704	430
NN5AA	**28**	**555,588**	**740**	**396**
			(Op: K5NA)	
NE5D	**28**	**377,664**	**570**	**336**
			(Op: K5RX)	
NU5A	**21**	**4,411,299**	**2226**	**789**
			(Op: K5GN)	
NN5P	*	567,764	672	394
			(Op: W5MJ)	
NA5B	**14**	**2,359,167**	**1478**	**643**
			(Op: W5AO)	
W5FO	**14**	**1,330,665**	**1027**	**551**
***WQ5L**	**A**	**3,289,814**	**1827**	**653**
***WD5K**	**A**	**1,903,068**	**1308**	**603**
***KR5V**	**A**	**1,528,800**	**1230**	**546**
*WQ5W	*	376,096	548	322
*K4NR	*	149,158	302	214
*N6ZZ	*	113,220	244	204
*K5KA	*	95,568	225	176
*AC5AA	*	42,069	126	111
***KG5RM**	**28**	**5,916**	**59**	**51**
NE6N	**A**	**6,754,176**	**2965**	**832**
			(Op: N6RT)	
WV6C	**A**	**5,323,981**	**2446**	**757**
			(Op: N6IG)	
WK6LA	**A**	**4,403,575**	**2274**	**737**
			(Op: K6LA)	
AE6Y	*	3,150,180	1822	660
WM6A	*	3,095,232	1795	686
			(Op: K6DB)	
W6TK	*	1,478,586	1116	526
NI6T	*	1,358,215	1084	493
AG7W	*	1,120,635	922	405
			(Op: K6XX)	
W6NL	*	1,111,560	905	471
K6GT	*	977,024	880	449
AJ6V	*	741,600	794	412
KU6J	*	645,962	789	382
KI6T	*	606,356	625	384
K6SRZ/6	*	431,457	507	299
K6RB	*	270,439	415	293
K6RIM	*	251,246	400	269
K6CTA	*	207,035	324	235
AA6W	*	200,811	397	247
K6SE	*	166,659	305	219
AE6TT	*	146,880	332	204
K6HRT	*	83,300	217	170
N6MU	**21**	**2,187,221**	**1326**	**659**
AK6R	*	230,175	405	279
AC6DD	*	160,506	308	241
K3EST	**14**	**2,486,380**	**1494**	**655**
KT6V	*	41,580	143	135
W6YJ	**7**	**248,860**	**347**	**230**
W7CB	*	110,214	205	157
***WN6K**	**A**	**1,015,151**	**997**	**437**
***AA6EE**	**A**	**432,783**	**521**	**351**
*K6UM	*	240,240	359	273
*N6JM	*	195,088	274	274
*KF6GUH	*	108,659	271	193
*AD6EN	*	74,690	232	154
*W6PLJ	*	41,652	133	117
*N6GG	*	30,987	107	99
*K6RO	*	23,387	115	91
*W6MIL	*	21,285	109	99
			(Op: WF6O)	
*KC6AWX	*	13,244	84	77
*AD6Z	*	11,616	100	88
*W6OUL	*	1,922	32	31
***WD6DX**	**28**	**7,056**	**71**	**63**
***W6RKC**	**21**	**7,616**	**66**	**64**
*N6IC	*	2,201	31	31
***KU6T**	**7**	**19,140**	**101**	**87**
KN7P	**A**	**4,373,811**	**2256**	**733**
			(Op: KL2A)	
KC7V	**A**	**3,946,890**	**2050**	**710**
AA7A	**A**	**3,595,627**	**2049**	**721**
AI7B	*	3,394,260	1940	692
W7OM	*	765,264	679	428
W7QN	*	583,300	652	380
W7HS	*	358,028	444	316
KC7UP	*	322,385	419	305
K7GJ	*	200,475	340	243
			(Op: K5RC)	
W7TSQ	*	5,106	47	44
K6LL/7	**21**	**3,175,104**	**1770**	**719**
W7LGG	*	238,497	282	277
W7AYY	*	9,520	57	56
K5ZM	**14**	**656,502**	**638**	**406**
W8AEF	**3.5**	**9,900**	**80**	**66**
***KN7Y**	**A**	**1,677,512**	**1233**	**554**
***K7ZA**	**A**	**968,184**	**847**	**476**
*N7KO	*	188,496	275	238
*NN7A	*	185,230	306	230
*WO7T	*	65,650	171	130
*NA7R	*	51,136	210	136
*W7YS	*	49,664	156	128
*AK7O	*	9,776	90	52
***K7WP**	**28**	**48,972**	**167**	**132**
***K7ON**	**21**	**460,692**	**558**	**382**
*W7YAQ	*	325,416	390	312
*KW7R	*	237,636	326	276
***AB7RW**	**14**	**345,320**	**490**	**333**
WØCG	**A**	**3,899,148**	**2022**	**654**
K3JT	**A**	**2,958,978**	**1691**	**642**
N8BJQ	**A**	**2,387,640**	**1486**	**591**
ND5S	*	2,352,431	1486	593
N4ZR	*	1,773,540	1174	501
K2UOP/8	*	829,268	733	401
NO8DX	*	506,344	554	334
			(Op: K8MR)	
WT8P	*	436,680	550	360
W8PT	*	195,935	324	263
W8PN	*	187,668	310	234
W8VE	*	146,740	335	230
N8II	**21**	**3,328,348**	**1772**	**701**
NI3S/8	**21**	**2,125,890**	**1354**	**585**
KE8M	*	365,190	460	282
AF8C	*	21,244	94	86
***WA8WV**	**A**	**778,948**	**725**	**386**
***W8UPH**	**A**	**709,710**	**679**	**410**
*K8EP	*	309,132	393	277
*KG8DH	*	108,680	264	209
*NS8O	*	60,516	194	164
*KC8FXR	*	39,240	149	120
*W8IDM	*	9,858	53	53
***W8DO**	**28**	**5,310**	**50**	**45**
***W8UMR**	**14**	**193,536**	**292**	**256**
K8JP	**A**	**2,090,361**	**1353**	**589**
WI9WI	**A**	**1,634,282**	**1268**	**526**
K9UQN	*	559,835	623	355
***K9QVB**	**A**	**2,409,456**	**1549**	**606**
***K9YA**	**A**	**880,224**	**816**	**424**
*K9MMS	*	563,030	603	355
*K9BG	*	489,512	554	344
*KI9A	*	439,185	576	335
*WT9U	*	364,514	545	302
*N9XX	*	269,775	400	275
*N9NT	*	122,802	252	194
*N9IJ	*	75,020	209	155
*W9HR	*	39,975	140	123
*AK9Y	*	18,320	84	80
***W9IXX**	**28**	**546**	**14**	**14**
***N4TZ**	**21**	**1,251,432**	**951**	**504**
*W9ILY	*	402,204	466	363
***KE9EX**	**14**	**1,364**	**22**	**22**
***K9CJ**	**7**	**15,340**	**60**	**59**
WØUA	**A**	**4,906,161**	**2328**	**741**
WØTM	**A**	**2,714,019**	**1631**	**651**
KØOU	**A**	**2,621,886**	**1657**	**633**
K2VV	*	2,168,595	1415	585
WØZP	*	1,444,275	1087	525
KEØUI	*	509,754	588	371
KØIW	*	203,616	330	252
NSØB	*	95,320	226	178
WØHW	*	92,852	200	167
KØJPL	*	7,056	52	48
N2IC/Ø	**21**	**3,492,246**	**1847**	**762**
NØNR	**21**	**2,956,248**	**1657**	**684**
***WØUY**	**A**	**238,592**	**350**	**256**
***KRØI**	**A**	**178,074**	**303**	**234**
*NEØP	*	139,968	291	216
*AAØA	*	28,100	115	100
*NØUU	*	25,382	106	98
*KØOAL	*	20,412	112	63
*KØCOP	*	13,725	100	75
***KGØUA**	**21**	**206,934**	**313**	**273**
*KØRY	*	153,180	273	230

CUBA

***CM2KC**	**14**	**395,933**	**470**	**317**

PANAMA

***HO3A**	**A**	**316,757**	**428**	**259**
		(Op: HP3XUG)		

U.S. VIRGIN ISLANDS

WP2Z	**A**	**12,506,280**	**4289**	**890**
		(Op: N5TJ)		

ALASKA

KL7RA	**A**	**4,273,637**	**2133**	**739**

PUERTO RICO

WP3A	**28**	**1,952,826**	**1433**	**542**
***WP4LNY**	**A**	**10,260**	**63**	**60**
*WP4MYD	*	1,380	23	23
***KP4AH**	**14**	**1,226,184**	**1030**	**453**
		(Op: WP3C)		

CAYMAN ISLANDS

ZF1A	**21**	**5,330,129**	**2533**	**799**
		(Op: W5ASP)		

CANADA

VE3EJ	**A**	**6,746,904**	**2815**	**747**
VE2ZP	**A**	**3,546,316**	**1874**	**628**
VY1DX	**A**	**2,354,800**	**1455**	**580**
		(Op: N6HR)		
VE7VF	**A**	**252,735**	**339**	**249**
VE3HX	**28**	**40,320**	**134**	**120**
VF6JY	**21**	**3,581,772**	**1883**	**708**
		(Op: VE5MX)		
VO1MP	**21**	**3,156,630**	**1747**	**645**
VE3KZ	**21**	**3,039,941**	**1626**	**673**
VE3PN	*	1,464,618	1073	498
VA1A	**1.8**	**103,680**	**200**	**120**
		(Op: K3BU)		
***XJ9DX**	**A**	**3,425,555**	**1622**	**679**
***VE7SZ**	**A**	**3,354,390**	**1729**	**610**
		(Op: VE7NTT)		
VE3OI	**A**	**2,819,733**	**1616**	**573**
*VA3UZ	*	2,697,496	1511	596
*VE3IAY	*	1,013,965	779	395
*VE3STT	*	570,465	543	315
*VE3UOL	*	543,609	500	323
***VE5SF**	**A**	**501,150**	**585**	**325**
***VE2AWR**	**A**	**457,227**	**526**	**303**
***VO1HE**	**A**	**47,117**	**136**	**17**
*NW7DX/VE7	*	27,390	101	83
*VE2FFE	*	20,076	94	84
*VE5CPU	*	9,280	68	58
***CI7A**	**21**	**2,729,540**	**1578**	**653**
		(Op: VE7SV)		
***VA3RJ**	**14**	**166,374**	**283**	**234**
***VE3ZT**	**7**	**75,371**	**149**	**113**
***VY2MGY/3**	**1.8**	**8,034**	**59**	**39**

TURKS & CAICOS

***VP5GA**	**A**	**5,438,184**	**2510**	**694**
		(Op: N2GA)		

MEXICO

***XE1RGL**	**7**	**257,260**	**310**	**190**

AFRICA

NIGERIA

5NØMSV	**28**	**2,867,292**	**1674**	**573**
***5N3CPR**	**21**	**712,975**	**661**	**361**

UGANDA

5X1Z	**28**	**4,575,420**	**2300**	**666**
		(Op: SM7PKK)		

ALGERIA

***7X2RO**	**A**	**266,904**	**383**	**198**

MOROCCO

CN8WW	A	13,140,434	4517	898	
					(Op: DL6FBL)
CN/DJ9RR	A	6,045,688	2573	638	

MADEIRA ISLAND

*CT3KN	A	861,552	734	386

CANARY ISLANDS

ED8PP	A	9,699,456	3375	754	
					(Op: EA3KU)
AM8ZS	A	7,520,856	3002	712	
					(Op: N6TJ)
*EA8CN	A	7,095	51	43	
*EA8AEI	28	56,952	156	126	
*EA8ASJ	21	1,871,352	1240	504	

EGYPT

*SU9ZZ	21	4,905,189	2307	711

MALI

TZ6DX	A	2,315,480	1430	535	
					(Op: K4RB)

