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Amateur Radio

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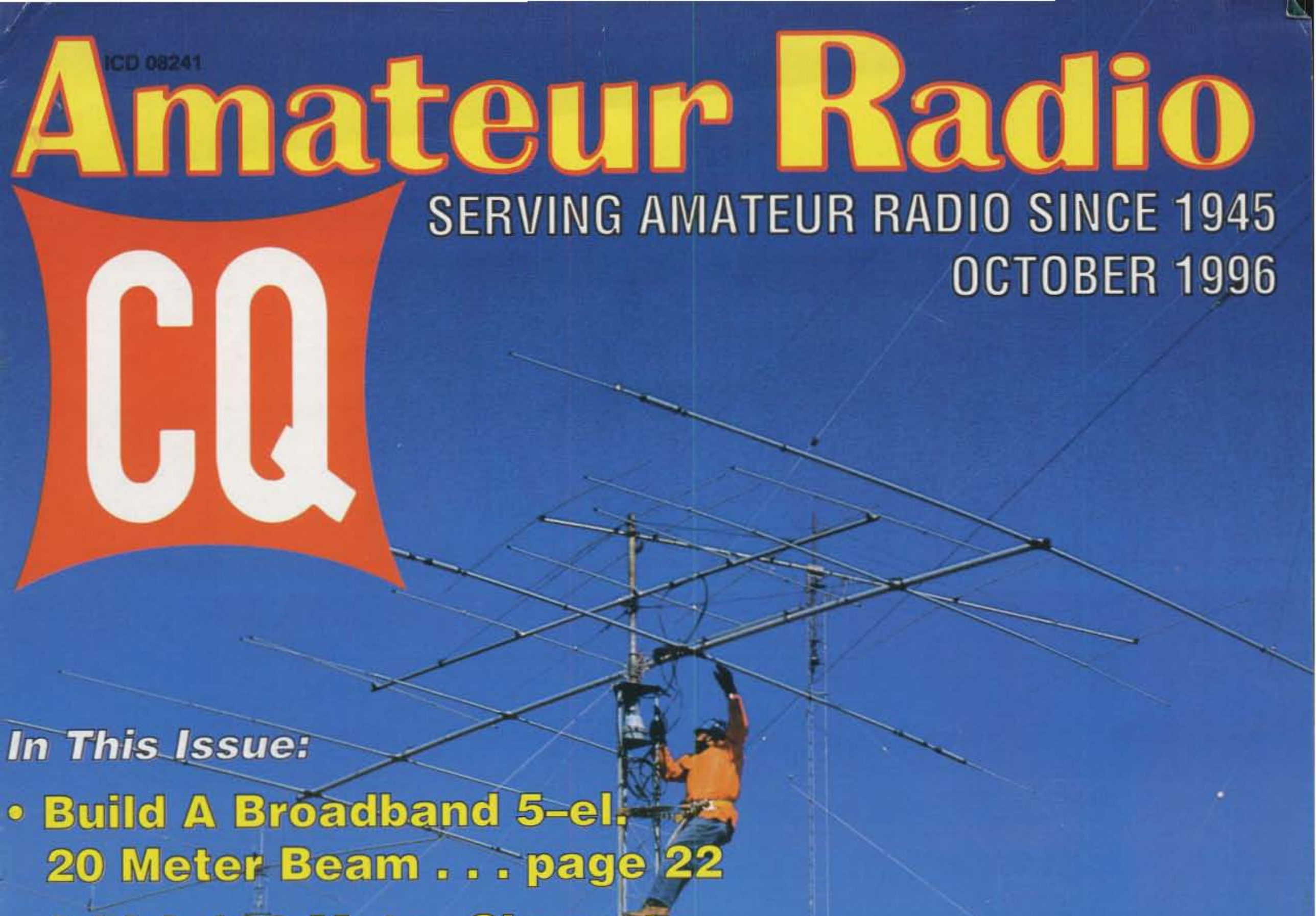
OCTOBER 1996

CQ



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- **CQ World-Wide CW DX Contest— The Complete Report . . . page 11**

Including:

- **Band–By–Band Breakdowns • Top Scores • Trophy Winners**
- **Single–Op Zone Leaders • Club Scores •**

ALSO: All Time Phone and CW Contest Records (page 86)

The Antenna Farm of Bill Smith, NF2L, Medford, NJ

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THE RADIO AMATEUR'S JOURNAL

Looking for value in Amateur Radio?

THIS IS HOW IT'S DONE.

ALINCO DX-70 HF+6 METER MOBILE/BASE/PORTABLE ALL MODE

Big performance in a small, low-cost package!

- **160 - 6 meters, all modes. Includes CTCSS for 6 and 10 meter FM repeaters.**
- **Detachable head for convenient remote mounting**
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- **Speech compressor and narrow band filter included at no extra cost**
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- **Excellent price – superior value. You get more for less from Alinco!**

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Equip your DX-70 (or other HF Radio) with the Alinco EDX-2 Automatic Antenna Tuner. Quickly tunes any antenna from 8 to 80 feet, for any band from 10 through 160 meters (minimum 40 foot wire antenna required for 160 meter use). Perfect for base, mobile or marine use. Control cable plugs directly into the popular Alinco DX-70 mobile/base HF radio; usable with other HF units. Be sure to check the low price at your favorite dealer.

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- **35A (max), 30A Continuous**
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- **Meters included at no extra cost**
- **110V and 220V AC input models available**
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Phone: (310) 618-8616 • Fax: (310) 618-8758 • Internet: http: //www.alinco.com

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Alinco DJ-S41 Big Performance—Tiny Price!

How will you use the S-41? Fits in pocket or purse, so you can always be ready to communicate. Perfect for personal communications in the great outdoors or the local shopping mall, use it simplex or through repeaters. Because it operates on the 440 MHz band, it's ideal for using through a cross-band mobile or base radio — there's no end to the fun!

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Runs on 3 AA cells, so power is always available.

Options include DC adapter, speaker mic, nicad battery pack, even a tie-pin mic and earphone with vox.

How did Alinco build so much radio for such a tiny price? Because we're the new value leader in Amateur Radio and we're out to prove it!

"BIG RADIO" FEATURES

- **21 memories**
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Full-featured 2 meter/440 performance at an amazingly low price! 50 memory channels per band, CTCSS encode, cross-band repeat, full duplex capability, an internal antenna duplexer, 9600 packet port and so much more. Up to 50 watts out on VHF, 35 watts on UHF, MARS/CAP capability (permits required), a large display, large easy-to-operate controls and easy programming make the DR-605 a very special radio. Did we mention the low price? It's so low, you can probably buy both radios in this ad for less than the cost of many other dual-band mobiles sold alone. That's value. That's Alinco—The new value leader in Amateur Radio.

DR-605T

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Specifications are subject to change without notice or obligation. Performance specifications only apply to amateur bands. Permits required for MARS/CAP use.

CQ Amateur Radio

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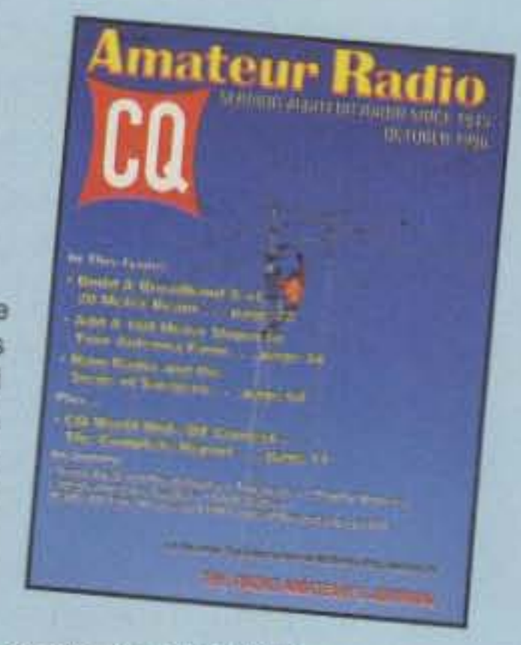
Features

Departments



ON THE COVER: At the youthful age of 59, Bill Smith, NF2L, is hardly a casual ham, as you can see by his antenna farm. His QTH is littered with five towers that support various monobanders, including a 3-el, 80 meter Yagi at 140 ft. (not pictured here) and a 3-el, full-size, 40 meter Yagi at 130 ft. Bill has been an active DXer and contester for years. Assembling some of the finest multi-op contest teams around, his station has produced nationally contending results for years. In addition to his amateur radio prowess, Bill has an intense passion for competitive bowling. Among his many accomplishments in that sport are a number of "300" perfect games. Professionally, Bill works for the State of New Jersey in the Department of Education. He is the proud father of two children, and together with his wife, Vivian, he enjoys life to its fullest! (Photo by Larry Mulvehill, WB2ZPI).

True IF-Stage DSP + Computer Programmability

The TS-870S provides a new level of HF performance. You can now pick out weak signals you've never heard before. True IF-Stage Digital Signal Processing is achieved using two 24-bit 20MIPS (Million Instructions Per Second) Motorola DSP chips providing an impressive dynamic range of 144 dB. Analog data is processed via a 10,000+ gate array device converting analog signals to digital information with amazing CW characteristics and SSB audio clarity. By capturing the signal at IF frequencies and applying complex algorithms according to personal configuration parameters, you can achieve filtering that is ***simply impossible with an analog circuit.*** Enjoy filtering sharp enough to attain over 100 dB out of band attenuation with virtually no signal loss. Imagine 70 nanosecond access time ROM devices and SRAM designed with an astonishing 25 nanosecond access time, makes the TS-870S in a class by itself for rejection of QRM and QRN. Kenwood's IF-Stage DSP design ***eliminates the need for additional expensive and inferior analog filters.*** The TS-870S let's you easily adjust the filtering system to meet your personal taste and requirements eliminating signal loss and "ring" found with conventional analog filters. All this is achieved by using Kenwood's easy to use menu system and Radio Control Program software that is included. Any operator can custom design multiple radios (CW, DX, RTTY, Packet, or Ragchewing), and save to a file for future use. The TS-870S has no competition, check for yourself.

TS-870S
HF Transceiver

Investing in a new HF transceiver is a serious decision. Kenwood has produced a clear and easy to understand, In-Depth TS-870S manual. It's yours for the asking! In our continuing role as a technology leader, Kenwood is proud to offer the TS-870S IF-Stage DSP Transceiver. The TS-870S has a full array of smooth operating features including, general coverage RX 100KHz-30MHz, full-function electronic keyer, dual antenna terminals, TX-RX auto antenna tuner (160-10M bands), auto notch, beat cancel, transmit equalizer, noise reduction, all active within the DSP processors. The TS-870S filtering system allows selectivity down to 50 Hz on CW without ringing or signal loss. Optional features like a Digital Recording Unit (DRU-3) and Voice Synthesizer (VS-2) are also available. TS-870S is truly in a class by itself.

With included PC software, build different radios on screen and save all your functions and settings to a file for future use.

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ZERO BIAS

AN EDITORIAL

Eureka! The long lost carton of cables that I carefully packed, marked, and stored away has finally surfaced! Where its odyssey took it during my shack rebuilding would be a bit too anthropomorphic to speculate on, but it came back and that's all that counts. Obviously, if I ever redo the shack again, I'll need a much bigger storage carton to hold all the new cables I bought and made. Timing in these things is everything, and I should be up and running in time for the big one at the end of the month.

Well, this is it—the event most of us have been planning for, setting goals for, and looking forward to. The CQ World-Wide SSB Contest is coming up in a few weeks. There is, of course, the smattering of groans, grimaces, and grunts to contend with, plus my anticipation of receiving "I hate contests" letters. For most of us, though, it's time to put away that oft played LP record of Simon and Garfunkle's "The Sounds of Silence" for another sunspot low and prepare ourselves for Cycle 23. Although this year might not be really great, George Jacobs, W3ASK, tells us we can expect to see High Normal conditions, which gives us a fighting chance for some bigger scores.

For most of us the CQ World-Wide is about excitement and fun. It's the chance to work all sorts of stations both near and exotic and know that everyone is keenly interested in working you. For some it's deadly serious competition with long-standing rivalries. Whether you take part for a few hours or stay with it right up to the last nanosecond, you can't help but be caught up in the rush. Hearing, recognition, selectivity, and memory become acute, and it's amazing how quickly your brain responds to the challenge. If you've never tried it, you should. You owe yourself the experience. Realistically, it's not that important (except for a few) to win, and everyone makes a fool of himself now and then, but the CQ World-Wide is a wonderful communal, world-wide amateur radio event you shouldn't miss.

If you think about it, the CQ World-Wide Contest periods are probably the only times when so many amateurs have relatively the same goal, purpose, and focus of attention. Most of our time is spent in factionalized pursuit of a myriad of vertical interests. During the non-contest period, each of us is firmly convinced that what we choose to do (and how we do it) is the only worthwhile expression of amateur radio. We also know that by doing what we choose, by extension we are the only worthwhile amateurs, the true amateurs, and obviously the most deserving. Everyone else is undeserving and is taking up "our" spectrum.

In terms of absolute numbers, contest periods (regardless of who sponsors them) bring more amateurs together for a common purpose and like mindset than any other amateur radio activity. Obviously, the amateurs who like the status quo hate contests with just about as much passion as they hate DXpeditions, which also bring out large numbers of amateurs. To them, all of this is meaningless activity which takes up all available spectrum. This translates into "This is not real amateur radio to me, and it keeps me from pursuing my vision of what *real* amateur radio should be." Well, they're just about as right as the great numbers who take part in contests and DXpeditions. Each of us, no matter how we cloak it, is searching for the illusory concept of fun, enjoyment, and a sense of accomplishment. For a lot of us, this dichotomy only occasionally passes through what the rest of us or the rest of the non-amateur world would consider real life.

If you're not one of the several hundred thousand people around the world who are anxiously awaiting the start of the contest, don't worry about it. It might be a good chance for you to lower your stress level by getting out of the shack for a while, enjoying some fresh air, talking to the family (maybe even taking them out to dinner), catching up on your sleep, and possibly reacquainting yourself with some folks who rarely see you and thought you had moved. I know you don't understand why all these people insist on taking part in this activity, but I'm sure there are people who don't understand all the good things that you do, too. At the moment I can think of two good friends of mine who really enjoy fishing—a sport I can't see myself doing or enjoying. It's a whole ritual, much like amateur radio, with equipment, designated times for specific fish, and an expertise built up over time. Well, they get up early, meet, and drive to a lake. They launch a small boat and fish all day into the evening. They catch fish, record all the pertinent data (including the lure used), and then release the fish. No, they don't keep, kill, or eat the fish they catch. So after all these years, even though Arnie says the fish like it, I can't figure out why they do it or why I would want to either. I do know my friends like it, enjoy a day out and away from the everyday cares, and look forward to going again.

I can see the parallels between fishing and contesting, the latter being a sport I enjoy. You can spend a day or two away from the everyday cares of the world, you can use and manipulate exotic equipment, and you can develop skills and expertise over time. In the long run it doesn't matter what you "catch," whether it's a record or a trophy; it's very enjoyable just to take part. Like my friends, I compare my scores and efforts year to year, and generally I find myself competing against myself rather than against anyone else. I also know that some of my friends don't understand contests or amateur radio and wonder why I enjoy it and have fun doing what seems meaningless to them.

So what is it about this "meaningless" activity called contesting that makes hundreds of thousands of people throughout the world sit up and take notice? True, during these periods there is little or no spectrum space available to hold a discourse on one's ailments or petty hatreds, to discuss solutions to world problems, or simply to exchange banal chitchat. All of that generally is replaced with a cacophony of signal reports and exchanges. There is a certain definite thrill of hearing your own call through that sea of noise, even at breakneck speed. There's an immense satisfaction in being able to pick out someone else's call and have it be a new one or a new multiplier. Maybe it's the atavistic thrill of the hunt or the ability to focus one's senses that heightens the whole experience.

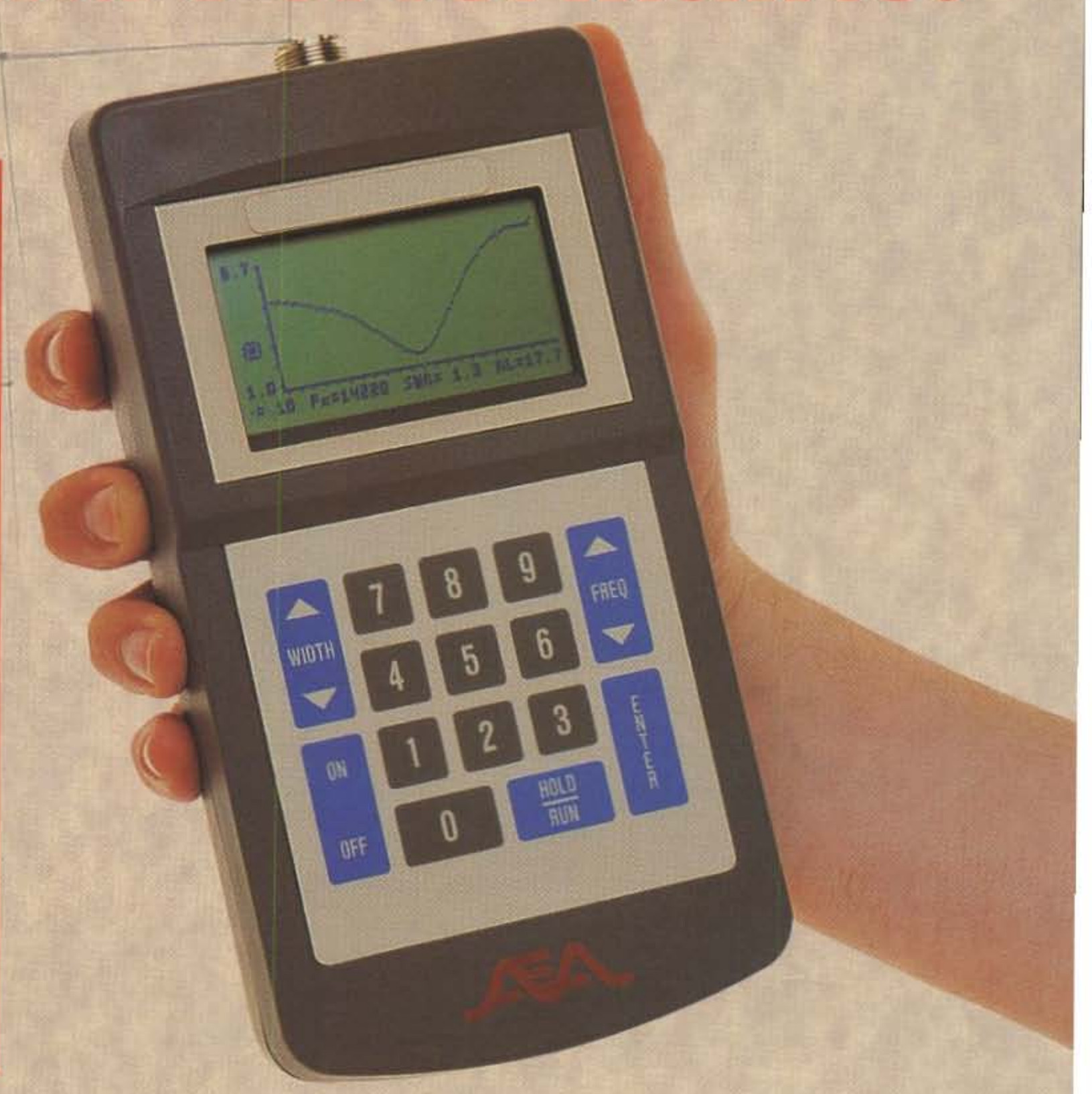
With so many people taking part, the ability to think fast, act fast, and move on becomes very important. Preparation and the facility for quick field repairs becomes invaluable. Do these skills become transferable to real-life situations? For some of us they do, or maybe that's just the way we are. For some of us it is simply testing the waters to see how competitive we really are. The answer can be surprising. For most of us it's the only way we are going to work some stations we've heard about or only read about. Some contests, especially the CQ World-Wide, are a test bed for a new logging program or a bit of new technology, always looking for that edge.

The plain and simple truth is most of what I can cite or what the most avid contester can put forth is basically a rationalization. The plain and simple truth is the whole thing is a lot of fun. Most of us have been conditioned upon receipt of our license to give up fun and become serious in everything we do related to amateur radio. Believe me, the whole thing is a lot of fun. Think about it. If it wasn't a lot of fun, we'd have maybe three or four guys at best enter any contest, and it would be over in less than a minute. The only time you have to get really serious about any of this is if suddenly you have a notion that you can win some part of this at some level. This thought has been known to occur to most people after a few contests. You can always choose to ignore the fact that you might be having a good time.

Spend some time, take a chance, and see what everyone else is experiencing. You don't have to win anything to have a great time. Just be there to see what it's like. An amazing number of people all get together at the same time for one big party, and you're invited. It doesn't get much better than this, except at a sunspot high.

73, Alan, K2EEK

Get a Grip on Antenna Performance!



Antenna Analyst Features

- Measures SWR and calculates coax line loss.
- Graphs SWR vs. bandwidth over your selected range.
- Displays results of antenna adjustments on-the-spot.
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- Works with 50 or 75 ohm antennas.
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Tuning antennas for lowest SWR in your favorite operating range could be a lengthy check-adjust-and recheck results procedure, but AEA's Antenna Analyst™ makes the process a cinch. Simply enter any desired frequency and bandwidth on its keypad, connect your antenna, and the full SWR curve (plus return loss of coax) appears right on the display. The Analyst is battery powered so you can use it anywhere: atop a tower, at an antenna's base, or in the shack. It works with beams, verticals, dipoles, and mobile antennas of all types. Optional software and cable lets you save and print SWR curves on an IBM-compatible computer. A versatile instrument you will appreciate using year after year, antenna after antenna, at home, mobile, or portable. Get an AEA Analyst and ensure your rig never again experiences reduced output power due to high SWR!

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ANNOUNCEMENTS

• **The 1996 Military Mail Campaign** is underway. Morale-boosting cards and letters from all over the United States are intermingled and made up into packages and sent via priority mail to people in the Armed Forces around the world. To learn how to take part in this program, send your name, address, and a first-class stamp for return postage (no SASEs) to Military Mail, P.O. Box 339, Soldier, KY 41173.

• **Bird Electronic Corporation** has announced eleven winners in their year-long contest, QUEST 43. QUEST 43 was held to locate the oldest working Model 43 Thruline® Wattmeter. The announcement of Grand Prize Winner, Justin Dennis, KAØHKV was made at this year's show. Bird displayed Justin's wattmeter, serial number 71, which was produced in 1952 and continues to deliver accurate RF power measurements 44 years later. Justin received a 24 kt gold-plated Model 43 wattmeter, a $1000 gift certificate, and a brand new Model 43. Ten runner-up prizes were also announced.

•**FAR Scholarship Recipients Announced** – The Foundation for Amateur Radio, Inc. announced the 1996 winners for the 56 scholarships it administers. The scholarships were open to all licensed radio amateurs meeting the qualifications and residence requirements of the various sponsors. Announcement of the 1997 awards will appear early in 1997. FAR Scholarships' address is 6903 Rhode Island Ave., College Park, MD 20740.

•**These Special Events are slated for October:**

W3XX, from centennial of the Carnegie Science Center, *U.S.S. Requin,* Pittsburgh, Pennsylvania; Breezeshooters ARC; 1400–2100Z Oct. 6; operating vintage CW equipment in 40 meter Novice band and Novice portions of 10 and 15 meters, conditions permitting; phone in General segment of 20 and 40 meters. For certificate and QSL send QSL and 8½ × 11 SASE to Jack Buzon, KA3HPM, 47 Grubbs Rd., Cheswick, PA 15024.

KE4ZIS, from The Devil's Courthouse, Transylvania County, North Carolina; Transylvania County ARC; 1900Z Halloween, Oct. 31, to 0100Z Nov. 1; SSB 7.237, 14.295, 21.365, and 28.335, and 146.52 FM simplex. For certificate send business-size or 9 × 12 SASE to TCARC, P.O. Box 643, Brevard, NC 28712.

W4D, from 25th anniversary of Walt Disney World, Orlando, Florida; 9 AM to park closing, Oct. 1; CW 15 and 40 meters, SSB 20 and 75 meters. For special QSL send SASE to Colin Wilson, KD4QFT, 16605 Cordoba St., Winter Garden, FL 34787.

WB4TON, from Broward County Historical Commission Pioneer Days, Hollywood, Florida; Hollywood ARC; 1300–2100Z Oct. 19 & 20; General 40–10 and Novice 28.400. For certificate send SASE to Hollywood ARC, 720 N. 71st Ave., Hollywood, FL 33024.

5- and 7-land, from 7th annual Missionfest for all Christian missionaries and their supporters, etc., co-sponsored by Christ Lutheran Church of Wichita Falls, Texas, and Elim Lutheran of Lake Stevens, Washington; 0800–2200 Pacific time on 28.480, 21.340, 14.340, 7.260 MHz (±QRM). For QSL certficate or more info contact Mike Crowell, N5UJA, 206-334-2540, or write c/o MissionFest, Elim Lutheran Church, Box 318, Lake Stevens, WA 98258.

AC5BI, from centennial anniversary of the founding of Mena, Arkansas and building of the Kansas City Southern Railroad; Ouachita ARA; 1400–2200Z Oct. 18–19; in 80–40 meter phone bands. For QSL send QSL and #10 SASE to L. J. Brewer, Jr., AC5BI, 268 Polk 36, Hatfield, AR 71945.

KC5SJX, from Duncanville Hamfest, Duncanville, Texas; South West Dallas County ARC; 1300–2300Z Oct. 19; General portion of 80, 40, 20, 15 meter phone and CW subbands and Novice 10 meters phone and CW subband. For QSL send QSL and SASE to SWDCARC, P.O. Box 381023, Duncanville, TX 75116.

KE5TC, from *USS Batfish* WWII submarine, Muskogee, Oklahoma; Ft. Smith ARC; 1400–2130Z Oct. 12 and 1600–2130Z Oct. 13; on 14.250 and 7.240 phone. For QSL send SASE to Royce Rainwater, KE5TC, P.O. Box 236, Keota, OK 74941.

N6SFV, from Edwards AFB Open House and Air Show, Edwards AFB, California; MARS Base Support Team; 1400Z Oct. 19 to 0200Z Oct. 20; on 7.265, 14.265, 21.365 MHz ±QRM and 6 and 2 meters SSB. QSL with SAE to WA6NKL, P.O. Box 874, Acton, CA 93510.

WV7T, from U.S. Navy's 221st birthday celebration, U.S. Naval Training Center, Great Lakes, Illinois; Great Lakes ARC; 0000Z Oct. 12 through 2359Z Oct. 14; 80–10 meters CW, SSB, RTTY. Include contact number on QSL. For certificate send QSL and SASE or IRCs to Great Lakes ARC, 2072-A Langley Street, Great Lakes, IL 60088.

8-land, from U.P.200 Sleddog Race, Marquette, Michigan; Hiawatha ARC; Oct. 16–18 *(no times or call given)*; on 10, 15, 20, 40 meters. For certificate send SASE to N8GBA, 21 Smith Ln., Marquette, MI 49855.

W8DZ, from 60th anniversary of the founding of Greater Cincinnati ARA; greater Cincinnati, Ohio area; 0000Z Oct. 13 through 2400Z Oct. 20; on 1.936 MHz, 28.480 MHz, and +25 kHz from other band edges. QSL with SASE to K8JE, P.O. Box 40201, Forest Park, OH 45240.

KBØVGA, from Nowhere, Illinois; Iowa Radiosport Society; 1400–2100Z Oct. 19; in lower portion of General 40 and 20 meter phone subbands. For photo QSL send SASE to P.O. Box 68, Burlington, IA 52601-0068.

KCØGL, from Baldwin City Maple Leaf Festival, Nowhere, Kansas; 1400–2100Z Oct. 19 on 40–10 meters; and /Railroad Mobile aboard the Midland Historical Railway Caboose enroute bewteen Baldwin City and Nowhere. For certificate send QSL and SASE to Ken Blair, 1711 West 19th St. Terrace, Lawrence, KS 66046.

OS4CLM, from Canadian Week/Canadian Liberation March ceremonies, Knokke, Heist, Belgium; BFARA, RNARS, BYLC, and IPA; Oct. 25 to Nov. 3; SSB 3.685, 7.045, 14.145, 21.245, 28.545, 144.250 MHz; CW 3.515, 7.012, 14.020, 21.020, 28.020, 144.020; FM 145.475 and packet OS4CLM@ON4KTK. For certificate and QSL send ($5 US, no checks please) to OS4CLM, Postbus 110, B-8300 Knokke, Heist, Belgium. For more information, contact Bob Dyserinck, ONL 453 (N1TBH), Vuurtorenstraat 12, B-8301 Heist aan Zee, Belgium.

•**The following hamfests, etc., are slated for Oct.:**

Oct. 4–5, **Northwest Arkansas ARC Hamfest '96**, Jones Center for Families, Springdale, Arkansas. Contact Northwest Arkansas ARC, P.O. Box 673, Springdale, AR 72765-0673, or call Sherri Hyde, 501-524-4797. (VE exams call Mike Diaz, KJ5OP, 501-524-8090.)

Oct. 4–5, **International QCWA Convention**, Citadel Inn hotel, Ottawa, Canada. For a registration form call 1-800-481-4649, or the Internet QCWA page at <http://www.efn.org/~qcwa>.

Oct. 5, **York County ARS Hamfest**, Knights Stadium, Fort Mill, South Carolina. Contact George Trunk, AB4BG, 803-327-4344. (Exams.)

Oct. 5, **North Central Indiana Hamfest**; Miami Co., Indiana Fairgrounds, near Peru, Indiana. Contact North Central Indiana Hamfest, c/o Cass Co. ARC, P.O. Box 1092, Logansport, IN 46947.

Oct. 5, **Hamilton ARC Fleamarket '96 Amateur Computer & Electronic Show**, Marrit Hall (Ancaster Fair Grounds), on Hwy #53, Ontario, Canada. Contact Hamilton Amateur Radio Club, c/o 13 Puritan Crt., Stoney Creek, ON Canada L8E 4K9. Vendor info by fax only 905-664-2801.

Oct. 5, **Temple, Texas ARC Ham Expo**, Bell County Expo Center, Belton, Texas. Contact Mike LeFan, WA5EQQ, telephone 817-773-3590, or e-mail <mlefan@vvm.com>. (Exams at 1 PM.)

Oct. 5, **20th Annual Mid Atlantic States VHF Conference**, Horsham Days Inn, Horsham, Pennsylvania. Contact John Sorter, KB3XG, 1214 N. Trooper Road, Norristown, PA 19403 (telephone 610-584-2489; or e-mail <johnkb3xg@aol.com>.

Oct. 5, **Boaz, Alabama Hamfest,** VFW Fairgrounds, Boaz Alabama. Call Buddy Smith, KC4URL, 205-593-2516, or write to Marshall County ARC, P.O. Box 2811, Albertville, AL 35950.

Oct. 6, **8th Annual Huntington County ARS Hamfest**, PAL (Police Athletic League) Club, Huntington, Indiana. Contact Ray Tackett, P.O. Box 284, Huntington, IN 46750 (219-786-0057). (Exams.)

Oct. 10–13, **Bakersfield ARA 3rd Annual Hamfest**, Costerian Lake, south of Bakersfield, California. Contact Robert Gerner, Jr., 805-588-7065, or write to BARA Hamfest, P.O. Box 80222, Bakersfield, CA 93380-1222. (Exams.)

Oct. 11–13, **1996 Gulf Coast Ham Convention**, Humble Convention Center, Houston, Texas. Contact Gulf Coast Ham Convention, Inc., P.O. Box 890307, Houston, TX 77289-0307 (1-800-231-3057).

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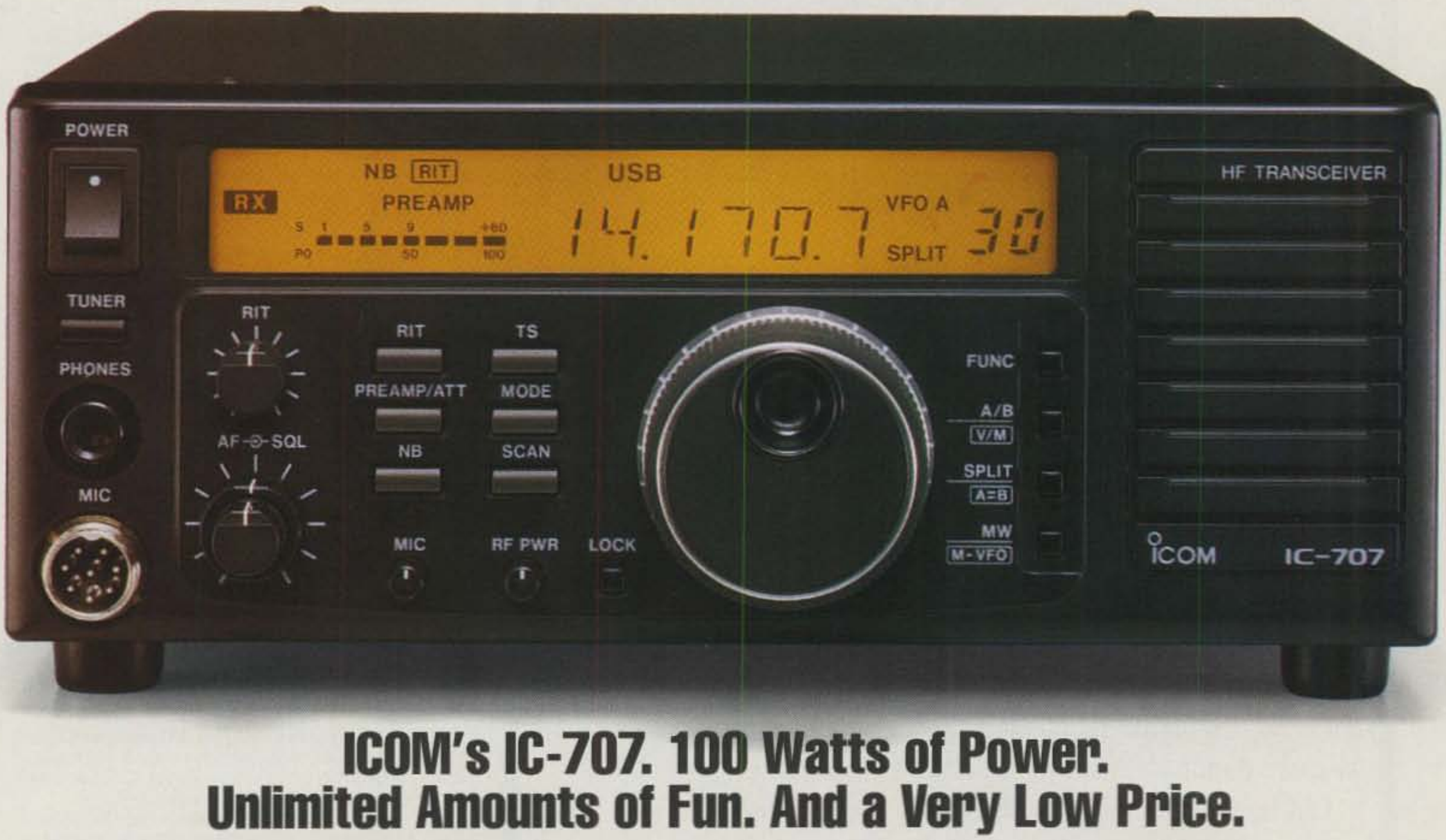

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Oct. 12, **Bergen ARA Fall Hamfest**, Fairleigh Dickinson University, Teaneck, New Jersey. Call Jim Joyce, K2ZO, 201-664-6725 before 10 PM. (Exams.)

Oct. 12, **Thunder ARC Hamfest**, Hinks Elementary School, 7 miles north of Alpena on US 23N, Michigan. Contact Tom, K8CHS, 517-354-2469. (Exams 1 PM.)

Oct. 12–13, **Memfest 1996, Greater Memphis Amateur Radio & Computer Show**, Shelby Farms Show Place Arena, Germantown, Tennessee. Contact Mary Moore, AC4GF, 901-758-0661 (fax 751-6717). (Exams Sat. and Sun. until 11 AM.)

Oct. 12–13, **Lexington Computer Fair**, Heritage Hall, Lexington, Kentucky. Call 513-263-3378.

Oct. 13, **Hall of Science ARC Hamfest**, Hall of Science, Flushing Meadow Park, Queens, New York. Call Arnie Schiffman, WB2YXB, 718-343-0172 (eves. only).

Oct. 13, **Hamfest of the Chicago ARC**, Oakbrook Terrace, Illinois. Contact George at 312-545-3622 or Dean at 708-331-7764, or write to CARC, 5631 W. Irving Pk. Rd., Chicago, IL 60634.

Oct. 13, **LCDRA & CMARC HamFair**, Ingham County Fairgrounds, near Mason, Michigan. Contact Jeff Oberg, KB8SXK, 517-393-4713 or LCDRA, P.O. Box 80106, Lansing, MI 48908.

Oct. 13, **Shore Area Hamfest/ARRL NJ State Convention**, Brookdale Community College, Lincroft, New Jersey. Contact Al Jackson, NK2O, Shore Area Hamfest, P.O. Box 635, Eatontown, NJ 07724 (908-922-8121). (Exams—call for schedule.)

Oct. 13, **Lima, Ohio Hamfest & Computer Show**, Allen County Fairgrounds, Lima, Ohio. Contact NOARC, P.O. Box 211, Lima, OH 45802. (Exams at 9 AM paperwork at 8 AM, preregistration required. Send completed FCC form 610, copy of old license, check for $6.05 made out to NOARC, and SASE to: License, c/o NOARC, P.O. Box 211, Lima, OH 45802.)

Oct. 13, **1996 Nutmeg Hamfest, Computer Show, & ARRL Connecticut State Convention**, Durham Fairgrounds, Durham, Connecticut. For info packet <W1KKF@W1NRG.CT.USA.NA> or e-mail <sbicycle@connix.com>. (Exams, preregister contact Joel Curneal, N1JEO, 203-235-6932.)

Oct. 18–20, **Pacificon '96**, Concord Hilton, Concord, California. Contact Pacificon '96, P.O. Box 272613, Concord, CA 94527-6125 (phone 510-932-6123; e-mail <pacificon@designlink.com>). (Exams 9 AM.)

Oct. 19, **Fort Venango Mike & Key Club Ham-Auction**, Christian Life Academy, Seneca, Pennsylvania. Contact Mary Housholder, N3QCR, 121 N. Front St., Franklin, PA 16323 (telephone 814-437-2036; packet:< N3QCR@WA#ZCA.#NWPA>; e-mail: <mahoushold@aol.com>.

Oct. 19–20, **Palm Beach County Hamfest, Amateur Radio & Computer Show**, South Florida Fairgrounds, West Palm Beach, Florida. Contact Vi Kiekenapp, 561-585-9074. (Exams both days 9 AM.)

Oct. 19–20, **Ninth International Hamfiesta**, National Guard Armory, El Paso, Texas. Contact The International Hamfiesta, P.O. Box 10496, El Paso, TX 79995.

Oct. 20, **USECA Swap**, OLR Conference Center, Warren, Michigan. Contact Kevin, N8QVX, 810-636-3414. (Exam preregistration call Bill, N8CVC, 810-468-8345.)

Oct. 20, **Kalamazoo Hamfest**, Kalamazoo County Fairgrounds, Kalamazoo, Michigan. Call 616-657-4482.

Oct. 20, **Centralia Wireless Assn. Hamfest**, Salem Community Activity Center, Salem, Illinois. Contact Centralia Wireless Assn., Inc., P.O. Box 1166, Centralia, IL 62801, or call Daisy King, AA9EK, 618-532-6606. (Exams.)

Oct. 20, **Sellersville Hamfest**, Sellersville Fire House, Sellersville, Pennsylvania. Contact Linda Erdman, 215-679-5764, or P.O. Box 29, Colmar, PA 18915. (Exams 9 AM.)

Oct. 20, **Greensburg Hamfest**, Greensburg Hose Company #1, Greensburg, Pennsylvania. Contact Al Compton, N3LQX, 412-523-3727.

Oct. 20, **HAMEXPO 96/ARRL Hudson Div. Convention**, Huntington Hilton Hotel, Melville, New York. Contact Radio Central ARC, P.O. Box 680, Miller Place, NY 11764; or call Joann, N2IME, at 516-399-1877; or e-mail <n2mdq@li.net>. (Exams.)

Oct. 20, **1996 Rocky Mountain Radio League Hamfest**, Jefferson County Fairgrounds, Golden, Colorado. Contact Joe Dickinson, WTØC, 303-771-9577. (Exams.)

Oct. 26, **SWAP-TOBERFEST, ARES/RACES Convention**, Polk County Fairgrounds, Rickreall, Oregon. Contact Evan Burroughs, N7IFJ, 503-585-5924, or e-mail <http://www.teleport.com/~n7ifj>. (Exams, preregistrationrequired.)

Oct. 26, **Halloween Hamfest**, St. Louis, Missouri West County Tech.Contact Keith, NØKFE, 314-832-8895, or write to 8427 Mathilda Ave., St. Louis, MO 63123.

Oct. 26, **Sumter ARA 10th Annual Hamfest & Computer Fair**, Sumter County Exhibition Center, Sumter, South Carolina. Contact Steve Bregger, KD4HTS, P.O. Box 52302, Shaw AFB, SC 29152-0302 (803-953-4251), or Mike Dunlap, 803-481-4611.

Oct. 26, **Hamfest Minnesota & Computer Expo**, Main Arena, St. Paul Civic Center, St. Paul, Minnesota. Contact Hamfest Minnesota & Computer Expo, P.O. Box 5598, Hopkins, MN 55343, or call 612-535-0637. (Exams Friday night.)

Oct. 26, **Lakeshore Hamfest & Computer Expo**, Holland Christian High School, Holland, Michigan. Call 616-72-0367, or write Peter Venlet, 536 Huizenga St. Zeeland, MI 49464-1423. (Exams.)

Oct. 26–27, **Hamfest Chattanooga**, Camp Jordan, Chattanooga, Tennessee. Contact Hamfest Chattanooga, P.O. Box 3377, Chattanooga, TN 37406. (Exams Sat. 1 PM and Sun. 12 noon.)

Oct. 27, **Penn Wireless Assn. Tradefest '96**, Bucks County Community College, Newtown, Pennsylvania. Call Steve, 215-752-1202 or e-mail to <sewall@mciunix.mciu.k12.pa.us> or <http://www.perljam.com/~perljam/pwa>.

Oct. 27, **Marion ARC 22nd Annual HamFiesta & Computer Show**, Marion County Fairgrounds coliseum, Marion, Ohio. Contact Karen Eckard, N8JDH, 6583 So. Street, Meeker, OH 43302 (614-499-3565).

Oct. 27, **7th Annual Mason-Dixon Computer & Hamfest**, Carroll County Ag Center, Westminster, Maryland. Contact George Johns, N3JKY, 717-632-1621. (Exams, preregistration requested, contact Bill Wolfgang, NZ3J, 717-359-7095.)

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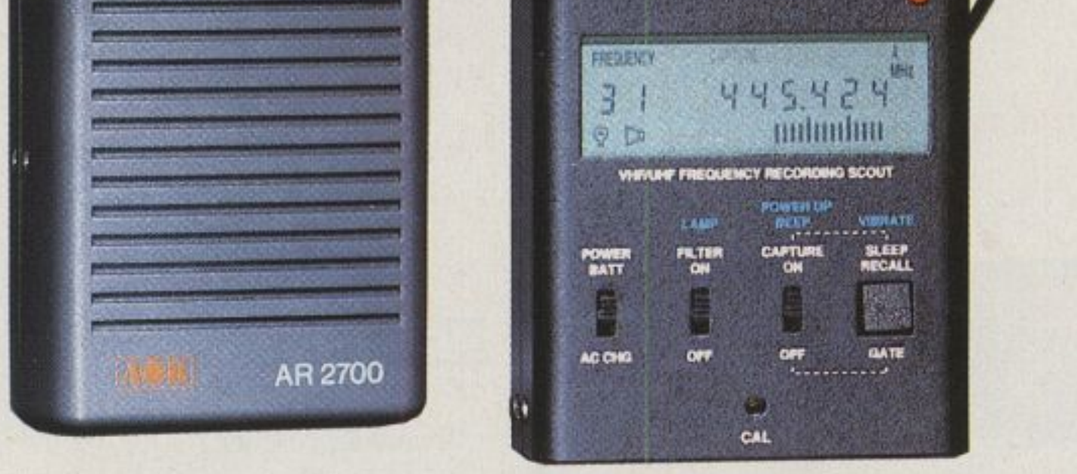

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Results of the 1995 CQ World-Wide DX CW Contest

BY BOB COX*, K3EST

The sunspots were gone, the weather was changing and the CQ WW CW took place. The 1995 contest will be remembered as the year when 160 meters was fantastic and 10 meters was almost completely dead. The low bands were alive with activity. Several entrants had country totals in the high 80s to 90s on 160 meters!

Contesters had their stations ready to take advantage of good conditions. Many enthusiasts traveled to distant lands to put rare places on the air. Can any contester or DXer remember when two stations from Burma could be found very active on the air (XZ1A and XY1HT)? To name some of the more exotic DXpeditions makes for quite a list: AHØT, 3V8BB, 3W5FM, 3B8/N6ZZ, 3DAØNX, J45T, AP2NY, 7Z5OO, TY5A, HC8N, 4S7TWB, ZK1TB, FOØZR, TX8FU, TA4ZM, ZD8Z, C4A, VK9XH, ZL7CW/PYD, T32BE, 9M6NA, HKØ/DL4MEH, A71CW, A61AF, XV7SW, IG9R,A,T, TK2C, VP5FOC, 4M5X, ZF2JI, ZF2RF, EX/RU1AO, HSØ/SM3CVM, 4UØITU, 3A/K1VWL, V47KP, 8R1K, 9Y4H, PYØFF, V73WP, ZB2X, CT9U/X, VP2EFO P4ØW, P4ØJ, and P49V. Perhaps the contester who traveled the most between the SSB and CW WW weekends was N6AA. Dick went from JT1Z (SSB) to Zone 2 (CW) via Australia!

VK9XH operated by JA1CMD got into a lot of logs.

Single Operator

Traveling down to EA8 has become a cottage industry for OH2MM. Ville took full advantage of his skill and location to key himself into first place in the world. Sitting inside a converted water cistern without windows, he started preparing himself several days before the contest by shifting his sleeping habits so that at the starting bell, which occurs at midnight, he would be refreshed and ready to go.

Second place went to another frequent flyer, Jose, CT1BOH, who traveled down to Recife and the over to Fernando de Noronha to activate the QTH of PYØFF. Looking at the top ten world scores reveals that working three pointers really makes a difference.

With one exception, A92Q, all the top ten world scores were DXpeditions. Thanks for making the contest more interesting!

In the USA, W1KM took top honors from his QTH in the salt marshes of southeastern Massachusetts. His 80 meter score points out the advantage of a salt-water ground. The battle for second place was fierce. Only 186K separated second and fourth place. Putting his phased tribanders to good use was Dean, N6BV/1, who took second place USA.

The battle for top score in Europe was equally tough. After all the dust settled, OM8A had put the Slovak Republic on the map by ending up at the top, with GIØKOW finishing second. There were five stations from the Balkans in the top ten European list. Further north, OH6WZ pushed his keyboard to the top Scandanavian spot.

*1816 Poplar Lane, Davis, CA 95616

Low Power

The top three all band low power winners would be good DX catches on any day. Catching them in the CQ WW makes it much more fun. The top all band honors went to 9X4WW, Mark, ON4WW, who is working in central Africa for the UN trying to help out the people in that war-torn area. Not only did he make a lot of participants happy, he set a new all-time low power record in the process. His rival was 7Q7A, who also was on a goodwill mission by working for the JOVC, an organization somewhat similar to the US Peace Corp. Third place went to TA4ZM, DK5WL operating from Asiatic Turkey.

It was just last year that we requested increased participation in the Low Power category in the USA, and you sure heard us! The competition is now just packed solid. After knocking on the door for the last two years running, K2SG finally did it. Tony amassed an overwhelming lead in the QSO Total department, beating out challenger KR2Q by 250 contacts! After getting stung himself, K2SG finally hit the right balance of QSOs versus Multipliers; so despite Doug's 3Ø multiplier lead, it was only good enough for second place. And the story was the same for third-place finisher K7SV. Although Larry worked even more mults than KR2Q (and 63 more than K2SG!), KR2Q's larger QSO Total again proved to be the deciding factor. Congratulations to all three for a fine job during a closely fought battle, and especially to K2SG, who now adds a CW win to last year's SSB victory.

In Europe EA7CEZ repeated as the top low power champ. His modest station and skill brought him the Europe trophy. Second place went to US1E, a member of the dynamic and growing Ukrainian Contest Club.

QRP

The QRP category continues to uphold its popularity with four continents represented in the top five finishers. The winner in '95 was DL2HBX. Ulrich, using antennas up 60 meters on a building, and a pair of transceivers, managed over 1000 QSOs to finish with over 715k. Taking second in the world, and first USA, was Randy, AA2U, with a score of over 600k. Randy is now entering the world of CQ WW "dynasty" designation, as this is his sixth consecutive win on CW. Not too many stations can say that! There is W1FV with nine consecutive wins (80 meters CW USA, '83–'91), LU1DAB (10 meters SSB, '60–'67), K1PBW (160 meters CW USA, '74–'79), and N6AA (World, Single Op All Band, '80–'86 from 9Y4 and EA8). AA2U is cer-

tainly in good company. Congratulations, Randy. Just three more to go!

Grabbing the third-place world position was PV2U, operated by Jose, PY2OU. Using just an Index Labs QRP-plus, a tribander, and 2-element 40, Jose put Sao Paulo on the QRP map with a fine showing of just over 560k.

The only other QRP station to break the 1000 QSO barrier, and in fourth position, was Gediminas, LY3BA, with a score of 540k. And rounding out the world top five was JA6GCE, representing both Japan and Asia as our fourth continent. Nobuo ended up with 438k. Congratulations to all the QRP winners.

Assisted

The assisted category is tough. You cannot get caught up in the never-ending spots. If you do, your rate falls way down and you will not do very well. A clever assisted entrant therefore makes little use of packet. The guy who continues to lead the way in this category is Chas, K3WW. Not only is he a dentist and FRC sparkplug, he also has won for the world. The top four assisted world winners were all from the FRC area: K3WW, K2WK, K2TW, and N3AD. Congratulations on your efforts.

A reminder about packet: If you use packet in **any** way to help your score, you are assisted and **must** indicate that on your cover sheet.

Multi-Single

The competition began with two stations trying to break the CW multi-single record. One group headed down to HC8, where they overcame generator problems to make more points than ever before in the history of the CQ WW for the multi-single category. And they did it without *any* Europeans on 10 meters. HC8 is sure an ideal QTH. You get the US propagation better than P4 or PJ, and your shot to JA is much better than that from zone 9. The only downside is that you are a skip farther west from Europe.

OH2MM operating at EA8EA was the world high score. Here he drinks his secret stay-awake formula.

Finishing in second place was the team of 4M5X. Operating from just outside of Caracas, 4M5X did an outstanding job. The team also worked no Europeans on 10 meters! Ten meters is mentioned because I can never remember a Caribbean/South American station not working Europe. It was a real dead band.

The competition in Europe was very close. The team from the operating cave at Mt. Capra (it really is a cave), IQ4A, just edged out the splendid effort from the Balearic Islands, EA6IB. Rounding out the top three was DFØHQ, formally of Y34K fame. Toiling against a partial faraday cage in the sky, OH2HE did a fine job.

In the US, K1AR operating from K1EA's QTH blew away the competition and almost beat their old multi-single US record. The fight for second through fourth place was close, with N3RS, N2NU, and K1DG finishing in that order.

Finishing just out of the world top six box was the Japan Crazy Contester team at AHØT. They made a fantastic effort from a long way away from the USA and Europe. The effort from 3V8BB was well received by all. These enthusiastic Tunisian amateurs and DXpeditioners will be back from a new 3V8 QTH this year.

Multi-Multi

Traveling overland from 9G, the Voodoo contest club made their way through various obstacles to arrive at TY1PS's QTH. Located very near the water, the team worked hard to set up a station that could hand out the rare TY CW QSO. The Voodoo guys finished first in the world from another African country. They plan to head out again this year to another rare African destination. Good luck! Second place went to the DXpedition effort from the Bavarian Contest Club.

Heading down to TK makes for a lot of happy contesters who ended up with TK in their logs. Very close behind TK2C was the famous 9A1A contest team. Operating from a school house in the mountains near Zagreb, this fine crew once again proved that you can be loud and still hear almost everything that calls you.

The juggling of top position in the US multi-multi struggle found N2RM once again at the head of the class. Operating from their rustic QTH, the team made excellent use of their limited space to edge out W3LPL farther south. The flag carrier of the PVRC will be hard to top this year with 15 towers up in the air.

The top score from Japan was the Mt. RF gang from Nara, JA3ZOH. Operating from a hilltop in a green-tea plantation made for a winning combination. Farther north in latitude was NL7G, who made a terrific score from the land

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Donor: Gene Walsh, N2AA

U.S.A
Gregory Cronin, W1KM
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Donor: North Coast Contesters

U.S.A. Zone 3
W7RM (Opr. Michael Conatore, AA7NX)
Donor: Bill Fisher, KM9P

U.S.A. Zone 4
Mike Wetzel, W9RE
Donor: Dennis O'Connor, K8DO

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Caribbean/C.A.
8P9Z (Opr. John Laney III, K4BAI)
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OM8A
Donor: Edward Bissell, W3AU

Europe Low Power
Angel Martinez Claus, EA7CEZ
Donor: Scott Jones, WR3G, & Tim Duffy, K3LR

Africa
ZD8Z (Opr. Jim Neiger, N6TJ)
Donor: Gordon Marshall, W6RR

Asia
C4A (Opr. Peter Grillo, AH3C)
Donor: Chuck Shinn, W7MAP

Japan
Satoshi Hara, JH5FXP
Donor: Japan Crazy Contesters Club

Oceania
Mirowslaw Rozbicki, VK3DXI
Donor: Peahi Contest Club

South America
PYØFF (Opr. Jose Carlos Cardoso Nunes, CT1BOH)
Donor: Venezuela DX Club

SINGLE OPERATOR, SINGLE BAND
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Donor: Joel Chalmers, KG6DX

World—21 MHz
ZW5B (Opr. Arturo Gargarella, LU6ETB)
Donor: Don Busick, K5AAD
(N5JJ Memorial)

World—14 MHz
9M6NA (Opr. Saty Nakamura, JE1JKL)
Donor: North Jersey DX Assn.
(W2JT Memorial)

World—7 MHz
YV5A (Opr. Olli Rissanen, OHØXX)
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World—3.5 MHz
John Devoldere, ON4UN
Donor: Fred Capossela, K6SSS

World—1.8 MHz
OHØMEP
Donor: Kenneth Byers, Jr., K4TEA

USA—28 MHz
Melvin Brafford, W4YV
Donor: Michael Conatore, AA7NX

USA—21 MHz
John Taylor, K5MR
Donor: Wayne Carroll, W4MPY

USA—14 MHz
Dave Donnelly, K2SS/1
Donor: Northern Illinois DX Assn.

USA—7 MHz
WØUN (Opr. George Schultz, WØUA)
Donor: Jan Perkins, N6AW
(W6AM Memorial)

USA—3.5 MHz
Robye L. Lahlum, W1MK
Donor: Bill Feidt, NG3K

USA—1.8 MHz
Jeffrey Briggs, K1ZM
Donor: Peter Hutter, WW2Y

Canada (14 MHz)
VE6JY (Opr. Gary Caldwell, VE6WQ)
Donor: Radio Amateurs of Canada

Carib./C.A. (7 MHz)
TE1C (Opr. Carlos Fonseca, TI2CF)
Donor: Snake River Contest Club

Europe—28 MHz
Arpad Berke, S51AY
Donor: John Pryor, K4OGG

Europe—21 MHz
Tine Brajnik, S5ØA
Donor: Robert Naumann, KR2J

Europe—14 MHz
Maurizio Tramuto, IT9TQH
Donor: Maud Slater
(G3FXB Memorial)

Europe—7 MHz
Sobon Krzysztof, SP7GIQ
Donor: Ivo Pezer, 5B4ADA/T93A

Europe—3.5 MHz
SN3A (Opr. Czeslaw Dubicki, SP3HLM)
Donor: Frankford Radio Club
(K3VW Memorial)

Europe—1.8 MHz
Zbigniew Leszcynski, SP5GRM
Donor: Pat Barkey, WA8YVR, &
Terry Zivney, N4TZ

Japan—21 MHz
Akito Nagi, JA5DQH
Donor: DX Family Foundation

MULTI-OPERATOR, SINGLE TRANSMITTER
World
HC8N (Oprs. WN4KKN, WX3N, AG9A)
Donor: Anthony Susen, W3AOH

U.S.A.
K1AR (Oprs. K1AR, K1EA, K1GQ, K5ZD, KM9P)
Donor: Douglas Zwiebel, KR2Q

Canada
VA9DH (Oprs. VE1DH, AK4L, K2NJ, VE9DX, VE9WH, WA2ASM)
Donor: Eastern Canadian DX Assn.

Carib./C.A.
VP2MDE (Oprs. K5GA, W5ASP, N5DU, N5RP)
Donor: North Nevada DX Contest Club

Europe
IQ4A (Oprs. I4EAT, I4IKW, I4IND, I4LCK, I4PVP, I4TJE, I4VEQ, IK4CZF, IK4DCT, IK4EWK, IK4QJH, IK4XQH, IK2NCJ)
Donor: Friends of K3AO
(K3AO Memorial)

Oceania
AHØT (Oprs. JA6VZB, JI3ERV, JK3GAD, JR7OMD)
Donor: Junichi Tanaka, JH4RHF

MULTI-OPERATOR, MULTI-TRANSMITTER
World
TY5A (Oprs. G3SXW, GM3YTS, K5VT, KC7V, N7BG)
Donor: Doug Zwiebel, KR2Q
(K2GL Memorial)

World—SSB/CW Combined
9A1A: 31,757,004
Donor: Ehrhorn Technological Operations

U.S.A.
N2RM (Oprs. N2RM, KZ2S, N2AA, KA2AEV, WT3Q, K8GL, N2NT,WZ1R, W2RQ,KR2J)
Donor: Bob Ferrero, W6RJ
(N6RJ Memorial)

Europe
TK2C (Oprs. DF9LJ, DL2NBU, DL4RDJ, DL6RAI, TK5EP, TK5NN, UA2FJ, UA2FM)
Donor: Finnish Amateur Radio League

Japan
JA3ZOH (Oprs. JH3DPB, JH3PRR, JG3KIV, JG3MRT, JG3WDN, JI3OPA, JM3XKG, JH4CES, JH4IFF, JH4NMT, JF4FUF, JG4CLV, JK4KSD)
Donor: Ryozo Goto, JH3JYS

CONTEST EXPEDITIONS
World—Single Operator
Phil Goetz, 3B8/N6ZZ
Donor: Yankee Clipper Contest Club

World—Multi-Operator
TY5A (Oprs. G3SXW, GM3YTS, K5VT, KC7V, N7BG)
Donor: Bill Schneider, K2TT

SPECIAL SINGLE OPERATOR AWARD
World—All Band Under 21 Years Old
Martin Lindwall, SM7UYS
Donor: Bruce Sawyer, AA6KX

CLUB
World SSB/CW
Frankford Radio Club: 278,642,809
Donor: CQ Magazine
(W1WY Memorial)

NON-USA SSB/CW
Rhein-Ruhr DX Association: 96,401,762
Donor: Northern California Contest Club
(N6AUV Memorial)

TOP SCORES

WORLD

SINGLE OPERATOR HIGH POWER All Band

EA8EA	12,402,642
PYØFF	10,427,400
P4ØW	9,278,280
ZD8Z	8,047,364
C4A	7,410,858
8P9Z	7,131,914
9Y4H	7,124,700
P49V	7,042,488
3B8/N6ZZ	6,881,690
A92Q	6,457,388

28 MHz

ZX5CW	118,065
5NØ/OK1MU	88,395
XV7SW	19,604
EA8ZS	12,801
W4YV	9,412
S51AY	7,007

21 MHz

ZW5B	1,359,881
CX6VM	779,955
S5ØA	396,708
CT1FJK	309,816
F5NBX	288,627
S51FA	277,820

14 MHz

9M6NA	1,143,930
IG9R	1,126,472
CXØCW	1,065,075
CT9U	1,058,145
VE6JY	978,950
HZ1AB	828,856

7 MHz

YV5A	1,364,465
TE1C	1,062,302
IG9A	1,047,591
PA6A	919,853
SP7GIQ	913,605
HA9BVK	780,440

3.5 MHz

ON4UN	642,600
P4ØJ	641,245
SN3A	549,310
DJ7AA	390,300
LX4B	385,710
UU1J	379,696

1.8 MHz

OHØMEP	251,136
SP5GRM	207,000
4X4NJ	200,735
OY9JD	174,930
EK6GC	173,604
K1ZM	142,358

LOW POWER All Band

9X4WW	4,121,685
7Q7A	3,645,398
TA4ZM	3,640,040
WP2AHW	3,524,044
CN2PK	3,428,820
EA7CEZ	2,517,597
US1E	2,345,056
S59AA	1,888,176
K2SG	1,789,468
KR2Q	1,599,336

28 MHz

LW4DYI	83,283
YV6AZC	60,526
LU8HSO	58,020
AZ9W	51,852
VK4XA	25,604
4X1VF	6,063

21 MHz

LU4FM	679,896
4Z3T	480,402
VK2APK	460,768
EA8ADJ	352,800
ON4RU	284,258
LS7EE	231,000

14 MHz

Z3ØM	560,348
LU4FD	466,662
IR9A	365,286
DL1YAW	302,917
JA7SSB	236,062
5N3/SP5XAR	25O,470

7 MHz

TA2/OK1EE	355,850
VK6VZ	337,906
PA3AAV	299,880
HA8RH	242,214
JH7JVJ	212,652
VK1FF	199,066

3.5 MHz

UAØSMM	165,658
ES2RJ	166,320
T99W	134,726
RA9AE	121,072
EA8CN	105,160
UA3WU	99,120

1.8 MHz

HA8EK	103,693
HA8BE	100,900
DL5MHB	46,160
UN2O	42,904
SM7/T94BO	39,910
LY2OU	32,538

QRP All Band

DL2HBX	715,035
AA2U	602,089
PV2U	564,756
LY3BA	540,379
JA6GCE	438,084
KP4DDB	296,823
DL3KVR	249,444
YT7TY	236,032
JA6UBK	227,724
YU1LM	202,248

ASSISTED All Band

K3WW	4,179,600
K2WK	3,956,248
K2TW	3,718,806
N3AD	3,088,470
G3ZEM	3,002,975
DK3GI	2,938,434
K2SX/1	2,738,177
KE2PF	2,259,750
DJ2YA	2,198,248
DK8FD	2,193,091

MULTI-OPERATOR SINGLE TRANSMITTER

HC8N	14,302,820
4M5X	10,277,794
VP2MDE	9,085,230
K1AR	9,008,245
EA9EU	8,496,792
3V8BB	7,662,336

MULTI-OPERATOR MULTI-TRANSMITTER

TY5A	21,994,325
TK2C	15,648,052
9A1A	15,394,068
N2RM	12,765,600
VP5FOC	12,382,625
W3LPL	12,439,905

EUROPE

SINGLE OPERATOR HIGH POWER All Band

OM8A	4,404,480
GIØKOW	4,083,632
G4BUO	3,755,334
YU7AV	3,396,304
YT1AD	3,355,744
PA3DZN	3,230,370
YU7BW	3,028,013
S53R	2,787,480
DJ6QT	2,629,812
ZA1AJ	2,526,230

28 MHz

S51AY	7,007
DJ7PT	3,081
GØAEV	2,484
UT8IM	551
OK1TW	468

21 MHz

S5ØA	396,708
CT1FJK	309,816
F5NBX	288,627
S51FA	277,820
US2WV	223,825
G4ODV	214,060

14 MHz

IT9TQH	654,978
RW1ZA	571,132
EU1AA	567,920
YR4A	526,864
OK1RF	548,892
LZ7G	489,078

7 MHz

SP7GIQ	913,605
PA6A	811,146
HA9BVK	780,440
S56M	768,545
S57AL	616,952
SMØKCO	479,007

3.5 MHz

ON4UN	642,600
SN3A	549,310
DJ7AA	390,300
LX4B	385,710
UU1J	379,696
OH3BZY	348,834

1.8 MHz

OHØMEP	251,136
SP5GRM	207,000
OY9JD	174,930
ZB2X	141,120
G3XTT	135,660
DL1IAO	134,392

LOW POWER All Band

EA7CEZ	2,517,597
US1E	2,345,056
S59AA	1,888,176
HA8FM	1,509,770
SP4EEZ	1,090,600
S54A	979,032
DK9IP	895,400
EA7TG	845,875
G3SWH	805,896
SN7L	758,940

28 MHz

YO9AGI	3,069
EA5AAJ	1,748
DJ5GG	1,148
S52SK	357
T99T	285
SM5DUT	6

21 MHz

ON4RU	284,258
S57J	172,029
UA4LL	166,716
OK1ABP	115,843
YU7KWX	90,272
S51QZ	80,040

14 MHz

Z3ØM	560,248
IR9A	365,286
DL1YAW	302,917
S52UT	212,824
RA3DUT	210,532
S57U	209,808

7 MHz

PA3AAV	299,880
HA8RH	242,214
SP2FAP	206,920
HA8JP	193,130
OE6MMD	171,958
HA3PT	160,160

3.5 MHz

ES2RJ	166,320
T99W	134,726
UA3WU	99,120
RV6LNA	88,061
DL5FDA	88,026
HA7JJS	77,088

1.8 MHz

HA8EK	103,693
HA8BE	100,900
DL5MHB	46,160
SM7/T94BO	39,910
LY2OU	32,538
OK2PWJ	30,877

MULTI-OPERATOR SINGLE TRANSMITTER

IQ4A	7,030,000
EA6IB	6,931,600
DFØHQ	6,310,953
SN2B	5,672,828
OH2HE	5,561,388
TM9C	5,459,592

MULTI-OPERATOR MULTI-TRANSMITTER

TK2C	15,648,052
9A1A	15,394,068
HG73DX	10,541,466
EM2I	10,217,031
YT9W	9,412,552
GXØAAA	9,262,892

USA

SINGLE OPERATOR HIGH POWER All Band

W1KM	5,127,270
N6BV/1	4,261,624
KC1XX	4,167,383
K3ZO	4,111,064
N2LT	4,075,298
K5ZD/1	3,780,024
W3BGN	3,565,706
KT3Y	3,518,820
W6XR/2	3,473,415
KQ2M	3,334,840

28 MHz

W4YV	9,412
KE5FI	4,171
K9OM	3,366
W6KFV	2,772
W2HG	2,744
N4BP	2,580

21 MHz

K5MR	237,600
K2MT	217,257
N4CT	189,552
W6YA	163,674
N6MU	93,951
KI3L/5	78,383

14 MHz

K2SS/1	768,852
N7TT	359,100
K9QVB	324,478
AA4M/Ø	275,706
W9OF	263,544
KV4P	240,812

7 MHz

WØUN	683,060
W6GO	633,919
AA4NC	492,900
W3GH	434,080
N7DD	398,958
K9DX	361,140

3.5 MHz

W1MK	349,596
WE3C	163,625
K4PI	141,812
K8OQL	102,960
K8MD	39,688
KN5S	37,518

1.8 MHz

K1ZM	142,358
WB9Z	101,971
WØZV/4	61,578
KVØQ	47,460
W8UVZ	44,589
W2VO	43,650

LOW POWER All Band

K2SG	1,789,468
KR2Q	1,599,336
K7SV/4	1,514,735
K8PO/1	1,490,760
AC1O/4	1,263,140
N2BA	1,145,952
WS1E	882,189
K2PH	866,565
KM1X	819,790
WAØQOA/2	675,920

28 MHz

WB5CRG	3,220

21 MHz

WB4TDH	146,699
NI5M	70,730
AI2C/4	67,235
KJ6HO	51,152
NY5B	45,493
WA9BOW	43,120

14 MHz

K9KU	201,965
N4MO	201,066
N4TJ	132,736
K2MFY	131,856
W4PLL	100,480
W8UMR	82,718

7 MHz

AA2SZ	103,220
W9CH	67,832
K9MMS	53,560
KF5IU	41,322
WW3S	40,470
N4OT	37,932

3.5 MHz

W4HM	15,312
W9IL	12,852
W1NH	709

1.8 MHz

N8RFK	8,007
WA8MEM	28

MULTI-OPERATOR SINGLE TRANSMITTER

K1AR	9,008,245
N3RS	7,322,805
N2NU	7,311,630
K1DG	7,119,538
K8AZ	6,074,623
K1ZZ	6,071,210

MULTI-OPERATOR MULTI-TRANSMITTER

N2RM	12,765,600
W3LPL	12,439,905
K3LR	11,908,899
K1KI	11,680,892
KY1H	9,718,302
KY3N	7,256,201

of the northern lights. "If only we could get more multipliers," we can hear them saying.

Team Contesting

It sure is nice to see an increase in interest in this category. The pros in team contesting are the guys from the Southern California Contest club. Once again they scattered all over the world to make the contest more interesting. In second and third place, respectively, were the Yugoslavian team and Slovenian team #1. The key to doing well in this category is to choose team members who will have a good score, or go on a DXpedition yourself. That helps your score, your club, and your team all at once.

New Records

Congratulations to the following operators who set new world or continental records.

CW World: 1.8 MHz OHØMP, 7 MHz YV5A (OHØXX), Multi-Single HC8N. CW World Low Power: 9X4WW (ON4WW). CW Continental: Asia 1.8 MHz 4X4NJ, Europe 1.8 MHz OHØMEP, Europe 3.5 MHz ON4UN, South America 3.5 MHz P4ØJ (WX4G), South America 7 MHz YV5A (OHØXX).

In the September SSB results we did not report those record setters. They are as follows: SSB World: 3.5 MHz IG9T (IV3TAN). SSB Continental: Africa 1.8 MHz IG9W (IV3SHF), Africa 3.5 MHz IG9T (IV3TAN), Africa 7.0 MHz IG9A (IT9GSF), Africa 14 MHz ZD8Z (N6TJ), Asia 14 MHz 4X6TT, Oceania 7 MHz 9M8R (W7EJ), South America 1.8 MHz P49I (K4PI).

Will, AA4NC, tunes the band for multipliers.

Comments

Rule XI. Take a look at the rules that appeared in the September issue of *CQ*. Notice the change in rule XI.5. The log-checking process of the CQ WW has evolved to the point where we feel that we can accept your log on disk accompanied by a **paper** summary sheet. So if you wish to submit your log on disk plus paper summary sheet, you now can do it. In addition to the summary sheet, please include your check sheet (dupe sheet) as required by Rule XI.9. Rule XI.9 states that all entrants are required to submit cross-check sheets (an alphabetical list of calls worked) for each band on which 200 or more QSOs were made. So to summarize the change: You can submit your log on paper or on disk with a paper summary sheet and check sheets.

Please look at rule XI.5 and follow the suggested log instructions. If you feel that your log might end up in the top score boxes, you are **required** to submit an IBM-compatible disk containing your log. We would like to encourage all participants to send disks plus paper summary sheet.

Packet

All of us know that packet radio is pervasive. It provides easy access to other amateurs. It also can be a problem. For some unexplained reason some people believe that using packet makes them a plain single operator. It does not. It makes you assisted. Assisted means that you are getting help. True single operator means getting no help. There have been abuses of packet radio in recent years by entrants who are claiming single op but are really *using* packet radio. If you are entering the single operator

BAND-BY-BAND BREAKDOWN—TOP ALL BAND SCORES

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

WORLD TOP SINGLE OPERATOR, ALL BAND

Station	160	80	40	20	15	10
EA8EA	321/18/55	916/23/70	1555/33/97	1434/38/107	1895/33/106	218/21/57
PYØFF	215/16/41	491/21/60	983/29/83	1607/34/107	2285/33/111	204/20/45
P4ØW	367/15/52	569/22/68	1404/29/87	1592/30/91	1578/28/90	287/12/16
ZD8Z	83/14/28	366/19/52	636/29/76	1316/33/105	2173/30/108	279/19/46
C4A	203/11/47	50/21/70	1638/32/99	1314/34/104	991/30/89	13/6/11
8P9Z	323/13/35	619/18/68	1706/30/86	1198/27/82	1633/27/88	187/12/16
9Y4H	370/17/44	693/28/75	1041/29/58	1188/28/86	1333/24/89	124/13/17
P49V	255/14/45	472/22/70	1175/23/80	1288/30/80	1446/26/80	193/10/12
3B8/N6ZZ	0/0/0	71/22/48	625/32/77	949/35/101	2270/33/111	359/24/79
A92Q	50/9/33	512/21/69	1316/31/92	1151/35/104	1290/30/94	15/11/13

USA TOP SINGLE OPERATOR, ALL BAND

Station	160	80	40	20	15	10
W1KM	96/16/49	741/27/86	874/31/91	1010/33/102	450/23/84	7/6/6
N6BV/1	71/12/37	466/20/68	805/30/100	621/32/97	835/26/92	16/7/8
KC1XX	40/10/32	460/19/68	1211/26/82	833/28/83	580/22/74	6/4/7
K3ZO	56/14/42	283/22/73	817/35/102	970/33/102	437/25/99	10/4/5
N2LT	57/12/39	205/18/66	752/34/97	820/34/103	745/26/99	7/6/8
K5ZD/1	71/12/44	386/17/59	950/32/84	885/30/85	430/24/74	14/6/11
W3BGN	116/14/52	247/19/61	811/28/85	710/30/86	544/23/80	17/11/13
KT3Y	28/9/27	246/19/63	755/34/98	835/33/103	481/25/85	20/10/13
W6XR/2	26/10/18	377/19/70	723/32/100	837/33/98	508/25/84	8/3/3
KQ2M/1	30/11/27	315/19/74	824/33/96	689/31/101	354/25/82	14/9/12

WORLD MULTI-OPERATOR SINGLE TRANSMITTER

HC8N	374/14/46	712/26/77	1770/36/115	2128/37/119	1845/29/103	423/20/43
4M5X	183/16/47	429/23/113	1985/35/113	1114/31/108	1601/30/105	115/13/28
VP2MDE	69/16/47	497/23/81	2153/30/112	1641/28/100	1229/14/22	23/14/22
K1AR	82/21/73	613/28/102	1479/39/135	1180/37/138	712/29/117	18/12/20
3V8BB	176/8/38	937/18/68	1242/29/92	1631/36/102	797/31/86	13/7/13
IQ4A	72/18/80	453/34/112	1556/39/133	1271/40/120	509/35/102	67/10/37

USA MULTI-OPERATOR SINGLE TRANSMITTER

K1AR	82/21/73	613/28/102	1479/39/135	1180/37/138	712/29/117	18/12/20
N3RS	60/17/61	291/24/84	1399/38/134	925/39/148	754/28/121	30/13/28
N2NU	127/20/71	504/28/92	1094/39/130	1196/39/146	422/28/113	33/15/32
K1DG	86/17/60	562/28/96	1096/37/130	986/37/134	712/30/117	23/11/22
K8AZ	61/15/58	286/25/89	948/39/128	1298/39/142	404/28/109	25/10/21
K1ZZ	81/17/60	315/28/93	830/35/119	1237/37/136	468/29/116	27/13/27

WORLD MULTI-OPERATOR MULTI-TRANSMITTER

TY5A	95/14/46	871/24/83	2243/33/109	3654/38/132	3009/35/126	335/19/66
TK2C	1276/22/85	2190/33/112	2960/39/138	2164/38/128	1478/37/129	110/10/32
9A1A	1007/22/82	1867/35/119	2748/39/141	2082/40/147	1254/38/135	105/16/35
N2RM	233/21/70	729/28/106	1830/39/138	1810/38/152	1031/29/124	100/14/29
W3LPL	246/21/78	832/29/103	1533/38/134	1924/40/154	908/31/125	160/17/37
VP5FOC	554/12/40	1568/27/88	2114/31/93	2795/37/115	2274/29/79	102/12/12

USA MULTI-OPERATOR MULTI-TRANSMITTER

N2RM	233/21/70	729/28/106	1830/39/138	1810/38/152	1031/29/124	100/14/29
W3LPL	246/21/78	832/29/103	1533/38/134	1924/40/154	908/31/125	160/17/37
K3LR	290/22/75	683/31/109	1365/39/135	1928/39/159	897/30/122	118/15/31
K1KI	346/21/78	688/27/99	1764/38/139	1546/38/143	947/29/121	100/16/29
KY1H	184/21/68	590/28/92	1123/37/126	1606/38/139	747/28/113	96/15/28
KY3N	154/19/65	286/21/83	1389/39/129	1014/38/138	694/29/115	47/13/24

CLUB SCORES

USA

Frankford Radio Club	278,642,809
Yankee Clipper Contest Club (W1)	218,414,567
Potomac Valley Radio Club	95,835,567
Southern CA Contest Club	82,184,052
North Coast Contesters	54,933,613
Society Midwest Contesters	48,464,079
Northern CA Contest Club	38,937,426
Mad River Contest Club	26,545,560
Central AZ DX Association	17,817,568
Central Florida DX Association	14,049,539
Florida Contest Group	13,587,227
Western Washington DX Club	12,910,133
Carolina DX Association	12,737,354
Mile High DX Association	12,526,366
Southeast DX Club	11,922,084
North Texas Contest Club	10,313,041
North FL DX Association	9,256,940
Rochester DX Association	8,808,230
Southern CA DX Club	6,515,613
Central Texas DX & Contest Club	6,381,841
Dixie Dxers (W4)	6,167,651
North Alabama DX Club	6,161,774
Willamette Valley DX Club	5,590,127
Tennessee Contest Group	5,030,146
Kentucky Contest Group	4,986,420
Kansas City DX Club	4,188,317
San Diego DX Club	3,872,572
Woodbridge Wireless (VA)	3,193,597
Western NY DX Association	3,112,515
Virginia DX Contest Club	2,354,230
Minnesota Wireless	2,193,392
Grandmesa Contesters	2,060,048
Southwest Ohio DX Association	1,908,198
Downeast DX Association (W1)	1,883,079
River City Contest Club	1,767,883
Salt City DX Association	1,733,646
HICKS (W9)	1,526,921
Calif Central Coast DXC	1,319,738
Amarillo DX Society	1,095,987
Texas DX Society	1,081,584
Central Virginia Contest Club	1,026,276
Eastern IA DX Association	935,346
Hoosier Contesters (W9)	864,126
No Dot DXers (W9)	843,196
Northern CA DX Club	751,513
Northern IL DX Association	686,538
Northern Shenandoah DX Association	686,161
Fresno ARC	673,462
American Red Cross ECS (W2)	655,634
Long Island DX Association	560,308
Mississippi Valley DX Contest Club	509,713
Valley RC of Eugene (W7)	409,384
Sterling Park ARC (W4)	372,432
Ohio Valley ARA	305,271
South Jersey Radio Association	299,376
Sturdy Memorial Hospital (W1)	280,395
Metro Radio Club	269,625
Northern AZ DX Association	188,719
Dauberville DX Association (W3)	166,506
Eastern AZ DX Ring	137,786
Northrop-Grumman Radio Club	126,422
Redwood Empire Club (W6)	80,136
West Park Radio Ops (W8)	69,236
Hamfesters Radio Club (W9)	62,150

DX

Rhein-Ruhr DX Association	96,401,762
Bavarian Contest Club	94,284,725
YU CW Club	50,332,874
Slovenian Contest Club	40,876,107
Ukrainian Contest Club	37,835,966
Croatian DX Club	37,264,932
LNDX (F)	33,001,066
Low Lands Crazy Contesters (PAØ)	26,274,475
Mt. RF (JA3)	23,346,666
Chiltern DX Club (G)	22,005,568
Moscow DX Club	21,030,001
OH DX Ring	20,767,688
Japan Crazy Contesters	20,486,222
Lithuanian DX Group	20,118,862
Kaunas Technical Univ RC	15,372,179
Araucaria DX Group (PY5)	14,421,535
Pretoria Contest Club	13,091,261
SP DX Club	12,658,651
Hungarian DX Club	12,195,889
Marconi Contest Club (I)	12,158,832
Rosario Club (LU)	11,952,053
LYNX (EA)	11,028,372
Fortalenza DX (PY7)	8,647,460
URVO (EA)	8,347,667
Puerto Rico DX Club	8,068,457
Groupo Portugal DX	7,886,292
Croatia CW Group	7,208,616
LZ Contest Club	5,552,736
EA Contest Group	5,513,015
Top of Europe Contesters	4,946,435
Kiel Canal Activity Group (DL)	4,836,231
Tupy DX Group (PY2)	4,604,839
Beemster Contest Club (PAØ)	4,590,359
Vojvodina DX Club (YU)	4,445,726
Cordoba RC (LU)	3,890,084
OH3NE Club	3,509,896
EA DX Club	3,392,612
UFT (F)	3,313,089
Czech Contest Club	3,090,521
Los Locos Del DX (XE)	2,961,374
Kiev Contest Team	2,851,732
Vasteras Radio Club (SM)	2,743,028
Sarajevo Contest Group	2,719,656
Shizuoka DX Association	2,642,005
Santa Caterina DX Association (PY5)	2,599,672
OH1AF Club	2,513,586
YU DX Club	2,339,648
SP Contest Club	2,269,273
BC DX Club (VE7)	2,243,925
Radio Luxembourg	1,565,412
South German DX Club	1,502,748
North Greece RAU	1,407,932
Perugia DX Club(IØ)	1,212,059
Guayaquil Radio Club	1,156,933
Fraser Valley DX Club (VE7)	1,120,015
Tartu Radio Club (ES)	1,102,882
Berghem Contest Cluc (I)	1,073,783
Granada RC (EA)	947,810
Rostov on Don Radio Club	817,317
OPOLE (SP6)	728,358
Noviomagnum DX Club (PAØ)	644,753
AFRAH (F)	596,871
Lleid ARC (EA3)	590,787
Regina ARC	559,926
S59DBC Club	509,937
North Shore ARC (VE7)	506,936
Fox Contest Club (YU)	415,690
Koryazhma DX Club (UA1O)	407,532
GACW (LU)	369,515
Amsterdam Contest Group	319,039
Tokyo International ARA	286,506
Bavarian DX Group	210,272
GADX (LU)	154,610
Radio Club Venezuela	128,620
UR Avila (EA)	112,498
Zlin Radio Club (OK)	88,571
SP CW Club	72,856
OK QRP Club	68,884
UR BLL (EA3)	66,681
Norwegian DX Group	48,492

not assisted category, the best thing you can do is to unplug your 2 meter rig and TNC during the contest. If you do that, you will not be tempted to take a look at packet.