SOUTH AFRICA

ZT6Z	21	3,639,105	1907	639	
					(Op: ZS6EZ)
*ZS5RON	A	10,976	61	56	

ASIA

AZERBAIJAN

*4K9W	A	194,484	280	228

ISRAEL

4X4NJ	1.8	157,014	192	143
*4Z5JA	A	1,189,664	888	452
*4X3DIG	3.5	187,572	228	147
*4Z5FW	21	1,503,280	1208	460

WESTERN MALAYSIA

*9M2TO	A	1,902,314	1500	514
*9M2ZA	21	372,842	510	288

SINGAPORE

*9V1BI	A	139,446	275	183

OMAN

A45XR	21	6,557,697	2937	843

TAIWAN

BV/JA0ID	A	1,502,461	1453	503
BV7FF	21	460,080	681	360

CHINA

BY1DX	A	4,498,628	2444	716
				(Op: OH2PM)
BD4ED	21	1,074,398	1058	403
*BD4DW	21	901,710	833	430

CYPRUS

C4A	A	10,196,730	3782	801
				(Op: 5B4ADA)
*C40M	3.5	355,892	327	193
				(Op: 5B4AFM)

KYRGYZSTAN

EX2A	21	135,000	265	200

KOREA

*HL5UOG	A	198,882	326	254
*HL5AP	28	12,045	123	73
*HL0C	21	233,168	944	247

THAILAND

HS0/SM3DYU	21	343,476	424	329

SAUDI ARABIA

HZ1AB	A	6,388,470	3033	717	
					(Op: SM0CXU)

JAPAN

JR3NZC	A	4,540,144	2052	784	
JH4UYB	A	4,267,350	2169	654	
JA8RWU	A	3,770,688	2008	656	
JS2LHJ	*	3,212,220	1783	620	
JA1YNE	*	3,031,984	1748	628	
					(Op: JP1OGL)
JA0QWO	*	2,480,544	1477	594	
JN2AMD	*	2,380,365	1444	585	
JA6ZLI	*	1,201,760	953	464	
JA6SRB	*	759,858	720	397	
JR1LEV	*	699,033	641	389	
JA2AXB	*	513,400	551	340	
JA1HP	*	439,005	502	339	
JH6OPP	*	424,628	501	332	
JA3ARM	*	395,632	481	313	
JH1FNU	*	132,136	252	199	
JR3XEX	*	123,464	240	184	
JA0FVU	*	117,936	239	189	
JA2QVP	*	107,709	220	161	
JA5AIQ	*	104,220	211	180	
JF2FIU	*	92,960	215	160	
JI1RXQ	*	92,040	218	156	
7J1ABD	*	70,560	176	147	
JA9CWJ	*	37,185	118	111	
JJ4PPK	*	24,319	93	83	
JN7OJA	*	21,983	93	89	
JA2FSM	*	14,688	76	68	
JG3WCZ	*	27	3	3	
JA3XOG	**28**	**58,164**	**199**	**148**	
JA2VQF	*	10,948	80	68	
JS1KQQ	*	5,733	53	49	
JA1XEM	*	108	6	6	
JH7XGN	**21**	**3,158,838**	**1711**	**666**	
JH4JNG	**21**	**2,121,640**	**1349**	**590**	
JR1CBC	**21**	**1,445,940**	**1077**	**522**	
JA9XBW	*	180,240	289	240	
JJ1JRH	*	58,546	161	146	
JQ1NGT	*	55,900	166	130	
JO1QZI	*	31,376	114	106	
JR3XTO	*	4,900	70	70	
JE1CKA	**14**	**1,800,560**	**1171**	**568**	
JA5APU	**14**	**499,500**	**549**	**333**	
JR3WXA	*	330,012	418	309	
JA1QZC	*	33,912	112	108	
JA1GS	*	20,800	123	64	
JK1LUY	*	7,400	50	50	
JA5IP	**7**	**41,151**	**95**	**87**	
JA4YPE	**1.8**	**4**	**2**	**2**	
***7M1MCT**	**A**	**2,059,200**	**1326**	**550**	
***JA6UBK**	**A**	**1,465,230**	**1043**	**510**	
***JA2KVB**	**A**	**1,272,063**	**977**	**507**	
*JH5OXF	*	1,267,002	1034	474	
*JE4MHL	*	1,097,044	907	442	
*JA7NVF	*	1,067,904	931	432	
*JH2NWP	*	935,649	779	429	
*JH1AZO	*	916,980	772	465	
*JA4KTE	*	837,366	734	402	
*JA2BY	*	744,744	690	403	
*JM1LRQ	*	725,305	735	391	
*JS1OYN	*	671,913	650	363	
*JO3JYE	*	610,488	647	366	
*JN1NOP	*	590,772	652	364	
*JQ1UKK/7	*	564,102	638	363	
*JN1MSO/1	*	559,988	608	356	
*JR0BQD	*	552,189	573	319	
*JA2CUS	*	498,597	615	319	
*JF6ZUU	*	440,733	536	321	
*JA1CP	*	410,346	510	206	
*JI7OED	*	345,261	484	287	
*JE8KKX	*	340,104	459	296	
*JE4QGF	*	334,323	459	307	
*JA2OJ	*	330,544	428	283	
*JK1KNB	*	310,097	391	289	
*JJ3TBB	*	274,890	465	255	
*JJ6TWQ	*	249,744	358	242	
*JH1DYV	*	239,717	353	239	
*JA7KM	*	223,074	336	243	
*JJ1QJP	*	188,936	31	226	
*JA8AJE	*	186,369	305	219	
*JA7ARW	*	176,410	300	230	
*JH0NEC	*	166,195	293	215	
*JG1OWV	*	162,288	272	196	
*JA1KI	*	161,871	277	237	
*JA3UWB	*	159,328	263	208	
*JA1BUI	*	152,865	261	215	
*JA1AB	*	138,106	269	199	
*JR1TMI	*	137,428	254	188	
*JH1PXY	*	127,890	251	174	
*JH7CJM	*	103,618	216	206	
*JR5EHB	*	80,634	200	151	
*JA1YFG	*	63,042	155	133	
				(Op: 7M4DPF)	
*JA2BQX	*	63,036	184	153	
*JK2VOC	*	41,984	163	128	
*JA1MXY	*	40,950	141	105	
*JG1TVK	*	40,494	128	102	
*JO1VRL	*	39,445	131	115	
*JA1XUY	*	37,700	125	100	
*JM2RUV	*	35,226	122	103	
*JH1NXU	*	33,170	120	107	
*JA2HO	*	31,680	103	96	
*JE1HJV	*	28,812	106	98	
*JA1WHG	*	25,571	100	91	
*JA1JSV	*	25,487	83	77	
*JA9KUG	*	12,705	64	54	
*JJ2TKX	*	9,804	63	57	
*JH1KSB	*	8,900	72	50	
*JH1UES	*	8,064	72	63	
*JF7DXT	*	6,480	53	48	
*JH1YHS	*	5,830	60	55	
*7M2GCW	*	5,000	41	40	
*JK6SKN	*	4,980	63	30	
*JF7GDF/7	*	4,608	50	48	
*JA3WFQ	*	2,970	35	27	
*JA7AXP	*	572	12	11	
*JI2VLM	*	532	14	14	
*JA1KAL	*	216	10	9	
***JH9VSF**	**28**	**196,612**	**378**	**247**	
*JQ3UDL	*	35,207	129	109	
*JA1PS	*	18,450	130	82	
*JA1NLX	*	17,739	90	81	
*JA1XRH	*	5,814	62	51	
*JA3HC	*	2,541	35	33	
*JA1AAT	*	1,560	27	26	
*JA4AQR	*	946	22	22	
*7K2PBB	*	895	17	15	
***JQ6NAW**	**21**	**1,721,760**	**1203**	**544**	
***JF1SQC**	**21**	**1,326,830**	**1017**	**479**	
***JR4GPA**	**21**	**795,368**	**737**	**392**	
*7K4GUR	*	550,500	524	375	
*JA0BMS/1	*	460,736	500	368	
*JH4FUF	*	323,832	422	309	
*JH7QXJ	*	295,210	402	265	
*JH6TYD	*	294,921	389	297	
*JJ1GQH	*	236,640	326	272	
*JA3VXH	*	200,143	319	263	
*JA2KKA	*	164,964	273	233	
*JA4BAA	*	132,600	250	204	
*JA1EM	*	123,800	229	200	
*JR7CJO/1	*	104,710	214	185	
*JA2KPV	*	66,440	176	151	
*JA3EVZ	*	57,510	156	142	
*JK7KCC	*	52,003	147	133	
*JG3NKP/1	*	36,480	120	114	
*JE4JPQ	*	28,925	119	89	
*JN2QYN	*	28,611	105	99	
*JE9RRO	*	26,572	106	91	
*JR1UMO	*	16,093	77	77	
*7K1EQG	*	3,480	41	40	
*JA6QDU	*	3,104	35	32	
*JF1VXB/6	*	2,002	27	26	
*JF7VVL	*	1,008	28	24	
*JH0SGG	*	765	17	17	
*JM1IXB	*	242	12	11	
*JF5FGY	*	176	8	8	
***JH0EPI**	**14**	**578,708**	**592**	**359**	
*JJ1RMV/6	*	15,466	79	74	
*JA5HBB	*	8,610	75	70	
*JA3HPD	*	784	17	16	
***JA0EKI**	**7**	**30,222**	**87**	**73**	
***JE1SPY**	**1.8**	**80**	**10**	**8**	

JORDAN

JY9NX	A	8,642,799	3648	737	
					(Op: JM1CAX)

LEBANON

OD5SB	28	1,986,610	1421	514	
					(Op: OK1MU)
*OD5PL	A	1,145,424	1009	392	

TURKEY (ASIATIC)

*TA3D	21	3,494,813	1917	679
*TA2BD	14	740,440	763	346

ASIATIC RUSSIA

RM0F	A	1,462,230	1087	495	
					(Op: RA0FU)
UA0LS	*	512,640	492	360	
UA0JDD	*	430,008	574	328	
UA0FAI	*	215,500	343	250	
UA0AGI	**21**	**2,146,000**	**1335**	**592**	
***RA0FF**	**A**	**2,199,600**	**1440**	**600**	
***RU0LL**	**A**	**1,309,464**	**1201**	**468**	
*RA0JX	*	925,280	917	414	
*UA0ANW	*	605,690	629	370	
*RU0AT	*	83,148	200	164	
***UA0WU**	**21**	**181,597**	**309**	**229**	
*UA0FEN	*	32,103	123	123	
***UA0SAD**	**14**	**475,043**	**544**	**347**	
UA9CDC	**A**	**2,368,144**	**1342**	**566**	
RA9AN	**A**	**1,193,566**	**791**	**454**	
RA9AC	*	573,210	572	330	
RA9MY	**21**	**552,375**	**550**	**375**	
UA9AB	*	320,501	408	289	
UA9LAC	**14**	**654,132**	**636**	**361**	
UA9JLJ	**3.5**	**341,548**	**312**	**206**	
***RA9AE**	**A**	**1,679,216**	**1037**	**464**	
***RA9AUH**	**A**	**506,178**	**523**	**366**	
*RW9QA	*	498,456	511	301	
*RX9JW	*	341,460	466	271	
*RZ9AE	*	326,655	412	305	
*RX9AM	*	216,690	294	192	
*UA9JMS	*	182,192	316	236	
*UA9YAB	*	163,282	316	218	
*UA9WQK	*	76,880	216	155	
*UA9JMM	*	31,200	122	100	
***RZ9OU**	**28**	**161,182**	**348**	**203**	
*RU9UG	*	10,899	66	63	
***RA9JP**	**21**	**943,516**	**832**	**434**	
*UA9OSV	*	12,444	81	68	
***RJ9J**	**14**	**2,112,200**	**1338**	**590**	
					(Op: RA9JR)
*RA9ASA	*	915,057	793	429	
*UA9AOL	*	582,516	581	396	
*UA9BS	*	418,715	458	331	
***UA9FEG**	**3.5**	**38,250**	**98**	**75**	

KAZAKHSTAN

UN8LQ	A	2,700	28	27	
UN0LL	*	2,464	33	28	
UP4L	14	1,956,192	1248	574	
					(Op: UN7LZ)
UP0L	3.5	686,964	472	262	
UN7RBD	*	192,234	224	161	
*UN9FB	A	1,672	27	22	
*UN7LT	28	184,500	364	225	
*UN8PF	21	146,845	259	215	
*UN4PD	14	66,097	165	157	
*UN4PG	7	25,568	73	68	