If you choose the Assisted or Multi categories, you can use packet, but only passively. That means you can send spots and look at spots, but *not* solicit specific information or calls to aid your log. You can *not* say, "Let me know when you hear that JT again; I need it." If you have someone actively looking for that JT for you, then you are no longer single operator Assisted; you are Multi-Single. You are then faced with a violation of two parts of rule III: For all categories, transmitters and receivers must be located within a 500 meter circle or the station owners property, whichever is larger and, only the entrant's callsign can be used to aid the entrant's score.

Unique QSOs

As many of you have read in *CQ Contest* magazine, unique QSOs are those contacts that appear in only your log when your log is compared against the disks of all other entrants. You can imagine how difficult it is to work a unique QSO if you are in the USA, Europe, or Japan, for example. Suppose you are a W1 and your log shows 10% uniques on 20 while others in your category show an average of 1% uniques. There are probably 200 disks available to the committee from stations on the east coast of the US. These logs contain single op all band, single band, and multis. You are now claiming that 8% of your log was *not* worked by any other station in the database. This 8% is a significant boost to your score.

With many years of experience behind the log-checking process, the CQ WW Committee can say that at least 90% of all uniques in a non-propagationally isolated area are miscopied calls. Your 8% increase in QSOs might make the difference to win. This is wrong, and we spend considerable effort in removing bad QSOs from a log.

There are probably 0.5% uniques in a clean, skillful effort. You can readily see that copying and logging skill are rewarded in the CQ WW. A not-too-often-mentioned aspect of the contest is the training of a cadre of operators who accurately copy and log information.

CQ WW CW Expansion

Look for increased reporting of the CQ WW on the pages of *CQ Contest* magazine. Space requirements in *CQ* limit the number of tables and the amount of analysis we can present. *CQ Contest* provides the opportunity for further coverage. Randy, K5ZD, will help write the expansion for *CQ Contest* for the 1996 contests. Profiles for *CQ Contest*, including interesting propagation and your contest story, would be of special interest to us. Please send your information and pictures to K3EST (e-mail <k3est@netcom.com>).

WRTC and Thanks

This was a very interesting year in amateur radio. The WRTC, which occurred in July, was major a generator of the true amateur spirit. Many of the participants, both local and distant, can be found in almost all contests. They understand the need to participate and hone their skills. Whoever you are, you can get on in the

"CQ WW—The Big One" to meet the famous and newcomer alike. All are welcome to participate and flame their amateur radio spirit.

This was a tough year for your CQ WW Committee. We had to develop new methods of log checking to meet the challenge high tech brings. We were able to stay ahead of the curve thanks to log checkers K1DG, N3ED, W2RQ, N2AA, KR2Q, WA8YVR, WR3G, W9RE, KRØY, K6NA, N6ZZ, W7EJ, K3UA, KR2J, and KZ2S; special advisors K3ZO, W3ZZ, and WN4KKN; DX advisors G3SXW, UA9BA, S5ØA, OK2FD, EA3DU, I2UIY, JE1CKA, DL6RAI, OH2KI, OH2MM, PY5EG, and CT1BOH; log-checking software expert N6TR; and log-checking advisor and expert N6AA. All of the above worked many, many hours to ensure the integrity of the CQ WW. Thanks, guys.

Congratulations to all of you who won or accomplished your objectives. See you in the CQ WW!

73, Bob, K3EST

USA QRM

Condx were better than expected—very high participation and no noise problems. Worked NL7G on all bands and HC8N on 5. Tks everyone for the Q's . . . *AG6D*. My main goal was to work all-time new ones. I achieved that goal on very first QSO: BV! . . . *AAØCY/7*. I worked several new ones, which was my goal. See you next time . . . *AAØNB*. We both enjoyed the fast pace and the hours of the contest . . . *AA3GQ*. Great 40 meter conditions. I got my new ant up a week before the contest . . . *AA4NC*. Was on 80 meters and accidently the wrong memory button. Ended up on 40 meters with all the narrow filters on; it left me exactly zero beat with VK9XH between two very strong W stations. Worked him on first try! . . . *AA7FL*.

This was my first CQ WW. Golly I sure had fun! . . . *AA7UC*. Nice to hear activity again on 15 CW and good ops and condx both days . . . *AA9KH*. After not sleeping for 60 or so hours towards the end of the contest, I started seeing undulating patterns in the carpet, monitor, and radio's readouts. I got to wondering if I was hearing things, too . . . *AB6FO*. Well, this is one I'll never forget. Called my eye doctor at 2 AM Sunday with signs of a detached retina. Gave up 80 minutes of prime time that morning to see doctor. He said, "It's not your retina; lighten up!" On Tuesday the detached retina was correctly diagnosed by another doctor and was reattached in a 3½ hour procedure . . . *AC1O/4*. Forty was hot! I could not believe the signal strengths, considering I'm using some fairly simple wire antennas . . . *AD4KE*.

I hope I live long enough for the good propagation to come back . . . *AE2N*. Forty meters was the best I have very experienced. All parts of the world coming in at once . . . *AJ6V*. Best condx on the low bands that I have ever heard. Forty was truly awesome with major EU signals bombing in well before local sunset . . . *NØAX/7*. Have never heard EU wall to wall on 40 meters at noon! . . . *N7RO*. How does *CQ* manage to get the K index to be 0 or 1 every contest?! . . . *N6BV/1*. This was the contest when the lights went out on 10 meters . . . *N6AR/4*. Our first attempt at MS. Guest ops enjoyed running 20–80 meters. Conditions were great at the bottom of the sunspot cycle. The team will be back next year . . . *N2FF*.

I am a Rip Van Winkle ham: I got my General ticket again last Feb. after a lapse of 33 years. With my 50W and a 2-element fixed X-beam in a town house attic, I worked 10 new countries! . . . *N3UMA*. I was a guest op at the N6NB station in the Tehachapi Mts. High winds forced us to keep the tower cranked down . . . *N6MU*. 26K—not bad for 100W, indoor dipoles up 25 feet, and the shack in condo bedroom. I thank the XYL for her tolerance . . . *N2LKF*. Condx were good on the graylines. Band was open into western and central Europe on both days for an hour or so . . . *KC6X*. You have to admire LS7EE's masterful control of his bug! . . . *KN4ZT*. Very exciting to operate under my call and amazed by score using only low wire antennas . . . *KQ2M*.

Biggest thrill was working G4BUO on 160 using 5W! . . . *KRØB (Opr. AF9T)*. One-sixty meter condx were great! Actually beat USA all-time record from CO! . . . *KVØQ*. What can I say? One-sixty was fabulous! I only heard three mults I couldn't get: JA, T77, and ER3. I got 84! . . . *K1ZM*. First WW contest since 1952 when I operated from Libya as 5A2TC. It's a whole different ball game! . . . *K2ZA*. Seventeen days before contest I had open-heart surgery. Do I set the record for fastest return to contesting? . . . *K4VUD*. My 39th year in this bash—still the best! . . . *K7ABV*. ZL7PYD answered my CQ . . . *W4YV*. Working EA7CEZ on 40 meters with 5W and dipole. He was the only EU to hear me . . . *W8QZA/6*. New to 160 and what a blast! Felt like I was playing hide and seek rather than search and pounce . . . *WA6KUI*.

Condx on 40 meters were fantastic! I could hear EU from 22 through 17Z. Best 40 meter condx in my memory . . . *W6BIP (age 81. Fantastic, BIP—ed.)*. Many thanks to W6XR for giving a west coast op a chance to try CQWW from the East Coast for the very first time. Man, what a difference! . . . *W6XR/2 (Opr. N6TV)*. I tried my best, but K2SWZ with his attic dipoles still beat me . . . *W2GMA*. Condx unbelievable; 160 sounded like 20 . . . *WB9Z*. My vote for top op goes to 3B8/N6ZZ—quick on the draw, always signed his call, and he called me on 80! . . . *W1KM*. Nice condx on 40/80; best mult totals ever there . . . *WB9HRO*. My best effort on 40 meters—more mults, more QSOs. Really a fun contest . . . *W6RCL*. Forty meter band condx were superb! For example, JA stations were heard around the clock both long and short path . . . *W8UCI*.

Contesting is a lot like fishing—you plan, dream, get your gear together, and finally go to the water. You pick a spot and cast your line and hope for the "big one" to strike. When it's over, you go home and plan for the next time and talk about the one that got away. There are only 11 more months until the next one. I can hardly wait! . . . *W5CWQ*. If 40 meters could talk, I think it would say, "I couldn't get solar, but I sure got polar!" . . . *WØUN (Opr. WØUA)*.

DX QRM

I got licensed in May, 16 years old. This was my first CW contest . . . *OE6MMD*. We are located 1000m from Serb line . . . *9A3B*. Power failure 15 minutes into contest had me worried . . . *P4ØW (Opr. W2GD)*. Many common mults were missing, especially from Europe, Africa, and Central Asia . . . *4X4NJ*. Despite the condx on 10 and 15, which were worse than last year, the final score was more than twice. Was surprised by being called on 160 by VE1ZZ, WB9Z, and P4ØW . . . *TA4ZM (Opr. DK5WL)*. I have been building my antennas entire autumn. I really had fun. Next year we will be better prepared for the CQWW . . . *OH6YF*. I would like to thank my parents for food support for my first mono-band effort . . . *F6FYA*. My first CW contest. Made almost 250 QSOs. It was great! . . . *UA1OMX*.

Forty meters was wide open to North America during entire contest! Next time will try new ant for this band . . . *UA1OMS*. Due to fine propagation it was very good here. Missed 10 meter opening, if there was one. Too much QRN . . . *RK9AWN*. We enjoyed multi-multi for the first time in 40 years of Moscow University history. See you every contest . . . *RU3A*. First WW in almost a decade. By God's grace, I was able to put in a reasonable effort. I seem to have a knack for ending up in challenging locations. Last serious effort was from 2-point Mexico in early 1970s (XE1IIJ/6D1AA/4C5AA). Zone 21 isn't zone 9 or 33, but it nevertheless was a fun time from the Arabian Gulf . . . *A92Q*. Big, big thanks to LU1IV and family—LU7IAQ, LU9DMC, LU6EBY—and my wife Sandra for their support . . . *AY1I (Opr. LW9EUJ)*.

Bad conditions in extreme on 10 meters . . . *AZ9W (Opr. LU5UL)*. The worst condx on 28 MHz since I am active—1966 . . . *4X1VF*. Arua is located in NW corner of 5X. There is normally commercial power between 7 and 10 PM. Normal 220 volt line runs 130-160 volts. I have seen it reach 200 volts only once . . . *5X4F*. I am not sure of UA multipliers. Total QSOs three times last year! I did it! . . . *7N2DXF*. Had to improve on 9X5EE new record. With a bit of luck I got there. Taking into account power fluctuations, failures, battery operation, and stormy wx, the propagation

TOP SCORES IN MOST ACTIVE ZONES

Zone 3

W7RM	1,654,020
AB6FO	1,443,000
AA7CQ	793,854
XM7NTT	689,475
N7RO	667,680
CK7A	666,094
*W6JTI	655,380
W6GO	633,919
*NØAX/7	562,100
XM7SBO	520,260

Zone 4

VE3EJ	5,023,118
W9RE	3,180,906
KØRF	3,104,260
K5GO	2,022,246
K5YAA	1,516,736
K9MA	1,455,440
KØKX	1,299,913
N7ML	1,282,157
WBØO	1,197,620
K7UP/5	1,184,040

Zone 5

W1KM	5,127,270
N6BV/1	4,261,624
KC1XX	4,167,383
N2LT	4,075,298
K3ZO	4,111,064
K5ZD/1	3,780,024
W3BGN	3,565,706
KT3Y	3,518,820
W6XR/2	3,473,415
KQ2M	3,349,840

Zone 14

GIØKOW	4,083,632
G4BUO	3,755,334
PA3DZN	3,230,370
*EA7CEZ	2,517,597
DJ6QT	2,629,812
G3KDB	2,398,466
GØIVZ	2,372,150
OY1CT	1,874,982
DL7UTM	1,586,667
DL4MCF	1,540,948

Zone 15

OM8A	4,404,480
YU7AV	3,396,304
YT1AD	3,355,774
YU7BW	3,028,013
S53R	2,787,480
ZA1AJ	2,526,230
OH6WZ	2,216,022
OH1NSJ	2,204,186
OH6KIT	2,176,416
LY6M	2,059,695

Zone 25

JH5FXP	3,616,704
JH7WKQ	2,249,124
JH4UHW	2,082,249
JA8RWU	1,706,475
JA1IDY	1,546,702
JH7XGN	1,165,056
*JEØUXR	973,245
JA9CWJ	924,603
JA1JKG	840,642
*JF1SEK	824,912

The OL5T team climbs their tower to say hello!

must not have been that bad after all. See u next year from ? . . . *9X4WW (Opr. ON4WW)*. The CQWW has been the best way to improve my poor DXCC on 80 meters. Nine new ones in a couple of days is a nice gift! . . . *EA3ALV*.

Great fun on TOP BAND! Maybe beverages for next year . . . *EA6ACC*. I always work with 4W. My conditions are not so good, but the important thing is participation . . . *EA7AAW*. New rig and antenna tested on the best testing ground there is, the CQWW DX Contest . . . *EI6FR*. Very hard job with QRP. I'm quite sure that the QRP class winner never, never is 80 meters! . . . *ES1CW*. I love this contest! Thank you! . . . *EU4AA*. Was a wonderful contest, I worked 37 zones and 97 DXCC with my vertical AP8A . . . *F5JKK*. The very first contest for the French *CQ* gang. We'll be back next year! . . . *F5KAC*. I QRV from my condominium. I built a fishing-rod antenna on my balcony. Low power category is very good for such a condominium ham. Hi! . . . *JE1SPY*.

I have been enjoying CQWW since 1970s. This is the greatest contest! . . . *JL7PVR/1*. N.A. big stations have very nice ear! . . . *JR4DAH*. Was really surprised about the fantastic conditions on 40 meters to USA. Band is like 20 meters in top times! . . . *OE2BZL (Opr. DK5AD)*. The condx were excellent! My best result on the 40 meter band . . . *OK2GG*. My license arrived the Thursday before the contest. Each zone and country was a new one! I've been an active SWL for many years, and it was a pleasure to work the guys! . . . *ON4CAS*. I was not sure whether to operate 40, 80, or 160. I now know I missed two great days on 160—too bad! But I knew LX4B was going to attack my European record, so I wanted to defend it! . . . *ON4UN*.

Just halfway through the contest I had 39 zones on 40 meters. Unfortunately, zone 12 never showed up! . . . *PA6A (Opr.PA3DFT)*. Never stay at home! . . . *SM6CNS (Opr. DU7CC)*. The 48 hrs of the contest made me happy! War, hunger, cold apartment, and all the difficulties my people face were forgotten for the moment. Contests are a real treasure, although you can't live on them . . . *T99W*. I wish I lived in the countryside and had a chance to run a beverage antenna . . . *UA3AGW*. The ops at US4LWM were 12, 14, 15, 15, and 17 years old! . . . *editor*. I was shocked when 3B8/N6ZZ, XZ1A, YB2UDH, W6 stns called me on long path on 80 meters . . . *UU1J (Opr. UU7JM)*. My cat, Kob, wanted to take part in CQWW. He caused some trouble with the PA! . . . *UX5VK*.

Best ears to VS6WO who picked my call out of an awesome W pileup . . . *V31UA (Opr. KT6V)*. Spectacular opening over the pole both day and night on 160. Broke all my previous records . . . *VE3DO*. My first contest after a 10 year break! As SP5IFU had 5BDXCC. Starting over again . . . *VE3XSP*. I always enjoy the mother of all contests . . . *VE6HPT*. Had planned to operate all band, but became father of a baby girl just before contest . . . *VK1FF*. The purpose was to have fun and that was easily achieved. VP2EHF and VP2EE did everything they possibly could to make things comfortable for me . . . *VP2EFO (Opr. K8MFO)*. Special tks to YO4WZ, YO4CIS, and YO4HW for constant support . . . *YR4A (Opr. YO4NF)*. Sunspot minimum was a powerful enemy on 28 MHz . . . *YV6AZC*.

The power went off on Saturday morning and was not repaired until Tuesday! To stay in the contest feeling, I walked down to Vit, ZA1AJ, to make coffee for him, as he was lucky enough to have electricity . . . *ZA1AB (Opr. OH6MKT)*. KL7 did not hear my desperate calling on 160 . . . *ZB2X (Opr. OH2KI)*.

STATION OPERATORS
Multi-Op Single Transmitter

3V8BB: DJ7IK, DL2OBF, DL8OBC. **4M5X:** WM2C, WS4E, WX9E, KØPP, KE7X, YV5JDP. **4UØITU:** DK1BT, DK7YY, DL3DXX, DL7UBA, DL7URH, DL7VOA. **6D2X:** K5NU, K5TSQ, W5VX, WB5VZL, XE2KB, XE2XDX, XE2YNS. **8S3BG:** SM3CER, SM3DMP, SM3PZG. **9A1HBC:** 9A4KJ, 9A5MR. **9A5D:** 9A2FK, 9A2TL, 9A3ID, 9A3DU, 9A3VM, 9A4SG. **9A6V:** 9A2YD, 9A6W. **AB2E &** NU3Y, W6TER. **AB7BS &** KC7BNH. **AG6D &** K2MM, N4TQO, NF6S. **AHØT:** JA6VZB, JI3ERV, JK3GAD, JR7OMD. **CG2ZP:** VE2ZP, VA3ZC. **DA1WA:** DL1AO, DJ9CB, DJØHB. **DFØESA:** DL1AWI, DL5AWI, DL9AWI, DL3APO, DL1ASA, DL5XU. **DFØHQ:** DL1AUZ, DL3OI, DL4MM, DL5ANT, DL5AOM, DL5ARX, DL5AXX, DL8WAA. **DFØRG:** DJ9XT, DE1ARW, DE1FRW. **DF8WS &** DK7ZT, DL7AOJ, DL9ZQ. **DJ6TF &** DJ7TO, DL6UST. **DKØTZ:** DL8SCT, DL4AAE, DL1SBF, DF5EN. **DKØUB:** DK7FP, DL1EFD, DL1EFO, DL1EKA, DL9XY.

DK6WL & DK2OY, DL1GGT, DL2MEH. **DX9C:** LA7JO, OH2BH. **EA3CWK &** EA3GFA, EA3AJW, EA3GGO. **EA5BY:** EA5CZ, EA5EU, EA5KW, EA5RS. **EA5FX &** EA5BM, EA5WU, EA5KK, EB5IFI. **EA6IB:** EA3AIR, EA3AKY, EA3DU, EA3KU. **EA9EU &** EA1AK, EA7TL, EA9AI, EA9GK, EA9UG. **EI7M:** EI4BZ, EI3DP, EI6BT, EI4HQ, EI9HC, EI5HB, EI6GF, EI8GS, EI7DNB. **EX2M:** Club. **F5KAC:** F5HDN, F6HOT, F6JSZ. **F6KCS:** F5JCB, F5PRH. **GB5WW:** G3LZQ, G3SJJ, G3WYW, G3ZRS, G4BYG, G4DRS. **GS4TMS:** GM3FDN, GM4DGT, GMØAZC, GMØKMD, GMØKWL, GMØMZB, GMØTTY, GMØUUB. **HA3KNA:** HA3NS, HA3NU, HA3OV. **HA4KYV:** Fulop, Fulop, Boor, Skutovics, Kemeny, Hizoh. **HG5A:** HA5IW, HA5OM, HA5ML, HA5MK, HA6WX, HA5CQA, HA7RY, HA7VB, HA5UA. **HG5M:** HA5MY, HA5WA, HA5EH, HA5BVO, HA5AWP, HA5BBC, HA5OF, HA1DRJ. **HG6V:** Bak, Bota, Fulop, Papp, Suszter, Varga.

HG6Y: HA6DX, HA6OB, HA6KNV, HA6OY, HA6OI. **HI3CVV:** DL1GKG, DL2GGA. **II2K:** I2KHM, IK2UCK, IK2PFL, I2GXS. **IK4UOP &** IK4CFV, IK4COH, IK4LHC, IK4VPY, IK4UNZ. **IO2L:** I2OKW, I2FGT, IK2MLV, IK2NCF, IK2NVU, IK2YYE. **IQ2W:** IK2FIQ, IK2PZG, IK2VFQ, IK2DUW. **IQ2X:** IK2GZU, IK2GSN, IK2WAD, IK2GXK, IK2SGO, IK2SAU, IK2EAD, IK2FYH, I2CZQ, SWL-Severino. **IQ4A:** I4EAT, I4IKW, I4IND, I4LCK, I4PVP, I4TJE, I4VEQ, IK4CZF, IK4DCT, IK4EWK, IK4QJH, IK4XQH, IK2NCJ. **IR3X:** I3TJE, IK3HUK, IK3QAR, IK3VIA. **JAØYAK:** JFØESV, JEØETP, JF1USQ, Kozawa. **JA2YKA:** JP1QNB, JS2ERL, JI4RDO, JL7JRO, AHØK, KHØBA. **JA7YAA:** JE1AMC, JF2CKX, JF1SXL, JJ1CVH, 7M2SOB, JG7PSJ, JRØSPG, Odashima. **JA9YAV:** JR9GXQ, JA9-3Ø17. **JE6ZIH:** JR6GKT, JI6BRB. **JH2ZUN:** JI2KGI, JM2CQN, JE8KKX.

JR1ZTT: JRØXHL, JEØBKI, JFØMQX, Hiyoshi. **JT1T:** JT1CD, JT1BL, JT1BR. **K1AR &** K1EA, K1GQ, K5ZD, KM9P. **K1DG &** NX1H, K1TR, WT1S, K1MNS. **K1KP &** NB1B, KM1D. **K1RX &** W1RR, AA1HJ. **K1ZZ &** AA2Z. **K2QMF &** AA2FB. **K4LTA &** AC4EM, N4IR, NK4N, W4TYU, WA4TKR, WM4U, KI4UZ, KE4QDZ, KR4C, KY4L. **K6XT &** Others. **K7FR &** W7WMO, K7MM, KW1K, KA7EKL. **K8AZ &** K8BL, K8NZ, W8CAR, W8KIC, WT8C, NI8L, NX8R, N8ATR. **K8DO &** KB8NNU, KY8I. **K8JP &** KS9O. **KB1H &** AA2CE, K1EBY, K1DW, NB1U, KZ1M, K1GX. **KF7JF &** N7UOW, W7DOZ. **KF8VS &** AL7L. **KGØE &** NØUEI. **KG4MN:** WV3R, KD4D. **KS1G/5 &** N5CT, NJ1V, AA5UO. **KS9K &** N9XX, NØBSH, W9XT, WE9V. **KT1O &** WB1ELA, KB1AXF, WO1N. **L4XT:** LU3XQ, LU1XSI. **LA5M:** LA6MJA, LA7AJA. **LA9GX &** LA6YEA, LA5UF, LA9VDA. **LX/DFØBK:** DL8SCG, DL4SDX, DL4SDW, DL5SEJ.

LY3MR: LY3NFW, LY1DL, LY2BIL, LY2BKF, LY1FF. **LZ7M:** LZ1UQ, LZ2HM, LZ3FN, LZ3SM, LZ3SF, LZ4AX, LZ4KL, LZ5VK, Deyan, Drago, Gosho, Vasko, Yasen. **LZ9A:** LZ1JK, LZ1UK, LZ2BE, LZ2CC, LZ2DF, LZ2HE, LZ2PO, LZ2JE, LZ2TT, LZ2WF, LZ2WM, LZ2XA, LZ5JE, Plamen. **M2SS &** W2GMA. **N2FF &** N2LSK, N2LPD, AA2XY. **N2IC/B &** NQØI, N2PNG. **N2NU &** WW2Y, K2WI, W2REH. **N3BNA &** KD3CN, K3SW, KM3D. **N3RS &** N3RD, N3ED, KY2T. **N4ZC &** K2SD, WZ3Q, KI4HN, KE4EW, W5VWN. **NCØP &** WRØG, WOØV, KFØH, WDØGVY, WAØFLS. **NF2L &** K2BU. **NK7U &** N7BZ. **NP4Z &** KP4TK, KP4BZ,

ZONE LEADERS SINGLE OPERATOR

Zone	Call	Score	Zone	Call	Score
1	VY1JA	687,610	21	A92Q	6,457,388
2	VE2/N6AA	2,929,536	22	4S7TWB	1,714,144
3	W7RM	1,654,020	23	JT1BH	268,096
4	VE3EJ	5,023,118	24	BY4SZ	353,210
5	W1KM	5,127,270	25	JH5FXP	3,616,704
6	XE1VV	664,930	26	3W5FM	280,578
7	V31UA	2,829,310	27	DU1KK	1,794,415
8	8P9Z	7,131,914	28	9M6NA	1,143,930
9	P4ØW	9,278,280	29	UAØZDA/MM	761,400
10	CP1OZ	174,675	30	VK3DXI	2,227,770
11	PYØFF	10,427,400	31	T32BE	693,504
12	CE3F	429,125	32	ZL7CW	503,700
13	CXØCW	1,065,075	33	EA8EA	12,402,642
14	GIØKOW	4,083,632	34	SU2MT	6,141,658
15	OM8A	4,404,480	35	TU2MA	635,294
16	US1E	2,345,056	36	ZD8Z	8,047,364
17	RV9XF	733,670	37	5X4F	552,636
18	RZ9UA	704,725	38	ZS6EZ	5,626,962
19	UAØJQ	441,188	39	3B8/N6ZZ	6,881,690
20	C4A	7,410,858	40	JW1CCA	150,450

TEAM CONTESTING

1. Southern California Contest Club: 26,697,434. By 4S7TWB, 9Y4H, ZD8Z, VE2/N2AA, 3B8/N6ZZ.
2. Yugoslavian Contest Team: 9,780,061. By YU7AV, YT1AD, YU7BW.
3. Slovenian Contest Club TEAM #1: 5,072,364. By S53R, S59AA, S5ØA.
4. Lithuanian Dream Team: 3,976,216. By LY6M, LY2MW, LY2OX, LY2PAQ.
5. Kiev Contesting Team: 2,851,732. By UT3UZ, UT4UZ, UT5UGR, UX1UA.
6. EA Contest Team: 1,880,727. By EA5FID, EA5BY, EA5CKP.
7. Team Estonia: 1,700,375. By ES2RJ, ES5RY.
8. Slovenian Contest Club Team #2: 1,038,167. By S51AY, S54A, S59L.

EU1DX with his 4-element 21 MHz antenna.

KP4DDB, WP4IIW, WP4Q. **OE2S:** OE2DYL, OE2EJN, OE2GEN, OE2LCM, OE2VEL, OE3GSA. **OH2AAZ:** OH2BSI, OH2BSQ. **OH2HE &** OH1NOA, OH2JA, OH2BVI, OH2KDY, OH2IW, OH2KXK, OH2KVH, OH2JNX, OH6DD, OH7BX, OH7JT. **OH4AB:** OH4EA, OH4JFN, OH4KBC, OH4KEC, OH4KZM, OH4MDY, OH4TY, OH4YR.

OH5LAQ & OH5MLH, OH5LEJ. **OH7M:** OH4LYX, OH6LNI, OH7MHL, OH7LTK, OH7MS, OH7WV, OH7KIR. **OK2KDS:** OK2VWB, OK2HIJ. **OK2KOD:** OK2BDI, OK2BGR, OK2BNX, OK2PID. **OK2KVI:** Club. **OK2OSU:** OK2BU, OK2PHC, OK2PND. **OK5W:** OK1AEZ, OK1WF, OK1CF, OK1TA, OK1TN, OK2FD, OK1JKT, OK2PAY. **OL3A:** OK1AY, OK1DX, OK1FJD, OK1MR. **OL5T:** OK1NR, OK1DNR, OK1AMM, OK1TC, OK1FXX, OK1HQJ. **OM3KTR:** OM2ABB, OM3-ØØ28, OM3-ØØ27. **OM3RJB:** OM5CD, OM5CW, OM5NA, OM5EA, OM5FA, OM5MB, OM5CPS. **OM3RKA:** OM3TDP, OM7YX, OM5MZ, OM5TX, OM3TTZ. **OM5M:** OM1KM, OM2IB, OM2KI, OM2RA, OM3BH, OM3EI, OK2ZW, Tana. **OM7M:** OM2KW, OM3PA, OM3PC, OM3EY, OM3TPV, OM3TZQ, OM3TQM, OM5AW, OM5RW, OM5ZW, OK2BFN. **ON6AH &** ON4LZ, ON4GO, ON6MH, ON6QR, ON6VL. **ON6RM:** ON4KEP, ON4KFM, ON4KHG, ON4KRO, ON5SV. **PI4CC:** PA3BSQ, PA3EPD, PA3FVW, PBØAIU.

PI4TUE: PA3EZL, PA3GFE. **PI4ZLD:** PA3BTH, PA3EOB, PA3GCU, DF6JC. **PI5ØALK:** PAØXAW, PA3VCY, PA3DLA, PA3FPA. **RK1OWZ:** UA1OSS, UA1ODU. **RK2FWA:** RA2FA, UA2FB, UA2FBA, UA2FF, UA2FZ. **RK3QWM:** RK3QAM, RW3QFP, UA3-121-31Ø2. **RK3RYY:** RX3RZ, RU3RQ, UA3-157-554. **RK4WWA:** UA4WA, RW4WA, UA4WAN, UA4WES. **RK6AYN:** UA6AH, RW6ACM, RN6BP, RV6ARU. **RK9AWN:** RA9AA, RA9AX, RA9AEW, RA9ANR, RA9ATU, UA9AR, UA9AU. **RN4W:** UA4WGU, RU4WJ, UA4WJF, UA4WEI. **RS3A:** RA3CW, RU4HP, RZ3AT, RX3APM, RA3CQ, RV3ACA, RZ3BW, UA3-170-79. **RU1A:** RN1AM, RN1AN, RU1AA, RU1AE, RV1AW, RW1AC, UA1ABR, UA1ARL, UA1BX, Others. **RZ6AXO:** RA6AX, RN6MM, RN6BN, RX6BA, RW6YY, RN6AA. **RZ6LZL:** Club. **SI6GM:** SM6DYU, SM6LPF, SM6MCW. **SK5AJ:** SM5AD, SM5BNZ, SM5CAK, SM5CBN. **SK6NL:** Club. **SN2B:** SP2FAX, SP3RBI, SP3RBR, SP8NR. **SP3KPN:** SP3GXU, SP3RXO. **SP9KRT:** SP9HNB, SP9-1753. **SP9PDF:** SP9TCV, SP9NRD. **T99MT:** T94EU, T94NF, T94TF, T94TU. **TM2Y:** F6BEE, F6FGZ, GØJFX, G4WVX. **TM6SPF:** F6EHE, F5NSL, F5BLE, F5RQC.

TM8A: F5SSG, F5NTV, F5OZF, F6EXV. **TM9C:** F5IN, F5LGE, F5SNJ, F6ARC, F6DZS, F6FVY. **UR4MWU:** UR5MB, UR5MA, UR5MFE, UR5MT, US5MP. **UR4PWC:** USP-272, USP-273, UT4PZ. **US4LWM:** USL-1Ø24, USL-1Ø25, USL-1Ø04, USL-1003, USL-1005. **UT7L:** UR4LRG, UR4LRQ, UR4LSB, UR4LTX, UR4LUG, UR4LQA, US4LGW. **UZ4AYT:** UA4AIY, UA4ALI, RA4AI, UA9COD, UA4-156-1Ø57. **VA9DH &** AK4L, K2NJ, VE9DX, VE9WH, WA2ASM. **VE2CLM:** VE2FFE, VE2CJZ, VE2ZDR. **VE6AO:** VE6KZ, VE6AMR, VE6JO, VE6BIR, VE6RAJ, VE6KC, VE6NJK, VE6CIZ, VE6KRR. **VK4EMM &** VK4XY. **VO2WL:** VE1BJW, NB3O, K3TM. **VP2MDE:** K5GA, W5ASP, N5DU, N5RP. **VP2MEY:** JH1NBN, JO1MEE. **VS6WO &** VR2NR, VR2EY. **WØCP &** K9AY, K9RHY, WYØJ. **W2SEX:** K2ZR, AA2YW, AA2VN, AA2OT, KA2WCM, KB2TDZ. **W4PRO &** W4DHZ, N4AIG, WB4DNL. **W6UE:** N6DLU, KA6SAR, N2MAU, N6LL.

W6YRA: KC6LDO, WA6AYI. **W7/ES5MC &** N6HR. **WA2LCC &** Others. **WA6IET &** W2KVA, KO6GA. **WA7EGA &** NQ7M. **WXØB &** NA5Q, W5XJ, KN5E, N4YGP, WB5B, AB5QY. **YU1AAV:** Bozic, Zoran, Zika, Sasa, Aca, Nenad, Slobodan, Nenad. **YU1HFG:** YU1OO, YU1ML, YT1JZ, YT1KZ, YZ1GD. **YU7BCD:** YU7FU, YT7TW. **YZ7A:** YU7CM, Hamlett. **ZF2RF:** K4UVT, K9LA, N8SR. **ZPØR:** JA7AYE, ZP5XF, ZP5AZL, ZP5KO, ZP5XFB, ZP5ECC.

STATION OPERATORS
Multi-Op Multi-Transmitter

9A1A: 9A5W, 9A9A, 9A2DQ, 9A2B, 9A2EU, 9A2HW, 9A2R, 9A3GW, 9A3NR, 9A4WW, 9A6A, 9A6D, 9A6M, 9A7R, F2CW, OH6XY, Roman. **A61AF:** K1XM, KQ1F. **AA3GQ &** N3BZN. **AA6MC &** AC6NS. **DF3QG &** DJ1FC. **DK5EZ &** DH4JL, DJ2YE, DJ4AX, DK4TP, DL2EBC, DL3EBH, DL8EAQ, DL6EAS. **DLØKF:** DJ4FZ, DJ7SW, DF4PA, DL4LBK, DL8KUA, DJ9MT, DK7XS, DK9LV, DL2ZT, DF3LZ, DJ6TN, DJ3UL, DL8LAQ. **EA4ML:** EA4KA, EA4ET, EA4AFA, EA4ENA, EA4AFD, EA4AED, EA4AEA, EA4EMC, EA4AKQ, EA4EKR, EA4EFJ. **EM2I:** UT2IA, UT2IB, UT2ID, UT2II, UT2IM, UT2IO, UT2IV, UT2IY, US1ITU, US3IZ. **GU3HFN:** G3IZD, GU3MBS, GU4EON, GU4SXM, GU4WRP. **GXØAAA:** G3MXJ, G3TXF, G3WVG, GW4BLE. **HG73DX:** HA1AH, HA1AR, HA1AV, HA1DAC, HA1DAE, HA1TJ, HA2RX, HA6ND, HA6NF, HA6NL, HA6NY, HA6OQ. **IYØTCI:** IKØCNA, IKØLZR, IØKHP.

J45T: SV5TH, SV5BYT, SV5/KB4PMS, SV5VR, SV5ADD. **JA1YDU:** JHØNZN, JF7TFK, JRØJFM, JA9VDA, JP1CWU, JRØUUU, JJ3PKB, JP1OGL, JL7MYL, JG3AXP, 7L1DGK, JO1RUR, Mizuno. **JA3YBF:** JJ3BDG, JO3LDN, JG3JHI, JL3AKW, JL1PEI, JF3HXS. **JA3YKC:** JP2BZE, JF3VXV, JH3RHQ, JE5DTS, JM3FVL, JO3UGI, JP3PZD, JG4LSR, JL4CUB, JL6BMJ, JP6RBN, JE9GMX, Fukada. **JA3ZOH:** JH3DPB, JH3PRR, JG3KIV, JG3MRT, JG3WDN, JI3OPA, JM3XKG, JH4CES, JH4IFF, JH4NMT, JF4FUF, JG4CLV, JK4KSD. **JH5ZJS:** JA5BJC, JA5FDJ, JA5JCC, JH5RXS, JR5PDX, JR5VHU. **JO1YAO:** Club. **K1KI &** K1CC, K1TO, KC1SJ, KG1D, KM1P, W1OD, W1RM, KF2FB, NJ2L, K5FUV. **K2LE/1 &** W2AX, K1JKS, W1FJ, K1CB. **K3ANS &** N2BIM, WF3H, N3RCA, N2MZH, N2KJM, AA3JA/JH7PKU, K3YD, N3JGX, N3IYX. **K3DI &** WD4IEH. **K3EST &** N6RO, W6RGG. **K3LR &** WR3G, W3YQ, K3UA, KC3MR, WA8YVR, WD8IXE, ND8L, KA3JWJ, K8CX.

K4VX/Ø & K4XU, K9BGL, N9JF, W9WI, KIØW, NSØZ. **K6VI &** W6CCP, W6UQF. **K8CC &** AA8AV, AC8W, K8DD, K8JM, N8CC, N8CQA, VA3NA. **KY1H &** WM1K, K2WR, K1MBO, NJ1F, AA1ND, NT2X, KB1W, KOØU, NS1M, WR2I, KB2WBQ. **KY3N &** WB3FIZ, W8FJ, WU3M, WN3K, N3ARK, W3FV. **LY5A:** LY1DC, LY1DD, LY1DR, LY2BFY, LY2BNZ, LY2IJ, LY2PAJ, LY2PX, LY3MM, LY3NOK. **LY7A:** LY1EE, LY1DF, LY2AO, LY2KZ, LY2BMX, LY3DA, LY3BAF, LY3BLF, LY4AA, LYR-346, LYR-728, LY2NK. **LZ1R:** LZ1GL, LZ1SS, LZ1DD, LZ1LZ, LZ1AP, LZ1QI, LZ1ZO, LZ1LG, LZ1CW, LZ1YQ, LZ1CP, LZ3UA, LZ3NY, LZ3RR, LZ3FM, LZ3MF, LZ5GB, LZ5ZO, LZ5TX. **N2MM &** WB2R. **N2RM &** KZ2S, N2AA, KA2AEV, WT3Q, K8GL, N2NT, WZ1R, W2RQ, KR2J. **N3ADL &** Others. **N6DX &** AD6C, N6RVZ, WA6CDR, WB6SHD, N6RZ, N6TU, AC6T. **NE3F &** KS3F, N3JLL. **NL7G &** KL7Y, KL7PJ, NL7GP, N7DF, KL7AF, NL7VJ, KØMVL, KL7U, KL7XX.

NM3K & N3ISH, N3WES, WE3E. **NQ4I &** KY2P, K2UFT. **OZ5W:** OZ1DOQ, OZ1FTE, OZ1FTU, OZ1KRF. **OZ5WQ &** Others. **PI4COM:** PA3BBP, PA3CAL, PA3ALP, PA3ERC, PA3EWP, PA3GBQ, PBØAIC, IK4SXJ, PA3DMH. **RK9CWW:** RA9DZ, UA9CGA, RA9DK, UA9CBN, RW9CF, UA9CMQ, RU9CO, UA9CMO, UA9CI, UA9CNV, UA9CDV, Bankin, RK9CXM, RU9CK. **RU3A:** KF2QX, RA3AUM, RA3AUU, RK3DT, RU3FM, RV6HY/3, RX3ACS, RX3DCX, RZ3GE, UA3AB, UA3AFS, UA6XGL/3. **SIØGM:** SMØKV, SMØBYD. **TK2C:** DF9LJ, DL2NBU, DL4RDJ, DL6RAI, TK5EP, TK5NN, UA2FJ, UA2FM. **TY5A:** G3SXW, GM3YTS, K5VT, KC7V, N7BG. **VP5FOC:** W9VNE, WØCG, N9DX, W9EFL, WD8AUB, KW8N. **WØAIH/9 &** AA9D, AA9BJ, AAØOC, AIØY, KØTG, KA9FOX, KMØO, KSØT, N9CKC, ND9O, WAØRBW, WWØJ.

W1CW & K1ZX, WC4E, G4BKI, WB4BBH, K7UPJ, AD4VH, N1EE, W1YL. **W3LPL &** WR3E, ND3F, KZ3H, AI3M, K3MQH, K3NA, KF3P, K3RA, K3RV, KO7V, N8II, KE9A, SM3SGP. **W4MYA &** N4ND. **W6BA &** N6AW, NF6H, KC6CNV, K6HMS, W6KP. **W9KDX &** KS9W, K9RN, AA9LX, KF9LB, KD5PJ, WA9YYY. **WD8LLD &** AF8A, N8ARD, KU8E, WB8WTS, N9AG. **WH6R &** AH6JF, K9VV, KH6IFN, KH6XT, N6VI. **WK6V &** N6NW, KA6NAL, N6HCS. **XZ1A:** JA1BK, JH1KRC, JA6LDD, OH1EB. **YT9W:** YU1ZZ, YU1JW, Velimir, 4N1DXX, YU1YV, YU1UA, YT1MA, YU1RA, 4N7DW, YU7GO, YU7GW, YZ1AU, YU1EA, YU6AR, YT1BB, YZ1KW, YZ1EB, YT1EA. **ZM2K:** ZL2AIZ, ZL2AGY, ZL2IR, ZL2BSJ, ZL4SS, ZL2BA, ZL2DX.

(Results continued on page 102)

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AS LITTLE AS

A DAY

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CIRCLE 151 ON READER SERVICE CARD

CONSTRUCTION

How To Build A Broad-Band 5-Element, 20 Meter Yagi

At some point in every amateur's life there comes a time to step up and away from the rest of the crowd. W6NGZ presents us with a project that will let you do just that.

BY JACK REEDER*, W6NGZ

As a long-time antenna experimenter, builder, and designer, I decided it was about time to try my luck at using the computer to come up with an antenna that would be guided by principles that would eliminate some of the guesswork.

My first step was to obtain the software program YAGIMAX[1] written by Lew Gordon, W4VX. It's an easy program, because it's user friendly. It allows you to design and stack Yagies and run graphics, but you must use dimensions that are realistic when you are designing.

Since I was using a homebrew 4-element, 20 meter Yagi on a 35 foot boom, I decided to design a 4-element beam, using a boom length of 40 feet. Forty foot, 3 inch diameter aluminum irrigation pipe is readily available and quite inexpensive.

I spent many hours trying every spacing arrangement and element length possible. These designs had reasonably good gain,

*1331 N. Abrego Dr., Green Valley, AZ 85614
[1]*YAGIMAX, by Lew Gordon, K4VX, P.O. Box 105, Hannibal, MO 63401*

Freq. (MHz)	Gain (dBi)	F/B (dB)	Impedance (ohms)	VSWR	Radiation Resistance
14.000	10.04	20.09	30.35–j8.71	1.32	32.9
14.020	10.07	21.01	30.46–j7.99	1.29	32.5
14.040	10.09	22.03	30.53–j7.23	1.26	32.2
14.060	10.12	23.19	30.56–j6.45	1.23	31.9
14.080	10.14	24.52	30.56–j5.62	1.19	31.6
14.100	10.17	26.10	30.56–j4.77	1.16	31.3
14.120	10.20	28.02	30.55–j3.88	1.13	31
14.140	10.22	30.50	30.55–j2.96	1.10	30.9
14.160	10.25	33.98	30.58–j2.03	1.06	30.7
14.180	10.28	39.84	30.65–j1.10	1.03	30.7
14.200	10.30	47.29	30.77–j.18	1.00	30.8
14.220	10.32	40.68	30.95+j.69	1.03	31
14.240	10.35	34.54	31.20+j1.49	1.06	31.3
14.260	10.36	31.05	31.53+j2.18	1.08	31.8
14.280	10.38	28.65	31.91+j2.70	1.10	32.1
14.300	10.39	26.85	32.32+j2.99	1.12	32.7
14.320	10.40	25.46	32.71+j2.97	1.12	33
14.340	10.41	24.37	32.97+j2.57	1.12	33.2
14.360	10.41	23.53	32.94+j1.75	1.10	33
14.380	10.40	22.92	32.40+j.52	1.06	32.4
14.400	10.40	22.53	31.09–j.96	1.03	31.1

Table I– Characteristics plotted for the 5-element 20 meter Yagi antenna.

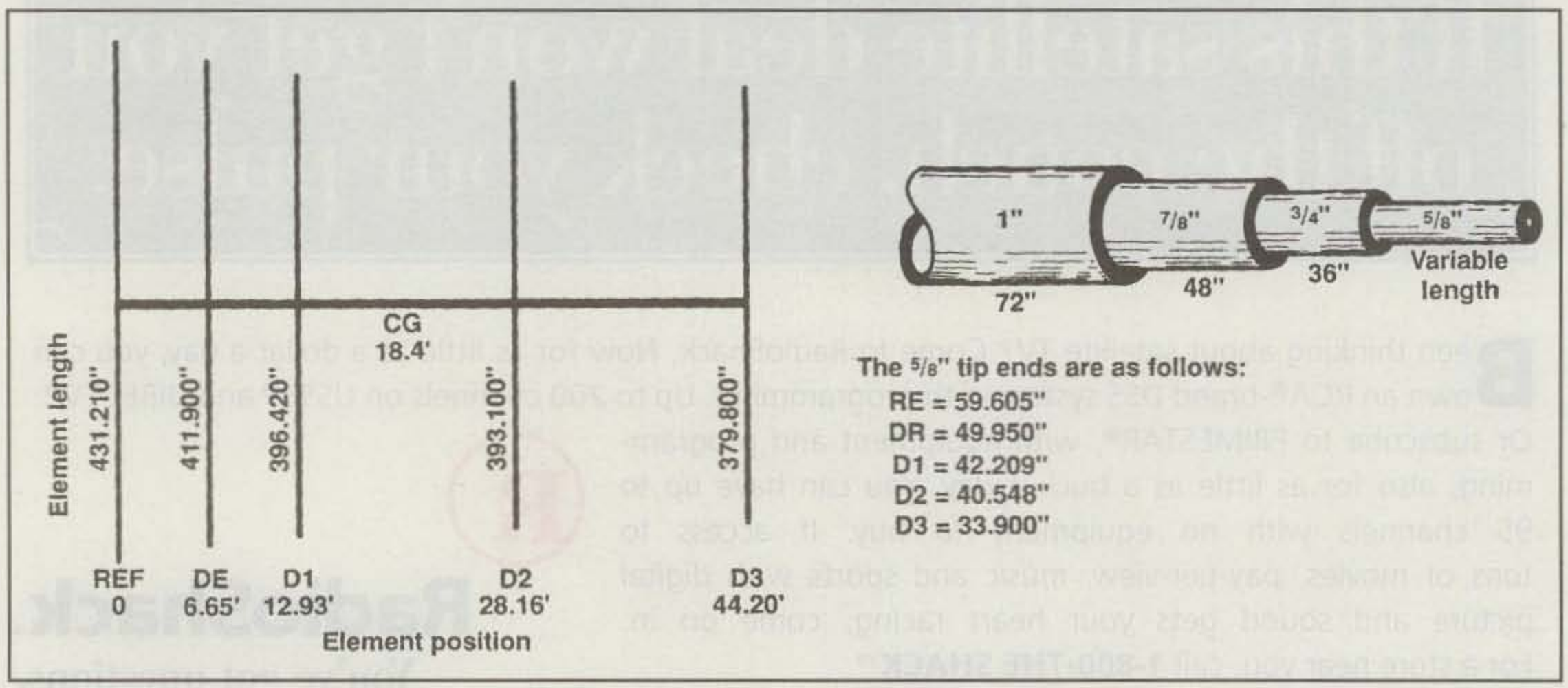
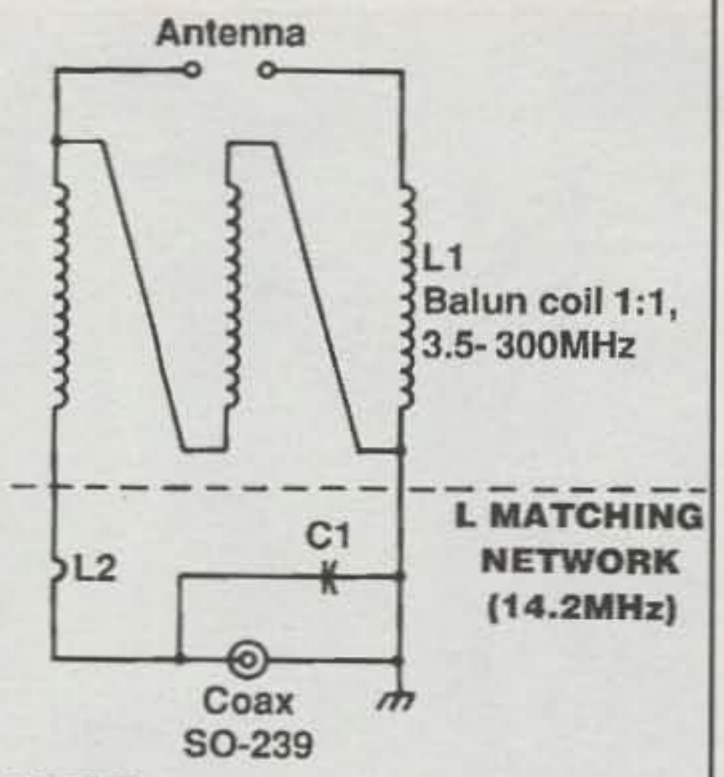


Fig. 1– Physical dimensions and spacing for the antenna. CG refers to the center of gravity. (See text for construction details.)



NOTES:

L1 = 12 turns #14, formvar, 1¼" dia PVC
L2 = 1 turn #14, formvar, 1¼" dia PVC
C1 = 1000V fixed mica (capacitor value as required)

Fig. 2– Schematic diagram for the balun and L matching network.

although the FB and SWR left something to be desired. Out of desperation I added a fifth element, placing it at a very unconventional spot between the reflector and driven element. The added element was now the driven element, and we had very close spacing between reflector, driven element, and director #1. This was a bit of luck, and I could tell on my trusty PC I was really on to something good.

Within a few minutes the 5-element Yagi was completely designed. I also designed a 5-element on a 42 foot boom. Both of these 20 meter designs have excellent FB and the SWR is better than 1:1.3 over the entire 20 meter band.

I completed these designs in November 1991. A short time later I mailed the hard copies to Lew Gordon, who placed the designs in YAGIMAX software. I am pleased to have these designs in YAGIMAX, and they are designated 520NGZ40.inp and 520NGZ42.inp.

A few of these designs were built, and many similar designs began to appear using spacings R-DE-D1 of .15 to .18 WL. The physical size and performace are very close to the computer calculations. These designs using this close spacing are becoming popular and are being accepted at this date.

In November 1994, with a new 486 computer and the latest YAGIMAX software #337, I worked on new designs with boom lengths of 40 to 50 feet for 20 meters (.58 to .7 WL). I hit on a design with a boom length of 44.2 feet (.64 WL) that really caught my attention. Table I shows calculations for gain, FB, impedance, VSWR, and radiation resistance. The radiation resistance (impedance) of this Yagi only varies between 30.7 and 33.2 ohms. This is only 2.5 ohms variation over the entire 20 meter band, which makes for an easy match and very low SWR. Note in Table I the FB is better than 20 dB over the bandwidth and peaks at approximately 60 dB. It is truly a broadband Yagi.

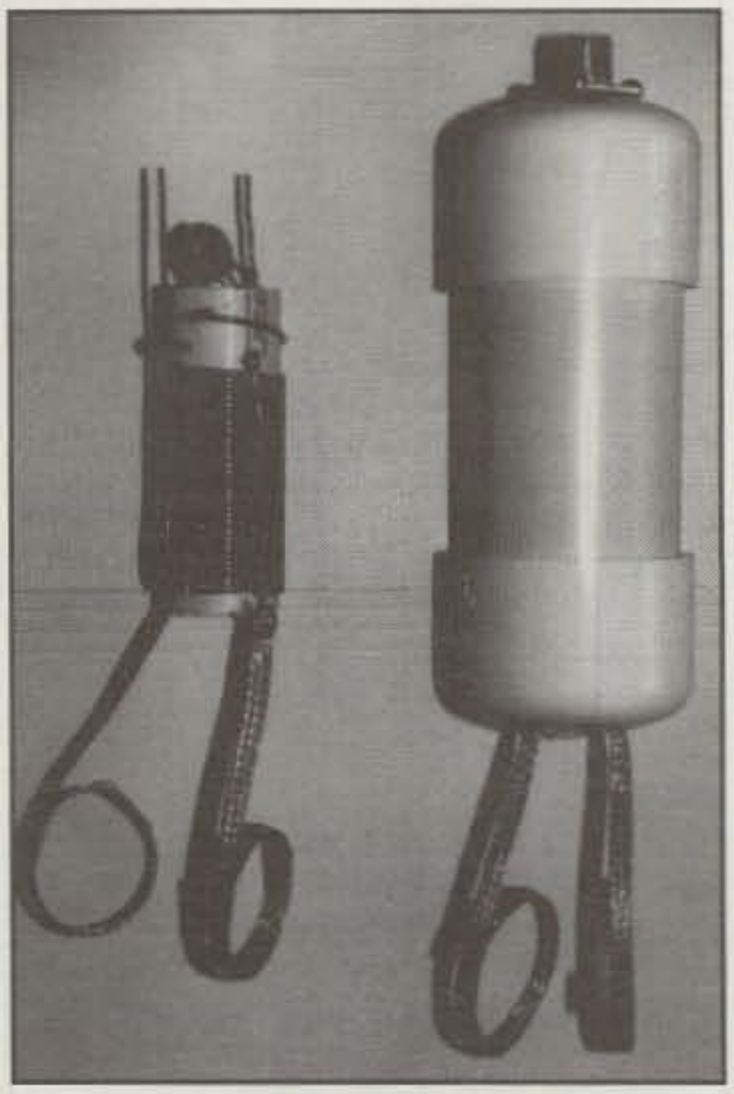
The physical dimensions are shown in fig. 1. Should you construct this Yagi and use elements of a different diameter, the taper will have to be calculated to arrive at the correct element lengths. All the elements are built the same length except for the 5/8 inch tip ends shown in the lower portion of fig. 1. The overall element lengths are also shown in fig. 1, as are the spacing dimensions.

To construct the Yagi use aluminum plates and U-bolts. They work quite well. The plate size should be 3/8 inch thick, 5 1/2 inches wide, and 7 inches long. These plate dimensions were used in the taper calculations. You may use your choice of the feed and matching systems; hairpin, gamma, and T-match are all acceptable. If you choose to use the hairpin match, the driven element should be shortened by approximately 2 1/2 inches to obtain a negative reactance required for the hairpin match.

This design has been checked out on another software analyzer program. The dimensions are very very close to those shown in fig. 1.

I use a split driven element with a homebrew balun and L circuit to match the Yagi (see fig. 2). These are two separate circuits: a trifilar (three wires wound parallel) air balun 1:1 that covers 3.5 to 30 MHz, and an L circuit, which is a different matter. This circuit matches the 50 ohm coax feed line to the 30 ohm Yagi. The balun is wound on PVC pipe, 1 1/4 inch OD. The L-circuit one-turn coil (shown in fig. 2, L2) should also be wound on the same pipe. Start the turn at 1 inch below the end of the balun and reverse the windings in the opposite direction from the winding of the balun. This L circuit is frequency limited, but is plenty broad enough to cover the 20 meter band.

The L circuit along with the balun can now be adjusted to match the antenna's impedance. This can be done at the workbench. Place a 30 ohm noninductive resistor across the balun output. Use a variable capacitor with short leads in the circuit, shown in fig. 2, C1. Dip the capacitor while feeding the circuit with your transceiver using only very low power—approximately 1 watt—to prevent blowing the resistor. The dip will occur on your transceiver SWR meter. The transceiver must be set at the antenna design frequency while running this test. With your test meter, check the capacity of the variable capacitor. Next solder a fixed mica capacitor of the same capacity in the L circuit. The fixed capacitor should be rated at 1000 volts. I have found that by using a small variable capacitor (3-340PF) instead of the fixed capacitor, the L circuit is much better and easier to adjust. Use a variable capacitor with a screwdriver slot and drill a small hole in the PVC to adjust the capacitor.



The completed balun is shown on the left just prior to encapsulation. The unit is housed and protected in PVC as shown on the right.

I have used this feed system for a number of years and like it very much. The insertion loss of the balun and L circuit has been tested with two baluns and L circuits attached together back to back, measuring the loss with a Bird wattmeter into a 50 ohm dummy load. The result is divided by two, which gives the correct insertion loss of one balun. This was found to be .16 dB for 20 meters.

The balun and L circuit may be placed in PVC pipe and sealed (see photo). The photo shows the balun and L circuit prepared to be placed in the 2 inch PVC pipe. Also shown is the completed circuit sealed in the pipe. Coax fitting SO-239 is placed on the outside of the pipe cap using four 6-32 screws and nuts. Solder the circuit to the coax connector. Solder two braided wires, 12 inches long, to the output of the balun. Drill two small holes in the other PVC end cap. Slip the balun inside the pipe and glue the cap in place. Pull the two braided wires through the holes in the other cap. Glue this cap in place. Now pull the slack tight on the two braided wires. Any excess length of the two wires can be trimmed off when attaching the balun to the antenna. Place silicone around the coax fitting and the two holes where the braided wire passes through the cap. Let the silicone dry for several hours.

How does this antenna perform? Just like the computer predicted—broad band, low SWR, excellent FB, and good gain. The Yagi checks out about the same as Table I illustrates.

I have always been fascinated by antennas and have built tribanders, log Yagis, delta loops, quads, and stacked quads. However, I always return to the monoband Yagi. In the past it was a lot of guesswork and a lot of adjusting, but now the computer eliminates all the guesswork. Build this Yagi. You're sure to like it! ■

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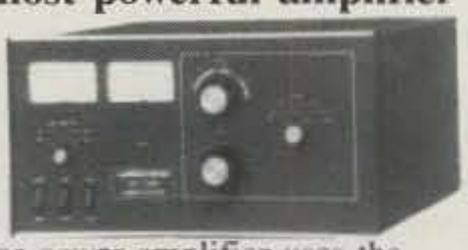

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CQ REVIEWS

The MFJ-411 Pocket Code Tutor

BY PAUL CARR*, N4PC

Allow me to get personal for a moment. About ten years ago I made a career change. After twenty years in the engineering industry, I decided that I wanted to teach. Luckily, I was able to secure a position as an instructor, but this required that I update my credentials.

Returning to the classroom as a student was totally frightening. I was working full time as an instructor and had obligations as a husband and a father. Where would I find the time to complete all the tasks?

The answer was very simple. I learned to use "flash cards." I put the significant information concerning the subject material on small cards and tucked these in my shirt pocket. When I found that I had 30 seconds or more, out came the flash cards. I took advantage of the time at hand for meaningful study. I found I had all the time needed if I used it wisely.

How many times have you heard someone say that he would have a license if he only had the time to learn the code? Well, MFJ has answered the challenge by creating an "electronic flash card" so an individual can find the time to learn the code.

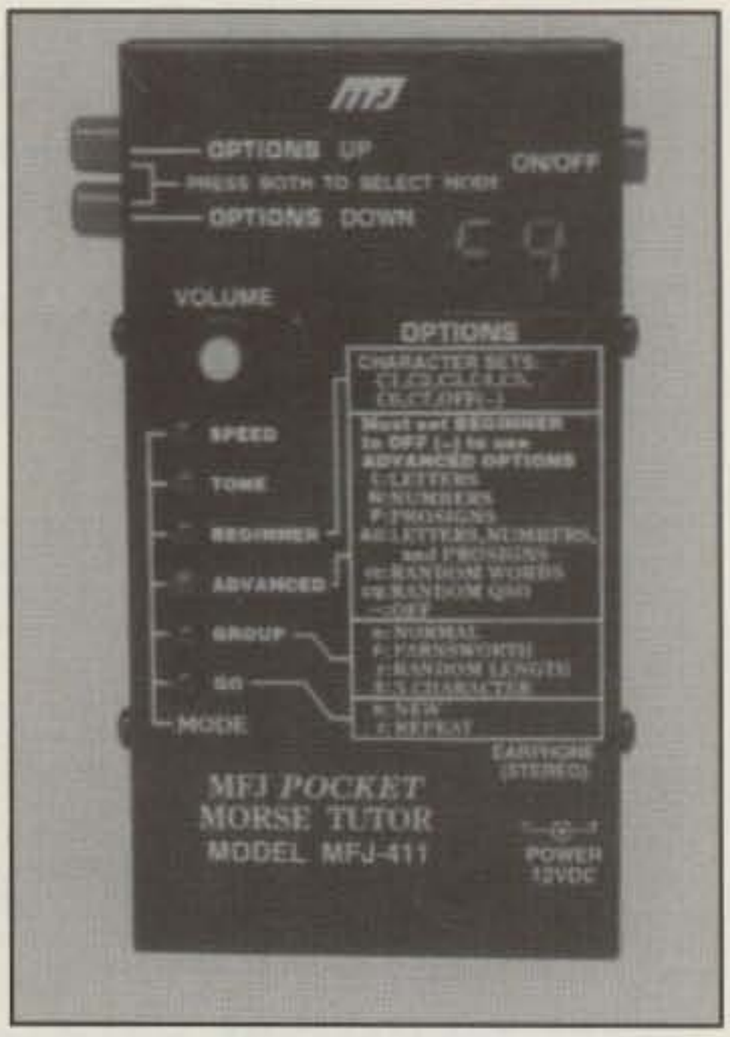
The MFJ-411 Code Tutor from MFJ Enterprises is a microprocessor-controlled device that can help an individual learn code from no code to 60 words per minute. It contains over 500 words, names, and callsigns used in amateur radio and a random QSO generator to simulate "on the air" contacts.

The MFJ-411 can be powered by an internal 9 volt battery, or it can be powered by an external 12 VDC source (not supplied). It is small enough to tuck into your lapel pocket, so you can take advantage of the formerly wasted time during commutes. You can learn code in private by connecting a pair of stereo headphones into the jack on the side of the unit.

The Code Tutor has all the features needed for learning Morse code individually or collectively. After you have decided how you will study code, it is simple to set the options on the Code Tutor.

There are control buttons on the right and left of the unit. When you turn on the unit, the MFJ-411 will send "ON" at the default speed of 13 wpm. If the unit sits for more than 5 seconds, the display will go blank—a designed battery-saving feature. With the display blank, the current drain is reduced to one half the normal demand. There are options available from a menu so that you can select speed, tone, and beginner or advanced lessons.

The beginner option is meant for someone who doesn't know any code and needs to learn



The MFJ-411 Pocket Code Tutor.

the sound of the characters. There are a total of seven character sets that will allow you to learn the alphabet, numbers, and punctuation characters. The Code Tutor sends each character set three times, and this can be repeated as often as necessary before advancing to random code groups. As your skills and confidence increase, you can go to the advanced mode. More characters are introduced, and you can increase your skills by choosing random code groups or practice QSOs. The practice QSOs are a good way to study for the exams, because this is the format for the current code tests. The random code groups can be sent in a normal format (all characters are sent at the speed selected by the mode selection) or the Farnsworth format. In the Farnsworth format all characters are sent at a speed of 18 wpm, and the overall speed is at the chosen default speed. This is a good technique to help beginners learn the sound of the characters instead of counting dots and dashes.

The instruction book is clearly written and fully explains all functions of the Code Tutor. The MFJ-411 is priced at $79.95, and there is a full 12 month warranty. The unit is manufactured by MFJ Enterprises, 921A Louisville Rd., Starkville, MS 39759. ■

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Interesting Antennas I Have Known

Marconi started it all with the grounded antenna bearing his name. The Marconi was the antenna of choice at the turn of the century (in most instances), but what about radio transmission from aircraft that were not at ground potential? To be more specific, what about the large Zepplin dirigibles of Count Hugo Eckner of Germany that monopolized long-distance air passenger service in Europe before World War I?

It was vital to keep the transmitting antenna away from the body of the airship, which contained large hydrogen-filled silk bags which gave the aircraft bouyancy. It was necessary to vent hydrogen to lower the airship, or to drop quantities of sand to lighten the weight for ascension. In either case, static electricity could create a spark that would destroy the craft in a flaming outburst. Not a few Zepplins (and crew and passengers) met their fate in this manner.

It was possible for an accidental electric arc to be created by the radio transmitting equipment aboard the Zepplin. The oscillating spark for transmission was carefully mounted in an enclosure, shielding it from the atmosphere. It also was necessary to remove the antenna a distance from the airship. This helped to isolate the metal skeleton of the Zepplin from the immediate field of the antenna, thereby reducing RF potential differences between individual parts of the airship. All metallic parts of the craft were bonded together carefully, and gas escaping from the silk balloon bags was vented away from the radio and electrical equipment. Even so, a radio spark and the high voltages on the transmitting antenna were a constant hazard to the giant dirigibles.

To isolate the antenna, which dropped vertically beneath the airship, a two-wire transmission line was used to feed a half-wave wire (fig. 1). The line was a quarter-wavelength long at the operating frequency, which in some cases was as high as 2 MHz.

The ungrounded airship antenna was called the Zepplin Antenna, and variations of it quickly were adapted by radio amateurs. It was featured in early editions of *The Radio Amateur's Handbook* (now called *The ARRL Handbook*). An early illustration of a "Zepp" antenna for amateur work is shown in fig. 2.

Successful operation of the Zepp is a function of correct feeder design. The two-wire line must be symmetrical—that is, the wires must be the same length, have the same capacitance to nearby objects, and be light enough to swing as a unit when the wind blows. Choosing the proper length for optimum operation was a subject as hotly discussed in the early days of amateur radio as antenna gain and front-to-back ratio of a beam are discussed these days.

In spite of mechanical problems dealing with feeder spacing, the Zepp antenna was a popular amateur radio skywire before World War II. Now few modern amateurs even know of its existence. For a decade or so, however, it was the DX antenna to beat in HF radio.

48 Campbell Lane, Menlo Park, CA 94025

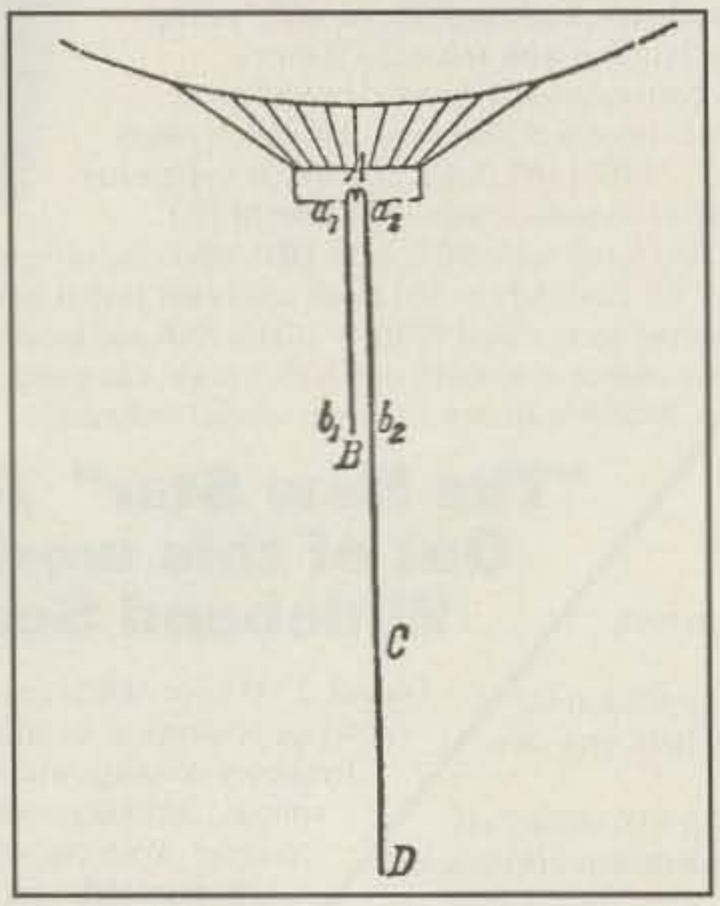

Fig. 1–The Zepp antenna hung beneath a dirigible. The feedline consists of a_1a_2–b_1b_2. The antenna is B-C-D. (Original drawing from Zenneck's Wireless Telegraphy, *1st ed. [1915], McGraw Hill Book Company. Zenneck was a smart engineer; he knew a thing or two!)*

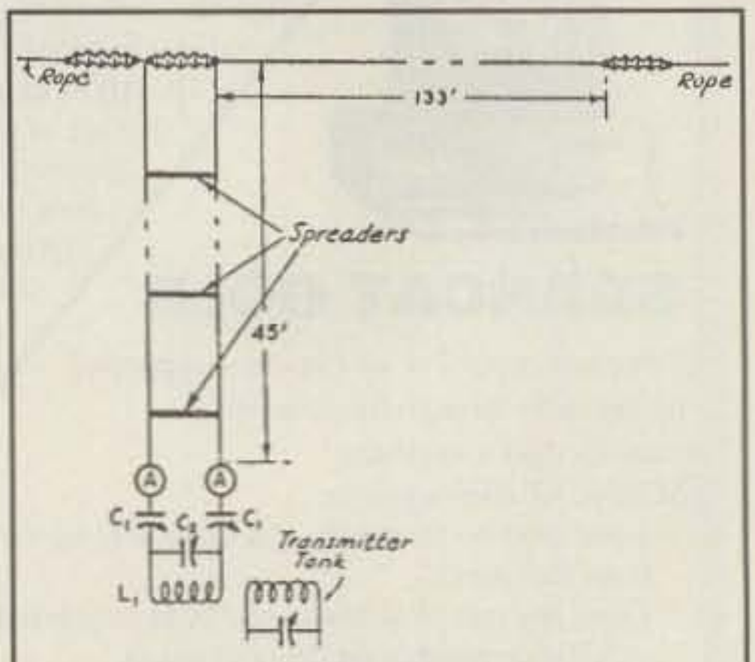

FIG. 1210—A ZEPPELIN (VOLTAGE FEED) ANTENNA FOR SEVERAL BANDS.

The antenna has a fundamental frequency of 3550 kc. but could be of any fundamental frequency between 3500 and 3600 kc. Since the feeders are less than a quarter-wave long for 3500 kc., parallel tuning should be used for this band. Series tuning will be best on the 7000- and 14,000-kc. bands and probably for the 28,000-kc. band. The condensers C_1 and C_2 may be of 250- or 350-μμfd. capacity.

Fig. 2–Early Radio Amateur's Handbook *drawing of the Zepp antenna. (Courtesy the ARRL.)*

Did The Zepp Really Work As Theorized?

The theory of the Zepp antenna is simple. The out-of-phase currents in the feeder wires are self-cancelling and prevent radiation from this section of the antenna, leaving the half-wave section to do its stuff. It permits a flat-top to be end-fed without the nuisance of having the high-voltage portion of the antenna enter the shack. This was ideal for an antenna on a dirigible, and had merit for an amateur installation, where the radiator was placed in the horizontal plane and the Zepp feeders dropped down the side of the home to the operating position.

Amateurs soon found that the Zepp antenna could operate on harmonic frequencies, provided a suitable tuning unit was used at the transmitter (fig. 3). Either series or parallel tuning would do the job, matching the terminal impedance of the feedline to the transmitter output circuit. With this flexible arrangement, it was apparent that feeder length was not so critical after all; the tuner could make up any deviation from the desired quarter wavelength. Radiation from the feeders was deemed unimportant.

Some engineers and amateurs believed that the Zepp could not possibly work in its true form because of the single-point connection to the radiator, with no path for return current. Successful operation of the Zepp was attributed to stray coupling and luck, and there the matter rested. By 1945 it was a forgotten antenna.

Recently Brian Beezley, K6STI (3532 Linda Vista Cr., San Marcos, CA 92069 [619-599-4962]), provided a computer analysis of the Zepp antenna in one of his antenna programs. The results are pleasantly suprising in that a properly constructed Zepp shows that feedline currents are remarkably equal and out-of-phase throughout most of the line length. Radiation from the feedline exists, but it is minimal, more than 20 dB below the field of the flat-top antenna. Thus, Zepp-feed can provide practically the same results as does center feed. The advantages of end-feed in certain installations are obvious.

The two-wire feeder provides a nice system for an end-fed antenna. Many amateurs run a wire antenna from their residence to a nearby tree or pole. Bringing the end of the antenna into the house is a poor idea, as it can lead to interference problems (TVI, telephone interference, etc.). Ground losses are high, and the setup also can make the chassis of the transceiver "hot" with RF. The end-fed Zepp permits the antenna to be coupled to the transmitter at a low-voltage, low-impedance point that works best with simple antenna tuners.

Many of today's tuners are single-ended circuits and use a ferrite balun to provide a balanced output. This is okay, provided the balun feeds a low-impedance, balanced load. This can be achieved easily with the Zepp, if the flat-top is multiples of a half-wave long, and the feeder is an odd multiple of quarter wavelengths long.

For instance, the flat-top can be 1/2, 1, 1 1/2,

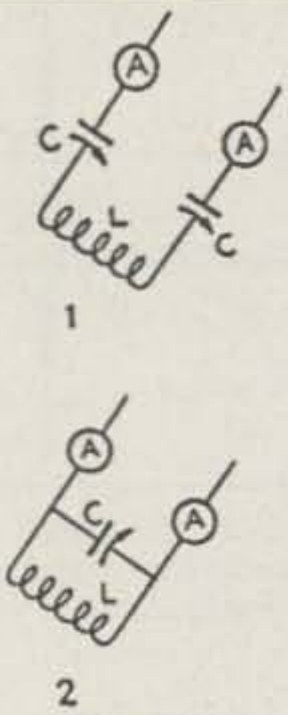

FIG. 1209—SERIES AND PARALLEL FEEDER TUNING. *Series tuning is used when there is a current loop on the feeders at the coupling point; parallel tuning when a voltage loop appears at the coupling point. The feeders are operating properly when the currents indicated by the two ammeters are identical.*

TABLE I—SOME SUGGESTED ZEPPELIN FEEDER LENGTHS AND RECOMMENDED TUNING METHODS FOR THE VARIOUS AMATEUR BANDS.

This table may also be used to determine the tuning method for the center-fed antenna system of fig. 1212. In this case it will be necessary merely to use the method opposite to that stated. Where series tuning is specified for a given feeder length for the Zepp, parallel tuning should be used with the same length of feeders in the center-feed system.

Approximate Length of Each Wire, Feet	*Tuning Arrangement for Various Bands*				
	1750 kc. (160 m.)	3500 kc. (80 m.)	7000 kc. (40 m.)	14000 kc. (20 m.)	28000 kc. (10 m.)
120	Ser.	Par.	Par.	Par.	Ser. or Par.
90	Par.	Ser.	Ser.	Par.	Ser. or Par.
60	Par.	Ser.	Par.	Par.	Ser. or Par.
40	(---)	Par.	Ser.	Par.	Par.
30	(---)	(---)	Ser.	Par.	Ser. or Par.
15	(---)	(---)	Par.	Ser.	Par.
8	(---)	(---)	(---)	Par.	Ser.

Ser.—Series Tuning. Par.—Parallel Tuning. (---)—Not Recommended.

Fig. 3– ATU data from early Handbook *showing how it is supposed to be.*

or 2 wavelengths long, with the feeder being 1/4, 3/4, or 5/4 wavelengths long. The longer the feedline, though, the harder it is to achieve proper line balance. Hence, most amateurs opted for a quarter-wave feed line in the early days.

Build A Zepp Antenna? Surely You Jest!

Well, why not? It doesn't cost much money or take much time to build a Zepp. It may be just the ticket if you yearn to end-feed your antenna. Let's say you want a 40 meter Zepp cut for the high end of the band (7.2 MHz). By the well-known formula the half-wave flat-top will be about 65 feet long, and the feedline will be half this, or 32 ft. 6 in. long. Line spacing is not critical, so 4 inches is chosen as a workable value.

In the good old days, ceramic feeder spreaders could be bought for a few cents each. Not so today. You have to make your own. Plastic rod will do the job (fig. 4). The best way to make the line is to stretch the two wires between fixed points, about waist high, under tension. The spreaders are then wired to the line. Need help? Ask any Old Timer.

Affixing the feeders at the antenna can be tricky, as you may wish to bring the feeders off at some odd angle to the antenna. The insulator shown in fig. 5 will do the job. It's made of a small plastic plate, with two standoff insulators affixed to it. Using this device, the feedline can be brought off at any angle to the flat-top without causing any physical unbalance or flexing of the wires.

The purist can use a dip meter at the feedpoint to trim the system to resonance. Simply short the end of the feed line with a one-turn loop coupled to the meter. Trim or lengthen the line until you get antenna system resonance at 7.2 MHz. This provides a balanced, low-impedance point to attach to the output terminals of the ATU.

The Zepp can be operated on harmonic frequencies, but this requires a balanced antenna tuner capable of operating into a high-impedance load. Construction of such a tuner seems to be a lost art. You'll have to look for old editions of *The ARRL Handbook* or *The*

Radio Handbook to find construction information, or else try to locate an old Johnson "Matchbox" tuner at a fleamarket.

Another alternative is to change the length of the feedline so that it is one- or three-quarter waves long at the harmonic frequency. In any event, the Zepp is a fun antenna to play with, and the end-feed idea may be helpful in your particular QTH.

The 73 kHz Amateur Band

Our friends the Brits have a leg up on us with regard to a new amateur band! According to *Radio Communication*, the flagship publication of the RSGB, on April 29, 1996 the Radiocommunication Agency (the British equivalent of the FCC) announced a new low-frequency amateur band, running from 71.6 to 74.4 kHz. Maximum ERP is 1 watt.

While it is true that American amateurs can operate at any spot in the low-frequency spectrum under rather stringent rules, there is no official recognition, per se, of strictly amateur operation using amateur radio calls. If my memory is correct, LF operation is severely limited by antenna length and power input. The scheme was originally conceived for so-called wireless record players, in vogue during the 1940s.

The British assignment is a real amateur radio band, where callsigns are used. It's not much of an assignment, as the bandwidth is very small (slightly less than one speech channel) and the power level is insignificant. This is a step in the right direction, however.

New Zealand, I understand, has an LF amateur assignment (165–190 kHz) with a power limit of 100 watts. Now that's something worthwhile! Australia too has special amateur permits for LF operation.

It would seem to me that some portion of the LF spectrum could be set aside for amateur work in the United States. I would opt for 20 or 30 kHz in the 150 to 350 kHz region, with a power level of 100 watts and no antenna restrictions. That would be something to look forward to before the turn of the century! Why not?

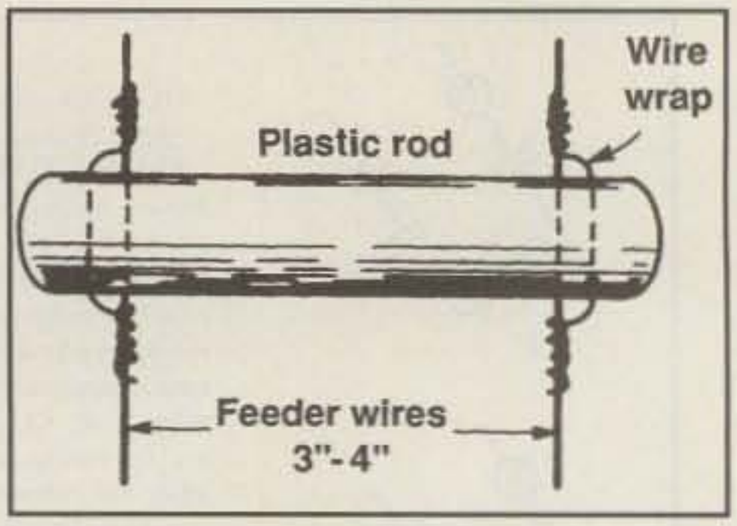

Fig. 4– Double sets of holes drilled at each end of a spreader permit wire wrap to hold the feed wires in place.

KB6GJX, The "Ghost of Guam"

On December 8, 1941 the bombardment of the island of Guam took place, spearheaded by the Imperial Naval forces of the Japanese Empire. This was followed up by invasion and occupation—the only populated American territory to suffer such a fate.

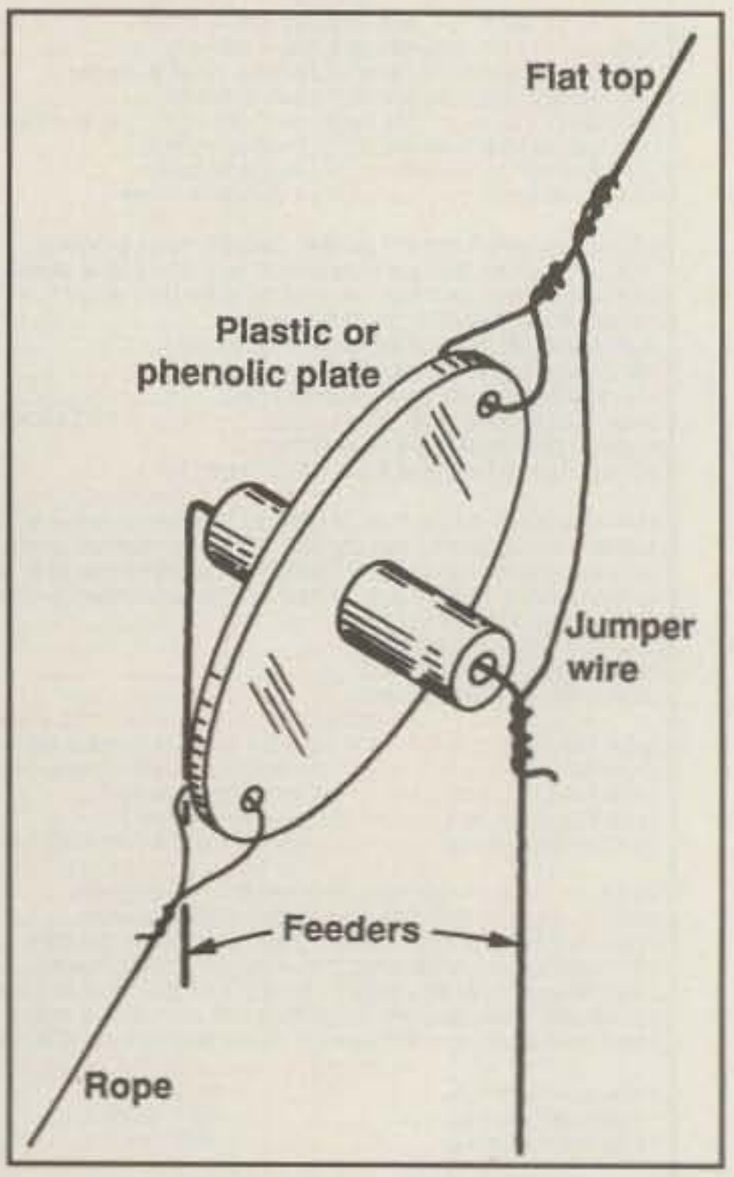

Fig. 5– Feeder-antenna junction plate. Old Timers used brown "beehive" insulators for best results. One-half inch maple boiled in paraffin was used. Feeders may be brought off at any angle. (Adapted from photo in The Radio Amateur's Handbook, *12th ed. (1935).*

Radio amateur activity on Guam had been closed down the previous June by the U.S. Navy, and all amateur transmitting equipment had been impounded and stored for delivery to the rightful owner at some time in the future.

That put Warrant Officer George Tweed, USN, off the air. As KB6GJX he was very active on 20 meters phone, with a 200 watt homemade transmitter and a Zepp antenna. One of the first bombs to hit Guam on the day of the invasion landed on George's house. No one was hurt, but most of the gear, including his receiver and test equipment, was blown up.

Aside from KB6GJX there were two other amateurs on Guam: KB6CBN, Roy Hennings, and KB6OCL, a club station operated by a Marine named Anderson. Henning was captured by the Japanese and taken away to a prison camp, and Anderson was killed in an air raid. George, KB6GJX, the only amateur left alive, prepared boxes of food and clothing before escaping into the hills, with the invaders firing at his car as he sped away.

A companion Navy radio man who escaped with him was killed and George was left alone, hiding in a cave in the interior of the island. He was assisted by friendly natives who told him that the Japanese had issued orders that all radios must be turned in and anyone caught with radio gear would be put to death.

In spite of the danger, George was anxious to know what was going on in the world, and he asked his friends to bring him a receiver. They brought him a Hallicrafters SX-16, stolen from the Japanese, plus a power supply and some storage batteries from wrecked cars. With effort George got the receiver and power supply working, and soon thereafter the natives brought him a collection of tools, a soldering iron, and a gas-driven 110 volt, 60 Hz generator! They also brought gas for the generator from wrecked military vehicles.

As time went by, George collected a Triplett analyzer, wire, solder, and various radio components. Eventually he got a copy of *The ARRL Handbook* and a typewriter. It looked as if he had enough junk at hand to build a transmitter!

All this time the Japanese were searching for the American radio man. KB6GJX had to change his location several times. His main objective was to stay alive, and building a transmitter took second place to that! Progress was slow. He listened daily to news broadcasts from KGEI in San Francisco, and even typed up a one-page newsletter for his native friends.

Eventually, one of the natives volunteered to take the parts to town, where it would be easier to assemble a transmitter. Alas, the good samaritan never returned, and George heard that he had been captured and shot. Chances of getting on the air now seemed slim indeed. Most of the transmitter components were gone, and there was a price of 1000 yen on his head. Finally, with the Japanese close on his trail, he gave his receiver and remaining equipment to a native to hide. When George later retrieved the equipment, it was damaged beyond repair by water and dampness.

For 31 months George Tweed dodged the Japanese. He finally was rescued when the Americans reclaimed Guam. A portion of his adventures were told in the March 1945 issue of *QST*. Soon after the publication of this article, Tweed collaborated with Blake Clark to write *Robinson Crusoe, USN: the Adventures of Grorge R. Tweed, RM1C, on Jap-held Guam.*

The book initally was a resounding success, but its sales were suppressed by powerful political problems on Guam. It soon disappeared and was unavailable for almost 50 years. Some years after the war the story of George Tweed was made into a movie starring Jeffery Hunter and entitled *No Man is an Island.*

The U.S. Naval Institute has announced that the book is now reprinted, with additional information about the characters and issues of conflict. It is in the public domain, and Tweed's widow, Doris, receives royalty checks on sales. The book is not available through bookstores, but may be ordered from the publisher for $24.95, which includes shipping by priority mail. The address is: The Pacific Research Institute, Box 26270, Barrigada, Guam 96921.

The story of KB6GJX is an amazing tale of human spirit, and his suppressed memoirs reveal an interesting story of intrigue and politics in a life or death situation.

And Finally . . .

My heartfelt thanks to the following amateurs who have written to me over the past months. I'm sorry I can't reply to all of you personally, but believe me, I read your input and really appreciate it. It's comforting to know that somebody actually reads this column!

Kudos to: W8FAZ, W9JUV, W8LVN, N4FG, W5IKB, N5AR, W8DMR, W7CG, W6LU, W6UVC, AH6NY, W4SXK, W2NBJ, K6YGK, KM6EH, N2TAI, W4WDS, WB4GNR, K2BRY, N1TEV, W8LVN, W1VMH, W9BRD, YS1AG, WA6PJQ, KB2TON, VE7FIF, W1KL, AAØRN/IT9, W7CG, WB6YJE, N6PUO, KR6A, W9CWG, W2QOC, K3VMS, AB5XV, W3LWX, W5AAD, KØBIT, W7XK, W4IBZ, K4VRN, W6TFG, N2KPE, W9CWG, NTØW, and NW2L.

73, Bill, W6SAI

CONSTRUCTION

How To Make A 160 Meter Quarter-Wave Sloper Antenna

There's still plenty of life left in 160 meters, and it's not that hard to get an antenna up for top band.

BY LEW McCOY*, W1ICP

I had an occasion to give a lecture on antennas at a recent club meeting. Much of the talk centered around 160 meter activity. As you well know, the sunspot cycle is really in the doldrums, and when that happens, usually the low bands (80 and 160 meters) spark great interest. After my talk several amateurs gathered around to ask additional questions and tell me what they were using. Clem, W7JGU, an old friend, told me about his 160 meter sloper, which has been an outstanding performer. I asked him for the details, with the aim of passing on the information to you.

Before you get too interested, one of the requirements for this antenna is a 50 foot tower. The tower doesn't have to be exactly 50 feet, but that's what Clem has. On the other hand, many amateurs have towers, so this antenna is well worth considering. Although the antenna is very simple, it has brought very, very good results—more on that in a moment.

Technical Editor, CQ, 1500 West Idaho Street, Silver City, NM 88061

Fig. 1 is a drawing of the antenna and installation. The antenna proper is a quarter wavelength radiator, 125 feet in length, plus or minus 5 feet for resonance adjustment. The angle of the antenna in relation to ground can be anything from 45 to 75 degrees. Feed is simple. Fifty ohm impedance coax is used from the station up to the antenna. The shield of the coax is connected to the tower via a good clamp. The inner conductor of the coax goes to the antenna wire. The bottom end of the antenna is connected via Kevlar line (any insulated material can be used) to a post or tree. In this case, the end of the antenna is 10 feet off the ground to avoid accidental contact. Be sure to waterproof the connection of the coax shield and inner conductor so moisture does not get into the coax. There are plenty of ways, such as the GE gel materials, to seal off the coax.

How good is the antenna? Clem has worked all states and a lot of DX on 160 meters with the antenna, operating from Tucson, Arizona. In fact, on one occasion he worked three Rhode Island stations in just an hour one evening. ■

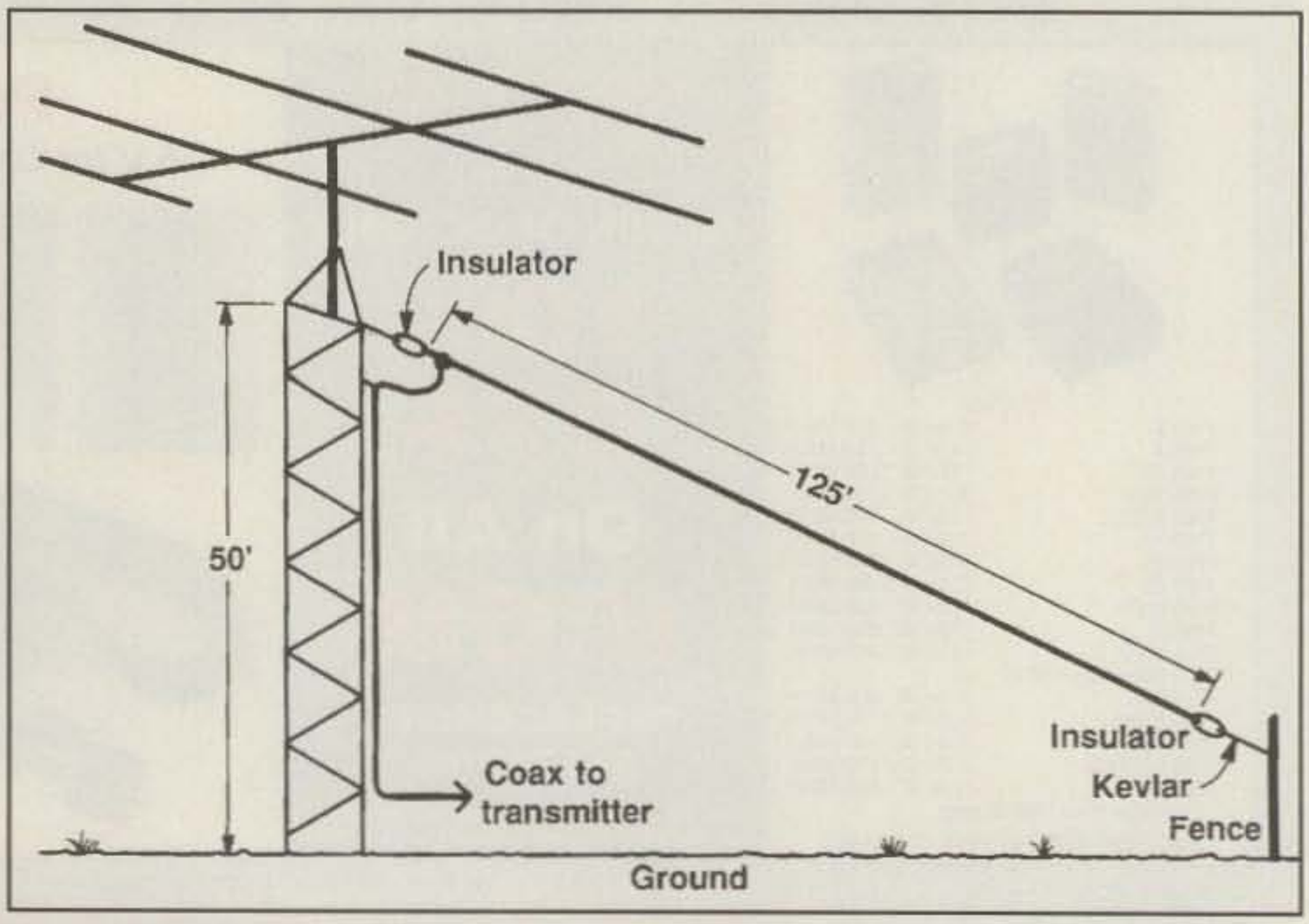

Fig. 1– The W7JGU sloper. The drawing is self-explanatory. The height of the tower doesn't have to be 50 feet, but the higher the better. We suggest running the coax very close to the tower. In other words, don't let it sway in the wind. It could upset the match. The antenna match can be checked by using an MFJ matching indicator bridge. Simply shoot for the lowest SWR by pruning the antenna length at the ground end.

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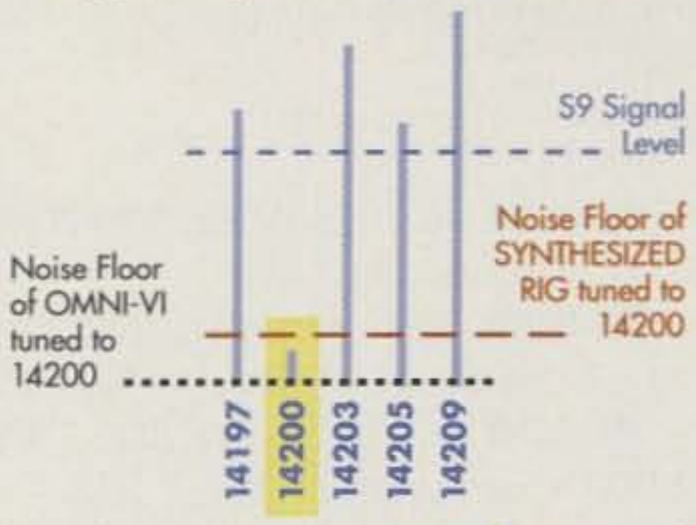

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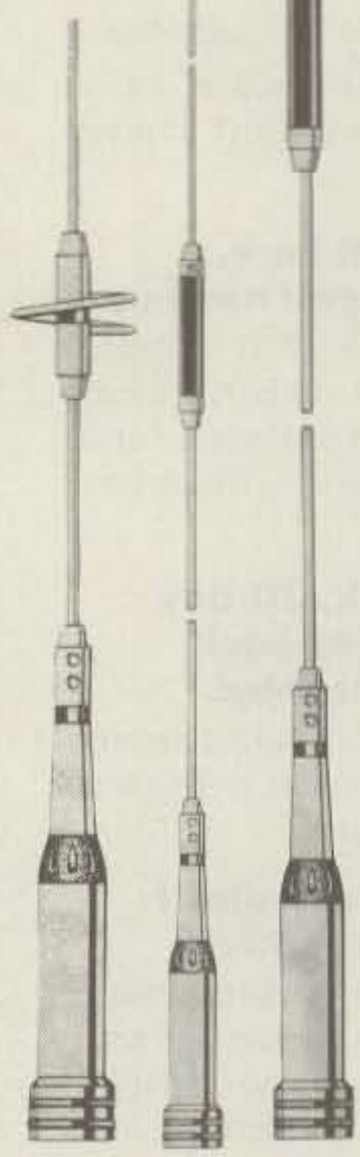

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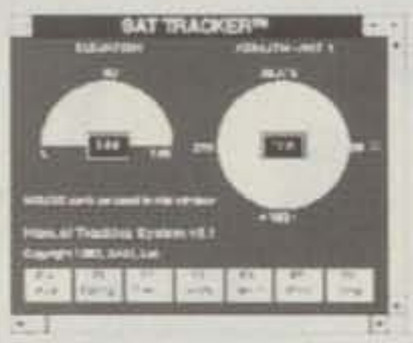

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UNIDEN BEARCAT BC50XL/BC55XLT/ BC70XLT/BC100XLT/ BC200XLT/BC205XLT
ALINCO DJX1
ICOM ICR1 Handheld
REALISTIC-TANDY-RADIO SHACK PRO35/PRO38/PRO41

SSE

SSE PSU101T

Desk Charger/Power Supply 9VDC Version

• 9 volt version for popular REALISTIC (RADIO SHACK) handheld scanners and others that require a 9 volt DC supply
• All the same quality & features of the PSU101 12 volt version above!

For: REALISTIC- TANDY- RADIO SHACK PRO34/PRO37/PRO43 and others.

Adjustable SSE BHA3 (C)

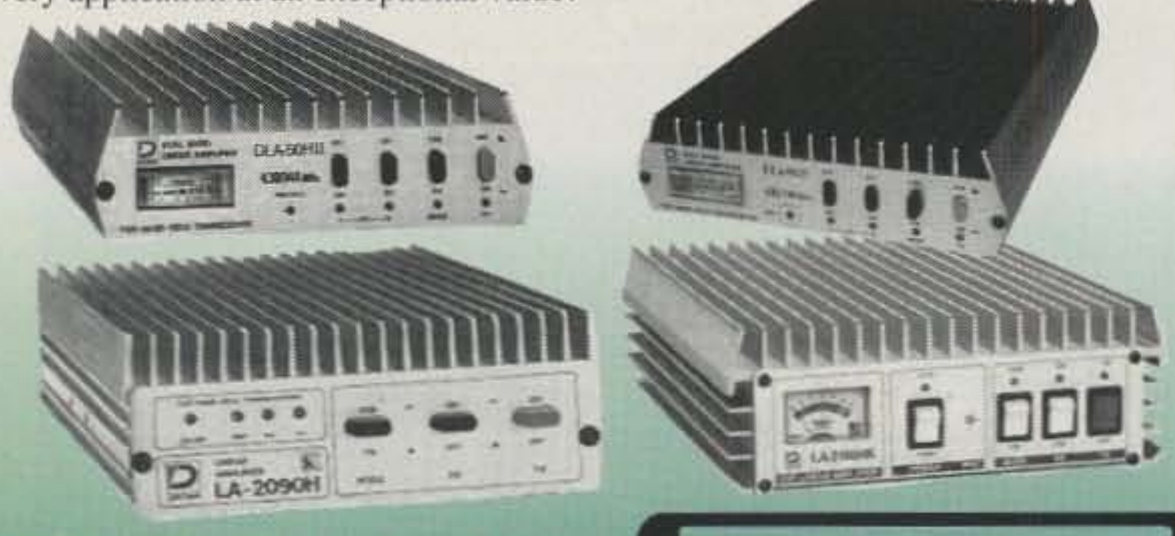
Universal base stand for handheld scanners and transceivers

• Heavy chrome base for extra stability, even with heavy handhelds.
• Adjustable front support stop which adjusts to fit all popular handheld scanners and transceivers.
• Convenient rear panel BNC connector for external antenna attachment - Use a short jumper to your radio and remove stress of large external antenna cable from your handheld's connector.
• Deluxe felt-lined radio tray that won't hurt your handheld's finish. BHA3 C comes with cable.

DAIWA

DAIWA DUAL-BAND & 2 METER AMPLIFIERS

World famous Daiwa dual-band and VHF amplifiers offer quality and rugged, reliable performance! All models feature switchable low-noise GaAsFET RX preamps. The dual-band models have a preamp for each band. Front panel power output meters and built-in duplexers are standard on all dual-band models - only one cable is needed between the amplifier and your dual-band antenna or dual-band radio! With power outputs from 35 to 200 watts available, you'll find a Daiwa amplifier that's perfect for virtually every application at an exceptional value!



DAIWA SSE

Professional Quality Preamps

Jim M-100

Specifications:

Frequency Range: (Using bandwidth selector switch)	A band 225MHz - 1500MHz B band 108MHz - 185MHz C band 24MHz - 2150MHz
Gain:	-10 - +20dB fully adjustable
Noise Figure:	Approx. 2dB
Max. Transmit Power:	5 Watts
Power Source:	9V battery PP3-006P etc.
Size:	80H x 59W x 30D mm
Weight:	Approx. 110g (without battery

M-51

Specifications:

Frequency Range:	A band 225MHz-1300MHz B band 108MHz-174MHz C band 24MHz-1500MHz
Gain:	0 to +20dB (24-1000MHz)
Noise Figure:	Approx. 2dB at 500MHz
Power Source:	3V (batt. UM-4 x 2) 12V (external DC)
Size:	75H x 37W x 17Dmm
Weight:	Approx. 80g (w/o batt.)

M-75

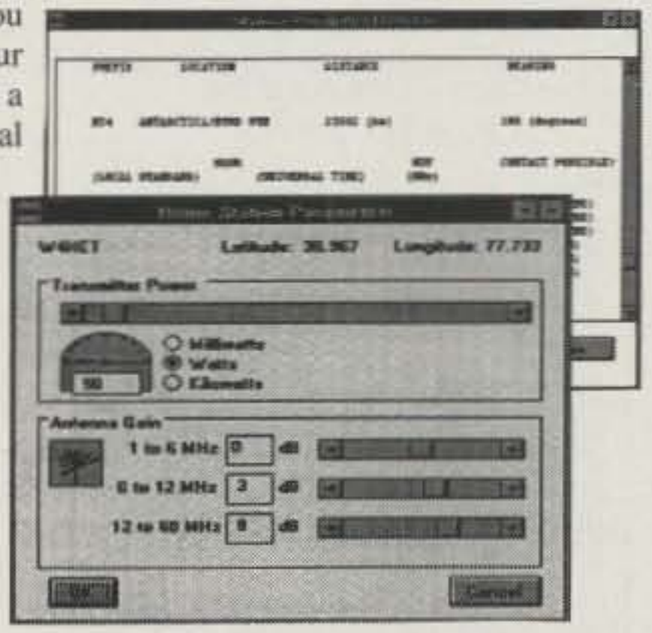
Specifications:

Frequency Range:	A band 225MHz - 1500MHz B band 108MHz - 185MHz C band 24MHz - 2150MHz
Gain:	-10 - +20dB fully adjustable
Noise Figure:	Approx. 2dB
Power Source:	9V battery PP3-006P etc.
Size:	80H x 59W x 30D mm
Weight:	Approx. 103g (w/ battery)

SKYCOM

Skywave Propagation Prediction Software for Windows 3.1/Windows 95

Tell SKYCOM where you are, your transmitter power and antenna gain. Enter the current Sunspot Number or Solar Flux measurement. SKYCOM's windows simplify data entry. Pick a location from SKYCOM's database of over 400 call sign prefixes, using SKYCOM's database search tools or map. You can tailor the SKYCOM database to your own needs by adding additional locations. Instantly obtain prediction reports that tell you the best time and frequency for your transmission. You can also obtain a detailed report that lists the vertical critical frequency, frequency of Optimum Transmission, Signal to Noise ratio, and other data. SKYCOM 2.0 includes an on-line beam heading reference to the direct and long path bearing and distances (in miles and kilometers) from your home station to all locations in the SKYCOM database.



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OPTOLINX PC-Radio Universal Interface

The OPTOLINX universal interface from Optoelectronics, Inc., is a computer interface that adapts to a variety of radios, scanners, decoders, frequency counters, and GPS receivers for connection to an RS-232C personal computer serial port. Both full and half duplex devices can be connected simultaneously using software to switch between them.

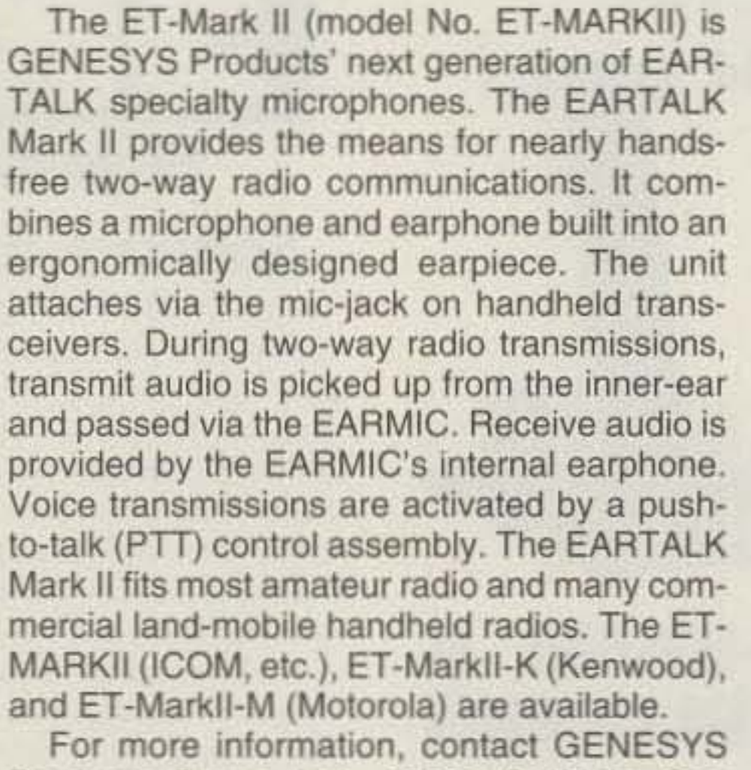
OPTOLINX incorporates special provisions for connecting the AR2700 and AR8000 to a PC for full-featured computer-controlled scanning, allowing the user to control multiple radios at one time, switching back and forth. The OPTOLINX can interface with an NMEA 0183 compatible GPS or LORAN receiver.

For more information, contact Optoelectronics, Inc., 5821 NE 14th Avenue, Ft. Lauderdale, FL 33486 (954-771-2050; orders 1-800-327-5912), or circle number 102 on the reader service card.

GENESYS EARTALK Mark II

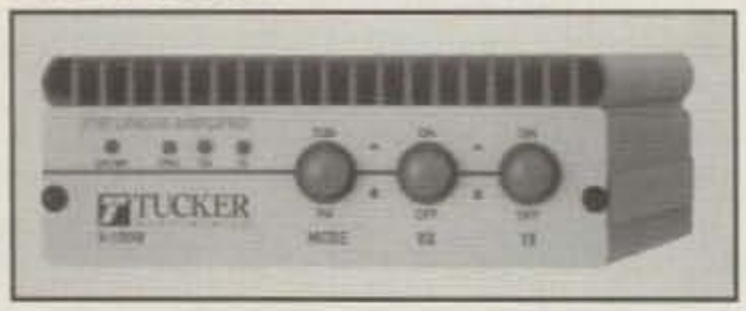
The ET-Mark II (model No. ET-MARKII) is GENESYS Products' next generation of EARTALK specialty microphones. The EARTALK Mark II provides the means for nearly hands-free two-way radio communications. It combines a microphone and earphone built into an ergonomically designed earpiece. The unit attaches via the mic-jack on handheld transceivers. During two-way radio transmissions, transmit audio is picked up from the inner-ear and passed via the EARMIC. Receive audio is provided by the EARMIC's internal earphone. Voice transmissions are activated by a push-to-talk (PTT) control assembly. The EARTALK Mark II fits most amateur radio and many commercial land-mobile handheld radios. The ET-MARKII (ICOM, etc.), ET-MarkII-K (Kenwood), and ET-MarkII-M (Motorola) are available.

For more information, contact GENESYS Products Group, Ltd., 10815 Gulfdale, San Antonio, TX 78216 (800-847-4745; fax 210-349-4300); e-mail <genesys@connecti.com>; internet< http://www.connecti.com/~genesys>; or circle 103 on the reader service card.



Tucker 2 Meter VHF Amplifiers

Tucker Electronics has introduced a new line of 2 meter VHF amplifiers. The first two amplifiers offered in this line are the V-35W and the V-100W. Both are designed to be used with 2 meter handheld transceivers and low-wattage 2 meter desktop transceivers, such as the ICOM IC-706. The Tucker V-35W will accept 0.5–8 watts input power and produces up to 35 watts of output power. It features a built-in 15 dB pre-amplifier and a DC Monitor Meter feature that provides the operator with a constant reading of DC input voltage. Also included in the V-35W is a built-in RF power meter. The V-35W operates on FM and SSB/CW. The Tucker V-100W will accept 0.5–8 watts input power and produces up to 100 watts of output power. An input power signal of only 0.5 watt is required to produce 50 watts of output power, and 3–8 watts will drive the V-100W to full power output of 100 watts. It also features a built-in 15 dB pre-amplifier and built-in RF power meter. The V-100W operates on both FM and SSB/CW.

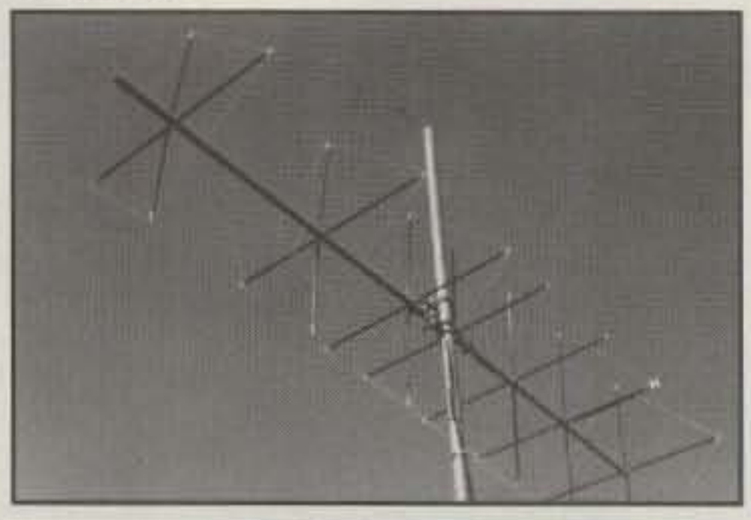


Both amplifiers are covered by Tucker's one-year warranty and 30-day "Satisfaction Plus No-Questions-Asked Return Privilege." For more information, contact Tucker Electronics, 1717 Reserve St., Garland, TX 75042 (800-559-7388; fax 214-340-5460), or circle number 104 on the reader service card.

The Cubex STINGER

The Cubex Quad Antenna Company is now offering an add-on supplement to their 2 meter "Yellowjacket" 4-element quad antenna. The 3-element STINGER is added to the director end of an existing Yellowjacket antenna, providing a solid 7-element quad antenna with 50% more gain than the "Yellowjacket" alone. No special tools or tuning is required. The STINGER comes with a fiberglass boom coupler and an aluminum boom/mast coupler plate. The STINGER is available alone or with the "Yellowjacket."

For more information, contact Cubex Quad Antenna Company, 2761 Saturn St. "E", Brea, CA 92621 (phone 714-577-9009; fax 714-577-9124), or circle number 105 on the reader service card.



MIRAGE...100 Watts...$199

Boost your 2 Meter handheld or multimode (like ICOM 706) to a super powerful 100 watts . . . All modes: FM, SSB, CW . . . 18 dB GaAsFET receive preamp . . . Reverse polarity protection . . . Silent cooling fan . . . Free HT-to-amp coax and mobile bracket

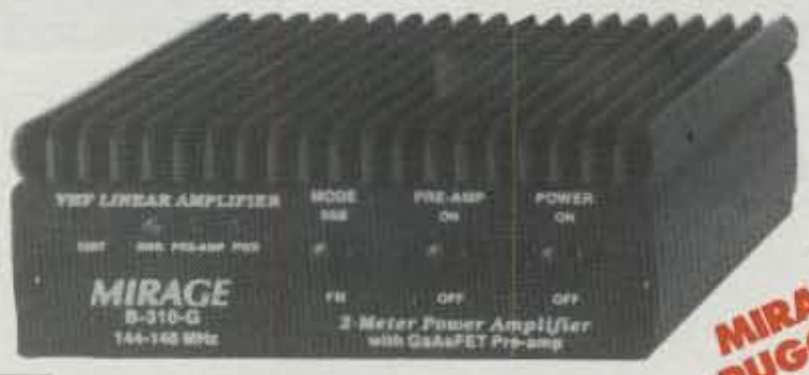
In Stock at ham dealers everywhere!

Call your dealer for your best price

$199

B-310-G Suggested Retail

NEW!



MIRAGE RUGGED!

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

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

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

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

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

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

Low noise GaAsFET pre-amp

A built-in *low noise* GaAsFET receive pre-amp gives you 18 dB gain -- lets you dig out weak signals.

Fully Protected

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

Compact but Powerful

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

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

Free Accessories

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

Plus more . . .

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

Full one year MIRAGE warranty

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

Dual Band 144/440 MHz Amp

$199 BD-35 Suggested Retail

MIRAGE RUGGED!

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

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

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

Full Duplex Operation

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

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

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

Call your dealer today for your best price!

35 Watts for 2 Meter HTs

B-34-G **$99** Suggested Retail

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

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

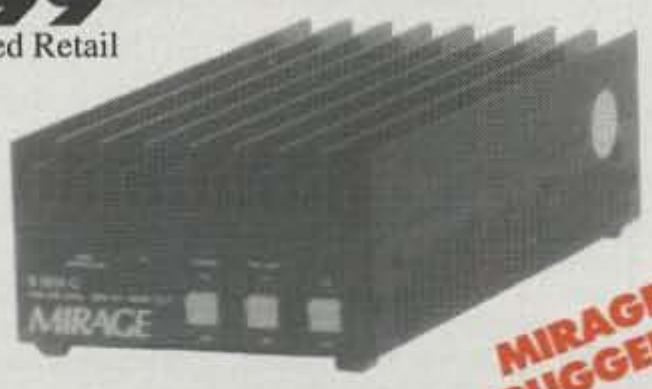
MIRAGE RUGGED!

35 watts, FM only . . . $79

B-34, $79. 35 watts out for 2 watts in. Like B-34-G, FM only, less preamp, mobile bracket. 3⅛x1¾x4¼ inches.

160 Watts on 2 Meters!

B-5016-G **$299** Suggested Retail



MIRAGE RUGGED!

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

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

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

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

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

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

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

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

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

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

More 160 Watt, 2 Meter Amplifiers . . .

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

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

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

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

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In-Depth Look At IF-DSP

Kenwood's TS-870S

Instead of the 16-bit DSPs used previously, the TS-870S features a pair of powerful Motorola DSP56002FC40 24-bit processors, offering an impressive performance of 20MIPS (20 million instructions per second).

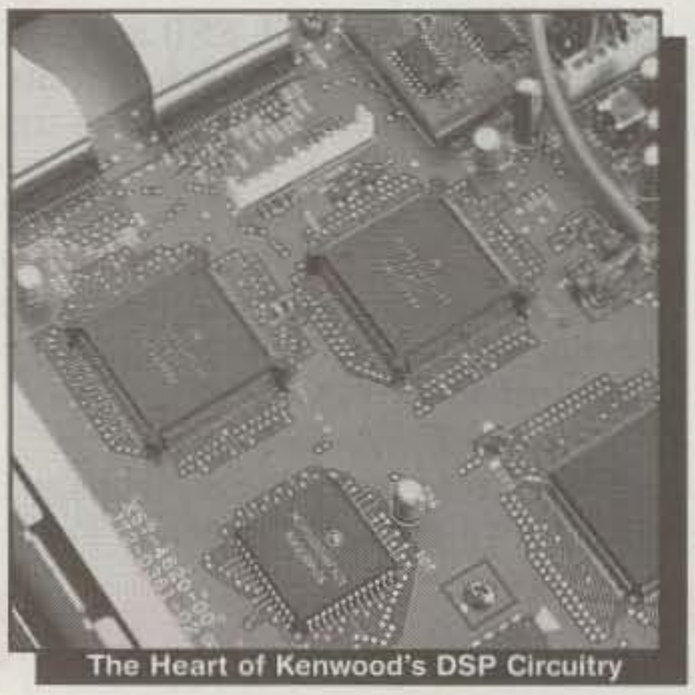
Among the benefits of adopting such high-speed, high-performance DSPs are digital signal processing right from the IF stage, as well as the sort of noise reduction and beat cancellation for which DSPs are renowned.

The DSPs operate at 40MHz. For this, the 20MHz clock signal is taken from the TS-870S's standard oscillator and then doubled internally via PLL. The instruction cycle is, however, half of this: 20MHz.

The two DSPs exchange data via a connecting gate array device with approximately 10,000 gates and internal dual-port RAM – a configuration that ensures high-performance processing. In addition, the gate array device features interfaces for the A/D and D/A converters as well as a bus switching capability.

As for the memory required by the DSPs for numerical calculation, each is provided with 512 x 24-bit RAM for program use and 256 x 24-bit RAM for data use. Externally there are three 32k x 8-bit ROMs for storing filter data and programs, and one high-speed 8k x 24-bit SRAM chip for signal processing. External ROM and RAM chips are connected to the main DSP. When necessary, the sub DSP accesses the main DSP's ROM and RAM using the bus switching capability of the gate array device that connects them. The timing of this bus switching is controlled by the EPM7032LC44, a semi-custom IC (CPLD).

With a 70-nanosecond access time, the ROM chips offer fast performance. Because of this, there is less waiting time and correspondingly less impact



The Heart of Kenwood's DSP Circuitry

on the DSP's processing speed during memory access.

The SRAM chip, designed exclusively for DSP use, has an astonishing 25-nanosecond access time. This means that frequently accessed RAM is effectively "zero wait" for the main DSP, allowing it to operate at its maximum potential.

With the configuration outlined above, the DSP-equipped TS-870S is able to offer such new functions as IF filtering, all-mode DSP detection – including AM/FM detection – noise reduction, auto-notch, and a beat canceller. The work of many other circuits has been taken over by the DSPs.

Let's now look at some of these features in detail.

IF Filters

1) Characteristics of IF digital filters

By turning over the entire IF stage to DSPs, one point on which the TS-870S differs totally from previous models is that it features (as standard) no fewer than 237 IF filters with extremely sharp characteristics. This is because digital filters suffer none of the performance degradation or inconsistency that can be traced to the devices that comprise conventional circuitry.

In addition to switching between numerous IF filters or between narrow and wide bandwidths, previous HF transceivers used variable bandwidth functions such as slope tuning and VBT with a combination of filters, as well as IF shift (local variation either side of a filter).

With the TS-870S, however, slope tuning and bandwidth width/shift control are implemented by switching between numerous digital filters. Thus there is no longer any need to install optional filters, as has been the case with HF transceivers until now. The digital filters installed are listed in Table 1 by mode.

On the TS-870S the filter with the narrowest bandwidth is the 50Hz filter for CW use. In the case of conventional analog IF filters, it is very difficult to create such a narrow filter, and even if it were possible to create one, filter loss would decrease sensitivity, and distortion would arise as a result of the filter's group delay characteristics; consequently, the quality of reception would be too poor for the filter to be of any practical use. In contrast, there is no loss with digital filters, so there is no decrease in

Table 1: Digital Filters

SSB mode	Operates as slope tune capable of independently varying high-cut and low-cut control frequencies. It is possible to eliminate interference with minimal effect on audio quality. • High-cut frequencies (kHz): 12 stages (default: 2.6kHz) 1.4 | 1.6 | 1.8 | 2.0 | 2.2 | 2.4 | 2.6 | 2.8 | 3.0 | 3.4 | 4.0 | 6.0 • Low-cut frequencies (Hz): 10 stages (default: 300Hz): 0 | 50 | 100 | 200 | 300 | 400 | 500 | 600 | 800 | 1000
CW mode	Operates as VBT capable of varying pass bandwidth or as SHIFT for moving the position of the central frequency. In either case, it is possible to avoid adjacent signals. • WIDTH – pass bandwidth (Hz): 6 stages (default: 1000Hz) 50 | 100 | 200 | 400 | 600 | 1000 •SHIFT – central frequency position (Hz): 13 stages (default: 800Hz) 400 | 450 | 500 | 550 | 600 | 650 | 700 | 750 | 800 | 850 | 900 | 950 | 1000
FSK mode	Operates as VBT capable of varying pass bandwidth and eliminating interference. • Pass bandwidth (Hz): 4 stages (default: 1500Hz) 250 | 500 | 1000 | 1500

96ARD-1474

sensitivity. As for group delay characteristics, Kenwood has made use of DSP technology to design filters with minimal group delay distortion – even for IIR (infinite impulse response) filters which have such sharp characteristics. We have thus created IF narrow filters which are sharper than any conventional analog IF filter or audio processing DSP.

As a means of suppressing the group delay distortion of narrow filters, it is possible at the design stage to employ FIR (finite impulse response) filters or to correct the filters' group delay characteristics. But the signal delay of an FIR filter or of a filter with corrected group delay characteristics is longer than that of an uncorrected filter, so they are not suitable for IF use. Since group delay distortion is barely perceptible to the human ear, there is no need to eliminate it entirely. What we have done with the TS-870S IF filters is, by combination with a PSN (phase shift network) approach, to ensure that group delay distortion is too low to cause any conceivable problem.

FIR filters have been used in the IF stage for AM and FM reception. While it may seem to contradict what has been said above, this has been done so as to reduce IF filter distortion and make efficient use of the DSP's detection capability in AM and FM modes. Group delay distortion in SSB and CW modes has no effect on amplitude, but in AM (detuned) and FM modes group delay distortion appears as amplitude distortion. Narrow-bandwidth FIR filters for SSB and CW use are not suitable as IF filters because their signal delay would be too long, but it is possible to arrange for the signal delay to be within an acceptable range for AM and FM use.

In AM mode, using 12kHz and 14kHz wide filters, audio quality is of the highest level found in any transceiver. You can enjoy shortwave broadcasts with breathtaking clarity.

In FM mode, since even-order distortion is reduced whether or not bandwidth is narrowed, even when selecting a narrow filter for reception of a weak signal – as in data communications, for example – the error rate is kept to an acceptable level.

2) Differences from AF filters

When AF filter bandwidth is made narrower than that of the IF filters, should there be an interfering signal between the cutoff frequencies of the AF and IF filters of the kind that can be attenuated by the AF filters but not by the IF filters, the interference can be made inaudible by inserting a sharp AF filter.

What then happens to the target signal when this interfering signal is made to disappear? If the target signal is stronger than the interfering signal, or even slightly weaker, the elimination of the latter will enable excellent reception. But if the target signal is significantly weaker than the interfering signal, the result may be that nothing at all is heard. This phenomenon arises because the receiver's AGC tries to maintain a set level for the signals – including both target signal and interfering signal – within the IF filters' bandwidth.

When the target signal and interfering signal are at the same level, it is acceptable if the target signal level is halfway (3dB) down, but if the interfering signal is 50dB stronger than the target signal, the target signal level will also be reduced 50dB below the interfering signal. Consequently, if AF filters are used to suppress an interfering signal, there will be nothing left to listen to. Trying to raise the volume will not be successful and, since the IF gain will have dropped by 50dB, deteriorating S/N may mean that everything is swamped in noise.

When filters with the same characteristics are employed in both AF and IF stages, it is the AF filter that will produce an audibly clearer result; this is the advantage of AF filters. In the IF stage, the AGC works to keep the reception level within a range, and thus the filter appears to function less crisply than its AF equivalent. Also, because the signal delay in the IF filter affects the AGC's attack time, filters which have a long signal delay – such as FIR filters – cannot be used.

3) Combinations of AF filters and IF filters

AF filters are effective as support for IF filters, but in difficult conditions – as when there is a great deal of interference – the sharp characteristics of IF filters are essential. If the IF filters are sharp, the AGC functions only with respect to the target signal and, unlike the situation with AF filters, the target signal does not become inaudible if it is weak. By efficiently combining the different characteristics of IF filters and AF filters one can create a high-performance filter that offers excellent interference reduction characteristics.

IIR filters

Digital filters can be divided into two general groups: IIR and FIR. One can think of IIR filters basically as DSP versions of analog filters; they can be designed to ensure sharp characteristics, but their drawback is group delay distortion. FIR filters are often used to avoid group delay distortion, although both analog filters and IIR digital filters can be designed to exhibit greatly reduced group delay distortion. In fact, with superior circuit design skills and DSP processing power available, one can design IIR filters with sharp characteristics yet with group delay distortion reduced to the level one finds with FIR filters.

In the TS-870S, AF filters are used together with IF digital filter slope tuning and width/shift control. Filter characteristics are sufficient with just the IF digital filters, but AF filters have been incorporated so as to improve the characteristics of the AGC, etc.

Excerpted from the Kenwood TS-870S IN-DEPTH MANUAL. For your copy, please write to Kenwood Communications Corporation, Amateur Radio Products Group, P.O. Box 22745, Long Beach, CA 90801-5745 or telephone 310-639-5300.

This is a paid advertisement.

BY BILL WELSH, W6DDB

BILL'S BASICS

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

Questions and Answers

This month's article contains an assortment of the questions that are most often received from the amateurs who read this column. Brief answers are supplied following each question.

Q. The receiver portions of transceivers have a control identified as RIT. What is the function of this control and how is it used?

A. This control may be labeled RIT (receiver incremental tuning), Clarifier, or OT (offset tuning). It is used to tune in stations answering above or below your frequency when they respond to your CQ call. It enables you to shift only your receive frequency while your transmit frequency remains unchanged. If you use the main tuning control to tune in an off-frequency station, the other operator may not locate your signal on your changed frequency. Before you answer another station's CQ call, either turn off the RIT or set it to the zero offset position. Failure to do this can easily result in unintentional interference by amateurs who find an unused frequency.

Q. What is offset?

A. Voice and code offsets are built into modern transceivers. They automatically shift the transmitter the desired amount from the receive frequency. As an example, if you want to listen to a code signal being transmitted on 21,121 kHz, you would actually tune to a frequency of about 21,121.7 kHz to hear the transmission at a tone of about 700 Hz. If tuned to the actual transmission frequency of 21,121, the audio tone difference would be 0 Hz, producing no audible signal you could hear. Some new amateurs mistakenly think they have to add such offset manually, which is wrong.

Q. When offset tuning is used, does the transmission occur on two frequencies?

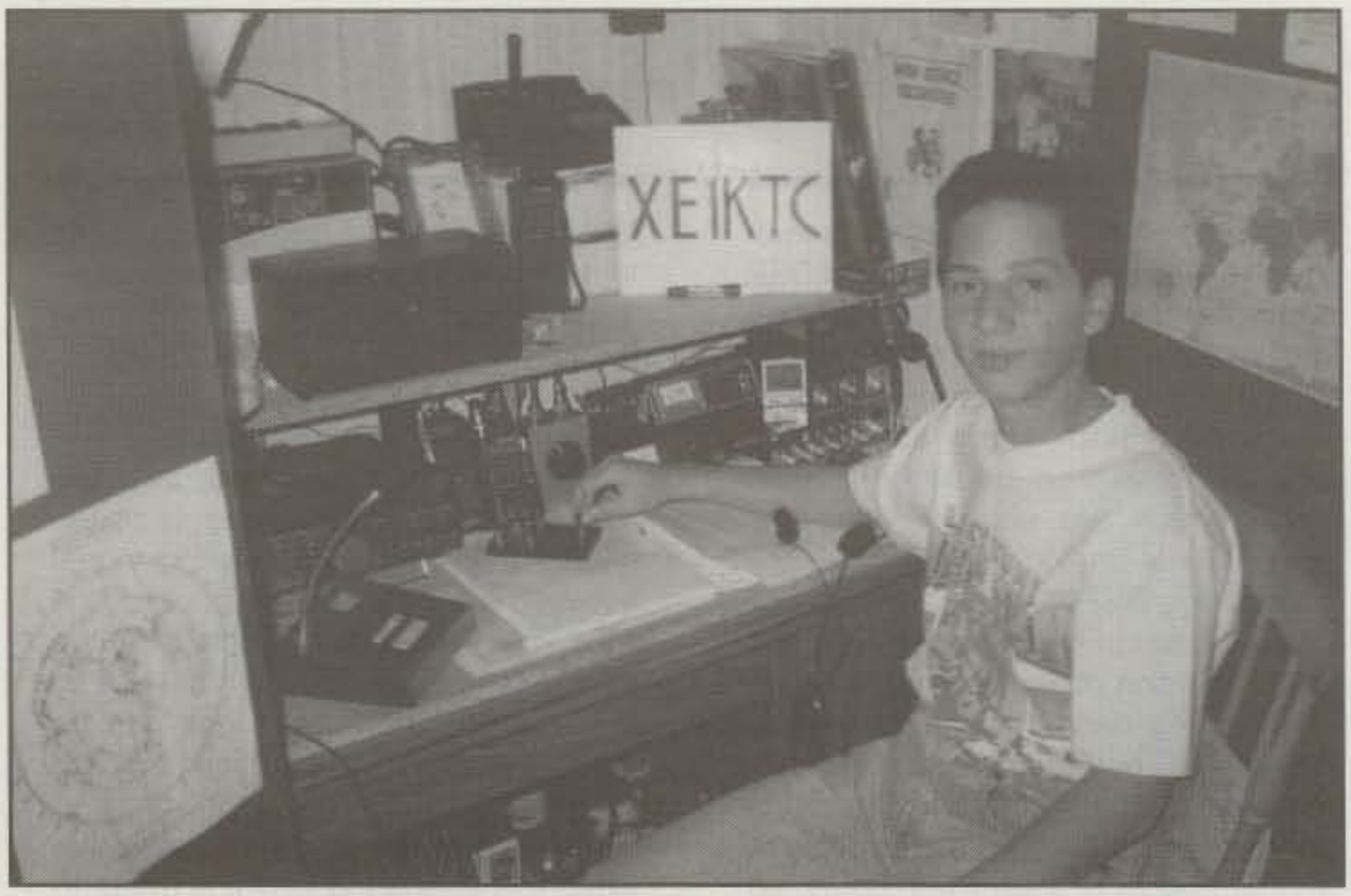
A. No. The transmission only occurs on the automatically offset transmit frequency that is usually 2700 or 700 Hz away for SSB voice or A1A Morse Code, respectively.

Q. What does the XIT control do?

A. It allows you to shift the transmitter (xmtr) frequency without moving the receive frequency. As an example, if you are tuned to a desired DX station and he/she states that he/she is listening for answers 5 kHz up, leave your receive frequency where it is, turn on the XIT, and move your transmit frequency to the DX station's listening frequency.

Q. How do you determine which filters to install in a high-frequency rig?

A. Modern transceivers usually just have an SSB voice filter installed in them. The width of such a filter is about 3000 Hz. An 1800 Hz filter is preferred by some SSB operators. If you are going to operate A1A Morse Code, the use of a narrow code filter can make code operation much more pleasant than it would be when using a voice filter. There is nothing to be gained from listening to noise (QRN) and man-made interference (QRM) you may hear when using a voice filter while operating code. A 250 Hz filter is suitable to use on code. You should not use anything wider than 500 Hz while operating code.



Fifteen-year-old Jack Fermon, XE1KTC, of Mexico, likes to work DX (foreign) amateurs using code. He contacted 56 countries during his first three months on the air. His station includes a Kenwood TS-450 transceiver and G5RV and vertical antennas. Jack's mentor is Mic Christ, XE1MD, who took this picture.

Q. How do you know whether to use upper or lower sideband?

A. There is no FCC regulation regarding which bands are restricted to lower sideband (LSB) or upper sideband (USB). However, USB is commonly used on the upper frequency bands of 10 through 20 meters, whereas LSB is commonly used on the lower frequency bands such as 40 and 75 meters. Modern transceivers automatically set you on the correct sideband as you select the band you intend to operate. A control is usually available which enables you to select the opposite sideband, when it is desired.

Q. What is a band plan?

A. Band plans provide segments of frequencies which are recommended to be used when using different modes of emission. These plans are in agreement with International Telecommunications Union (ITU) and FCC regulations, of course, but they are more detailed. The ARRL operating manual details this information. It can be purchased from the American Radio Relay League, 225 Main Street, Newington, CT 06111-9965. The VHF/UHF band plans are listed on the Amateur Radio VHF/UHF Band Plan handout ICOM publishes. ICOM's address is 2380 116th Ave. NE, Bellevue, WA 98004. Band plans minimize operating confusion.

Q. How do the high-frequency bands differ?

A. Each band attracts amateurs who prefer specific emission modes and operating activities. I do not think any band is better for all modes and activities than 10 meters when it is open. Unfortunately, we are still close to the bottom of the sunspot cycle and 10 meter activity is very low. However, contacts are presently available on this band. The 12 meter band is open a little more often than 10, but activity is low. The 15 meter band is slowly improving, with some DX contacts available daily in the 21.1–21.2 MHz Novice/Technician-Plus code segment. DX amateurs often answer American CQ code calls on voice in the 21,150–21,200 kHz portion of this band. The American Novice/Technician-Plus amateur transmits on code and listens on USB voice, whereas the DX amateur transmits on USB voice and listens on code. The 17 meter band is open more often than 15 meters is open, and activity keeps increasing. The 20 meter band remains useful most of the time, but activity is almost nil during the early morning hours. The 30 meter band

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is restricted to code, and it provides a lot of contact opportunities. The 40 meter band includes the 7100–7150 kHz Novice/Technician-Plus code segment, which is presently the most active code segment available to these newer amateurs. The 80 meter band includes the 3675–3725 kHz Novice/Technician-Plus code segment. Basically, the 10, 12, 15, 17, and 20 meter bands are most useful during daylight hours, whereas 30, 40, and 80 meters are most useful nights. There is contest activity almost every weekend, and it is usually heaviest on 20, 40, 15, and 80 meters. Contest activities can help you quickly improve your operating skills. Some operators prefer short contacts, whereas others like long contacts. If you are trying to improve your code proficiency, the longer ragchew contacts can be helpful. The ARRL's Rag Chewers Certificate (RCC) only requires you to complete a verified contact that is at least 30 minutes long. If you want this award, simply ask the other amateur to show the starting and ending times of your contact on the QSL card he/she is going to send to you. Such a card provides sufficient verification that you are qualified to receive the award.

Q. Do foreign/DX amateurs ever ragchew (chat) with American amateurs?

A. Yes, but chats are rather limited if the DX amateur does not have a good knowledge of the English language. If the DX amateur sends a CQ call and is working a series of brief contacts, he/she probably appreciates it if your transmission is also brief. If you heard the DX amateur chat with another amateur, the chances are good that he/she will also chat with you. If the DX amateur answers your CQ call, it is likely that he/she is willing to chat with you. In any case, DX cards are normally via the ARRL Incoming DX QSL Bureau. Your area's distribution group is listed in *QST* magazine and the callbooks. You do not have to be an ARRL member to receive DX cards via this bureau. Almost all DX amateurs represent desirable contacts to new amateurs. However, most of the DX heard on the bands is not rare DX, and other amateurs are not likely to be overly anxious to contact such amateurs. They are not likely to interfere with a DX contact that is in progress.

Q. Who should start the general conversation after signal reports, names, and locations have been exchanged?

A. When you transmit a CQ call, it is a general call to all stations. It is not a call to any specific station. When another amateur responds to the CQ call, he/she is specifically calling the amateur who made the CQ call. In other words, the amateur who made the CQ call ends up being the one who is called specifically by the responding amateur. The amateur who made the CQ call should just provide her/his name and QTH, plus the signal report, before turning the contact back to the responding amateur. The responding amateur should start the general conversation after he/she sends name, QTH, and signal report information. Simply stated, the amateur who made the CQ call should not be expected to start the general conversation. Once signal reports have been exchanged, both operators know the reception conditions and the general conversation should be started.

Q. Do you ever use the squelch control during high-frequency contacts?

A. Only when I am waiting for a transmission to be made, such as while waiting for a net control station to start activities. The squelch control eliminates unwanted background noise, muting receiver audio output until a bonafide signal is being received on the frequency being monitored. Squelch is much more popular on a band such as 2 meters rather than on the high-frequency bands.

Q. What does the notch control do?

A. It enables you to drop an unwanted (interfering) signal down to a level that is less bothersome.

Q. What does the IF shift control do?

A. It enables you to minimize/eliminate interference from a signal immediately above or below a desired signal. You simply drop out the unwanted/interfering signal.

Q. Does you need a linear amplifier and a beam antenna to have good results on the air?

A. No. However, there is no doubt that high power combined with a directional antenna have to make it easier to establish and complete two-way radio communications. Neither high-power output nor a highly directive antenna can replace operating skill. I use a wire antenna and 40 to 100 watts at all times, and I work a few thousand contacts each year, including any DX station that is being worked by other amateurs. Every operator should be able to equal or surpass these operating results, since they are not unusual.

Q. Do you disconnect antenna feedlines every time you turn off your rig?

A. No, but I do disconnect feedlines/antennas whenever there is any possibility of a lightning storm coming into my area.

Q. What does $\overline{KN}$ mean when using code? Is it the same as $\overline{AR}$?

A. $\overline{AR}$ means the end of a message. When copying code traffic, it alerts the operator that the message has ended and prepare to copy the next message. The letter K is the invitation to transmit when using code. When the Novice bands were established in 1951, General (and higher) class licensees used $\overline{KN}$ to indicate that a response from a Novice was desired. The ARRL ending signals do not always agree with the meanings specified for international use. $\overline{KN}$ is stated to mean that only the station involved in the ongoing two-way contact should answer, as opposed to a station answering a CQ call. It is preferable to use the internationally approved code symbols as they are specified in the official list of the International Morse Code symbols.

Q. How do you know which mode of emission you are hearing on the air?

A. A1A Morse Code, J3E SSB voice, etc. are easily recognized on the air. Slow-scan television, FSK teletype, AFSK teletype, amateur (fast scan) television, packet radio, amplitude modulation, frequency modulation, facsimile, and other modes quickly become recognizable to operators using such modes.

Q. Is it a mistake to purchase used equipment?

A. No. New amateurs need to try as many bands and as many emission modes as possible to help them determine which ones they like best. It is a little cheaper to buy used gear instead of new equipment. As always, good gear is not cheap, whether it is new or used. Amateur radio publications such as *CQ* contain classified sections which list used equipment and accessories. The safest way to buy used items, however, is to purchase them from members of your local amateur radio club.

Q. Why is single sideband considered to be a more efficient communications mode than amplitude modulation?

A. Output power is essentially not expended in the unwanted sideband or the carrier in SSB operation. When transmitting an amplitude modulated signal, you transmit power in a carrier and a sideband which are effectively discarded during processing in the receiver. The received SSB signal also provides improved communications effectiveness due to its narrower bandwidth.

Q. Why is Morse Code considered to be a more efficient mode of communications than SSB voice?

A. When using a well-designed radiotelegraph transmitter, the width of the emitted code signal is about five times the keying speed. If you are sending code at 10 words per minute, the width of the output signal is about 50 Hz, and all of the output power is packed within that narrow spectrum instead of being spread over the approximate 2700 Hz width of an SSB voice emission. A much narrower bandpass filter can be used to receive a code signal, reducing interference possibilities and providing improved reception.

Q. Where should a station be installed?

A. It should be set up in a well-lighted area that has adequate heating and cooling. If possible, install it where it will be in close proximity to antenna feedlines and the station's ground point.

Q. Should you start operating code using a manual telegraph key, a bug, or an electronic keyer with a paddle?

A. I have found that it is advisable to start with a manual (hand) telegraph key instead of either a bug (semi-automatic key) or an electronic keyer (fully-automatic key). Switch to a paddle with an electronic keyer after your code receiving proficiency has reached 10 to 15 words per minute. It is easier to develop proper spacing between words using a handkey than when using an electronic keyer. It has been my observation that amateurs who go to an electronic keyer without acquiring experience with a handkey usually send what I call perfectly formed garbage, since there is little (or no) spacing between words; everything gets run together. You can master proper use of a paddle and electronic keyer much faster and easier than a bug. Also, electronic keyers provide many automatic transmitting features.

Q. When should a new amateur get QSL cards?

A. You should order an adequate supply of cards as soon as your callsign is known. Cards should be on hand when you start operating. You are likely to contact some amateurs from whom you will want cards. QSL cards are displayed in the radio shacks of many amateurs. It is important to use standard postcard-size QSL cards. Avoid mistakes by reading the *PSE*

QSL! book that is sold by Tiare Publications, P.O. Box 493, Lake Geneva, WI 53147. It is common to change callsigns as you upgrade, but that is not a good reason to delay the purchase of cards. It is acceptable to cross out your old callsign and to mark in your new callsign on cards.

Q. What is a reasonable operating schedule for an amateur who wants to pass code tests related to license upgrade examinations?

A. One should average at least 7 to 10 code contacts per week. It is beneficial to participate in as many contests as possible. Contest results may not be significant, but the practice is important. Code tests are part of license examinations for every class of license except the Code-Free Technician license. If you want to upgrade to better operating privileges, increased code proficiency is required. The best way to improve your code proficiency is to use it often on the air.

Q. Should a new amateur join the American Radio Relay League?

A. The ARRL is an asset to amateur radio. It is probably the most effective organization in the world in respect to all facets of our amateur radio service. ARRL membership is a very good idea. The League provides a wide variety of help to amateurs.

Q. Is it advisable to join a local amateur radio club?

A. Yes. Local clubs can do many things which can increase your knowledge of amateur radio. Similarly, it is advisable to join special-interest groups such as SMIRK (6 meters), 10-X (10 meters), FISTS, ATV (television), YLRL (women), and others. The key to success is participation.

Summary

It is hoped that the preceding tips prove to be helpful to many readers. If you know an amateur who might benefit from reading this article, please pass it along to her/him. I'm particularly active in the Novice/Technician-Plus bands and enjoy meeting column readers on the air. No one goes too slow to be worked, and poor sending is acceptable. In fact, I make a concerted effort to work amateurs who are having trouble sending code.

Photographs Wanted

Photographs of new amateurs in their shacks provide introductions to a few of the newer licensees. Photograph size is unimportant, but good definition, contrast, and subject matter are important. Color pictures can be used, but black-and-white photographs are preferred. Operating activities and achievements, plus a self-introduction, are needed with each picture. Send an SASE if a picture must be returned. A free one-year *CQ* subscription (or renewal) is awarded to the one amateur whose picture I select as the winner for the month. If you are a subscriber, please enclose the mailing label (or copy) from your latest *CQ* issue. One award is made each month, no matter how many photographs are printed. DX amateurs, who frequently work the American Novice bands, are also urged to submit photographs.

73, Bill, W6DDB

BY DOUG DeMAW, W1FB

DOUG'S DESK

CONSTRUCTION PROJECTS, TECHNIQUES, AND THEORY

Some Practical Aspects of Toroids

Although few of today's construction projects are without toroidal tuned circuits or toroidal broadband transformers, a vast number of builders are confused about how to wind and use toroids. Many articles on this subject have been published in recent decades, but still the need for practical knowledge remains. We authors receive numerous letters concerning how the windings should be placed on toroid cores. Information on how to wind balun or "binocular" cores (see photo B) is also frequently requested. Most authors are pleased to answer such letters if the writer includes an SASE with his or her request: The cost of postage and envelopes can be significant for authors who may receive several letters per week.

Toroids are popular because they provide compact transformers and inductors, compared to air-wound equivalent components. Generally speaking, the Q of a given toroidal coil, if wound on the proper type of core, can exceed that of an air-wound coil. This is because less wire, and a larger wire diameter, is used to obtain a specified inductance. This reduces the AC or RF resistance of the coil and improves the Q (desirable). Another advantage provided by toroids is their self-shielding characteristic. Apart from stray capacitive coupling to nearby circuit components, an unshielded toroid is equivalent to an air-wound inductor in a metal shield. This enables the builder to develop compact equipment that operates in a stable manner.

Coil Turns and Wire Length

In order to determine how many turns of wire to use for obtaining a given inductance, the user must have knowledge of the AL factor of the particular toroid or balun core. The equations for calculating the number of turns are provided in the *ARRL Handbook* and in a catalog that is available from Amidon Associates, Inc.[1] AL factors are also given in the catalog. A quick answer to this question can be had by using VE3ERP's HAMCALC software.[2] Murphy's program runs under DOS and is written in GW BASIC. Complete data for selecting the right Amidon core, and determining the correct number of turns, is in the software program. Numerous other circuit design programs are included on the VE3ERP diskette.

The exact length of wire needed for a specified inductance can be determined by first wrapping one complete turn on the toroid core, then unwinding and measuring it. Multiply this dimension by the total number of turns. Allow three additional inches of wire to ensure that the pigtails are long enough to reach the connection points on the PC board.

Winding The Toroid

I received an interesting letter in which the reader asked, "Do I wind the wire around the outer perimeter of the toroid?" Definitely not! The wire always goes through the core, as shown in the accompanying photos.

Fig. 1 contains examples of the methods I use when winding toroids and balun cores. Example (A) shows a 30-degree gap between the ends of the winding. This is the prescribed procedure for best performance. In other words, the winding should occupy approximately 330 degrees of the core area.

Illustration (B) shows a toroid that would be used in a narrow-band tuned circuit. I prefer to wrap the smaller (primary) winding over the grounded or Vcc end of the larger (secondary) winding for this application. This minimizes the transfer of unwanted harmonic currents to the secondary via capacitive coupling. The smaller winding can, however, be wound over the entire secondary winding, as seen at (C) in fig. 1. The method shown at (C) is recommended for use when winding broadband transformers.

A balun core with two windings is seen at (D) of fig. 1. If the secondary has a center tap (terminal 4), it is made at the far end of the core where wires 1 and 2 exit the holes. Make certain that the bare wire at the tap point does not short circuit the adjacent coil turns. A shorted turn will spoil the Q of the winding. It is wise to place a small piece of meat-wrapping paper under and around the tap point on any toroid or balun-core transformer. This will help prevent a shorted turn. An example of a toroid with many taps may be seen in photo C. Since the turns are well separated from one another, it is unnecessary to insulate the taps with paper or tape. The taps were made by scraping the enamel insulation from each affected turn (at the tap point), then soldering a piece of bare wire to the appropriate turn, as shown. The small toroid with two windings (lower right foreground) has its primary wound over one end of the main winding, as illustrated in fig. 1(B).

Toroids with two or more windings should have their windings placed on the core in the same clockwise or counterclockwise sense or direction. A layer of insulating tape, such as 3M glass tape or masking tape, may be desirable between windings if one of them carries DC voltage. However, high-quality enamel- or form-

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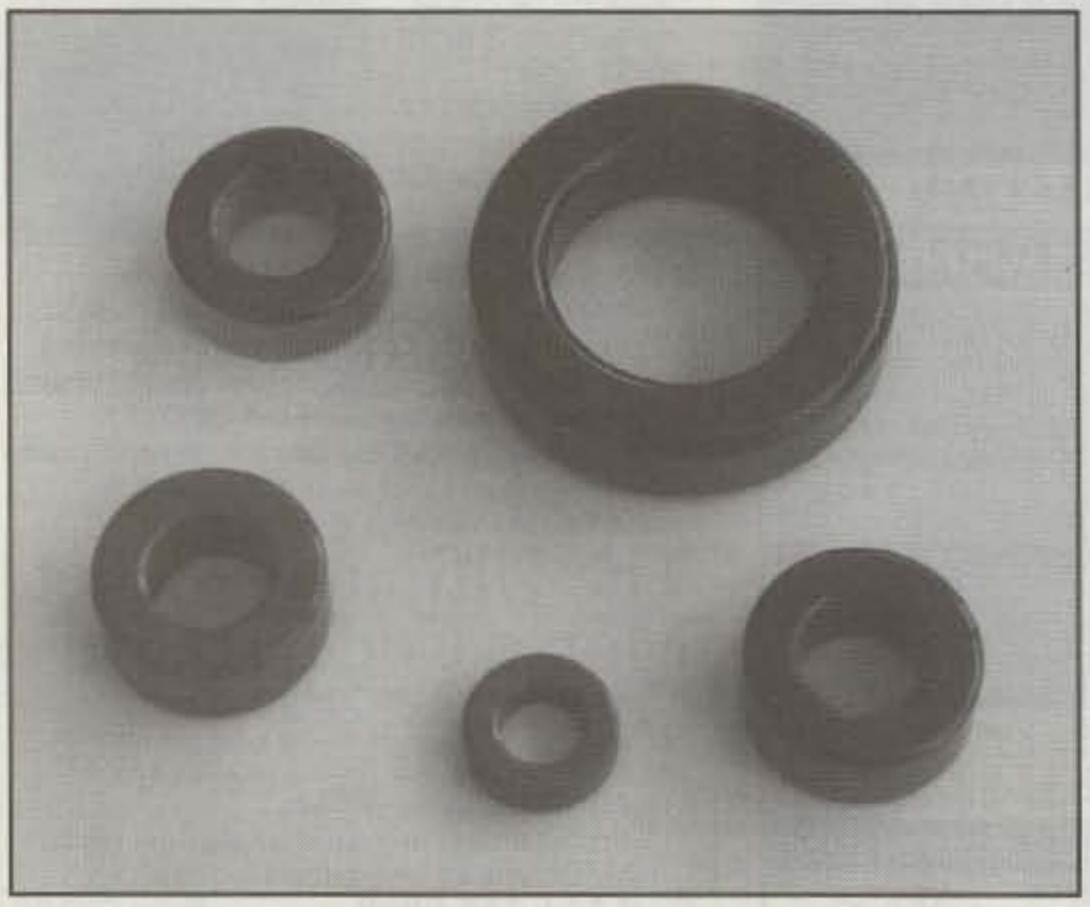

Photo A– Some generic versions of toroid cores.

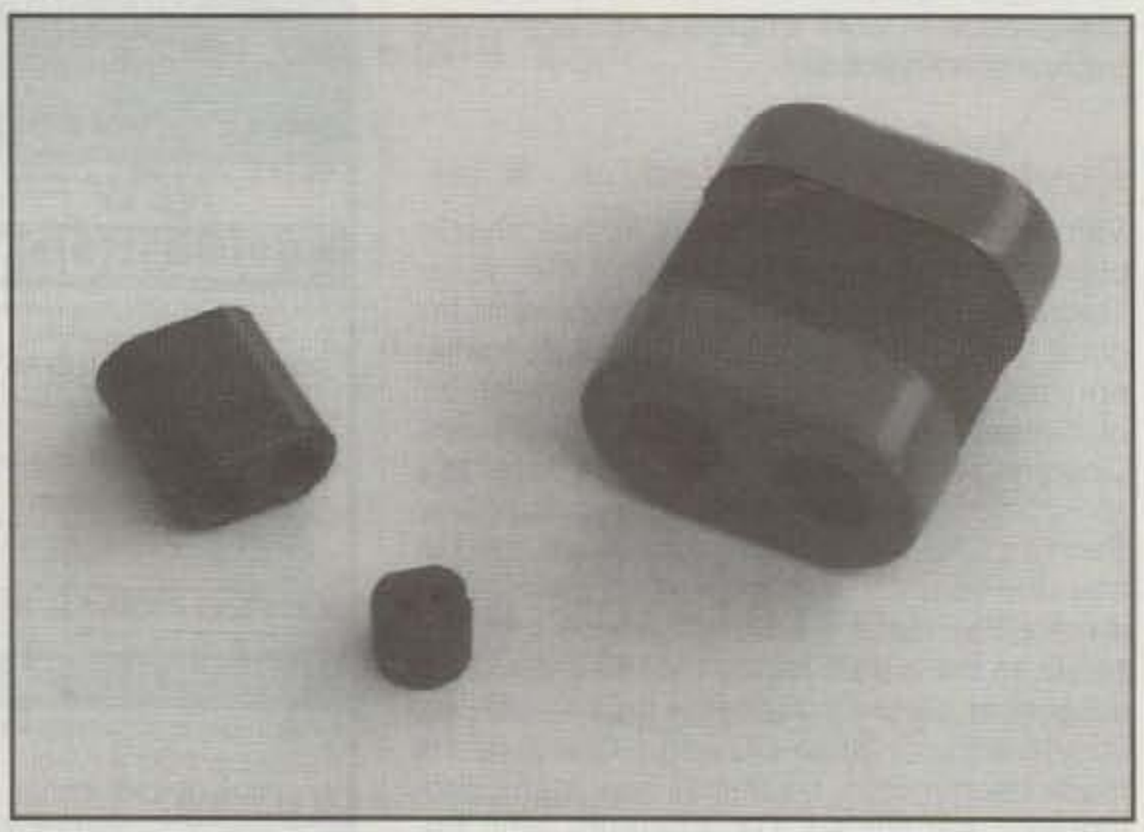

Photo B– Photograph of three styles of ferrite balun or binocular cores. The larger one is typical of those used for broadband matching transformers in push-pull solid-state RF power amplifiers.

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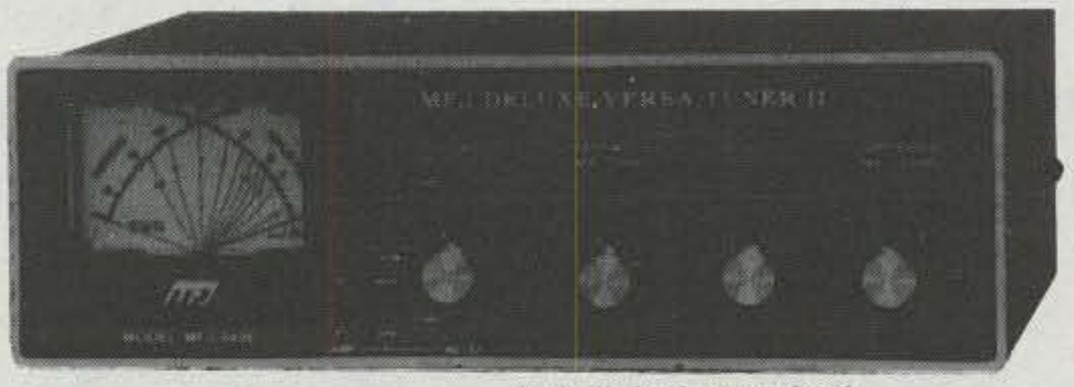

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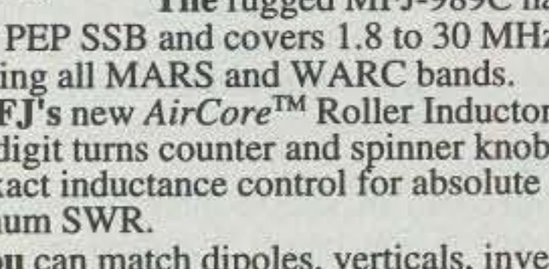

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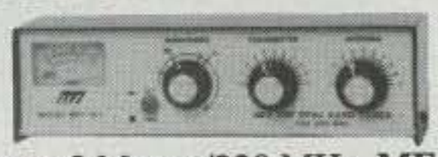

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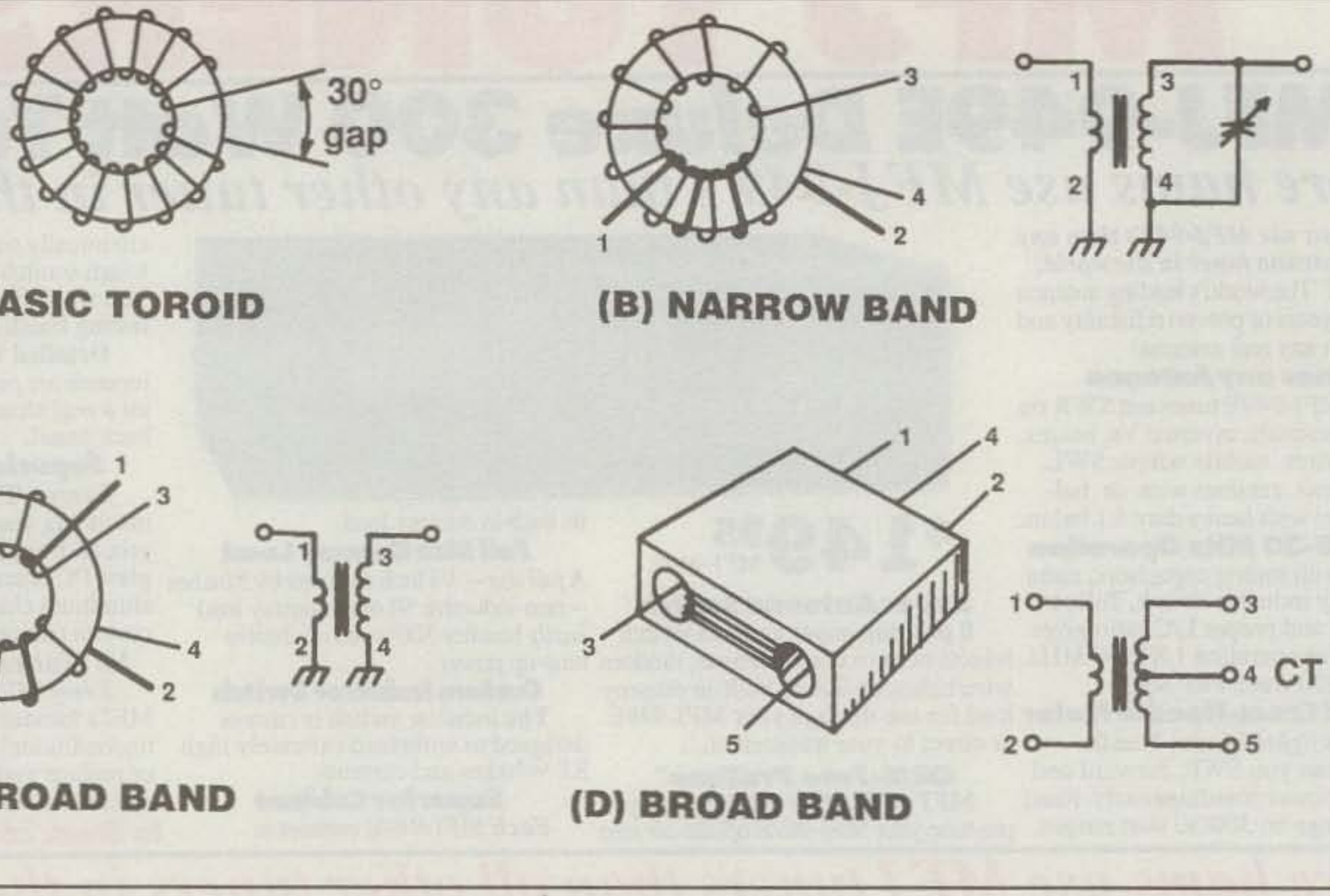

Fig. 1– Various ways to wind toroidal and balun-core inductors and transformers. The 30-degree gap at (A) is recommended for best performance. Illustration (B) shows the smaller primary winding wound over the grounded end of the secondary winding (see text). Drawing (C) shows both transformer windings wound over 330 degrees of the core. This is standard procedure for most broadband transformers. (D) depicts how a balun or binocular core is wound. Two rows of ferrite toroids may be glued together and used in the same manner.

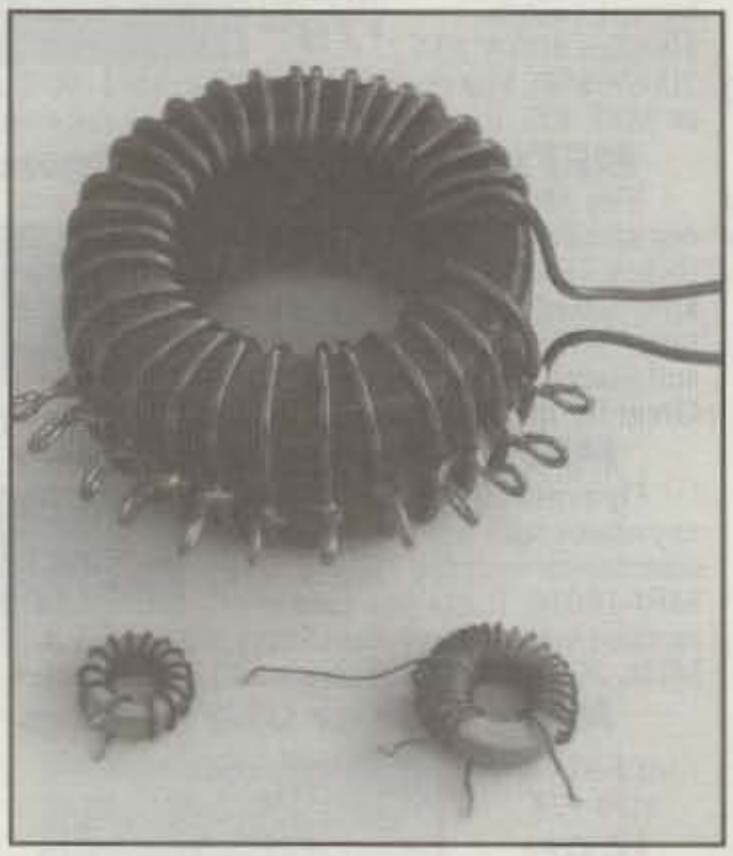

Photo C– Photograph of a tapped toroid inductor and two smaller cores that have been wound (see text for a discussion about the small core at the lower right).

var-insulated magnet wire that has not been abraded should require no additional insulation.

The Correct Core is Important

Beware of unidentified toroid cores that are sold at amateur radio fleamarkets and by vendors of surplus electronics equipment, unless the core type is clearly specified. All toroids look alike, except for their size and color. Some are designed for use at audio or very low frequencies. Others are designed to be used at HF or VHF. The lower the frequency rating the greater the core permeability in order to minimize the number of wire turns needed for larger inductances. Toroids are rated for optimum inductor over restricted frequency ranges. A low-frequency core used at HF, for example, will cause the inductor to have a very low Q. Circuit performance will suffer when this is done. Conversely, an HF type of core, when used to wind an LF inductor, may require more turns than the core can accommodate. The Amidon catalog lists the useful frequency range and AL factor for each type of toroid that Amidon sells.

Powdered-iron cores are used generally for resonant circuits that require high Q. These cores can handle more power than equivalent-size ferrite toroids without saturating, overheating or sustaining permanent core damage. In addition, they are more stable in terms of permeability while undergoing changes in core temperature.

Ferrite cores are used mainly for broadband transformers and balun transformers. Their

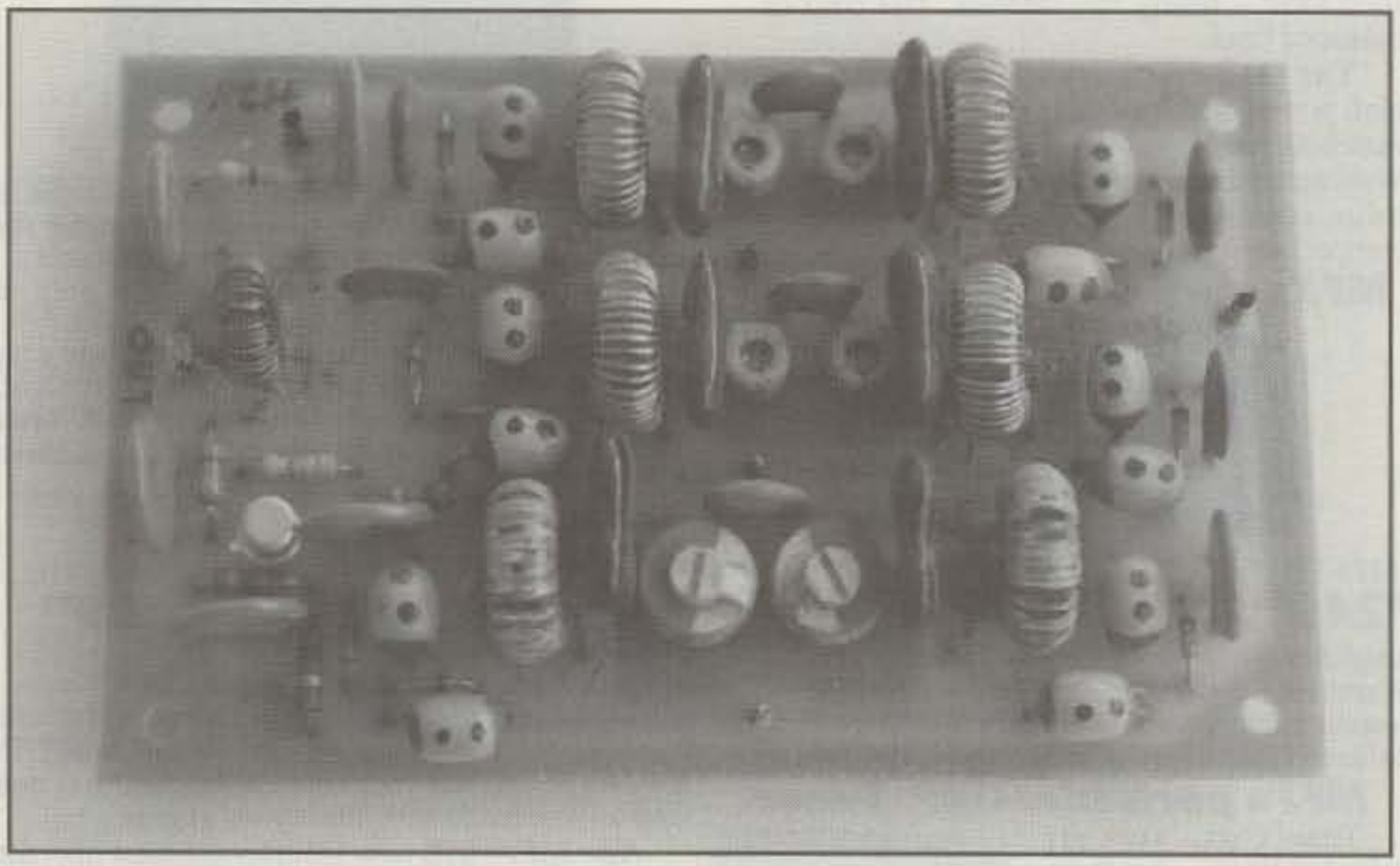

Photo D– An assembled PC board that contains seven toroids that are mounted vertically to save space (see text).