HONG KONG

VR2BG	21	2,601,841	1713	649

INDIA

VU3VLH	A	4,402,200	2644	600	
					(Op: OK1MM)

VIETNAM

*XV7SW	14	1,346,760	1082	516

EUROPE

CROATIA

9A3GW	21	4,893,108	2376	836
9A9D	*	108,180	242	180
9A5W	14	3,470,746	2107	766
9A9A	7	2,838,132	1366	594
9A3MR	*	621,429	601	359
9A2AJ	1.8	140,298	323	201
*9A1O	A	2,537,964	1661	663
				(Op: 9A5I)
*9A2EU	A	1,206,330	1002	509
*9A1CZZ	*	195,027	343	251
9A3SM	*	163,432	310	248
*9A5ZZ	*	88,232	200	164
*9A3ZG	*	12,312	100	81
*9A0CW	*	5,510	75	58
				(Op: 9A6GYL)
*9A3ZO	*	558	20	18
*9A6A	28	490,314	742	391
*9A3VM	28	312,285	605	327
*9A2R	*	194,184	400	279
*9A6ACY	*	5,668	62	52
*9A3B	21	1,550,250	1187	585
*9A7R	14	2,273,262	1554	669
*9A3CY	3.5	200,142	411	228

PORTUGAL

*CQ1A	A	2,120,371	1707	583	
					(Op: ON5UM)
*CT1BQH	21	520,902	676	387	
*CT1AOZ	3.5	77,280	164	140	

GERMANY

DL1AUZ	A	4,532,700	2326	725	
DA0WPX	A	3,662,436	2199	707	
					(Op: DK8LV)
DL1RK	A	2,630,040	1643	606	
DJ5BV	*	1,703,988	1228	572	
DF0FS	*	1,555,281	1338	567	
					(Op: DL1EKC)
DL8UAT/P	*	1,463,400	1143	540	
DL5YM	*	1,222,420	1011	509	
DF4SA	*	1,045,143	890	459	
DJ6QT	*	1,014,585	936	473	
DL1JF	*	874,608	851	456	
DL6AG	*	660,848	757	412	
DL9MRF	*	451,580	560	335	
DF0NF	*	190,350	388	270	
DJ2IA	*	60,208	164	142	
DL8UFO	*	26,695	109	95	
DF5AU	*	6,204	57	44	
DK8FD	**28**	**207,110**	**375**	**278**	
DK0MM	**28**	**206,480**	**380**	**290**	
					(Op: DJ7IK)
DM3FZN	*	99,015	280	205	
DJ9DZ	**7**	**1,064,095**	**831**	**437**	
***DJ9NMH**	**A**	**1,486,408**	**1137**	**532**	
***DF6LQ**	**A**	**859,617**	**851**	**457**	
***DL5SVB**	**A**	**521,184**	**634**	**356**	
*DL3ZAI	*	459,298	574	371	
*DJ5CL	*	406,144	615	334	
*DK7FP	*	312,432	450	276	
*DL2GBB	*	288,000	466	300	
*DF0FKB	*	239,088	420	272	
*DL3KWF	*	203,918	360	253	
*DL3KWR	*	199,111	363	253	
*DL7VOX	*	160,200	318	225	
*DK7ZH	*	159,501	333	237	
*DM3PKK	*	156,546	305	234	
*DL1SAN	*	128,316	311	222	
*DL2RTJ	*	127,000	265	200	
*DL7IZ	*	102,716	232	161	
*DJ8UV/P	*	95,418	234	186	
*DL5DBH	*	74,907	300	123	
*DL2ZAV	*	65,856	200	147	
*DL4JYT	*	61,710	185	165	
*DK4QT	*	48,512	159	128	
*DF5ZV	*	47,520	165	135	
*DJ2YE	*	46,683	170	133	
*DM3XI	*	34,944	122	96	
*DL6UAA	*	20,251	95	77	
*DK5ZX	*	15,089	89	79	
*DF3OL	*	9,120	67	60	
***DL7BY**	**28**	**82,810**	**237**	**182**	
*DL9NEI	*	7,524	68	66	
***DK0DO**	**21**	**779,850**	**757**	**450**	
					(Op: DL1MGB)
***DL7ANR**	**21**	**608,112**	**616**	**412**	
*DL1EMH	*	201,492	325	261	
*DL1CW	*	134,568	274	216	
*DL2MIH	*	5,334	45	42	
***DL1TH**	**14**	**273,656**	**460**	**316**	
*DL3JRA	*	2,336	33	32	
*DL6UBF	*	1,825	25	25	
***DL4FN**	**7**	**445,176**	**539**	**324**	
*DL7YAV	*	48,470	171	131	
***DL6KWN**	**3.5**	**118,604**	**293**	**199**	
***DL2AXM**	**1.8**	**364**	**14**	**14**	

SPAIN

EA1DAV	A	1,396,192	1366	542
AM5DCL	A	439,930	717	410
EA1FBJ	*	301,136	524	319
EA1FBU	*	111,520	310	205
EA1BAE	*	21,614	129	107
EA1JO	21	303,354	429	342
EA7MT	7	828	36	23
AM5YU	1.8	7,020	64	54
*EA7KN	A	2,014,394	1599	566
*EA2BNU	A	927,956	983	452
*EA2BDS	*	613,440	854	432
*EA1EQ	*	466,700	761	359
*AM7AKJ	*	433,538	640	358
*EA4BGM	*	270,248	565	332
*EA5EU	*	174,966	400	242
*EA7TG	*	46,991	150	137
*EA7CA	*	23,205	85	76
*EA1BXW	*	6,578	52	46
*EA5AFH	*	2,349	30	29
***EA5DWS**	**28**	**363,810**	**674**	**335**
***EA1AK/7**	**28**	**149,184**	**328**	**259**
*EA4AOR	*	2,376	37	36
***EA3ALV**	**21**	**273,798**	**409**	**318**
***EA3BIM**	**21**	**237,855**	**500**	**303**
*EA3GHZ	*	7,956	53	52
*EA4CIE	*	3,760	40	40
***AM7ASZ**	**14**	**115,412**	**302**	**244**
				(Op: EA7ASZ)
*EA1ND	*	75,116	253	178
***EA5FID**	**7**	**306,272**	**384**	**272**

BALEARIC ISLANDS

EA6GP	21	68,996	2240	188

IRELAND

*EI4DW	A	976,030	935	467
*EI8GP	21	560,920	623	370

MOLDOVA

ER0F	21	2,881,180	1949	710
				(Op: UX0FF)
*ER1LW	A	1,058,910	1135	470

ESTONIA

*ES6PZ	A	1,372,308	990	651

BELARUS

EW8EW	A	3,460,189	2164	713
EU5A	A	2,812,734	1783	614
				(Op: EU1FC)
EW3EW	14	50,575	622	425
*EU1DX	A	2,291,328	1440	624
*EU1SA	A	1,060,443	1015	493
*EW1EA	*	342,654	462	299
*EU7SD	*	47,355	200	105
*EW1NA	*	2,013	35	35
*EU6DX	28	153	9	9
*EV6M	14	1,847,937	1519	637
*EU1MM	*	608,845	725	463
*EU6AA	*	86,395	225	185
*EW6MM	21	307,584	440	288
*EW4EW	*	60,384	160	136
*EW2AO	3.5	34,352	143	113

FRANCE

F6BEE	A	4,044,256	2155	752
F5NBX	28	412,335	623	357
F8IPH	21	1,573,854	1205	596
F5RZJ	21	1,175,182	996	502
F5PIQ	14	253,286	406	319
F5TNI	*	163,709	331	257
*TM0AIN	A	1,391,270	1150	526
				(Op: F5JBR)
*F5YJ	A	522,640	609	376
*F5LJY	*	492,450	617	350
*F6GQO	*	445,346	594	341
*F5JOT	*	251,600	416	272
*F5JDG	*	188,468	362	254
*F5SGI	*	188,404	359	268
*F6CAV	*	187,984	344	248
*F5NLX	*	9,487	105	53
*F5NYK	*	9,120	81	76
*F5RPB	*	2,112	32	32
***F6IIE**	**28**	**111,510**	**345**	**210**
***F5NLY**	**21**	**607,774**	**620**	**409**
*F6FTB	*	172,788	300	238
***F/OK1EE**	**7**	**697,109**	**722**	**371**

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ENGLAND

M6T	**A**	**5,767,851**	**2845**	**771**
		(Op: G4PIQ)		
G3TXF	**A**	**2,604,437**	**1750**	**649**
G4BJM	*	554,382	672	342
G5G	**21**	**2,753,030**	**1715**	**670**
		(Op: GØLII)		
***M5A**	**A**	**1,170,748**	**1054**	**487**
		(Op: G3SXW)		
***G3ZRJ**	**A**	**939,147**	**940**	**447**
*G3JJZ	*	509,964	600	364
*G3OOU	*	500,193	683	373
*G3RSD	*	472,797	600	351
*G3HZL	*	229,568	406	272
*G3VQO	*	192,024	409	252
*G6QQ	*	162,564	333	228
*GØWHO	*	91,298	225	191
*G4ZME	*	32,472	133	123
***G4OTY**	**28**	**1,092**	**31**	**28**
***GØMTN**	**21**	**801,016**	**838**	**449**
*G3ESF	*	273,904	426	323
*GØVQR	*	8,710	74	65
***GØDEZ**	**7**	**601,215**	**640**	**352**
*G4OGB	*	147,084	284	206
*G5MY	*	137,416	220	178

SCOTLAND

2S4SID	**A**	**997,770**	**962**	**474**
		(Op: GM4SID)		
***GM3CFS**	**21**	**424,859**	**508**	**379**

WALES

***2C3KJN**	**A**	**45,152**	**170**	**144**
***2C3NJW**	**21**	**521,248**	**664**	**416**
		(Op: GW3NJW)		

HUNGARY

HA3OU	**A**	**110,010**	**250**	**193**
HG8Z	**21**	**1,364,519**	**1125**	**559**
HA3JB	*	388,370	498	355
HG3DX	**14**	**3,169,956**	**1900**	**758**
		(Op: HA3UU)		
HA3NU	**14**	**2,236,185**	**1650**	**687**
HA8VK	**14**	**1,765,848**	**1354**	**644**
HA7UG	*	1,460,004	1204	588
HA3PT	**7**	**296,940**	**394**	**294**
HG3G	**3.5**	**230,121**	**447**	**243**
***HA1CW**	**A**	**2,471,720**	**1827**	**610**
***HA4YF**	**A**	**1,007,124**	**880**	**492**
*HA5NK	*	731,442	808	426
*HAØDD	*	116,334	243	207
***HA8EN**	**21**	**386,988**	**496**	**357**
*HA3MU	*	365,781	486	339
***HAØKHT**	**3.5**	**202,016**	**425**	**236**
		(Op: HAØIL)		

SWITZERLAND

HB9FBS	**A**	**823,522**	**976**	**413**
HB9CRV	*	84,016	223	178
***HB9ARF**	**A**	**1,017,831**	**1065**	**471**
*HB9HQX	*	283,330	495	290

ITALY

IB2S	**A**	**2,036,826**	**1547**	**594**
		(Op: IK2IQV)		
IØZUT	**A**	**960,741**	**927**	**409**
IQ5Z	*	825,440	957	440
		(Op: IZ5AXA)		
IK2AHB	*	423,300	556	332
IK5RLS	*	23,584	100	88
IZØAIS	**28**	**363,303**	**617**	**333**
IN3/DK3KD	**7**	**420,472**	**620**	**311**
***IKØYVV**	**A**	**2,133,036**	**1536**	**614**
***IZØANC**	**A**	**123,646**	**283**	**211**
*IK4NPC	*	95,254	243	194
*IK4UNH	*	71,685	211	177
*IK3FHL	*	57,040	207	155
*IK2YSE	*	55,380	169	156
*IK2AIT	*	38,482	162	142
*IZ2DAY	*	9,675	85	75
*IV3KSE	A	3,960	44	40
***IU7X**	**21**	**906,471**	**923**	**513**
		(Op: I7PXV)		
***IQ3A**	**14**	**772,520**	**882**	**434**
		(Op: IV3TAN)		
*I5OQV	*	24,428	134	124
***IØØKHP**	**1.8**	**330**	**11**	**11**