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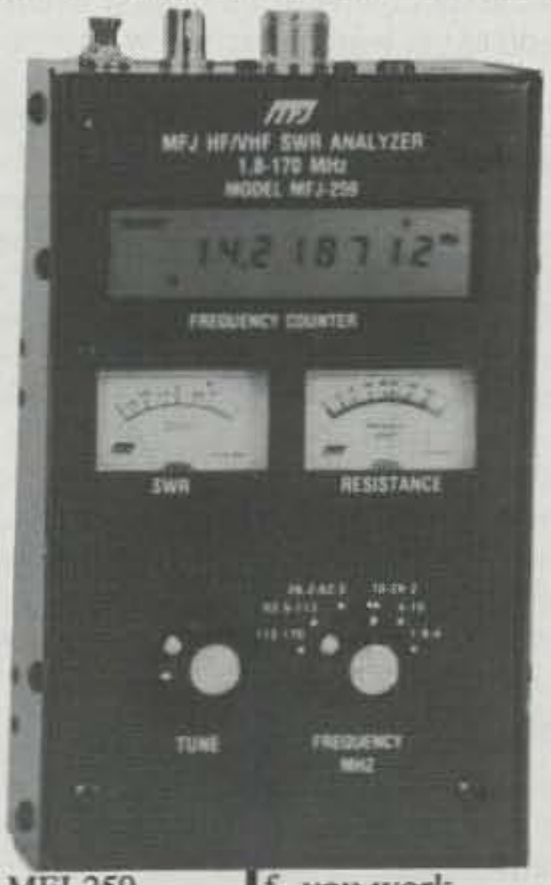

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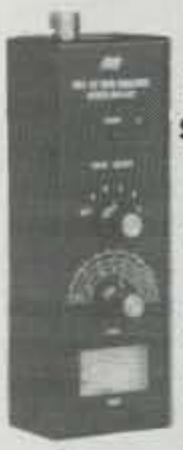

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Read SWR of any antenna 420 to 450 MHz -- just plug coax of your antenna into SO-239 connector, set frequency and read SWR. Uses microwave integrated circuits and microstrip technology. Jack for external frequency counter. 7½x2½x2¼ in.

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high permeability results in fewer turns of wire per core size, compared to powdered-iron toroids, to obtain a specified inductance. High Q is possible also with ferrite cores, but they are quite temperature sensitive. Hence, ferrite cores are unsuitable for use in VFOs. All balun cores are made from ferrite material, which is a semiconductor substance similar to ceramic. The foregoing rules apply also to the cores used in slug-tuned coil forms. Always use the appropriate core material for the desired operating frequency.

Toroid Mounting and Protection

Toroids can be laid flat on a PC board, or they can be mounted upright as in photo D. Vertical mounting saves space and helps to distance the toroids from nearby components. The 30 degree winding gap (see fig. 1(A)) is placed against the PC board. A generous drop of epoxy glue may be used to affix the toroid to the board. This will prevent lead flexing and possible breakage of the wires.

The completed toroid should be coated with General Cement Q-Dope or an equivalent RF coil compound. This brand of glue has become difficult to locate, but I recommend it for coating all coils. I have found that white carpenter's glue (Elmer's Glue, for one) works well as a coil coating. Once dry, it has no measurable effect on the coil Q, and it appears to be insensitive to temperature changes.

It is beneficial to coat the toroid windings to prevent them from shifting position, once in the circuit. This is especially important when using toroids in VFOs. Also, the coating provides protection against dirt, moisture, and abrasion.

Other Considerations

Large ferrite toroids that are used in RF power circuits, such as balun transformers, should be wrapped with insulating material before the windings are added. 3M glass tape is excellent for this purpose. I have had success when wrapping my cores with three layers of Teflon pipe-thread tape. This material is available in most hardware stores for a nominal price. If the core is not wrapped in the foregoing manner, RF voltage in the winding may arc to the core. Other types of low-loss, heat-resistive tapes are suitable also.

Always be careful to avoid dropping a toroid on a hard surface. Both core types break easily. Ferrite cores tend to shatter when they strike a hard surface. However, if you break a core in two or three pieces, the core can be glued together with epoxy cement. It will work practically the same as before it was broken.

Multiwire Windings

Some readers have expressed confusion about multiple windings that are identified as bifilar, trifiler, or quadrifilar types. A bifilar winding is one that has a characteristic impedance of roughly 25 ohms. These are used in what are called "transmission-line transformers." A multifilar winding may consist of two or more insulated wires that are parallel to one another when wrapped on a core. As an alternative, they may be twisted together prior to winding them on the core. Approximately 8 twists per inch is acceptable for amateur work. The wires can be twisted by means of a vise and a hand drill. One end of the wire pair or trio is clamped in a vise. The opposite ends are tightened in the chuck of an egg-beater type of hand drill, then twisted 8 turns per inch. The major difference between conventional and transmission-line transformers, other than efficiency, is that each winding of a conventional transformer is laid on the core separately. All of the same-length transformer wires are placed on the core at the same time when working with transmission-line transformers.

I hope this article has provided answers for the numerous by-mail questions I have fielded, following my articles that specified toroids. Perhaps you will want to photocopy this presentation and file it in your workshop notebook.

Footnotes

1. Amidon Associates, Inc., 3122 Alpine Ave., Santa Ana, CA 92704 (phone 714- 850-4660).

2 . George Murphy, VE3ERP, 77 McKenzie St., Orillia, Ontario L3V 6A6, Canada. Send $5 to cover postage and handling for a free 3.5-inch diskette. Software is not copy-protected.

73, Doug, W1FB

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BY KARL T. THURBER, JR., W8FX

ANTENNAS & ACCESSORIES

A LOOK AT THE SHACK FROM BOTH ENDS OF THE COAX

Antenna Column Ramblings

This month, we'll keep rambling on with our column's usual formula of antenna, software, and book notes. We'll begin where we should—with antennas. Stay with us. There's lots to come this month.

Antenna Ramblings

Top Ten Devices Antenna Selectors. Dave Hawes, N3RD, offers automatic antenna selectors under the Top Ten Devices (TTD) name. Designed with the computer-controlled contesting station and its "serious contester and DXer" operator in mind, the focal points for the TTD product line are the A/B Station Selector (A/BSS), Automatic Band Decoders, and Six Way Relay Box.

The A/BSS ($64.95) is a single-pole, double-throw, interlocked relay intended for stations where a single antenna feedline needs to be transferred between two separate transceivers. You can control the A/BSS manually with a toggle switch, or ideally, use automatic Band Decoders on each of the transceivers to effect automatic transfer (see fig. 1).

In this case, whichever station first "calls for" an antenna by QSYing to that band will automatically receive the antenna line. If the other station also goes to that same band, it's prevented from "stealing" the antenna by the integral interlocking scheme of the A/BSS. The A/BSS ratings are for 1500 watts CW/SSB to 30 MHz, or 1 KW RTTY. Isolation between ports is greater than 70 dB.

The automatic Band Decoder ($104.95) provides automatic antenna selection corresponding to the band in use; it attaches directly to the rig and "follows" its band changes, for control of external relays. Two models of the decoder are available.

The Yaesu model is controlled by either the Band Data port on the Yaesu radio, or a computer parallel port running software that supports automatic antenna selection. The ICOM model is controlled from the ACC port on the radio. The decoders are easily programmed to suit each station's antenna configuration. (A special configuration allows control of Kenwood radios, which don't have a direct connection for band data.)

The Six Way Relay Box ($104.95) completes the product line. The box has six 12 VDC relays which can be controlled directly by the Band Decoder, or they may be switched manually. The relays' enclosure is suitable for indoor use, but outdoor installation requires an additional drip-proof enclosure. Various custom configurations are available using multiple A/BSS Boxes and Six Way Relay Boxes.

You may need to use bandpass filters to reduce interference in multi-transmitter installations. Dunestar makes a six-band switched bandpass filter (Model 600) for this purpose.

289 Poplar Drive, Millbrook, AL 36054-1674

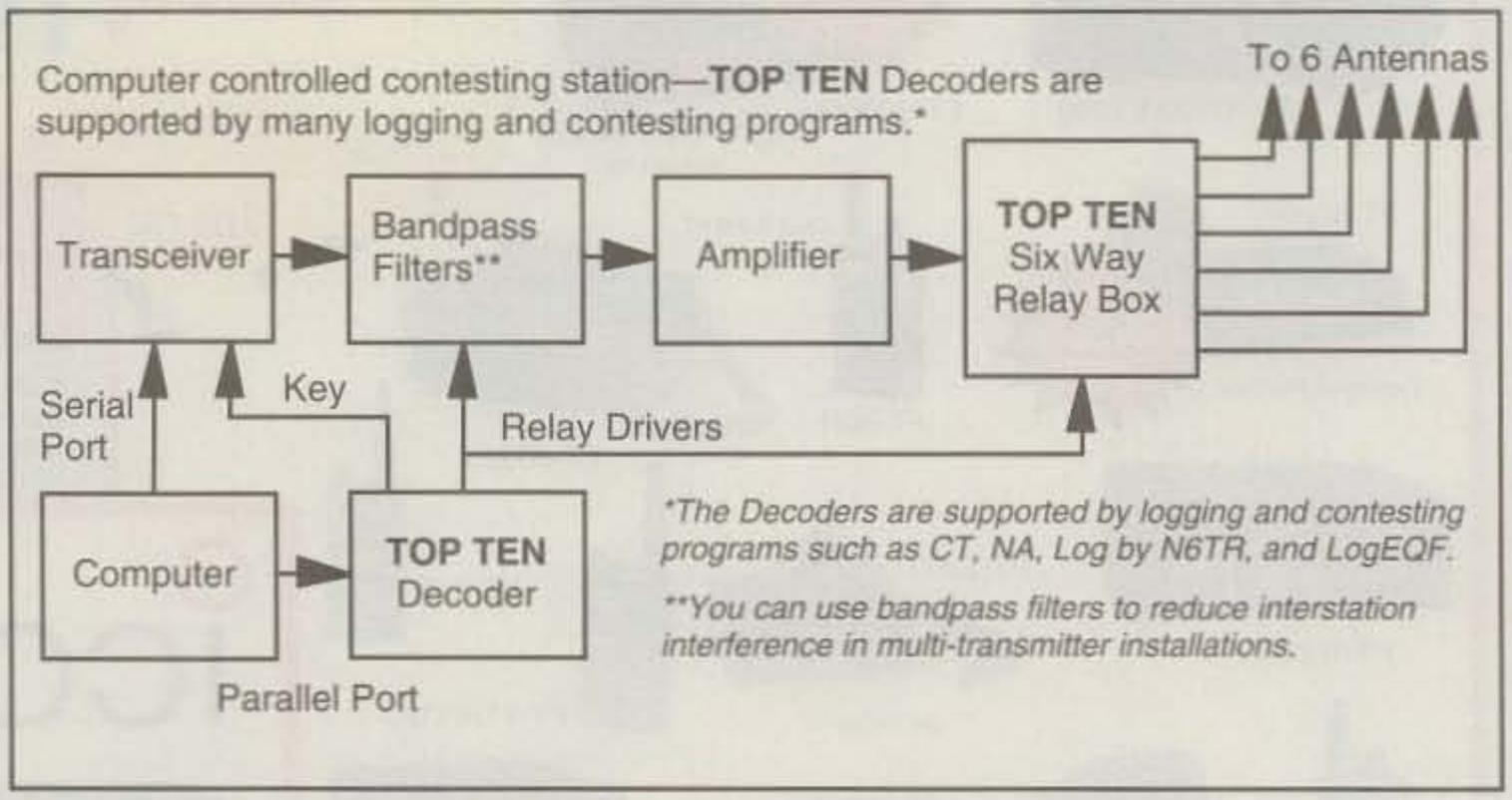

Fig. 1– Shown here is a typical computer controlled contesting station setup using the Top Ten Decoder (TTD) devices. The Band Decoder receives band information and keying signals from the computer's parallel port. The Band Decoder relay driver outputs select bandpass filters and antennas via the Six Way Relay Box; a unique relay driver output is provided for each band. The keying signal from the computer's parallel port is buffered and keys the transceiver. Programming is done with diodes on a plug-in component carrier and may be changed easily. (Source: Top Ten Devices, Inc. product literature.)

For more details and specifications, contact Top Ten Devices, Inc., 143 Camp Council Road, Phoenixville, PA 19460 (610-935-2684); Internet <n3rd@ix.netcom.com>.

Dunestar Systems Products. In November 1993 we described the line of Dunestar filters offered by Ron Crouse, AA7EA. We profiled the two transceiver RF bandpass filters he offered for multi-transmitter contesting, interference to and from other nearby amateur stations on adjacent bands, and TVI suppression. The Dunestar 100-Series RF bandpass filters were single-band units for 160, 80, 40, 20, 15, or 10 meters. The Model 500 filters were transceiver-controlled, five-band filters for 80, 40, 20, 15, and 10 meters.

The 100 Series filters have been replaced by the Model 300 Single Band Bandpass Filters ($36.50); they are self-contained, 200 watt units for any HF band. The Model 300 filters now are the Model 600 Multi Band Remote Switched Bandpass Filters ($239).

The Model 600 filters are suitable for use with the Top Ten Decoders, described above, and are mounted between the transceiver and antenna or amplifier. The filters, which cover the 160, 80, 40, 20, 15, and 10 meter bands, handle 200 watts RF, and include automatic bypass and failsafe features. Activation is jumper-selectable for either positive or negative keying, allowing compatibility with most antenna switches and interfaces. Filter connection is via a single DB9 connector for band selection and power input (12 VDC). Switching can be tracked with your transceiver bandswitching through use of an interface, or combined with your antenna remote switching setup.

Dunestar also offers other antenna accessories, including the WXØB Stack Match (highlighted in the April '95 "Antennas" column), an unbalanced-to-unbalanced (UNUN) transmission-line transformer used to stack beams and other antennas; various antenna stacking and steering systems; control switches; and antenna switches.

Also available is the Model 834 HF Directional Control System ($239), a rather novel antenna switching system used with two, three, or four antennas (such as verticals or sloper wire antennas) to create an electronically steerable parasitic HF array. The resulting array consists of a driven element and one to three reflectors, depending on whether two, three, or four antennas make up the array. When one antenna is selected as the driven element, the feedline is attached to that antenna only; the antennas not selected become reflectors.

For more information, contact Dunestar Systems, P.O. Box 37, St. Helens, OR 97051 (1-800-457-1690); Internet <aa7ea@aol.com>.

Productivity Resources Masts. In June 1995 *CQ*, Tom Taormina, K5RC, noted that the mast supporting your beam probably is the most frequently ignored and underrated part of your antenna system. In his article, "A Layman's Guide to Mast Material," he took the position that your mast should be a lifetime investment, rather than the "fuse" in your antenna system—especially since a bent mast can be extremely dangerous to take down safely.

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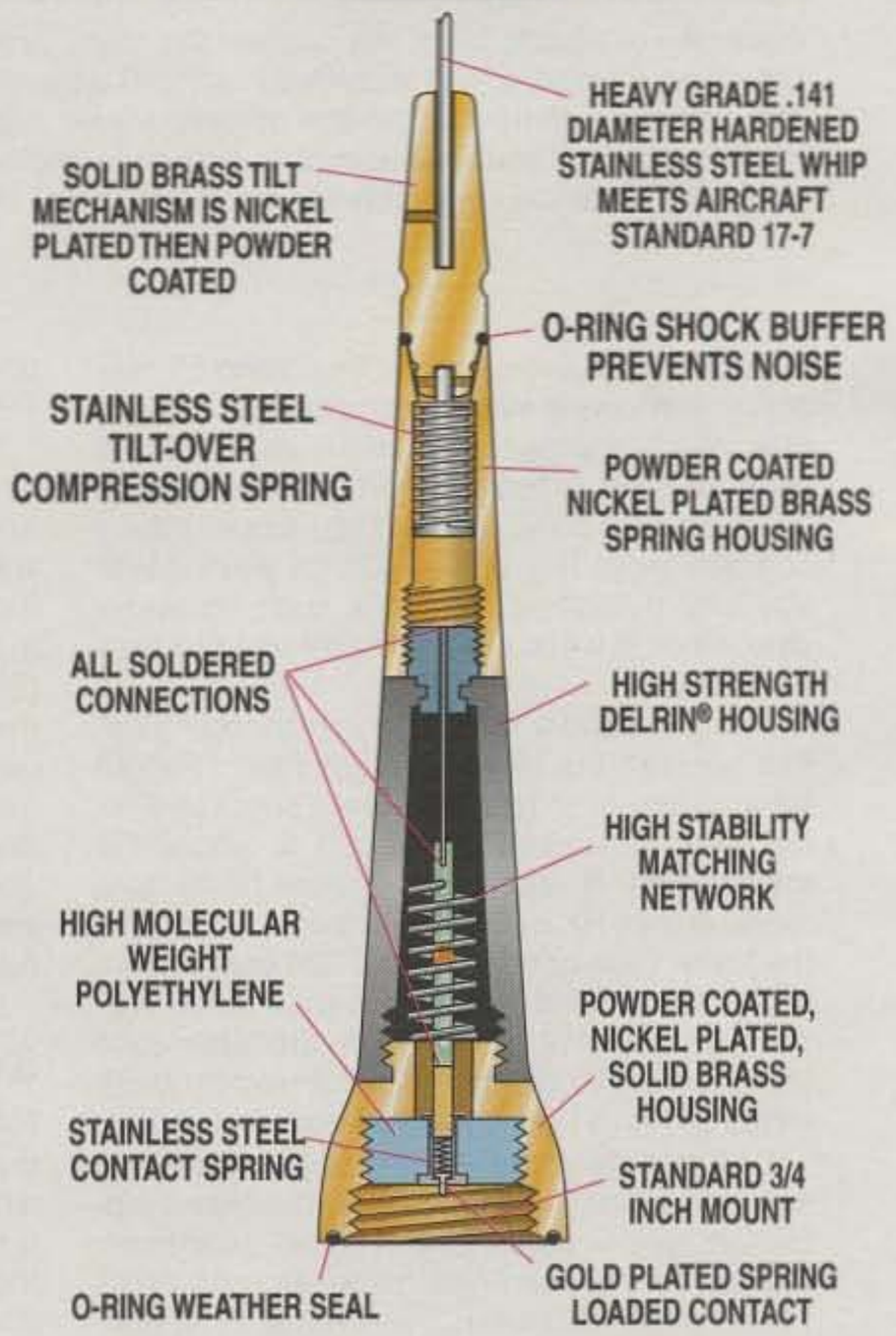

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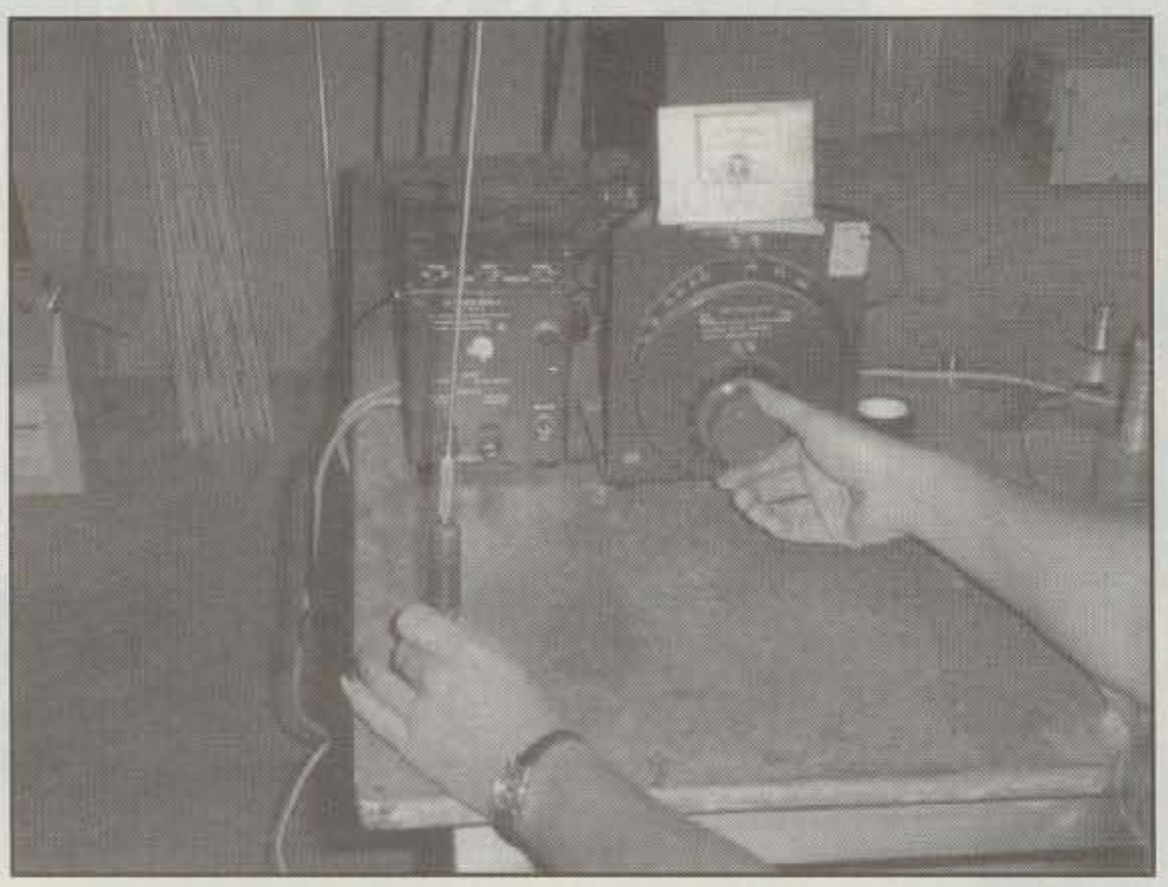

Photo A– In March 1995, we profiled the manufacturing facilities of the Lakeview Company, the WD4BUM/N4WHB operation in Anderson, SC. The company offers a broad line of inexpensive, high-quality, and good-performing fixed station and mobile antennas and accessories. Here, a VHF antenna coil is tuned prior to shipment. (N4WHB photo)

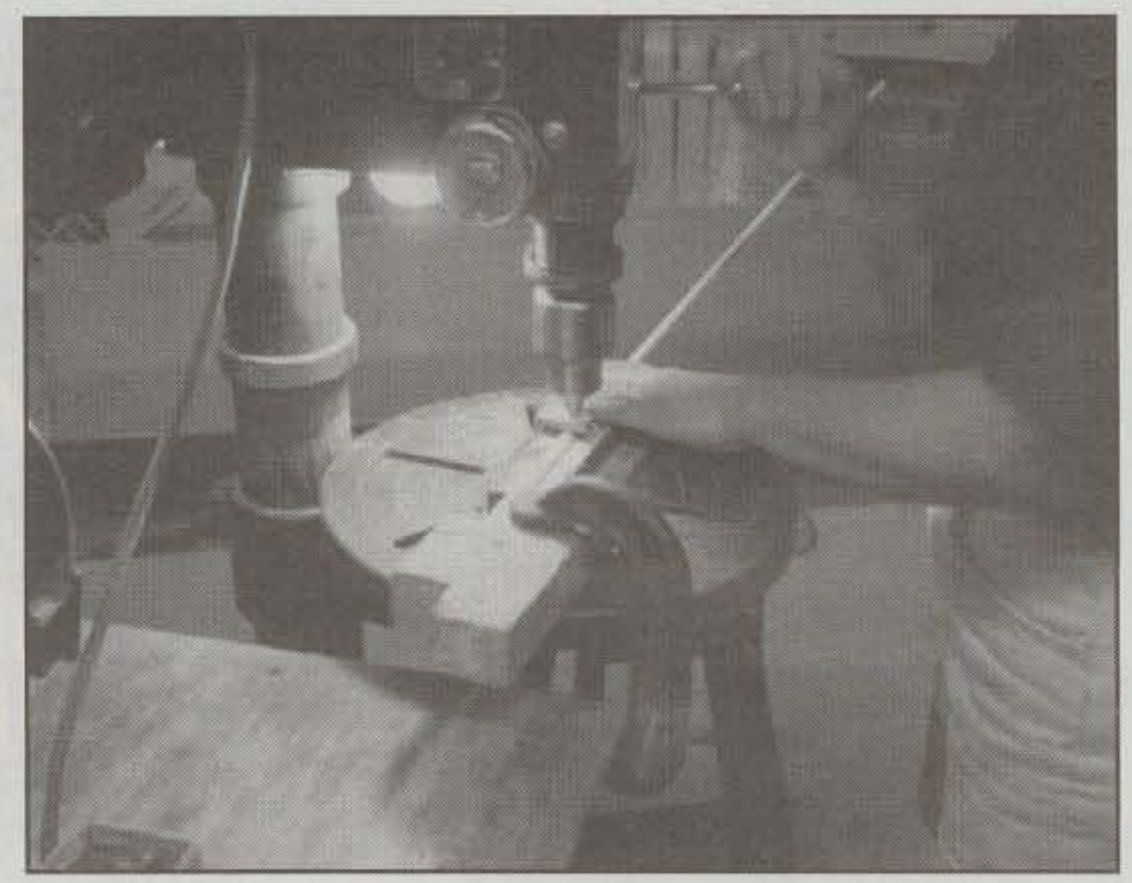

Photo B– A wide variety of inexpensive fixed station and mobile antennas are offered by the Lakeview Company. Many of the antennas offered by the firm are of fiberglass construction. In this photo, a worker prepares the fiberglass for use in mobile antennas. (N4WHB photo)

Tom argued the case for "designing for reliability" in antenna system components. In general, much sturdier mast material should be used for most antennas than typically is used (such as light-duty, thin-wall aluminum tubing or water pipe). He observed that you'll never see any published structural data on water pipe, since it wasn't meant to be used to support anything!

Tom provided a "mast material shopping list" that showed the required mast yield strength for a variety of antennas, from a small VHF or HF beam at a mast height of 1 ft. above the tower (6061-T6 aluminum is okay here), to a medium-size HF or VHF array some 8 ft. above the tower (you need at least 1026 cold drawn, heat-treated steel here), to a big HF or VHF stack 15 ft. above the tower. In the latter case you need 4130 cold-drawn, chrome moly steel, which in Tom's view should be your first choice.

Unfortunately, the sturdier steel masts are expensive and not as readily available as aluminum types, especially in small quantities. Consequently, Tom has made arrangements to offer 2 inch diameter, 3/8 inch wall 4130 non-galvanized mast (at $16/ft.) and galvanized mast (at $20/ft.), shipped freight collect. Both types are available in lengths to 25 ft.

Contact Productivity Resources, P.O. Box 813, Bellville, TX 77418-0813 (409-865-2727); Internet <virtuiso@aol.com>.

Lakeview Company Update. On several occasions we've mentioned the inexpensive, high-quality, and good-performing fixed-station and mobile antennas and accessories made by the Lakeview Company of Anderson, South Carolina. We began covering Lakeview products in the early 1980s after discussions with founder George Shira, WD4BUM, at various southeastern hamfests where he exhibited his latest antenna creations. George retired from the company in 1991, turning over the reins to son Butch, N4WHB.

We profiled the Model CBK-40 Carolina Bug Katcher, a heavy-duty, continuous-coverage 7–31 MHz mobile antenna, in April 1991. We also highlighted the company's operations with photos of their manufacturing facilities in March 1995 (see photos A and B).

The Lakeview Company product line now is offered by many dealers, but they still sell direct. An eight-page flyer covers the entire product line and includes the popular Carolina Bug Katcher; the single-band Ham Sticks®, for mobile operation; the effective but inexpensive ($9.95) WD4BUM Inducti-Match, for 80–15 meter mobile use; an enhanced discone scanner antenna, one which you also can use to transmit on the 146, 220, and 440 MHz bands; and a variety of mobile antenna accessories and mounts. For a catalog, contact the Lakeview Company, Inc., 3620-9A Whitehall Rd., Anderson, SC 29624 (864-226-6990).

Software Ramblings

RAC 'n Rollup. In a recent column we profiled the "Radio Amateur Callbook CD-ROM 1996," which claims to be the most complete and extensive radio amateur directory on the market. Incorporating both the North American and International editions of the *Callbooks*, the $49.95 RAC CD-ROM has over 1.3 million listings in more than 250 countries. (The CD-ROM is $49.95 from Radio Amateur Callbook, 1695 Oak Street, P.O. Box 2013, Lakewood, NJ 08701 [1-800-278-8477].)

Since we previewed the Version 1.0 CD-ROM, it's been enhanced significantly. Now it allows printing of multiple labels, including country names and date of birth in listings, and it offers QSL manager data, among other things.

Stephen B. Hajducek, N2CKH, sent us an innovative Windows-based enhancement to RAC, called RAC 'n Rollup. It offers a streamlined interface with additional features, ones which are especially useful if you have an early version of RAC that doesn't present the country information for printing or have a label-printing facility. Near-term, he's adding robust printer support for generic laser and inkjet printers, keyed to an Avery label number. Best of all, he advises that future versions of RAC 'n Rollup will have interface features and enhancements that still will make it highly desirable for use with future editions of RAC CD-ROM.

As this is written, the enhancement program is $9.95 plus $1.50 domestic s/h. A demo version of the software, "RAC 'n Rollup Demo," is available on Steve's support BBS, as well as on the ARRL BBS and at popular amateur radio Internet FTP sites.

For more information, contact Stephen B. Hajducek, N2CKH, P.O. Box 8, Morganville, NJ 07751-0016 (phone 908-364-3517). BBS 908-363-2760. Internet <n2ckh@bytewise.org>.

As we wrapped up this issue, Steve added that RAC 'n Rollup is the first of several products he has planned, and he will soon have available CATCC (Computer Aided Transceiver Control Center) software. The next version of RAC 'n Rollup, with many more new features, is expected to be available shortly after the next version of RAC is issued.

1995 ARRL Periodicals CD-ROM. As a writer, I find it very useful to have an array of reference software, programs, and files, on my PC's hard disk or at arm's reach on CD-ROM. I'm something of a PC packrat. For example, I keep a dictionary program on CD-ROM, as well as Microsoft Bookshelf, the Time Almanac CD-ROM, a multimedia encyclopedia, and various spell-checkers and thesauruses as part of wordprocessing programs.

For reference, I also keep *QST* index files from 1989 onward; a list of current hamfests; e-mail addresses for the ARRL staff and members of my local amateur radio club; and didah Publishing's *From Beverages to OSCAR* online index. All these help when I'm trying to "find something fast." I also keep a copy of every one of my columns back to 1987, indexed files that I can use to find just when and what I said, should a reader inquire.

Thus, I read with interest the availability of the 1995 ARRL Periodicals CD-ROM. It's a compilation of all 1995 *QST, QEX,* and *NCJ* articles. It contains the full text of every article in the three publications, including technical and general interest items and columns; every drawing, table, illustration, and photograph

(many in color); more than 1000 indexed advertisements; tools to create bookmarks at often-used places; and a powerful "search engine." The search engine helps you find information quickly by entering article titles, callsigns, names, or other key words.

The software supports Windows printing and its Clipboard, so you can print out articles. It's really neat, allowing you to toss your precious 1995 *QST*, *QEX*, and *NCJ* magazines if you're in need of space, since virtually everything is on the CD-ROM.

Still, after installing and using the CD-ROM, I ended up with mixed feelings about it. It certainly did most of what it was supposed to do, and the ability to "find something fast" and to collect related information across several issues was great. But there were some negatives, just as there usually are in Version 1.0 of any software program. First, the CD-ROM required 10 MB of hard disk space, and it was very demanding of "system resources," at least under Windows 3.1. Thus, I found the program wouldn't load or it would crash if I had several other programs running, or if I previously ran programs that didn't release all their memory when they terminated. It also didn't like the Super VGA drivers on my PC, and so I had to reconfigure to using standard VGA to use the CD-ROM at all—an annoyance.

All things considered, the CD-ROM holds great promise, but it is, in my view, a little unstable, so be prepared to tinker with your PC's configuration to use it reliably. However, the ARRL posts release and support notes and "bug fixes" on their Web page, and I got very good, personalized, and prompt tech support via e-mail to their Technical Information Services. I expect great things from the 1996 CD-ROM, which I hope to report on when it is released, probably early next year.

The 1995 ARRL Periodicals CD-ROM is $19.95 from the American Radio Relay League, 225 Main St., Newington, CT 06111 (860-594-0200); Internet <ltardette@arrl.org> or <http://www.arrl.org/>.

The Reference Shelf: Books and Catalogs

Keys II: The Emporium. In the January 1992 column, we noted fellow *CQ* colleague Dave Ingram, K4TWJ's book, *Keys, Keys, Keys.* Dave's book was a visual celebration of one of amateur radio's favorite accessories—the communications or telegraph key. Reflecting Dave's love of radio collectibles and classics, the book contained a wealth of information on semiautomatic keys ("bugs"), handkeys, telegraph sounders, custom fingerpieces, electronic paddles, and even miniature "spy keys."

A 77-page, self-published sequel is Dave's *Keys II: The Emporium*, subtitled "The World's Most Admired Keys—New and Old." The new book's emporium theme suggests that reading it is like visiting a combination museum, collector's exchange post, and new products showroom where the world's most famous, exotic, and glamorous keys are on display—along with photos and side notes on production dates and current prices.

The book is $15 plus $2.50 s/h via fourth class mail (or $3.50 via priority mail), from Dave Ingram, K4TWJ, 4941 Scenic View Drive, Birmingham, AL 35210 (205-951-0162).

Crash Courses at HighText. We've mentioned HighText Publications several times, most recently in the January 1994 column. Noted author Harry Helms, AA6FW, is closely identified with HighText, and you may recall that he's the author of the excellent *All About Ham Radio* beginner's book, which we profiled in February 1993. (Harry's book is the one my own XYL, Millie, used to study for the Tech license; she's now KD4SHM.)

Carol Lewis of HighText says they now focus on technical, engineering, and scientific topics, and especially, multimedia study guides. Their "Read-Me" newsletter stresses their new role as an "information publisher" rather than as a book publisher.

In keeping with this focus, they now offer the CrashCourse™ multimedia series on topics such as calculus, accounting, and algebra. They also offer a CrashCourse sampler CD-ROM for $5. It includes samples from five of their CrashCourses, letting you try before you buy. It also includes their interactive book catalog, in which you can hear audio files of their authors.

For a catalog and newsletter, contact HighText Publications, Inc., P.O. Box 1489, Solana Beach, CA 92075 (1-800-247-6553).

Three Newbies from Tiare. Gerry Dexter, of Tiare Publications, offers a good selection of books on SWLing, scanner and utility monitoring, broadcasting, and related pursuits. And in a recent column we took note of the set of four new amateur radio *License Guides* (Novice, No-Code Technician, General, and Advanced) developed by Larry R. Luchi, W7KZE. We also indicated that a fifth Luchi book, *Luchi's Easy Calculator Math for Electronics*, was due soon at $17.95.

The calculator math book now is available; it shows you how to easily solve electronic formulas using your calculator. The 81-page book takes you through each step in over 30 formulas used in electronics, from Ohm's Law to phase angles to component values for resonance. Each is explained carefully, with one or more step-by-step examples presented in an easy-to-follow format. Terminology and theory explanations also are included, along with diagrams to aid in understanding the material.

When Gerry sent me a copy, he also included two other interesting Tiare pubs that many readers will enjoy. The first is *Monitoring the Feds*, by John C. McColman; this $17.95, 105-page book is a practical guide on how to use your scanner or shortwave radio to eavesdrop on the federal government. The second is for the adventuresome: it's the *Pirate Radio Directory, Eighth Edition,* by Andrew Yoder and George Zeller. This $12.95, 68-page book describes some 125 pirate radio broadcasters.

A new "Great Radio Reads!" catalog is $1 from Tiare Publications, P.O. Box 493, Lake Geneva, WI 53147 (1-800-420-0579). Book s/h is $3 per title.

CB Modification Secrets. While we don't normally cover CB books, *CB Modification Secrets,* by Kevin Ross, nevertheless is a good follow-on to his previous book, *The CB Radio Hacker's Guide.* The new book offers a num-

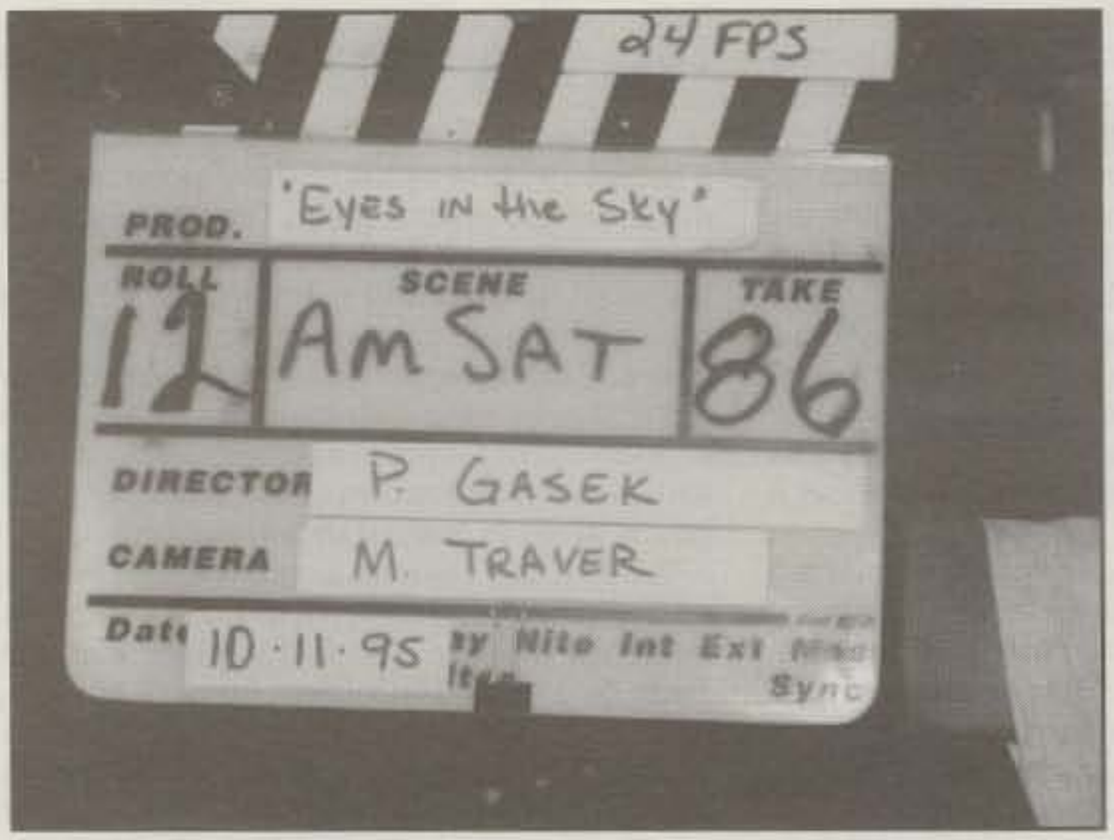

Photo C– AMSAT received a great deal of favorable publicity by its appearance on the Discovery Channel on cable TV in March. AMSAT was featured in a program about satellites called "Eyes in the Sky," the filming of which was completed last October. During the filming of the AMSAT portion, a camera crew exposed some 4800 ft. of 16mm movie film during shooting that lasted two days. (AMSAT-NA photo by Keith Baker, KB1SF)

Photo D– Here, Christophe Carlier, F4AAT, (left), President of the French CAC Club, presents Dick Jansson, AMSAT-NA Vice President for Engineering, with two spun aluminum L-band antenna reflectors for the Phase 3D satellite while Peter Guelzow, DB2OS, representing AMSAT-DL (second from right) and Jean-Marie Gaucheron, F3YP, REF President (far right) look on. The reflectors were fabricated near Bordeaux, France. (AMSAT-NA photo by Keith Baker, KB1SF)

Photo E– Matjas Vidmar, S53MV, is shown experimenting with prototypes of the LEILA circuit for the Phase 3D satellite at his home workshop in Slovenia. A flight model of the LEILA now is slated to be carried aboard the satellite. It's designed to alert ground station operators who inadvertently run too much uplink power by superimposing a warning message on the "offending" station's downlink signal. (AMSAT-NA photo by Keith Baker, KB1SF)

Photo F– Displayed at this year's JAMSAT annual meeting was a framed copy of the December 12, 1995 issue of the Japanese daily paper, the ASAHI News, *which carried a front-page feature article on the Phase 3D satellite. The article praised AMSAT's approaches to satellite construction and highlighted JAMSAT's SCOPE camera experiment that's set to fly on the satellite. (The* ASAHI News *is comparable to the* USA Today *newspaper in the U. S., with a daily circulation of some 8 million copies throughout Japan.) (AMSAT-NA photo by Keith Baker, KB1SF)*

ber of suggestions and tips on expanding, enhancing, and adding to the usefulness of recent AM and SSB CB equipment, and perhaps with good timing: With the new sunspot cycle poised to start its upward climb, many amateurs will be considering modifying and upgrading certain CB rigs for use on the to-be-hot 10 meter band, just as they've done through previous sunspot cycles.

The 200+ page book is $21.95, plus $5 s/h from CRB Research Books, Inc., P.O. Box 56, Commack, NY 11725 (1-800-656-0056). A free catalog also is available.

New Universal Radio Catalog. Universal Radio has issued its periodic update to its illustrated communications catalog. The new, 100+ page catalog is an excellent ordering and reference resource that covers equipment for the amateur radio, shortwave, and scanner enthusiast. An impressive selection of antennas, headphones, books, and accessories is also featured.

For a copy, contact Universal Radio, Inc., 6830 Americana Parkway, Reynoldsburg, OH 43068 (1-800-431-3939). The catalog is free by book-rate mail, or $1 by first-class mail.

While we're discussing Universal Radio, we should again mention the several beginner-oriented Information Pamphlets that are free of charge from the firm. Titles include "Antenna Safety Advisory," "Interested in Shortwave Radio?", "Interested in Amateur Radio?", "Installing RF Connectors," "Introduction to ACARS," "Listening to Radioteletype," and "Receiving FAX on Your Shortwave Radio." (ACARS, the Aircraft Communications Addressing and Reporting System, is a specialized VHF RTTY system that transmits data and messages between commercial aircraft and ground stations.)

Each of the pamphlets in the series is free if you send a self-addressed, stamped envelope (SASE) for the title(s) desired to Universal Ra-

dio at the address we listed, above.

New Radio Adventures Corp. Catalog and Address. In the December 1994 column we highlighted the R1 series of crystal-controlled, fixed-frequency receivers designed to copy amateur radio HF code practice sessions and bulletins from the ARRL headquarters station, W1AW. These receivers were offered by Lee Richey, WA3FIY, and were available (and still are) in several models (kit or wired) covering 80, 40, and 20 meters.

We also noted at the time that Lee was busy expanding his product line, and this he has done. In addition to the R1, his catalog now shows several new products. These include the A1 Code Boy electronic keyer, available in kit and wired form; the C1A, C1S, and C2 keyer chips; and the C5 frequency counter chip.

Radio Adventures Corp. also has a new address. For a catalog, contact them at P.O. Box 339, Seneca, PA 16323 (814-677- 7221); Internet <rac@usa.net>.

Introduction to Amateur Radio Update. In March 1992 we noted the achievements of Carole Perry, WB2MGP, a professional educator who has introduced many youths to amateur radio. We advised that she had packaged and made available to others her successful, 10-years-running amateur radio training program for youngsters in grades 3 to 12, "Introduction to Amateur Radio."

Carole's program is a complete, ready-to-teach "plug-in" curriculum for teaching amateur radio. It has all necessary student and instructor materials, including a teacher's manual, code practice oscillator, and audiocassette. The updated package includes a free video tape showing classroom use, and it's still $99. Extra practice "Space Code" audiocassettes and code keys are available separately.

Contact Carole at Media Mentors, Inc., P.O. Box 131646, Staten Island, NY 10313-0006 (718-983-1416).

BYTE Guide to Optimizing Windows 95. With all the hype surrounding Windows 95, it's easy to forget that the new operating system is *supposed* to make life easier, not harder. The *BYTE Guide to Optimizing Windows 95* provides many of the insights and information to help make this a true statement.

Written by Lenny Bailes and several others, the book is a lively guide filled with useful tips, tricks, and techniques for maximizing the potential of Windows 95. In it you'll find fresh solutions, optimizing shortcuts, and slick tips and expert advice on installing Windows 95; the Internet; multimedia; networking; troubleshooting; and handling old Windows and DOS programs.

The 636-page book is $29.95. It's available in bookstores, or contact Osborne/McGraw-Hill, 2600 Tenth St., Berkeley, CA 94710 (1-800-227-0900); Internet <http://www.osborne.com>.

Short Bursts

AMSAT Update. In several columns, most recently November 1995 and April 1996, we offered updates on ongoing AMSAT activities, particularly the Phase 3D Project, courtesy of our old friend Keith Baker, KB1SF, AMSAT Executive Vice-President.

Many amateurs don't realize that today there is only one major amateur radio satellite, OSCAR 13, that's capable of providing consistently reliable intercontinental amateur communications. Unfortunately, it soon will plunge into the atmosphere and be destroyed. The Phase 3D satellite is considered to be a replacement for OSCAR 13, but it's much more than that. It's the largest and most advanced amateur satellite ever built, aimed at reducing the cost and complexity of satellite-capable amateur stations, plus adding new frequency and data choices.

The satellite is an international project, with work being done in Germany, South Africa, Finland, Slovenia, the Czech Republic, Belgium, Japan, and other countries besides the United States. Assembly and checkout is in Orlando, Florida.

AMSAT received a great deal of favorable publicity by its appearance on the Discovery Channel on cable TV in March. It was featured in a major program about satellites called "Eyes in the Sky," the filming of which was completed last October. Photos C through F detail these and other recent Phase 3D activities.

For information on AMSAT membership, ways to contribute to the Phase 3D project financially, and a current catalog of AMSAT publications and software, contact AMSAT, P.O. Box 27, Washington, DC 20044 (301-589-6062). You also can make contributions to the ARRL Satellite Fund at 225 Main St., Newington, CT 06111-149; (860-594-0200). And check out AMSAT's neat Web home page at <http://www.amsat.org/amsat/AmsatHome.htm>l.

Looking Back Five

Five Years Ago in Antennas and Accessories. Okay, so now you know what the column is like for October 1996. But what was "hot" in October 1991? That column was "Books for the Hamshack."

Some of the top amateur radio and computer books back then were *Communications Formulas & Algorithms,* by C. Briton Rorabaugh; *Passport to World Band Radio*, by Larry Magne; *The Shortwave Listening Guidebook* and *The Underground Frequency Guide,* both by Harry Helms, AA6FW; *Scanner Modification Handbook, Vol. 2*, by Bill Cheek; *Dvorak's Guide to DOS and PC Performance*, by John C. Dvorak and Nick Anis; and the *Computer Professional's Dictionary*, by Allen L. Wyatt. We also profiled some ten antenna and communications catalogs.

Antenna-wise, we noted the surplus antennas and parts sold by N. E. Litsche, KA2TYT, and we described the tower-mounted metal box kits offered by Charles Byers, K3IWK. Turning to software, we covered the latest ELNEC antenna analysis program, offered by Roy Lewallen, W7EL. Finally, we discussed the Radio Shack Timekube® WWV/WWVH time signal receivers, issued a call for homebrew antenna photos (which we'll echo here), and presented humorous examples of "untranslatable technospeak" that is found in all-too-many amateur and computer user's manuals.

Wrap-Up

That's all for this time, gang. Next time more Antennas and Accessories topics of current interest. See you then.

Overheard: It took a while, but I finally learned that the *fast* way of doing something isn't always the *best* way.

73, Karl, W8FX

BY BUCK ROGERS, K4ABT

PACKET USER'S NOTEBOOK

CONNECTING YOU AND PACKET RADIO IN THE REAL WORLD

Digital RF Communications

In the August issue I covered various antenna applications and their adaptability to the world of digital communications. (In my work at Ericsson PRS, we have to deal with many types of digital applications that behave in a manner that is specific to various types of antennas.) We considered everything from an isotropic radiator to a beam (dipole plus parasitic elements).

"Everything from an isotropic radiator to a beam (dipole plus parasitic elements)." In that August column I may have omitted some very important points with respect to the proper installation of these antennas. When we install multiple or stacked antennas, we must also consider the influence of the adjacent antenna that is being combined with the array to increase the gain factor. Once the spacing of the antennas is factored into the equation, the rest of the problems tend to go away.

If we place the antennas too close together, several bad influences come into play. Please note that I said "too close." When we provide adequate spacing between antennas in a combined array, there is little mutual influence and fewer problems. The bad influence to which I refer can be near-field absorption and/or OR (not to be confused with operating room), directly associated with *object reflection*. Object reflections are what we see when we place a *reflector element* at some logical distance (.66 wavelength) from the driven element or a single dipole. This reflector element begins to make the dipole appear as if it were a beam.

Therefore, the two bad effects of placing antennas too close together are either loss or canceling of power between the antennas, or changing the intended coverage area of an antenna by unintentionally making it into a directional antenna.

I've included two nomograms (see fig. 1), one for vertical spacing and another for horizontal spacing of antennas. These should help alleviate this kind of problem by making sure that we observe the spacing between our VHF and UHF antennas.

211 Luenburg Drive, Evington, VA 24550
buck4abt@inmind.comnas.

Up and Down The Packet Network

Several years ago I authored a primer for the packet radio beginner. The purpose of this beginner's guide was to enable the new packet user to circumvent many of the pitfalls I encountered when I first took the plunge. When I began operating packet, there were three or four packeteers within 200 miles of me. This meant that in order to try any kind of packet tests or connects, I had to first arrange for the connect via telephone. The story goes downhill from there. The long and short of it is that it was not easy to get help learning how to make packet work.

Getting into packet radio networking is sometimes difficult for the new or prospective packet *system node operator* (SNO). For this reason I hope to circumvent some of the pitfalls we encountered in the mid-1980s when packet networking came into full swing.

Now, a decade later, we are beginning to attach our backbones to other networks and LANs, and in some instances there are a few SNOs who are willing to open the floodgates to the Internet. The latter is okay, except there are a few legalities that should be investigated before leaping headlong into that bottomless pit. I'll leave that thought alone for the moment, because we have a lot more to cover without opening the mailbox to more mail than I can answer in one month.

After The War is Over

We've already studied how to build the node and how to attach the backbone node to our LAN or local user port, but what we have not covered is how to set up the heirarchy of our network so that traffic from the user ports will migrate to, and travel on, the backbone.

It's easy enough to understand that our backbone is usually a high-speed packet system set up on a remote VHF or UHF frequency that is virgin to user access. This keeps the backbone frequency clear for node-to-node communication only. The only time the backbone stops passing data is when it comes to the final destination of the traffic or data flow along its path.

Parm #	Function	1200 baud gateway	9600 baud gateway	Stand-alone 1200 baud node	Stand-alone 9600 baud node
1	Size of destination node table	50	50	50	50
2	Minimum auto update quality	51	63	51	63
3	HDLC (radio port) default quality	102	177	203	203
4	RS-232 (Crosslink) port default quality	255	255	203	203
5	Initial obsolescence count	5	5	5	5
6	Minimum obsolescence to broadcast	3	2	3	2
7	Nodes broadcast interval (seconds)	900	900	900	900
8	Initial time to live	15	15	15	15
9	Transport FRACK timeout (seconds)	200	200	200	200
10	Transport RETRY counter	1	1	1	1
11	Transport (L4) ack delay (seconds)	2	2	2	2
12	Transport busy delay (seconds)	180	180	180	180
13	Transport window size (frames)	3	3	3	3
14	Transport overfill limit (frames)	4	4	4	4
15	No activity time out (seconds)	900	900	900	900
16	Persistance (n/256)	64	255	64	255
17	Slottime (x10ms)	10	1	10	1
18	FRACK (T1) time	4	1	4	1
19	AX.25 window size (L2 MAXFRAME)	2	2	2	2
20	AX.25 (L2) retries	10	10	10	10
21	ACK (T2) time (RESPTIME)	50	20	50	20
22	Active check (T3) (x10ms)	18000	18000	18000	18000
23	Digipeat	0	0	0	0
24	Callsign validation	0	0	1	1
25	Beacon mode control	2	2	2	2
26	CQ broadcasts	1	1	1	1

Table I– X-1J4 parameter settings used with the SEDAN nodes and gateways. Note the differences between the user port, gateway port, and the stand-alone node configuration.

YAESU

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FT-1000MP • Advanced features • EDSP • Collins mechanical filter **$2999.95**

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FT-990 HF Transceiver • tx: 160–10m **rx:** 100kHz–30MHz • 100W • 90 memories • SCAF • FSP • DDS • built-in antenna tuner • built-in AC • 12¾"w x 4½"h x11¾"d, 30 lbs..... **$1999.95**

FT-990DC • DC only..... **$1669.95**

FREE YSK-900 Remote Kit!
FT-900/AT
FT-900/CAT
Limited Time

FT-900/AT HF Transceiver • tx: 160 to 10m • **rx:** 100kHz–30MHz • 100 memories • 100W • built-in antenna tuner • CTCSS encode.• repeater offset • twin stacking VFOS • detachable front subpanel • 13.8VDC @ 20A • 9⅜"w x 3¼"h x10"d, 11 lbs .....**CLOSEOUT $1269.95**

FT-900/CAT Collins mech. filter .**$1399.95**

FT-840 HF Transceiver • tx: 160–10m • **rx:** 100kHz–30MHz • 100 memories • 100W • twin band stacking VFOs • optional FM mode • repeater offset • CTCSS encode •13.8V DC @ 20A • 9⅜"w x 3⅜"h x 9½"d,18 lbs....**$799.95**

All ACCESSORIES for items on this page are in stock.
When calling, be sure to ask your Salesperson about them!

Multi-Mode VHF/UHF Base

FT-736R • 2m: 144–148MHz; **70cm:** 430–450MHz • optional modules for **50, 220MHz & 1.2 GHz** • 100 memories • full duplex crossband • inverted tracking • 25W: 144, 220/440MHz; 10W: 50/1.2GHz • built-in AC supply or 13.5V DC • 5⅛"h x 14½"w x 11½"d, 19.8 lbs.....**$1969.95**

Dual Band FM Mobiles

All Similar: 32 memories • CTCSS encode • dual receive • built-in duplexer • cross-band repeat • remote capability • 5½ "w x 1⅝"h x 6"d, 2 lbs

FT-5200 2M/440MHz, 50/35W **$549.95**
CLOSEOUT with COUPON until gone

FT-5100 Like FT-5200 w/o remote.**$529.95**
SPECIAL!

FT-6200 440MHz/1.2GHz, 35/10w.**$749.95**

FT-8500 Dual Band FM Mobile • 2m 144–148MHz tx, 110–180MHz rx; **70cm** 430–450MHz tx, 420–470MHz rx • 110 memories • 50/35W • Spectra-Analyzer • Smart Controller mic • 10-memory auto-dialer • 5½"w x1⅝" x 6¼"d, 2¼ lbs..**$679.95**

FT-8500/MH-39 w/std. TTP mic ..**$639.95**

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FT-7200 430–450MHz FM Mobile • 35/15/5W • 50 memories • DTMF page and coded squelch • backlit DTMF mic • 5½"w x 1½"h x 6¼"d, 2.8 lbs.....**$529.95**

FT-3000M 2M FM Mobile • 70 WATTS! • 144–148MHz tx, 110–180MHz, 300-520 & 800-999MHz rx (cellular blocked) • 81 memories • 1200/9600b Packet compatible • 5½"w x 1⅞" x 6¼"d, 2¼ lbs...**$489.95**

Single Band FM Mobiles

Similar looks & features: • 31 memories, odd splits on any • alpha-numeric display • CTCSS encode • 5 scanning functions • advanced track tuning • backlit DTMF microphone • 6"w x 1⅞"h x 7"d.

FT-2500M (2m) 144–148MHz transmit, 140-174MHz rcv, 50/10/5W.....**$339.95**

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VXR5000UCDC 400–512MHz. **$1199.95**

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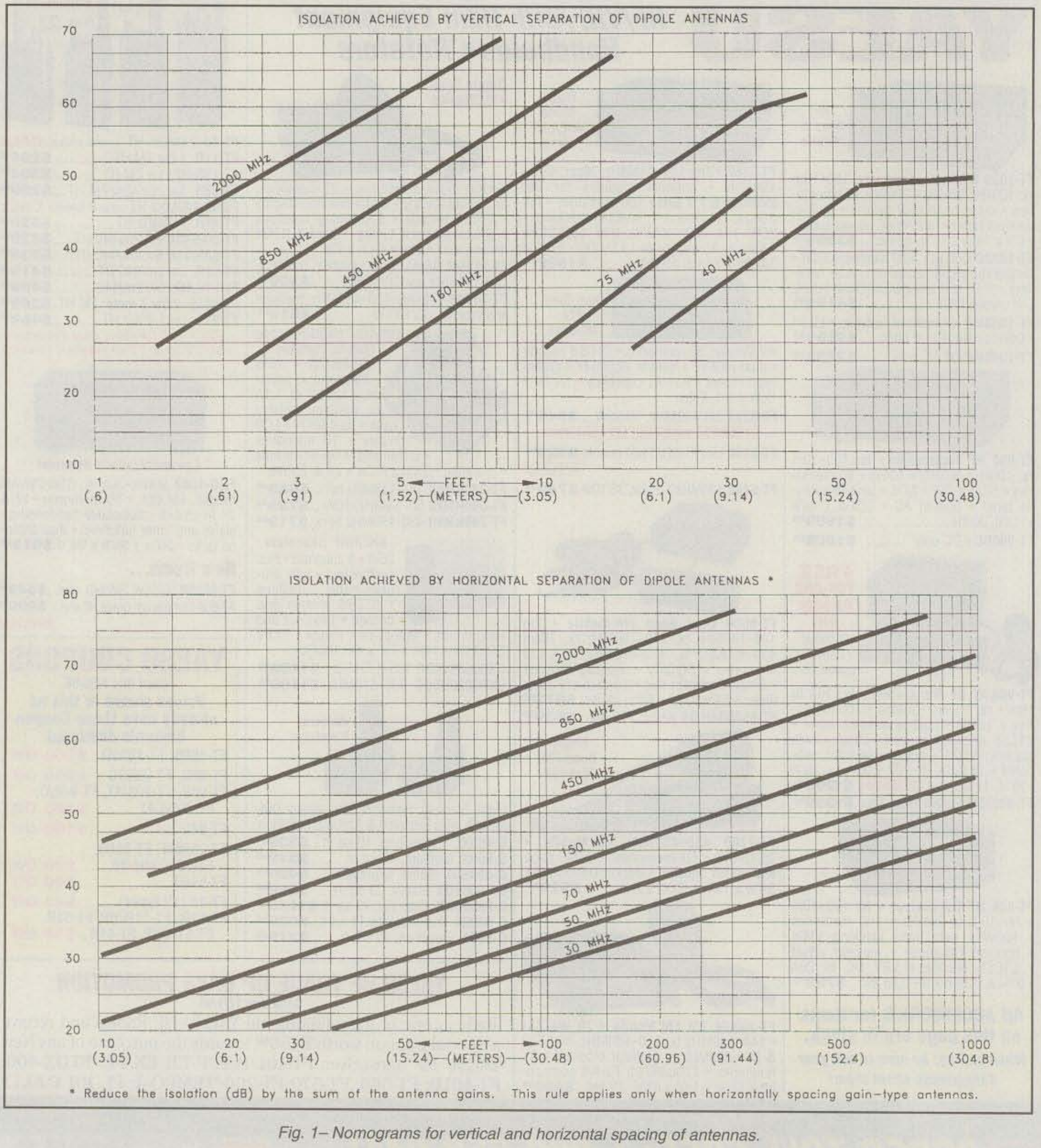

Fig. 1– Nomograms for vertical and horizontal spacing of antennas.

For simplicity, I will refer to the backbone as the 9600 baud link(s), and to the user or LAN access point as the 1200 baud port. There are several ways to make the data flow from the user port through the gateway into the backbone. Our configuration is not shown here, so it will be a bit confusing. Although many SNOs might find fault with the manner in which I explain the hierarchy of the user port to backbone migration of data, remember that we are building this configuration to help the new SNO and not for the seasoned veteran of "packet wars."

In Table I we define how we set our user port nodes with an HDLC quality to a lesser number than the HDLC quality of the backbone (9600 baud) node. Setting the backbone (9600 baud) node HDLC (parameter #3) to a greater HDLC quality, almost immediately we see how the migration from 1200 to 9600 baud occurs. Remember, at the gateway we also set (and lock) the port quality (parameter #4) to 255.

Multimode Nodes

Now if we really want to get into the nitty-gritty of node configuration, let's take a quick look at the Mode command structure. Here we soon discover that we can set the Mode commands in such a way as to make the node look for, or refuse to link to, and in many ways behave any way we wish.

Once the new SNO understands these two sets of commands (parameters and mode), there is a third set of commands that enables total connect, throughput, uplink, and downlink control.

With all the embedded features of the X-1J4 packet network node, the SNO can structure the new node or a complete network to respond

Mode #	Function	1200 baud node/port	9600 baud node/port
1	RS-232 host mode	0	0
2	CWID repeat period (seconds)	0	0
3	CWID keyer speed	6	6
4	Selective modes broadcast on ports (RS-232 and/or HDLC)	3	3
5	RS-232 crosslink protocol	0	0
6	Transmit keyup delay (TXD) (x10ms)	35	23
7	Full duplex (set as required)	0	0
8	Crosslink node broadcast interval (seconds)	425	450
9	Alternate node broadcast algorithm port control	0	0
10	Beacon period (seconds)	600	600
11	Connect redirector	1	1
12	User message control flags	27	27
13	Hash (#) node broadcast port control	0	0
14	Extra alias	0	0
15	Auto reconnect to node	1	1
16	Control of slime trails	0	0
17	Digipeat up/downlink control	3	3

Table II– The "Mode" settings for the SEDAN nodes and gateways. The SNO can use the "Mode" setup to complete several different configurations that can change the node performance and actions. Another important feature of the X-1J4 TheNET node is the "ACL" command. Complete details can be found in the X-1J4 documentation that comes with the disk of X-1J4 EPROM code.

and function as it is designed to perform. It can be made to accept connects from or refuse connects from. It can be made to allow connects to, or refuse to link to another node, or station call. The functions and features seem limitless.

In the Southeastern Emergency Digital Association Network (SEDAN) we have configured the nodes at 1200 baud to link to the backbone node at 9600 baud. In addition, we have the 1200 baud nodes on 145.770, while the backbone nodes are near 51 MHz. It is easy to understand how we use the nodes to move from one baudrate to another, and at the same time make the transition from one frequency to another. The transition can be from VHF to UHF, while at the same time changing baudrates.

Rather than rewriting the complete text of the X-1J4 node documentation here, I'll make it available to anyone who cares to have two books and a disk of the X-1J4 node code. The two books have all the drawings relevant to the building of the X-1J4 node, and how it can be interconnected as a gateway between baudrates or frequencies, or both.

The set of books and the disk of the X-1J4 node code and documentation are available *(USA only)* for $5.00, to cover shipping, handling, and the disk. I'm sorry, but I can only supply the data on a 3.5 inch disk. The disk contains both the node code for the TNC-2 type TNCs and the PK-96 code. The TNC-2 code supports the deviation meter PCB (if installed). The PK-96 code does not yet support the deviation meter add-on. To obtain the books and disk send $5.00, with your return address, and be sure to mention this column. Send to: Buck Rogers, K4ABT, 211 Luenburg Drive, Evington, VA 24550. All packages are mailed the same day as received via priority mail. My e-mail address is <buck4abt@inmind.com>.

If you are looking for all the packet radio information that you will need for a long, long time, look at the packet information that has been compiled on the SEDAN Packet Radio Home pages on their worldwide web site at <http://www.sedan.org> or <http://inmind.com/sedan>. At these two locations you'll find transceiver-to-TNC interface diagrams, how to get started in packet radio, where to find packet radio equipment, packet radio maps, hamfest calendars, links to other packet radio related sites, and more. *CQ* magazine information is available at: <http://www.sedan.org/cqmag>.

Until next month . . .

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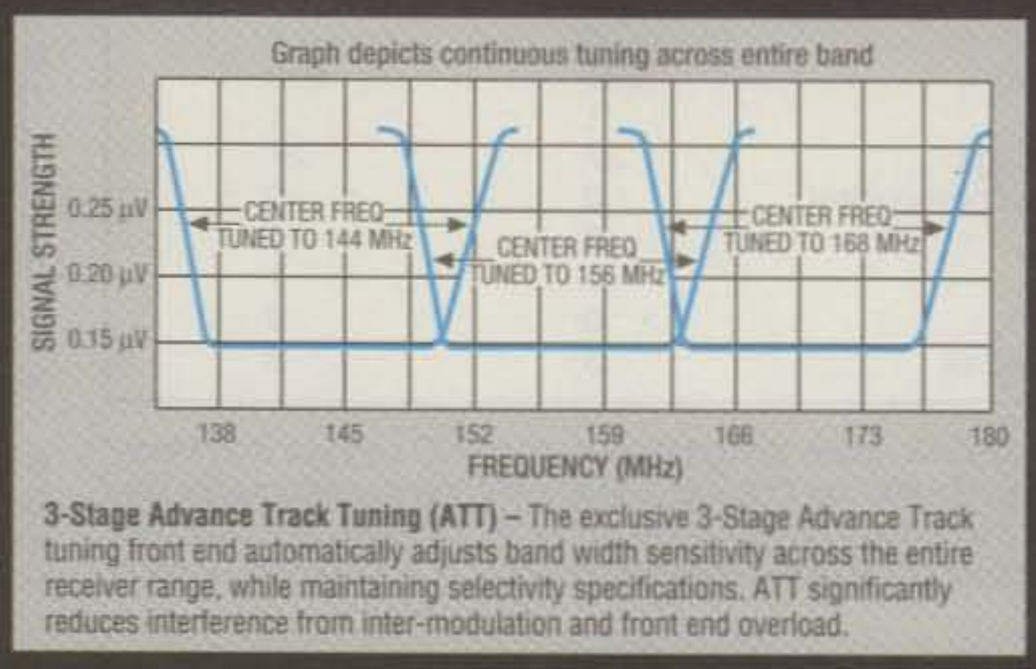

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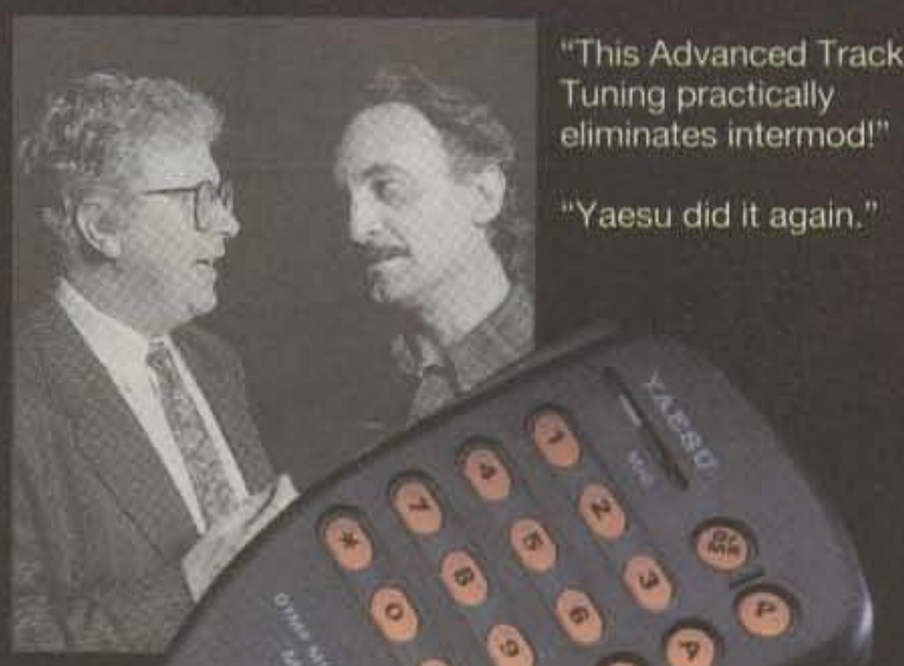

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BY JOE LYNCH, N6CL

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ALL ABOUT THE WORLD ABOVE HF

The Sarajevo Siege

It is extremely difficult to understand what has happened in the former Yugoslavia over the past four years. On the surface it appears to have been a civil war with one ethnic group fighting against another. The underside of war, however, wherever it is played out, is always terrible. And the terrible nature of it was most vividly and graphically played out in the country of Bosnia and Herzegovina.

For 35 years following World War II, Yugoslavia, which consisted of several republics, including Bosnia, was ruled by Marshall Josip Tito, a WW II Communist Partisan leader. Within the several republics were three major ethnic groups: the Bosnians, who generally are associated with the Muslim religion because of the Ottoman (Turkish) occupation in the 16th century; the Croatians, who generally are associated with the Roman Catholic religion; and the Serbs, who generally are associated with the Serbian, or Eastern Orthodox Catholic religion.

Tito was a Croat who resided in Serbia. He realized that ethnic tensions which had existed for centuries throughout the republics of Yugoslavia could not be tolerated. Hence, under his communistic rule, ethnic divisiveness was suppressed. In its place was a mandate for cooperative inter-ethnic existence. Nowhere else in Yugoslavia but in Sarajevo was this mandate of cooperation taken more seriously and worked at more diligently.

This cooperative spirit was recognized by the world community, and in particular the International Olympic Committee, which awarded the city the privilege of hosting the 1984 Olympic games. By all respects, the city rose to the occasion with a very successful hosting of the games.

After Tito's death in 1980, a succession of leaders tried to hold Yugoslavia together. However, gone was his charisma and his ability to accomplish the task of keeping the country unified. One by one the various republics tested their ability to break away from the main country. First it was Croatia, then Slovenia, then Bosnia, and finally Macedonia. The government of Yugoslavia attempted by force to hold the rebellious republics in the fold by going to war with Croatia and Bosnia. (Slovenia escaped hostility because the Yugoslav military was bogged down in fighting in Croatia and could not cross it to get to Slovenia. Macedonia also escaped hostility principally because the Yugoslav military was committed to the western hostilities occurring in Bosnia and Croatia.)

As often happens in a war, the aggressor develops a mind set which states that it is superior to the other side. This was the case with the aggressor in the hostilities which took place in Bosnia, and in particular its capital, Sarajevo. In the case of Sarajevo, the aggressor was a coalition of Bosnian Serbs which was influenced and supported by the military of the former Yugoslavia, which in turn was predominantly Serbian.

Because Sarajevo had the reputation of being a city of cooperative living among the various ethnic groups, it represented a threat to the goals of the Bosnian Serb forces. Therefore, the city had to be attacked and conquered.

The first attack on Sarajevo took place in April 1992, when a sniper took the life of a civilian pedestrian walking across a bridge. Within a month the city came under siege of constant bombardment from both within and the surrounding hills.

One of the first buildings to become a casualty of the siege was the post office. It was dynamited during the night of May 2, 1992. After the explosion the building was shelled to complete the destruction. The result of this destruction was the loss of the ability to send mail in and out of Sarajevo. In the following months more than 148,000 of the 150,000 phone lines were destroyed. Additionally, all phone lines out of the city were cut. Further, the power plant and electrical lines were repeatedly attacked, thereby limiting the access to electricity to hours at a time over several months at a time.

During the siege, amateur radio became increasingly important as conventional means of contact with the outside world was increasingly lost. Eventually amateur radio became the sole source of communications between citizens of Sarajevo and the rest of the world. While the Bosnian government had no third-party agreements with other countries, the prohibition against such communications was regularly ignored on both sides of the circuit. Eventually amateurs would handle in excess of eight million pieces of traffic in and out of Sarajevo, sometimes staying on the air for 20 hours per day, day after day. Such traffic principally went to families who had become refugees in other countries and displaced persons in other parts of Bosnia.

Amateurs also volunteered their services in other ways. Those who were of military age became part of the defense forces of Sarajevo. Amateurs also "loaned" their equipment to the government to assist in military communications. (The word "loan" is in quotes because it was understood that after the war the equipment would be returned. Such government's returning the equipment is slowly getting underway at the time of the writing of this column.)

Amateurs also gave their lives, both in the military and as civilians. Sometimes they were casual victims of the conflict. Other times they became victims in the performance of their duties as amateur operators. Their antennas were easy targets, as they stood out among the TV antennas on apartments and towers.

It was in this city of more than half a million that no one escaped being a victim of war in one way or another. Nevertheless, more than 10,000 civilians, including more than 1,600 children, were killed, and more than 50,000 were wounded during the siege which lasted until the end of February 1996.

Samir Durakovic, ex-T94ON, now T99S, wrote an excellent article about the amateur radio operations in Sarajevo during the siege. Entitled "Heroes Under Siege," it appeared in October 1995 *QST*. You may note that some of the same information which Samir wrote about is also found in this article. It is because information about amateur radio's role during the siege is widely known and frequently repeated with respect. When asked, almost any Sarajevan will tell of the importance of amateur radio, because of how amateurs gave of themselves repeatedly during the siege.

Hams I Met in Sarajevo

At the time of the writing of this article it is more than five months after the last of the Serbian forces left the occupied areas of Sarajevo and some of the surrounding hills. The city has come back to some semblance of life. People are now in the shops. The trams are full of com-

VHF PLUS CALENDAR

Oct. 4	Last quarter Moon.
Oct. 4-6	Microwave Update 1996. *(See text for details.)*
Oct. 5	Mid-Atlantic VHF Conference. *(See text for details.)*
Oct. 6	Moderate EME conditions.
Oct. 7	Moon Apogee.
Oct. 12	New Moon and Solar Eclipse.
Oct. 13	Poor EME conditions.
Oct. 17	Lowest Moon declination.
Oct. 19	First quarter Moon.
Oct. 20	Moderate EME conditions.
Oct. 21	*Orinids* meteor shower predicted peak.
Oct. 23	Moon Perigee.
Oct. 26	Full Moon.
Oct. 26–27	First weekend of ARRL EME Contest. *(See text for details.)*
Oct. 27	Moderate EME conditions.
Oct. 30	Highest Moon declination.

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From left to right are Hamo Muhamed, T92A; Kolar Jasmin, T94AA; Salko, T91A; and Samir Durakovic, T99S (ex-T94ON).

muters going to work, and the streets are full of traffic, both military and civilian.

There is a sense of cautious euphoria in the air in that the siege seems finally to be over. The caution, however, relates to the fact that everybody is holding their breath a bit as the national elections approach. (This article is scheduled to be printed within days of the September 14 election date.)

With the return of peace has come the influx of military and foreign workers connected with the various non-government organizations (NGOs). One of the NGOs is the United Methodist Committee on Relief (UMCOR), a branch of the Board of Global Ministries of the United Methodist Church. Operating under the auspices of the United Nations High Commissioner on Refugees, UMCOR has been involved in resettlement of displaced persons and refugees during the past three years.

As I did last summer, I traveled to Bosnia, again with a mission team connected with UMCOR. This past summer, however, I was in Sarajevo. Our team was responsible for making repairs on a gymnasium in a special education school in a newer section of Sarajevo. Last year I was in Zenica (pronounced *Zen-I-sa*), working as an advisor at UMCOR's Youth House. (For more information on that trip, see this column in September 1995 *CQ*.)

For the first time on my many mission trips I was not the only amateur radio operator. A fellow member of the team was Lloyd Hansen, AA8PW. Being the operators that we are, we set out to find amateurs in Sarajevo.

We didn't have to look very far. As I explained in my column last year, UMCOR sponsors Youth Houses which are set up for young people to go to and take classes or just hang out in a safe environment. During the siege UMCOR had established a Youth House in Sarajevo. The Sarajevan Youth House was within walking distance from the special education school. On our first day in Sarajevo I walked to the Youth House. Nosing around, I discovered an office on the opposite side of the building with a sign that read in part "T91ESC." I knew by the callsign that it was a location for a club station.

In talking to Leila, the assistant director of the Youth House, I discovered that members of the club would come by the Youth House in order to borrow a broom. I figured that if I kept coming by, eventually I would run into one of the members of the club. Sure enough, four days later I met one of the members walking out the door. I told him that I was an amateur and wanted to meet some of the amateurs in Sarajevo. He told me that the president of the club would be back that evening.

I then walked through the Youth House, and became caught up in the English club meeting. While I was there, Leila came in with a phone message for me. It turned out to be from my friend Samir Lemess, whom I had met in Zenica last year. Because we had exchanged e-mail, Samir knew when I would be in country. Samir's message said that he had some phone numbers of amateurs in Sarajevo. Because he had given me his home phone number and he was at work, I had to wait until after supper before I could call him back. When I called him back, he gave me the phone numbers of three amateurs. I held on to this list when Lloyd and I went back over to the club's office that evening. As it turned out, the president had already left for a family reunion. The young ham I had met earlier was still there waiting for us, along with a couple of non-amateur friends who were there to play pool. When I told them about the phone numbers, one of them took the list to his home nearby and made some calls.

The one of the three on the list, the one who spoke the best English, was Hamo Muhamed, T92A. It turned out that Hamo lives near the club house. The guys and gal at the club offered to escort us to Hamo's QTH, an offer we graciously accepted.

We met Hamo and his wife in their second-story flat, one of many in a ten-story building. As amateurs do, we immediately made friends. Hamo wears three hats. He is a delegate to IARU Region I; the vice-president of the national Bosnia and Herzegovina amateur radio orga-

nization; and the director of frequency allocations for the Bosnian government. During our visit Hamo spoke of the hardships he and his family had endured during the siege. He spoke of having no electricity for months at a time. He said, however, that he discovered that a police station about 20 meters from his home did have a generator. In an attempt to alleviate that problem, during the night, actually in the wee hours of the morning, one of his two sons strung a very small wire between his flat and the police station. He then tied it to the electrical lines. From that hookup Hamo was able to operate his station at a greatly reduced power of 50 watts. However, he pointed out that when he wasn't on the air, Zdravka would plug in the small television set and watch TV. Hamo said that during the rest of the time of the siege that they were without electricity their clandestine hookup was never discovered.

After some further conversation Hamo told us that he had made arrangements for us to go to a club-house type of building on the edge of a ridge in the east part of town. This club house is used by Salko, T91A, as his in-town QTH is blocked to the east. When we arrived at this club house we met Salko. We were almost immediately joined by T94AA and Samir Durakovic, T99S, ex-T94ON, the author of the above-mentioned article. For the next hour Samir, who spoke the best English of the group of Sarajevan amateurs present, gave us an update of how it is in Sarajevo now that the cease fire is in place. He told us that because of the way the political lines have been drawn, the club station, the former YZ4Z, is still in Serb territory. He said that he looks longingly through binoculars at the site and remembers when it was the premier Yugoslav contest station for so many years before hostility broke out.

At some point during the hour Hamo asked, "Do you want to operate while you are in Sarajevo?" Both of us readily agreed that we would. Hamo then told us to bring copies of our amateur licenses and passports to his office the next day, and he would arrange for us to be issued temporary licenses (good for six months), which would incorporate our U.S. callsigns as part of our Bosnian calls.

For the rest of the evening we listened to the stories of these amateurs who survived the siege, and the stories of other amateurs who were involved in the war in Bosnia. One story involved Fadil, T94HF, who was working as a stringer for various television networks in Zeppa. When the Serbs captured this town, Fadil was taken prisoner. He was held in Serbia for six months and finally deported. His life was spared, probably because he was well known as an international journalist. He ended up in the U.S. for a time but is now living in Sarajevo.

Perhaps the most tragic story we heard involved an amateur in Srebenica. He was one of two operators in this town when it was overrun by the Serbs (the other was his twin brother). When the Serbs reached a point near his home, he made a fateful decision. He decided that he would rather die than be captured. Standing next to his station, he pulled the pin in a grenade, thereby taking his life and destroying his station.

It was 10:30 PM. At the time of our visit Sarajevo was under an 11:00 PM curfew, and our team leader expected us to be back at the special education school (where, in addition to working, we were also sleeping) prior to the curfew. We bid a reluctant goodbye to everyone.

Upon our return to the school, Hamo issued an invitation to Lloyd and me and Lloyd's wife, Beth, to join Hamo and his wife, Zdravka, for dinner in their flat the next evening, an invitation we readily accepted. He then added, "You can get on the air with your calls from my QTH. Because I am in the government office of telecommunications, it will be alright."

That night I went to bed reflecting on what I had learned about amateur radio in Sarajevo during the war. I couldn't help but reflect back on amateurs' involvement in the Oklahoma City bombing disaster. I knew the tremendous pressure we felt during the hours and days which followed the disaster. I reflected upon the sense of accomplishment that we felt after we had secured our operation. I also mentally looked around at the city, remembering all of the damaged buildings. In Oklahoma City one building was targeted. Nearly 300 buildings were affected to some degree or another and 168 people lost their lives. However, all of this took place as part of one event. What I remembered was that thousands of buildings were damaged or destroyed and over 10,000 of the city's citizens lost their lives. I concluded that what my fellow amateurs in Sarajevo and other parts of Bosnia experienced made my experience pale and fade into oblivion in comparison to theirs.

Nevertheless, Sarajevo had turned a new page in its history, and I was, in a small part, participating in that process. I decided that I had to learn as much as I could about my fellow amateurs' experiences so I could write about them. Hopefully, by letting the world know about the tragedies of war, of hate gone wild and out of control, I could help further the peace process.

The next evening Lloyd, Beth, and I were picked up by Hamo. He drove around the southern perimeter of the city, along what was at one time part of the front lines. He had us look at the destruction and told us that he hoped it would never occur again. Upon arrival at his home he told us about how it came that he was now driving his father-in-law's 26-year-old VW Bug. He said his VW Golf had been destroyed during the war. He then pointed to a point on the door post just above the windshield. To me it looked like damage from a hail stone. He then said, "Sniper's bullet." Then, pointing to three points on his body—the back of his head, his back and his foot—he said, "Shrapnel wounds."

After arriving, Hamo took us out on his balcony, which is situated at the front of his flat just outside the living room. He pointed to his five-element beam and showed us where shrapnel had sheered off elements. He said that sometime in the future he hoped to repair it, but he was making do with the verticals on top of the ten-story building. Then, taking us to the edge of the balcony, he had us look below. He pointed to the flat just below and showed us where a shell had gone into it and the flat next door while he and his wife were sitting in their living room directly above. He said a succession of six shells fell—the two which hit the flats, and four more hitting in the courtyard of their quad of apartments. For him that night the war came as close as the front of his flat.

After dinner Hamo invited us to get on the radio. Knowing that Lloyd had never been DX, I told him to go first. Lloyd made a couple of contacts and then rejoined us in our conversations. Hamo then urged me to get on the air, saying that my special call, "T9/N6CL," would be a novelty and would attract a pileup. He was right. It wasn't long before I had a good pileup

Bosnia and Herzegovina ARA President Tarik Kupusovic, T94AK.

going and was reveling in the popularity of the novelty of being a U.S. citizen operating from Sarajevo. In the hour that I operated I made in excess of 100 contacts.

Finally it was time to go home. Because we were three blocks away from our temporary home at the school, we decided to walk home. Hamo and Zdravka bade us farewell and told us that we were welcome in their home at any time, especially to use the radio.

When I returned to the school I thought about the fun of being DX. Then the thought occurred to me that it was because of a very tragic situation that I had a popular callsign. I wondered why it had to happen that way. I didn't have any ready answers, just a feeling of sadness.

It was on my daily walk with a couple of my team members that I spotted a dipole strung from a three-story flat, across a canal, to the top of a ten-story flat. Upon closer inspection, I noticed a horizontally stacked 2 meter array and a multiband HF vertical. I resolved that day to find out to whom these antennas belonged. That night several of us were headed out. I accompanied the group, telling them I wanted to go to this apartment to meet the amateur who owned the antennas I had spotted.

Because we were required to travel in groups of two, I asked the two fellows who were walking with me to accompany me as far as the apartment. Walking into an unlit corridor, they asked me if I knew what I was doing. I assured them that amateurs the world over feel a kinship that expresses itself in almost immediate friendship upon meeting one another, and that it is not unusual to walk up to a stranger's home and introduce one's self as an amateur and be immediately invited into the home.

Bounding up the stairs in the dark, I preceded my two friends by some distance. Arriving at the apartment, I rang the doorbell. When the man answered, I flashed my QSL card and asked, "Radio amateur?" His face immediately lit up, and he said, "Wait!"

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CIRCLE 170 ON READER SERVICE CARD

Inside I saw him and his wife scurrying around to make their apartment presentable. At the same time my two friends finally caught up with me at the door. A moment later my new amateur friend motioned for all three of us to enter. He introduced himself as Meho, T94AT, and his wife as Vesna, T93DKV. Still leery of the situation, my friends decided to come in and stay with me. (They later expressed that they were concerned for my safety, a concern they realized was unfounded after they saw the camaraderie amongn me and my fellow hams.)

Before long we realized that we had a language barrier that prevented us from becoming better acquainted. Reaching into my notebook, I pulled out Hamo's QSL card and said, "Hamo." Meho went over to his phone and said, "Hamo, speed dial." Within a few minutes Hamo arrived and served as a translator for the remainder of the evening.

Meho had a 2 meter rig attached to the antenna outside, so I asked about 2 meter activity. I was informed that since the cease fire two repeaters had been re-established. One of them is in the Sarajevo area on 145.700 MHz and has the callsign of T99VSA and the other is in the Zenica area on 145.675 MHz and has the callsign T99VZE. Hamo and Meho invited me to try to make a couple of contacts. I did, with Dako, T95A, near Tuzla, and Edin, T97M.

During our visit with Meho and Vesna their son came home. He was introduced as Arjan, T95LAT, an electronics technician. Meeting Arjan brought the conversation to the subject of young people. Hamo pointed out that the T91ENS radio club, which has in excess of 150 members, sponsors training classes for young people who are interested in becoming amateurs. He said that even during the war the training classes went on, producing 80 new amateurs. Still on the subject of radio clubs, Hamo stated that before the war there were 15 radio clubs in the Sarajevo area, but now there are only five or six. Additionally, before the war there were about 1,500 amateurs in Sarajevo, but that number is now around 600 or 700.

Again, curfew time interrupted our visiting. We three said our goodbyes and walked back to the school. My two non-amateur friends were still amazed at how easily I had made friends with seemingly total strangers, especially in a foreign country.

On our last Saturday in Sarajevo, Hamo invited Lloyd and me to a very important amateur radio meeting to take place in the presidential government offices in downtown Sarajevo. Representatives of the Bosnian national amateur radio association were to meet to plan for the future of amateur radio in Bosnia.

In a preview of the agenda, conducted in English for Lloyd and me, B and H ARA President Tarik Kupusovic, T94AK, advised us of it. Among the items on the agenda was the dissolution of the association as it was presently constructed and a restructuring of the classes of licenses in Bosnia. The proposal was to form two regional associations, one for each division of Bosnia. From the two associations representatives would be elected, and from these representatives a leader would be elected by consensus of the representatives.

During the war amateurs continued to talk with each other. There was no ban on communications, because these were fellow countrymen and women. Now that the war is over, amateurs, being amateurs, continue to talk with each other,making it possible to encourage the development of the regional organizations.

Regarding the restructuring of the license classes, the Bosnian regulations had seven classes of license. It was the consensus of the leadership that Bosnia should come in line with the rest of Europe, which has four. Out of the meeting came a proposal which would reduce the number to four by upgrading holders of lower classes of licenses into the next higher level. While I was not made totally aware of how it would work, I was told that it would be done in such a way as to maintain the high standards required for licensing in Bosnia, and high they are. For example, for the extra class level one must pass a three-hour examination and be certified as a competent operator before being awarded the coveted class of license. In all of Bosnia there are only 75 extra class operators.

By having this meeting fully six weeks before the election, President Tarik stated that it demonstrated that amateur radio operators were the first of various non-government organizations to go to work at the business of pursing their hobby or special interest. They were not about dwelling on the past, but were interested in reestablishing a sense of normalcy in their

existence. Tarik stated that what amateurs did before the war was practice their hobby. Among the things they did were setting up and operating radio classes for potential new amateurs. In Bosnia, an amateur radio license is very important for a career, often being a prerequisite for an employment position.

I felt that I was privileged to sit in on an historic meeting, a meeting that would affect the future of amateur radio in Bosnia. The Dayton Accord had established the political division of the country of Bosnia and the amateurs, as well as the many other cultural and non-governmental private organizations found themselves compelled to comply with the political division. Successful cooperation with the "other side" is a paramount prerequisite for success in maintaining the peace in the country. The amateurs in the B and H ARA showed a tremendous amount of leadership and foresight in planning for potential solutions to cooperation with the "other side" of the conflict.

Unfortunately, the "other side" is not just one side. There are factions of Croats who do not feel that they are a part of either side and really want to be a part of Croatia. (We saw evidence of this on the way out of the country where several km inside the border we saw the Croatian flag flying over cities clearly inside Bosnian territory.) The amateurs in these communities recently voted to use the prefix "T911," followed by their Bosnian issued suffix. As pointed out in Samir's article, the Serbian side used a variety of prefixes, all of which are not legal in Bosnia. They continue to use these prefixes even after the cease fire and after the Bosnian government issued to them a block of "T9" callsigns specifically for them.

Clearly the road to peace and reconciliation is long and fraught with dangers. However, the amateurs of the B and H ARA have already walked the "second mile" to attain that peace.

After the meeting, Lloyd and I went over to the T91ENS clubhouse. Some of the members of the club had gathered there for an evening meal and to wait until 4 AM to watch the U.S. basketball team play the Yugoslav team for the Olympic gold medal. Because of the curfew, we could not stay and watch the game with them.

While at the clubhouse, which was located on top of a five-story apartment building, I met Danny Horvat, T93M, and Boris Knezovic, T93Y. Both are active contest operators. Boris also is the club station trustee. They talked about operating contests during the war. As Samir pointed out in his article, clubs would receive priority for electricity to participate in the contests, but often because of attacks on the power plants, electricity was lost. Danny said that three times he prepared for a long weekend of contesting only to be thwarted by the loss of electricity. On the fourth time he decided to outwit the odds by bringing along a natural-gas generator. Unfortunately, for this contest natural gas was also cut off.

Nevertheless, Danny pointed out that when they were able to operate, these club stations showed respectable results in the competition. A look at the results of the CQ WW DX Contest in the August issue of *CQ* shows the club call T91MT with a respectable score for Europe.

Being the VHF editor that I am, I asked Danny and Boris if they had competed in any VHF contests. Danny said that his only operation on 6 meters was two days with a borrowed radio. During that time he worked 800 stations. Nevertheless, his interest was not strong, as he preferred the huge numbers of contacts that can be generated during HF contests.

One of the losses of the war that Boris pointed out in a conversation with Lloyd was that of about one third of their collection of QSL cards. Before the war they had collected cards from all but North Dakota to complete WAS under the T91ENS call. However, because of the war they had lost many of the cards for other states. Ironically, they now own a card from North Dakota. Their request to the rest of the world is that if you have worked T91ENS, please send a duplicate card so that they might be able to fill in their missing states for the award.

On the day before we were scheduled to return to Split, Croatia, I was able to travel to Zenica to visit T91EZC, the radio club with which I had spent time last year. There I presented copies of the September 1995 issue of *CQ* which carried my story about the amateurs in Zenica. I learned that I had incorrectly assumed that Luka, T94C, is Croatian. He is a Bosnian Serb. Fortunately, my *faux pas* was interpreted as a good-natured joke on Luka and no harm came of it.

I was greeted by Sejad Sejmen, T96Z, the president of the Zenica radio club and given the red-carpet treatment. He presented me with two gifts, a copy of a book on Zenica and a memento medal depicting the tombstone of Judge Gradjesa, the first convert to Christianity in Bosnia in the 12th century. Because my visit was in the morning, the only amateur I met last year who was able to meet with me was

Mensur, T94M, and that was because his law office is near the radio club.

After the ceremonies, I had a lengthy conversation with Samir Hadzic, T94KW, the club station manager, who had also had acted as the interpreter. In Samir I found a kindred spirit in a passion for VHF operation. He was quite familiar with the various propagation modes associated with VHF operating. Fortunately, I had brought along copies of my book, *The VHF "How To" Book*, and I gladly presented him with a copy. We discussed plans for he and other members of the Zenica club to become active on VHF and also establishing a 6 meter beacon in Bosnia. (The next day I asked Hamo about the regulations, and he advised me of what they were and also the callsign for the beacon. I am now exploring how to go about establishing such a beacon in Bosnia.)

Also a part of our conversation was Victor Olujic, T96MOV. Victor is very interested in satellite operation, but needs software for tracking them. Equipment is lacking in Bosniat. Unfortunately, there are not the funds available to purchase the equipment for serious VHF operations. Perhaps some sort of equipment pool could be established that would help these serious operators pursue their new-found interest in this part of the amateur radio spectrum.

With my visit to the Zenica club, my visits to amateur radio operators were over for this trip. Several times I was asked if I would be back next year, and I replied that at present I didn't know. However, I went on to say that is what I had said last year and here I was in Bosnia.

My deep appreciation goes to all the many amateurs who acted as my hosts during my stay. I especially thank Hamo for all of the "out of the way" activities he planned to make my stay in Sarajevo profitable and successful. I also thank Emin Skopljak, T91E, for making it possible for Lloyd and me to obtain temporary licenses to operate from Bosnia.

I hope that this article about what has happened in Bosnia informs you about and alerts you to the terrible nature of war. Hopefully, we all will learn from what has happened in Bosnia and will, each in our own way, work for peace among all peoples. As amateur radio operators, we can do that one contact at a time.

My last visit with a foreign amateur was with Tom Dugec, 9A2AA, in Split, Croatia. I spent my last evening in Split in Tom's home. When Tom learned that I am in seminary, our conversation was predominantly about religious beliefs. I very much enjoyed meeting him and his family and look forward to the possibility of meeting them again in the future.

Current Conferences

Microwave Update: Microwave Update 1996 will be held in Phoenix, Arizona, October 4–6, at the Ramada Camelback Hotel. The hotel offers free airport transportation, and room rates for the conference are $62 per night for singles and $72 for doubles. For hotel reservations call the Ramada Camelback Hotel at 1-800-688-2021 or 602-264-9290, fax 602-264-3068. There will be a tour of the Phoenix area electronic surplus stores on October 3 starting at 9:30 AM. An X-Band EME demonstration is planned for Thursday night at WA7CJO's QTH. The Technical program will be devoted to frequencies above 902 MHz and will include microwave test equipment, low-noise amplifiers, TWT power amplifiers, as well other pertinent microwave topics. In addition to the "Who's Who in North America Microwave" speakers, we currently have speakers scheduled from Japan and Europe as well. We will have a microwave fleamarket on both Friday and Saturday nights. Noise-figure measurements through 24 GHz and dish feed-horn gain and pattern measurements are also planned. There will be a microwave equipment auction on Saturday afternoon which promises to have some high-power TWT amplifiers along with other useful "junk." Conference registration is $40 prior to September 22 and $45 at the door. Contact Jim Vogler, WA7CJO, 2540 East Heatherbrae Drive, Phoenix, AZ 85016 (602-954-0541 voice/fax).

Mid-Atlantic States VHF Conference: The Mid-Atlantic States VHF Conference will be held at the Horsham Days Inn on 5 October. For more information, contact John Sorter, KB3XG, 1214 N. Trooper Rd., Norristown, PA 19403 (phone 610-999-7658; or e-mail <john kb3xg@aol.com>.

Current Contest

The first weekend of the ARRL annual EME contest is scheduled for 26–27 October. The contest period is the entire 48 hour period, beginning at 0000 UTC. The object of the contest is to work as many stations as possible "off the moon." Categories include single operator, single band, single operator, multi-band, multi-operator, and commercial equipment. Each contact counts 100 points. Multipliers include each U.S. and Canadian call district and each DXCC country worked. Conditions are expected to be moderate during the contest weekend. Complete rules are in the September *QST*.

Current Meteor Showers

According to the OH5IY meteor shower prediction software, the *Orionids* is predicted to peak around 21 October at approximately 0150 UTC. A characteristic of this shower is that it has several smaller peaks both before and after the main spike. The second major peak is expected approximately four days after the main peak. At peak the zenith hourly rate (ZHR, the number of predicted meteors falling per hour) is predicted to be around 25. Look for activity associated with this shower for about 16 days beginning a week before the main peak.

And Finally . . .

Most of this column was about my trip to Bosnia. While little of it pertained to VHF, I felt that extensive coverage should be given to the trip because of the current events in the world. We have much to learn from the experiences of our fellow amateurs in Bosnia. Hopefully, these are lessons of how to work for peace in the world.

Next month I hope to be back to more extensive coverage of VHF-related activities. If you have something to report, please forward it to me at the usual routing places.

Until next month . . .

73, Joe, N6CL

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Ripple(max.)	3mV	3mV	3mV	3mV	3mV
Regulation	1%	1%	1%	1%	2%
Cooling Fan	NO	NO	NO	YES	NO
Size(inch.)	5x4x9	5x4x9	7x6x9	11x5.5x9	6x3x9
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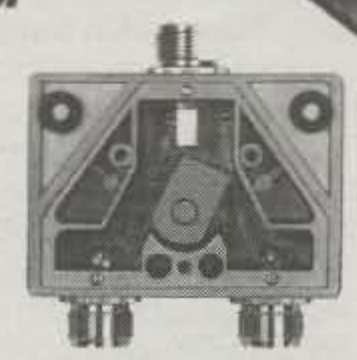

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AWARDS

NEWS OF CERTIFICATE AND AWARD COLLECTING

This month we feature John C. Kanode, N4MM, USA-CA #899, May 10, 1996. As you will see, John has been a very active amateur and has contributed a great deal to our hobby. Congratulations to John on another worthy achievement. His story is as follows.

"I became interested in radio in the late 1940s, when I was 10 or 11 years old and got old junk radios from some of the radio repair shops in my town. In 1950 I moved to another part of town, where I met Fred, W4UQT. He sparked my interest in amateur radio operating. With his help I was licensed in August 1952 as WN4WSF. I upgraded to General in May 1953 and then to Extra in late 1958.

"I graduated from Capitol Radio Engineering Institute in 1959 and moved from Virginia to New Mexico, where my call changed to K5UYF. I became active in the Certificate Hunters Club when it started and received membership #75. I proposed to Cliff, K6BX, that local chapters of the CHC be formed. He gave us, the New Mexico Chapter, #1. When *CQ* and K6BX started the USA Counties Award in 1961, I received award #ONE-W, dated September 26, 1961. The next step was 1000, #13, dated August 1, 1963. I organized and started the New Mexico QSO Party and made many trips to rare New Mexico counties, including four trips to the Four Corners area.

"In 1964 I returned to Virginia and regained my old call, W4WSF. In 1974 I encouraged the National Capitol DX Association to take on the responsibility of operating the W4/K4/N4 ARRL QSL Bureau, and I was appointed to the position of QSL Bureau Manager. In 1976 my call changed to N4MM. In 1981 I was elected ARRL Vice-Director for the Roanoke Division, and in 1989 I became Division Director. I also served as a QCWA National Director in the 1980s.

"County hunting was an off and on situation for many years due to travel, job changes, ARRL activities, etc. In 1966 I received the 1500 county award #53, and I got the 2000 award, #181, in April 1973. The 2500 and 3000 county level awards were received in September 1993. By the start of 1996 I was down to five counties, and I got the last one on April 27 by working Maynard, KA9BQA, in Menard County, Illinois. I got the opportunity to attend the National County Hunters Convention that was held in the Tidewater area several years ago and have attended several of the county hunter forums held at the Dayton Hamvention.

"I have served on the CQ Contest Committee and the CQ DX Awards Committee, and designed and proposed to *CQ* the WPX Award of Excellence plaque program. I am an active *CQ* checkpoint for their DX award programs.

"I retired from IBM Federal Systems Division four years ago, and most of my time is now devoted to ARRL activities. I am currently serving on the ARRL Executive Committee and have been appointed Chairman of the ARRL DXCC-2000 committee.

"I want to thank all the amateurs and mobile stations (some of whom are now Silent Keys) who over the 35-year span have helped me achieve the goal of working all counties. When time allows, I will be working for some endorsements, including 6 meters.—73, John, N4MM."

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SPECIAL HONOR ROLL

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May 10, 1996

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USA-CA All Counties #900
May 12, 1996

Gordon P. Pint, KØTVY
USA-CA All Counties #901
July 6, 1996

Robert E. Demchak, KC1NA
USA-CA All Counties #902
August 2, 1996

Mark A. Behrens, WB9OOG
USA-CA All Counties #903
August 2, 1996

Awards Issued

USA-CA 500: Steven Stepanov, YZ7AA, #2929: Bosko Milanko, YT7TY, #2920; Robert R. Knibb, K5ME, #2921; John Kanode, N4MM, #2922; Stan Heinsma, VE1BES, #2923; Gordon P. Pint, KØTVY, #2924; Eobert E. Demchak, KC1NA, #2925; Theodoros Kontoletas, SV9AVP, #2926; Andreas Glaeser, DL9USA, #2927; Fred F. Carroll, Sr., KD1HH, #2928; Raul Osvaldo Torre, LU2ATR, #2929; Jean V. Giesler, Jr., W4TYU, #2930.

USA-CA 1000: Steven Stepanov, YZ7AA, #1408; John Kanode, N4MM, #1409; Stan Heinsma, VE1BES, #1410; Gordon P. Pint, KØTVY, #1411; Eobert E. Demchak, KC1NA, #1412; Mark A. Behrens, WB9OOG, #1413.

USA-CA 1500: John Kanode, N4MM, #1175; Stan Heinsma, VE1BES, #1176; Gordon P. Pint, KØTVY, #1177; Eobert E. Demchak, KC1NA, #1178; Mark A. Behrens, WB9OOG, #1179; Heikki Tamminen, OH3JF, #1180.

USA-CA 2000: John Kanode, N4MM, #1081; Stan Heinsma, VE1BES, #1082; Gordon P. Pint, KØTVY, #1083; Eobert E. Demchak, KC1NA, #1084; Mark A. Behrens, WB9OOG, #1085; Heikki Tamminen, OH3JF, #1086.

USA-CA 2500: John Kanode, N4MM, #1409; Stan Heinsma, VE1BES, #1410; Gordon P. Pint, KØTVY, #1411; Eobert E. Demchak, KC1NA, #1412; Mark A. Behrens, WB9OOG, #1014; Heikki Tamminen, OH3JF, #1015.

USA-CA 3000: John Kanode, N4MM, #916; Stan Heinsma, VE1BES, #917; Gordon P. Pint, KØTVY, #918; Eobert E. Demchak, KC1NA, #919; Mark A. Behrens, WB9OOG, #920.

Special Endorsement: Alexander P. Marion, W2CUE, USA-CA #192, All CW, April 30, 1996.

HONOR ROLL

500		2000	
YZ7AA	2929	N4MM	1081
YT7TY	2920	VE1BES	1082
K5ME	2921	KØTVY	1083
N4MM	2922	KC1NA	1084
VE1BES	2923	WB9OOG	1085
KØTVY	2924	OH3JF	1086
KC1NA	2925		
SV9AVP	2926		
DL9USA	2927	**2500**	
KD1HH	2928	N4MM	1010
LU2ATR	2929	VE1BES	1011
W4TYU	2930	KØTVY	1012
		KC1NA	1013
1000		WB9OOG	1014
YZ7AA	1408	OH3JF	1015
N4MM	1409		
VE1BES	1410		
KØTVY	1411	**3000**	
KC1NA	1412	N4MM	916
WB9OOG	1413	VE1BES	917
		KØTVY	918
1500		KC1NA	919
N4MM	1175	WB9OOG	920
VE1BES	1176		
KØTVY	1177		
KC1NA	1178		
WB9OOG	1179		

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. Initial application must be submitted in the USA-CA Record Book, which may be obtained from CQ Magazine, 76 North Broadway, Hicksville, NY 11801 USA for $2.00. To qualify for the special subscriber rate, please send a recent *CQ* mailing label with your application. To be eligible for the USA-CA Award, applicants must comply with the rules of the program as set forth in the revised USA-CA Rules and Program dated June 15, 1991. A complete copy of the rules may be obtained by sending an SASE to Norm Van Raay, WA3RTY, USA-CA Award Manager, Box 76, Pleasant Mount, PA 18453-0076 USA. DX stations must include extra postage for airmail reply.

On A Personal Note

My apologies for not having a column in the last two issues. I've been in and out of hospital, first with some recurring coronary artery blockage and then with esophageal problems. I hope that I'll not be returning to the hospital again for a long, long while. It's too bad the Guthrie One Health Flight doesn't give frequent flyer miles. I'd have a bunch right now.

I really appreciate all the cards and expressions of concern, as well as the prayers of many of you. Thank you very much. It does help.

For those who are wondering what happened to their awards, I'm finally catching up and you should have yours by now. If by any chance I've missed yours, please let me know.

The Mobile Amateur Radio Awards Club held its annual convention in Phoenix over the Independence Day weekend. Bill Nash, WØOWY, and his committee did a great job, I understand. I'm hoping to get group pictures to share with you. See you next month!

73, Norm, WA3RTY

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Typical Band Widths (approximately):

75m	30 KHz	20m 400 KHz	12m 350 KHz
40m	125 KHz	17m 250 KHz	10m 600 KHz
30m	150 KHz	15m 400 KHz	

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current solutions to current problems

BY IRWIN MATH, WA2NDM

MATH'S NOTES

WHAT'S NEW AND HOW TO USE IT

DC Power Supply Filtering

A well-known consideration in the design of AC line driven DC power supplies is the filtering scheme used to eliminate AC ripple from the resulting DC output. The most common way this is accomplished is shown in fig. 1. The AC is first rectified, then applied to a high-value capacitor, a series resistor or choke, and finally to a smaller value capacitor as an output filter. The net result is a reduction of AC ripple to a value that is proportional to the current drawn by the load and the RC time constants of the circuitry. It is obvious that the larger the value of the capacitors, the greater the filtering action. This is why it is not uncommon to see capacitors with values extending into the thousands of microfarads in so-called "brute force" type high-current power supplies.

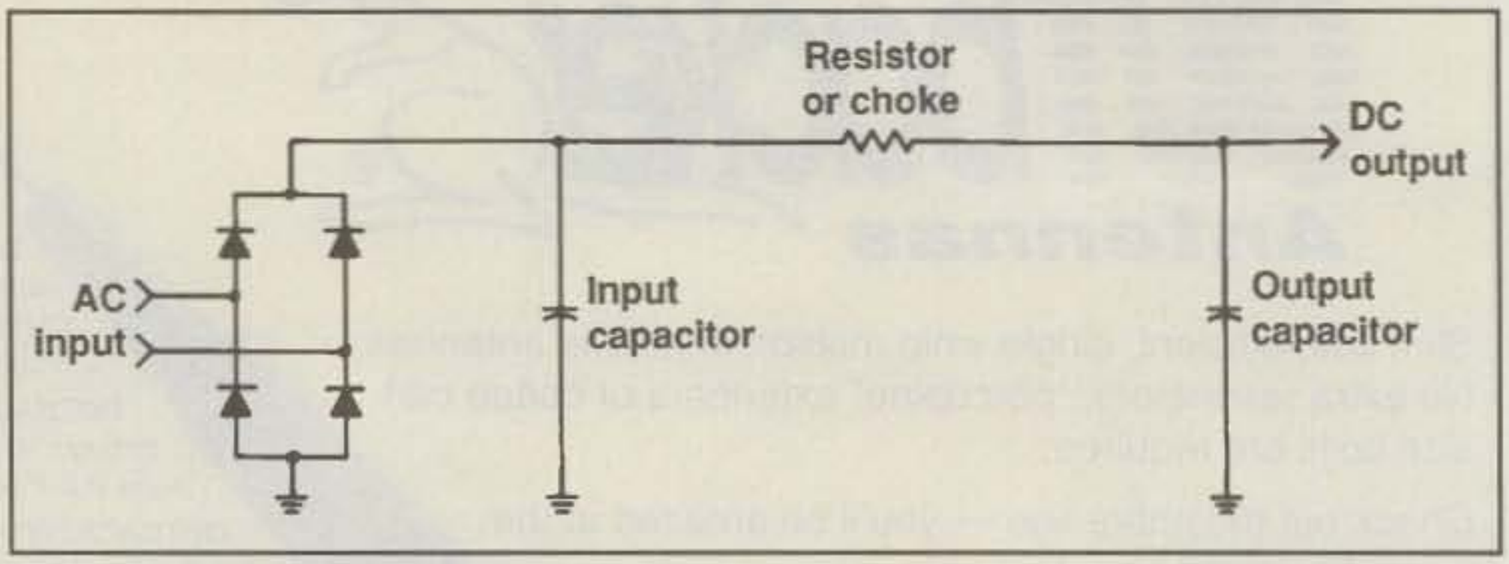

Fig. 1– Basic capacitor ripple filter.

For many applications the filtering scheme of fig. 1 is adequate. In cases where AC ripple is critical, however, such as high-quality audio amplifiers, video amplifier circuitry, or high-gain front-end states in a receiver, almost any residual ripple on the DC line can be the source of significant problems, and the circuit of fig. 1 simply will not "cut it" alone. Virtually pure DC is a must. For these types of applications the input filter is usually preceded by a regulator. Fig. 2 shows the familiar 3-terminal 7800 series regulator circuit as used in the power supplies for a myriad of varied devices. This regulator has internal circuitry which, in addition to its primary function of regulation, also cancels a great deal of the input AC ripple. Typical ripple reduction figures are on the order of 65 to 70 dB (a ratio of more than a 2000:1). This means that for one volt of input ripple, less than 0.5 millivolts of ripple will appear in the output. Seems pretty good at first glance, right?

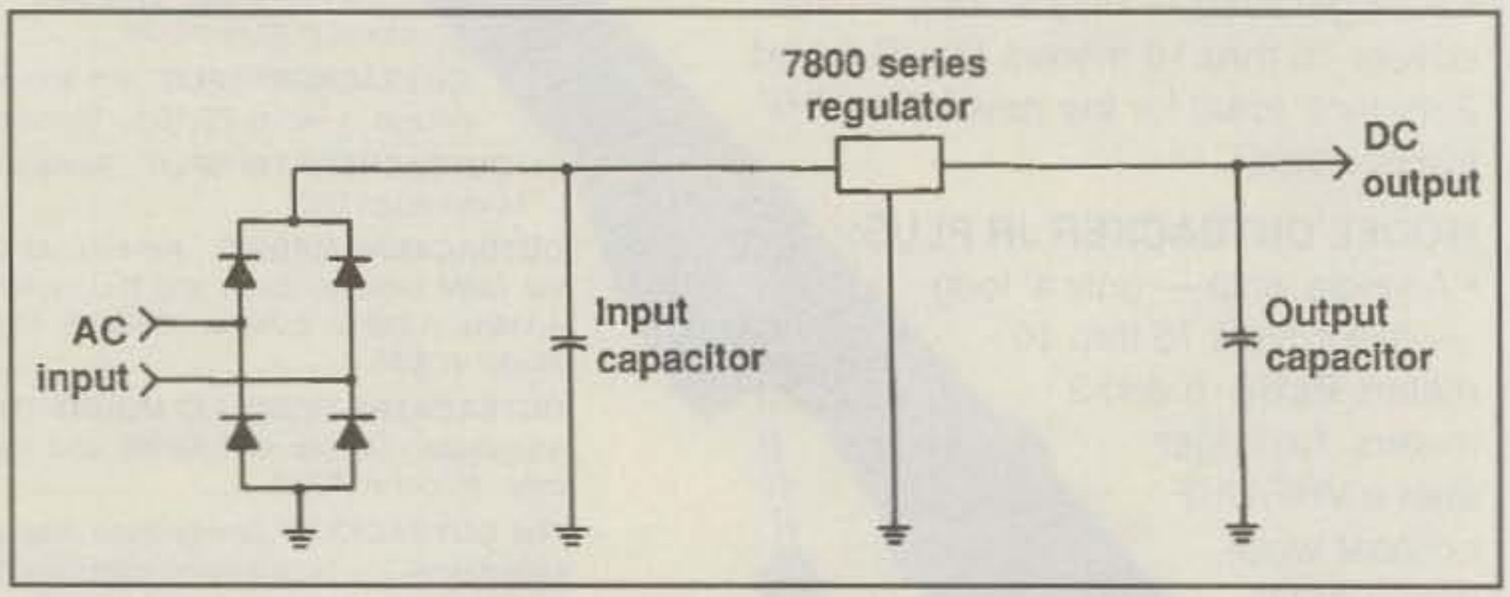

Fig. 2– A 7800 series regulator circuit.

Now look at fig. 3, the circuit for an input stage such as might be used with an electret- type microphone, and consider that the output from such a microphone might be only 5 to 10 millivolts peak for normal speech and maybe 0.1 to 0.5 millivolts for background audio. Suddenly the 0.5 millivolts of AC ripple on the Vcc line, coupled into the input along with the audio via the microphone load and first-stage biasing resistors, will result in an annoying 60 or 120 Hz hum, only 20 dB down, that would clearly be present in the background. For professional audio quality applications, hum levels of –80 dB down are not uncommon.

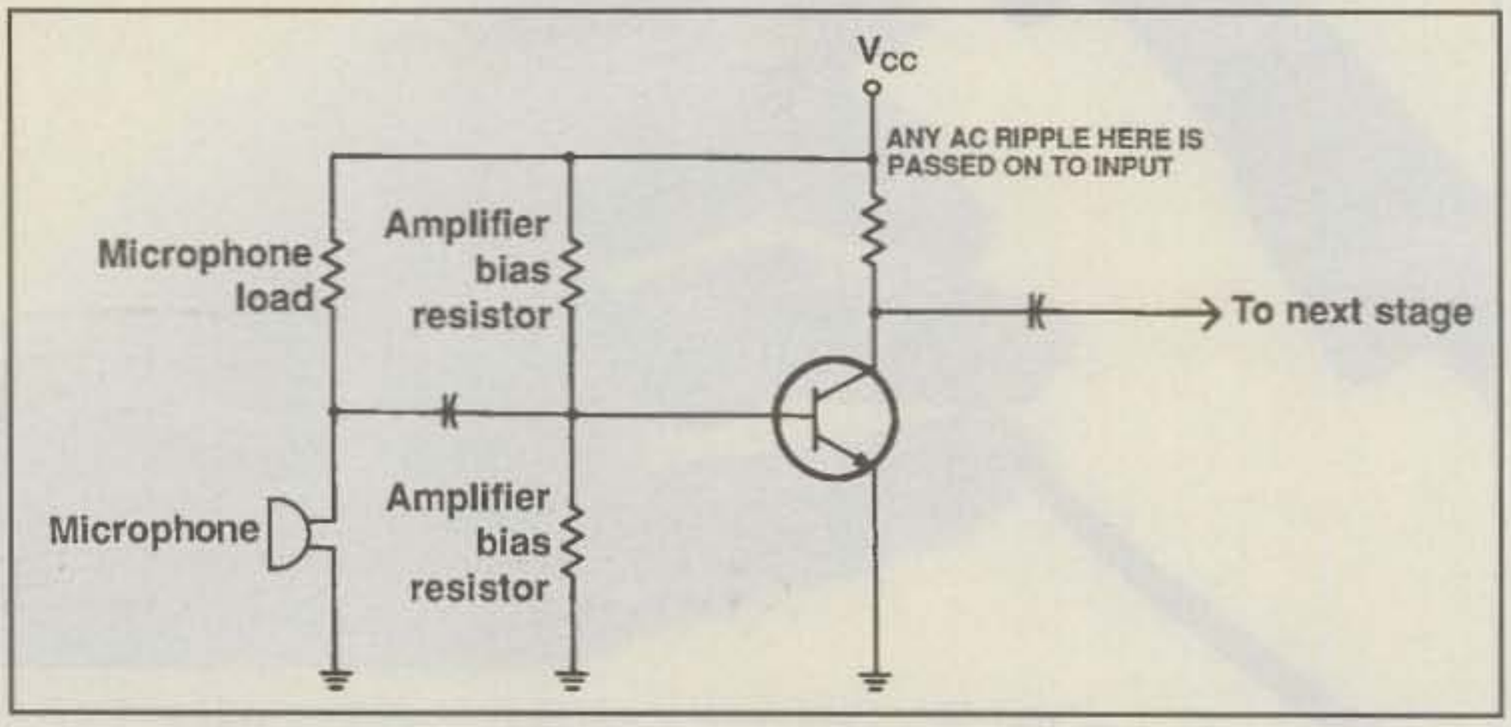

Fig. 3– Typical microphone input stage.

What all of this means is that the better the input filter the better the output DC. What is the easiest way to improve the filter? Raise the capacitor values. Sounds simple, but high-value capacitors tend to be expensive and physically large as well. A better way, shown in fig. 4, is to "multiply" the apparent value of a capacitor with a transistor. This circuit is the familiar emitter-follower pass-transistor regulator with a capacitor in the base-to-ground path instead of the usual reference

c/o of CQ magazine

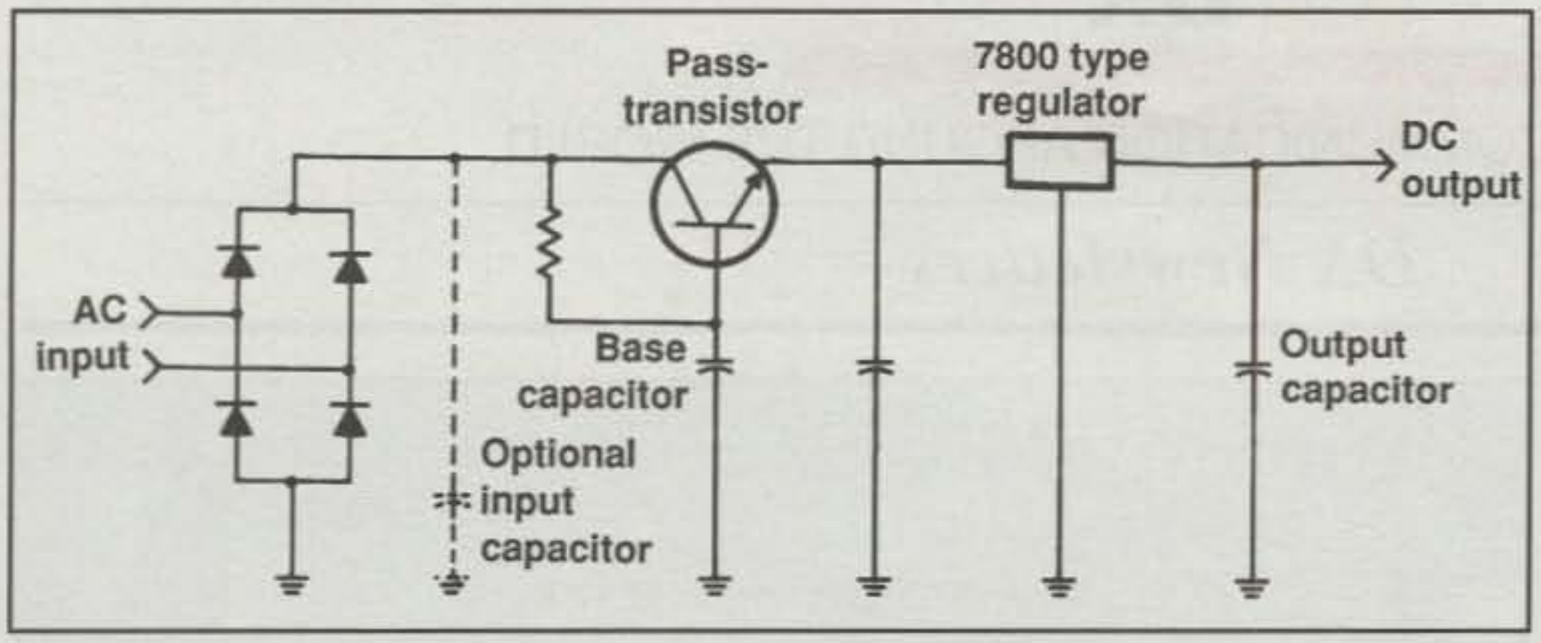

Fig. 4– Electronic capacitor multiplier circuit.

source. Since the current flowing through the collector-emitter path of the transistor is a function of the base current multiplied by the gain (beta) of the transistor, any ripple on the base is reduced by the same factor at the emitter. The result is that the value of the capacitor in the base is "multiplied" by the gain of the transistor and results in the same effect at the emitter as a larger capacitor without a transistor. In the example of fig. 4, the effective value of the base capacitor can be multiplied by anywhere from 50 to 100 times, depending on the transistor used. Note that an optional moderate-value additional input capacitor may be used to absorb or minimize surges in a power supply that is subject to heavy load current peaks.

Since output load current and voltage requirements vary as a function of the application, we did not feel that there was any point in giving actual component values in the above examples. All (or at least most) regular readers of this column are avid experimenters anyway, so the basic approach to such a technique should be all that is necessary to get something working in your particular application. At least I hope so!

73, Irwin, WA2NDM

DX

BY CHOD HARRIS, VP2ML

NEWS OF COMMUNICATION AROUND THE WORLD

DX Newsletters

Effective mid-August I retired as editor and publisher of *The DX Bulletin*, *The DX Magazine*, and *The Long Island DX Bulletin*. Paul, AE4AP, and Nancy, KB4RGW, Smith of Paducah, Kentucky are the new editors of all three publications. Contact the Smiths at P.O. Box 2306, Paducah KY 42002-2306 (telephone 502-898-8863). Paul and Nancy will be the fourth team to edit *The DX Bulletin*. Previous editors were *CQ* DX Hall of Famer Hugh Cassidy, WA6AUD; Jim Cain, K1TN; and me.

To give you some idea of the magnitude of this task, here are a few statistics. Over the past years I have paid more than $1,000,000 to the United States Postal Service. The computer files exceed a gigabyte (and that's almost all text). I have purchased more than 1,000,000 envelopes and 50 miles of address labels. I can't begin to count the number of trees I have killed. My retirement concludes more than 11-1/2 years of my editing *The DX Bulletin*, a complete sunspot cycle's worth. There are many excellent reasons why less than a handful of DX editors have kept at the task for more than 10 years. The responsibility of gathering, sorting, editing, and distributing accurate DX information around the world puts great pressure on DX editors. With a weekly newsletter, the next deadline looms ahead almost as soon as the previous issue goes into the mail. This relentless schedule disrupts family life, results in huge telephone and postage bills, and can lead to burnout. To better understand what is behind those four pages of DX information that arrive in your mail box each week, let's follow a DX newsletter editor through a typical week.

The editing of the weekly newsletter begins on Thursday morning with a electronic trip to the Space Environment Center's (SEC) computer bulletin board. The SEC is the organization that provides the solar indices transmitted on WWV and WWVH, among many other tasks. The SEC updates the computer files of solar indices daily.

After downloading the solar index files, the DX editor enters the data into a graphing program to produce a visual representation of what has been happening on the sun during the last two solar revolutions. (The sun rotates in about 27.5 days, and the indices from the last two revolutions help predict what will happen in the next revolution.) The data is also entered into a table which is used to make the daily propagation predictions. *The NEW Shortwave Propagation Handbook* by Jacobs, Cohen, and Rose contains graphs that predict band conditions from various combinations of solar indices at different phases of the sunspot cycle. At low levels of solar activity, as we are experiencing now, a solar flux level of about 70 combined with a quiet geomagnetic field (A index less than 10) leads to a prediction of Above Normal or High Normal conditions. The prediction also depends on the waxing and waning of individual sunspot regions, coronal holes, coronal mass ejections, and other factors. After entering the propagation data, the DX editor updates the computer files from the previous issue.

P.O. Box 50, Fulton, CA 95439

ZA1AJ, ZA1AB, and Z32KV meet in Struga, Macedonia, in Z32KV's shack.

The next step is to organize the DX information that has arrived since the previous issue was completed. This DX news arrives at the editor's desk via a variety of ways, with electronic submissions rapidly overtaking U.S. postal service reports. The DX news comes from DXpeditioners, DXers overhearing DX plans on the air, and other DX newsletters from around the world.

Most DX newsletter editors exchange copies with their fellow editors around the globe. Editors scour these issues seeking DX tidbits that haven't been printed elsewhere. Some of these newsletters are in languages other than English, making the task of deciphering them much more interesting. The French (LNDX) and German (DXMB) newsletters present little difficulty to editors who have had some skill in those languages, but the Japan DX news presents a serious problem for those editors who cannot read written Japanese!

In many cases, the DX editor uses the information in other newsletters as a starting point in the quest for complete and accurate DX information. The diligent editor will try to independently verify any DX news, usually by contacting the DXpeditioners directly by mail, phone, fax, or electronic mail. DX information received directly from the individuals involved avoids the inevitable errors that creep into second-hand reports. This means that the DX editor must maintain an up-to-date list of mail and e-mail addresses of DXpeditioners around the world. It also means significant telephone bills; international calls are very expensive.

A very important part of the DX editor's job is to maintain excellent relations with contributors of DX information. This means letters and phone calls to regular contributors, talking to them face-to-face at DX gatherings, providing personalized DX information, and other goodies. The information in a DX newsletter is only as good as the number and quality of the contributors. The DX editor then uses a wide range of reference material to check spellings, addresses, exact locations, Islands On The Air reference numbers, sunrise and sunset times, and more.

The weekend is crunch time for the DX editor. This is because a timely DX newsletter is one that arrives in the readers' hands on Friday, as most DXing is done on the weekend. This means a Tuesday mailing and a Monday printing deadline. The DX editor completes about 75% of the newsletter by Sunday night, leaving just enough space for late-breaking news on Monday morning.

Working weekends puts a strain on the editor's family. Weekend excursions and trips to DX gatherings must be carefully planned to allow time to complete the newsletter by Monday morning. Readers will notice that DX editors usually leave DX gatherings early Sunday, to rush back to the office to get out the next issue.

Finishing the newsletter is a juggling act, balancing the available DX news with the space available in each issue. Prior to editing *The DX Bulletin*, I had never heard of the phrase "write to fit." However, the DX editor quickly learns how to squeeze the maximum amount of information into the space available.

The actual editing ends with the dash to the printer, who has been anxiously awaiting the final copy so that he can print and fold the

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- The element-to-boom brackets are pre-aligned on the boom, so every element is straight and will not move.
- The ***C-4*** maintains the same turning radius, weighs about 40 pounds, with separate feedline so that the ***C-3*** remains intact.
- **Force 12** has more than 60 HF antennas from 3 el 80/75 mtr yagis to 6 mtr beams. The ***MAGNUM 2 / 2*** shown above is a 2el 80/75 and 2el 40 mtr on a single boom with two feedlines. The ***MAGNUM 2 / 2*** uses EF-180B (66.5') elements on 80/75 and EF-140 (44.5') elements on 40. At about 14 sqft, the ***MAGNUM 2 / 2*** is the answer to gain on both bands. Other 80/40 available.
- **Force 12** now offers **magnetic transmitting / receiving loops** for 40 and 80/75, perfect for limited space and **NVIS** use: the ***MTR-66*** (6'x6') and the ***MTR-618*** (6'x18'), both made with 2" tubing. These mount vertically on the ground, deck, balcony, etc.
- **Force 12** has verticals for 40, 80/75 and 160 mtrs. Add to this the several 20-40 yagis, the 40-30-20 yagi and multiple band antennas like the 5BA (20-10) and the 4BA (17-10). **Force 12** offers a pair of 50 ohm 1:1 baluns; fully tested and vacuum impregnated for reliability. The B-1 is rated at 3KW and the B-1/C commercial version with N-connector, rated at 25KW.

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2921 ..... DL1CL 2923 ..... 9A3GO

Mixed

1747 ..... IK1NLZ 1749 ..... DL1NOF
1748 ..... JH2BCN

Mixed: 500 KE7VO. 550 KE7VO, KL7OH. 600 KL7OH. 650 KL7OH. 700 PA3AEB. 750 PA3AEB. 850 JA3BKP. 900 JA3BKP. 1500 JN3SAC. 1550 JN3SAC. 1600 JN3SAC. 1750 W7DM. 1800 W9OM. 1850 W7OM. 2350 N4UH. 2500 HA5NK. 2550 HA5NK. 2800 WB2YQH. 3500 W1BWS. 3550 W1BWS. 3600 W1BWS. 3650 W1BWS.

SSB: 350 LU1EYW, CT1EEN. 400 LU1EYW, CT1EEN. 450 LU1EYW, CT1EEN. 500 LU1EYW, CT1EEN. 550 LU1EYW, CT1EEN. 600 LU1EYW, CT1EEN. 750 LU1EYW, CT1EEN. 800 LU1EYW, CT1EEN. 850 LU1EYW, CT1EEN. 900 CT1EEN. 950 CT1EEN. 1000 CT1EEN. 1050 CT1EEN. 1100 CT1EEN, LU2ATR. 1150 LU2ATR, CT1EEN. 1200 LU2ATR, CT1EEN. 1250 LU2ATR, CT1EEN. 1300 LU2ATR, CT1EEN. 1350 LU2ATR. 1400 LU2ATR. 1550 WA1JMP. 1600 WA1JMP. 1650 WA1JMP. 1700 WA1JMP. 1750 WA1JMP. 1800 WA1JMP. 1850 WA1JMP. 3950 ZL3NS.

CW: 350 F5MQW, JK1AJX. 400 F5MQW, JK1AJX. 450 F5MQW, JK1AJX. 500 JK1AJX. 550 JK1AJX. 600 JK1AJX. 650 JE3CYH, K3WWP, JK1AJX. 700 K3WWP, JK1AJX. 750 JK1AJX.

10 Meters: JA3ARM
15 Meters: JK1AJX
20 Meters: KB2FD
40 Meters: KB2FD
80 Meters: KB2FD
160 Meters: KB2FD

Asia: LU1EYW, JK1AJX
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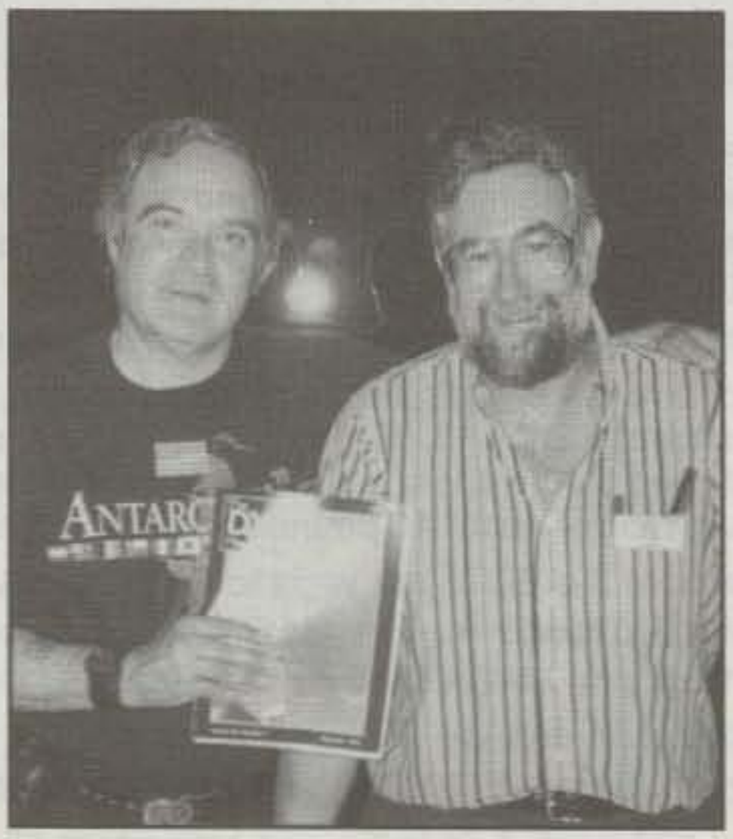
Oceania: JK1AJX

Award of Excellence Plaque Holders: I8YRK, W4CRW, SMØAJU, K5UR, K6XP, N5TV, K2VV, VE3XN, W6OUL, DL1MD, DJ7CX, DL3RK, WB4SIJ, SM6DHU, N4KE, I2UIY, DL7AA, ON4QX, WA8YTM, YU2DX, OK3EA, I4EAT, OK1MP, N4NO, ZL3GQ, VK9NS, DEØDXM, DK4SY, UR2QD, AB9O, FM5WD, I2DMK, W4BQY, IØJX, SM6CST, VE1NG, I1JQJ, WA1JMP, PY2DBU, HI8LC, KA5W, KØJN, W4VQ, KF2O, K3UA, HA8XX, HA8UB, W8CNL, K7LJ, W1JR, F9RM, W5UR, WB8ZRL, SM3EVR, CT1FL, K2SHZ, UP1BZZ, W8RSW, WA4QMQ, EA7OH, K2POF, DJ4XA, IT9TQH, W8ILC, K2POA, N6JV, W2HG, ONL-4003, VE7DP, K9BG, W5AWT, KBØG, HB9CSA, F6BVB, W1BWS, YU7SF, G4BUE, N3ED, DF1SD, K7CU, I1POR, LU3YL/W4, NN4Q, KA3A, YBØTK, VE7WJ, VE7IG, K9QRF, YU2NA, N2AC, W4UW, NXØI, W9NUF, N4NX, SMØDJZ, DK5AD, WB4RUA, DK5AD, WD9IIC, W3ARK, I6DQE, LA7JO, VK4SS, K6JG, I1EEW, I8RFD, I3CRW, VEFXR, N4MM, KC7EM, ZS6BCR, CT1YH, IV3PVD, KA5RNH, ZP5JCY, F1HWB, KC8PG, NE4F, VE3MS, K9LJN, ZS6EZ, YU2AA, I1WXY, IK2ILH, DEØDAQ, LU1DOW, N1IR, IK4GME, WX3N, KC6X, N6IBP, W5ODD, IØRIZ, I2MQP, I5ZJK, JAØSU, S51NU, K9XR, WØULU, HB9DDZ, F6HMJ, I2EOW, IK2MRZ, KS4S, KA1CLV, WZ1R, CT4UW, KØIFL, IN3NJB, WT3W, S50A, AA6WJ, W3AP, W9IL, OE1EMN, IK1GPTG, KØDEQ, DL5ARS.

Award of Excellence Plaque Holders with 160 Meter Endorsement: CT1YH, IV3PVE, KA5RNH, ZP5JCY, AB9O, FM5WD, SMØDJZ, DK5AD, SM6CST, I1JQJ, PY2DBU, W3ARK, HI8LC, KA5W, UR2QD, VE3XN, K6XP, LA7JO, W4VQ, K6JG, K3UA, HA8UB, W4CRW, N4MM, K7LJ, SMØAJU, KF2O, SM3EVR, K5UR, UP1BZZ, OK1MP, N5TV, K2POF, W8CNL, DJ4XA, IT9TQH, DL9RK, N6JV, ONL-4003, W1JR, W6OUL, W5AWT, KBØG, F6BVB, W4BQY, YU7SF, W5UR, N4NO, DF1SD, K7CU, I1POR, W8RSW, N4KE, I2UIY, YBØTK, W8ILC, W1BWS, VE7WJ, K9QFR, NN4Q, W4UW, NXØI, G4BUE, LU3YL/W4, I4EAT, WB4RUA, VE7WJ, N4NX, DEØDXM, VE7IG, K9BG, I1EEW, AB9O, CT1YH, IV3PVD, KA5RNH, ZP5JCV, I2MQP, IØRIZ, W5ODD, WX3N, IK4GME, HA8XX, YU1AB, F6HMJ, HB9DDZ, K9XR, KØJN, ZS6EZ, JAØSU, I5ZJK, I2EOW, KS4S, KA1CLV, KØIFL, K9LJN, WT3W, IN3NJB, S50A, AA6WJ, W3AP, KØDEQ.

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 88101-9511 USA.



Luis, XE1L, joins your favorite DX editor at the top of the Stouffer's Hotel in Dayton, Ohio.

newsletter in time for the late-afternoon pick-up. Newsletters with a large number of subscribers usually contract out the mailing, as stuffing and sealing thousands of newsletters is too much of a task for one person.

While the job of editing the newsletter ends on Monday morning, the DX editor still faces additional tasks before beginning the next issue on Thursday. Up-dating the mailing list takes much of the rest of the week: opening, sorting, and entering new and renewal subscriptions; changes of address; requests for samples and QSL information; making bank deposits; providing the necessary audit trail to meet Postal Service requirements; and much more. By the time all these housekeeping chores are completed, it's time to start the next issue.

In addition to actually editing the newsletter, the DX editor handles many DX-related tasks. Readers frequently seek QSL routes and other DX information. Potential DXpeditioners ask whether anyone else is planning a DXpedition to a given area, or request licensing or other information about operating in a different country. DXpeditioners are also anxious to provide contacts for those who need them most. Thus, they frequently request band plans for working DXers in the farthest corners of the world.

DX editors are privy to a host of confidential information. In some cases, DXpeditioners don't want their plans to be widely known until just before their operation, to discourage pirates. Maintaining confidentiality is an important part of the DX editor's job, especially when potential new countries are concerned.

Of course, editing a DX newsletter is not without its rewards. The DX editor has first crack at DX information, before the news is widely disseminated. Regular readers of *The DX Bulletin* may have noticed the phrase "easy to work," in reference to an on-going operation or extended DXpedition. This means I used the

information that was about to be published in *The DX Bulletin* to work the DX myself; "easy to work" means I got them on the first call. Also, the DX editor gets to meet and discuss DX issues with most well-known DXpeditioners.

However, 11 1/2 years of this grind is enough for anyone. It's time for a fresh look and a more enthusiastic attitude. I am confident that Paul and Nancy Smith will maintain the high quality that marks the best DX newsletter in the world.

End of Paper DX Newsletters?

When news of the new editors of *The DX Bulletin* reached the Internet DX reflector, a few DXers wondered why DX newsletters continued to publish on paper in this electronic communications era. These comments generated considerable mail (called a "thread" in Internetese). The vast majority of DXers strongly defended the paper edition of DX newsletters. In fact, the handful of DXers who no longer subscribe to a DX newsletter because the news is available without additional charge from the Internet were all "keyboard junkies"—DXers

The WAZ Program

Single Band WAZ

15 Meter SSB

497.....JM2DRM

20 Meter SSB

988.....BV5BG

12 Meter CW

15.....SM6CST

17 Meter CW

19.....SM6CST

30 Meter CW

21.....JA0AWF

All Phone

625.....KO4RR

All CW

93.....JL1RML

160 Meter WAZ

34	W1JZ	36 Zone Endorsement
94	K8GG	36 Zone Endorsement
96	SM5BFJ	40 Zones New
97	DJ6RX	38 Zones New

All Band WAZ

SSB

4339.....IK2QPO 4340.....JM2DRM

CW/Phone

7690.....KN4ZT	7694.....JR5KQF
7691.....AB5RM	7695.....KO4RR
7692.....W4HM (CW)	7696.....OH3MUA (CW)
7693.....K2NV	

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 Manager, Jim Dionne, K1MEM, 31 DeMarco Road, Sudbury, MA 01776. 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 Award Manager. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. Questions regarding the WAZ Award may be sent to K1MEM with an SASE.

The WPX Honor Roll

The WPX Honor Roll is based on the current confirmed prefixes which are submitted by separate application in strict conformance with *CQ* Master Prefix List. Scores are based on the current prefix total regardless of an operator's all-time count. Honor Roll must be updated annually by addition to, or confirmation of, present total. If no up-date, file will be made inactive. Lifetime Honor Roll fee is $4.00 (U.S.) for each mode, with no fee for additions.

MIXED

4692 F9RM	3218 N4UU	2885 PAØSNG	2491 I2EOW	2105 N2AIF	1834 SM6CST	1519 AE5B	1265 VE4ACY	967 JR3TOE
4657 9A2AA	3198 N9AF	2884 W9DWQ	2488 WB2YQH	2070 KS4S	1776 W7OM	1516 F5NBX	1222 YV7QP	953 S52QM
3962 IT9TQH	3184 I2PJA	2866 HAØDU	2416 K8LJG	2067 W6OUL	1716 WB3DNA	1491 I2EAY	1212 CT3CU	906 KB5OHT
3696 EA2IA	3165 N4MM	2847 YU7SF	2385 S53EO	2053 KØDEO	1683 LU8DY	1454 KC6X	1177 WT3W	874 W2EZ
3673 W2FXA	3141 YU1AB	2834 YU7BCD	2375 HA5NK	2049 W8UMR	1681 I2AOF	1402 I1-21171	1168 Z32KV	835 AA1KS
3475 K6JG	3101 I1EEW	2756 K9BG	2252 S51NU	2007 WB4RUA	1662 PY2DBU	1383 OZ1ACB	1137 YU7FW	801 EA2BNU
3451 N4NO	3078 ZP5JCY	2658 YT7DX	2249 IK2ILH	1978 S58MU	1589 JN3SAC	1383 AI6Z	1123 IK2PZG	679 W4RTE
3442 W1BWS	3063 KA5W	2657 N2AC	2200 K5UR	1976 9A4RU	1563 CT1YH	1346 WA3HUP	1054 VE6BMX	663 HI8LC
3394 N6JV	2990 WA8YTM	2601 SM7TV	2141 WA1JMP	1967 W9IL	1550 EA3CWK	1305 W9IAL	1013 WB2PCF	636 9A2AJ
3358 VE3XN	2981 UA3FT	2601 I2EOW	2132 DK5AD	1947 KBØG	1532 KØIFL	1269 WØIZV	999 VE6FR	
3229 SM3EVR	2948 HA8XX	2510 4N7ZZ	2131 W4UW	1899 G4OBK				

SSB

4593 F9RM	2795 EA2IA	2317 LU8ESU	2044 K5RPC	1574 KS4S	1415 HA5NK	1107 WA2FKF	889 W6RQQ	724 I2EAY
4025 IØZV	2754 EA8AKN	2294 EA3AQC	2029 KD9OT	1564 N2AIF	1401 W7OM	1106 KØIFL	860 IK4HPU	712 DF1IC
3948 IT9TQH	2708 I1EEW	2240 I8KCI	1954 CX6BZ	1533 LU7HJM	1396 K8MDU	1101 KB4HU	846 JR3TOE	709 SN5CST
3571 ZL3NS	2699 OZ5EV	2237 WA4QMQ	1948 EA2AOM	1532 OE2EGL	1393 K3IXD	1053 EA8AG	832 I6KYL	682 US1IDX
3514 VE1YX	2678 N4NO	2220 YU7BCD	1933 W4UW	1527 KBØC	1355 DK5WQ	1040 DF7HX	831 VE4ACY	676 HI8LC
3234 K6JG	2616 I4CSP	2206 PY4OY	1906 IN3QCI	1483 N2AC	1355 IKØEIM	1036 IKØJMS	831 LU3HBO	639 VE4ROY
3192 I2PJA	2595 KA5W	2164 I1EOW	1903 K5UR	1447 AE5B	1321 I3ZSX	976 WT3W	821 EA3EQT	626 VE6BMX
3172 WD8MGQ	2588 HA8XX	2141 EA5AT	1754 K2POF	1447 K2EEK	1310 IK2AEQ	973 IK2PZG	782 YV7QP	609 JA2OCU
2966 ZP5JCY	2525 PAØSNG	2133 4X6DK	1748 LU8DY	1441 W6OUL	1138 KC6X	943 S51NU	772 LW2DBM	604 KZ5ZD
2903 CT4NH	2447 I5ZJK	2087 CT1AHU	1638 N6FX	1435 WN5MBS	1129 KBØG	936 AI6Z	756 AE4MJ	601 EA1MK
2812 N4MM	2362 I2MQP	2077 N4UU	1633 K8LJG	1428 CT1BWW	1124 W9IL	912 ZS6Y	744 N3DRO	
2798 F2VX	2350 WA8YTM	2050 KF7RU	1606 YU7SF	1419 WB3CQN	1118 EA5GKE	907 KF7IO	738 EA1OT	

CW

3911 IT9TQH	2435 K9QVB	1998 S51NU	1767 K5UR	1645 I7PXV	1342 EA7TG	1090 AI6Z	914 YV7QP	742 9A3UF
3681 WA2HZR	2318 W9DWQ	1954 HA5NK	1742 N6FX	1552 W6OUL	1302 I2EAY	1067 EA2CIN	870 W9IL	729 KF7JF
3376 N6JV	2283 WA8YTM	1945 KA7T	1741 W1WAI	1542 I1EEW	1302 JN3SAC	1066 IK5TSS	863 PY4WS	701 VE6BMX
2993 N4NO	2280 KA5W	1939 EA7AZA	1740 OZ5UR	1510 G4OBK	1300 IK2ECP	1056 AC5K	851 K2LUQ	697 K3WWP
2957 YU7LS	2268 G4UOL	1933 JA9CWJ	1730 SM6CST	1504 KS4S	1278 W7OM	1051 4X6DK	844 YU1TR	691 KØIFL
2843 N4UU	2264 YU7BCD	1903 G3VQO	1707 G4SSH	1480 IK3GER	1277 KA1CLV	1024 W9IAL	831 LU3DSI	656 HA9PP
2759 EA2IA	2224 LZ1XL	1863 HA8XX	1687 IT9VDQ	1477 ZP5JCY	1266 9A3SM	1021 W4UW	830 LU7EAR	649 WT3W
2722 K6JG	2173 N4MM	1858 K8LJG	1680 S58MU	1448 LU2YA	1241 9A2HF	983 KC6X	796 I2EOW	602 VE4ACY
2564 YU7SF	2117 W8IQ	1818 KF2O	1662 KBØG	1440 EA6BD	1191 G4MVA	925 LW2EUB	782 KB5OHT	600 LU6VCD
2439 N2AC	2085 S51NR	1809 TI4SU	1649 N2AIF	1426 DJ1YH	1182 EA6AA	921 I2MQP	760 EA2BNU	

ASTRON CORPORATION
9 Autry
Irvine, CA 92718
(714) 458-7277 • FAX (714) 458-0826

ASTRON POWER SUPPLIES

• HEAVY DUTY • HIGH QUALITY • RUGGED • RELIABLE •

NEW

SWITCHING POWER SUPPLIES

	CONT.	ICS	WT.(LBS)
SS-25	20	25	4.2
SS-30	25	30	5.0

SPECIAL FEATURES

- SOLID STATE ELECTRONICALLY REGULATED
- FOLD-BACK CURRENT LIMITING Protects Power Supply from excessive current & continuous shorted output
- CROWBAR OVER VOLTAGE PROTECTION on all Models except RS-3A, RS-4A, RS-5A, RS-4L, RS-5L
- MAINTAIN REGULATION & LOW RIPPLE at low line input Voltage
- HEAVY DUTY HEAT SINK • CHASSIS MOUNT FUSE
- THREE CONDUCTOR POWER CORD except for RS-3A
- ONE YEAR WARRANTY • MADE IN U.S.A.

PERFORMANCE SPECIFICATIONS

- INPUT VOLTAGE: 105-125 VAC
- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE Less than 5mv peak to peak (full load & low line)

SL SERIES

MODEL RM-35M

- LOW PROFILE POWER SUPPLY

MODEL	Colors Gray	Colors Black	Continuous Duty [Amps]	ICS* [Amps]	Size [IN] H × W × D	Shipping Wt. [lbs]
SL-11A	•	•	7	11	2⅝ × 7⅝ × 9¾	12
SL-11R	•	•	7	11	2⅝ × 7 × 9¾	12
SL-11R-MC		•	7	11	5¾ × 7¼ × 9¾	13
SL-11R-GE	•		7	11	5¾ × 7 × 9¾	13
SL-11R-RA		•	7	11	4¾ × 7 × 9¾	13
SL-11R-EFJ		•	7	11	5⅛ × 7¼ × 9¾	13
SL-11MG		•	7	11	5⅛ × 7 1/18 × 9¾	13
SL-15R	•	•	12	15	2⅝ × 7 × 9¾	13
SL-15R-GE	•		12	15	5⅛ × 7⅝ × 9¾	14
SL-15R-RA		•	12	15	4¾ × 7¼ × 9¾	14
SL-15R-EFJ		•	12	15	5⅛ × 7 1/18 × 9¾	14

RS-L SERIES

- POWER SUPPLIES WITH BUILT IN CIGARETTE LIGHTER RECEPTACLE

MODEL		Continuous Duty [Amps]	ICS* [Amps]	Size [IN] H × W × D	Shipping Wt. [lbs]
RS-4L	•	3	4	3½ × 6⅛ × 7¼	6
RS-5L	•	4	5	3½ × 6⅛ × 7¼	7

RM SERIES

MODEL RM-35M

- 19" RACK MOUNT POWER SUPPLIES

MODEL	Continuous Duty [Amps]	ICS* [Amps]	Size [IN] H × W × D	Shipping Wt. [lbs]
RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
RM-60A	50	55	7 × 19 × 12½	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50
RM-60M	50	55	7 × 19 × 12½	60

RS-A SERIES

MODEL RS-7A

MODEL	Colors Gray	Colors Black	Continuous Duty [Amps]	ICS* [Amps]	Size [IN] H × W × D	Shipping Wt. [lbs]
RS-3A		•	2.5	3	3 × 4¾ × 5¾	4
RS-4A	•	•	3	4	3¾ × 6½ × 9	5
RS-5A		•	4	5	3½ × 6⅛ × 7¼	7
RS-7A	•	•	5	7	3¾ × 6½ × 9	9
RS-10A	•	•	7.5	10	4 × 7½ × 10¾	11
RS-12A	•	•	9	12	4½ × 8 × 9	13
RS-12B		•	9	12	4 × 7½ × 10¾	13
RS-20A	•	•	16	20	5 × 9 × 10½	18
RS-35A	•	•	25	35	5 × 11 × 11	27
RS-50A	•		37	50	6 × 13¾ × 11	46
RS-70A	•		57	70	6 × 13¾ × 12⅛	48

RS-M SERIES

MODEL RS-35M

MODEL	Continuous Duty [Amps]	ICS* [Amps]	Size [IN] H × W × D	Shipping Wt. [lbs]
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 1	46
RS-70M	57	70	6 × 13¾ × 12⅛	48

VS-M AND VRM-M SERIES

MODEL VS-35M

- **Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load**

MODEL	Continuous Duty [Amps] @13.8VDC	@10VDC	@5VDC	ICS* [Amps] @13.8V	Size [IN] H × W × D	Shipping Wt. [lbs]
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
VS-70M	57	34	16	70	6 × 13¾ × 12½	48
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

ICS - Intermittent Communication Service (50% Duty Cycle 5 min. on 5 min. off)

Frank, DJ9ZB, Ali, operator at 5A1A, and Elias, DL1SEB, gather at Friedrichshafen, Germany.

who spend many hours a day at their computer. For the average DXer the paper versions are far superior to the disorganized mass of DX information on the Internet.

DXers mentioned several reasons why the paper DX newsletters continue to be useful. The first advantage of printed DX newsletters is one of time. It takes hours to go through all the various sources of DX information available on the Internet to pull out the few really useful tidbits. Most DXers would gladly pay someone else (the DX editor) to do this task. Also, the printed newsletters are very convenient. The news is presented in a clear and readable fashion. The weekly newsletter can be propped up next to the rig, something far more difficult to do with information on a computer screen.

Good DX newsletters also are carefully organized. The DXer can turn immediately to the information needed the most, whether it is propagation, bandpass, the calendar, IOTA notes, etc. Good DX newsletters provide additional information that is not in the raw e-mail messages on the Internet. This information may be sunrise or sunset times, the full names and addresses of the DXpeditioners, expected propagation and band openings, and much more. Finally, the information printed in *The DX Bulletin* is significantly more accurate than other sources of DX news. Knowledge of call-sign allocations, additional reference materials, and years of experience permit the good DX editor to spot mistakes and pirate openings.

The printed versions of DX newsletters will continue to be valuable references for the active DXer for years to come. Meanwhile, my numerous DXer friends can continue to enjoy my DX writing through this DX column, which I will continue to edit.

October DX Operations

The best opportunity to work interesting DX this month is in connection with the CQ WW DX SSB Contest, Oct. 26–27. The DXer can find

5 Band WAZ

As of June 30, 1996, 443 stations have attained the 200 Zone level.

New recipients of 5 Band WAZ Award with all 200 Zones confirmed:

US1IDX
IØJX

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

N4WW, 199 (26)	OE6MKG, 199 (31)
AA4KT, 199 (26)	HA8IB, 199 (2 on 15)
K7UR, 199 (34)	DK1FW, 199 (31)
NAØY, 199 (26)	YU1AB, 199 (1)
WØPGI, 199 (26)	OH2DW, 199 (1)
W2YY, 199 (26)	IK1AOD, 199 (1)
W9WAQ, 199 (26)	UA3AGW, 198 (1, 12)
W1JR, 199 (23)	VO1FB, 198 (19, 27)
VE7AHA, 199 (34)	EA5BCK, 198 (27, 39)
W1FZ, 199 (26)	KZ4V, 198 (22, 26)
IK2GNW, 199 (1)	K4PI, 198 (23, 26)
W9CH, 199 (26)	G3KDB, 198 (1, 12)
ACØM, 199 (34)	DK2GZ, 198 (1, 24)
IK8BQE, 199 (31)	KG9N, 198 (18, 22)
JA2IVK,199 (34,40m)	KM2P, 198 (22, 26)
K1ST, 199 (26)	GM3YOR, 198 (12, 31)
ABØP, 199 (23)	DKØEE, 198 (19,31)
KL7Y, 199 (34)	KØSR, 198 (22, 23)
UY5XE, 199 (27)	YO3APJ, 198 (29, 35)
NN7X, 199 (34)	K3NW, 198 (23, 26)
DL3ZA, 199 (31)	WB6OKK, 198 (22, 37)

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

N8KOL, 152 Zones	K8MDU, 151 Zones
IØJX, 200 Zones	

Endorsements:

US1IDX, 200 Zones	LU2FFD, 196 Zones
KB4HU, 196 Zones	NT5C, 193 Zones

1011 Stations have attained the 150 Zone level as of June 30, 1996.

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 Manager, Jim Dionne, K1MEM, 31 DeMarco Road, Sudbury, MA 01776. 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 Award Manager. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. Questions regarding the WAZ Award may be sent to K1MEM with an SASE.

lots of new band-countries in the contest DXpeditions. In addition to the contest itself, however, the contest DXpeditioners usually set up their stations several days in advance of the contest, checking antennas, propagation, station interaction, etc. Since the competition to work these stations is less before the contest, the savvy DXer searches for these contest DXpeditioners before the contest. (While some contest DXpeditioners continue to operate *after* the contest, far more are available before the contest.)

Among the many contest DXpeditions this year are **5N9N** by Pete Meyers, WØAW (ex-NØAFW), and others, and a Sable Island **CYØ** DXpedition by Murray Adams, WA4DAN, and others. Both operations are due to set up on Oct. 22, providing a couple of days of activity before the contest begins at 0000Z Oct. 26.

Josep, EA3BT, and his wife Nuria, EA3AOK, Gibert will operate as **8Q7BT** and **8Q7OK,** respectively, Oct. 22–31, including an entry in the contest. Outside the test they will operate some CW and try the new bands. QSL to EA3BT, P.O. Box 366, 08800 Vilanova i la Geltru, Spain.

In Islands On The Air news look for **ZV2EPA** from Comprida Island (SA-024) Oct. 24–28.

ZP5ALI visits two mainstays of Egyptian amateur radio in Cairo.

QSL to PY2EPA. Also listen for **FOØSUC,** operated by Joel, F5JJW, from Rurutiu Island (OC-050) Oct. 9–14 and from Tubuai (OC-152) Oct. 14–19, SSB only. QSL home call.

QSL Notes

In the QSL information box in the August column the P.O. Box of **A61AN** was incorrect. The correct QSL route is as follows: A61AN to Naser Fekri, P.O. Box 53656, Dubai, United Arab Emirates.

QSL **C9LCK, C9LCK/p, 5H1CK, 5H3CK, 5H3CK/a, J56CK,** and **J56DY** via Franco Armenghi, I4LCK, Via Jussi n. 9, 40068 San Lazzaro, Bologna, Italy, direct only please, with SAE and US$1.

QSL **S79CK/D, H44/I4LCK, 3D2CK, 3D2CK/p, S79CK,** and **S79CK/d** direct or via the Italian bureau to I4LCK.

QSL **CQ2I** direct or via the W1 bureau to Frank Dlugokinski, WA1ECA, P.O. Box 772, Litchfield, CT 06759.

QSL Elio Eloy Salinas R., **HP1BYS,** via his new address: P.O. Box 6-7146, El Dorado, Panama, Republic of Panama.

QSL **VP5/W5ASP** and the 1996 WPX CW operation **only** via W5ASP. He cannot help with earlier operations of VP5Z.

QSL **EW3LC** via new manager Frank Stelloh, K9AU.

QSL **4S7EA** direct to E. Amarasinghe, 275 6 Colombo Rd., Divulpitja, Boralesgamuwa, Sri Lanka.

QSL **5X4C** via Sebastiano Bianchi, Catholic Mission Iceme, P.O. Box 43, Lira, Uganda.

QSL **KC6JF** direct to P.O. Box 66, Koror, Palau 96940.

QSL **R1/EU1FC** and **R1/EW1MA** direct to P.O. Box 202, Minsk-5, 220005 Belarus.

QSL **VQ9DX** via R. Marra, AA5DX, Marginal 301-C, La Rambla, Suite 205, Ponce, Puerto Rico.

73, Chod, VP2ML

QSL INFORMATION

3ZØPEA to SP1NQF
3ZØWAW to SP5PBE
4F4IX to DU4IX
4J3M to UD6DJ
4K8F to UA9AB
4U1UN to WB8LFO
5NØT to F2YT
5N3/SP5XAR to SP5CPR
5U7AA to HH2HM
5WØAN to DF8AN
5X1T to ON5NT
6W1/N2WCQ to PA3BUD
7Z5OO to W1AF
8P9IR to DJ1TO
8R1ZG to W4FRU
9A4A to 9A4AA
9H3TZ to DL7VRO
9H3UJ to PA3CRA
9K2MU to WA4JTK
9K5HR to 9K2HR
9M2JJ to SMØOEK
9M8BC to HL5AP
9M8HIM to 9M8DB
9M8HN to JH4NPP
9N1ARB to KV5V
9N1RHM to KV5V
9Q5MRC to G3MRC
9U5CW to EA1FFC
BV4MU to KA6SPQ
BV4OQ to W3HCW
C6AIE to WZ8D
CN8GB to CN8BA
CU3YY to CT1GG
CU7R to CU7AA
EA8BYR to WA1ECA
EG9IA to EA4URE
EM5DIG to UY5AA
EM8W to UY5XE
EO7J to UT5JAJ
ER1M to SP9HWN
ER2DX to KD1CT
EU1ØC to SP8JM
EU3FT to W3HCW
EW1WZ to DL1OY
EW3LB to W3HNK
EX8DX to IK2QPR
FG5FR to F6FNU
FG5GZ to F6CLK
FG5HR to F6BUM
FM5CD to F5VU
FO5PI to F5OTZ
FP5CJ to VE2FB
HKØOEP to HKØNZY
HL5KY to W3HNK
HP1XBH to AD4WU
HP2DZL to WP4NAC
HSØZAA to KM1R
HSØZBI to NW3Y
IK3PQH/IL3 to IK3ABY
J73VE to N4SPQ
JW5HE to OZ8RO
JY8FO to KA1FFO
KE4EKV/6W1 to PA3BUD
KG4CM to N5FTR
LZ7ØBFR to LZ1BJ
OHØ/SMØIHR to SM5HJZ
OIØJWH to DJ2PJ
P29VR to W7LFA
P29WK to N3ART
P49V to AI6V
PJ2MI to K2PEQ
R1FJZ to DF7RX
RPØAKO to RKØAZZ
RUØLAX to W3HCW
S21A to W4FRU
S79MAD to GW4WVO
SPØCW to SP2FAP
T3ØBH to ZL1AMO
T32Z to N7YL
T94KW to HAØHW
TK5NI/P to HH2HM
TM5FER to F6KQK
TU2XR to AK1E
UAØAP to AA2SZ
UXØZZ to N3IRZ
V21CW to KA2DIV
V44KJ to WB2TSL
V73C to N4GAK
V73W to WW1V
VI75RAAF to VK4LV
VI9NS to VK9NS
VK1CW to JA6EGL
VK1FF to WB2FFY
VK2IGT to JH2BCN
VK2IMD to VK2KAA
VK9XM to JA1BK
VP2EFF to JH4IFF
VP8BPZ to DA4RG
VQ9DX to AA5DX
X5EBL to YU1FW
XT2JF to N5DRV
YB3OSE to W7TSQ
YM12HCS to TA1KA
YS1ZV to KB5IPQ
Z35ØDRS to Z31FK
ZD7WRG to WA2JUN
ZD8DEZ to GØDEZ
ZD8Z to VE3HO
ZF2DR to K5RQ
ZF2PA to W5ZPA
ZK1XB to HB9DKX
ZL3FAN to DF8AN
ZS8IR to ZS6EZ
3V8BB to I.S.J., P.O. Box 2055, Bir el Bey, Tunisia
5H3DS to David, P.O. Box 7, Bariadi, Tanzania
5H3LM to P.O. Box 519, Arush, Tanzania
9U5TN to Bob, C.F.Z, P.O. Box 24077, Bujumbura, Burundi
AP2AL to Ali Munir, 39A Gulberg V., Lahore, Pakistan
BG7YA to Li HongMin, 15F Zhongfang senior apartment, Yusha road, Financial trade area, Haikou city, Hainan 570125, China
BY5QMU to P.O. Box 211, Fuzhou, China
C21TT to Tony, P.O. Box 372, Republic of Nauru
C91CB to Dan, P.O. Box 4161, Maputo, Mozambique
CE6TC to Radio Club Temuco, P.O. Box 1234, Temuco, Chile
CE8EIO to Luis A. Fierro Andrate, Mardones 739, Punta Arenas, Chile
CP6EB to P.O. Box 291, Santa Cruz, Bolivia
CT9F to P.O. Box 490, Funchal, Madeira
CX4CB to Juan Carlos Amorin, P.O. Box 74, Montevideo, Uruguay
DJ4TR to Helmut Muschalle, Oberer Kunberg 30, D-89081 Ulm, Germany
DL5PV to Frank Eichstaedt, Mussbacher Str. 7, D-67067 Ludwigshafen, Germany
DL7VBW to Wolfgang Bedrich, Muehlenstr 31, D-13187 Berlin, Germany
EA1FFC to P.O. Box 727, Aviles 33400, Asturias, Spain
EA9BC to Jose, P.O. Box 600, Melilla
EKØAK to P.O. Box 22, 375002 Yerevan, Armenia
EP2MKN to Majid, P.O. Box 1175, Mashad 91375, Iran
ER9V to P.O. Box 6637, 2050 Kishinev, Moldova
EY8MM to Nodir Tursoon-Zadeh, P.O. Box 303, Dushanbe, 734001, Tajikistan
F5TKA to Eric Heidrich, 11 Avenue Leon Blum, F-91100 Corbeil, France
FR5DX to J.H.Vandersteen-Mauduit-Larive, P.O. Box 200, F-97490 Le Tampon, Reunion Island, via France
HB9CVN to Fernando Bernasconi, CH-6717 Dangio, Switzerland
HJØVGJ to Abel, P.O. Box 852, San Andres Island, Colombia
HKØNAF to Leroi Mitchell, P.O. Box 852, San Andres Island, Colombia
HL5FUA to Jongsool Choi, 22 Sadong, Ulreungeup, Ulreung Chungbuk, 799-800, Korea
IØJBL to Luciano Blasi, Via Monte Razzano 75, 00063 Campagnano (RM), Italy
IK1HLG to Frank Imbesi, P.O. Box 155, 17025 Loano (SV), Italy

CQ DX Awards Program

SSB

2200 .....BV5DR

CW

947 .....OH7MSW 948 .....KK7K

SSB Endorsements

320 .....SM6CST/328
320 .....W3GG/328
320 .....I4EAT/328
320 .....W4UNP/328
320 .....YU1AB/328
320 .....F9RM/328
320 .....OE2EGL/327
320 .....K8CSG/327
320 .....4Z4DX/327
320 .....K1UO/327
320 .....KB4HU/326
320 .....W4EEE/326
320 .....WDØBNC/321
320 .....CT1EEB/321
310 .....F6BFI/318
275 .....KQ4WD/284

CW Endorsements

320 .....I4EAT/328
320 .....SM6CST/328
320 .....W2UE/328
320 .....KB4HU/324
300 .....HB9DDZ/305
275 .....YU1AB/294

RTTY Endorsements

275 .....K3UA/282

Total number of active countries is 328. The basic award fee for subscribers to *CQ* is $4. For non-subscribers, it is $10. In order to qualify for the reduced subscriber rate, please enclose your latest *CQ* mailing label with your application. Endorsement stickers are $1.00. Updates not involving the issuance of a sticker are made free when an SASE is enclosed for confirmation of total. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business-size, No. 10 envelope, self-addressed and stamped, to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. DX stations must include extra postage for airmail reply. Please make all checks payable to the awards manager.