SARDINIA

***ISØHQJ**	**A**	**455,961**	**677**	**337**

SICILY

***IT9ORA**	**A**	**113,980**	**273**	**205**

NORWAY

LA7MFA	**A**	**2,669,667**	**1753**	**637**
LA6P8	**21**	**128,088**	**270**	**216**
***LA9HFA**	**A**	**415,596**	**621**	**354**
*LA9DK	*	156,689	282	221
*LA5TFA	*	128,128	295	224

LUXEMBOURG

***LX1JH**	**A**	**116,424**	**270**	**198**

LITHUANIA

LY6M	**A**	**5,504,946**	**2713**	**817**
		(Op: LY1DS)		
LY2BTA	**A**	**4,334,810**	**2277**	**802**
LY8X	**A**	**4,311,523**	**2152**	**777**
		(Op: LY2BIL)		
LY3BA	*	3,939,516	2240	756
LY5W	*	3,338,175	2030	705
		(Op: LY1DR)		
LY2HN	*	1,135,266	1013	501
LY2MM	*	1,020,402	904	498
LY2OX	*	838,295	824	431
LY2AT	*	170,912	333	218
LY3ID	*	101,200	216	176
LY2PX	**21**	**3,106,150**	**1675**	**730**
LY2BM	**21**	**1,698,465**	**1240**	**569**
LY1FEY	*	769	16	16
LY2KW	**14**	**2,094,108**	**1468**	**654**
LY2IJ	**7**	**1,241,638**	**953**	**458**
LY2LF	**3.5**	**32,508**	**137**	**108**
LY2OU	**1.8**	**43,875**	**170**	**125**
***LY2DX**	**A**	**1,135,044**	**1057**	**492**
***LY2LA**	**A**	**1,134,848**	**1064**	**496**
***LY2BN**	**A**	**1,114,975**	**1000**	**515**
*LY2BBF	*	367,422	483	418
*LY2FN	*	355,576	521	338
*LY1DM	*	330,770	406	310
*LY1BW	*	222,942	370	219
*LY1DD	*	77,088	181	146
***LY2FF**	**21**	**55,198**	**173**	**143**
***LY1CY**	**14**	**116,678**	**262**	**227**
*LY2EC	*	81,955	239	185

BULGARIA

LZ1BJ	**A**	**2,147,760**	**1656**	**628**
LZ6A	**A**	**2,084,726**	**1697**	**602**
LZ1QZ	*	973,950	1139	453
LZ2HR	*	886,414	958	527
LZ3W	*	252,301	422	271
LZ2DL	*	109,217	286	203
LZ3AB	*	17,920	97	80
LZ1PJ	*	7,840	70	56
LZ3FM	*	1,452	26	22
LZ2PL	**21**	**1,876,844**	**1410**	**607**
LZ1DFP	**21**	**1,486,800**	**1195**	**590**
LZ4UU	**14**	**500,544**	**602**	**396**
LZ1OJ	*	376,353	532	338
***LZ1ABC**	**A**	**871,051**	**942**	**431**
***LZ1CW**	**A**	**572,016**	**710**	**408**
*LZ1MC	*	142,650	309	224
*LZ1AQ	*	111,066	214	173
*LZ4BU	*	21,756	98	84
***LZ1UQ**	**21**	**494,433**	**659**	**401**
*LZ1ZM	*	118,326	270	222
***LZ1FW**	**3.5**	**6,837**	**55**	**53**

AUSTRIA

OE5OHO	**21**	**278,528**	**444**	**254**
OE8CIQ	*	42,240	174	132
***OE1BKA**	**A**	**16,000**	**92**	**80**

ALAND ISLAND

OHØZ	**A**	**5,610,208**	**2933**	**796**
		(Op: K7BV)		
OHØV	**21**	**3,045,845**	**1815**	**701**
		(Op: OH6LI)		

FINLAND

OH5NQ	**A**	**4,449,120**	**2473**	**780**
		(Op: OH6EI)		
OH5VT	**A**	**1,349,270**	**1070**	**535**
OH6NJ	**A**	**1,271,025**	**1222**	**525**
OH6XY	*	786,992	806	404
OH2VZ	*	596,910	656	394
OH2BR	*	554,358	629	402
OH3RR	*	508,113	623	369
OH8OB	*	257,210	413	289
OH3JR	*	134,285	253	251
OH1F	**21**	**1,683,672**	**1215**	**584**
		(Op: OH1NOA)		
OH9DX	**14**	**2,315,726**	**1735**	**659**
OH1F	**14**	**2,278,105**	**1661**	**677**
		(Op: OH1MDR)		
OH2W	**3.5**	**302,356**	**488**	**269**
OH3BU	**1.8**	**21,780**	**115**	**90**
***OH9A**	**A**	**1,559,608**	**1290**	**548**
		(Op: OH3WW)		
***OH8BQT**	**A**	**1,185,275**	**1095**	**521**
*OH2NN	*	611,770	607	467
*OH6RC	*	217,061	349	283
*OH3IR	*	159,012	356	252
*OH3NM	*	81,988	241	199
*OH1MM	*	45,666	167	129
*OH7DK	*	15,747	87	87
***OH6MRA**	**21**	**850,766**	**800**	**469**
*OH1UP	*	12,032	70	64
***OH2BSQ**	**7**	**40,777**	**155**	**121**

CZECH REPUBLIC

OK1RI	**A**	**5,806,760**	**2659**	**811**
OK1DWC	**A**	**2,001,952**	**1551**	**584**
OK1FDY	**A**	**1,770,720**	**1283**	**560**
OK1VD	*	658,768	675	394
OK1FRO	*	616,176	738	389
OK1FTW	*	17,686	94	74
OL5Y	**28**	**553,980**	**705**	**420**
		(Op: OK1FUA)		
OK1NI	*	58,090	214	157
OK2BJT	*	25,584	116	104
OL4S	**21**	**1,693,616**	**1212**	**604**
		(Op: OK2ZU)		
OK2SG	*	179,250	300	250
OK7DX	**14**	**1,741,072**	**1413**	**592**
OL4M	**7**	**529,592**	**619**	**343**
OK2EQ	*	358,776	454	297
OK1IE	*	253,330	297	245
OK1EW	*	102,892	873	426
OK2RZ	**3.5**	**805,513**	**789**	**397**
***OK1DG**	**A**	**1,496,720**	**1230**	**530**
***OK2PP**	**A**	**1,327,536**	**1104**	**504**
***OK1HX**	**A**	**1,279,460**	**1133**	**518**
*OK1ZP	*	1,107,840	1001	480
*OK1DOL	*	1,087,680	1009	480
*OK2QX	*	1,073,276	989	502
*OK2EC	*	995,692	887	458
*OK1WF	*	911,178	906	446
*OK2BDI	*	906,635	870	455
*OK1FCA	*	894,222	914	423
*OK2PHC	*	663,404	792	406
*OK1AYY	*	585,390	699	390
*OK1AAZ	*	363,400	513	340
*OK5ACR	*	202,188	449	249
		(Op: OK1FKV)		
*OK1AOU	*	196,896	252	224
*OK1KZ	*	87,210	228	171
*OK2PBG	*	50,400	163	126
*OK2BHE	*	2,552	30	29
*OK1DSU	*	585	15	13
***OK1XW**	**28**	**140,385**	**316**	**245**
***OK1AUC**	**28**	**86,850**	**247**	**193**
*OK1XC	*	79,608	224	186
*OK1AES	*	66,696	214	168
*OK2PCN	*	32,670	137	121
*OK2PMS	*	4,158	46	42
***OK2DU**	**21**	**1,215,493**	**1001**	**521**
***OK2SAT**	**21**	**822,360**	**756**	**462**
*OK1DSZ	*	767,284	706	469
*OK2TBC	*	390,722	487	347
*OK1FHI	*	319,716	423	321
*OK1BA	*	194,546	308	239
*OK2BJK	*	101,750	225	185
***OK1MKI**	**14**	**352,588**	**521**	**362**
*OK1DVK	*	78,792	208	201
*OK2BCZ	*	58,820	220	170
***OK2ZC**	**7**	**847,912**	**787**	**403**
*OK1ANS	*	17,716	103	86
***OK2ZV**	**1.8**	**9,394**	**73**	**61**

SLOVAKIA

OM7M	**A**	**2,438,952**	**1526**	**673**
OM8FF	**A**	**1,531,810**	**1266**	**553**
OM3IAG	**A**	**1,287,720**	**1091**	**504**
OM5NU	**1.8**	**89,846**	**252**	**167**
***OM8ON**	**A**	**1,023,642**	**857**	**477**
***OM4DN**	**A**	**773,297**	**836**	**427**
*OM8DD	*	725,328	779	414
*OM7RC	*	283,269	482	287
*OM4DA	*	169,136	346	248
*OM2FY	*	89,517	200	159
*OMØCW	*	76,734	232	174
*OMØCR	*	37,926	160	129
*OM8CD	*	35,406	141	126
***OM3CAE**	**21**	**170,275**	**328**	**245**
*OM4RM	*	143,691	300	227
*OM7YC	*	91,160	214	172
*OM6TX	*	37,407	135	111
***OM9OT/P**	**14**	**231,880**	**427**	**310**
*OM5AR	*	227,672	519	298
*OM2TB	*	68,220	209	180
***OM4WW**	**7**	**488,312**	**512**	**341**
*OM3CDN	*	147,278	317	211
***OM1AW**	**3.5**	**8,160**	**65**	**60**

BELGIUM

ON4XG	**A**	**579,223**	**671**	**397**
***ON6CW**	**A**	**541,450**	**700**	**350**
*ON4CBW	*	64,124	217	164
*ON4CAS	*	21,716	100	89
***ON6LO**	**A**	**256,230**	**400**	**351**

DENMARK

OZ/TF3CW	**A**	**892,664**	**1023**	**463**
OZ5RM	*	65,670	193	165
OZ1BMA	**14**	**151,147**	**284**	**235**
***OZ5UR**	**A**	**176,715**	**315**	**231**
*OZ1AA	*	79,092	224	169
***OZ4FF**	**21**	**94,905**	**211**	**185**

THE NETHERLANDS

PA3HBI	**A**	**102,060**	**244**	**189**
PA3EWP	**21**	**1,803,824**	**1231**	**592**
PA4EA	**14**	**1,641,207**	**1328**	**591**
***PA3ELD**	**A**	**33,320**	**124**	**98**
*PA3AAV	*	32,294	133	118
*PA3BEJ	*	14,904	100	92
*PA3EXI	*	527	17	17
***PA5BW**	**28**	**55,224**	**184**	**156**
*PA3CAL	*	34,001	146	121
*PAØJED	*	12,375	90	75
***PAØRRS**	**21**	**100,425**	**217**	**195**
*PAØMIR	*	2,697	31	31

SLOVENIA

S5ØL	**A**	**4,334,172**	**2322**	**732**
		(Op: S59AA)		
S53R	**A**	**3,969,756**	**2172**	**708**
S57DX	**A**	**3,880,560**	**2197**	**690**
S57J	*	3,472,550	2045	698
S5ØK	*	2,634,762	1852	663
S59L	*	2,012,020	1552	580
S53MJ	*	1,241,506	1179	497
S55A	*	1,167,886	1041	482
S53FO	*	867,394	835	443
S5ØU	**28**	**775,525**	**891**	**463**
S5ØC	**21**	**2,393,064**	**1550**	**648**
		(Op: S53RM)		
S5ØR	**21**	**2,018,559**	**1354**	**619**
S57AL	**7**	**1,879,956**	**1093**	**507**
***S53EO**	**A**	**2,128,973**	**1530**	**643**
***S51F**	**A**	**1,858,428**	**1424**	**572**
***S52LW**	**A**	**1,716,130**	**1373**	**559**
*S57U	*	1,371,496	1207	532
*S54X	*	1,209,285	1007	495
*S57IIO	*	506,044	652	371
*S53AU	*	363,940	538	310
*S57NPR	*	4,606	50	47
***S52OT**	**28**	**196,393**	**413**	**277**
***S51WA**	**21**	**348,502**	**445**	**341**
*S51U	*	17,460	110	97
***S58AL**	**14**	**1,756,891**	**1341**	**587**
***S54A**	**7**	**1,096,550**	**815**	**455**
*S53F	*	784,449	713	387
***S5ØD**	**3.5**	**203,696**	**409**	**232**
		(Op: S52RU)		