CQ World-Wide DX Contest All-Time Phone Records

BY FREDERICK CAPOSSELA, K6SSS

Number groups after calls are: year of operation, total score, contacts, zones and countries. All-band and Multi-Operator records include a band-by-band breakdown of the world leader in each category.

Single Operator/Single Band WORLD RECORD HOLDERS

1.8	UG7GWO('87)	255,852	1,327	12	57
3.5	IG9T('95) (Opr. IV3TAN)	816,959	1,938	33	110
7.0	PJ9U('93) (Opr. OH1VR)	1,199,968	2,637	34	120
14	PYØFM('94) (Opr. PY5CC)	3,202,242	5,109	38	175
21	ZD8Z('94) (Opr. N6TJ)	3,481,925	5,535	36	179
28	ZV5A('91)	2,984,166	5,154	37	156
	AFRICA				
1.8	IG9W('95) (Opr. IV3SHF)	137,020	560	14	71
3.5	IG9T('95) (Opr. IV3TAN)	816,959	1,938	33	110
7.0	IG9A('95) (Opr. IT9GSF)	1,168,855	2,486	35	120
14	ZD8Z('95) (Opr. N6TJ)	2,356,065	3,925	38	167
21	ZD8Z('94) (Opr. N6TJ)	3,481,925	5,535	36	179
28	ZD8Z('91) (Opr. N6TJ)	2,341,866	4,521	33	141
	ASIA				
1.8	UG7GWO('87)	255,852	1,327	12	57
3.5	UW9AF('83)	222,192	554	19	53
7.0	H21A('92) (Opr. 4N4OO)	736,422	1,812	32	107
14	4X6TT('95)	1,557,951	2,877	40	161
21	JAØJHA('92)	1,430,856	2,912	37	130
28	JH1AJT('88)	1,421,070	2,409	38	163
	EUROPE				
1.8	LZ2CJ('84)	107,818	1,319	13	61
3.5	HA8IE('90)	361,343	1,455	35	116
7.0	S59UN('92)	875,875	2,419	37	138
14	OH2BH('92) (Opr. OH2IW)	1,870,170	4,008	39	154
21	CQ4A('90) (Opr. CT1BOP)	1,757,780	3,912	38	141
28	YU3ZV('88)	1,541,603	3,219	39	134
	NORTH AMERICA				
1.8	VE3BMV('86)	52,240	662	14	26
3.5	TI1C('92) (Opr. TI2CF)	498,037	1,695	31	108
7.0	TI1C('94) (Opr. TI2CF)	1,108,140	2,882	31	134
14	KP2A('94) (Opr. KW8N)	2,255,250	4,810	38	156
21	V26N('93) (Opr. KW8N)	2,159,460	4,623	36	150
28	VP2ET('88) (Opr. K5RX)	2,423,880	5,137	37	143
	OCEANIA				
1.8	KH6CC('85)	45,984	484	13	19
3.5	T32AF('85)	222,768	1,064	23	49
7.0	9M8R('95) (Opr.W7EJ)	1,091,835	2,354	37	122
14	ZM1BIL('83)	1,334,232	2,635	38	136
21	AHØAB('82) (Opr. JA3DOC)	1,923,840	4,509	36	108
28	KD7P/NH2('88)	2,309,304	4,885	38	123
	SOUTH AMERICA				
1.8	P49I('95) (Opr. K4PI)	58,653	353	14	43
3.5	P4ØR('87) (Opr. K4UEE)	552,786	1,628	23	91
7.0	PJ9U('93) (Opr. OH1VR)	1,199,968	2,637	34	120
14	PYØFM('94) (Opr. PY5CC)	3,202,242	5,109	38	175
21	ZW5B('93) (Opr. N5FA)	2,834,228	4,524	39	173
28	ZV5A('91)	2,984,166	5,154	37	156

Single Operator/All Band

AF	CT3BH('90) (Opr. OH2BH)	14,892,102	7,177	166	531
AS	H2ØA('94) (Opr. 5B4ADA)	7,618,670	4,522	127	463
EU	S52AA('92)	7,134,192	4,378	151	473
NA	KP2A('93) (Opr. CT1BOH)	13,202,298	8,691	148	506
O	YJ1A('90) (Opr. OH1RY)	9,516,731	6,429	160	381
SA	HC8A('92) (Opr. N6KT)	16,316,568	8,318	160	508
QRP	PJ2FR('87) (Opr. K7SS)	3,171,166	3,212	100	234
Low Pwr.	TJ1GG('92) (Opr. I2VXJ	5,925,760	5,052	96	298
Asst.	P4ØW('94) (Opr. W2GD)	11,224,877	6,323	131	470

WORLD RECORD

Station	Band	QSOs	Zones	Countries
	1.8	125	11	25
HC8A	3.5	357	20	51
(Opr. N6KT)	7.0	638	28	74
(1992)	14.0	1,166	34	111
16,316,568	21.0	2,031	36	127
	28.0	4,001	31	120
	Total	8,318	160	508

Multi-Operator/Single Xmtr.

AF	EA8AGD('88)	17,172,672	8,203	157	547
AS	YM5KA('90)	15,056,664	7,609	164	548
EU	IQ4A('90)	17,255,700	7,253	183	717
NA	VP2EC('92)	16,287,152	7,434	183	685
O	KH2S('91)	11,095,392	7,086	145	387
SA	PJ1B('93)	22,596,570	9,386	164	646

WORLD RECORD

Station	Band	QSOs	Zones	Countries
	1.8	111	10	24
PJ1B	3.5	937	25	94
(1993)	7.0	1,055	29	114
22,596,570	14.0	2,011	38	147
	21.0	1,829	32	139
	28.0	3,443	30	128
	Total	9,386	164	646

Multi-Operator/Multi-Xmtr.

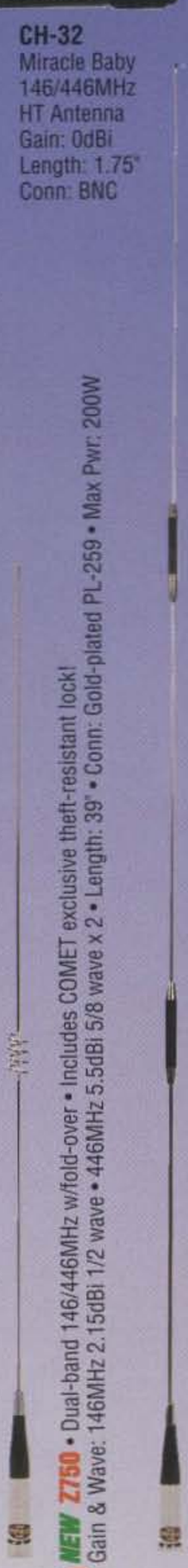
AF	EA9UK('93)	37,140,597	13,547	179	744
AS	EW6V('82)	18,746,136	10,100	142	544
EU	LX7A('89)	26,578,978	14,947	175	751
NA	VP2KC('79)	37,770,012	17,767	175	677
O	KHØAM('90)	35,730,600	16,309	179	565
SA	PJ1B('90)	57,610,400	19,655	189	803

WORLD RECORD

Station	Band	QSOs	Zones	Countries
	1.8	531	19	50
PJ1B	3.5	1,335	24	99
(1990)	7.0	2,104	31	117
57,610,400	14.0	4,860	38	179
	21.0	5,395	38	176
	28.0	5,430	39	182
	Total	19,655	189	803

CH-32
Miracle Baby
146/446MHz
HT Antenna
Gain: 0dBi
Length: 1.75"
Conn: BNC

- **Gold-Plated Connectors**
- **High-Quality Craftsmanship**
- **Unique Fold-Over Feature**



THEFT

NEW **Z750** • Dual-band 146/446MHz w/fold-over • Includes COMET exclusive theft-resistant lock!
Gain & Wave: 146MHz 2.15dBi 1/2 wave • 446MHz 5.5dBi 5/8 wave x 2 • Length: 39" • Conn: Gold-plated PL-259 • Max Pwr: 200W

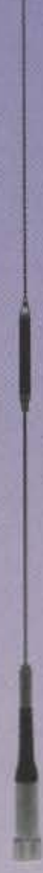
THEFT

NEW **Z780** • Dual-band 146/446MHz w/fold-over • Includes COMET exclusive theft-resistant lock!
146MHz 6/8 wave 4.5dBi • 446MHz 5/8 wave x 3 7.2dBi • Length: 62" • Conn: Gold-plated PL-259 • Max Pwr: 150W

NEW **SBB-15** • Tri-band 52/146/446MHz w/fold-over **NEW BLACK COLOR**
Gain & Wave: 52MHz 0dBi 1/4 wave • 146MHz 4.5 dBi 6/8 wave • 446MHz 7.2dBi 5/8 wave x 3 • Length: 58" • Conn: PL-259 • Max Pwr: 120W

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

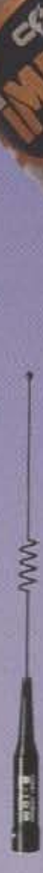
NEW **SBB-5/SBB-5NMO** • Dual-band 146/446MHz w/fold-over **NEW BLACK COLOR**
Gain & Wave: 146MHz 2.5dBi1/2 wave • 446MHz 5.5dBi 5/8 wave x 3 • Length: 39" • Conn: SBB-5 PL-259/SBB-5NMO NMO • Max Pwr: 120W



CX-224/CX-224NMO • Tri-band 146/220/446MHz w/fold-over
Gain & Wave: 146MHz 2.15dBi 1/2 wave • 220MHz 3.5dBi 5/8 wave • 446MHz 6.0dBi 5/8 wave x 2 • Length: 36" • Conn: CX-224 PL-259, CX-224NMO NMO • Max Pwr: 100W

B-20/B-20NMO • Dual-band 146/446MHz w/fold-over
Gain & Wave: 146MHz 2.15dBi 1/2 wave • 446MHz 5.0dBi 5/8 wave x 2 • Length: 30" • Conn: B-20 PL-259/B-20NMO NMO • Max Pwr: 50W

SH-55 • Super Flexible 146/446MHz HT Antenna
Gain: 146MHz 1.5dBi • 446MHz 3.2dBi • Length: 15.5" • Conn: BNC • Max Pwr: 10W



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

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CIRCLE 180 ON READER SERVICE CARD

CQ World-Wide DX Contest All-Time CW Records

BY FREDERICK CAPOSSELA, K6SSS

Single Operator/Single Band

WORLD RECORD HOLDERS

1.8	OHØMEP('95)	251,136	1,451	24	85
3.5	NP4A('88) (Opr. K1ZM)	808,640	2,243	31	102
7.0	YV5A('95) (Opr. OHØXX)	1,364,465	3,095	35	122
14	P4ØV('91) (Opr. N7NG)	1,883,700	3,521	38	142
21	ZPØY('93) (Opr. K4UEE)	1,869,978	3,627	35	139
28	CXØCW('90) (Opr. CX8BBH)	1,890,607	3,795	39	128

AFRICA

1.8	EA8AK('82)	75,768	385	15	51
3.5	EA8XS('88) (Opr. OH5XT)	516,390	1,649	24	81
7.0	EA9EO('94) (Opr. EA7TL)	1,122,506	2,503	34	120
14	ED9ED('90)	1,444,436	3,063	37	121
21	CR3W('92) (Opr. DF5UL)	1,652,170	3,092	38	141
28	ZS6BCR('91)	1,397,658	3,209	34	112

ASIA

1.8	4X4NJ('95)	200,735	756	20	75
3.5	ZC4DX('87) (Opr. 4Z4DX)	430,560	1,318	29	88
7.0	C41A('93) (Opr. T93A)	1,307,944	2,972	34	133
14	7L1GVE('92)	1,181,937	2,255	40	139
21	4Z4T('91) (Opr. 4Z4UT)	939,900	2,240	36	120
28	4Z5DX('90)	826,759	2,003	39	120

EUROPE

1.8	OHØMEP('95)	251,136	1,451	24	85
3.5	ON4UN('95)	642,600	2,204	35	118
7.0	S59UN('92)	971,049	2,484	38	135
14	OHØBH('94) (Opr. OH2MAM)	1,003,353	2,957	39	130
21	OH6MCW('89)	775,620	2,208	37	102
28	9H1EL('92)	794,846	2,249	39	120

NORTH AMERICA

1.8	VO1NA('93)	148,050	661	20	70
3.5	NP4A('88) (Opr. K1ZM)	808,640	2,243	31	102
7.0	ZF2TG('92) (Opr. WQ5W)	1,087,862	2,985	31	111
14	KP2A('94) (Opr. KW8N)	1,332,460	3,115	38	132
21	V29W('90) (Opr. KD6WW)	1,110,512	2,829	37	115
28	J79DX('89) (Opr. AA5DX)	859,360	2,661	33	98

OCEANIA

1.8	KH6CC('93)	68,250	547	18	24
3.5	VR3AH('76)	178,560	956	24	40
7.0	ZL3GQ('94)	672,612	1,732	36	102
14	ZL3GQ('91)	1,148,418	2,396	36	126
21	N7DF/NH2('89)	1,205,776	2,977	37	99
28	KD7P/NH2('88)	1,037,608	2,456	38	105

SOUTH AMERICA

1.8	YV3AGT('85)	147,588	591	21	63
3.5	P4ØJ('95) (Opr. WX4G)	641,245	1,650	28	103
7.0	YV5A('95) (Opr. OHØXX)	1,364,465	3,095	35	122
14	P4ØV('91) (Opr. N7NG)	1,883,700	3,521	38	142
21	ZPØY('93) (Opr. K4UEE)	1,869,978	3,627	35	139
28	CXØCW('90) (Opr. CX8BBH)	1,890,607	3,795	39	128

Single Operator/All Band

AF	EA8EA('91) (Opr. OH2MM)	13,225,295	6,490	171	514
AS	JY8VJ('92) (Opr. DL1VJ)	8,031,168	4,900	141	432
EU	ZB2X('93) (Opr. OH2KI)	6,129,904	4,606	147	491
NA	TI1C('93) (Opr. N6TR)	9,123,817	6,335	159	448
O	AH3C('90)	6,798,363	4,539	172	335
SA	P4ØF('94) (Opr. KRØY)	12,393,150	6,557	150	488
QRP	HI8A('91) (Opr. JA5DQH)	3,316,768	3,320	117	325
Low Pwr.	9X4WW('95) (Opr. ON4WW)	4,121,685	3,439	111	294
Asst.	P4ØW('94) (Opr.W2GD)	10,288,950	5,541	155	460

WORLD RECORD

Station	Band	QSOs	Zones	Countries
EA8EA (1991) 13,225,295	1.8	254	14	57
	3.5	567	21	64
	7.0	1,114	30	90
	14.0	1,405	37	108
	21.0	1,374	36	100
	28.0	1,776	33	95
	Total	6,490	171	514

Multi-Operator/Single Xmtr.

AF	EA9EA('91)	13,096,080	5,854	170	582
AS	TA5KA('90)	13,915,044	7,201	175	527
EU	LZ9A('89)	9,962,386	5,342	200	626
NA	J6DX('93)	11,691,029	7,180	159	532
O	KH2S('92)	7,249,952	4,306	169	399
SA	HC8N('95)	14,302,820	7,252	162	503

WORLD RECORD

Station	Band	QSOs	Zones	Countries
HC8N (1995) 14,302,820	1.8	374	14	46
	3.5	712	26	77
	7.0	1,770	36	115
	14.0	2,128	37	119
	21.0	1,845	29	103
	28.0	423	20	43
	Total	7,252	162	503

Multi-Operator/Multi-Xmtr.

AF	CN5N('90)	33,659,256	14,179	178	644
AS	VS6WO('92)	17,799,960	9,841	190	570
EU	LX7A('89)	20,497,632	12,735	189	705
NA	KP2A('88)	32,325,150	15,198	191	631
O	KHØAM('92)	23,951,385	11,253	190	527
SA	PJ1B('88)	38,415,760	14,921	194	672

WORLD RECORD

Station	Band	QSOs	Zones	Countries
PJ1B (1988) 38,415,760	1.8	717	17	65
	3.5	1,447	24	83
	7.0	3,119	37	133
	14.0	3,791	40	140
	21.0	2,997	39	134
	28.0	2,850	37	117
	Total	14,921	194	672

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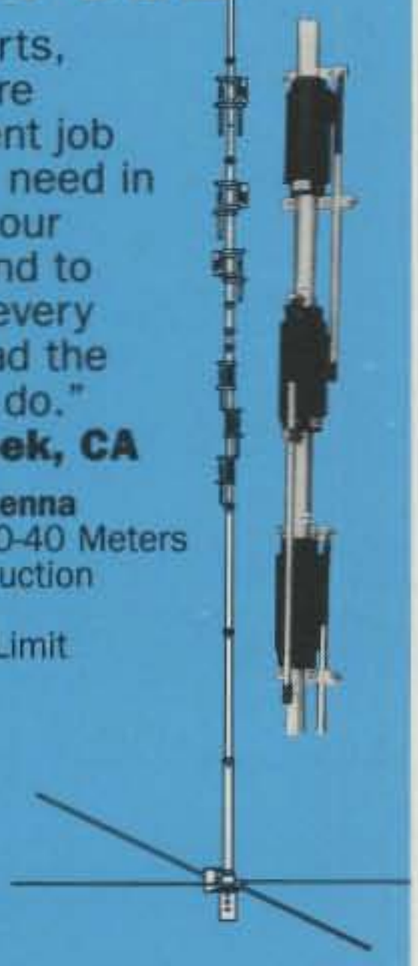

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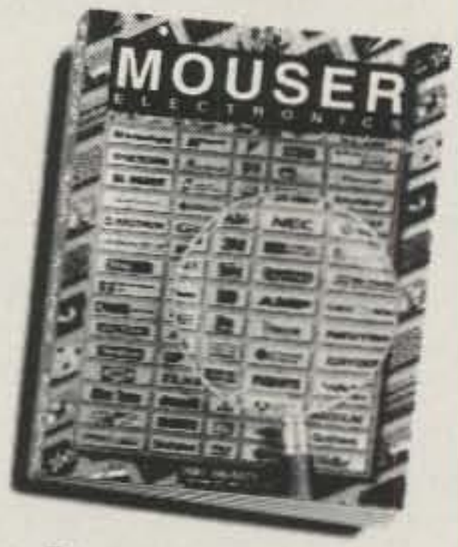

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CIRCLE 58 ON READER SERVICE CARD

CQ World-Wide DX Contest All-Time U.S.A. Records

BY FREDERICK CAPOSSELA, K6SSS

Tabulated below are the record-high scores achieved by U.S. Contesters in the CQ World-Wide DX Contest. Number groups following calls and bands are: year of operation, total score, contacts, zones, and countries.

PHONE

Single Operator/Single Band

1.8	K1ZM('95)	55,420	215	15	70
3.5	K1ZM('92)	223,971	742	28	93
7.0	KC7EM('95)	409,446	1,083	34	95
14	K1OX('85) (Opr. KC1F)	1,131,328	2,176	36	140
21	K3RV/4('88)	1,270,478	2,298	39	148
28	WØZV('88)	1,145,368	2,158	39	142

Single Operator/All Band

Station	Band	QSOs	Zones	Countries
K1AR (1992) 7,810,446	1.8	24	10	21
	3.5	239	15	73
	7.0	311	26	88
	14.0	969	39	133
	21.0	913	33	125
	28.0	1,292	32	119
	Total	3,748	155	559

QRP

KR2Q('90)	1,246,974	1,069	106	305

Low Power

N8II('92)	1,864,747	1,424	114	365

Assisted

WM5G('92) (Opr. KRØY)	6,631,513	2,800	171	662

Multi-Operator/Single Xmtr.

Station	Band	QSOs	Zones	Countries
K1AR (1990) 11,193,606	1.8	32	12	30
	3.5	197	18	76
	7.0	154	26	95
	14.0	1,370	39	167
	21.0	1,167	38	165
	28.0	1,517	37	170
	Total	4,437	170	703

Multi-Operator/Multi-Xmtr.

Station	Band	QSOs	Zones	Countries
N2RM (1992) 19,603,032	1.8	95	14	41
	3.5	485	23	98
	7.0	721	32	128
	14.0	1,654	40	178
	21.0	2,367	40	178
	28.0	1,688	36	170
	Total	7,010	185	793

CW

Single Operator/Single Band

1.8	K1ZM('95)	142,358	470	23	83
3.5	K1ZM('92)	416,160	1,059	30	106
7.0	K1ZM('90)	839,520	1,783	34	125
14	KM1H('93) (Opr. KQ2M)	1,001,035	1,892	39	146
21	W7WA('89)	772,146	1,647	39	119
28	K1ZM('89)	732,564	1,447	37	134

Single Operator/All Band

Station	Band	QSOs	Zones	Countries
N4RJ (Opr. KM9P) (1992) 5,851,152	1.8	34	13	27
	3.5	170	21	65
	7.0	687	34	104
	14.0	696	37	114
	21.0	709	35	107
	28.0	670	32	92
	Total	2,966	172	509

QRP

AA2U('92)	1,188,000	938	118	332

Low Power

N8II('92)	2,008,982	1,419	135	368

Assisted

K3WW('93)	5,056,464	2,499	160	547

Multi-Operator/Single Xmtr.

Station	Band	QSOs	Zones	Countries
K1AR (1989) 9,383,459	1.8	36	16	33
	3.5	313	26	75
	7.0	920	35	100
	14.0	1,139	37	128
	21.0	773	39	123
	28.0	920	37	129
	Total	4,101	150	588

Multi-Operator/Multi-Xmtr.

Station	Band	QSOs	Zones	Countries
K1AR (1992) 19,473,615	1.8	106	16	59
	3.5	726	29	107
	7.0	1,862	37	141
	14.0	1,721	39	156
	21.0	1,584	37	154
	28.0	1,128	34	136
	Total	7,127	192	753

Club Record: Frankford Radio Club ('92) 389,564,535
Team Contesting: Phone—Southern California Contest Club #1 ('92) 53,779,847
CW—Southern California Contest Club #1 ('93) 45,194,836

CIRCLE 34 ON READER SERVICE CARD

CIRCLE 41 ON READER SERVICE CARD

CIRCLE 40 ON READER SERVICE CARD

BY JOHN DORR, K1AR

CONTEST CALENDAR

NEWS/VIEWS OF ON-THE-AIR COMPETITION

Tips for Improving Your SSB Contesting Skills

October's Contest Tip

Are you continuously frustrated by your paddle moving about your operating desk? Now I don't mean the kind of "virtual" movement that occurs after 48 hours of non-stop contesting, but the type that happens while you're trying to send "Mississippi." One friend recently suggested taking a quality mouse pad and drilling holes that align with the feet on the paddle. Not only will it provide a more comfortable operating position, but it will hold that paddle exactly where it belongs!

I received so much response to last month's column "Improving CW Contest Skills" that it only seemed right to focus on phone in this month's edition. It seems that much more has been written over the years about improving one's CW skills than about SSB operating. Perhaps this is based on the assumption that CW is a more difficult operating mode. After all, on SSB the skill is simply to talk fast with clarity, right? As you'll see this month, nothing could be further from the truth.

I believe that more training is possible for an SSB-challenged operator than for one who has problems with CW. One reason is that we all begin with an ability to talk and speak a language. CW operating adds the complexity of "learning the code" before you even consider proficiency. Now while it's clear that some contesters seem to have God-given talents, there's plenty of opportunity to improve anyone's skillset. When considering SSB operating proficiency, a few skill categories come to mind: calling CQ, timing, phonetics, and a myriad of miscellaneous topics. With these subjects in mind, let's dive into the meat of the study.

Calling CQ

The act of calling CQ seems simple enough, yet it is a skill in and of itself in the world of contesting. Consider one of the main goals of contesting: to make as many QSOs in as short a period of time as possible. Having said that, does it make sense to call CQ Contest like you would if you were DXing on a Tuesday afternoon? Calling an effective "contest" CQ requires several attributes, which include brevity, clarity, emphasis on your callsign, energy, and speed that reflects the conditions at the time. Let's unpack each of these areas in some more detail.

There's rarely, if ever, a scenario in which a long-winded CQ becomes a productive strategy in an SSB contest. Remember, the longer you're transmitting, the longer you're not working someone. Many stations simply will tune right by you, especially if you don't have one of the bigger signals on the band.

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Calendar of Events

Sept.	**28-29**	**CQ WW RTTY Contest**
Sept.	28-29	Scandinavian SSB Activity Contest
Sept.	29-30	Tennessee QSO Party
Sept.	29-30	Classic Radio Exchange
Oct.	5-6	California QSO Party
Oct.	5-6	VK/ZL SSB Contest
Oct.	6	RSGB 21/28 MHz SSB Contest
Oct.	9-11	YLRL CW Anniversary Party
Oct.	12-13	Pennsylvania QSO Party
Oct.	12-13	VK/ZL CW Contest
Oct.	20	RSGB 21/28 MHz CW Contest
Oct.	20-21	Illinois QSO Party
Oct.	23-25	YLRL SSB Anniversary Party
Oct.	**26-27**	**CQ WW DX SSB Contest**
Nov.	2-4	ARRL CW Sweepstakes
Nov.	8-10	Japan Int'l DX SSB Contest
Nov.	9-10	Worked All Europe RTTY Contest
Nov.	16-18	ARRL SSB Sweepstakes
Nov.	**23-24**	**CQ WW DX CW Contest**
Dec.	7-9	Telephone Pioneer QSO Party
Dec.	14-15	TARA RTTY Sprint
Dec.	16-17	Worldwide Naval Contest
Dec.	21-22	Croatian CW Contest
Dec.	29	RAC Canada Winter Contest

Speaking with a clear, unambiguous voice is an important attribute to phone operating. Just like your mother used to say, never mumble your words. While you can only control your signal strength to a certain point, articulation is entirely up to you.

When calling CQ, what is the one piece of information that the other station doesn't have? You guessed it: your callsign. For that reason, it makes sense to emphasize that in your CQing style. Spending less time saying the words "CQ Contest" and more time signing your callsign will pay dividends.

Energy and speed go hand-in-hand when CQing. A station is much more likely to call you if you show some animation in your voice. Make it sound like you're really into the event when you're transmitting, even when you're exhausted. This approach is infectious and will draw stations to your calls. Speed is part of this equation as well. If you have a "snappy" approach to operating, the favor will be returned by most stations. Dull, uninspiring CQs are not the order of the day with phone contest operating. Also, remember that while speed is essential in most operating contexts, you don't want to sound like a speeding maniac when CQing on a nearly dead band or a QRN-laden low frequency. Also, it sometimes pays to slow things a little, especially when you're trying to attract calls from rare/unusual multipliers who may not be operating competitively in the contest.

Timing

They say in life that timing is everything and so it is with contest operating, too. Timing in pileups has as much to do with eventually working another station as does your signal strength. My experience in phone pileups is that short calls with small breaks in between is one of the best operating methods you can use to be successful. There will be a rare need to sign the other guy's call; after all, he already knows that!

Every pileup has its own characteristics. There's a kind of ocean wave effect to most pileups that is a timing opportunity for you. The secret to effective calling in phone pileups (and CW ones also, for that matter) is to call when others are not. If the pileup is big, delay the start of your call by a second or two. You want to be the guy whose callsign hangs out at the end of a series of calls so that the other station can say, "Something Alpha Radio, you're 5934!"

Tailending is another operating technique unto itself. Simply put, it is a calling method whereby you sign your call at the end of another person's QSO. You have to dance a fine line of acceptable calling procedure, with the guideline being that you never eradicate information the other station is trying to copy (i.e., callsign, exchange, etc.). That's one certain way you'll end up out of his log!

Tailending begins by trying to get a feel as to whether the other station accepts that kind of operating procedure. Ultimately, there's really only one way to find out, and that's to try to see if it works (or if you get yelled at!). Just as with any pileup situation, the secret is very simple: Get your callsign heard when others are not calling.

Phonetics

The use of phonetics seems so simple, yet many operators are poor at its application. Always remember why we use phonetics on SSB: It's not so that we can sound cute or cool, but so that we can help the other station copy our callsign correctly. For that reason alone, always use common words for phonetics. The standard Alpha, Bravo, Charlie phonetic list was created for just that reason. While using "Kill One Albino Rabbit" may be cute, it'll get "lost in the sauce" during a contest.

Another common error in the use of phonetics is that we sometimes get stuck in a rut with our word choices. For example, I tend to be a Kilo One Alpha Radio kind of guy. Never forget to change the phonetics you're using if you're having trouble working someone. Your word choice may be a challenge to a non-English speaking operator, or it just may not break through a pileup as well as another selection. Consider the tradeoffs for phonetic choices such as "United vs. Union" or "Easy vs. Echo" or "Uncle vs. Uniform." Sharp, ear-piercing words are almost always more effective in phone operating.

Miscellany

There are a class of operating techniques that fit into the miscellany category. With that in mind, let me ramble for a bit!

Like most contest operators, I hate QRM. I

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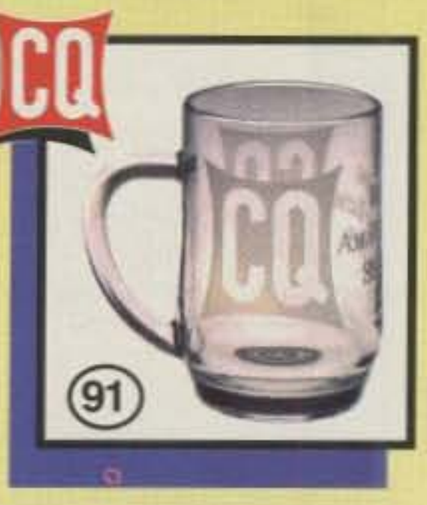

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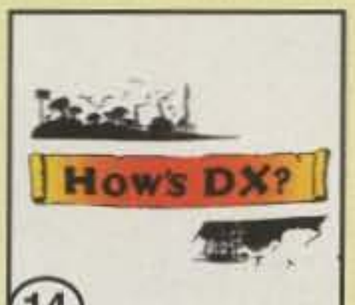


W3AU in person and still ready to climb at 76 years young.

live for the day when 10 meters comes back to life so that I can hide high in the band and run guys for hours and be free of QRM. Unfortunately, in today's 20 meter SSB scenario, we all are left to "duke it out," fighting for precious running real estate on the band along with hundreds of others. One technique I use is to preemptively strike when someone asks if my frequency is in use. By that I mean drop everything and respond. I do this even if the station is slightly off my "zero beat" frequency. Most stations will move immediately if you catch them right at the end of their first CQ. They are just as likely to stay if you don't respond right away! For this reason, I'll react right in the middle of an active QSO, if I have to, to maintain my frequency, even if I end up losing the QSO. In my book, a clear frequency is worth much more than a couple of lost QSOs here and there. I've also noticed that many incomplete QSOs end up being "reworked" later on, so that the scoring loss is minimized by the end of the contest.

Another factor to consider is the quality of your transmitter's audio. There are an amazing number of stations on the band with simply terrible, uninspiring audio. And despite our reputation, contest audio is not generated by turning your processor all the way up. It does mean, however, that you need to evaluate audio settings on your transceiver—especially if it is new or unfamiliar to you. You should also invest in a high-quality microphone. Again, there is not a 1:1 VSWR between money spent and desired audio. Do your homework and make extensive tests before the contest. It's a shame to have all the operating pieces in place with the exception of your transmit audio. As an aside, I should mention that the same analysis applies to digital voice recorders. How many stations can you think of that sound just great until they hit the F1-key in their computer logging program?

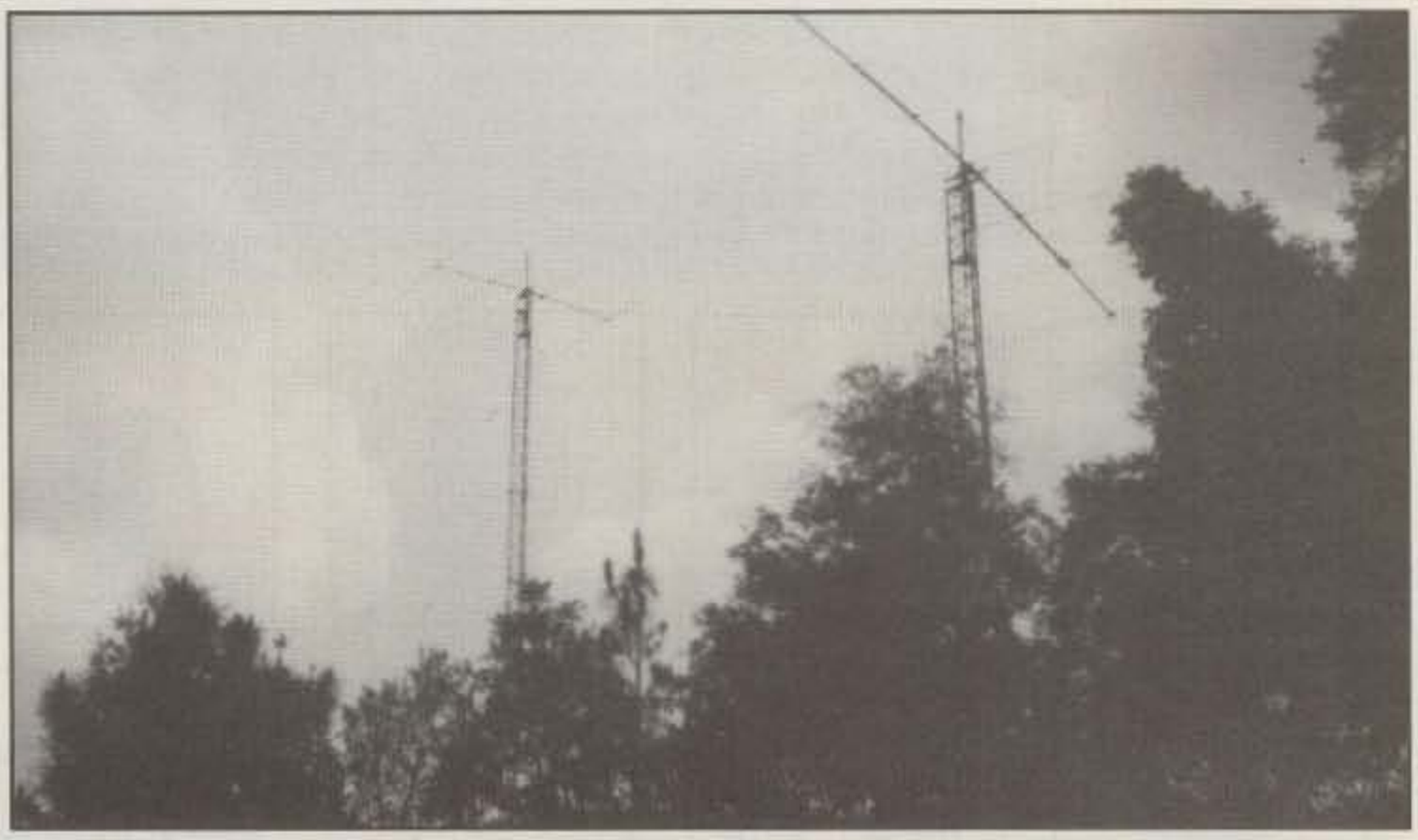
Finally, I'd be remise if I didn't take the opportunity to point out the perils that come from not signing your entire callsign when calling someone. Not only is this poor contest operating, but it is a terrible practice for any mode of amateur radio activity. Simply put, signing a partial version of your call will almost always slow the other station down, resulting in an extra transmission to "fill in" the missing data. Unfortunately, this technique has grown from the net operations around the bands and has extended itself into contesting as well. Common sense should prevail here. If a station can copy your callsign in its entirety, what advantage comes from just signing part of it?

Only The Surface

As you can imagine, I've only scratched the surface of phone operating techniques. Hopefully, you've gained some insight that will improve your next contest score. I'd like to hear about some of the tangible results that you obtained from this discussion.

For You Old-Timers

Some of you may recall one of contesting's icons from the 1960s and '70s, Ed Bissell, W3AU (formerly W3MSK). I, along with many others including K3EST, cut my contest teeth at Ed's Maryland superstation back in the '70s. We used impressive hardware that still would pass muster in today's competitive climate.



Here are a few of the antennas at W3AU. Left to right: tower 1 supports a 7-element 15 meter Yagi on a 48 foot boom at 85 feet; tower 2 holds a 204BA at 125 feet.

Although Ed has long since moved to Florida, a recent e-mail thread asked the question, "Is W3AU still active?" Well, much to my delight, I can report that one of contesting's fathers is still with us and up to his old tricks. Still doing it at 76 years young, Ed's been hamming since 1934. And as you can see by the pictures he sent me, he's not exactly rolling over in retirement, as evidenced by his homemade 15 and 20 meter monobanders.

By the way, if you're ever in Florida and need a car, Ed can take care of that, too! When he's not climbing towers, he sells used cars. Can we trust a fellow contester to sell you that cherry-new '87 Chevy in the lot?

Final Comments

As most of you are reading this, the CQ WW is almost upon us. As always, I wish each of you the best of luck (except in my category, of course!). Remember, the main objective in contesting above everything else is to have fun. Make sure you do that this year!

Please remember that the Contest Calendar deadline for the January issue is November 1st.

73, John, K1AR

California QSO Party

1600Z Sat. to 2200Z Sun. Oct. 1–2

This year's party is being sponsored by the Northern California Contest Club. Effort will be made to activate all CA counties and make this the most successful of all state parties.

Operating time is limited to 24 out of the 30-hour contest period for single operator stations (multi-ops may use the entire 30 hours). Off-times must be at least 15 minutes and clearly indicated in the log.

The same station may be worked on each band and mode, and CA stations may contact other in-state stations for QSO and multiplier credit. CA mobiles may be worked in each county change.

Classes: Single operator, multi-single, multi-multi, California county expedition, mobile, and Novice/Technician.

Exchange: QSO number and QTH. County for CA stations; state, province, or DX country for others.

Scoring: Two points for phone contacts; 3 points on CW.

Multiplier: CA stations use states (50) and VE call areas (8). VO/VE1–7 and VY1/VE8. Out-of-state entries use CA counties (maximum 58).

Final Score: Total QSO points times the sum of the multipliers.

Frequencies: 160 meters through 2 meters, except WARC bands. CW—1805 and 40 kHz up from band edge. Phone—1815, 3850, 7230, 14250, 21300, 28450. Novice—10 kHz up from edge of Novice bands and 28450. Try CW on the half hours; 147.54 at 2000Z, 0000Z, 0400Z; 160 at 0500Z; and 80 at 0300Z and 0700Z.

Awards: Certificates to the highest scoring single operator in each state, province, and country; also each CA county and stations scoring 100 or more QSOs. There are also many trophies, including single operator, top three out-of-state, and CA top three. Also, CA county expedition, and a special award for stations making the most CW QSOs, multi-single and multi-multi winners in CA, and county expedition. The CA mobile team making the most QSOs and the top scorer outside the United

States and Canada, high-scoring low-power entry (less than 200 watts) will also receive a trophy. A special award of a personalized bottle of California wine goes to the top 20 single operators in CA and out of state and to the top-scoring Novice/Tech entry, both in CA and out of state.

Include a summary sheet showing the scoring, etc., and a dupe sheet if you make more than 200 QSOs, with a large SASE for a copy of the results. Entries may be submitted in CT Ver. 8 format with a signed hard-copy summary sheet.

The mailing deadline is November 15th and entries go to: NCCC c/o Ken Anderson, K6PU, Box 853, Pine Grove, CA 95665. A contest paperwork packet containing log, summary sheet, contest records, county abbreviations, and special awards list is available by sending a large SASE to K6PU.

VK/ZL/Oceania DX Contest

SSB: Oct. 1–2 CW: Oct. 8–9
1000Z Saturday to 1000Z Sunday

This is the 59th year of the VK/ZL contest. Use all bands, 1.8–28 MHz, except WARC bands. Oceania stations can work anyone. The rest of the world can work VK, ZL, and Oceania stations only. The same station may be worked on each band for QSO and multiplier credit.

Exchange: RS(T) plus a three-figure QSO number starting with 001.

Points: For each contact score 20 points on 160, 10 points on 80, 5 points on 40, 1 point on 20, 2 points on 15, and 3 points on 10 meters.

Multiplier: Each VK/ZL/O prefix worked on each band.

Final Score: Total QSO points from all bands times the sum of the prefix multiplier from each band.

Awards: Special large, color certificates to the top scorers in each country and each continental are available.

There is an SWL section. Only VK/ZL/O station are logged. Call of station being worked and RS(T) being sent must be reported. Scoring is the same as above, but both SSB and CW scores are combined for final score (maximum total of 24 hours).

Use a separate log sheet for each band and underline each new VK/ZL/O prefix as it is worked on each band. Include a summary sheet showing the scoring and other essential information, and the usual signed declaration indicating that all rules and regulations have been observed.

This year contest logs go to NZART Contest Manager John Litten, ZL1AAS, 146 Sandspit Road, Howick 1705, New Zealand. They must be postmarked by November 15 for SSB and November 22 for CW.

Pennsylvania QSO Party

1600–0500Z Sat.–Sun., Oct. 8–9
1300–2200Z Sun., Oct. 9

This one is sponsored by the Nittany ARC of State College, Pennsylvania. The same station may be worked on each band and mode for QSO points. PA stations may also work other in-state stations for QSO and multiplier credit, and mobiles in each county.

Classes: Single operator low power, high power, QRP, multi-single, multi-multi, portable, Novice/Technician, and mobile.

Exchange: QSO number and county (PA stations); ARRL section or DXCC country for others.

Scoring: One point for SSB contacts, 1.5 points for CW, 2 points on 80 or 160 meters.

PA stations multiply total by (ARRL sections + PA counties + 1 DX country) a maximum of 150. Others use PA counties for their multiplier (total of 67 possible).

Mobiles add 500 points for each county operated from, with a minimum of 10 QSOs. Mobiles on a county line give one QSO number but receive credit for 2 multipliers. QRP stations multiply their score by 2; Novice/Tech by 3. Final score is total QSO points times multipliers.

Frequencies: CW—1810 kHz and 40 kHz up from bottom of each band. SSB—1850, 3980, 7280, 14280, 21380, 28310 kHz. Try 160 meters at 0300Z on Sunday.

Awards: Plaques will be awarded to the top entries in all entry divisions plus single operator USA Time Zones, EPA, WPA, and others as warranted. Certificates will be sent to county and section winners.

Logs must be postmarked no later than November 13 and should be sent to: Douglas Maddox, W3HDH, Nittany Amateur Radio Club, Box 614, State College, PA 16804-0614. An information package is available for the contest by sending a #10 SASE to the sponsor's address.

XVII Iberoamericano Contest

2000Z Sat. to 2000Z Sun. Oct. 8–9

Organized by "Unio Radioaficionats del Valles Oriental" and by "CQ Radio Amateur de Boixareu Editores," this contest will be sponsored every year the week before October 12th to commemorate the anniversary of the discovery of America. This a phone-only contest with the emphasis on Latin-American areas.

Classes: Single operator and multi-operator, single transmitter; both Latin-American and non Latin-American. Single operator EC (EA novice), QRP, less than 5 watts output, and SWL.

Exchange: RS plus a progressive QSO number (001, etc.).

Bands: All six bands, 1.8 through 28 MHz, SSB only.

Points: Latin-American stations score one point per QSO. Non-Latin-Americans, 3 points per QSO with Latin-Americans, 1 point with other non-Latin-Americans.

Multiplier: Latin-Americans use the DXCC list. Non-Latin-Americans use the following country list: CE, CO, CP, CR, CT, CX, C3, C9, DU, EA, HC, HI, HK, HP, HR, HT, KP4, LU, OA, PY, TG, TI, XE, YS, YV, ZP, 3C, and DXCC dependencies.

Final Score: Total QSO points from all bands times the sum of the multipliers from all bands.

SWL: Same rules apply to SWL entries. The same station cannot be logged more than 15% of the total logged. And the same station can only be logged again after 5 other entries.

Penalties: Taking credit for excessive duplicate contacts, and violation of rules and amateur radio regulations could result in disqualification.

Awards: Certificates will be issued to the highest scorers in each DXCC country. Participation certificates will go to non-Latin-American stations making 50 or more QSOs. There are plaques for overall winning scorers showing at least 4 hours of operation and 100 or more QSOs.

Mailing deadline for entries is November 30 to: Concurso Iberoamericano, c/ Concepcion Arenal 5, 08027 Barcelona, Spain.

Illinois QSO Party

1800Z Sun. to 0200Z Mon., Oct. 9–10

This is the 32nd anniversary of the Illinois QSO Party sponsored by the Radio Amateur Megacycle Society. It's short; only 8 hours long.

Stations may be worked once per band and mode, and IL stations can contact other in-state stations for QSO and multiplier credit.

Exchange: RS(T) and QTH. County for IL stations; state, VE province, or DX country for others.

Scoring: One point for phone contacts, 2 points for CW. Illinois stations multiply total QSO points by (states + provinces + IL counties + maximum of 5 countries) worked. Additional DX QSOs count for points but not multiplier. Others use IL counties for their multiplier (maximum of 102). Illinois mobiles add 200

points to final score for each county from which 10 or more QSOs were made.

Frequencies: CW—3550, 7050, 14050, and 30 kHz above bottom edge of Novice subbands CW and 28390 phone. SSB— 3890, 7290, 14290. Other bands may also be used.

Awards: Certificates will be sent to the top 10 scoring IL fixed stations; 5 IL mobiles; winners in each state, province, county; and the highest club/team aggregate score. A plaque goes to the top-scoring Illinois station (fixed and mobile).

Logs: Indicate band and mode, circle each new multiplier, and IL mobiles must indicate each county change. Stations with over 100 QSOs must submit a dupe sheet.

A summary sheet showing the scoring and the usual signed declaration is also requested. Mailing deadline for logs is November 7 to: RAMS, 3620 N. Oleander, Chicago, IL 60634. Enclose an SASE for contest results.

JARTS WW RTTY Contest 1996

0000Z Sat., Oct. 15 to 2400Z Sun., Oct. 16

This is the third WW RTTY Contest sponsored by the Japanese Amateur Radio Teleprinter Society, JARTS, and it is open to amateurs worldwide on 80–10 meters.

Classes: Single operator all band, multi-op single transmitter, and SWL.

Exchange: RST and operator age (00 is acceptable for YLs). All multi-operator stations send 99 for age.

Scoring: Count 2 points for QSOs in your continent and 3 points outside of your continent. Multipliers are each DXCC country worked and JA/VK/W/VE call area. Multipliers count once per band. You can work your own country or call area for a multiplier.

Final Scoring: Final score is total QSO points times multiplier.

Frequencies: 3520–3525, 7025–7040, 14070–14112, 21070–21125, 28070–28150 kHz.

Awards: Plaques will be awarded to the top scorer in each operating class. Certificates will be sent to the top five winners in each operating class and continent. Special participation awards will be sent to the remaining top 12 stations in each category.

The mailing deadline for logs is December 31. Logs can be sent to: JARTS Contest Manager, Hiroshi Aihara, JH1BIH, 1-29 Honcho, 4 Shiki, Saitama, 353 Japan.

YLRL Anniversary Party

CW: Oct. 12–14 SSB: Oct. 26–28
1400–1359Z, Wed.–Fri.

This is the 55th annual party run by the YL Radio League. It is open to all YLs around the world. Activity will be found on all bands, 10 through 80 meters, and will be between YLs only. CW and SSB are separate contests and require separate logs. A station may be worked once on each band for contest credit.

Exchange: QSO no., RS(T), and QTH; U.S. state, VE province, or DX country.

Scoring: One point per QSO between stations within the U.S. and Canada (including Alaska and Hawaii). Two points for contacts with stations in other areas. DX YLs score 2 points for QSOs with the U.S. and Canada and with other continents, but 1 point with stations in own continent.

Final Score: Multiply total QSO points from all bands by the sum of states, provinces, and DX countries worked. There is a low-power bonus multiplier of 1.5 for stations using 100 watts or less on CW and 200 watts PEP on SSB. For each duplicate contact removed from your log there is a penalty of 3 additional and equal contacts removed from your log.

Frequencies: CW—3555, 7055, 14055, 21135, 28195. SSB—3955, 7255, 14265, 21395, 28395 (plus or minus 15 kHz). Look in DX portions of band on 40 and 80 meters.

Awards: Certificates to winning scorers in each district, province, and DX country, and first-, second-, and third-place overall winners. There are cups and plaques for YLRL members in North America and DX countries.

Include a summary sheet with your entry showing the scoring and other essential information. Logs must be in their original form, no carbon copies. Entries must be received by November 30, and this year logs go to: L. Carla Watson, YLRL Contest Logs, 473 Palo Verde Drive, Sunnyvale, CA 94086.

Texas QSO Party

1400Z Sat. to 2200Z Sun., Oct. 22–23

This is one of the more popular QSO parties and is sponsored by the Texas DX Society. Stations work as many Texas QSOs as possible (Texas works everyone). Operators may work no more than 24 hours and off-times must be at least 30 minutes.

Classes: Single operator, fixed/mobile; multi-single, fixed/mobile.

Exchange: Name and state/province; VE/DX stations send name only. Texas stations send name and county.

Frequencies: CW—50 kHz up from bottom of bands; SSB—3850, 7230, 14250, 21350, 28450; Novice—3710, 7110, 21110, 28110, 28450 kHz.

Scoring: Score one point/QSO on SSB and 2 points/QSO on CW. Non-Texas stations score 5 points for Texas mobiles on SSB and 7 points on CW.

Multipliers: Texas stations use Texas counties, stations, VE call areas, and DXCC countries. All others use Texas counties. Final score is total QSO points times total multiplier.

Awards are available to the winners of each category. Send summary sheet, logs, multiplier and dupe sheets, and signed statement by November 30 to TXDS, Box 540291, Houston, TX 77254-0291.

CQ World-Wide DX Contest

Phone: Oct. 29–30 CW: Nov. 26–27
0000Z Saturday to 2400Z Sunday

Complete rules for the contest were published in last month's issue. With the growing number of entry categories, be sure to list your entry category on your summary sheet.

A few trophies have been eliminated, but there are many new additions which fill in quite a few of the category gaps of previous years. The detailed trophy list can be found in the rules announcement.

All entries must be postmarked no later than December 1, 1996 for the phone section, and January 15, 1997 for CW. All logs must be sent directly to: CQ World-Wide DX Contest, 76 N. Broadway, Hicksville, NY 11801. **Be sure to indicate Phone or CW on the envelope.**

BY FREDERICK O. MAIA, W5YI

WASHINGTON READOUT

REGULATORY NEWS IN THE WORLD OF AMATEUR RADIO

FCC Creates Family Radio Service

In a three month period this past summer, the Federal Communications Commission established two new unlicensed personal radio services and eliminated the need for operators of radio stations aboard pleasure boats and aircraft to hold individual licenses.

The FCC created the first new Citizens Band Radio Service since 27 MHz CB was established some 40 years ago. The Family Radio Service (FRS) will operate on channels overlapping the 462 and 467 MHz allocations of the General Mobile Radio Service (GMRS), CB's predecessor. FRS is a new unlicensed, low-power (half watt), short-range UHF personal radio service designed to meet the communication needs of families and groups. The service will use 14 frequencies located in between full-power GMRS 462/467 MHz channels.

The FRS culminates more than 20 years of attempts by the FCC and industry to establish a new unlicensed personal radio service: the Class E CB and Personal Emergency Locator Transmitter Service (PELTS) at 220 MHz, the Personal Radio Communications Service (PRCS) at 800 MHz, and the Consumer Radio Service (CRS) at 460 MHz. The FCC even considered placing a new CB-type service in the 902–928 MHz band, and a personal digital service in the 6 meter band.

General Electric spent millions on PRCS in the 1980s, but pulled out of the business just before the FCC ruled on PRCS spectrum. (Some PRCS radios, known as "CarFone," are believed to still be on the air illegally. They are like a private cellular phone system.) PRCS and the other ideas never received official spectrum allocation. However, after Tandy Corporation's Radio Shack division petitioned the FCC in 1994 to create a short-distance Family Radio Service on frequencies it believed were underutilized, the FCC moved promptly to authorize it.

The FCC likes to see equipment manufacturers eager to make radios for a proposed service. Besides Radio Shack, other industry biggies such as Cobra, Uniden, and Motorola (probably the single most influential corporation at the FCC) weighed in. They told the Commission they want to release products into the FRS band as soon as possible.

GMRS licensees had been arguing in favor of a new personal radio service for the public since the 1970s. The one thing they had been unable to deliver, however, was manufacturers willing to make products.

They were not thrilled by Radio Shack's insistence that FRS be placed in the GMRS band, including the 467 MHz channels the FCC only a few years before had withheld from allocation due to Commission concern about interference to GMRS repeaters.

National Volunteer Examiner Coordinator, P.O. Box 565101, Dallas, TX 75356-5101 (817-461-6443)

There are about 4000 GMRS repeaters nationwide, most of them operated by not-for-profit organizations, communications teams, and individuals. Often a group of families will pool resources and put up a GMRS repeater for their use. Some repeaters are used by businesses, holdovers from past years when commercial entities could obtain GMRS licenses. Friction between commercial and personal users used to dominate GMRS; it continues to be a problem in some geographic areas.

GMRS licensees feared that far from being used by hunters and campers as the FCC portrayed it, FRS would turn out to be used mostly by businesses that historically have cared little for sharing radio channels. They believed that FRS would interfere with their repeaters and bring unlicensed CB-style chaos to the band.

Some 58 of the 73 comments in the FRS proceeding objected to FRS, at least as it was proposed by the FCC. The Commission dismissed these concerns. "The comments overwhelmingly support establishing the FRS," the FCC said on May 15. "The FRS is a low power service such that the range of any particular transmitter is small as compared to the more wide area nature of GMRS."

The Commission declined to use technical standards to inhibit the connection of external packet data and repeater controllers. The FRS operator rules prohibit such violations, but manufacturers need not inform purchasers of FRS rules. There is little realistic possibility of enforcement anyway, with the FCC pulling back from local monitoring and enforcement.

FRS antennas must be fixed permanently to the FRS radio. There will be no external RF connector. This should frustrate those who would attach amplifiers or external antennas. Radio Shack has stated that it expects to have one or two models of FRS radio in the $150 to $200 price range available for Christmas or the first quarter of 1997.

Essentials of The Four FRS Rules

FRS Rule 1 – Eligibility and responsibility. Anyone of any age may use FRS unless he/she represents a foreign government. No license will be issued. The operator is responsible for all communications, must share each channel with other users, and may not claim any channel for private or exclusive use.

FRS Rule 2 – Authorized locations. If the operator complies with FRS rules, he/she may operate FRS anywhere in the FCC's jurisdiction. This includes on any registered or unregistered vessel or aircraft. You must obtain the permission of the captain, however, to operate FRS aboard registered ships or airliners.

FRS Rule 3 – Types of communications. FRS may transmit two-way voice communications and one-way messages to establish communications, send an emergency message, provide traveler assistance, make a voice page, transmit audible and subaudible tones, or conduct a brief test. You must not use an FRS unit in connection with any illegal activity. Priority must be given to emergency traffic. Family Radio Service radios may not be interconnected to the public telephone system—in other words, no phone patching.

FRS Rule 4 – FRS units. Only FCC-certified FRS radios may be used. No internal modification is allowed. No antenna, power amplifier, or other equipment that was not FCC certified as part of that unit may be attached to the FRS unit. Internal modification or external, non-certified attachments to the FRS radio cancel the FCC certification of the radio and void everyone's authority to operate it.

FRS technical specifications. There are 14 simplex frequency channels. Unlike CB radios, they need not be crystal controlled. However, they must be maintained within a frequency tolerance of 0.00025%. The channels are:

Channel 1—462.5625 MHz
Channel 2—462.5875 MHz
Channel 3—462.6125 MHz
Channel 4—462.6375 MHz
Channel 5—462.6625 MHz
Channel 6—462.6875 MHz
Channel 7—462.7125 MHz
Channel 8—467.5625 MHz
Channel 9—467.5875 MHz
Channel 10—467.6125 MHz
Channel 11—467.6375 MHz
Channel 12—467.6625 MHz
Channel 13—467.6875 MHz
Channel 14—467.7125 MHz

An FRS unit may only transmit narrow-band FM (F3E) with a maximum frequency deviation of 2.5 kHz and an audio frequency response of 3.125 kHz. No FRS unit shall exceed 500 milliwatts (one-half watt) effective radiated power (ERP).

The Personal Radio Steering Group, a GMRS advocacy group, is vehemently opposing the creation of FRS and immediately filed a Petition for Reconsideration with the FCC. PRSG contends that the current FRS rules do not preclude FRS repeaters, do not bar music or other sound effects, do not prohibit obscene or indecent language, do not prohibit business use, and do not even prohibit transmitting false international distress calls. PRSG believes the FCC should limit transmission time and require pre-transmission monitoring.

FCC Creates Low Power Radio Service (LPRS)

Originally proposed in April 1995, the FCC announced at the end of July that it was creating yet another new personal radio service to be known as the Low Power Radio Service (LPRS) in the 216–217 MHz band.

An FM systems manufacturer petitioned the FCC for LPRS use in the 23 cm band, which had been used at one time for aircraft beacons. LPRS will operate under Part 95 of the Commission's rules, the same as CB. However, it will not be authorized for two-way personal communications.

The new radio service—authorized on a secondary, non-interference basis—accommodates four types of communication:

1. LETS (Law Enforcement Tracking Systems) or "beacon bucks"; flat (and foldable) transmitters disguised as paper currency for theft tracking;

2. AADs (Auditory Assistance Devices) used in the education of the hearing impaired and in churches and theaters;

3. Health care assistance devices, such as medical telemetry and listening devices; and

4. Control stations in the Automated Maritime Telecommunications Service.

AMTS is a two-way communications system for vessels operating on inland and coastal waterways. AADs amplify and transmit sound to individuals with hearing disabilities. Existing auditory assistance devices currently operate on an unlicensed basis in the 72–76 MHz band, but many are rendered useless by wireless interference, especially pagers.

The FCC said, "LPRS promotes the Commission's goal of fostering efficient and effective utilization of radio spectrum because it establishes a use for the 216–217 MHz band, which had been found unusable for high power communications due to the potential for interference to television (TV) channel 13 reception."

Initially, the FCC proposed to allocate the 30 channels on a licensed basis. However, the Commission has decided to authorize LPRS transmitters by rule, rather than by individual licenses for each transmitter. This will promote the rapid deployment of these devices without imposing unnecessary regulatory burdens on the public. The FCC also has a campaign underway to eliminate the necessity of issuing individual licenses where possible.

In addition, to reduce the potential for harmful interference to other LPRS devices, AMTS, and TV reception, these transmitters must be type accepted in accordance with technical standards set forth in the rules.

Under the technical standards for LPRS, manufacturers will have the flexibility to produce narrowband (5 kHz), standard-band (25 kHz), or wide-band (50 kHz) equipment with all transmissions limited to 100 milliwatts effective radiated power (ERP).

Pleasure Boat & Aircraft Radio Station Licensing Abolished

The 1996 Telecommunications Act grants the FCC authority to remove the individual radio station licensing requirement for recreational vessels and aircraft that operate domestically when it determines that public interest, convenience, and necessity are served. Although no final action has been taken, the Commission has approved interim measures that immediately eliminate the Maritime and Aviation Services rules that previously required individual ship and aircraft radio licensing. They will now be "blanket licensed" by rule.

The FCC said the proposed action is in the public interest because it would eliminate administrative burdens for both the public and the Commission without having a negative impact on safety or spectrum management in the Maritime and Aviation Services. The FCC concluded:

1. that individual licenses are neither necessary for the safety or operational requirements of pleasure vessels and aircraft;

2. that individual licensing is unnecessary to meet the Commission's regulatory and spectrum management responsibilities;

3. that eliminating the individual licensing requirement will remove an unnecessary regulatory burden on the public; and

4. remove an administrative licensing hardship for the FCC.

Prior to enactment of the 1996 Telecommunications Act, the FCC only had discretion to license radio stations in the Citizens Band (CB) and Radio Control (R/C) services by blanket rule rather than by individual licenses. The Commission ended its licensing of CB and R/C in 1983 because no individual testing was necessary, the existence of a data base of licensees did not assist the FCC in enforcement procedures, and individual licensing was very costly and administratively burdensome.

By treaty, ship and maritime radio stations used for international communications and traveling to foreign locations must be individually licensed. The Communications Act also requires some commercial vessels and aircraft to be licensed. Although no statute requires recreational vessels and aircraft to be equipped with a radio station, FCC rules required those which did to be individually licensed.

According to FCC licensing records, there are nearly 600,000 individual ship station and 150,000 aircraft station licensees operating domestically that are not subject to the radio carriage requirements of any statute or treaty. The FCC has now issued a Notice of Proposed Rulemaking saying it will remove the individual radio licensing requirement for these vessels and aircraft. Under the proposal, the public would be authorized to operate a marine or aircraft VHF radio, any type of emergency position indicating radio beacon (EPIRB) or emergency locator transmitter (ELT), and/or radar on board a recreational vessel or aircraft without an individual license.

The FCC said that station licenses are not needed as a means of identification, since the name of the vessel is usually used for domestic identification, and could readily replace the use of FCC-issued callsigns. In the case of aircraft, the Commission's individual licensing duplicates that of the Federal Aviation Administration (FAA). The FAA assigns each aircraft an identification number, which then becomes the FCC callsign.

Ship and aircraft radio stations would still be subject to the Commission's Rules and enforcement procedures. The FCC added that "... eliminating the individual licensing requirement will not have a negative impact on safety at sea or safety of air navigation since operators of recreational vessels and aircraft are not currently required to pass a test or in any way demonstrate knowledge of radio procedures prior to licensing. Rather, we rely on cooperative efforts by informed radio users to distribute distress communications and safety information. . . . We anticipate that recreational vessel and aircraft operators will continue to learn about the proper use of marine and aircraft radios through instructional courses and through public forums established by various organizations such as the U.S. Coast Guard Auxiliary, the FAA, and the Commission." The FCC implemented the proposed rules immediately pending the conclusion of the proceeding which will be expedited.

The FCC action thus eliminates the filing of approximately 125,000 license applications each year by operators of recreational ship and aircraft stations and the $45 filing fee. Persons traveling to foreign ports, making international flights, or engaging in international communications must continue to be licensed individually.

73, Fred, W5YI

Number groups after call letters denote following: Band (A = all), Final Score, Number of QSOs, Zones, and Countries. An asterisk (*) before a call indicates low power. Certificate winners are listed in boldface. (All country terminology reflects the DXCC list at the time of the 1995 contest.)

CW RESULTS
SINGLE OPERATOR
NORTH AMERICA

UNITED STATES

W1KM	**A**	**5,127,270**	**3178**	**136**	**418**
N6BV/1	**"**	**4,261,624**	**2814**	**127**	**402**
KC1XX	**"**	**4,167,383**	**3128**	**111**	**346**
K5ZD/1	**"**	**3,780,024**	**2736**	**121**	**357**
					(Opr. KM3T)
W1WEF	*	3,011,424	2127	118	376
K5MA/1	*	2,200,380	1634	119	346
N4XR/1	*	1,732,812	1034	136	455
K1IU	*	1,542,933	1360	107	292
W1PH	*	911,756	789	99	313
K1EFI	*	571,077	585	88	263
KA1DWX	*	444,966	479	87	240
K1TWF	*	434,232	519	75	221
N6RFM/1	*	223,850	308	72	203
AK1N	*	216,265	296	74	185
K1BV	*	187,312	365	48	136
KD1SG	*	163,085	305	53	140
NM1K	*	60,377	150	68	105
K1EM	*	55,056	136	51	97
K1DS	*	53,406	160	42	87
K2SS/1	**14**	**768,852**	**1610**	**35**	**127**
W1XS	**7**	**244,800**	**572**	**37**	**116**
K1WGM	*	136,110	380	32	98
W1CWU	*	90,513	290	29	84
W1MK	**3.5**	**349,596**	**1047**	**26**	**91**
K1ZM	**1.8**	**142,358**	**470**	**23**	**83**
W1ZK	*	29,299	128	19	64
K2LP/1	*	2,576	34	7	21
***K8PO/1**	**A**	**1,490,760**	**1491**	**102**	**302**
***WS1E**	**"**	**882,189**	**799**	**99**	**300**
***KM1X**	**"**	**819,790**	**860**	**90**	**275**
*WA1FCN	*	590,961	653	84	237
*NA1R	*	574,525	606	100	243
*WA1S	*	528,045	605	85	236
*K8JLF/1	*	344,253	452	69	204
*K2TE/1	*	263,373	378	69	184
*WZ1K	*	249,458	381	74	179
*K1TN	*	201,447	307	61	182
*W3SOH/1	*	167,359	303	55	144
*W1WFZ	*	61,800	226	25	75
*K2MN/1	*	45,750	136	39	86
*WS1H	*	35,595	130	30	75
*KB1AXF	*	24,156	155	33	66
*AB1U	*	8,515	51	24	41
*NM1W	*	7,938	55	23	40
*KD1IA	*	3,813	35	14	27
***WE1B**	**21**	**37,148**	**175**	**21**	**53**
*K1VSJ	14	24	2	2	2
***WØMHK/1**	**7**	**33,418**	**159**	**21**	**56**
*W1NH	3.5	709	21	11	16
N2LT	**A**	**4,075,298**	**2586**	**130**	**412**
W6XR/2	**"**	**3,473,415**	**2479**	**122**	**373**
					(Opr. N6TV)
KQ2M	**"**	**3,349,840**	**2226**	**128**	**392**
K2PS	*	1,876,392	1482	109	329
W2HPF	*	1,660,260	1381	109	311
KA2HMJ	*	784,920	889	75	235
K3JGJ/2	*	727,320	679	103	277
WA2VYA	*	681,120	632	100	296
KW2J	*	565,579	671	83	218
K2DM	*	423,810	498	87	219
N2AIF	*	302,634	417	67	191
N2MR	*	268,260	382	68	187
K2MP	*	268,019	367	74	197
NA2M	*	262,870	358	83	188
W2OMV	*	194,312	315	62	165
N2PEB	*	192,681	314	74	90
W2PAU	*	159,120	244	75	165
K2FL	*	134,456	250	52	144
WA2UDT	*	121,590	236	34	100
N2UN	*	59,094	162	47	100
W2EZ	*	53,280	125	48	96
N2QLT	*	25,506	95	37	72
W2GMA	*	10,108	51	29	47
AA2VN	*	9,720	60	29	43
W2HG	**28**	**2,744**	**70**	**10**	**18**
K2MT	**21**	**217,257**	**546**	**28**	**111**
NB2V	7	11,544	148	20	58
AA7QZ/2	3.5	6,579	51	14	37
W2FR	*	3,914	37	8	30
W2VO	**1.8**	**43,650**	**178**	**20**	**70**
N2WK	*	30,261	151	16	45
N2KA	*	2,964	30	11	27
***K2SG**	**A**	**1,789,468**	**1494**	**109**	**319**
***KR2Q**	**"**	**1,599,336**	**1244**	**115**	**343**
***N2BA**	**"**	**1,145,952**	**1055**	**104**	**310**
*K2PH	*	866,565	804	98	295
***WAØQOA/2"**		**675,920**	**754**	**86**	**254**
*WA2SRQ	*	442,298	566	78	200
*WK2G	*	441,731	474	83	264
*KA2CDJ	*	341,968	401	94	225
*K2UF	*	293,846	385	76	202
*WA2EYA	*	189,342	345	54	147
*KM2L	*	157,620	304	49	136
*NA2Q	*	130,977	265	56	133
*WA2YSJ	*	130,942	244	58	141
*W2KHQ	*	116,887	236	54	125
*AA2GS	*	116,444	253	47	125
*WA2RZJ	*	74,784	174	54	110
*N2INN	*	62,376	150	42	96
*K2ZA	*	62,101	177	38	92
*K2SWZ	*	47,946	138	36	95
*WB2WPM	*	37,408	125	34	78
*KA2GSL	*	35,298	120	31	80
*N2LKF	*	26,429	98	34	73
*KF2C	*	18,705	70	23	64
*WB2JFP	*	18,135	81	36	57
***K2MFY**	**14**	**131,856**	**348**	**31**	**103**
*AE2N	"	3,959	41	13	24
***AA2SZ**	**7**	**103,220**	**288**	**30**	**100**
*WA2ASQ	"	20,054	101	19	55
*KE2WE	*	17,355	99	16	49
K3ZO	**A**	**4,111,064**	**2573**	**133**	**423**
W3BGN	**"**	**3,565,706**	**2445**	**125**	**377**
KT3Y	**"**	**3,518,820**	**2365**	**130**	**389**
AA1K/3	*	2,925,415	1984	131	390
W3UM	*	1,513,707	1090	120	361
K3TEJ	*	1,216,332	959	108	344
KX3Y	*	689,017	658	82	200
W3AZ	*	510,156	553	90	243
W3NX	*	373,626	453	79	218
WK3H	*	335,546	440	75	203
W3GN	*	317,696	403	80	212
KL7HIR/W3	*	267,650	376	76	189
N3KR	*	255,360	389	66	174
AA3JU	*	159,192	232	75	193
W3QIR	*	117,362	227	60	142
W3HDH	*	87,039	193	57	114
K3OO	*	77,100	177	42	108
K5ME/3	*	76,406	189	41	110
NI3I	*	66,410	165	45	50
WR3D	*	58,116	177	42	74
N2US/3	*	47,320	130	40	100
NA3K	*	34,928	119	39	79
K4JLD/3	*	21,414	94	22	61
KM3D	*	20,916	91	25	58
N3ARK	*	8,568	60	22	34
W3FQE	14	5,402	53	11	26
W3GH	**7**	**434,080**	**963**	**36**	**124**
W3TMZ	*	49,368	174	28	74
WE3C	**3.5**	**163,625**	**491**	**28**	**91**
AA3JI	*	36,354	163	18	65
N6CQ/3	*	19,734	104	17	52
***W3UJ**	**A**	**418,874**	**500**	**81**	**221**
***W7FKF/3**	**"**	**227,495**	**332**	**75**	**188**
*NY3C	*	178,506	323	56	155
*AA3FY	*	115,552	223	48	136
*WB3AAL	*	50,553	165	46	91
*NV3L	*	35,763	125	26	65
*KB3MM	*	30,284	103	39	74
*KE3JA	*	13,063	98	21	40
*N3MTU	*	2,625	32	16	19
*N3UMA	14	9,348	60	15	42
***WW3S**	**7**	**40,470**	**162**	**26**	**69**
*N3RW	*	26,248	136	15	53
*W3CPB	*	9,165	70	13	34
K4PQL	**A**	**2,962,400**	**1964**	**134**	**395**
W4RX	**"**	**2,790,912**	**1767**	**136**	**416**
N6AR/4	**"**	**2,749,780**	**1682**	**146**	**434**
W4XJ	*	1,724,666	1320	123	343
W1IHN/4	*	1,596,22	1275	109	332
N4TO	*	1,014,344	881	113	299
AD4KE	*	995,880	824	99	331
W3VT/4	*	962,360	708	128	363
N4XM	*	841,890	780	111	288
NA4K	*	600,036	584	103	269
WR3O/4	*	575,484	590	108	264
N4MM	*	456,599	479	93	248
W4NTI	*	384,888	460	90	226
KJ4VH	*	346,112	385	107	231
WB4MAI	*	304,612	360	92	216
W4YE	*	303,924	416	69	189
W4RW	*	169,386	285	64	158
WB4VKW	*	125,334	220	66	145
KO4PY	*	112,117	222	55	136
K4CSB	*	90,060	180	71	119
AC4PQ	*	61,880	170	44	96
W4LMJ	*	50,540	139	44	89
KC4UG	*	46,717	136	47	90
W4OGG	*	42,522	129	41	73
WA4DAI	*	30,396	110	39	63
N4XMX	*	8,844	50	26	41
W4YN	*	8,790	85	34	52
K4VUD	*	6,897	55	25	32
K6ETM/4	*	3,121	67	17	44
W4YV	**28**	**9,412**	**95**	**16**	**36**
N4BP	*	2,580	75	11	19
N4CT	**21**	**189,552**	**517**	**28**	**104**
KD4FAZ	*	37,620	180	26	64
KI4DC	*	22,260	100	24	60
KV4P	**14**	**240,812**	**645**	**33**	**110**
K4RZ	"	111,848	330	29	95
N4OHE	"	59,052	183	28	86
AA4NC	**7**	**492,900**	**1177**	**35**	**115**
AB4RX	*	171,500	434	35	105
KC2X/4	*	142,250	414	30	95
K4SXT	*	126,412	310	33	110
KA4RRU	*	108,125	316	32	93
AD4MQ	*	105,536	274	32	104
K4PI	**3.5**	**141,812**	**420**	**29**	**92**
WB4OSN	*	24,885	114	21	58
W4YDD	*	17,664	105	16	53
WØZV/4	**1.8**	**61,578**	**226**	**22**	**77**
K4TEA	**"**	**30,560**	**141**	**19**	**61**
W4DR	**"**	**30,260**	**134**	**20**	**69**
N4UH	*	4,472	41	13	30
***K7SV/4**	**A**	**1,514,735**	**1153**	**130**	**361**
***AC1O/4**	**"**	**1,263,140**	**1017**	**120**	**341**
*WA6KUI/4	*	629,031	616	109	272
*KK4SM	*	325,470	434	82	203
*AA4EL	*	298,329	401	73	204
*N8LM/4	*	186,150	328	68	151
*KR4NY	*	153,360	265	65	148
*WA4JUK	*	145,730	303	60	130
*AC4ZO	*	106,578	225	60	126
*W3FTG/4	*	93,248	191	60	128
*NN7A/4	*	68,096	164	40	112
*KN4Y	*	33,463	123	39	70
*K4OGG	*	25,315	105	25	58
*KI4KR	*	20,805	85	26	69
*AJ4F	*	16,281	82	28	53
*W4YN	*	10,171	102	38	63
***WB4TDH**	**21**	**146,699**	**393**	**31**	**102**
*AI2C/4	*	67,235	216	26	87
*AA4GA	*	39,618	156	25	68
***N4MO**	**14**	**201,066**	**535**	**33**	**108**
*N4TJ	*	132,736	353	31	105
*W4PLL	*	100,480	271	31	97
***N4OT**	**7**	**37,932**	**159**	**23**	**64**
***W4HM**	**3.5**	**15,312**	**92**	**15**	**51**
K5GO	**A**	**2,022,246**	**1458**	**139**	**374**
K5YAA	**"**	**1,516,736**	**1334**	**113**	**303**
K7UP/5	**"**	**1,184,040**	**1025**	**129**	**285**
					(Opr. KN5H)
KM5G	*	726,921	798	57	170
W5UDA	*	706,304	715	100	256
KF7E/5	*	361,121	413	119	212
WA5VGI/5	*	207,137	328	83	150
W5GAI	*	16,128	65	42	54
AB5TV	*	3,700	39	23	27
KE5FI	**28**	**4,171**	**51**	**17**	**26**
K5MR	**21**	**237,600**	**638**	**33**	**111**
KI3L/5	**"**	**78,383**	**300**	**27**	**76**
WA5SOG	**14**	**55,684**	**213**	**27**	**69**
K5UA	**7**	**76,832**	**241**	**29**	**83**
W5UN	*	48,500	177	31	66
KN5S	**3.5**	**37,518**	**174**	**22**	**56**
W5FO	**"**	**37,230**	**167**	**22**	**63**
W5EU	*	35,250	136	24	70
W5CWQ	*	21,816	112	21	51
***WD5K**	**A**	**674,478**	**677**	**100**	**271**
*NN5T	*	184,149	296	86	151
*N5XUS	*	75,276	157	64	100
*WC5D	*	70,048	156	62	114
*W5EIJ	*	26,442	100	44	73
*N6PHZ/5	*	11,224	78	27	34
***WB5CRG**	**28**	**3,220**	**41**	**14**	**21**
***NI5M**	**21**	**70,730**	**235**	**27**	**83**
*NY5B	*	45,493	189	28	69
*WT5U	14	35,844	156	27	60
***KF5IU**	**7**	**41,322**	**159**	**30**	**67**
*WA5JWU	*	29,963	135	22	61
*N7XX/5	*	14,326	90	16	42
AB6FO	**A**	**1,443,000**	**1437**	**123**	**252**
WY6K	**"**	**336,798**	**624**	**64**	**125**
K7JYE/6	*	255,234	455	76	130
W6BIP	*	228,774	317	94	179
W6NKR	*	219,736	333	80	162
AJ6V	*	211,470	412	68	122
W6RCL	*	209,532	355	81	147
N6GG	*	156,147	265	88	131
AB6YL	*	153,576	364	66	92
AD6E	*	118,852	253	67	105
AEØM/6	*	117,990	337	55	83
WW6D	*	97,774	209	64	102
K6ZUR	*	72,756	136	71	70
W6WB	*	72,631	181	52	99
W6RFF	*	66,066	164	66	88
N6AZR	*	57,584	178	45	77
N6VR	*	54,990	147	41	89
N6HK	*	53,400	165	43	77
KN6DQ	*	50,808	167	45	71
KO6IG	*	19,186	129	23	30
K6MA	*	8,432	55	30	32
W6ISQ	*	2,640	22	19	21
W6KFV	**28**	**2,772**	**62**	**11**	**17**
W6YA	**21**	**163,674**	**477**	**32**	**94**
N6MU	**"**	**93,951**	**360**	**30**	**69**
KC6X	"	59,000	289	29	71
W6BSY	"	48,459	222	27	60
W6UM	**14**	**102,300**	**241**	**38**	**112**
W6GO	**7**	**633,919**	**1409**	**39**	**130**
					(Opr. N6IG)
W7CB/6	*	144,907	405	36	91
K6LEB	*	137,844	379	35	91
N6NB	*	122,266	375	32	81
					(Opr. N6MU)
N7QQ/6	*	27,209	106	29	62
K6UO	*	19,516	83	27	55
WA6VNR	*	861	17	10	11
K6SSS	**3.5**	**11,550**	**56**	**27**	**50**
N2UN/6	*	9,843	75	21	30
NI6T	**1.8**	**6,600**	**60**	**17**	**27**
AJ6T	*	1,764	30	12	16
***W6JTI**	**A**	**655,380**	**724**	**112**	**218**
***N6NF**	**"**	**385,290**	**534**	**93**	**177**
*WA6URY	*	156,780	290	74	127
*N6JM	*	98,720	226	62	98
*N6IBP	*	52,848	152	62	82
*N6GL	*	50,630	166	53	69
*AA6EE	*	39,262	133	59	75
*W6PLJ	*	30,056	116	43	61
*N7FF/6	*	29,430	125	36	54
*N6IC	*	660	14	9	13
***KJ6HO**	**21**	**51,152**	**212**	**27**	**65**
*WZ9J/6	*	11,809	88	19	30
*WA6FGV	*	10,868	80	19	33
*KU6T	*	7,392	64	15	29
***W6EUF**	**14**	**55,483**	**183**	**33**	**80**
W7RM	**A**	**1,654,020**	**1504**	**131**	**274**
					(Opr. AA7NX)
N7ML	**"**	**1,282,157**	**1209**	**120**	**259**
W2VJN/7	**"**	**1,219,962**	**1153**	**129**	**252**
AA7CQ	*	793,854	812	117	249
N7RO	*	667,680	762	100	212
W7SE	*	427,779	512	103	216
AI7B	*	312,284	446	101	165
AA7FL	*	259,945	400	85	160
W7HS	*	237,636	354	89	157
K6XO/7	*	230,607	389	79	140
W7WHY	*	211,544	328	89	159
W7MB	*	179,088	310	62	146
WA7UVJ	*	178,235	314	86	129
W7LGG	*	162,792	265	83	155
WG7A	*	126,338	259	69	112
W7IIT	*	111,777	255	61	98
K9JF/7	*	43,560	121	49	83
W7QDM	*	35,380	128	52	64
KX7J	*	31,185	122	35	64
KJ7CU	*	26,508	223	38	56
KI6WJ/7	*	7,888	90	23	28
K7OX	**21**	**62,856**	**248**	**28**	**69**
VE7UF/W7	*	18,772	133	20	32
N7TT	**14**	**359,100**	**893**	**36**	**114**
WA7FAB	*	220,997	596	36	95
W7AYY	*	30,015	158	23	46
N7DD	**7**	**398,958**	**1025**	**37**	**110**
					(Opr. NJ6D)
KA7WDM	*	103,138	261	36	103
N7RT	*	92,192	246	37	97
W7TSQ	*	15,435	90	22	41
K7ABV	**3.5**	**12,374**	**101**	**19**	**27**
W7ZI	*	4,040	39	16	24
W7DRA	*	2,016	33	11	10
N6SS/7	**1.8**	**20,097**	**123**	**17**	**46**
***NØAX/7**	**A**	**562,100**	**611**	**112**	**238**
***W7ZMD**	**"**	**245,262**	**376**	**87**	**159**
*WW7Q	*	162,108	261	84	153
*WQ7R	*	145,010	323	66	104
*N7EPD	*	134,136	273	75	109
*WJ7R	*	81,510	219	58	72
*W7YS	*	66,396	185	46	86
*WA6BXH/7	*	53,406	150	56	82
*WN7J	*	50,958	112	65	106
*KJ7BD	*	28,392	117	33	58
*AA7UC	*	26,496	105	42	54
*WB9ZPK/7	*	23,310	102	40	50
*KA7FEF	*	13,048	82	25	31
*WB7ASR	*	4,884	39	21	23
*WA2OCG/7	*	589	31	9	10
*W7VIH	21	1,647	23	10	17
*AA4Q/7	14	572	16	7	6
*K7WA	7	6,847	62	18	23
K3JT/8	**A**	**621,418**	**607**	**104**	**269**
KB8TI	**"**	**592,324**	**536**	**108**	**289**
KF8TM	"	318,402	392	83	211
KU8U	"	242,208	302	80	208
N8KSO	"	185,612	357	56	140
W8RSW	"	147,256	231	67	166
W8UPH	"	100,098	231	51	115
W8FN	"	80,088	203	38	104
W8PN	*	69,208	171	60	104
KF8GE	*	56,565	164	43	92
WB8BUQ	*	6,171	45	15	36
N8EA	*	1,702	26	10	13
W8UD	**14**	**188,730**	**489**	**32**	**103**
W9LT/8	**7**	**280,166**	**704**	**33**	**109**
W8UCI	*	92,070	238	36	99
K8OQL	**3.5**	**102,960**	**476**	**20**	**68**
K8MD	**"**	**39,688**	**171**	**21**	**61**
K8SJ	*	6,210	54	13	33
W8UVZ	**1.8**	**44,589**	**208**	**20**	**69**
W8QID	"	8,154	59	13	41
WD9INF/8	"	6,720	54	12	36
WA8SAE	"	3,840	40	12	28
***K8LJG**	**A**	**191,995**	**325**	**62**	**153**
***N8AA**	**"**	**166,600**	**305**	**59**	**141**
*W8GOC	*	158,015	264	61	160
*N8FEH	"	139,956	251	76	138
*AD8J	*	135,900	269	53	74
*K8UC	*	109,560	250	54	112
*KG8GW	*	26,840	114	37	73
*WA8AHK	*	21,300	86	39	61
*N8LXS	*	1,428	20	10	18
*W8UMR	14	82,718	252	28	90
*WT8P	*	45,225	210	16	59
*N8RFK	1.8	8,007	73	12	39
*WA8MEM	*	28	8	4	3
W9RE	**A**	**3,180,906**	**2024**	**136**	**413**
K9MA	**"**	**1,455,440**	**1166**	**124**	**328**
WB9IIQ	*	965,181	836	111	302
WB9HRO	*	850,164	903	106	243
WN9O	*	649,458	674	93	249
K9WIE	*	422,268	502	83	225
W9OA	*	238,630	356	69	176
K9UQN	*	100,815	264	46	95
W9HE	*	88,608	211	52	104
K9QVC	*	68,544	167	52	101
W9ILY	*	43,225	137	51	82
AK9Y	*	33,411	112	33	78
KE9EX	*	3,313	43	7	13
K9OM	**28**	**3,366**	**56**	**13**	**21**
KO9Y	**21**	**66,120**	**245**	**24**	**71**
W9GIL	*	55,076	207	27	71
KA6A/9	*	27,664	111	26	65
K9QVB	**14**	**324,478**	**742**	**36**	**118**
W9OF	**"**	**263,544**	**577**	**35**	**123**
K9CAN	*	233,928	552	36	116
WA9TPQ	*	208,485	611	29	94
W9YYG	*	202,032	522	32	106
K9DX	**7**	**361,140**	**850**	**38**	**118**
K9HMB	*	72,574	199	34	97
K9CJ	*	61,827	204	29	82
W9GXR	**3.5**	**26,784**	**135**	**17**	**55**
WB9Z	**1.8**	**101,971**	**354**	**23**	**84**
K9BG	*	27,392	94	16	48
W9PNE	*	6,090	54	12	30
WE9V	*	5,074	49	12	31
***AA9CG**	**A**	**340,374**	**439**	**79**	**203**
***KJ9C**	**"**	**313,252**	**420**	**79**	**205**
*W9RN	*	282,348	375	89	190
*AA9IV	*	56,658	168	39	94
*W9LNQ	*	14,339	100	33	73
***WA9BOW**	**21**	**43,120**	**164**	**23**	**75**
*NA9N	*	16,571	86	21	52
*AA9KH	*	3,780	36	13	29
***K9KU**	**14**	**201,965**	**541**	**36**	**119**
*W9JOO	*	11,816	79	18	38
*N9GBB	*	8,450	63	17	33
***W9CH**	**7**	**67,832**	**199**	**35**	**87**
*K9MMS	*	53,560	189	26	78
*W9IL	3.5	12,852	84	15	39
KØRF	**A**	**3,104,260**	**2057**	**143**	**395**
KØKX	**"**	**1,299,913**	**1503**	**141**	**398**
WBØO	**"**	**1,197,620**	**928**	**133**	**333**
NSØB	*	399,655	442	101	234
KJØG	*	249,249	376	86	163
NIØB	*	248,520	162	32	102
WØRSR	*	155,820	264	67	145
NJ8M/Ø	*	153,874	301	67	136
WØHW	*	147,857	266	58	141
WØML	*	116,656	230	62	122
KSØM	*	102,836	201	61	127
WØRA	*	93,380	250	56	89
KØAD	*	47,412	154	32	76
KØJPL	*	44,251	133	52	85
W4ETO/Ø	*	39,780	178	28	50
WB4RDV/Ø	*	29,344	107	43	69
WIØR	*	14,980	78	22	48
KIØE	*	6,043	64	17	20
WAØCLR	*	532	11	10	9
AA4M/Ø	**14**	**275,706**	**662**	**35**	**118**
KØRWL	**"**	**186,732**	**423**	**36**	**120**
WØUN	**7**	**683,060**	**1482**	**37**	**127**
					(Opr. WØUA)
KØOD	*	231,264	555	37	109
ACØS	3.5	13,603	87	20	41
KCØEI	*	8,848	64	18	38
KEØY	*	980	17	5	15
KVØQ	**1.8**	**47,460**	**205**	**20**	**64**
AA6TT/Ø	*	16,254	100	17	46
NØTT	*	6,946	60	13	33
KJØB	*	6,192	51	15	33
WØRXL	*	5,124	50	14	28
***AAØSQ**	**A**	**367,319**	**479**	**94**	**195**
***KEØUI**	**"**	**270,000**	**452**	**70**	**155**
*KØOAM	*	198,588	324	73	155
*WØVU	*	195,795	314	73	156
*K9BQL/Ø	*	144,969	274	65	126
*WBØOLA	*	98,000	220	57	118
*WX7G/Ø	*	97,482	235	56	98
*WAØBNX	*	53,760	163	41	79
*WAØOZP	*	21,087	84	37	62
*NØGOS	*	5,049	42	22	29
*AAØNB	21	3,959	48	17	20
*AAØXJ	7	2,250	56	8	10

ALASKA

AL7MX	**1.8**	**20,774**	**284**	**15**	**19**
KL7XX	*	13,533	142	10	23
***NL7DU**	**A**	**154,105**	**849**	**37**	**48**

Scanners/CB/Weather Stations

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NEW! Davis Grounding Kit, helps protect your station - 7780-Z ... $19.95
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Frequency step resolution 5, 12.5 & 25 KHz.
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25.000-549.995 MHz., 760.000-823.995 MHz., 849.0125-868.995 MHz., 894.0125-1,300.000 MHz.