SWEDEN

SK3LH	**A**	**1,599,829**	**1366**	**553**
		(Op: SM3WMV)		
SM7EH	**A**	**635,850**	**678**	**405**
SM5CIL	*	563,140	613	370
		(Op: SM7CIL)		
SM7BVO	*	148,004	316	227
SM5HJZ	**21**	**1,049,750**	**891**	**494**
SM5CEU	*	573,769	578	399
SM2CEW	*	239,568	400	276
SMØKV	*	110,772	239	204
SK3GW	**14**	**2,157,548**	**1607**	**656**
		(Op: SM5IMO)		
SLØZG	**7**	**230,015**	**361**	**257**
		(Op: SMØAJU)		
***SM2EZT**	**A**	**1,456,950**	**1282**	**550**
***SM5JBM**	**A**	**1,177,640**	**1092**	**499**
***SM3CVM**	**A**	**993,564**	**984**	**468**
*SM3CER	*	941,064	882	452
*SMØBDS	*	375,535	501	335
*SM4SX	*	306,900	474	310
*SM7BJW	*	204,609	350	241
*SM7BHM	*	104,640	273	192
*SK6HD	*	27,063	111	93
		(Op: SM6FKF)		
*SM4TU	*	1,144	22	22
***SMØGNS**	**21**	**234,270**	**364**	**285**
*SM7ATL	*	55,440	159	132
*SM7BUN	*	1,029	21	21
***SMØGYX**	**14**	**13,846**	**101**	**86**
***SM3ARR**	**7**	**7,752**	**65**	**57**

POLAND

SP7GIQ	**A**	**6,048,240**	**2832**	**790**
3Z4N	**A**	**2,542,371**	**1608**	**611**
		(Op: SP4NI)		
SN9J	**A**	**2,403,648**	**1669**	**624**
		(Op: SP9HWN)		
SN7N	*	1,859,277	1354	609
		(Op: SP7NMW)		
SP3HRN	*	242,466	437	251
SP9LAS	*	13,440	71	60
SQ9BZK	**28**	**258,266**	**386**	**263**
SP5DIR	*	41,925	147	129
SP5GRM	**21**	**3,859,874**	**1911**	**766**
SP3GTS	*	510,490	591	355
SP3MGP	*	256,343	366	289
SN2B	**14**	**3,602,968**	**2063**	**776**
		(Op: SP2FAX)		
SQ6Z	**7**	**1,031,261**	**779**	**413**
		(Op: SP3RBR)		
SP5GH	**3.5**	**232,775**	**263**	**256**
***SP6CPF**	**A**	**891,202**	**857**	**454**
***SP6CXH**	**A**	**307,224**	**506**	**306**
***SP8FHJ**	**A**	**268,011**	**449**	**291**
*SP3JUN	*	262,920	432	280
*SP3HC	*	236,544	407	264
*SP2AYC	*	165,796	296	229
*SP5LCC	*	159,600	289	200
*SP9KJM	*	147,660	275	230
*SP9IIL/P	*	136,484	277	229
*SQ2HEB	*	118,770	302	214
*SP5CGN	*	103,824	230	193
*SP9KJU	*	100,608	259	192
*SP3XR	*	88,570	228	170
*SP5ICS	*	73,899	210	161
*SP6BEN	*	58,110	163	130
*SP9EMI/P	*	38,080	143	119
*SPØAAZ	*	37,830	150	130
*SP2QVS	*	32,754	150	103
*SP4KSY	*	32,212	179	92
*SP3FAR	*	25,300	100	92
*SP2FWC	*	16,478	86	77
*SP4TKO	*	14,625	102	75
*SQ9DXN	*	12,920	82	76
***SQ9HYM**	**28**	**36,703**	**151**	**110**
***SP9XCN**	**21**	**1,100,693**	**900**	**517**
*SP6AUI	*	101,104	202	178
*SP9CCA	*	41,860	136	115
*SP3MEP	*	13,452	103	59
***SN4PLJ**	**14**	**1,394,960**	**1189**	**530**
*SP8BAB	*	254,280	420	326
*SQ8BGJ	*	10,857	101	77
***SP2NA**	**7**	**745,963**	**672**	**398**
*SP5CNA	*	237,160	368	242
***SP7ELQ**	**3.5**	**199,520**	**388**	**232**
*SP9PRH/P	*	42,212	160	122
*SP6LV	*	38,748	152	121

GREECE

SV8CRI	A	62,868	200	169
*SV1DKR	28	303,968	714	322
*SV2BFL	21	301,550	501	326
*SV1BSX	14	86,680	314	197

DODECANESE

J45KLN	**A**	**803,010**	**1224**	**435**
		(Op: SMØCMH)		

CRETE

***SV9/OH7WW**	**21**	**490,432**	**960**	**388**
***SV9/ OH9MM/P**	**14**	**754,390**	**984**	**455**

BOSNIA & HERZEGOVINIA

***T95A**	**A**	**2,881,890**	**1830**	**639**
***T99T**	**28**	**160,854**	**396**	**249**
*T92M	*	20,930	107	91
***T94MZ**	**21**	**664,000**	**802**	**415**
***T93Y**	**14**	**1,721,304**	**1464**	**613**
***T91AAW**	**7**	**698,005**	**695**	**385**
		(Op: T94IW)		
***T94YT**	**1.8**	**18,170**	**111**	**79**

EUROPEAN RUSSIA

UF3CWR	**A**	**4,165,591**	**2527**	**787**
RA4AG	**A**	**3,258,508**	**2192**	**719**
RK3AD	**A**	**2,597,535**	**1906**	**639**
RW4WR	*	2,311,340	1551	652
UA4WA	*	2,286,900	1732	630
RU6AV	*	1,122,165	1052	495
RA4CTR	*	557,438	719	406
RK3BA	*	486,576	655	372
UA1ANA	*	484,352	640	352
UA4HEJ	*	138,061	301	163
UA4PI	*	77,168	238	182
RW4AA	*	68,609	188	157
RA4AR	*	67,878	212	162
RN3D	*	67,404	229	164
RI4C	**21**	**1,071,339**	**1124**	**843**
		(Op: RU4CO)		
RA3XO	**21**	**1,034,880**	**911**	**528**
RZ6FA	**14**	**2,253,676**	**1594**	**693**
RV6AVE	*	281,388	470	358
UA3TGC	*	235,427	401	311
RV1AB	*	82,621	235	203
RA3NX	*	62,370	188	165
RA3XA	*	30,375	138	125
RX3AP	**7**	**19,536**	**102**	**88**
***RW3GB**	**A**	**1,711,872**	**1411**	**576**
***UA4CJJ**	**A**	**1,551,225**	**1352**	**559**
***RA3CW**	**A**	**1,519,434**	**1325**	**558**
*UA4WAN	*	1,467,102	1385	546
*UA3ABJ	*	1,409,400	1130	540
*UA4PA	*	1,114,812	1054	537
*RU3AQY	*	939,816	1049	456
*RU3FF	*	807,976	810	457
*RN1AO	*	725,580	1007	435
*RA3UAG	*	550,680	710	390
*RA3SL	*	503,412	647	364
*UA4SS	*	455,184	623	327
*RX6AY	*	413,685	700	235
*RA9CO/3	*	321,233	500	319
*RV4LM	*	274,302	419	311
*RX3AEX	*	207,164	415	268
*RW3AFY	*	187,698	300	218
*RV1CC	*	183,651	326	221
*RK6CM	*	181,770	334	249
*RU4WE	*	146,041	340	217
*RN3AU	*	105,927	300	201
*RU3RQ	*	80,560	194	152
*UA6AGK	*	41,055	122	105
*UA6ATG	*	27,084	131	111
*UA4PT	*	20,636	91	77
*RA6AR	*	19,866	104	86
*UA6AN	*	1,620	28	20
***UA4LL**	**21**	**1,860,550**	**1362**	**635**
***UA3DJY**	**21**	**495,573**	**523**	**393**

*RV3VR/6	*	209,979	480	303
***RW3GU**	**14**	**717,800**	**800**	**485**
***UA3IKO**	**14**	**661,940**	**817**	**460**
*RW4NW	*	343,224	539	378
*RA1ZZ	*	253,980	526	340
*UA3LDZ	*	173,610	373	270
*RV3YR	*	119,615	320	235
***RW4CW**	**7**	**74,368**	**202**	**166**
*RN3AG	*	35,616	154	112
***UA6AKD**	**3.5**	**97,440**	**263**	**174**

UKRAINE

UTØU	**A**	**3,936,890**	**2300**	**730**
		(Op: UT5UDX)		
UR8MA	**A**	**3,108,864**	**1906**	**704**
UU7J	**A**	**3,050,927**	**2193**	**713**
		(Op: UUØJM)		
EM7Q	*	2,793,704	2033	662
		(Op: UR3QCW)		
UX7IA	*	2,494,280	1852	635
UX1UA	*	2,196,212	1579	619
UR3QT	*	1,734,084	1401	604
UY1U	*	1,629,752	1403	548
UT4PZ	*	938,221	861	457
UX3ZW	*	909,106	792	473
UR6IJ	*	680,504	844	407
UX8IX	*	575,700	555	475
UT7WR	*	388,892	581	323
UR6QS	*	255,316	422	284
US7VL	*	213,864	394	266
UX7QQ	*	45,008	140	116
UU2JZ	*	13,132	74	67
US9QA	*	4,450	56	50
EO7V	**28**	**598,416**	**779**	**411**
		(Op: UR7VA)		
UR8QX	**28**	**509,848**	**713**	**404**
UY9VY	*	122,460	261	195
EO1I	**21**	**2,432,425**	**1761**	**653**
		(Op: UT1IA)		
UY5ZZ	**21**	**1,765,763**	**1362**	**607**
US1E	**21**	**1,732,224**	**1326**	**624**
UT2ID	*	1,302,740	1122	530
UR7IWW	*	1,098,099	1007	513
		(Op: US7IGF)		
UX2MM	*	1,076,250	979	525
UT8IM	*	1,054,100	1016	508
UR5LCV	*	1,038,568	912	524
UR5MBY	*	1,242	24	23
UX6F	**14**	**1,161,888**	**1203**	**546**
		(Op: UX3FW)		
UX5VK	*	174,042	402	293
UT5HP	*	6,150	52	50
UT7IY	**7**	**1,132,404**	**832**	**442**
UY5QQ	**7**	**721,820**	**616**	**374**
UR7QM	*	405,288	503	312
UT1WZ	*	358,470	429	315
US6EX	*	225,500	351	250
UT1QW	*	156,541	290	209
UR5IOK	**3.5**	**72,534**	**221**	**157**
UR7QC	**1.8**	**66,440**	**207**	**151**
***UY8IF**	**A**	**2,124,440**	**1808**	**614**
***US3IZ**	**A**	**1,136,187**	**1154**	**507**
***UT2UZ**	**A**	**1,120,752**	**954**	**516**
*UY3QW	*	676,500	880	410
*UY2ZA	*	652,054	754	403
*UX5EF	*	645,981	761	399
*UT8IT	*	595,584	734	384
*UY5TE	*	420,420	661	330
*UY5QO	*	96,886	252	193
*UT2IW	*	62,480	202	142
*UR3QCW	*	43,662	137	114
*UR5EIT	*	9,370	136	123
*UR5ZO	*	6,157	82	47
***UR4QOS**	**21**	**411,774**	**588**	**367**
***UX1KR**	**21**	**223,584**	**360**	**274**
*UR3MP	*	172,032	308	256
*UR5TAU	*	161,696	280	249
***UY8LM**	**14**	**149,094**	**410**	**251**
*UT7ET	*	82,812	252	201
*US5EVD	*	75,762	202	183
*UY5YA	*	47,628	201	147
***US8IBS**	**7**	**90,988**	**222**	**172**
***UT1FA**	**1.8**	**56,146**	**197**	**134**
*UR4III	*	9,438	73	66

LATVIA

YL2KO	**A**	**2,311,446**	**1529**	**641**
YL2MR	**A**	**823,392**	**943**	**432**
YL2KF	*	18,620	104	95
YL2IP	*	1,825	31	25
YL2UZ	**21**	**218,350**	**347**	**275**
YL3RW	**3.5**	**88,060**	**238**	**170**
***YL2PP**	**21**	**76,437**	**179**	**171**
***YL3FW**	**14**	**304,736**	**515**	**356**

ROMANIA

YO8GF	**A**	**75,012**	**192**	**141**
YO4GDP	**21**	**1,044,448**	**1027**	**508**
YO4A	**14**	**1,856,670**	**1652**	**622**
		(Op: YO4FRF)		
YO2BEH	**1.8**	**2,170**	**32**	**31**
***YO3APJ**	**A**	**1,974,312**	**1465**	**612**
***YO3FRI**	**A**	**1,458,050**	**1300**	**550**
*YO3CTK	*	838,598	1031	458
*YO4XF	*	218,624	424	256
***YO2AQB**	**28**	**11,172**	**85**	**76**
*YO5CRQ	*	5,264	52	47
***YO9FJW**	**21**	**34,290**	**162**	**135**
***YO4BBH**	**14**	**84,456**	**300**	**207**
***YO2DFA**	**7**	**633,988**	**635**	**353**

YUGOSLAVIA

YU1OJ	**28**	**152,152**	**398**	**247**
***YU1BO**	**A**	**105,792**	**251**	**192**
*YU1PJ	*	144	9	9
***YU7SF**	**28**	**25,132**	**115**	**103**
***YTØC**	**21**	**2,079,506**	**1380**	**661**
		(Op: YU7CB)		
***YU7KM**	**14**	**245,552**	**416**	**298**
*YU1RA	1.8	2	1	1

MACEDONIA

Z32AU	**A**	**5,119,005**	**2948**	**795**
Z37FCA	*	540	16	15
***Z31MM**	**28**	**293,664**	**508**	**322**
***Z31GX**	**21**	**1,376,830**	**1298**	**595**
***Z31CN**	**14**	**1,074,855**	**1127**	**547**

OCEANIA

THE PHILIPPINES

***4F1RWW**	**A**	**1,467,786**	**1079**	**446**
***DU3RCM**	**28**	**61,938**	**188**	**111**

SAIPAN

WHØV	**A**	**1,198,916**	**925**	**386**
***NHØE**	**A**	**842,384**	**802**	**326**

HAWAII

WH7Q	**A**	**3,270,466**	**1693**	**586**
		(Op: ND3A)		
KH6ND	**21**	**6,107,256**	**2520**	**813**
AH7R	**1.8**	**660**	**11**	**10**
***KH7L**	**A**	**206,857**	**326**	**203**

MARSHALL ISLANDS

V73ZZ	**21**	**3,365,906**	**1783**	**634**

AUSTRALIA

VK4EMM	**A**	**3,809,041**	**1561**	**599**
VK8AV	**A**	**752,265**	**596**	**365**
VK4UC	**28**	**278,888**	**407**	**238**
VK5GN	**21**	**886,655**	**778**	**385**
***VK6HG**	**A**	**222,444**	**309**	**222**
***VK4ICU**	**28**	**323,722**	**425**	**266**
***VK2APK**	**14**	**1,851,100**	**1167**	**535**
***VK4TT**	**14**	**43,992**	**128**	**117**

INDONESIA

YB1AQS	**A**	**6,741,928**	**2992**	**712**
YBØFMT	**21**	**1,486,408**	**988**	**508**
YCØLOW	**1.8**	**132**	**6**	**6**
***YB2UU**	**A**	**3,216,591**	**1738**	**567**
***YBØUNC**	**A**	**936,540**	**731**	**387**
*YB4JIM	*	357,315	406	287
***YB3OSE**	**28**	**182,754**	**314**	**198**

NEW ZEALAND

ZM1A	**A**	**5,886,942**	**2066**	**667**
		(Op: F2CW)		

SOUTH AMERICA

CHILE

XR1X	**A**	**3,472,794**	**1736**	**587**
		(Op: XQ1IDM)		
***CE3AA**	**A**	**1,774,080**	**1165**	**495**
		(Op: XQ3IDY)		

URUGUAY

***CW9A**	**A**	**1,433,190**	**966**	**473**
		(Op: CX9AU)		

ECUADOR

HC2SL	**21**	**2,763,360**	**1528**	**606**
***HC1HC**	**A**	**2,464**	**30**	**28**

COLOMBIA

HK3JBR	**A**	**1,175,154**	**955**	**438**

ANTARCTICA

***8J1RL**	**21**	**9,396**	**58**	**54**
		(Op: JA9BOH)		

ARGENTINA

LO1F	**A**	**4,835,894**	**2300**	**671**
		(Op: LU4FPZ)		
LUØHØWW	*	167,790	274	210
		(Op: OH1EB)		
***LU7EE**	**A**	**2,088,976**	**1255**	**548**
***LU1EWL**	**A**	**1,208,093**	**896**	**431**
*LO7H	*	984,732	826	399
		(Op: LU7HN)		
***LU4FD**	**28**	**760,772**	**719**	**356**
***LUØAPM**	**28**	**561,118**	**603**	**314**
***LS7D**	**3.5**	**408**	**19**	**17**

ARUBA

P49V	**A**	**8,217,440**	**3190**	**805**
		(Op: AI6V)		

BRAZIL

PY1ARS/4	**A**	**1,162,926**	**849**	**414**
PY7OJ	*	108,850	215	175
PP1RR	*	102,663	209	153
PR2CW	*	25,972	100	86
		(Op: PY2GG)		
PY1BLL	*	7,568	51	43
PP5BRV	**28**	**2,162,944**	**1336**	**544**
PY2DBU	*	4,033	37	37
ZY2DX	**21**	**3,380,762**	**1787**	**638**
		(Op: PY2QE)		
PY3FBI	*	3,944	76	69
PY1LVF	*	532	14	14
PY7CJN	**7**	**5,104**	**30**	**29**
PT2HO	**3.5**	**16,416**	**59**	**57**
***PY2YU**	**A**	**3,806,112**	**1934**	**656**
***PT1A**	**A**	**2,154,816**	**1333**	**522**
		(Op: PY1NX)		
***PW1S**	**A**	**1,308,920**	**980**	**430**
		(Op: PY1KS)		
PR2W	*	334,273	435	263
*PP7CI	*	307,582	362	242
*PY4MBJ	*	249,956	356	226
*PP7CW	*	209,230	378	245
*PY7IQ	*	104,912	210	158
*PY2TI	*	44,110	134	110
*PY7YL	*	1,975	26	25
***PY2TNT**	**28**	**77,469**	**177**	**147**
*PY4LH	*	65,075	171	137
*PU2A	*	36,924	126	102
		(Op: PY2GG)		
***PY2NY**	**21**	**790,956**	**700**	**381**

VENEZUELA

***YV7QP**	**28**	**202,312**	**330**	**209**

TRIBANDER/ SINGLE ELEMENT

UNITED STATES

N5NU	**A**	**2,645,461**	**1629**	**637**
N1EU	**A**	**2,444,375**	**1345**	**625**
N2CU	*	2,427,005	1345	595
N8BJQ	**A**	**2,387,640**	**1486**	**591**
ND5S	*	2,352,431	1486	593
N2ED	*	2,021,418	1338	549
K2SX	*	1,942,464	1310	536
NV4X	**A**	**1,658,904**	**1183**	**507**
		(Op: K2AV)		
W6TK	**A**	**1,478,586**	**1116**	**526**
W4YE	*	1,107,600	852	426
K2UOP/8	*	829,268	733	401
W1CU	*	822,393	659	429
AJ6V	*	741,600	794	412
KY5N	*	710,360	704	430
KU6J	*	645,962	789	382
KI6T	*	606,356	625	384
W2ZU	*	599,760	600	360
W7QN	**A**	**583,300**	**652**	**380**
NO8DX	*	506,344	554	334
		(Op: K8MR)		
WT8P	*	436,680	550	360
KC7UP	*	322,385	419	305
K6CTA	*	207,035	324	235
W8PN	*	187,668	310	234
K1TS	*	132,591	260	193
K6LL/7	**21**	**3,175,104**	**1770**	**719**
NI3S/8	**21**	**2,125,890**	**1354**	**585**
AK6R	**21**	**230,175**	**405**	**279**
K3VA	**14**	**47,168**	**145**	**134**

USA LOW POWER

WD5K	**A**	**1,903,068**	**1308**	**603**
WD4AHZ	**A**	**1,901,830**	**1408**	**538**
WK2G	**A**	**1,457,310**	**1205**	**465**
WN6K	**A**	**1,015,151**	**997**	**437**
K9MMS	**A**	**563,030**	**603**	**355**
KM2L	*	340,180	448	292
K8EP	**A**	**309,132**	**393**	**277**
K4QPL	*	245,248	421	256
K6UM	*	240,240	359	273
K4NR	*	149,158	302	214
NEØP	**A**	**139,968**	**291**	**216**
KG8DH	*	108,680	264	209
K4BEV	*	103,880	228	196
N4LF	*	100,968	220	168
AK9Y	**A**	**18,320**	**84**	**80**
KG5RM	**28**	**5,916**	**59**	**51**
W9IXX	**28**	**546**	**14**	**14**
W9ILY	**21**	**402,204**	**466**	**363**
KGØUA	**21**	**206,934**	**313**	**273**
K9CJ	**7**	**15,340**	**60**	**59**

DX

JY9NX	**A**	**8,642,799**	**3648**	**737**
		(Op: JM1CAX)		
Z32AU	**A**	**5,119,005**	**2948**	**795**
LY2BTA	**A**	**4,334,810**	**2277**	**802**
S50L	**A**	**4,334,172**	**2322**	**732**
		(Op: S59AA)		
LY8X	*	4,311,523	2152	777
		(Op: LY2BIL)		
UF3CWR	**A**	**4,165,591**	**2527**	**787**
S53R	*	3,969,756	2172	708
VE2ZP	**A**	**3,546,316**	**1874**	**628**
LY5W	*	3,338,175	2030	705
		(Op: LY1DR)		
UU7J	**A**	**3,050,927**	**2193**	**713**
		(Op: UUØJM)		
JA1YNE	**A**	**3,031,984**	**1748**	**628**
		(Op: JP1OGL)		
EU5A	**A**	**2,812,734**	**1783**	**614**
		(Op: EU1FC)		
RK3AD	*	2,597,535	1906	639
JAØQWO	*	2,480,544	1477	594
SN9J	**A**	**2,403,648**	**1669**	**624**
		(Op: SP9HWN)		
JN2AMD	*	2,380,365	1444	585
UA9CDC	**A**	**2,368,144**	**1342**	**566**
VY1DX	**A**	**2,354,800**	**1455**	**580**
		(Op: N6HR)		
UX1UA	*	2,196,212	1579	619
SN7N	*	1,859,277	1354	609
		(Op: SP7NMW)		
OK1FDY	**A**	**1,770,720**	**1283**	**560**
DJ5BV	**A**	**1,703,988**	**1228**	**572**
DL8UAT/P	*	1,463,400	1143	540
OH5VT	**A**	**1,349,270**	**1070**	**535**
OH6NJ	*	1,271,025	1222	525
S53MJ	*	1,241,506	1179	497
JA6ZLI	*	1,201,760	953	464
S55A	*	1,167,886	1041	482
IØZUT	**A**	**960,741**	**927**	**409**
LY2OX	*	838,295	824	431
J45KLN	**A**	**803,010**	**1224**	**435**
		(Op: SMØCMH)		
JR1LEV	*	699,033	641	389
OH2VZ	*	596,910	656	394
SM5CIL	**A**	**563,140**	**613**	**370**
		(Op: SM7CIL)		
RA4CTR	*	557,438	719	406
G4BJM	**A**	**554,382**	**672**	**342**
OH3RR	*	508,113	623	369
JH6OPP	*	424,628	501	332
JA3ARM	*	395,632	481	313
OH8OB	*	257,210	413	289
EA1FBU	**A**	**111,520**	**310**	**205**
JA2QVP	*	107,709	220	161
JF2FIU	*	92,960	215	160
JI1RXQ	*	92,040	218	156
RN3D	*	67,404	229	164
5X1Z	**28**	**4,575,420**	**2300**	**666**
		(Op: SM7PKK)		
G5G	**21**	**2,753,030**	**1715**	**670**
		(Op: GØLII)		
OE5OHO	**21**	**278,528**	**444**	**254**
OH3BU	**1.8**	**21,780**	**115**	**90**