The Bearcat 9000XLT is superb for intercepting communications transmissions with features like TurboSearch™ to search VHF channels at 300 steps per second. This base and mobile scanner is also ideal for intelligence professionals because it has a selectable attenuator to help eliminate annoying intermodulation from adjacent frequencies in highly populated areas and selectable AM, Wide FM and Narrow FM modes that allow you to change the default receiving mode of the BC9000XLT. Other features include ***Auto Store*** – Automatically stores all active frequencies within the specified bank(s). ***Auto Recording*** – This feature lets you record channel activity from the scanner onto a tape recorder. **Hi-Cut filter** to help eliminate unwanted static noise. You can even get an optional ***CTCSS Tone Board*** (Continuous Tone Control Squelch System) which allows the squelch to be broken during scanning only when a correct CTCSS tone is received. For maximum scanning enjoyment, order the following optional accessories: **PS001** Cigarette lighter power cord for temporary operation from your vehicle's cigarette lighter $14.95; **PS002** DC power cord - enables permanent operation from your vehicle's fuse box $14.95; **MB001** Mobile mounting bracket $14.95; **BC005** CTCSS Tone Board $54.95; **EX711** External speaker with mounting bracket & 10 feet of cable with plug attached $19.95. The BC9000XLT comes with AC adapter, telescopic antenna, owner's manual and one year limited Uniden warranty.

VHF Transceiver

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Cobra HH40-Z CB 40 channel handheld transceiver .. $79.95
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Ranger RCI2950-Z 25 watt 10 meter transceiver ... $219.95
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Monitor police, fire, weather, marine, medical, aircraft and other transmissions with your Bearcat scanner.

Bearcat 9000XLT-Z base/mobile ... $357.95
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Bearcat 220XLT-Z handheld/SPECIAL ... $199.95
Bearcat 178XLT-Z base with weather alert $119.95
Sportcat 150-Z handheld with 800 MHz. .. $151.95
Bearcat 148XLT-Z base with weather alert . $83.95
Bearcat 120XLT-Z handheld ... $119.95
Bearcat 80XLT-Z handheld with 800 MHz. $134.95
Bearcat BCT7-Z information mobile ... $152.95
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VR204DAT4 4 channel, single DAT drive, 500+ channel hours ... $7,395.95
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*KL7WP	*	38,984	159	35	53
KL7/KG5EG		5,160	53	17	23

ANGUILLA

VP2EFO	**A**	**5,838,225**	**5044**	**120**	**355**
		(Opr. K8MFO)			

BARBADOS

8P9Z	**A**	**7,131,924**	**5666**	**127**	**375**
		(Opr. K4BAI)			

BELIZE

V31UA	**A**	**2,829,318**	**3371**	**111**	**263**
		(Opr. KT6V)			

BERMUDA

***VP9MZ**	**A**	**568,512**	**1131**	**67**	**157**

CANADA

VO1MP	**A**	**1,856,421**	**2017**	**89**	**284**
VE1JF	*	34,980	119	29	81
VO1AH	*	16,348	108	20	41
VE9ST	**14**	**756,279**	**1932**	**35**	**118**
VE9AA	**1.8**	**94,416**	**509**	**19**	**65**
***VE1AZN**	**A**	**937,976**	**1226**	**78**	**233**
*VE1AYY	*	45,630	305	21	44
*VE1KB	*	22,050	110	23	52
***VO1GO**	**7**	**48,468**	**233**	**18**	**66**
VE2/N6AA	**A**	**2,929,536**	**3320**	**102**	**282**
VE2AYU	**"**	**1,079,120**	**1353**	**84**	**244**
***XM2AWR**	**A**	**131,566**	**372**	**49**	**108**
***VE2XAR**	**14**	**46,314**	**187**	**20**	**73**
VE3EJ	**A**	**5,023,118**	**3596**	**146**	**408**
VE3KP	*	936,598	1210	94	244
VE3EN	*	102,370	310	45	100
VE3ZTH	*	71,370	165	64	119
VE3MM	*	69,069	177	55	106
VA3SK	*	40,608	174	29	65
VE3KUK	*	8,299	100	21	22
VE3HX	**28**	**2,550**	**43**	**9**	**16**
VE3DO	**1.8**	**53,592**	**279**	**19**	**65**
VE3PN	*	34,160	251	14	47
***VE3OTL**	**A**	**265,545**	**612**	**63**	**126**
***VA3SYL**	**"**	**109,020**	**794**	**33**	**36**
*VE3UPG	*	61,893	240	40	77
*VE3DSN	*	24,420	141	24	50
*VE3BZR	*	20,400	100	26	54
*VE3XSP	*	3,337	30	18	52
VE4JB	**A**	**173,085**	**434**	**51**	**114**
*VE4YU	A	33,600	139	42	63
VE5GC	**A**	**55,320**	**453**	**12**	**31**
***VE5SF**	**A**	**335,886**	**862**	**64**	**114**
*VF5AAD	*	75,716	829	22	24
*VE5CPU	*	1,440	45	11	7
VE6JY	**14**	**978,950**	**2282**	**39**	**136**
			(Opr. VE6WQ)		
***VG6BF**	**A**	**546,060**	**1137**	**83**	**145**
			(Opr. VE6BF)		
*VE6FR	*	80,280	184	67	113
*VE6HPT	*	20,424	125	31	38
***VE6BMX**	**21**	**58,767**	**508**	**19**	**38**
XM7SBO	**A**	**520,260**	**715**	**102**	**188**
VE7IN	**"**	**328,048**	**694**	**83**	**119**
VE7QO	*	307,515	664	68	127
CK7U	**21**	**144,596**	**918**	**26**	**48**
			(Opr. VE7WRA)		
XM7NTT	**14**	**689,475**	**2063**	**36**	**109**
CK7A	**"**	**666,094**	**2111**	**34**	**103**
VA7A	*	439,166	1501	35	92
			(Opr. VE7XR)		
XM7CC	**3.5**	**296,928**	**1351**	**32**	**64**
VE3IY/7	**1.8**	**53,924**	**523**	**20**	**32**
VE7FPT	*	13,489	153	15	26
VY1JA	**A**	**687,610**	**1618**	**73**	**117**
*VE8NC	14	720	32	6	4

COSTA RICA

TE1C	**7**	**1,062,302**	**3058**	**33**	**109**
			(Opr. TI2CF)		
***TI4VSG**	**A**	**70,059**	**249**	**44**	**77**
			(Opr. AA7JM)		

CUBA

***CM8DM**	**7**	**25,875**	**274**	**11**	**34**
***CO2VG**	**3.5**	**49,206**	**398**	**14**	**45**

EL SALVADOR

YS1VV	**7**	**128,115**	**886**	**18**	**47**

GREENLAND

***OX3KV**	**A**	**77,717**	**426**	**30**	**79**

HAITI

HH2PK	**A**	**5,919,521**	**5434**	**117**	**340**
			(Opr. 9A3A)		

JAMAICA

WH6X/6Y5	**A**	**2,980,828**	**4123**	**94**	**222**
			(Opr. JE3MAS)		

MARTINIQUE

FM5BH	**1.8**	**131,904**	**622**	**21**	**75**

MEXICO

XE1VV	**A**	**664,930**	**1248**	**85**	**160**
***XE2MX**	**A**	**256,998**	**672**	**71**	**103**
*XE1/AA6RX	*	202,521	478	60	127
***XE2DV**	**7**	**197,974**	**1158**	**26**	**53**

PANAMA

***HP3XUG**	**A**	**258,450**	**783**	**47**	**103**
			(Opr. KG6UH)		
*HP1XZQ	14	40	8	3	2

PUERTO RICO

***KP4L**	**A**	**220,252**	**613**	**54**	**110**

SAN ANDREAS

***HKØ**					
/DL4MEH	**A**	**544,854**	**1147**	**61**	**152**

SINT EUSTATIUS

*PJ5JP	A	5,117	51	18	25

ST. KITTS & NEVIS

V47KP	**A**	**1,397,790**	**2172**	**77**	**202**
			(Opr. K2DOX)		

ST. LUCIA

***J6/WJ2O**	**A**	**1,034,647**	**2510**	**53**	**138**

U.S. VIRGIN ISLANDS

***WP2AHW**	**A**	**3,542,044**	**4069**	**98**	**258**
			(Opr. WD5N)		

AFRICA

AFRICAN ITALY

IG9R		**141,126,472**	**2501**	**36**	**119**
			(Opr. I2VXJ)		
IG9A	**7**	**1,047,591**	**2507**	**39**	**113**
			(Opr. UA3DPX)		
IG9T	**3.5**	**334,750**	**1089**	**24**	**79**
			(Opr. IT9GSF)		

ANTARCTICA

KC4AAA	**14**	**194,688**	**832**	**27**	**51**
			(Opr. UA3YH)		

ASCENSION ISLAND

ZD8Z	**A**	**8,047,364**	**4853**	**144**	**415**
			(Opr. N6TJ)		

CANARY ISLANDS

EA8EA	**A**	**12,402,642**	**6339**	**166**	**492**
			(Opr. OH2MM)		
EA8ZS	**28**	**12,801**	**109**	**12**	**39**
***EA8**					
/ON5UM	**A**	**240,961**	**417**	**64**	**139**
***EA8ADJ**	**21**	**352,800**	**1187**	**24**	**76**
***EA8NQ**	**7**	**148,302**	**505**	**23**	**76**
***EA8CN**	**3.5**	**105,160**	**405**	**17**	**71**
*EA8AF	*	7,825	63	10	33

EGYPT

SU2MT	**A**	**6,141,658**	**3975**	**131**	**396**
			(Opr. W6NV)		

IVORY COAST

TU2MA	**14**	**635,294**	**1601**	**31**	**103**

MADEIRA ISLANDS

CT9U		**141,058,145**	**2410**	**39**	**120**
			(Opr. DL2HYH)		
CT9X	**7**	**66,861**	**391**	**14**	**43**
			(Opr. DK8WF)		
CT3FN	**3.5**	**318,566**	**1138**	**21**	**73**
			(Opr. HB9CRV)		
*CT3/DF5AN	21	21,973	173	13	30

MALAWI

***7Q7A**	**A**	**3,645,398**	**2866**	**111**	**294**

MAURITIUS

3B8/N6ZZ	**A**	**6,881,690**	**4274**	**146**	**416**

MOROCCO

***CN2PK**	**A**	**3,428,820**	**2979**	**89**	**298**
			(Opr. OH6KIT)		

NIGERIA

5NØ/OK1MU	**28**	**88,395**	**392**	**18**	**65**
5NØMVE	**3.5**	**57,100**	**334**	**14**	**44**
***5N3**					
/SP5XAR	**14**	**250,470**	**740**	**29**	**86**

RWANDA

***9X4WW**	**A**	**4,121,685**	**3439**	**111**	**294**
			(Opr. ON4WW)		

SAO TOME & PRINCIPE

***S92PI**	**21**	**99,144**	**324**	**29**	**79**

SOUTH AFRICA

ZS6EZ	**A**	**5,626,962**	**3223**	**156**	**438**
ZS6SA	*	760,716	1141	76	150
ZS6NW	**21**	**523,000**	**1350**	**30**	**100**
ZS6MG	**7**	**272,087**	**705**	**35**	**96**
ZS6KR	3.5	10,560	68	21	39
***ZS6AJS**	**A**	**582,920**	**818**	**81**	**166**

SWAZILAND

3DAØNX	**A**	**3,164,000**	**2688**	**113**	**287**
			(Opr. JM1CAX)		

UGANDA

***5X4F**	**A**	**552,636**	**732**	**86**	**172**

ZONE 36

YL3IZ/MM	**7**	**512,100**	**1148**	**38**	**112**

ASIA

ARMENIA

EK6GC	**1.8**	**173,604**	**680**	**18**	**74**

ASIATIC TURKEY

***TA4ZM**	**A**	**3,640,040**	**2940**	**97**	**327**
			(Opr. DK5WL)		
*TA3D	*	1,387,232	1584	80	228
*TA3DD	*	213,664	430	43	133
*TA2IJ	*	19,278	127	14	40
***TA2/OK1EE**	**7**	**355,850**	**1146**	**25**	**85**

ASIATIC RUSSIA

RV9XF	**A**	**733,670**	**1119**	**59**	**176**
RK9CWY	**"**	**730,520**	**936**	**71**	**209**
			(Opr. RX9CAZ)		
RZ9QWM	*	215,605	557	44	111
			(Opr. UA9QCP)		
RA9XF	*	212,868	476	36	126
RW9JO	**21**	**152,544**	**682**	**26**	**70**
RZ9UA	**14**	**704,725**	**1576**	**38**	**137**
RW9SW	*	319,156	819	35	111
UA9XEN	*	99,619	385	24	73
UA9CR	**1.8**	**79,440**	**358**	**17**	**63**
UA9XC	**7**	**59,760**	**269**	**20**	**60**
UA9OC	**3.5**	**94,752**	**411**	**22**	**72**
UA9XS	*	61,880	316	15	55
*UA9KDZ	A	78,570	129	23	74
*RA9XU	14	25,069	139	17	54
***RA9AE**	**3.5**	**121,072**	**487**	**18**	**74**
UAØZY	**A**	**120,250**	**553**	**58**	**72**
RZØCQ	*	88,160	223	56	104
UAØSJ	*	37,300	224	40	60
RUØLAX	*	19,242	173	83	104
UAØSBQ	*	10,956	112	28	38
RWØAB	**14**	**211,038**	**894**	**27**	**75**
UAØDC	*	151,736	648	33	71
UAØAGI	**7**	**622,950**	**1586**	**38**	**112**
UAØJQ	**"**	**441,188**	**1266**	**37**	**111**
UAØSR	3.5	16,802	109	16	46
UAØFDX	1.8	6,336	83	14	18
***RWØFO**	**A**	**60,372**	**248**	**51**	**78**
***UAØYAY**	**14**	**48,706**	**347**	**19**	**52**
***UAØSMM**	**3.5**	**165,658**	**692**	**30**	**83**

AZERBAIJAN

***4K9W**	**A**	**100,377**	**230**	**52**	**119**

BAHRAIN

A92Q	**A**	**6,457,388**	**4334**	**137**	**405**

CHINA

***BY4SZ**	**A**	**353,210**	**1077**	**63**	**106**
			(Opr. BZ4SCT)		

CYPRUS

C4A	**A**	**7,410,858**	**4809**	**134**	**420**
			(Opr. AH3C)		

INDIA

VU2TLO	**A**	**357,696**	**606**	**58**	**158**

ISRAEL

4X4WN	**3.5**	**211,068**	**754**	**23**	**76**
4X4NJ	**1.8**	**200,735**	**756**	**20**	**75**
*4X1VF	28	6,063	45	16	31
***4Z3T**	**21**	**480,402**	**1434**	**26**	**91**
			(Opr. 4Z4UT)		
*4Z5FW	14	32,376	190	15	42
***4Z4TA**	**7**	**45,900**	**240**	**16**	**52**
*4X6RA	*	13,520	122	11	29

JAPAN

JA1IDY	**A**	**1,546,702**	**1432**	**131**	**255**
JA1JKG	**"**	**840,642**	**1098**	**94**	**177**
JA1QOW	*	316,800	502	84	141
JR1GRF	*	191,984	293	59	110
JA1BUI	*	190,800	366	81	131
JA1TRP	*	83,880	249	43	77
JG1BPS	*	50,668	175	45	61
JR1XFS	**14**	**256,305**	**853**	**31**	**74**
JA1YXP	**7**	**668,277**	**1469**	**38**	**121**
			(Opr. JM1UWB)		
JK1OPL	*	276,750	656	38	112
JA1AAT	*	1,380	23	12	8
JH1OGC	**3.5**	**244,067**	**810**	**30**	**77**
JA1XEM	*	1,440	21	12	12
***JF1SEK**	**A**	**824,912**	**866**	**116**	**228**
***JS1OYN**	**"**	**308,737**	**535**	**83**	**138**
*JR4PMX/1	*	245,622	426	76	125
*JH1SVO	*	157,731	308	75	128
*JA7KBR/1	*	136,565	265	75	116
*JL7PVR/1	*	135,408	304	67	101
*JA1KI	*	127,512	301	60	101
*JA1BRL	*	94,360	254	55	86
*JP1ROA	*	84,708	224	61	95
*JM1KNI	*	77,168	251	50	62
*JA1QN	*	72,352	240	40	72
*JE3UHV/1	*	69,850	214	51	76
*JF1SQC	*	62,602	201	51	62
*JA1WHG	*	55,250	155	57	73
*7K1EQG	*	38,831	152	42	61
*JE1LFX	*	37,673	135	34	67
*7N3SDR	*	32,760	137	39	52
*JA1AB	*	32,417	151	33	44
*JI1RCB	*	24,485	116	37	46
*JG1TVK	*	20,776	80	43	55
*JA1BCP	*	13,740	119	32	28
*JR1VNX	*	5,934	46	21	22
*JG3AXP/1	*	5,568	61	14	17
*JH1UES	*	5,537	42	23	26
*JH1JGZ	*	2,844	34	17	19
*JE1KUP	*	2,226	42	25	28
*JJ3OLZ/1	*	1,060	21	10	10
*JE1KDM	*	896	22	8	6
*JE1HXZ	*	684	14	7	12
***JO1CRA**	**28**	**1,632**	**27**	**9**	**15**
*JA1NLX	*	1,386	24	9	13
*JJ1GQH	21	16,566	99	23	43
*JA1XPU	*	1,280	26	7	13
*JH1NXU	*	495	12	8	7
***JA1HP**	**14**	**48,360**	**227**	**25**	**53**
*7N2DXF	*	24,592	151	22	36
*7N3PJA	*	14,076	111	19	27
*JA1KFX	*	10,010	133	13	13
*JA7JNF/1	*	8,878	72	18	28
*JI1CYX	*	875	21	10	15
***JS1UMQ**	**7**	**44,892**	**186**	**29**	**58**
*JI3FAD/1	*	38,290	205	25	45
*JK1AFI	*	32,417	156	25	52
*JA2FNY/1	*	17,686	91	27	47
*7K2GMF	*	380	15	6	4
*JM1NKT	3.5	20,618	130	21	40
*JE1LPZ	*	5,600	54	17	23
*JAØBMS/1	*	1,656	33	13	15
*JM1YCN	1.8	832	23	7	6
			(Opr. 7K1EWD)		
*JE1SPY	*	351	14	5	4
JA2EU	**A**	**279,186**	**614**	**52**	**106**
JA2SWF	*	76,033	207	53	86
JA2JNA	**28**	**3,906**	**45**	**14**	**17**
JE2PCY	*	2,208	37	11	13
JH2ECB	**21**	**61,422**	**261**	**30**	**57**
JR2AGL	**7**	**353,562**	**1025**	**34**	**87**
JG2LGM	3.5	7,200	62	16	32
***JA2ZJR**	**A**	**604,443**	**808**	**100**	**169**
			(Opr. JH2CMI)		
***JA2IU**	**"**	**524,433**	**709**	**98**	**175**
*JA2BY	*	502,021	622	101	198
*JN2AMD/2	*	304,875	525	80	145
*JA9DDF/2	*	211,788	358	90	132
*JA2AXB	*	175,684	382	66	101
*JA2QVP	*	9,625	66	27	28
***JI2UNR**	**21**	**118,770**	**403**	**33**	**74**
*JA2KVB	*	45,000	141	27	63
*JO2CKU	*	1,820	27	10	18
***JA2ANA**	**14**	**111,264**	**327**	**36**	**86**
*JH2NWP	*	55,328	268	26	50
*JA2DN	*	35,834	165	28	54
*JJ2KFF	*	25,875	126	26	49
*JQ2LGS	*	19,656	138	22	30
*JH2CYU	*	2,556	25	14	22
*JG2TSL	7	36,778	184	27	47
*JA2GTW	*	23,628	134	24	42
*JA2FMW	3.5	11,700	70	20	40
*JF2WXS	*	7,614	70	18	29
*JR2WLQ	*	594	14	11	11*
JA3ARM	**A**	**200,508**	**405**	**71**	**115**
JA3JOT	**"**	**156,978**	**366**	**61**	**92**
JA3EEM	*	12,780	139	36	60
JR3NZC	**14**	**142,800**	**644**	**25**	**50**
JO3JJN	*	3,306	33	15	23
JG3KCK	7	5,180	48	16	21
***JI3BFC**	**A**	**422,799**	**567**	**101**	**192**
***JA1DZC/3**	**"**	**411,271**	**545**	**104**	**183**
*JF3IUC	*	284,704	478	81	143
*JH3CUL	*	177,600	345	79	121
*JH3JYS	*	146,640	303	76	119
*JI3MVO	*	13,715	81	30	35
*JG3EHD	*	6,321	49	24	25
*JG3WCZ	*	3,800	33	17	23
*JA3TBT	*	3,748	61	21	31
***JK3GWT**	**21**	**45,778**	**199**	**30**	**64**
*JO3JUG	*	5,000	35	20	30
***JE3HHT**	**14**	**91,800**	**341**	**33**	**69**
*JN3DSH	*	44,854	210	26	56
*JA3VOV	*	26,352	120	22	39
*JA3AVO	*	13,179	65	25	44
*JA4AQR/3	*	510	12	7	8
***JA3GN**	**7**	**66,229**	**242**	**32**	**71**
*JA3AYX	*	4,032	41	14	22
***JF3NLQ**	**3.5**	**13,281**	**94**	**19**	**38**
*JA3BLN	*	3,955	46	13	22
*JG1EIQ/3	"	546	12	9	12
JH4UHW	**A**	**2,082,249**	**2153**	**106**	**227**
JA4HIX	"	48,396	163	48	63
JA4RTX	"	48,348	116	65	93
JA4CES	*	2,860	31	22	22
JA4DHN	7	1,040	18	11	9
JA4CUU	**3.5**	**34,719**	**187**	**23**	**48**
JH4CPC	*	22,268	114	23	53
***JR4GPA**	**A**	**384,898**	**633**	**81**	**142**
*JA4XRN	*	184,632	342	68	128
*JA1XCZ/4	*	145,770	258	75	140
*JA4CZM	*	73,360	196	56	84
*JA4BAA	*	58,528	172	46	78
*JA4ENY	*	23,780	110	34	48
*JE4SDB	*	9,800	76	2	2
*JH4OYA	*	3,600	45	18	22
*JA4ETH	28	2,325	30	13	18
***JR4CAU**	**14**	**181,566**	**144**	**29**	**40**
***JH4JNG**	**"**	**153,855**	**474**	**36**	**81**
*JL4CMT	*	58,225	256	28	57
***JE4CIL**	**7**	**37,730**	**142**	**30**	**68**
*JI4HKA	3.5	1,275	37	15	20
JH5FXP	**A**	**3,616,704**	**3035**	**126**	**288**
JA5IP	*	54,540	168	47	61
JA5AF	*	14,700	79	34	41
JA5DQH	**21**	**241,957**	**674**	**35**	**96**
JA5CKD	*	101,757	346	31	76
JA5APU	**14**	**98,560**	**441**	**28**	**49**
JA5THU	**7**	**614,774**	**1422**	**37**	**112**
JA5JGV	3.5	5,371	54	18	23
***JG5OYV**	**A**	**45,864**	**164**	**41**	**57**
*JA5MOO	*	32,883	113	47	66
*JG5OYU	*	32,064	125	34	62
*JA5QDU	*	22,360	100	40	46
*JA5PEE	14	492	15	12	15
*JA5PDS	7	20,919	141	22	35
JA6COW	**A**	**377,865**	**464**	**109**	**202**
JA6VU	*	163,904	303	81	127
JR6CF	*	23,968	84	39	73
JA6WIF	**7**	**72,565**	**235**	**31**	**84**
JR6LLN	*	51,615	207	30	63
JF6OJX	3.5	15,340	99	23	42
***JA6SRB**	**A**	**208,373**	**371**	**70**	**139**
*JJ6DGP	*	97,940	226	66	100
*JA6CM	*	11,448	76	23	31
*JA6AKV	*	4,600	49	21	19
***JH6NBW**	**21**	**49,476**	**238**	**25**	**51**
***JH6TYD**	**7**	**58,240**	**230**	**27**	**64**
*JA6WFM	*	37,212	164	29	55
*JE6IBJ	3.5	6,468	54	15	34
JH7WKQ	**A**	**2,249,124**	**2265**	**117**	**231**
JH7XGN	**"**	**1,165,056**	**1083**	**123**	**261**
JH7BMZ	*	35,934	121	41	65
JA7JI	28	1,325	20	14	11
JH7DNO	**21**	**153,986**	**485**	**35**	**84**
JE7JDL	**14**	**322,000**	**796**	**38**	**102**
JA7AXP	*	7,701	55	21	30
JH7AUL	**7**	**247,716**	**695**	**35**	**91**
JA7NI	**1.8**	**24,738**	**145**	**19**	**43**
***JA7VEI**	**A**	**95,172**	**230**	**56**	**98**
***JA7SUR**	**"**	**88,971**	**238**	**62**	**79**
*JH7FUJ	*	30,690	134	37	56
*JE7DOT	*	600	12	8	12
***JA7AMK**	**21**	**43,949**	**189**	**27**	**44**
*JF7GDF	*	2,272	34	14	18
*JA7KM	*	1,584	28	10	14
***JA7SSB**	**14**	**236,062**	**785**	**30**	**76**
*JA7MSQ	*	206,747	714	32	69
*JA7DOT	*	61,659	240	28	65
*JA7JND	*	24,072	154	22	37
*JF7VVL/7	*	4,550	46	15	20
***JH7JVJ**	**7**	**212,652**	**569**	**36**	**96**
*JA7FFN	*	6,369	67	15	18
JA8RWU	**A**	**1,706,475**	**1639**	**130**	**243**
JH8FAJ	14	6,864	74	15	18
***JA8AJE**	**A**	**148,404**	**336**	**63**	**103**
*JR8UNT	*	7,497	63	22	27
*JA8XOD	28	264	9	5	6
***JA8DIM**	**21**	**46,965**	**201**	**30**	**63**
*JA8XIC	*	1,482	25	11	15
*JH8BDA	7	19,411	124	21	38
JA9CWJ	**A**	**924,603**	**1072**	**105**	**206**
JA9JFO	**14**	**176,436**	**536**	**35**	**82**
***JA9XBW**	**A**	**397,615**	**530**	**106**	**177**
*JE9LLO	*	63,842	177	58	79
*JAØTEA/9	*	29,348	113	43	49
***JH9KVF**	**21**	**68,780**	**279**	**28**	**67**
***JR9OPJ**	**14**	**102,608**	**339**	**33**	**73**
*JA9TSI	*	91,876	325	32	71
*JA9KUG	*	25,039	128	23	50
*JE9HVF	*	1,210	20	7	15
***JR9NVB**	**7**	**44,604**	**188**	**28**	**56**
JAØQWO	**A**	**385,299**	**533**	**97**	**182**
JAØAXA	*	15,257	78	33	40
JHØAUY	**14**	**45,428**	**212**	**27**	**55**
JAØGZ	7	2,626	35	11	15
JHØFUW	**3.5**	**30,528**	**167**	**24**	**48**
***JEØUXR**	**A**	**973,245**	**1044**	**111**	**234**
*JHØGHZ	*	301,070	477	88	150
*JAØGCI	28	1,248	21	11	13
***JHØEPI**	**21**	**38,220**	**206**	**26**	**44**
***JFØSGW**	**14**	**106,857**	**425**	**32**	**61**
*JAØUMV	*	95,040	387	29	59

*JHØFWV	"	3,942	50	13	14
*JRØBQD	7	7,820	85	15	19
***JAØAOQ**	**3.5**	**22,236**	**126**	**24**	**44**
*JHØDNX	1.8	6	1	1	1

KAZAKHSTAN

UN7FDM	**A**	**501,963**	**833**	**59**	**172**
UN7LZ	**14**	**348,528**	**839**	**36**	**123**
UN5J	**3.5**	**171,122**	**625**	**28**	**91**
***UN8IM**	**A**	**336,087**	**405**	**77**	**244**
***UN7GG**	**3.5**	**73,014**	**330**	**20**	**66**
*UN7FCO	"	64,990	265	24	73
***UN2O**	**1.8**	**42,904**	**254**	**10**	**52**

KOREA

HL9CW	**A**	**985,426**	**1335**	**100**	**202**
			(Opr. W8KJP)		

KYRGYZSTAN

EX/RU1AO	**7**	**142,158**	**468**	**32**	**82**

LEBANON

OD5PL	**21**	**168,504**	**850**	**16**	**52**

MONGOLIA

JT1BH	**A**	**268,096**	**849**	**42**	**100**

PAKISTAN

AP2MY	**7**	**815,628**	**2398**	**33**	**99**
			(Opr. N9NC)		

QATAR

A71CW	**A**	**4,472,608**	**2802**	**145**	**429**

SAUDI ARABIA

7Z5OO	**A**	**3,904,810**	**3174**	**118**	**337**
			(Opr. K3UOC)		
HZ1HZ	**"**	**1,131,945**	**1058**	**99**	**292**
HZ1AB	**14**	**828,856**	**1866**	**36**	**128**

SINGAPORE

***9V1YC**	**A**	**1,015,952**	**1444**	**103**	**226**

SRI LANKA

4S7TWB	**A**	**1,714,144**	**1756**	**104**	**287**

TAIWAN

BV7FF	**A**	**165,648**	**340**	**72**	**131**
BVØCRA	"	74,412	229	63	93

THAILAND

HSØ /SM3CVM	**A**	**20,735**	**175**	**27**	**37**
***HS1NIV**	**A**	**72,240**	**436**	**45**	**75**

TURKMENISTAN

EZ8AI	A	25,872	120	22	55

VIETNAM

3W5FM	**A**	**280,578**	**871**	**83**	**119**
XV7SW	**28**	**19,604**	**309**	**19**	**33**

WESTERN MALAYSIA

***9M2TO**	**A**	**238,280**	**724**	**70**	**115**

EUROPE

AALAND ISLANDS

OHØRJ	**3.5**	**55,806**	**551**	**15**	**56**
OHØMEP	**1.8**	**251,136**	**1451**	**24**	**85**
***OHØNLP**	**21**	**44,832**	**244**	**26**	**70**
*OHØKLG	7	9,984	150	11	41
***OHØLQK**	**3.5**	**58,110**	**597**	**15**	**63**

ALBANIA

ZA1AJ	**A**	**2,526,230**	**3208**	**111**	**367**
			(Opr. OK2ZV)		
ZA1AB	**7**	**96,760**	**661**	**21**	**61**
			(Opr. OH1MKT)		

AUSTRIA

OE2BZL	**A**	**808,275**	**1283**	**79**	**146**
			(Opr. DK5AD)		
OE9SLH	"	56,682	211	40	101
OE3DSA	**21**	**65,520**	**229**	**31**	**86**
OE5JDL	**3.5**	**121,104**	**634**	**27**	**89**
***OE6MMD**	**7**	**171,958**	**886**	**30**	**97**

BALEARIC ISLANDS

EA6ACC	**1.8**	**56,643**	**621**	**14**	**65**
***EA6GP**	**A**	**180,672**	**565**	**49**	**143**
*EA6ZS	14	11,778	143	9	30
*EA6PZ	7	500	24	6	14

BELGIUM

ON4UN	**3.5**	**642,600**	**2204**	**35**	**118**
ON6AB	"	123,760	929	17	74
***ON6CR**	**A**	**73,584**	**271**	**44**	**100**
*ON4CAS	"	60,129	256	33	98
*ON4PX	"	15,576	120	29	30
***ON4RU**	**21**	**284,258**	**681**	**38**	**131**
***ON6CW**	**14**	**85,500**	**451**	**24**	**66**
*ON4XG	"	67,914	350	23	75
*ON4ARJ	"	7,134	106	11	30
***ON4ON**	**1.8**	**29,988**	**408**	**9**	**59**
*ON6YH	"	21,672	297	10	53

BELARUS

EU1DX	**A**	**1,197,800**	**1353**	**112**	**312**
EW3DU	"	195,721	567	51	127
EU1AA	**14**	**567,920**	**1643**	**39**	**116**
EW6TU	**7**	**113,226**	**657**	**27**	**86**
EW8OS	"	86,031	435	30	91
EW6AL	"	62,016	265	26	88
EW3CW	"	21,340	100	24	73
EU3FT	**3.5**	**182,710**	**1230**	**24**	**86**
EU4AA	"	80,550	560	17	73
EU6AA	"	32,406	427	10	56
EU2MM	"	27,972	378	11	52
***EW6BL**	**A**	**259,812**	**617**	**58**	**194**
***EU4EU**	**3.5**	**25,376**	**312**	**11**	**50**

BOSNIA-HERZEGOVINA

T93M	21	9,576	73	22	34
T94ON	**1.8**	**88,655**	**830**	**12**	**73**
*T99T	28	285	10	5	10
***T99W**	**3.5**	**134,726**	**1055**	**22**	**84**

BULGARIA

LZ1BJ	**A**	**335,170**	**839**	**62**	**180**
LZ2VP	"	79,488	292	40	98
LZ3AA	21	8,910	62	20	35
LZ7G	**14**	**489,078**	**1592**	**39**	**123**
			(Opr. LZ3GA)		
LZ1ZD	"	200,220	743	34	108
LZ2TF	"	49,530	336	22	56
LZ2KBA	**7**	**182,040**	**998**	**26**	**94**
			(Opr. LZ2CG)		
*LZ1ZF	A	40,293	164	29	82
*LZ1AG	"	31,115	117	48	79
*LZ1IQ	"	10,049	206	31	90
*LZ1FJ	7	5,828	97	8	39
***LZ1VQ**	**3.5**	**14,271**	**172**	**11**	**56**
*LZ1IA	1.8	259	43	5	24

CROATIA

9A1HDE	**21**	**179,949**	**588**	**33**	**100**
			(Opr. 9A7V)		
9A5Y	**7**	**477,932**	**1540**	**39**	**130**
9A1CRJ	**"**	**460,500**	**1412**	**36**	**114**
			(Opr. 9A4LA)		
9A2AJ	"	446,080	1456	38	132
9A3MA	"	79,378	260	23	63
9A3MA	"	79,378	260	23	63
9A7A	**3.5**	**240,536**	**1529**	**23**	**84**
			(Opr. 9A3TR)		
9A2TW	**1.8**	**97,428**	**713**	**16**	**76**
9A3B	**"**	**86,359**	**749**	**16**	**75**
			(Opr. 9A2VR)		
***9A9R**	**A**	**675,840**	**1059**	**85**	**235**
*9A3SM	"	161,616	337	67	155
*9A4RC	"	34,345	109	46	69
*9A1CHP	"	4,400	62	12	13
***9A3QK**	**7**	**71,173**	**389**	**19**	**84**
***9A2NO**	**3.5**	**42,075**	**413**	**14**	**71**

CZECH REPUBLIC

OK1EP	**A**	**549,056**	**733**	**95**	**273**
OK2ABU	"	469,030	823	78	232
OK1TW	28	468	23	6	12
OK1RF	**14**	**548,892**	**1444**	**36**	**122**
OK1DT	"	227,664	775	33	103
OK2PCL	"	18,444	123	18	35
OK2GG	**7**	**152,192**	**707**	**32**	**95**
OL4M	**"**	**148,944**	**857**	**27**	**89**
OK1NG	"	100,040	452	30	92
OK1XJ	"	93,456	454	30	88
OK1EW	**3.5**	**184,785**	**1152**	**21**	**76**
OK1CW	**"**	**172,750**	**956**	**26**	**99**
OK1IF	"	144,384	1081	24	70
OK1IR	"	129,100	891	17	83
OK1DTP	"	97,566	704	19	82
OK5M	**1.8**	**66,544**	**655**	**17**	**65**
			(Opr. OK1DOT)		
OK2SG	"	21,432	241	13	63
***OK1AW**	**A**	**629,486**	**854**	**100**	**303**
***OK2SAT**	**"**	**459,797**	**800**	**74**	**239**
*OK1BA	"	408,895	820	57	208
*OK1BMW	"	384,237	628	78	243
*OK1ZP	"	338,513	700	67	192
*OK2QX	"	336,608	631	80	234
*OK1MKI	"	299,115	712	72	183
*OK2EC	"	284,935	649	61	184
*OK1FPS	"	268,583	591	59	200
*OK2EQ	"	198,606	486	62	175
*OK1KZ	"	175,428	564	43	155
*OK1DMS	"	138,408	575	33	113
*OK2SWD	"	54,875	317	31	94
*OK1AOU	"	45,719	244	29	102
*OK2PBG	"	45,144	196	39	93
*OK1FCA	"	35,280	276	18	77
*OK2AJ	"	34,128	322	32	40
*OK1FKV	"	19,980	126	28	62
*OK1RV	"	13,348	176	17	54
***OK1ABP**	**21**	**115,843**	**324**	**31**	**102**
*OK1AES	"	74,494	256	30	89
*OK1LL	"	65,920	264	29	74
*OK2ON	"	62,115	248	18	41
*OK2UQ	"	5,060	48	18	28
*OK2BHE	"	3,105	50	10	13
***OK1FZM**	**14**	**120,192**	**443**	**32**	**96**
***OK2BEE**	**"**	**119,000**	**478**	**33**	**86**
*OK2TBC	"	90,678	357	31	88
*OK1EV	"	66,898	377	21	62
*OK1KW	"	57,500	254	25	75
*OK2PCN	"	43,764	236	23	61
*OK1FF	"	38,232	271	18	54
*OK2SW	"	9,982	78	18	28
***OK1DCF**	**7**	**106,344**	**505**	**32**	**94**
*OK1JST	"	27,797	239	19	59
*OK2BXR	"	20,100	229	18	57
*OK1FSM	"	17,612	174	16	52
*OK1AUP	"	2,625	50	16	19
***OL3Z**	**3.5**	**62,656**	**533**	**16**	**73**
			(Opr. OK2HI)		
*OK2WM	"	32,940	442	10	50
*OK1FOG	"	31,464	381	13	56
*OK2BWJ	"	18,414	250	10	52
*OK1FJD	"	2,886	74	5	32
*OK2OU	"	1,581	41	6	25
***OK2PWJ**	**1.8**	**30,877**	**351**	**14**	**63**
*OK1HGM	"	5,254	142	4	33
*OK2BWM	"	1,496	40	5	29

DENMARK

OZ4OC	**A**	**158,355**	**439**	**53**	**154**
OZ2RH	"	136,500	200	60	190
OZ7NB	"	17,700	123	30	177
OZ5DX	**14**	**85,248**	**379**	**23**	**80**
OZ7YL	7	14,440	100	23	53
OZ1AXG	**1.8**	**67,410**	**641**	**17**	**73**
***OZ4FF**	**A**	**179,352**	**500**	**56**	**156**
*OZ7JQ	"	21,472	120	31	57
***OZ1KWG**	**14**	**42,818**	**276**	**20**	**59**
*OZ1BMA	"	36,225	257	18	51
***OZ6PI**	**7**	**20,560**	**170**	**21**	**59**
*OZ1IZB	"	9,720	104	12	48
*OZ1APA	"	8,172	85	14	45

DODECANESE

J49AF	**3.5**	**204,323**	**1646**	**20**	**81**
***SV5 /SMØCMH**	**A**	**287,570**	**1118**	**46**	**147**

ENGLAND

G4BUO	**A**	**3,755,334**	**2831**	**137**	**424**
G3KDB	**"**	**2,398,466**	**2166**	**121**	**348**
GØIVZ	**"**	**2,372,150**	**2681**	**118**	**357**
G3UFY	"	1,043,352	1410	83	261
GØLZL	"	395,360	806	54	126
G4TSH/P	"	205,088	418	58	150
GØAEV	**28**	**2,484**	**53**	**11**	**25**
G4ODV	**21**	**214,060**	**623**	**33**	**107**
G4IUF	"	23,046	123	21	48
G3IGW	**14**	**129,125**	**542**	**30**	**95**
G4FAM	**3.5**	**255,402**	**1183**	**25**	**101**
G3XTT	**1.8**	**135,660**	**856**	**23**	**79**
***G3SWH**	**A**	**805,896**	**1237**	**81**	**288**
***GØDEZ**	**"**	**521,766**	**1053**	**100**	**187**
*G3NKS	"	465,080	815	70	210
*G4FRE	"	375,541	733	64	219
			(Opr. WG3I)		
*G3ESF	"	318,836	766	48	186
*G3RSD	"	250,076	662	62	140
*G6QQ	"	219,651	554	45	166
*G3VNG	"	144,072	447	54	120
*G3JKY	"	106,856	500	41	111
*G3LIK	"	49,776	146	56	80
*G3RZF	"	38,280	204	46	70
*G4OTY	"	15,444	150	15	39
*G4ZME	"	14,942	114	20	42
***G3RXP**	**14**	**164,484**	**662**	**28**	**80**
***GØLII**	**3.5**	**54,285**	**543**	**14**	**63**
*GØVQR	"	1,104	50	3	20

ESTONIA

ES6DO	**3.5**	**280,416**	**1343**	**30**	**97**
*ES4NG	A	27,559	124	35	92
*ES3BQ	"	9,108	120	13	33
***ES2RJ**	**3.5**	**166,320**	**1165**	**26**	**84**

EUROPEAN RUSSIA

UA4RZ	**A**	**1,074,964**	**1276**	**114**	**370**
UA6LTI	**"**	**843,588**	**1078**	**115**	**313**
RZ6FZ	"	159,104	437	58	168
UA3UCD	"	53,246	184	53	105
UA4ANZ	"	40,326	170	44	97
RX3RT	"	17,170	92	24	61
UA4LM	**21**	**206,921**	**846**	**32**	**111**
RA3XO	"	69,342	275	30	97
RW1ZA	**14**	**571,132**	**1696**	**35**	**113**
RA3AQ	"	334,600	1215	34	106
UA1OZ	"	164,854	607	34	105
UA6LAK	"	71,722	351	27	82
UA6BAD	**7**	**197,723**	**812**	**36**	**113**
UA1OMS	**"**	**147,963**	**707**	**33**	**96**
RA4LX	"	84,420	475	28	77
RW1AN	**3.5**	**148,608**	**743**	**30**	**99**
RW6HA	**"**	**135,660**	**695**	**32**	**101**
UA1ANA	"	45,050	401	16	69
RW3YA	"	24,548	281	10	58
UA6ATG	"	7,535	113	9	46
RX6LRI	**1.8**	**8,321**	**133**	**7**	**46**
***UA3AGS**	**A**	**220,104**	**661**	**24**	**53**
***UA3RO**	**"**	**187,836**	**475**	**63**	**183**
***RU4WE**	**"**	**145,920**	**960**	**35**	**117**
*RW4AO	"	73,080	275	43	131
*UA1OMX	"	66,300	243	45	111
*UA4AGO	"	61,272	208	44	104
*RU6BV	"	55,632	234	41	111
*RV6ASY	"	16,380	150	24	66
***UA4LL**	**21**	**166,716**	**725**	**30**	**102**
*RZ6HX	"	77,063	412	29	80
*UA3ABJ	"	48,178	250	28	81
***RA3DUT**	**14**	**210,532**	**708**	**34**	**112**
*RU3D	"	116,977	558	28	91
			(Opr. RU3HD)		
*RA4LH	"	112,585	531	29	86
*RN9XA	"	76,704	402	29	73
*UA3XGM	"	27,492	144	20	59
*RV6APN	"	11,725	116	15	52
*RA3VY	"	4,953	91	9	30
***RW3AX**	**7**	**57,700**	**374**	**26**	**74**
***RA6FV**	**"**	**42,486**	**279**	**24**	**73**
*RV1AB	"	34,528	280	18	65
*RX3AGO	"	19,380	205	15	53
*UA4SS	"	15,834	214	12	46
*RA6LAE	"	14,508	82	6	26
*RSØF	"	13,532	71	23	45
***UA3WU**	**3.5**	**99,120**	**791**	**20**	**85**
***RV6LNA**	**"**	**88,061**	**584**	**21**	**86**
*UA3AGW	"	53,599	467	18	73
*RA3PP	"	18,476	235	13	49
*UA1ODN	"	11,440	172	10	45
*UA4FES	"	8,479	105	11	50
*UA3TU	"	5,229	51	12	51
***RA4UDU**	**1.8**	**11,600**	**155**	**12**	**47**
*UA1NDX	"	6,525	130	5	39

FAROE ISLANDS

OY1CT	**A**	**1,874,982**	**3092**	**93**	**318**
OY9JD	**1.8**	**174,930**	**1098**	**23**	**79**

FINLAND

OH6WZ	**A**	**2,216,022**	**2191**	**129**	**409**
OH1NSJ	**"**	**2,204,186**	**2250**	**126**	**412**
OH6KIT	**"**	**2,176,416**	**2270**	**109**	**349**
OH2PM	"	1,815,432	1798	131	405
OH6YF	"	1,230,120	1655	104	304
OH8LAE	"	1,215,400	1513	115	357
OH5VT	"	769,392	1035	106	326
OH3MMH	"	449,360	802	97	241
OH6KZP	"	257,145	675	54	183
OH6NEV	"	215,820	621	53	167
OH2VZ	"	158,508	666	72	166
OH3WS	"	158,167	308	75	202
OH2KQ	"	80,199	204	55	146
OH1BV	"	57,564	210	48	116
OH2FS	"	29,766	106	39	84
OH1SH	"	27,004	200	16	70
OH6MRA	**21**	**59,532**	**253**	**27**	**96**
OH5PA	"	10,579	63	23	48
OH8LQ	**14**	**356,478**	**1590**	**32**	**82**
OH6OS	"	198,880	845	32	78
OH3NXW	"	148,695	713	26	89
OH2MPO	**7**	**42,456**	**334**	**22**	**65**
OH1BMH	"	21,185	127	23	72
OH2BCD	"	19,200	139	22	53
OH3BZY	**3.5**	**348,834**	**1371**	**35**	**106**
OH9BVM	**"**	**208,962**	**864**	**34**	**107**
OH1TN	"	173,030	835	28	102
OH7UE	"	155,078	867	29	77
OH2BCI	**1.8**	**119,728**	**705**	**25**	**87**
OH1MA	"	32,620	210	20	50
***OH1XT**	**A**	**162,400**	**552**	**44**	**156**
***OH2VF**	**"**	**113,322**	**374**	**49**	**153**
*OH6MBQ	"	33,062	208	23	99
*OH5MW	"	27,328	90	52	60
*OH2RL	"	22,152	151	23	81
*OH6LDA	"	9,300	91	15	47
*OH6FW	"	6,240	60	19	46
*OH9AB	"	3,492	43	13	23
			(Opr. OH9TD)		
*OH7NW	"	460	21	7	16
***OH8MIZ**	**21**	**24,966**	**269**	**18**	**55**
*OH8LC	"	8,500	62	21	47
***OH3MC**	**14**	**60,669**	**271**	**26**	**81**
*OH1LVR	"	1,848	34	9	24
*OH2KMG	7	15,265	91	25	46
*OH3TZ	"	13,780	146	15	50
*OH3NM	"	4,494	53	11	31
*OH4TY	1.8	3,168	83	5	31

FRANCE

F6IRA	**A**	**586,840**	**879**	**83**	**257**
F5JKK	**"**	**334,685**	**725**	**66**	**181**
F5JBR	"	267,360	600	66	174
F2AR	"	109,886	360	41	126
F5TGR	"	34,968	203	30	64
F5GEG	"	4,557	55	20	29
F5NBX	**21**	**288,627**	**848**	**35**	**106**
F6DKV	**14**	**330,463**	**1205**	**30**	**89**
F6FYA	**7**	**434,562**	**1597**	**32**	**106**
F6EZV	**1.8**	**131,424**	**879**	**21**	**75**
F6CWA	"	27,365	302	11	54
***F6HWU**	**A**	**482,396**	**700**	**86**	**246**
***F5KFL**	**"**	**407,069**	**1067**	**51**	**122**
			(Opr. F5IJT)		
*F6ACD	"	334,056	644	62	186
*F6FII	"	263,648	660	50	164
*F5RBG	"	253,364	634	50	144
*F6FTB	"	234,366	533	56	145
*F6HNX	"	196,721	542	51	128
*F5YJ	"	189,316	510	48	164
*F5NKX	"	170,140	393	57	131
*F6DZD	"	163,680	516	44	132
*F5PHW	"	157,384	437	52	139
*F5OJL	"	139,941	338	55	158
*F5JLV	"	131,040	380	48	120
*F5NQL	"	129,940	400	44	134
*F5JDG	"	97,028	390	33	94
*F5JOT	"	82,164	330	32	91
*F5RAB	"	78,069	283	39	120
*FE6CYT	"	38,472	213	25	59
*F5OIU	"	35,712	153	33	63
*F5POJ	"	25,792	164	34	70
*F5OAV	"	21,736	186	18	58
*F5AKL	"	21,285	99	35	64
*F2FX	"	20,230	124	26	59
*F5LET	"	13,390	108	22	43
*F5RPB	"	8,960	86	18	46
*F5ROL/P	"	3,872	42	18	14
***F6ABI**	**21**	**14,630**	**124**	**18**	**40**
***F9DK**	**14**	**36,856**	**282**	**17**	**51**
*F6JOU	"	29,664	167	22	50
***F6EEM**	**7**	**18,768**	**182**	**19**	**49**
*F6EAS	"	2,464	176	7	7
***F5AH**	**3.5**	**18,080**	**360**	**9**	**31**
*F8TM	1.8	285	24	2	13

GERMANY

DJ6QT	**A**	**2,629,812**	**2555**	**118**	**326**
			(Opr. DL5XX)		
DL7UTM	**"**	**1,586,667**	**1556**	**132**	**369**
DL4MCF	**"**	**1,540,948**	**1554**	**130**	**397**
DK5PD	**"**	**1,253,931**	**1335**	**115**	**382**
DK3KD	"	874,732	1128	95	284
DJ7MG	"	856,482	1029	104	314
DL1NCT	"	793,193	1043	107	276
DL7VOG	"	772,852	1004	101	303
DL6NCY	"	751,658	801	116	350
DL1JF	"	632,520	832	91	269
DJ8CR	"	601,902	830	79	278
DL7BQ	"	536,270	875	81	248
DK3YD	"	508,080	1047	63	227
DJ9MH	"	472,960	797	74	246
DL3ZI	"	420,840	599	85	249
DL8YR	"	408,558	727	67	231
DL8KAW	"	359,700	631	81	219
DL1MAJ	"	353,362	523	81	242
DF4PD	"	346,794	502	80	242
DF3OL	"	316,677	695	67	216
DL1LOD	"	304,038	646	55	199
DL8UCC	"	288,894	400	94	173
DL5JAN	"	288,267	644	60	199
DL2DXX	"	270,891	526	58	179
DL1TH	"	250,701	612	53	160
DJØIF	"	250,000	615	56	150
DL9SEV	"	147,637	515	45	116
DL3JZN	"	145,248	382	53	125
DK5MV	"	116,688	201	87	185
DF3HU	"	106,200	263	58	122
DJ6JC	"	101,790	321	45	100
DF1QQ	"	96,361	300	45	128
DL6DVU	"	82,425	305	45	112
DJ6DO	"	81,322	400	43	103
DL7MAE	"	73,533	191	59	134
DL3DRN	"	59,535	218	47	100
DF1QF	"	46,168	270	46	70
DL5XAT	"	39,032	151	38	81
DL2DSA	"	26,730	198	35	100
DL5AUA	"	17,181	74	32	51
DK7AN	"	16,863	94	30	43
DL2HUM	"	16,128	97	25	47
DL5KBC	"	15,488	80	31	57
DJ3TF	"	7,616	51	25	39
DL7YS	"	6,300	50	23	27
DL9GMC	"	1,679	38	11	12
DJ7PT	**28**	**3,081**	**57**	**10**	**29**
DK5QN	**14**	**430,413**	**1132**	**39**	**120**
DL2DN	"	50,232	285	18	66
DJ5LA	**7**	**346,906**	**1301**	**36**	**106**
DL5RDO	"	93,856	395	32	80
DJ2XC	"	50,778	332	22	71
DL5DXF	"	32,512	115	33	94
DL5AUJ	"	12,352	101	16	48
DJ7AA	**3.5**	**390,300**	**1530**	**34**	**116**
DK8TU	**"**	**162,710**	**1007**	**22**	**84**
DK2GZ	"	31,537	277	14	47
DL1IAO	**1.8**	**134,392**	**809**	**24**	**83**
DJ4SO	"	57,594	488	17	70
***DK9IP**	**A**	**895,400**	**776**	**134**	**416**
***DF4ZL**	**"**	**654,912**	**932**	**93**	**286**
***DL7QU**	**"**	**555,681**	**874**	**79**	**250**
*DJ1QJ	"	466,140	775	81	259
*DK8FS	"	456,020	801	71	231
*DL1JDK	"	431,830	709	82	228
*DK3DM	"	399,285	735	63	222
*DL4BQE	"	390,216	814	62	222
*DL6UNF	"	350,672	678	65	183
*DL4JYT	"	329,664	698	65	207
*DL7CF	"	310,230	560	75	195
*DL5ABI	"	251,370	500	68	198

*DK4WW	*	229,770	487	68	162	
*DL5AYI	*	192,918	507	49	173	
*DK7ZH	*	171,160	389	60	160	
*DL5SVB	*	163,944	479	65	142	
*DL7VZF	*	161,138	394	56	170	
*DF1DV	*	154,137	519	43	148	
*DLØDWD	*	150,514	507	45	137	
			(Opr. DF6QC)			
*DL5WS	*	141,276	370	50	133	
*DL4VBP	*	132,908	300	66	157	
*DJ4JF	*	131,425	346	52	123	
*DF2KK	*	127,925	450	40	135	
*DJ8EF	*	124,030	412	44	113	
*DL6AG	*	121,485	334	55	140	
*DL4XU	*	118,041	427	41	106	
*DL6UKL	*	109,836	445	62	100	
*DL1ZQ	*	102,760	500	40	100	
*DL4FDM	*	92,571	319	43	134	
*DL3JMK	*	91,798	332	42	116	
*DL2RMS	*	86,400	440	32	112	
*DL6UAM	*	78,658	429	37	97	
*DL3DBY	*	67,332	309	35	89	
*DJ4PT	*	61,480	228	35	81	
*DL1VTL	*	54,096	247	34	104	
*DL6KVA	*	50,434	118	43	108	
*DL6MHW	*	50,120	185	43	97	
*DL8UVG	*	48,037	202	41	80	
*DL3HRH	*	46,866	150	55	91	
*DL2VLA	*	42,229	196	42	80	
*DL9DBZ	*	39,552	209	29	74	
*DL3KWR	*	36,580	179	33	85	
*DL7VOX	*	32,648	132	26	80	
*DL3KWF	*	30,765	170	28	77	
*DL1ET	*	28,304	113	42	80	
*DL1SWA	*	24,846	129	43	80	
*DL9YAJ	*	22,672	92	41	68	
*DL4NBV	*	20,492	125	28	66	
*DF2FM	*	19,291	102	35	66	
*DL8UAD	*	16,563	98	32	59	
*DL5ST	*	16,245	113	28	67	
*DL3YEI	*	15,456	168	14	78	
*DF3QN	*	9,828	88	25	53	
*DL9OT	*	9,758	46	37	45	
*DL2ZA	*	9,570	90	20	46	
*DL5AMF	*	5,728	46	25	32	
*DL2HEB	*	4,536	77	13	43	
*DF9RC	*	3,696	52	14	30	
*DL3JRA	*	1,785	29	14	21	
DJ5GG	**28**	**1,148**	**43**	**7**	**21**	
DL3BRA	**21**	**67,362**	**249**	**30**	**79**	
DL1EMH	**"**	**53,457**	**208**	**29**	**74**	
*DL8HCO	*	52,250	227	29	66	
*DL2TG	*	32,148	135	28	66	
*DL4UL	*	29,829	183	21	40	
*DL8NBY	*	27,619	141	22	49	
*DL2YAK	*	12,480	116	14	34	
*DK9KW	*	464	11	7	9	
DL1YAW	**14**	**302,917**	**850**	**37**	**112**	
*DL3LAR	*	94,916	357	32	90	
*DL1MGB	*	86,557	418	22	79	
*DF7TU	*	29,930	227	19	54	
*DL2SBY	*	22,936	200	16	45	
*DL5CD	*	2,016	40	10	11	
DL7BY	**7**	**94,464**	**387**	**31**	**97**	
DL2DXA	**"**	**87,348**	**407**	**27**	**89**	
*DL2BWG	*	63,130	264	18	100	
*DL1DWT	*	10,207	103	15	44	
*DL7UXG	*	2,886	75	5	32	
DL5FDA	**3.5**	**88,026**	**609**	**19**	**83**	
DL5BWE/P	**"**	**59,013**	**589**	**15**	**68**	
*DL6MTA	*	46,013	380	17	72	
*DL4WA	*	31,725	380	12	63	
*DL2AL	*	29,502	280	19	80	
*DJ2RB	*	12,545	151	13	52	
DL5MHB	**1.8**	**47,120**	**442**	**17**	**63**	
*DL9SXX	*	22,908	346	10	59	
*DJ9LJ	*	19,578	200	12	66	
*DJ5MN	*	4,532	103	4	40	
*DJ2YE	*	2,268	62	5	31	

GIBRALTAR

ZB2X	**1.8**	**141,120**	**975**	**19**	**79**
			(Opr. OH2KI)		

GREECE

SV2BBJ	**14**	**28,721**	**196**	**21**	**56**
SV2BOH	**7**	**115,575**	**636**	**31**	**84**

HUNGARY

HA3LI	**A**	**773,604**	**1172**	**96**	**281**
HA1AG	**"**	**428,944**	**707**	**87**	**245**
HA8ZO	*	267,894	485	71	175
HA7PF	*	158,175	427	50	175
HA3OU	*	138,400	256	74	126
HA3GJ	**21**	**32,016**	**140**	**26**	**66**
HA5AHS	*	29,491	163	22	55
HA4XG	14	12,528	170	12	46
HA9BVK	**7**	**780,440**	**2143**	**39**	**140**
			(Opr. HA9PP)		
HA1ZN	**"**	**168,475**	**920**	**26**	**89**
HA2MV	*	103,884	397	33	99
HA8IB	**3.5**	**172,634**	**934**	**30**	**103**
HA6VA	*	37,840	395	13	67
HA6VR	*	20,996	360	11	47
HA8FM	**A**	**1,509,770**	**1730**	**120**	**295**
*HA8AT	*	193,200	545	54	156
*HA8FW	*	101,384	286	52	132
*HA2MJ	*	57,750	239	48	77
*HA9PB	*	53,760	230	41	99
*HA1SD	*	34,578	206	29	84
*HA4GDO	*	21,586	201	25	61
HA6NW	**21**	**62,727**	**237**	**30**	**73**
*HA3GQ	*	6,210	47	20	34
*HA3GI	*	5,304	41	21	30
HA8FK	**14**	**101,500**	**544**	**26**	**74**
*HA6OZ	*	32,912	249	14	54
*HA4FB	*	10,584	105	16	38
HA8RH	**7**	**242,214**	**1065**	**36**	**110**
HA8JP	**"**	**193,130**	**714**	**36**	**119**
*HA3PT	*	160,160	663	35	108
*HA5NK	*	125,120	543	32	104
*HA8EN	*	36,579	247	22	67
*HA5AEX	*	16,632	140	14	49
*HA7JJS	*	77,088	743	18	70
*HA4FV	*	58,725	630	14	67
*HA4XN	*	36,762	497	16	50
*HAØDD	*	24,290	260	56	347
HA8EK	**1.8**	**103,693**	**767**	**20**	**77**
HA8BE	**"**	**100,900**	**729**	**20**	**80**

ICELAND

TF3EJ	**1.8**	**34,684**	**427**	**11**	**41**
TF3GB	**A**	**58,936**	**300**	**30**	**76**

ISLE OF MAN

GD4UOL	**A**	**715,770**	**1223**	**68**	**262**

ITALY

IU2E	**A**	**957,453**	**1218**	**97**	**284**
			(Opr. IK2VUE)		
IØZUT	**"**	**593,135**	**1002**	**74**	**239**
IK8CHL	*	505,849	830	98	255
I3EVK	*	471,086	838	87	235
IR3L	*	272,291	533	77	200
			(Opr. I3FDZ)		
IK2AHB	*	83,838	303	44	113
IU2D	**21**	**207,264**	**644**	**36**	**100**
IK2QEI	**"**	**163,748**	**548**	**35**	**99**
IK1LBL	**14**	**76,718**	**422**	**24**	**65**
I3VHO	**3.5**	**105,210**	**792**	**21**	**69**
IKØPRG	*	24,064	326	10	54
IKØTUG	**A**	**430,416**	**818**	**81**	**255**
IK4EWX	**"**	**388,360**	**850**	**69**	**197**
IKØUKS	*	295,120	449	83	227
IK4SDS	*	185,752	506	50	167
IK3SCB	*	121,014	324	51	115
IK5RLS	*	115,230	283	55	112
IKØVSX	*	71,680	270	38	102
IKØDWJ	*	63,042	306	32	101
IK4QIE	*	56,090	210	47	95
IK1RQQ	*	50,505	227	32	79
IK2TQG	*	36,176	172	35	98
I3VYK	*	34,048	173	38	74
IK2NVE	*	20,160	112	32	64
IR7A	*	19,400	164	22	75
			(Opr. I7ALE)		
IKØUUM	*	14,134	164	16	58
IKØADY	*	11,592	90	23	49
IK2IAR	*	8,932	82	22	55
IK6HWX	*	4,346	52	20	33
IØLTX	*	3,621	51	17	34
IK2IKW	*	2,832	47	15	33
IK5TBK	*	1,025	17	11	14
IK3NLK	**21**	**72,468**	**306**	**30**	**69**
IR4R	**"**	**63,125**	**257**	**33**	**68**
			(Opr. IK4ALM)		
IK8UIF	14	22,052	159	24	50
I2IFT	**7**	**76,232**	**466**	**22**	**82**
IKØTXF	*	6,314	111	9	32
IK4WMG	**3.5**	**63,162**	**513**	**19**	**80**
IK2JLL	**1.8**	**10,395**	**189**	**7**	**48**
I4JEE	*	3,192	31	2	19

JERSEY

GJ3YHU	**21**	**70,131**	**280**	**27**	**70**

KALININGRAD

UA2FP	**A**	**227,260**	**702**	**50**	**170**
RA2FB	*	44,880	277	25	95
UA2EC	*	8,127	61	19	44
UA2CZ	7	11,800	100	15	44
UA2FT	**1.8**	**16,653**	**254**	**10**	**51**

LATVIA

YL2KL	**A**	**1,039,870**	**1359**	**103**	**318**
YL2KO	**"**	**583,324**	**1143**	**80**	**252**
YL1ZD	*	47,932	807	49	165
YL2GN	**7**	**230,790**	**945**	**38**	**119**
YL2SM	**3.5**	**195,052**	**1125**	**27**	**94**
YL2IP	**1.8**	**24,850**	**274**	**14**	**56**
YL2SW	**A**	**153,342**	**562**	**40**	**111**
YL3FW	*	97,300	319	49	126
YL2EC	*	79,744	239	48	130
YL3IG	**7**	**42,856**	**349**	**19**	**69**
YL2UZ	**3.5**	**40,600**	**524**	**12**	**58**

LITHUANIA

LY6M	**A**	**2,059,695**	**2184**	**120**	**393**
LY2MW	**"**	**748,312**	**1261**	**86**	**270**
LY2OX	*	716,689	1017	99	280
LY2IC	*	489,060	797	80	262
LY2PAQ	*	451,520	907	78	242
LY2BN	*	446,862	654	85	252
LY3JY	*	335,360	440	91	229
LY2KM	*	134,232	456	43	161
LY3ID	*	122,640	294	58	152
LY2CX	*	22,185	201	20	65
LY2BM	**14**	**317,709**	**1145**	**32**	**91**
LY3BX	**7**	**186,333**	**925**	**32**	**101**
LY2LF	*	25,410	311	15	40
LY6K	**3.5**	**348,361**	**1550**	**33**	**94**
			(Opr. LY3BS)		
LY2BZ	*	79,180	573	21	86
LY2BR	**1.8**	**32,634**	**382**	**13**	**61**
LY2FN	**A**	**671,399**	**1076**	**95**	**288**
LY3BU	*	267,997	638	65	198
LY2DX	*	170,136	538	53	151
LY1FM	*	77,420	370	58	100
LY2PBM	*	39,269	253	28	79
LY3BY	*	17,313	170	19	68
LY3KB	*	9,928	120	18	55
LY2BB	**14**	**24,053**	**141**	**27**	**40**
LY3CW	*	13,684	139	13	31
LY1DT	7	4,658	122	5	29
LY2OU	**1.8**	**32,538**	**451**	**8**	**58**

LUXEMBOURG

LX/DL1DTC	**A**	**329,625**	**959**	**50**	**175**
LX4B	**3.5**	**385,710**	**1840**	**29**	**101**
			(Opr. OH2PQ)		

MACEDONIA

Z32KV	**A**	**333,526**	**754**	**63**	**199**
Z37FCA	*	1,330	20	15	20
Z30M	**14**	**560,358**	**2019**	**35**	**111**
Z31GB	**7**	**56,816**	**268**	**29**	**77**

MALTA

9H3UP	**3.5**	**40,105**	**527**	**11**	**54**

MOLDOVA

ER1OA	**A**	**251,208**	**771**	**56**	**160**

MONACO

3A/K1VWL	**A**	**57,436**	**247**	**44**	**122**

NETHERLANDS

PA3DZN	**A**	**3,230,370**	**2779**	**140**	**445**
PAØLOU	**"**	**439,950**	**658**	**86**	**264**
PAØCOR	*	129,396	335	47	117
PA3GKT	*	20,405	126	26	51
PA6A	**7**	**811,146**	**2095**	**39**	**147**
			(Opr. PA3DFT)		
PA3BUD	**3.5**	**59,032**	**500**	**18**	**76**
PA3ELD	**A**	**240,243**	**495**	**56**	**163**
PA3GNO	**"**	**212,576**	**443**	**64**	**160**
PA3FNE	*	128,828	403	56	158
PAØCOE	*	119,686	370	66	100
PAØJR	*	80,511	301	43	98
PA3ECJ	*	79,560	299	38	92
PAØYN	*	9,009	100	18	45
PA2NJN	*	6,672	85	12	36
PA3BEJ	*	4,510	62	15	40
PA3FZZ	*	3,308	40	12	20
PAØPLN	**21**	**15,533**	**128**	**19**	**60**
PA3FHA	**14**	**66,300**	**367**	**19**	**66**
PAØJED	*	43,092	282	20	56
PA3DUS	*	38,148	263	17	51
PA3AAV	**7**	**299,880**	**1005**	**39**	**129**
PAØMIR	**3.5**	**20,040**	**297**	**10**	**50**
PA3AFF	**1.8**	**5,590**	**123**	**4**	**41**

NORTHERN IRELAND

GIØKOW	**A**	**4,083,632**	**3644**	**119**	**413**
			(Opr. GIØNWG)		
GIØSAP	**14**	**112,259**	**584**	**21**	**58**

NORWAY

LA9DFA	**A**	**603,873**	**1336**	**62**	**231**
LA6IHA	*	301,096	832	52	192
LA7DHA	*	261,813	618	50	147
LA1YE	*	151,380	492	48	126
LA8LA	*	135,520	373	50	170
LA9MB	*	64,727	191	54	115
LA5ZC	*	55,319	251	34	73
LA9AU	*	12,654	113	19	55J
LA2O	**A**	**222,142**	**729**	**45**	**173**
LA8CE	*	57,685	213	42	97
LA9HFA	*	8,440	96	15	20
LA5LJA	21	6,786	51	28	30
LA9WDA	**14**	**37,536**	**311**	**18**	**50**
LA8WG	**1.8**	**8,190**	**165**	**2**	**43**

POLAND

SP9DWT	**A**	**1,321,472**	**1493**	**109**	**355**
SP9FKQ	*	349,680	430	105	267
SP6AZT	*	310,744	443	101	258
SP5XMM	*	133,509	453	50	141
SP5CEQ	*	47,677	188	59	80
SP2IU	*	38,376	122	45	78
SP4AVG	*	38,307	220	29	84
SP3GTS	*	23,108	116	30	79
SP9LAS	*	15,645	69	37	56
SP3ASN	**14**	**330,718**	**985**	**36**	**101**
SP8UFO	**"**	**277,770**	**877**	**34**	**107**
SP7FUH	*	63,729	353	28	69
SP2JGK	*	49,662	264	24	69
SP7GIQ	**7**	**913,605**	**2371**	**37**	**128**
SP5CTY	*	197,394	541	39	128
SP6CIK	*	112,332	473	32	100
SN3A	**3.5**	**549,310**	**1891**	**38**	**125**
			(Opr. SP3HLM)		
SP5BWO	*	18,225	110	20	61
SP5GRM	**1.8**	**207,000**	**1055**	**25**	**90**
SP3NX	*	37,985	451	14	57
SP5INQ	*	3,638	40	13	21
SP4EEZ	**A**	**1,090,600**	**1022**	**125**	**407**
SN7L	**"**	**758,940**	**1107**	**97**	**293**
			(Opr. SP7NJX)		
*SP9BBH	*	745,536	1169	84	268
*SP9WZJ	*	717,320	899	108	287
*SP2QCH	*	575,190	1073	90	240
*SP3SLA	*	429,732	867	72	204
*SP5CNA	*	363,320	570	100	210
*SP6CPF	*	352,869	646	77	212
*3Z2UKB	*	326,865	580	75	208
*SP7NMW	*	294,880	488	79	225
*SP1AEN	*	288,960	473	80	200
*SP7GAO	*	257,431	375	86	237
*SP6CES	*	188,604	514	59	127
*SP3MGP	*	174,720	539	52	140
*SP1MHV	*	140,183	145	46	97
*SP5GKN	*	120,400	323	55	145
*SP6NIF	*	115,960	256	67	156
*SP9AGS	*	96,160	439	32	128
*SP5ASY	*	71,103	223	53	120
*SP5CGN	*	63,450	278	25	110
*SP5CGN	*	63,450	278	25	110
*SP8FHJ	*	49,552	237	40	112
*3Z8LZC	*	44,880	249	37	83
*SP2AHD	*	22,078	195	23	60
*SP9MDY	*	19,504	117	27	65
*3Z4GAP	*	18,228	174	24	69
*SP6NIG	*	16,464	64	45	53
SP3EQE	**21**	**34,560**	**142**	**30**	**60**
*SP5YQ	*	11,352	66	24	42
*SP3AOT	*	8,802	62	21	33
*SP3FPF	*	6,768	54	17	30
SP8HXN	**14**	**51,120**	**278**	**21**	**69**
SP8BAB	**"**	**35,931**	**161**	**27**	**60**
*SP6SYF	*	31,450	170	26	59
*SP9GKM	*	19,910	160	14	41
*SP9HOF	*	17,584	168	14	42
*SP1IXG	*	16,247	99	19	58
*SP5ICS	*	12,400	140	13	37
*3Z6CXH	*	10,633	117	14	35
*SP6STS	*	8,610	116	9	26
*SP5OXJ	*	1,971	33	11	16
SP2FAP	**7**	**206,920**	**660**	**33**	**109**
SP6OJE	**"**	**152,614**	**509**	**39**	**115**
*SP5ANX	*	59,808	383	20	76
*SP7JQO	*	59,424	349	22	74
*3Z4GHL	*	51,584	299	25	79
*SP5JCL	*	46,075	262	22	73
*SP2WDW	*	26,448	235	15	61
*SP1JXJ	*	24,568	220	16	58
*SP9OYK/9	*	10,800	150	12	42
*SP9EML	*	8,700	101	15	43
*3Z3AFS	*	345	18	6	9
*SP9DGO	*	273	11	5	8
SP5DIR	**3.5**	**66,248**	**506**	**22**	**82**
3Z4DCR	**"**	**61,600**	**694**	**15**	**62**
*SN6O	*	20,262	245	12	54
			(Opr. SP6GCU)		
*SP4HHI	*	5,412	107	6	35
*SP4JWB	*	4,256	100	7	31
*SP9KGG	*	3,072	94	5	32
			(Opr. SP9IKN)		
SP5MNJ	**1.8**	**12,768**	**263**	**6**	**42**
*SP5GH	*	8,360	73	11	65
*SP9AJT	*	1,505	180	7	42

PORTUGAL

CT1CJJ	**A**	**166,296**	**398**	**65**	**181**
CT1FJK	**21**	**309,816**	**1112**	**36**	**120**
			(Opr. OH2BZ)		
CT1AOZ	**1.8**	**98,686**	**599**	**23**	**75**
CT1YH	**21**	**62,712**	**282**	**26**	**78**
CT4DX	7	11,760	101	15	33

ROMANIA

YO3APJ	**A**	**1,109,980**	**1595**	**96**	**284**
YO3FRI	**"**	**734,127**	**1426**	**84**	**237**
YR4A	**14**	**526,864**	**2102**	**33**	**103**
			(Opr. YO4NF)		
YO3AWC	**7**	**336,150**	**1314**	**37**	**113**
YO3FWC	*	48,160	341	21	65
YO2DFA	**A**	**510,900**	**1067**	**81**	**244**
YO4SI	**"**	**266,770**	**698**	**57**	**202**
YO2ADQ	*	21,912	159	38	50
YO2ARV	*	12,691	207	29	59
YO5CUU	*	2,855	53	27	36
YO7BA	*	2,664	50	6	18
YO9AGI	**28**	**3,069**	**70**	**9**	**22**
YO2AQB	**21**	**17,810**	**106**	**21**	**45**
YO4DCF	**14**	**23,580**	**133**	**24**	**66**
YO4CAH	*	9,284	99	14	30
YO3GDA	**7**	**14,356**	**109**	**16**	**58**
YO6FGN	*	5,806	80	12	34
YO6OBH	**1.8**	**18,297**	**302**	**8**	**49**
YO2CJX	*	6,783	62	5	52

SARDINIA

ISØ/YO3RA	**14**	**98,774**	**398**	**33**	**98**
ISØMKU	**7**	**60,812**	**425**	**22**	**70**
ISØOMH	**A**	**283,515**	**851**	**51**	**154**
ISØGSR	**"**	**264,225**	**813**	**44**	**151**
ISØWBT	*	173,600	468	57	167
ISØUWX	**14**	**13,266**	**124**	**15**	**51**

SCOTLAND

GM3WOJ	**14**	**243,507**	**872**	**36**	**105**
GM4FDM	**7**	**340,764**	**1382**	**35**	**111**
GM3YOR	**1.8**	**89,360**	**585**	**18**	**62**
GM4SID	**A**	**330,687**	**864**	**61**	**200**
GMØIIO	*	100,305	375	38	97
GM3CFS	**21**	**15,780**	**132**	**17**	**43**

SICILY

IT9TQH	**14**	**654,978**	**1848**	**39**	**134**
IT9ZGY	**1.8**	**102,802**	**775**	**18**	**80**
IT9ORA	**A**	**136,728**	**427**	**53**	**163**
IR9A	**14**	**365,286**	**1349**	**34**	**104**
			(Opr. IT9XUC)		
IR9AF	**"**	**208,278**	**900**	**33**	**100**
			(Opr. IT9AF)		

SLOVAK REPUBLIC

OM8A	**A**	**4,404,480**	**3420**	**138**	**454**
OM3PC	*	306	9	8	9
OM3OM	**21**	**66,360**	**280**	**25**	**80**
OM3GI	**14**	**287,056**	**809**	**37**	**117**
OM5RJ	**7**	**113,792**	**468**	**31**	**97**
OM2XW	**1.8**	**47,175**	**430**	**17**	**67**
OM3WM	*	13,786	212	7	54
OM3PQ	**A**	**342,056**	**589**	**80**	**206**
OM8ON	*	150,178	234	89	149
OM3CDZ	*	107,387	483	61	100
OM6TX	*	79,268	360	32	101
OM3IF	*	79,236	240	62	124
OM2SM	*	27,048	220	24	68
OM7AG	*	21,681	83	39	60
OM6MO	**14**	**103,320**	**406**	**32**	**91**
OM3TB	*	25,376	194	19	42
OM3TU	**7**	**29,419**	**273**	**23**	**50**
OM4DN	*	18,420	253	11	49
OM3CDN	*	13,130	139	19	46
OM3TPL	*	2,988	78	6	30
OM5KM	**3.5**	**24,360**	**361**	**10**	**48**