DX LOW POWER

PY2YU	**A**	**3,806,112**	**1934**	**656**
XJ9DX	**A**	**3,425,555**	**1622**	**679**
T95A	**A**	**2,881,890**	**1830**	**639**
VA3UZ	**A**	**2,697,496**	**1511**	**596**
IKØYVV	**A**	**2,133,036**	**1536**	**614**
LU7EE	**A**	**2,088,976**	**1255**	**548**
7M1MCT	**A**	**2,059,200**	**1326**	**550**
EA7KN	**A**	**2,014,394**	**1599**	**566**
9M2TO	**A**	**1,902,314**	**1500**	**514**
S51F	**A**	**1,858,428**	**1424**	**572**
S52LW	*	1,716,130	1373	559
4F1RWW	**A**	**1,467,786**	**1079**	**446**
JA6UBK	*	1,465,230	1043	510
UA3ABJ	**A**	**1,409,400**	**1130**	**540**
RUØLL	**A**	**1,309,464**	**1201**	**468**
JH5OXF	*	1,267,002	1034	474
M5A	**A**	**1,170,748**	**1054**	**487**
		(Op: G3SXW)		
JE4MHL	*	1,097,044	907	442
OK2QX	**A**	**1,073,276**	**989**	**502**
SM3CVM	**A**	**993,564**	**984**	**468**
JH1AZO	*	916,980	772	465
JM1LRQ	*	725,305	735	391
JS1OYN	*	671,913	650	363
JO3JYE	*	610,488	647	366
UAØANW	*	605,690	629	370
JN1NOP	*	590,772	652	364
VE3STT	*	570,465	543	315
JN1MSO/1	*	559,988	608	356
F5YJ	**A**	**522,640**	**609**	**376**
EA1EQ	*	466,700	761	359
AM7AKJ	*	433,538	640	358
JE8KKX	*	340,104	459	296
JE4QGF	*	334,323	459	307
PR2W	*	334,273	435	263
JA2OJ	*	330,544	428	283
RA9CO/3	*	321,233	500	319
JK1KNB	*	310,097	391	289
JJ3TBB	*	274,890	465	255
JJ6TWQ	*	249,744	358	242
SP3HC	**A**	**236,544**	**407**	**264**
JJ1QJP	*	188,936	31	226
JHØNEC	*	166,195	293	215
JG1OWV	*	162,288	272	196
JA3UWB	*	159,328	263	208
JR1TMI	*	137,428	254	188
PY7IQ	*	104,912	210	158
UY5QO	**A**	**96,885**	**252**	**193**
IK4NPC	*	95,254	243	194
RU3RQ	*	80,560	194	152
OZ1AA	**A**	**79,092**	**224**	**169**
UR3QCW	*	43,662	137	114
JK2VOC	*	41,984	163	128
JG1TVK	*	40,494	128	102
JO1VRL	*	39,445	131	115
SP2QVS	*	32,754	150	103
SK6HD	*	27,063	111	93
		(Op: SM6FKF)		
JA1JSV	*	25,487	83	77
JA9KUG	*	12,705	64	54
VE5CPU	**A**	**9,280**	**68**	**58**
PY7YL	*	1,975	26	25
JA4AQR	**28**	**946**	**22**	**22**
PAØRRS	**21**	**100,425**	**217**	**195**
JA2KPV	**21**	**66,440**	**176**	**151**
JG3NKP/1	*	36,480	120	114
PAØMIR	**21**	**2,697**	**31**	**31**

ROOKIE

SK3LH	**A**	**1,599,829**	**1366**	**553**
		(Op: SM3WMV)		
***PW1S**	**A**	**1,308,920**	**980**	**430**
		(Op: PY1KS)		
***LZ1ABC**	**A**	**871,051**	**942**	**431**
***EA2BDS**	**A**	**613,440**	**854**	**432**
***KØIW**	**A**	**203,616**	**330**	**252**
***IZØANC**	**A**	**123,646**	**283**	**211**
***N9NT**	**A**	**122,802**	**252**	**194**
***SQ2HEB**	**A**	**118,770**	**302**	**214**
***KF6GUH**	**A**	**108,659**	**271**	**193**
***K4BEV**	**A**	**103,880**	**228**	**196**
***OZ1AA**	**A**	**79,092**	**224**	**169**
***ON4CBW**	**A**	**64,124**	**217**	**164**
***KG4BIG**	**A**	**48,470**	**152**	**131**
***N3WK**	**A**	**31,283**	**120**	**109**
***NW7DX/VE7**	**A**	**27,390**	**101**	**83**
***IZ2DAY**	**A**	**9,675**	**85**	**75**
***EA8AEI**	**28**	**56,952**	**156**	**126**
***AM7ASZ**	**14**	**115,412**	**302**	**244**
		(Op: EA7ASZ)		

BAND RESTRICTED

***JR5EHB**	**A**	**80,634**	**200**	**151**
*JI2VLM	*	532	14	14
***7K2PBB**	**28**	**895**	**17**	**15**
***PT1A**	**A**	**2,254,014**	**1362**	**534**
		(Op: PY1NX)		
***S57II**	**A**	**506,044**	**652**	**371**
*S57NPR	*	4,606	50	47

SINGLE OP ASSISTED

UNITED STATES

W8AV	**A**	**4,190,248**	**2068**	**718**
KW2O	**A**	**3,837,435**	**1926**	**681**
		(Op: K2LE)		
KF3P	**A**	**3,713,580**	**1738**	**690**
		(Op: K3MM)		
K5KG	*	3,681,972	1865	684
W3PP	*	3,641,100	1774	687
WØGJ	**A**	**3,307,962**	**1963**	**678**
		(Op: AAØBY)		
WF2B	*	2,434,112	1430	584
		(Op: K2ONP)		
K3KO	**A**	**2,161,235**	**1288**	**571**
N5JR	**A**	**1,988,802**	**1260**	**625**
KC1F	**A**	**1,422,040**	**1055**	**487**
KD6WW	**A**	**1,418,844**	**1055**	**532**
AD6E	*	1,269,940	998	470
K2QMF	*	1,251,093	880	467
AB6WM	*	1,192,890	1040	510
WA5VGI	*	710,985	673	417
K6III	*	627,600	662	400
W9OP	**A**	**574,980**	**587**	**370**
N2JT	*	351,604	436	262
K9YO	*	351,528	542	291
WT3P	*	193,756	321	236
W3AP	*	89,872	200	164
K6JG	*	84,760	172	163
WO1N	*	58,800	205	147
NA2X	*	39,715	459	315
K1NU	*	33,600	120	105
N6EE	*	26,675	108	97

USA LOW POWER

K3DI	**A**	**639,468**	**564**	**372**
K1KU	**A**	**355,792**	**400**	**296**
KA2D	**A**	**263,144**	**369**	**254**
WD4JNS	**A**	**234,596**	**351**	**263**
W2GG	*	103,935	217	169
WE4ARC	*	71,604	200	153
			(Op: AJ4Y)	
NC1N	*	56,700	185	140
N7UJJ	**A**	**31,916**	**109**	**101**
N5KB	**A**	**27,948**	**110**	**102**
W6BSY	**21**	**419,862**	**510**	**381**

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DX

WP3R	**A**	**9,532,019**	**3672**	**833**
		(Op: DL2CC)		
DK3GI	**A**	**5,108,220**	**2379**	**780**
EA5FV	**A**	**3,867,315**	**2534**	**743**
OL6X	**A**	**3,789,140**	**2031**	**695**
		(Op: OK1DIG)		
S56A	**A**	**2,838,372**	**1692**	**708**
IQ7A	**A**	**2,203,812**	**1877**	**612**
		(Op: IK7XIV)		
JH3AIU	**A**	**1,617,552**	**1210**	**478**
OE3I	**A**	**1,488,840**	**1222**	**570**
OK1AXB	"	1,211,211	1050	531
DJ9MH	"	1,185,345	1025	477
DL3NEO	"	986,910	922	491
OK1FED	"	838,409	883	451
OK1DDO	"	812,682	779	453
SM6FUD	**A**	**542,944**	**657**	**376**
UA3AP	**A**	**527,352**	**624**	**344**
JH4NMT	"	451,528	485	308
OK1DXW	"	429,174	540	339
7N2JJP	"	418,386	501	309
SMØDJZ	"	338,239	483	317
IK5QQE	"	279,321	510	283
7L2OHM	"	248,706	371	246
OH1BOI	**A**	**195,840**	**333**	**256**
DL6KVA	"	149,184	281	168
OZ5MJ	**A**	**146,845**	**284**	**215**
UU2JQ	**A**	**1,640**	**27**	**20**
S51AY	**28**	**450,835**	**620**	**385**
JH1FSF	**28**	**130,968**	**268**	**214**
JH6QIL	**21**	**462,057**	**507**	**339**
IK4WMH	**21**	**306,504**	**452**	**324**
OM3A	**3.5**	**586,470**	**674**	**346**
		(Op: OM3CGN)		
EA7AGW	**3.5**	**12,090**	**75**	**65**

DX LOW POWER

UT2IO	**A**	**1,076,400**	**1027**	**468**
EA8/9A4KK	**A**	**624,000**	**645**	**325**
UA1OAM	**A**	**337,983**	**490**	**339**
JI1CUP	**A**	**211,536**	**338**	**234**
JAØBJY	"	124,292	239	193
DK2ZO	**A**	**70,455**	**200**	**165**
9A7P	**28**	**187,616**	**422**	**286**
EA3AJW	**21**	**962,802**	**913**	**534**
EA8NQ	**21**	**191,586**	**291**	**222**
F5LMJ	**14**	**433,884**	**602**	**418**
JA1KVT	**7**	**76,260**	**149**	**124**
T97Y	**7**	**33,054**	**507**	**283**

MULTI-OPERATOR SINGLE TRANSMITTER

UNITED STATES

K3WW	**8,008,910**	**3143**	**845**
N4WW	**7,365,848**	**3076**	**868**
AJ4Y	6,380,137	2997	811
KM5G	**5,714,410**	**2762**	**778**
WO8CC	**5,038,660**	**2525**	**740**
NC7J	**3,779,831**	**1934**	**697**
K6ZM	**3,682,656**	**1945**	**673**
NR6R	3,058,425	1899	675
NN5NN	3,084,587	1915	671
WX6V	1,683,180	1251	540
W1AF	**1,527,600**	**1146**	**475**
KJØG	**1,160,522**	**901**	**493**
WT1T	1,137,720	866	456
WØTT	587,265	712	357
W1SRG	514,895	583	335
W6YRA	33,166	118	103

NORTH AMERICA

CY9RF	**13,651,000**	**4728**	**850**
V26E	**10,629,322**	**3980**	**862**
VE6SV	**5,442,408**	**2489**	**807**
TI1C	**2,646,621**	**2926**	**747**

ASIA

E4/OK5DX	**11,753,844**	**4716**	**786**
UA7A	**9,886,184**	**3408**	**847**
JY9QJ	**9,313,532**	**3563**	**838**
RF9C	6,900,043	2727	739
JA5BJC	**6,747,555**	**2898**	**799**
RY9C	6,252,344	2502	718
JN4FEU	5,931,303	2631	771
JA7YAA	4,360,425	2217	705
RK9KWI	4,059,864	1936	678
RK9CZO	3,231,846	1613	582
HSØAC	**2,811,624**	**1816**	**607**
RKØSXF	**2,109,150**	**1403**	**545**
UPØF	**1,514,648**	**1057**	**472**
JE2YHS	646,782	632	373
JJ1ZXE	259,118	384	262

EUROPE

HG1S	**9,443,500**	**4060**	**935**
RD3Q	**8,559,611**	**4143**	**943**
YL4U	**7,510,272**	**3343**	**889**
9A7A	**7,446,040**	**3341**	**917**
IR4T	**7,356,786**	**3322**	**914**
M5X	**7,269,345**	**3642**	**837**
OE4A	**6,873,588**	**3270**	**862**
OM5M	**6,395,840**	**3012**	**869**
RN4LP	6,076,938	3441	861
OH2U	**5,979,884**	**2984**	**842**
DJ7AA	**5,798,097**	**2741**	**842**
TM9C	**5,771,706**	**2939**	**771**
S5ØG	**5,747,406**	**2874**	**791**
UT7Z	**5,515,497**	**2807**	**799**
OL3A	**5,442,372**	**2802**	**802**
LA8W	**5,286,435**	**2820**	**805**
OH8LQ	5,234,148	2704	838
OH7M	5,200,646	2790	814
LZ9A	**5,054,422**	**2753**	**818**
MU2K	**4,948,416**	**2942**	**726**
II2K	4,842,807	2482	807
OK3RKA	4,476,276	2355	764
UR3IWA	4,424,652	2642	773
OT9U	**4,250,298**	**2400**	**754**
YP3A	**4,247,600**	**2761**	**740**
OL5Q	4,240,405	2400	733
OZ5WQ	**4,159,488**	**2276**	**768**
OL5T	3,642,813	2124	729
II1R	3,623,368	2256	712
S53DS	3,569,995	2156	715
DLØDX	3,427,104	1961	696
LY2VAD	**3,202,062**	**1992**	**681**
TM4C	3,060,900	2025	683
DL3KZA	3,018,110	1860	685
S57XX	2,799,007	1812	673
S57M	2,595,964	1719	644
RZ4AWR	2,548,458	1966	671
TM5AKL	2,535,412	1751	638
HA8KAZ	2,477,238	1623	667
RK1OWZ	2,319,450	1801	658
DKØHY	2,048,150	1452	598
EM4E	2,028,852	1749	581
RK3UWA	1,804,586	1410	581
PA3HBB	**1,709,981**	**1308**	**559**
ES2X	**1,402,920**	**1247**	**540**
S51A	1,148,976	1112	474
IZ3ASA/3	1,039,441	1088	481
OK2KDS	868,368	803	458
5P1ER	832,136	831	472
OM7F	620,539	768	419
RK3QWM	292,932	459	309
IO2L	197,425	400	265
LA1ARK	183,960	293	210
M4T	125,976	378	232
LA1K	83,304	245	178
OL5DX	68,697	201	153
OK1KCF	41,652	152	117
OH3AT	40,754	194	142

OCEANIA

ZL6QH	**5,199,510**	**2074**	**659**
4G1A	**2,265,536**	**1733**	**416**
DX1S	**326,151**	**411**	**217**

SOUTH AMERICA

L5ØUG	**5,724,225**	**2467**	**741**
LU8XW	**1,404,083**	**674**	**383**
LT5V	**504,000**	**539**	**315**

MULTI-OPERATOR MULTI-TRANSMITTER

UNITED STATES

NQ4I	**14,867,020**	**5391**	**1031**
NR4M	11,820,768	4379	944
KTØR	**10,464,531**	**4208**	**979**
NZ8O	**9,935,266**	**4091**	**913**
KG6OK	**7,930,772**	**3457**	**892**
WM1K	**7,783,552**	**3202**	**833**
WR3L	**6,616,122**	**2960**	**834**

NORTH AMERICA

WL7E	**18,257,208**	**5,777**	**1,048**

ASIA

P3A	**39,494,534**	**10,099**	**1,174**
JA3ZOH	**10,863,720**	**4,180**	**945**

EUROPE

RW2F	**19,150,695**	**6,655**	**1,161**
S54W	**16,405,930**	**6,293**	**1,093**
HG5A	**15,658,289**	**6,080**	**1,073**
RM6A	**15,204,986**	**6,236**	**1,114**
HG6Y	14,979,843	5,804	1,103
EA4ML	**13,002,444**	**5,668**	**1,029**
S56MM	11,235,180	4,652	957
LY7A	**10,621,080**	**4,754**	**978**
ES5Q	**9,362,304**	**4,373**	**972**
DF3CB	**7,829,052**	**3,410**	**916**
OL7W	**6,541,700**	**3,315**	**836**
SK7BI	**3,887,730**	**2,274**	**726**

SOUTH AMERICA

HC8N	**54,697,072**	**12,421**	**1,264**
LT1F	**20,364,960**	**5,923**	**1,015**

CHECK LOGS

The following logs were used for cross-checking. Check logs are always appreciated:

4N1SM, CX9AU, DJ1MM, DL2JAN/P, DL5DWW, DL5JMN, DL5NA, DL6MWG, EA4AHD, EA5OI, EA5RM, EA5TD, EA7AIN, EA8ASJ, EA8BIE, HAØMO, HA5AF, HA6VA, HSØZCW, IV3RLB, K3SWZ, K6FM, LA4IAA, LA4NE, LZ3YY, OH3TZ, OK1DXP/P, OK1JDJ, OK2KRK, OK2OBW, OK2PCS, OK2PKY, OM2XW, ON6LO, ON6TJ, OZ5PA, OZ6TL, PAØRBO, PAØUV, PA3BFH, PA5TT, PP5CIA, PY3JRG, RN3AM, RW9SG, RZØCQ, SMØNJO, SM2KAL, SM5BUH, SP1BLE, SP2DVH, SP2GUC, SP2GUC, SP2HMT, SP5CEQ, SP5FLB, SP6NIF, SP7BDS, SP7ICE, SP7XK, SP8JMA, SP9MDY, SV5DZX, UAØCW, UAØZC, UAØZS, UA3DNR, UA3DSS, UA4AO, UA9XK, UT2XX, UT7ND, UY5ZI, VA3RU, W8LYT, YO2ARV, YO2QY, YO5BFJ, YO5CL, YO8CRU, YO8ROO, YO9BGV.

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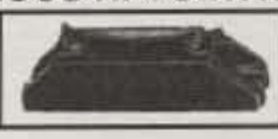

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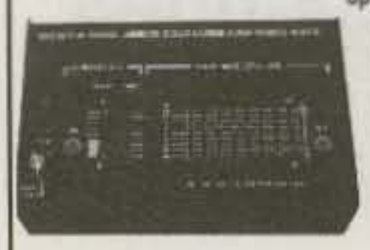

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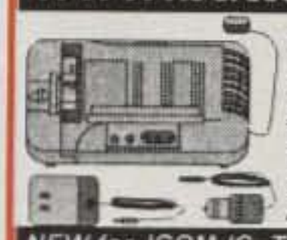

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EBP-34xh NiMH pk.	4.8v	2400mAh	$39.95
EBP-36 5w NiMH pk.	9.6v	650mAh	$36.95
NEW for ADI HT-600 & REALISTIC HTX-204:				
ADI-600x 8w NiMH pk.	12.0v	1000mAh	$39.95
For ICOM IC-Z1A / T22A / T42A / W31A / W32A / T7A:				
BP-180xh NiMH pk.	7.2v	1000mAh	$39.95
BP-173 5w NiMH pk.	9.6v	700mAh	$49.95
BC-601d	Rapid/Trickle Charger		$54.95
For ICOM IC-W21A / 2GXAT / V21AT (Black or Gray)				
BP-131xs NiMH pk.	7.2v	1800mAh	$39.95
BP-132s 5w NiMH pk	12.0v	1600mAh	$49.95
For ICOM IC-2SAT / W2A / 3SAT / 4SAT etc :				
BP-83xh NiMH pk.	7.2v	1600mAh	$39.95
BP-84x NiMH pk.	7.2v	1800mAh	$43.95
BC-79A	Rapid/Trickle Charger		$52.95
For ICOM 02AT etc & Radio Shack HTX-202 / 404:				
BP-8h NiMH pk.	8.4v	1400mAh	$32.95
BP-202h pk (HTX-202)	7.2v	1400mAh	$29.95
IC-8	8-Cell AA NiCd/Alkaline Case		$15.95
BC-350	Rapid Charger		$49.95
For KENWOOD TH-79A / 42A / 22A etc :				
PB-33xh NiMH pk.	6.0v	2000mAh	$39.95
PB-34xh 5w NiMH pk.	9.6v	1000mAh	$39.95
For KENWOOD TH-78A / 48 / 28 / 27 etc:				
PB-13x (orig. size pk,NiMH)	7.2v	1200mAh	$34.95
PB-13xh NiMH pk.	7.2v	1600mAh	$39.95
For KENWOOD TH-77, 75, 55, 46, 45, 26, 25 etc :				
PB-6x (NiMH, w/ chg jack)	7.2v	1200mAh	$34.95
NEW for KENWOOD TH-205 / 215 / 225 / 315 etc :				
PB-2h NiMH pk.	8.4v	1200mAh	$39.95
PB-12 5W NiMH pk.	12.0v	1000mAh	$49.95
NEW for KENWOOD TH-2500 / 2600: EXCLUSIVE!				
PB-25s NiMH pk.	8.4v	1200mAh	$39.95
For YAESU FT-50R / 50RD / 40R / 10R etc :				
FNB-47xh NiMH pk.	7.2v	1800mAh	$49.95
FNB-41xh NiMH pk.	9.6v	1000mAh	$45.95
For YAESU FT-51R / 41R / 11R etc :				
FNB-33xh NiMH pk.	4.8v	2000mAh	$39.95
FNB-38 5W NiMH pk.	9.6v	700mAh	$39.95
For YAESU FT-530 / 416 / 415 / 816 / 76 / 26 etc :				
FNB-25x NiMH pk.	7.2v	1000mAh	$28.95
FNB-26xs NiMH pk.	7.2v	1800mAh	$36.95
FNB-27x NiMH pk.	12.0v	1100mAh	$45.95
For YAESU FT-411 / 470 / 73 / 33 / 23 etc :				
FNB-10 NiCd pk.	7.2v	600mAh	$20.95
FNB-11 5W NiCd pk.	12.0v	600mAh	$24.95
FBA-10	6-Cell AA case		$14.95
Packs for ALINCO DJ-580 / 580T / 582 / 180 / 280T etc :				
EBP-20nh NiMH pk.	7.2v	1800mAh	$32.95
EBP-22nh 6w NiMH pk.	12.0v	1100mAh	$36.95
EDH-11	6-Cell AA case		$14.95
SANYO Nickel Metal Hydride AA Cells (Long Life):				
HR-3u Button top	1.2v	1600mAh	$ 3.50

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Truly an elite-class HF masterpiece, the 200 Watt FT-1000D provides Dual Receive (in-band or cross-band), Cascaded IF Filters, extraordinary Dynamic Range, DDS, high-speed Automatic Antenna Tuner, and 100 memory channels.

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FT-840
Affordable yet feature filled, the FT-840 is an ideal traveling companion. It offers 160-10M TX with general coverage RX, 100 memory channels, DDS, CTCSS, Twin Band Stacking VFOs, and excellent receiver dynamic range.

FT-600
This compact 100 Watt HF Transceiver offers the utmost in operating simplicity. The MIL-STD rated FT-600 covers the 160-10M Amateur bands with General Coverage Receive, 100 memory channels, Direct Keypad Frequency Entry, and a front-mounted speaker.

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The VL-1000 Quadra System is a Solid-State Linear Amplifier featuring four twin-MOSFET PA modules to produce 1000 Watts of clean power output on 160-15 Meters (500 Watts on 6M, modifiable for 12/10 meters). Included are an Automatic Antenna tuner, 2 Input and 4 Output Antenna Jacks, and extensive status displays on the multi-function LCD.

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