SLOVENIA

S53R	**A**	**2,787,480**	**2305**	**138**	**402**
S57DX	**"**	**1,943,928**	**2223**	**119**	**337**
S51AY	**28**	**7,007**	**121**	**14**	**35**
S50A	**21**	**396,708**	**1074**	**38**	**118**
S51FA	**"**	**277,820**	**789**	**38**	**107**
S50R	**"**	**187,279**	**616**	**35**	**102**
S56M	**7**	**768,545**	**2206**	**38**	**125**
S57AL	**"**	**616,952**	**1902**	**37**	**124**
S570	**3.5**	**290,378**	**1248**	**31**	**103**
			(Opr. S51IX)		
S50D	**"**	**217,648**	**1166**	**26**	**96**
			(Opr. S57AD)		
S51WV	*	151,478	1105	21	68
S59DDR	*	30,056	400	11	57
			(Opr. S57NOJ)		
S59WA	**1.8**	**128,340**	**969**	**18**	**72**
S53X	*	82,450	671	17	68
S59L	*	52,128	615	13	59
S59AA	**A**	**1,888,176**	**1661**	**137**	**429**
S54A	**"**	**979,032**	**1085**	**121**	**335**
*S51WA	*	451,520	692	89	251
*S53BM	*	180,540	523	44	133
*S57KM	*	79,998	500	29	105
*S57NW	*	32,643	169	34	83
*S58MU	*	4,032	34	24	32
*S52SK	28	357	12	6	11
S57J	**21**	**172,029**	**471**	**36**	**107**
*S51QZ	*	80,040	276	34	82
S52UT	**14**	**212,824**	**648**	**37**	**111**
S57U	**"**	**209,808**	**702**	**36**	**105**
*S52KD	*	133,576	530	28	90
S52HO	**7**	**100,662**	**553**	**30**	**84**
S51W	**3.5**	**50,400**	**500**	**15**	**69**
S57X	**"**	**38,960**	**400**	**13**	**57**
*S51SLO	*	15,400	305	7	43
*S57NGR	*	11,180	206	7	45

SPAIN

EA5FV	**A**	**805,306**	**1634**	**63**	**200**
EA5CKP	*	241,686	455	67	194
EA4AV	*	55,176	208	36	85
EA7HAB	*	42,180	205	28	67
EA1QJ	*	34,163	105	47	80
EA7CA	*	30,624	140	36	60
EA2CNH	*	26,016	145	25	71
EA7BR	*	10,736	65	24	60
EA2CR	*	8,316	88	18	43
EA3ALN	**21**	**146,410**	**550**	**31**	**79**
EA1JO	**"**	**135,355**	**489**	**31**	**84**
EA1DD	**7**	**330,046**	**1301**	**26**	**92**
EA7EZ	*	103,323	470	29	80
			(Opr. OH2BAZ)		
EA3ALV	**3.5**	**50,196**	**451**	**17**	**72**

*EA7CEZ	A	2,517,597	2600	120	347
*EA7TG	"	845,875	1245	78	257
*EA3AEQ	"	682,549	1322	77	204
*EA2CLU	*	523,252	1059	61	196
*EA3GHB	*	396,988	935	58	186
*EA4AU	*	369,818	1105	40	106
*EA3CA	*	352,408	838	53	179
*EA2BNU	*	287,593	730	50	161
*EA4AMJ	*	215,180	674	50	153
*EA3BOW	*	188,640	524	46	134
*EA1EWG	*	155,480	400	48	136
*EA7AID	*	151,704	461	41	127
*EA1FEL	*	140,785	367	50	135
*EA1EZZ	*	132,000	500	46	130
*EA5LA	*	110,351	301	44	116
*EA7FZ	*	66,417	292	35	96
*EA3AHQ	*	50,901	169	41	100
*ED1FBJ	*	42,568	258	28	108
*EC1AKQ	*	28,618	216	22	60
*EA5WX	*	24,598	128	33	65
*EA3ACM	*	23,400	157	22	50
*EA5BZS	*	16,351	105	33	50
*EA7HCB	*	13,172	87	31	43
*EA3CZM	*	12,240	80	30	60
*EC1ANF	*	11,418	116	19	47
*EA5FQF	*	10,354	103	18	44
*EA4EIS	*	8,694	70	21	42
*EA4CWN	*	5,346	53	20	34
*EC5AFK	*	3,680	60	13	33
*EA5AGW	*	3,564	48	10	26
*EA5AAJ	*	2,484	40	12	24
*EA4BNQ	*	1,692	40	10	26
*EA5AAJ	28	1,748	40	18	20
***EA7AGW**	**21**	**42,900**	**328**	**19**	**56**
*EA5EDN	*	3,596	70	9	22
***EA7IL**	**14**	**155,760**	**852**	**23**	**65**
*EA1AKB	*	43,428	298	15	51
***EA5FID**	**7**	**75,141**	**440**	**20**	**79**
*EA3AHQ	*	34,009	297	17	54
*EA7MT	*	32,925	265	15	60
***ED3KEY**	**3.5**	**57,960**	**573**	**14**	**58**
					(Opr. EA3ANE)

SVALBARD

JW1CCA	**A**	**150,450**	**415**	**56**	**94**

SWEDEN

SM5AOE	**A**	**693,392**	**1063**	**84**	**244**
SM5CLE	**"**	**379,101**	**708**	**80**	**241**
SM5RE	*	62,377	297	33	100
SM5CSS	*	57,915	242	39	126
SM5DYC	*	19,950	159	25	50
SMØNJO	*	18,312	80	45	64
SM5BEU	*	7,176	64	20	49
SIØGM	**21**	**107,956**	**395**	**32**	**105**
					(Opr. SMØKV)
SLØCB	**14**	**146,072**	**545**	**31**	**93**
					(Opr. SMØAJV)
SM1OII	*	78,698	313	31	78
SMØKCO	**7**	**479,007**	**1446**	**38**	**119**
SI5GM	*	14,868	174	10	32
					(Opr. SM5FUG)
SMØARR	*	132	9	4	8
SM7VIK	**3.5**	**38,250**	**399**	**16**	**59**
SM6DOI	**1.8**	**37,204**	**376**	**14**	**57**
***SM6CNS**	**A**	**566,236**	**1002**	**93**	**281**
					(Opr. DU7CC)
***SMØBDS**	**"**	**267,648**	**603**	**57**	**189**
*SM2DMU	*	250,652	557	72	209
*SM6SHF	*	54,656	307	28	94
*SM3LDP	*	29,952	144	30	50
*SM7BZV	*	15,980	136	23	62
*SM7UYS	*	5,508	56	20	34
*SM5DUT	28	6	1	1	1
*SM6JY	14	12,546	112	12	38
*SM4BW	*	2,892	115	12	12
*SM6AHU	7	2,774	65	8	30
*SM6NJK	3.5	1,425	55	4	21
***SM7 /T94BO**	**1.8**	**39,910**	**581**	**11**	**54**

SWITZERLAND

HB9DX	**21**	**22,848**	**83**	**31**	**81**
HB9KC	"	14,766	117	18	28
HB9FMD	**3.5**	**91,134**	**897**	**15**	**68**
***HB9IBA**	**A**	**343,371**	**824**	**56**	**193**
*HB9ARF	*	205,390	554	54	176
***HB9APJ**	**14**	**89,000**	**437**	**23**	**77**
***HB9HLE**	**7**	**75,095**	**400**	**29**	**86**

UKRAINE

UT6Q	**A**	**2,038,080**	**2347**	**116**	**364**
					(Opr. UR6QA)
UT4UZ	**"**	**1,782,091**	**1847**	**135**	**436**
UR8LA	**"**	**1,547,410**	**1735**	**127**	**415**
UX5UO	*	1,394,152	1849	113	345
US5ZC	*	642,250	1112	91	276
UX1UA	*	555,397	883	97	276
UY5ZZ	*	405,461	747	84	255
UT4EK	*	348,743	759	70	207
UY2ZA	*	234,546	534	74	217
UY5TE	*	227,584	702	52	172
UT3EM	*	177,156	391	63	189
UR5EDX	*	141,264	495	55	161
UR5IAE	*	124,410	405	46	149
UT5AT	*	97,053	316	46	141
UT7ZT	*	72,220	164	66	140
UY3QW	*	54,460	216	42	98
UR5EIT	*	11,947	162	58	90
UT8IM	28	551	25	5	14
US2WV	**21**	**223,825**	**563**	**38**	**137**
UU9JH	**"**	**125,760**	**960**	**34**	**97**
US5WE	**14**	**417,973**	**1277**	**30**	**109**
UT2QT	**"**	**417,105**	**1459**	**38**	**117**
UT3UZ	*	295,423	925	40	127
UX5NQ	*	220,500	850	33	93
UT3QW	*	173,610	670	32	103
UT1IA	*	59,388	364	26	72
UX3ZBG	*	56,745	309	23	74
UX5VK	*	25,200	184	19	51
UT4EA	**7**	**448,624**	**1279**	**39**	**137**
UY5QQ	**"**	**324,368**	**1200**	**38**	**114**
UT7ND	*	199,728	732	36	110
UT1PD	*	117,720	600	29	79
UR7QM	*	72,012	491	24	78
UY5QO	*	70,906	308	34	87
UT8MM	*	58,824	238	31	98
UT8IM	*	54,405	338	27	66
UT1QR	*	30,504	223	20	62
UU1J	**3.5**	**379,696**	**1606**	**34**	**118**
					(Opr. UU7JM)
UT5UGR	**"**	**218,821**	**1277**	**30**	**97**
UT5UIA	*	174,812	929	25	91
EM7V	*	144,690	1052	22	84
			(Opr. UR7VA)		
UX3HA	*	12,400	246	15	35
UYØZG	**1.8**	**18,720**	**274**	**9**	**51**
***US1E**	**A**	**2,345,056**	**2436**	**117**	**434**
*UT2UB	*	440,022	693	95	244
*UU2JA	*	368,401	631	79	234
*UR3MP	*	327,918	846	58	200
*UX4UN	*	306,249	663	69	198
*UX5EF	*	209,202	604	54	184
*UR5UW	*	108,336	337	48	135
*UR3PDM	*	81,037	410	39	100
*UT1ZZ	*	69,921	337	38	115
***UT3QQ**	**21**	**46,500**	**256**	**29**	**71**
*UX1HW	*	31,924	185	26	66
*US7QJ	*	3,136	36	15	28
***UR5QU**	**14**	**60,192**	**302**	**27**	**72**
***UY5WA**	**7**	**72,488**	**301**	**21**	**61**
*UY2ZZ	*	33,520	288	19	61
*UYØCA	*	30,324	224	21	63
*UR3IOB	3.5	3,596	108	6	25
***UR4QFG**	**1.8**	**19,028**	**223**	**11**	**56**
*UT1FA	"	13,041	178	11	52

WALES

***GW3JI**	**A**	**338,364**	**844**	**53**	**181**
*GWØKZW	*	31,080	230	24	116
*GW3GWX	1.8	5,500	93	7	37

YUGOSLAVIA

YU7AV	**A**	**3,396,304**	**2647**	**146**	**446**
YT1AD	**"**	**3,355,744**	**2829**	**138**	**430**
YU7BW	**"**	**3,028,013**	**2690**	**136**	**435**
YT5ØS	**14**	**142,100**	**618**	**31**	**85**
					(Opr. YU1TD)
***YZ1MB**	**1.8**	**20,876**	**285**	**10**	**58**
***YU7AL**	**A**	**343,672**	**608**	**88**	**235**
*YU5ØBO	*	68,697	327	34	119
			(Opr. YU1BO)		
*YU7XM	*	34,680	168	33	69
*YU7SF	*	32,130	158	35	70
***YU7KWX**	**21**	**90,272**	**326**	**30**	**82**
***YU1GR**	**14**	**112,548**	**547**	**27**	**86**
***4N1N**	**"**	**106,810**	**547**	**28**	**82**
***YU1BX**	**7**	**41,915**	**206**	**29**	**72**

OCEANIA

AUSTRALIA

VK3DXI	**A**	**2,227,770**	**2051**	**116**	**254**
VK5GN	*	607,380	1103	71	120
VK3APN	3.5	10,305	84	17	28
***VK2BQQ**	**A**	**222,354**	**408**	**67**	**131**
***VK2VM**	**"**	**197,472**	**554**	**45**	**76**
*VK4EET	*	40,014	172	24	57
*VK4XW	*	36,491	143	31	60
***VK4XA**	**28**	**25,604**	**249**	**17**	**20**
***VK2APK**	**21**	**460,768**	**1390**	**27**	**85**
*VK6AJ	*	64,032	256	24	63
*VK5AI	*	9,196	88	12	26
***VK4TT**	**14**	**83,328**	**260**	**31**	**62**
***VK6VZ**	**7**	**337,906**	**1073**	**28**	**79**
***VK1FF**	**"**	**199,066**	**578**	**31**	**87**

CHATHAM ISLAND

ZL7PYD	A	21,125	127	27	38
***ZL7CW**	**A**	**503,700**	**1170**	**56**	**94**

CHRISTMAS ISLAND

***VK9XH**	**A**	**101,721**	**301**	**56**	**67**

EASTERN KIRIBATI

T32BE	**A**	**693,504**	**1384**	**80**	**92**
					(Opr. WC5P)

EASTERN MALAYSIA

9M6NA	**14**	**1,143,930**	**2309**	**39**	**131**
					(Opr. JE1JKL)

FRENCH POLYNESIA

FOØZR	**A**	**243,936**	**605**	**62**	**82**
					(Opr. WA9INK)

HAWAII

KH6CC	**1.8**	**41,644**	**495**	**12**	**17**
***NH6/N6IP**	**A**	**34,349**	**239**	**24**	**25**

INDONESIA

***YB3AS**	**21**	**111,881**	**496**	**24**	**53**
*YB6ZZ	"	44,296	452	17	81
			(Opr. YC6KXA)		

MARSHALL ISLANDS

***V73WP**	**A**	**151,998**	**548**	**43**	**51**
					(Opr. JA1WPX)

NEW CALEDONIA

***TX8FU**	**7**	**56,463**	**338**	**21**	**38**
					(Opr. FK8FU)

NEW ZEALAND

***ZL2AL**	**A**	**139,428**	**443**	**40**	**68**
***ZL2VS**	**7**	**120,086**	**427**	**31**	**66**

PHILIPPINES

DU1KK	**A**	**1,794,415**	**2007**	**108**	**199**
					(Opr. WN7S)
***DU3 /W4NXE**	**A**	**309,620**	**691**	**54**	**83**

SOUTH COOK ISLANDS

***ZK1TB**	**A**	**270,070**	**416**	**95**	**144**
					(Opr. W7TB)

ZONE 29

***UAØZDA /MM**	**A**	**761,400**	**909**	**99**	**183**

SOUTH AMERICA

ARGENTINA

LU5CBA	**A**	**564,799**	**994**	**66**	**131**
					(Opr. LU8EHW)
LW2EUE	*	401,196	620	67	134
AY1I	**7**	**638,604**	**1831**	**35**	**111**
					(Opr. LW9EUJ)
LU4FC	*	17,500	166	20	24
LU2BRG	3.5	2,312	27	14	20
***LU1EWL**	**A**	**368,358**	**745**	**62**	**112**
*LW2DRF	*	12,600	65	31	32

***LW4DYI**	**28**	**83,283**	**416**	**23**	**48**
***LU8HSO**	**"**	**58,020**	**339**	**20**	**40**
***AZ9W**	**"**	**51,852**	**341**	**20**	**38**
			(Opr. LU5UL)		
*L5F	*	4,323	57	16	17
			(Opr. LU1FNH)		
*LU6MFD	*	3,240	129	11	16
*LW8EXF	*	1,185	36	8	7
*LWØCD	*	1,156	31	9	8
***LU4FM**	**21**	**687,456**	**1846**	**29**	**97**
			(Opr. LU3FSP)		
*LS7EE	*	231,000	774	27	78
			(Opr. LU7EE)		
***LU4FD**	**14**	**466,662**	**1281**	**31**	**92**
*LU7EAR	*	113,680	493	30	82
*LU1BW	*	55,930	211	33	61
*LU5EW	*	31,034	180	22	37
*LU4HKN	*	9,321	94	17	22
*LU3EAQ	*	4,880	47	16	24
*LU1AEE	7	11,132	87	15	31

ARUBA

P4ØW	**A**	**9,278,280**	**5797**	**136**	**404**
			(Opr. W2GD)		
P49V	**"**	**7,042,488**	**4829**	**125**	**367**
			(Opr. N7NG)		
P4ØJ	**3.5**	**641,245**	**1650**	**28**	**103**
			(Opr. WX4G)		

BOLIVIA

***CP1OZ**	**A**	**174,675**	**435**	**50**	**87**
			(Opr. JE6OXU)		

BRAZIL

ZX2A	**A**	**142,578**	**300**	**64**	**114**
			(Opr. PT2BW)		
PQ1CZ	*	107,406	366	43	59
PY1AJK	*	40,626	121	52	70
PT7NK	*	21,400	77	39	68
PY2NFE	*	10,175	71	22	33
ZX5CW	**28**	**118,065**	**526**	**25**	**60**
			(Opr. PY5CW)		
ZW5B	**21**	**1,359,881**	**2925**	**36**	**131**
			(Opr. LU6BEG)		
PY4AST	14	1,960	23	16	19
PY1CAS	7	6,665	65	16	27
***PW2N**	**A**	**503,652**	**946**	**69**	**119**
			(Opr. PY2NY)		
***PU2MHB**	**"**	**467,100**	**916**	**65**	**115**
*PP7CW	*	103,500	270	53	97
*PP7CI	*	61,008	194	41	82
*PT7SD	*	56,970	152	45	90
*ZW2Z	*	31,304	197	22	34
			(Opr. PY2ZI)		
*PY2NZR	*	24,346	118	24	50
*PT2NP	*	22,090	102	39	46
*PY4WS	*	18,414	128	37	68
*PY7OJ	*	11,137	98	43	65
*PY2DUN	28	338	18	6	7
*PU2KER	21	23,789	120	20	53
*PT2AW	*	14,396	96	22	39
*PY2PAH	*	10,608	141	14	12
*PY2OZF	*	10,290	106	11	24
*PU2RCM	*	5,396	58	18	20
*PY5FB	3.5	722	17	8	11

CHILE

CE3F	**A**	**429,125**	**1170**	**34**	**91**
			(Opr.CE3FIP)		
CE3BFZ	*	11,550	131	13	17

COLOMBIA

HK5QGX	A	4,560	41	16	24

ECUADOR

*HC2NWI	21	12,352	142	13	19

FERNANDO DE NORONHA

PYØFF	**A**	**10,247,400**	**5785**	**153**	**447**
			(Opr. CT1BOH)		

GUYANA

8R1K	**A**	**5,798,879**	**3935**	**131**	**368**
			(Opr. AB6NJ)		

PARAGUAY

ZPØC	21	14,760	137	15	26
			(Opr. ZP6CC)		

TRINIDAD & TOBAGO

9Y4H	**A**	**7,124,700**	**4749**	**139**	**369**
			(Opr. K6NA)		

URUGUAY

CX6VM	**21**	**779,955**	**1896**	**34**	**111**
CXØCW	**14**	**1,065,075**	**2450**	**38**	**127**

VENEZUELA

YV5A	**7**	**1,364,465**	**3095**	**35**	**122**
			(Opr. OHØXX)		
YV1ØB	**1.8**	**55,350**	**415**	**15**	**36**
***YV6AZC**	**28**	**62,532**	**437**	**17**	**37**
***YV7QP**	**3.5**	**34,578**	**231**	**12**	**39**

QRP

WORLD

DL2HBX	**A**	**715,035**	**1017**	**86**	**279**
AA2U	**"**	**602,089**	**661**	**85**	**247**
PV2U	**"**	**564,756**	**909**	**76**	**152**
			(Opr. PY2QU)		
LY3BA	**"**	**540,379**	**1095**	**72**	**251**
JA6GCE	**"**	**438,084**	**629**	**97**	**186**
KP4DDB	**"**	**296,823**	**915**	**48**	**115**
DL3KVR	**"**	**249,444**	**683**	**55**	**179**
YT7TY	**"**	**236,032**	**589**	**69**	**187**
JA6UBK	*	227,734	401	89	158
YU1LM	**"**	**202,248**	**760**	**49**	**172**
LX2PA	**"**	**196,225**	**500**	**62**	**173**
WT3W	**"**	**196,168**	**328**	**67**	**159**
N1AFC	**"**	**191,061**	**425**	**50**	**157**
DLØQW	*	190,128	529	54	150
			(Opr. DL4MFM)		
YU1GN	*	187,257	513	58	183
KV8S	**"**	**182,856**	**312**	**70**	**158**
NM1Q	*	180,504	335	49	158
N7IR	**"**	**178,704**	**334**	**72**	**132**
RA3MR	*	176,784	498	51	181
UAØKCL	**"**	**163,608**	**504**	**50**	**86**
KRØB	**"**	**161,202**	**302**	**63**	**138**
			(Opr. AF9T)		
UA4YJ	**"**	**160,035**	**509**	**53**	**182**
UA9UUN	*	152,312	399	44	114
EA1GT	*	151,662	584	36	102
OH1LUZ	**"**	**147,000**	**460**	**52**	**144**
EA3FHC	**"**	**145,302**	**584**	**54**	**149**
F6OIE	**"**	**145,119**	**507**	**44**	**139**
PAØADT	**"**	**143,114**	**483**	**42**	**121**
ISØLYN	**"**	**139,098**	**312**	**69**	**170**
FB1IPH	*	131,704	400	48	115
JK1GXU	**"**	**108,720**	**275**	**67**	**84**
EA7AAW	*	108,360	398	30	90
KA1CZF	*	104,328	223	52	132
HP1AC	**"**	**102,935**	**393**	**44**	**75**
VE7CA	**"**	**90,240**	**331**	**59**	**69**
7Z1AB	**"**	**89,112**	**213**	**45**	**113**
			(Opr. SM5CCT)		
LA2HFA	**"**	**86,394**	**345**	**36**	**118**
9A3GU	**"**	**78,842**	**344**	**38**	**120**
KIØG	*	65,703	210	54	67
N9LMU	**"**	**63,961**	**156**	**61**	**106**
DF1NH	*	63,800	355	30	115
W8QZA/6	**"**	**59,776**	**182**	**53**	**75**
WB6ITM	*	56,374	164	61	81
AA1CA	*	41,374	120	46	91
W8ERN	*	38,634	151	30	64
DJ3XK	*	35,712	250	37	91
W4QO	**"**	**30,016**	**118**	**43**	**69**
DL4GBR	*	27,634	337	32	50
TA2ZO	**"**	**25,472**	**120**	**22**	**42**
YL2TW	**"**	**24,096**	**212**	**22**	**74**
DL1LAW	*	21,836	209	21	82
W6ZH	*	21,074	100	33	49
DL1DQY	*	20,544	122	27	69
N7JXS	**"**	**19,872**	**107**	**28**	**41**
OK1DEC	*	19,206	140	28	71
K3WWP	*	17,028	85	37	62
VE6GK	*	16,912	146	29	27
VE2ABO	*	16,896	124	24	42
VE7CQK	*	15,950	157	25	25
OH2YL	*	14,553	109	20	43
WØKEA	*	12,675	78	28	47
DJ5QK	*	11,692	148	21	58
OE1KYW	**"**	**9,048**	**133**	**15**	**43**
LZ1KZ	**"**	**6,372**	**108**	**14**	**45**
UA6LDF	*	6,120	60	18	33
VE2BLX	*	5,957	75	17	20
HB9AYZ	**"**	**5,461**	**93**	**10**	**33**
AB5OU	**"**	**5,406**	**47**	**26**	**27**
PAØTA	*	4,551	57	15	26
WD9IWP	*	4,108	35	24	28
W2JEK	*	3,840	33	18	30
SMØHPL	*	2,744	50	14	35
YO4AAC	*	1,332	33	8	28
DL2PY	*	974	32	10	23
N8AXA	*	651	14	11	10
HB9LDO	*	540	12	8	10
OK1DMP	*	234	8	6	7
LU9HUP	**28**	**5,712**	**65**	**17**	**17**
JR7RJZ	*	144	7	4	5
PY3FBI	*	72	14	3	3
S59D	**21**	**47,430**	**204**	**30**	**63**
JA1YNE	**"**	**33,150**	**172**	**27**	**51**
			(Opr. JR1NKN)		
GØTDX	**"**	**32,067**	**220**	**20**	**43**
EA1BMA	**"**	**21,500**	**225**	**12**	**31**
VE7FJE	**"**	**15,551**	**185**	**15**	**24**
EA1BV	*	12,190	120	16	37
EA3CKX	*	9,234	111	16	22
ES1CR	**"**	**4,242**	**50**	**15**	**27**
SP6JOE	**"**	**1,794**	**38**	**8**	**15**
UAØKAY	**14**	**84,870**	**374**	**25**	**65**
SM3DXC	**"**	**35,112**	**221**	**23**	**65**
JA7RPC	**"**	**26,784**	**139**	**23**	**49**
JH3FTZ	**"**	**26,727**	**165**	**20**	**39**
EA2ANG	**"**	**16,720**	**210**	**10**	**34**
HB9CBR	**"**	**14,664**	**165**	**12**	**40**
HAØGK	**"**	**12,236**	**143**	**10**	**36**
OM7PY	**"**	**10,388**	**88**	**18**	**35**
JR4DAH	**"**	**9,640**	**87**	**18**	**22**
EA1ATL	*	9,460	106	11	32
VE5AEO	**"**	**9,361**	**124**	**16**	**21**
JK2KOX	**"**	**9,180**	**81**	**18**	**27**
EA8/DL4TJ	**"**	**8,730**	**68**	**12**	**33**
DL4OBJ	**"**	**7,410**	**110**	**19**	**20**
DL1AVH	*	5,863	62	11	44
JRØGFM	**"**	**4,585**	**51**	**18**	**17**
SM5DQ	**"**	**3,939**	**43**	**15**	**24**
OZ5RM	**"**	**3,782**	**62**	**9**	**22**
KA6SGT	**"**	**2,888**	**67**	**10**	**9**
EA3AJM	*	1,121	27	7	12
JK1OLP	*	707	31	11	14
IT9GXE	*	176	14	4	7
JI4SEU	*	104	6	3	5
OM7DX	**7**	**110,880**	**392**	**31**	**101**
G3JXC	**"**	**61,586**	**350**	**23**	**83**
SMØDZH	**"**	**41,499**	**320**	**21**	**66**
RA3FO	**"**	**29,151**	**215**	**23**	**56**
ON6TJ	**"**	**16,815**	**177**	**11**	**46**
UX8IX	**"**	**16,236**	**104**	**21**	**45**
F5LMJ	**"**	**6,966**	**120**	**7**	**36**
JA1AA	**"**	**5,402**	**58**	**17**	**20**
JL3SBE	*	1,188	33	8	10
JA8HSC	*	76	7	2	2
WAØOUI	*	48	5	4	4
SP4GFG	**3.5**	**41,902**	**474**	**13**	**60**
UT1PO	**"**	**27,553**	**423**	**9**	**50**
ES1CW	**"**	**24,674**	**266**	**12**	**61**
HA8LUH	**"**	**19,380**	**249**	**10**	**58**
SP8UFY	**"**	**10,246**	**215**	**7**	**40**
UA4SMM	**"**	**7,320**	**158**	**8**	**32**
DL6JBA	*	1,015	36	5	24
HB9QA	*	806	29	6	20
UT8IT	**1.8**	**11,070**	**172**	**9**	**45**
OM2ZZ	**"**	**4,251**	**110**	**5**	**34**
YO4FRF	**"**	**2,640**	**83**	**3**	**30**
SP5NOG	*	500	26	3	17

ASSISTED

UNITED STATES

K2SX/1	**A**	**2,738,177**	**1605**	**147**	**460**
W1NG	**"**	**1,893,310**	**1142**	**136**	**454**
KC1F	**"**	**1,191,168**	**1073**	**99**	**285**
KS1L	*	1,156,815	807	122	391
WB2DND/1	*	900,600	703	113	343
W1BIH	*	842,764	613	124	370
WA2CJT/1	*	471,903	523	77	246
WE1F	*	432,016	602	56	192
KD2NT	*	422,299	457	91	256
WA2TIF/1	*	320,372	470	66	178
K1SSN	*	242,970	332	81	192
K1FWF	*	222,992	272	97	211
N1OPZ	*	210,087	282	75	204
N1AU	*	206,280	276	77	193
NO1J	*	182,820	306	64	156
AA1V	*	173,794	271	68	158
WA1KSY	*	119,567	219	60	143
KS9Z/1	*	104,125	209	46	129
KB2R/1	*	100,084	211	56	135
KA1CB	*	44,244	123	55	89
KG1V	14	47,940	197	24	78
NG2P	*	3,549	32	16	23
K1YXV	3.5	13,888	82	13	49
K2WK	**A**	**3,956,248**	**2296**	**133**	**463**
K2TW	**"**	**3,718,806**	**2046**	**148**	**489**
KE2PF	**"**	**2,259,750**	**1362**	**133**	**442**
W9NGA/2	*	1,589,050	1079	116	405
K2ONP	*	1,342,666	1038	110	347
W1GD/2	*	1,244,160	924	114	366
KF2O	*	1,016,834	710	129	389
N1CC/2	*	1,001,835	951	92	277
K2DB	*	692,640	671	100	290
K2SB	*	578,956	523	111	295
K2XA	*	513,091	481	108	281
WB2P	*	444,316	362	115	337
K2PF	*	263,544	353	78	200
WA2UZI	*	229,296	300	68	213
N2CQ	*	215,730	258	78	228
WB2RAJ	*	205,200	319	70	170
KB2NU	*	202,788	281	74	188
W2XN	*	176,825	236	73	202
WA2WYR	*	116,688	214	60	144
N2MZH	*	104,800	204	62	138
KA2CKI	*	50,673	144	42	85
KB2SE	*	34,979	100	40	93
N2VW	*	16,376	74	28	61
N2KJM	*	1,276	20	12	17
K3WW	**A**	**4,179,600**	**2242**	**144**	**504**
N3AD	**"**	**3,088,470**	**1886**	**135**	**438**
AA3B	**"**	**2,095,553**	**1443**	**116**	**393**
K3MD	*	1,871,702	1211	125	413
NN3Q	*	1,636,392	1158	110	382
K3NZ	*	1,555,568	1036	129	403
W3MM	*	1,334,680	871	130	417
K3II	*	1,135,680	736	127	433
N3NA	*	986,968	803	108	320
K3SA	*	943,068	804	106	306
W3AP	*	861,372	734	118	308
K1HTV/3	*	850,653	732	107	316
W3OV	*	843,480	756	101	296
K3ND	*	768,638	628	116	326
N3II	*	709,182	624	114	300
AA3HM	*	556,091	564	90	269
K3YGU	*	493,266	489	92	267
W3GK	*	420,550	478	89	236
W3HVQ	*	415,324	468	98	228
N3AM	*	378,531	446	83	224
NK3U	*	371,408	409	83	251
WT3P	*	338,708	440	74	215
AA3HA	*	316,368	350	86	252
W3FG	*	304,554	420	68	195
K3ATO	*	270,265	370	82	201
W3KV	*	232,288	352	67	177
WA3TXR	*	210,432	320	80	176
N3FDL	*	206,646	247	73	230
N3MKZ	*	150,036	216	76	180
KE3GA	*	128,304	202	73	170
WR3D	*	58,116	177	42	74
KB3X	*	55,539	131	57	96
K3NL	*	19,690	76	43	67
NU3Y	*	7,242	51	15	36
WR3L	**21**	**53,352**	**166**	**25**	**89**
WF3T	**14**	**537,257**	**1166**	**36**	**125**
WA4CTA	**A**	**1,836,969**	**1206**	**138**	**405**
K4CEF	**"**	**1,034,184**	**792**	**134**	**358**
KG4W	**"**	**1,007,100**	**838**	**113**	**337**
KØLUZ/4	*	815,828	770	95	282
N4ZR	*	719,320	700	93	274
KN4ZT	*	323,120	431	71	209
KC4ZV	*	272,844	370	89	197
N4DW	*	213,696	319	70	182
K4HSF	*	199,898	300	76	178
K4PB	*	185,955	274	71	174
AC4OB	*	90,988	219	52	120
K8UNP/4	*	68,996	142	71	117
N4TG	*	28,440	89	43	77
K4AMC	**14**	**481,245**	**523**	**32**	**101**
AC4HB	**7**	**219,300**	**524**	**35**	**115**
WB2NQT/4	**1.8**	**14,490**	**87**	**13**	**50**
W4JVN	*	1,380	22	7	16
KRØY/5	**A**	**1,271,071**	**810**	**148**	**425**
K5LP	**"**	**1,050,364**	**827**	**132**	**334**
KA5W	**"**	**804,440**	**646**	**124**	**331**
WF5T	*	313,407	411	96	195
KD5IA	*	250,113	356	89	174
WB5UDX	**21**	**51,612**	**188**	**28**	**74**
N5NMX	**3.5**	**22,796**	**110**	**22**	**60**
WZ6Z	**A**	**1,165,710**	**919**	**138**	**317**
W6REC	**"**	**815,052**	**789**	**127**	**245**
WS6X	*	575,552	543	123	268
W6QHS	*	465,633	440	116	273
W6OUL	*	432,055	519	105	194
K6SG	*	411,705	469	101	214
W6OAT	*	269,952	327	100	204
WR6R	*	218,880	280	107	197
W6TKF	*	145,392	265	83	125
WA8LLY/6	*	31,548	90	53	79
KN6EL	**7**	**113,640**	**329**	**35**	**85**
K6LRN	*	23,408	111	26	51
WAØRJY/7	**A**	**415,860**	**539**	**101**	**189**
WA7LNW	**"**	**267,794**	**375**	**84**	**173**
NT7E	*	258,250	374	83	167
K7NPN	*	205,428	348	87	141
AA7WP	*	136,740	258	80	135
AAØCY/7	*	25,443	105	40	59
N7IXG	*	21,658	101	41	50
N7IRR	**14**	**148,740**	**399**	**34**	**100**
WB7DPM	7	13,064	64	26	45
K8JJC	**A**	**1,334,313**	**1035**	**117**	**342**
KE8M	**"**	**615,664**	**612**	**98**	**270**
NF8R	*	575,701	560	111	268
K8CX	*	468,488	455	101	272
ND5S/8	*	253,776	332	90	22
K8CV	*	88,509	201	49	114
NG8D	*	73,320	210	35	85
WG8M	**7**	**43,764**	**185**	**22**	**62**
AA8U	**1.8**	**64,416**	**331**	**22**	**74**
W9OP	**A**	**750,860**	**680**	**103**	**277**
N9NS	*	214,668	313	92	176
K9OSH	*	88,074	186	65	124
N9AU	**7**	**150,849**	**358**	**37**	**114**
NK9G	*	71,876	220	32	87
K9GS	*	25,187	109	25	64
KMØL	**A**	**707,872**	**758**	**106**	**246**
NRØX	*	370,440	373	96	264
AKØM	*	190,688	301	73	163
NØAT	*	114,240	177	81	159
KK9W/Ø	*	59,055	141	51	104
KØGU	**1.8**	**18,724**	**122**	**17**	**45**
KØCS	**"**	**17,152**	**103**	**17**	**50**

CANADA

VA3NR	**A**	**277,574**	**510**	**73**	**169**
VA2AM	*	242,820	342	81	203

ASIA

HONG KONG

VS6BG	**A**	**1,586,769**	**2053**	**123**	**260**

JAPAN

JL1ARF	**28**	**2,156**	**30**	**12**	**16**
JQ1NGT	**21**	**17,812**	**117**	**21**	**40**
JK1GKG	**7**	**29,841**	**136**	**30**	**57**
JA1SJV	*	22,422	115	26	48
JK2VOC	**A**	**181,704**	**383**	**79**	**122**
JG2DWS	*	48,514	144	54	73
JE2HCJ	**3.5**	**33,078**	**168**	**25**	**49**
JF2BNG	*	22,330	112	24	53
JL2ICO	14	9,116	68	21	32
JH3AIU	**A**	**909,374**	**880**	**123**	**250**
JN3SAC	*	176,400	365	65	115
JI3KDH/3	**21**	**55,080**	**212**	**31**	**71**
JA3VXH	**14**	**85,914**	**289**	**33**	**78**
JH7QXJ	21	9,593	73	20	33
JH8SLS	**A**	**530,272**	**672**	**103**	**189**
JN2QCV/9	**A**	**807,510**	**900**	**115**	**215**
JGØSXC	A	6,213	40	27	30
JRØQFA	3.5	21	4	4	3
JHØSPE	21	3,483	34	13	30
JAØBJY	**14**	**82,222**	**313**	**30**	**68**

EUROPE

BELGIUM

ON4UW	**A**	**81,366**	**252**	**42**	**100**

CROATIA

9A3ZO	**A**	**90,650**	**263**	**55**	**130**

CZECH REPUBLIC

OK1PG	**A**	**193,401**	**361**	**81**	**180**

ENGLAND

G3ZEM	**A**	**3,002,975**	**2502**	**131**	**434**
G5LP	*	937,040	1224	101	323

ESTONIA

ES5RY	**A**	**1,534,055**	**2000**	**117**	**368**

FINLAND

OH1KAG	**A**	**88,360**	**740**	**19**	**75**
OH2BO	**1.8**	**17,892**	**141**	**17**	**67**
OH2LU	**3.5**	**58,805**	**493**	**26**	**89**

FRANCE

F5TCN	**A**	**164,768**	**252**	**73**	**198**

GERMANY

DK3GI	**A**	**2,938,434**	**1977**	**152**	**490**
DJ2YA	**"**	**2,198,248**	**1569**	**148**	**450**
DK8FD	**"**	**2,193,091**	**1662**	**153**	**454**
DF3CB	**"**	**2,184,336**	**1918**	**137**	**391**
DL2ZAE	*	1,371,435	1306	126	381
DJ9IE	*	1,031,650	1108	111	359
DF4RD	*	1,005,032	823	135	413
DK9DA	*	665,874	722	108	310
DL8KJ	*	453,351	626	88	261
DF2RG	*	219,373	434	75	184
DJØIP	*	129,042	384	48	153
DL4OCL	*	16,770	119	27	59
DJ1YH	*	14,592	72	38	58
DAØUN	**7**	**887,355**	**2208**	**39**	**150**
			(Opr. DL4NAC)		
DLØTD	*	316,665	1024	38	117
			(Opr. DL1FDV)		
DJ9RR	*	140,140	548	35	105
DJ4KW	*	49,608	247	25	81
DL3KDV	**1.8**	**78,678**	**576**	**20**	**74**
DJ6TK	*	34,522	341	14	68

HUNGARY

HAØHW	**A**	**146,965**	**360**	**62**	**159**

IRELAND

EI6FR	**14**	**223,748**	**1014**	**28**	**94**

ITALY

IKØHBN	**A**	**814,332**	**890**	**121**	**353**
IV3UHL	**21**	**54,600**	**294**	**25**	**59**
IK5TSS	**14**	**152,792**	**503**	**33**	**109**
IQ7A	*	82,944	512	19	62
			(Opr. IK7XIV)		

NETHERLANDS

PAØCYW	**3.5**	**64,337**	**458**	**19**	**82**

NORWAY

LA7AFA	**A**	**224,523**	**545**	**67**	**180**
LA1PHA	*	43,028	198	34	90
LA2KD	*	38,775	131	47	94
LB2UE	*	9,717	57	36	43

POLAND

SP3FAR	A	53,352	117	61	91
SO5TW	*	7,800	61	23	28
			(Opr. K3TW)		

SLOVENIA

S56A	**A**	**972,900**	**1012**	**117**	**343**

SPAIN

EA5WI	**A**	**162,729**	**403**	**57**	**132**
EA7DPU	**21**	**146,740**	**622**	**28**	**87**

SWEDEN

SKØWJ	**A**	**1,512,728**	**2062**	**116**	**338**
			(Opr. SMØTHN)		
SM3JLA	*	1,375,166	1610	112	354
SM5IMO	*	821,997	1142	98	263
SMØDJZ	**7**	**85,140**	**376**	**33**	**99**
SM3BDZ	**1.8**	**77,657**	**574**	**17**	**62**

UKRAINE

US2YW/UT5U	3.5	7,943	132	10	37

SOUTH AMERICA

BRAZIL

PU2LSR	**21**	**66,120**	**322**	**27**	**49**

MULTI-OPERATOR SINGLE TRANSMITTER

NORTH AMERICA

UNITED STATES

K1AR		**9,008,245**	**4084**	**166**	**585**
K1DG		**7,119,538**	**3442**	**160**	**559**
K1ZZ		**6,071,210**	**2958**	**159**	**551**
K1KP		3,457,710	1951	145	473
K1RX		3,257,078	1823	150	476
KB1H		2,786,112	1703	134	442
KT1O		1,231,818	1037	103	319
N2NU		**7,311,630**	**3376**	**169**	**584**
NF2L		2,924,917	1700	139	460
K2QMF		1,772,385	1191	116	403
NS2K		1,729,626	1299	115	359
AB2E		1,519,203	1066	118	393
N2FF		873,776	862	93	295
N2SS		357,046	394	92	242
WA2LCC		89,460	193	56	124
W2SEX		66,880	172	54	106
N3RS		**7,322,805**	**3459**	**159**	**576**
W3GG		2,240,760	1391	132	436
N3BNA		1,432,530	1018	125	370
N4ZC		**3,595,071**	**1859**	**157**	**530**
K4LTA		1,256,184	992	124	354
W4PRO		1,033,758	745	120	386
WXØB/5		**3,366,886**	**2043**	**157**	**465**
KS1G/5		2,372,958	1755	134	375
AG6D		**2,149,839**	**1621**	**143**	**334**
K6XT		1,077,876	824	147	327
WA6IET		976,005	943	120	249
W6UE		301,674	415	96	178
W6YRA		4,602	70	13	13
NK7U		**1,296,850**	**1259**	**121**	**249**
WA7EGA		1,069,764	1085	121	252
W7/ES5MC		777,280	1009	105	215
KF7JF		486,343	727	84	163
AB7BS		430,078	767	97	139
K8AZ		**6,074,623**	**3022**	**156**	**547**
K8JP		1,450,840	1139	117	343
K8DO		1,001,880	1117	97	233
KF8VS		102,828	195	74	135
KS9K		**3,856,006**	**2042**	**155**	**531**
N2IC/Ø		**4,083,024**	**2460**	**151**	**441**
NCØP		**3,536,250**	**2097**	**152**	**473**
WØCP		2,113,176	1476	142	379
KGØE		110,971	225	77	114

CANADA

VA9DH	**5,418,900**	**3952**	**124**	**416**
CG2ZP	1,791,042	2132	98	265
VO2WL	1,354,353	2094	76	211
VE6AO	550,896	1414	68	116
VE2CLM	31,312	210	34	42

CAYMAN ISLANDS

ZF2RF	**5,730,499**	**5863**	**111**	**298**

DOMINICANA

HI3CVV	**3,182,400**	**4448**	**85**	**227**

GUANTANAMO BAY

KG4MN	**3,169,600**	**4064**	**95**	**255**

MEXICO

6D2X	**6,716,736**	**4921**	**154**	**444**

MONTSERRAT

VP2MDE	**9,085,230**	**5612**	**144**	**483**
VP2MEY	1,402,104	2925	76	150

PUERTO RICO

NP4Z	**7,389,804**	**5152**	**146**	**450**

AFRICA

CEUTA & MEILLA

EA9EU	**8,496,792**	**5045**	**134**	**432**

TUNISIA

3V8BB	**7,662,336**	**4796**	**129**	**399**

ASIA

ASIATIC RUSSIA

RK9AWN	**3,325,350**	**2356**	**122**	**403**

HONG KONG

VS6WO	**4,667,766**	**4383**	**120**	**318**

JAPAN

JA7YAA	**2,872,002**	**2386**	**131**	**296**
JR1ZTT	**1,588,301**	**1503**	**121**	**262**
JE6ZIH	**1,291,850**	**1330**	**112**	**238**
JA2YKA	**876,360**	**1172**	**96**	**172**
JA9YAV	**678,600**	**833**	**102**	**198**
JH2ZUN	315,435	473	93	162
JAØYAK	44,200	160	45	59

KIRGHIZIA

EX2M	**2,171,415**	**2418**	**97**	**264**

MONGOLIA

JT1T	**1,609,344**	**2524**	**86**	**202**

EUROPE

4U-GENEVA

4UØITU	**3,970,230**	**3980**	**137**	**446**

AUSTRIA

OE2S	**3,788,820**	**3072**	**148**	**482**

BALEARIC ISLANDS

EA6IB	**6,931,600**	**5361**	**158**	**492**

BELGIUM

ON6AH	**1,520,685**	**1761**	**104**	**319**
ON6RM	118,767	421	50	133

BOSNIA-HERZEGOVENIA

T99MT	**1,622,539**	**2231**	**97**	**300**

BULGARIA

LZ9A	**4,798,444**	**3738**	**153**	**491**
LZ7M	3,672,544	3309	144	484

CROATIA

9A5D	**2,546,558**	**2952**	**108**	**305**
9A6V	708,964	745	122	299
9A1HBC	356,360	713	72	223

CZECH REPUBLIC

OK5W	**5,581,765**	**3445**	**167**	**540**
OL3A	**4,270,620**	**3406**	**157**	**496**
OK2KOD	1,118,656	1364	111	337
OL5T	728,802	1346	77	265
OK2OSU	397,568	984	70	186
OK2KDS	293,964	625	67	195
OK2KVI	420	20	6	9

ENGLAND

GB5WW	**3,484,838**	**3035**	**137**	**444**

EUROPEAN RUSSIA

RS3A	**5,439,879**	**4316**	**163**	**554**
RU1A	**4,874,616**	**3647**	**166**	**545**
RN4W	3,019,218	3038	137	470
RZ6AXO	2,118,561	2150	140	439
RK4WWA	1,769,482	2241	114	392
RZ6LZL	1,281,537	2115	89	280
RK6AYN	871,222	1355	98	300
UZ4AYT	754,626	1443	85	261
RK3QWM	673,326	883	62	160
RK3RYY	181,051	400	67	180
RK1OWZ	16,975	146	21	76

FINLAND

OH2HE	**5,561,388**	**3531**	**173**	**588**
OH7M	**3,463,054**	**2911**	**159**	**499**
OH4AB	1,953,640	2105	138	440
OH5LAQ	1,305,604	1980	94	325
OH2AAZ	1,088,235	1661	90	315

FRANCE

TM9C	**5,459,592**	**3977**	**163**	**491**
TM2Y	**4,785,504**	**3404**	**151**	**480**
TM8A	2,353,344	2799	113	363
F6KCS	883,440	1362	85	275
TM6SPF	184,036	724	36	103
F5KAC	150,150	460	48	147

GERMANY

DFØHQ	**6,310,953**	**3769**	**176**	**553**
DK6WL	**4,301,658**	**2879**	**167**	**539**
DFØESA	3,511,665	2565	157	500
DJ6TF	2,474,745	2102	128	427
DKØUB	2,021,562	2021	122	392
DF8WS	1,868,592	1648	123	405
DKØTZ	700,448	955	97	274
DA1WA	453,612	817	79	230

GREECE

SV1AFA	**617,070**	**1314**	**80**	**255**

HUNGARY

HG5A	**4,853,759**	**3398**	**157**	**510**
HG6Y	**2,741,025**	**2669**	**130**	**395**
HG5M	2,587,115	2689	117	388
HA3KNA	1,138,209	1483	116	345
HG6V	145,110	1004	23	82
HA4KYV	34,216	200	28	76

IRELAND

EI7M	**3,722,998**	**3421**	**126**	**416**

ITALY

IQ4A	**7,030,000**	**3928**	**176**	**584**
IQ2X	**3,878,322**	**2870**	**152**	**490**
II2K	3,524,934	2886	137	437
IR3X	1,301,832	1868	98	280
IO2L	775,799	1136	94	265
IK4UOP	649,298	1123	94	244
IQ2W	50,922	255	34	104

KALININGRAD

RK2FWA	**5,669,160**	**3909**	**169**	**545**

LITHUANIA

LY3MR	**1,493,874**	**1608**	**124**	**433**

LUXEMBOURG

LX/DFØBK	**1,457,248**	**2238**	**98**	**305**

NETHERLANDS

PI4CC	**1,919,456**	**2255**	**113**	**338**
PI4ZLD	**1,762,992**	**2019**	**112**	**365**
PI4TUE	1,333,520	1573	103	292
PI5ØALK	48,641	230	37	90

NORWAY

LA9GX	**2,383,248**	**2726**	**124**	**395**
LA5M	17,181	165	24	59

POLAND

SN2B	**5,672,828**	**3700**	**166**	**555**
SP9PDF	470,532	669	94	253
SP9KRT	273,790	608	23	75
SP3KPN	24,926	168	22	81

SCOTLAND

GS4TMS	**1,112,150**	**2006**	**82**	**243**

The crew at VP5FOC handed out a lot of perfect CW QSOs.

SLOVAK REPUBLIC

OM7M	**5,110,824**	**3213**	**172**	**560**
OM5M	**5,234,320**	**3379**	**173**	**555**
OM3RKA	1,957,740	1972	123	364
OM3RJB	1,333,563	1372	123	360
OM3KTR	7,181	109	11	32

SPAIN

EA5FX	**3,316,608**	**2951**	**136**	**440**
EA3CWK	1,609,920	2152	108	282
EA5BY	1,563,900	2105	105	285

SWEDEN

SI6GM	**2,797,340**	**2868**	**134**	**396**
8S3BG	**1,295,043**	**2245**	**85**	**294**
SK5AJ	771,524	1083	101	300
SK6NL	30,096	144	34	65

UKRAINE

UT7L	**1,509,825**	**1703**	**120**	**371**
UR4PWC	505,180	1026	75	215
US4LWM	164,312	668	51	133
UR4MWU	83,356	304	52	130

YUGOSLAVIA

YU7BCD	**1,095,122**	**1598**	**102**	**256**
YU1AAV	474,484	600	68	240
YU1HFG	320,535	804	64	191
YZ7A	304,546	725	62	192

OCEANIA

AUSTRALIA

VK4EMM	**1,257,037**	**1608**	**94**	**175**

NORTHERN MARIANAS

AHØT	**7,236,000**	**4550**	**152**	**388**

PHILIPPINES

DX9C	**5,648,886**	**4359**	**132**	**306**

SOUTH AMERICA

GALAPAGOS ISLANDS

HC8N	**14,302,820**	**7252**	**162**	**503**

PARAGUAY

ZPØR	**1,060,560**	**1531**	**82**	**158**

VENEZEULA

4M5X	**10,277,794**	**5427**	**148**	**493**

MULTI-OPERATOR MULTI-TRANSMITTER NORTH AMERICA

UNITED STATES

N2RM	**12,765,600**	**5733**	**169**	**619**
W3LPL	**12,439,905**	**5603**	**176**	**631**
K3LR	**11,908,899**	**5281**	**176**	**631**
K1KI	**11,680,892**	**5391**	**169**	**609**
KY1H	**8,718,302**	**4346**	**167**	**5665**
KY3N	**7,256,201**	**3584**	**159**	**554**
K4VX/Ø	**6,617,160**	**3839**	**159**	**501**
K8CC	**6,353,538**	**3385**	**157**	**521**
W1CW/4	**5,872,324**	**3304**	**149**	**512**
K2LE/1	5,350,569	2919	151	500
WØAIH/9	**5,085,330**	**2819**	**156**	**518**
K3ANS	4,481,400	2377	152	527
W9KDX	**4,133,430**	**2349**	**155**	**475**
W6BA	**3,977,056**	**2364**	**165**	**427**
WD8LLD	3,962,910	2068	156	522
NQ4I	3,897,280	2417	147	461
K3EST/6	3,633,519	2534	147	372
N6DX	3,608,730	2182	167	439
N2MM	**3,603,942**	**2194**	**131**	**446**
W4MYA	3,133,625	1917	138	445
K6VI	2,386,787	1756	142	345
NM3K	1,837,394	1465	106	336
K3DI	1,236,852	1047	107	316
K7FR	**1,051,725**	**1130**	**125**	**254**
WK6V	856,004	920	114	232
NE3F	451,915	487	97	258
AA6MC	433,948	512	100	214
N3ADL	307,197	352	85	236
AA3GQ	28,145	209	32	33

ALASKA

NL7G	**9,911,736**	**7797**	**154**	**368**

TURKS & CAICOS ISLANDS

VP5FOC	**12,382,625**	**9407**	**148**	**427**

AFRICA

BENIN

TY5A	**21,994,325**	**10207**	**163**	**562**

ASIA

ASIATIC RUSSIA

RK9CWW	**9,704,772**	**5374**	**158**	**535**

JAPAN

JA3ZOH	**9,261,126**	**5013**	**172**	**479**
JH5ZJS	**7,067,838**	**4360**	**161**	**410**
JA1YDU	**6,320,496**	**3655**	**171**	**453**
JA3YKC	3,491,196	2874	126	302
JA3YBF	1,438,494	1327	123	271
JO1YAO	43,680	154	45	60

MYANMAR

XZ1A	**3,088,176**	**3704**	**109**	**283**

UNITED ARAB EMIRATES

A61AF	**1,980,180**	**1898**	**101**	**285**

EUROPE

BULGARIA

LZ1R	**5,273,028**	**4900**	**148**	**491**

CORSICA

TK2C	**15,648,052**	**10319**	**181**	**631**

CROATIA

9A1A	**15,394,068**	**9063**	**190**	**659**

CZECH REPUBLIC

OK1OKE	61,506	237	41	93

DENMARK

OZ5W	**4,653,864**	**3871**	**146**	**447**
OZ5WQ	2,599,384	2676	141	443

DODECANESE

J45T	**1,513,635**	**3544**	**79**	**260**

ENGLAND

GXØAAA	**9,262,892**	**6257**	**163**	**553**

EUROPEAN RUSSIA

RU3A	**7,178,850**	**5298**	**169**	**573**

GERMANY

DLØKF	**4,080,268**	**3463**	**143**	**483**
DK5EZ	2,267,001	1890	131	430
DF3QG	542,532	825	86	262

GUERNSEY

GU3HFN	**2,077,105**	**3569**	**79**	**276**

HUNGARY

HG73DX	**10,541,466**	**7273**	**166**	**575**

ITALY

IYØTCI	**400,531**	**900**	**67**	**226**

LITHUANIA

LY5A	**9,187,864**	**6279**	**170**	**594**
LY7A	4,255,236	4165	144	468

NETHERLANDS

PI4COM	**7,293,879**	**5419**	**155**	**532**

SPAIN

EA4ML	**2,160,239**	**2554**	**107**	**350**

SWEDEN

SIØGM	**411,264**	**867**	**74**	**214**

UKRAINE

EM2I	**10,217,031**	**7756**	**156**	**581**

YUGOSLAVIA

YT9W	**9,412,552**	**6305**	**191**	**633**

OCEANIA

HAWAII

WH6R	**7,745,160**	**5605**	**149**	**325**

NEW ZEALAND

ZM2K	**5,591,425**	**4298**	**135**	**310**

CHECK LOGS

Our thanks to the following stations who sent in check logs:
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BY GEORGE JACOBS, W3ASK

PROPAGATION

THE SCIENCE OF PREDICTING RADIO CONDITIONS

1996 Contest First During New Sunspot Cycle 23

While it still may take several months before it is determined by scientists, there is increasing evidence that Cycle 22 may have ended and Cycle 23 may have begun during July 1996.

The monthly mean sunspot number for June, as reported by the Royal Observatory of Belgium, was 11.8, as compared to a mean count of 5.6 for May. While there were 16 spotless days during May, there were only 5 during June. June's mean level results in a 12-month running smoothed sunspot number of 10.7 centered on December 1995. This is a drop of 0.5 from the previous month's smoothed level.

Canada's Dominion Radio Astrophysical Observatory reports a corresponding 10.7 cm solar flux level of 72 for June 1996. This results in a smoothed value of 73 centered on December 1995.

Unofficial data available for July indicates an increasing number of new cycle sunspots, and the first time in almost a year that 10.7 cm solar flux values in excess of 80 were reported on at least seven days. It appears almost certain that Cycle 23 began during July!

A smoothed sunspot count of approximately 10 is expected during the 1996 WW DX Contest period, with a corresponding solar flux level of approximately 72. This would be at about the same levels that occurred during last year's contest.

High-Normal Conditions For Most of SSB WW Contest

At the time of writing, during early August, a long-range *CQ* day-to-day forecast based primarily on the 27-day recurrence tendencies of geomagnetic, solar, and ionospheric conditions indicates a great probability of High Normal propagation conditions on October 26, the first day of the SSB contest weekend. Conditions may drop to Low Normal on October 27 on trans-polar paths. See the Last-Minute Forecast box at the beginning of this month's column for additional information concerning expected day-to-day conditions for the entire month of October. An updated day-to-day forecast for the SSB contest weekend will appear as a bulletin at the beginning of next month's column. The November issue of *CQ* should reach most subscribers before the SSB contest begins.

Salting The Ionosphere— Improved DX Conditions?

After last year's "Salting of the Ionosphere," Mother Nature cooperated very nicely and overall conditions during the 1995 WW Contest periods were better than expected. This year we selected another "sacred" communication location for our annual salting of the ionosphere. We originally thought that Magnetic Hill in New Brunswick, Canada would be a logical place. When we arrived there, however, we found that what caused vehicles to go uphill with their engines off was really an optical effect rather than a magnetic one.

We continued on into Nova Scotia to the town of Baddeck on the shore of the Bras d'Or Lake. This is where Alexander Graham Bell spent a good deal of his life experimenting with communications and his other inventions. An architecturally attractive museum has been erected there, and it contains a fascinating and elaborate collection of Bell's many inventions, including his early telephones. Outside the museum is a stone monument in the form of a pyramid, erected in honor of Bell. This was the sacred spot to "salt the ionosphere" for the 1996 WW Contest periods.

If Mother Nature cooperates and there are no radio storms during the 1996 WW Contest periods, conditions this year should be noticeably better than last year. If such is the case, expect better openings and higher scores than last year, noticeably on 10 and 15 meters.

If you plan to participate in the 1996 WW DX Contest, the DX propagation charts and other information appearing in this month's column are designed to help you stay sharp and informed, and to make the best use of the ionosphere for piling up as many contacts and points as possible.

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LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for October 1996

	Expected Signal Quality			
Propagation Index.....	**(4)**	**(3)**	**(2)**	**(1)**
Above Normal: 12, 14-15, 24-25	A	A	B	C
High Normal: 3-4, 8, 11, 13, 26, 28-29, 31	A	B	C	C-D
Low Normal: 1-2, 6-7, 9, 17-18, 21-23, 27, 30	B	C	D	D-E
Below Normal: 5, 10, 16, 20	C	C-D	D-E	E
Disturbed: 19	C-D	D	E	E

Where expected signal quality is: **A—Excellent opening, exceptionally strong, steady signals greater than S9.**

B—Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S9 and S6, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S3, and with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from 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 band opening for any date of the month. For example, an opening shown in the charts with a *propagation index* of 3 will be fair (C) on October 1st and 2nd, good (B) on the 3rd and 4th, fair-to-poor (C-D) on the 5th, etc. Good conditions (B) are expected on Oct. 26th, the first day of the 1996 CQ WW DX Contest, with fair (C) conditions forecast for Oct. 27th.

DX CONTEST SPECIAL

The 1996 CQ World-Wide DX Contest will be held on the following dates:

SSB: 0000 UTC Saturday, Oct. 26 to 2400 UTC Sunday, Oct. 27

CW: 0000 UTC Saturday, Nov. 23 to 2400 UTC Sunday, Nov. 24

For the 46th consecutive year this month's propagation column is devoted to special forecasts and information applicable to both the SSB and CW contest weekends. The accuracy of the forecasts for the previous 45 contests is greater than 90%!

The pyramid at the Alexander Graham Bell memorial museum in Baddeck, Nova Scotia, which served as this year's sacred site for W3ASK's annual "salting of the ionosphere." (Photo by Bea)

General Conditions, Band By Band

The following is a band-by-band summary of DX propagation conditions normally expected from mid-October through mid-December and centered on the contest periods.

10 Meters: With the start of sunspot Cycle 23, a noticeable increase in 10 meter openings is now likely. During High or Above Normal conditions look for some openings towards Africa and Europe before noon, towards Central and South America from a few hours before until a few hours afternoon, and towards the South Pacific during the afternoon.

15 Meters: The new cycle will also bring an increasing number of openings on this band. This should be a fairly good band during most of the daylight hours. When conditions are Normal, the band should open to many areas of the world from shortly after sunrise through the late afternoon. Signals from Europe and Africa should peak an hour or two before noon, while signals from Central and South America,

the Far East, and the South Pacific should peak during the late afternoon. During Below Normal or Disturbed conditions, 15 meter openings will be spotty and of very short duration, if possible at all.

20 Meters: This is again expected to be the "backbone" band during the contest. During Normal conditions good DX openings are expected to almost every corner of the world sometime between sunrise and the early evening hours. Conditions should peak for a few hours after sunrise and again during the late afternoon and early evening. During these peak periods, 20 meters should be the optimum band for DX, with openings usually characterized by strong signal levels. When conditions are Below Normal, 20 meter openings should be fewer in number, of shorter duration, and with weaker signal levels. In general, however, the band should hold up for some DX openings during all but Disturbed conditions.

40 Meters: The band is expected to open during the late afternoon hours, and remain open for DX to one area of the world or another until shortly after sunrise. Look for openings to Europe and Africa from an hour or so before sundown to about midnight in the MST and PST time zones, and to at least 2 AM in the CST and EST zones. Good openings towards Central and South America should be possible throughout most of the hours of darkness. Openings towards the South Pacific and the Far East are expected to peak during a two-hour period before sunrise. During most of the hours of darkness, 40 meters should be the optimum band for DX propagation. When conditions are Below Normal or Disturbed, openings will be spotty and considerably fewer in number.

80 Meters: DX propagation conditions are generally at their best on this band during periods of low solar activity. Some fairly good 80 meter DX openings are expected to several areas of the world during the hours of darkness and the sunrise period. When propagation conditions are Normal, signal levels should be strong on many openings. Even during Below Normal or Disturbed periods there is a fairly good chance that some DX openings may be possible during the hours of darkness. Expect conditions normally to peak around midnight for openings towards Europe and Africa, after midnight and before sunrise for openings towards Central and South America, and just before sunrise for openings towards the South Pacific and the Far East.

160 Meters: With longer hours of darkness, DX conditions on this band should improve. While DX conditions may not be as good on 40 and 80 meters, look for openings to many areas of the world during the hours of darkness and the sunrise period. Because of power limitations in force on this band in many areas of the world, signals are likely to be weak and noisy, especially on phone. The best time for 160 meter DX is when a path is in complete darkness. Within this period conditions often peak just as the sun begins to rise at the easterly point on the path. The best forecaster for 160 meter DX (and 40 and 80 meters, as well) is a set of sunrise and sunset tables. For example, if the sun is expected to rise at 0700 UTC in western Europe, then this would be the best time to look for 160 meter openings between western Europe and the USA, plus or minus a half hour. Conditions on 80 meters can often also serve as an indicator for 160 meter openings. The band will often open at the same time 80 meters

NOAA/ERL Space Environmental Laboratory BBS

P)ropagation	C)oronal Data Report
S)olar Report	G)eoalert Message
R)egion Report	L)og of Magnetic Data
A)ctivity Summary	D)ata Listing Menu
O)utlook for 27 days	W)eekly Summary
Q)uick Look Data	M)UF Predictions
N)ews of Services	F)eedback to Sysop
H)elp Menu	B)ye – Leave System

Fig. 1– Menu of information available from NOAA/ERL Space Environmental Laboratory BBS at 303-497-5042. Similar data can be obtained from web sites at <http://www.sel.noaa.gov> and <http://holly.cc.uleth.ca/solar>.

seems to peak on a particular path. With these tips and some patience, it should be possible to work many DX areas of the world on 160 meters during the contest.

WARC Bands

While the WARC bands are not yet included in the World-Wide DX Contest, expect 12 meter openings during the same time periods as shown for 10 meters, but with this band opening a bit more frequently than 10 meters. Seventeen meters should behave much as shown for 15 meters. Openings on 30 meters should resemble 40 meter openings during local sunrise and sunset times, but the band is expected to open less frequently than 40 meters during the hours of darkness.

Contest Work Plans

The DX Propagation Charts on the following pages show the times when each amateur band from 10 through 160 meters is expected to open for DX from the United States to the major areas of the world. Instructions for the proper use of these charts are given elsewhere in this column.

This information contained in the charts can easily be reorganized into more convenient types of operational work plans, or schedules, which can serve as valuable propagation guides during the contest. Experience gained during previous contests has shown that such plans can be extremely useful in piling up contacts and points with a minimum of wasted time.

Table I is an example of one of several types of plans that can be devised. For each three-hour period throughout the day it shows the areas of the world to which 20 meter propagation conditions are expected to be optimum. Only those openings shown in the charts with a propagation index of (2) or higher were used in compiling this plan.

A western USA QTH has been chosen for this example, but similar plans can be devised for other locations, for other bands or for multiband operation, and for other time spans.

Radio Storms

The forecasts discussed in this column are based on *normal* propagation conditions expected with a sunspot level in the low teens. If actual conditions during the contest turn out to be *above normal*, DX openings on 10, 15, and 20 meters are likely to be somewhat better than shown in the charts. On the other hand, if Mother Nature should play a trick and produce a radio storm during the contest period, expect conditions to drop to Below Normal or Disturbed to many areas of the world, depending on the storm's severity. The storm's influence will generally extend outward from the polar regions, the more severe the storm becomes. Under storm conditions expect considerably fewer openings on 10, 15, and 20 meters, with weaker signals, increased fading, flutter fading, and higher noise levels. Paths passing through the polar regions and the upper latitudes are often more adversely affected than signals coming from mid and lower latitudes.

Conditions on 40, 80, and 160 meters are likely to become erratic as well. During certain types of storms conditions may actually improve at times for openings on all bands towards southern and tropical areas, and on 40, 80, and 160 meters during the hours of darkness.

If a radio storm should develop, concentrate on working trans-polar paths on 10, 15, and 20 meters during the daylight hours. Check the 40, 80, and 160 meter bands for possible openings to some areas of the world during the hours of darkness.

Do-It-Yourself Forecasting

If you have a modem-equipped personal computer, you can obtain a wealth of updated daily summaries of solar and geophysical activity and a daily HF propagation summary and forecast (updated every six hours) directly from the NOAA Space Environmental Services Center (SESC) bulletin board in Boulder, Colorado. Information about a variety of other useful SESC services and products is also posted on the board.

The SESC bulletin board has been upgraded and is in operation 24 hours a day. Modem-equipped PCs can access the system at 303-

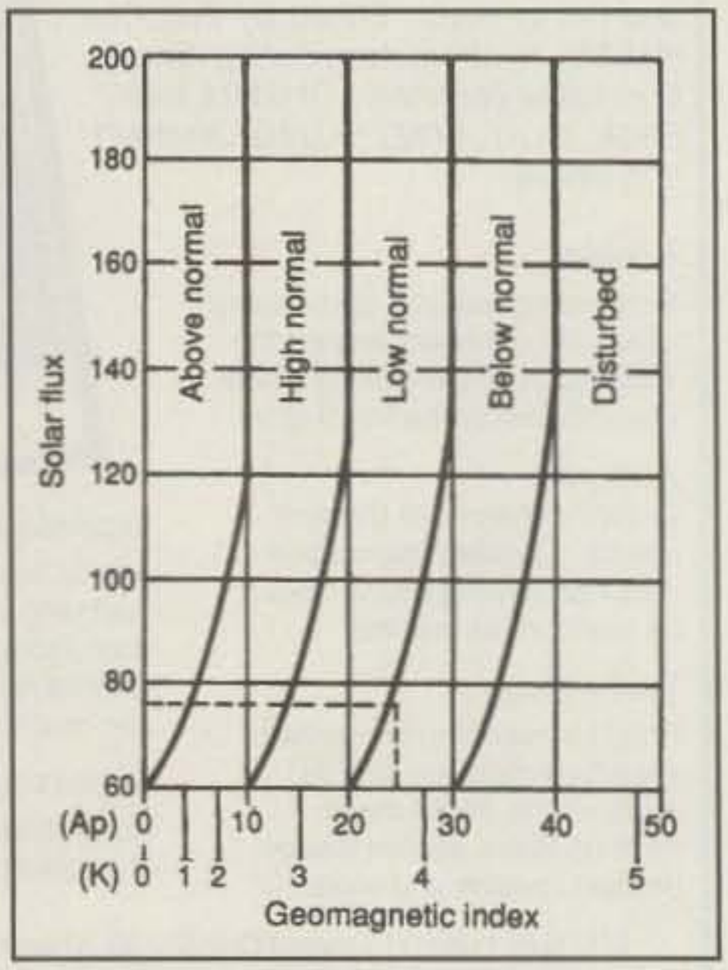

Fig. 2– Intersection of given values of solar flux and geomagnetic activity determine expected HF ionospheric propagation conditions. (Example: The solar flux is 75 and Ap is 25: therefore, expect Below Normal conditions.)

HOW TO USE THE DX PROPAGATION CHARTS

1. Use chart appropriate to your transmitter location. The Eastern USA Chart can be used in the 1, 2, 3, 4, 8, KP4, KG4, and KV4 areas in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9, and 0 areas; the Western USA Chart in the 6 and 7 areas; and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (15 through 80 meters) for a particular DX region, as shown in the left-hand column of the charts. An * indicates the best time to listen for 160 meter openings. An ** indicates best time to check for 10 meter openings.

3. The propagation index is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of days during the month on which the opening is expected to take place as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual dates on which an opening with a specific *propagation index* is likely to occur, and the signal quality that can be expected.

4. Times shown in the charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. Appropriate *standard* time is used, not GMT. To convert to GMT, add to the times shown in the appropriate chart 8 hours in PST Zone, 7 hours in MST Zone, 6 hours in CST Zone, and 5 hours in EST Zone. For example, 13 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 04 GMT, etc.

5. The charts are based upon a transmitted power of 250 watts CW, or 1 kw, PEP on sideband, into a dipole antenna a quarter-wavelength above ground on 160 and 80 meters, and a half-wavelength above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 dB gain above these reference levels, the *propagation index* will increase by one level; for each 10 dB loss, it will lower by one level.

6. Propagation data contained in the charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept of Commerce, Boulder, Colorado 80302.

497-5042. 300 through 9600 baud can be used. Protocol is the standard 8-bit data word with one stop bit and no parity. There is no charge for the data that can be obtained from the SESC bulletin board, but the telephone call is not toll-free. The program is very user friendly and menu driven. A wealth of propagation data is available, including propagation and solar reports, solar and geomagnetic data, and MUF predictions (see fig. 1).

Fig. 2 can be used with the updated values of geomagnetic activity (Ap or K figures) and the latest reading of solar flux available from SESC to determine real-time day-to-day conditions in terms of Disturbed, Below Normal, Low Normal, High Normal, or Above Normal. If you do not have a modem-equipped computer, the latest geomagnetic and solar flux levels can be obtained from National Bureau of Standards Radio Station WWV broadcasts at 18 minutes past each hour. These broadcasts are transmitted simultaneously on 2.5, 5, 10, 15, and 20 MHz. They contain the latest available geomagnetic Ap and K figures, as well as the 10.7 cm solar flux level and short-term forecast of expected conditions. The same information can be obtained at any time by calling 303-497-3235 (collect calls will not be accepted).

WWVH, located on the island of Kauai, Hawaii, broadcasts geophysical alerts at 45 minutes past each hour on frequencies of 2.5, 5, 10, and 15 MHz, with its signal audible throughout the Pacific Oceania area and farther into other parts of the world, depending upon radio propagation conditions. These augment the same alert broadcasts from WWV, which can

October 15–December 15, 1996
Time Zone: EST (24-Hour Time)
EASTERN USA TO:

Reception Area	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	09-11 (1)	08-09 (1) 09-11 (3) 11-12 (2) 12-13 (1)	06-07 (1) 07-08 (2) 08-09 (4) 09-11 (3) 11-13 (4) 13-14 (3) 14-15 (2) 15-17 (1)	16-17 (1) 17-18 (2) 18-20 (3) 20-02 (2) 02-03 (3) 03-04 (2) 04-05 (1) 19-21 (1)* 21-23 (2)* 23-02 (3)* 02-03 (2)* 03-04 (1)*
Northern Europe & CIS**	09-11 (1)	08-09 (1) 09-10 (2) 10-11 (1)	06-07 (1) 07-10 (3) 10-13 (2) 13-15 (1)	17-19 (1) 19-22 (2) 22-01 (1) 01-03 (2) 03-04 (1) 19-21 (1)* 21-01 (2)* 01-03 (1)*
Eastern Mediter-ranean & Middle East	08-10 (1)	08-09 (1) 09-11 (2) 11-12 (1)	06-10 (1) 10-12 (2) 12-15 (3) 15-16 (2) 16-18 (1)	18-20 (1) 20-00 (2) 00-02 (1) 20-22 (1)* 22-00 (2)* 00-01 (1)*
Western Africa	11-14 (1)	08-10 (1) 10-12 (2) 12-13 (3) 13-15 (4) 15-16 (2) 16-17 (1)	06-07 (1) 07-09 (2) 09-13 (1) 13-15 (2) 15-16 (3) 16-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	18-20 (1) 20-02 (2) 02-03 (1) 20-22 (1)* 22-01 (3)* 01-02 (1)*
Eastern & Central Africa	10-13 (1)	08-12 (1) 12-14 (2) 14-15 (1)	07-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	20-01 (1) 22-00 (1)*
Southern Africa	10-12 (1)	08-10 (1) 10-11 (2) 11-13 (3) 13-14 (2) 14-15 (1)	07-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-19 (1) 22-00 (1)	18-19 (1) 19-22 (2) 22-23 (1) 19-22 (1)*
Central & South Asia	*Nil*	09-11 (1) 17-19 (1)	07-08 (1) 08-10 (2) 10-12 (1) 19-21 (1)	05-07 (1) 18-21 (1) 05-07 (1)* 18-20 (1)*
Southeast Asia	*Nil*	17-19 (1)	07-08 (1) 08-10 (2) 10-13 (1) 18-21 (1)	05-07 (1) 18-20 (1) 05-07 (1)*
Far East	*Nil*	16-17 (1) 17-18 (2) 18-19 (1)	07-08 (1) 08-10 (2) 10-11 (1) 16-19 (1) 19-21 (2) 21-22 (1)	04-08 (1) 17-19 (1) 05-07 (1)* 17-18 (1)*
South Pacific & New Zealand	12-16 (1)	12-14 (1) 14-15 (2) 15-16 (3) 16-18 (2) 18-19 (1)	06-07 (1) 07-08 (2) 08-09 (3) 09-11 (2) 11-17 (1) 17-18 (2) 18-20 (3) 20-22 (2) 22-01 (1)	23-00 (1) 00-02 (2) 02-06 (3) 06-08 (2) 08-09 (1) 02-04 (1)* 04-06 (2)* 06-07 (1)*
Australasia	14-16 (1)	10-15 (1) 15-16 (2) 16-17 (3) 17-18 (2) 18-19 (1)	06-07 (1) 07-09 (2) 09-15 (1) 15-17 (2) 17-20 (1) 20-23 (2) 23-01 (1)	02-05 (1) 05-07 (2) 07-08 (1) 04-05 (1)* 05-07 (2)* 07-08 (1)*
Caribbean, Central America & Northern Countries of South America	08-09 (1) 09-13 (2) 13-15 (1)	07-08 (1) 08-09 (2) 09-14 (3) 14-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	00-06 (1) 06-07 (2) 07-09 (4) 09-11 (3) 11-15 (2) 15-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-22 (1) 22-00 (2)	18-19 (1) 19-21 (3) 21-03 (4) 03-05 (3) 05-06 (2) 06-07 (1) 19-21 (1)* 21-01 (2)* 01-04 (3)* 04-05 (2)* 05-06 (1)*

Time PST	Areas to which openings should be optimum
00-03	No openings expected with a propagation index of (2) or higher. Some (1) openings should be possible to South America, South Pacific, New Zealand, and Australasia, but this means condtions should be High Normal or better. This is a good time to catch up on some sleep.
03-06	About the same as the previous block.
06-09	Should open in just about every direction: Europe, North Africa, Eastern Mediterranean and Middle East,most of Asia and the Far East, Pacific Islands, New Zealand, Australasia, the Caribbean, Central America, and most of South America. This is the period in which to rack up points.
09-12	About the same as previous period, but signals getting weaker and openings falling off.
12-15	Western and southern Europe, most of Africa, most of the Caribbean, Central America, and the northern countries of South America.
15-18	All of the Caribbean, Central America and South America, most of Africa, the Pacific Islands and New Zealand, the Far East.
18-21	Another peak period, and a good time in which to increase scores. Most of Asia including the Far East; the Pacific Islands, New Zealand, and Australasia; Caribbean,Central and South America, but falling off; Antarctica.
21-00	South Pacific, New Zealand and Australasia, much of South America, Antarctica. A propagation index (1) opening to Europe and Africa.

Table I– Sample 20 meter operating schedule for a western USA QTH.

Peru, Bolivia, Paraguay, Brazil, Chile, Argentina, & Uruguay	10-15 (1)	07-08 (1) 08-10 (2) 10-13 (1) 13-14 (2) 14-16 (4) 16-17 (2) 17-18 (1)	06-07 (1) 07-09 (3) 09-10 (2) 10-14 (1) 14-16 (2) 16-18 (4) 18-19 (3) 19-20 (2) 20-22 (1) 22-00 (2) 00-02 (1)	20-22 (1) 22-04 (2) 04-06 (1) 21-23 (1)* 23-03 (2)* 03-04 (1)*
McMurdo Sound, Antarctica	*Nil*	08-10 (1) 13-15 (1) 15-16 (2) 16-17 (1)	16-18 (1) 18-19 (2) 19-21 (3) 21-23 (2) 23-00 (1) 06-08 (1)	03-06 (1)

Time Zones: CST & MST (24-Hour Time) CENTRAL USA TO:

Reception Area	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	08-10 (1)	08-09 (1) 09-12 (2) 12-13 (1)	06-07 (1) 07-09 (2) 09-11 (1) 11-12 (2) 12-14 (3) 14-16 (2) 16-17 (1)	17-18 (1) 18-20 (3) 20-22 (2) 22-00 (1) 00-02 (2) 02-03 (1) 18-20 (1)* 20-00 (2)* 00-02 (1)*
Northern Europe & CIS**	08-10 (1)	08-11 (1)	06-07 (1) 07-12 (2) 12-14 (1)	18-19 (1) 19-21 (2) 21-23 (1) 23-00 (2) 00-01 (1) 19-00 (1)*
Eastern Mediter-ranean & Middle East	08-10 (1)	09-11 (1)	06-10 (1) 10-12 (2) 12-14 (3) 14-15 (2) 15-17 (1)	18-20 (1) 20-23 (2) 23-00 (1) 20-23 (1)*
Western Africa	10-13 (1)	07-10 (1) 10-11 (2) 11-13 (3) 13-14 (2) 14-15 (1)	06-12 (1) 12-14 (2) 14-15 (3) 15-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	18-19 (1) 19-23 (2) 23-00 (1) 19-23 (1)*
Eastern & Central Africa	09-12 (1)	08-11 (1) 11-13 (2) 13-14 (1)	07-14 (1) 14-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	20-00 (1) 21-23 (1)*
Southern Africa	09-12 (1)	07-10 (1) 10-11 (2) 11-12 (3) 12-13 (2) 13-14 (1)	21-23 (1) 07-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	18-19 (1) 19-22 (2) 22-23 (1) 19-22 (1)*
Central & South Asia	*Nil*	17-19 (1)	07-08 (1) 08-10 (2) 10-12 (1) 17-18 (1) 18-20 (2) 20-21 (1)	05-08 (1) 18-20 (1) 05-07 (1)* 18-20 (1)*
Southeast Asia	*Nil*	14-16 (1) 16-18 (2) 18-19 (1)	07-08 (1) 08-10 (2) 10-14 (1) 18-19 (1) 19-21 (2) 21-22 (1)	04-07 (1) 17-19 (1) 05-07 (1)*
Far East	16-18 (1)	15-16 (1) 16-18 (2) 18-19 (1)	07-08 (1) 08-10 (3) 10-11 (2) 11-12 (1) 16-18 (1) 18-20 (2) 20-22 (1)	01-02 (1) 02-04 (2) 04-06 (1) 06-08 (2) 08-09 (1) 02-03 (1)* 03-05 (2)* 05-07 (1)*
South Pacific & New Zealand	12-17 (1)	10-14 (1) 14-16 (2) 16-18 (3) 18-19 (2) 19-20 (1)	06-07 (1) 07-09 (3) 09-12 (2) 12-17 (1) 17-18 (2) 18-20 (3) 20-22 (2) 22-00 (1)	23-01 (1) 01-02 (2) 02-07 (3) 07-08 (2) 08-09 (1) 00-02 (1)* 02-07 (2)* 07-08 (1)*
Australasia	14-17 (1)	10-13 (1) 13-15 (2) 15-17 (3)	05-07 (1) 07-08 (2) 08-10 (2)	02-04 (1) 04-08 (2) 08-09 (1)
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina, & Uruguay		17-18 (2) 18-19 (1)	10-11 (2) 11-15 (1) 15-17 (2) 17-19 (1) 19-20 (2) 20-22 (3) 22-00 (2) 00-02 (1)	03-04 (1)* 04-07 (2)* 07-08 (1)*
Caribbean, Central America & Northern Countries of South America	08-09 (1) 09-14 (2) 14-16 (1)	07-08 (1) 08-09 (2) 09-14 (3) 14-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	00-06 (1) 06-07 (2) 07-09 (4) 09-11 (3) 11-13 (2) 13-15 (3) 15-18 (4) 18-19 (3) 19-20 (2) 20-22 (1) 22-00 (2)	18-19 (1) 19-20 (2) 20-21 (3) 21-03 (4) 03-05 (3) 05-07 (2) 07-08 (1) 19-21 (1)* 21-00 (2)* 00-03 (3)* 03-05 (2)* 05-06 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina, & Uruguay	09-15 (1)	07-08 (1) 08-10 (2) 10-12 (1) 12-14 (2) 14-15 (3) 15-16 (4) 16-17 (2) 17-18 (1)	00-07 (1) 07-09 (2) 09-14 (1) 14-16 (2) 16-18 (4) 18-19 (3) 19-20 (2) 20-22 (1) 22-00 (2)	19-21 (1) 21-01 (2) 01-03 (1) 03-05 (2) 05-06 (1) 21-23 (1)* 23-01 (2)* 01-03 (1)*
McMurdo Sound, Antarctica	*Nil*	07-09 (1) 13-15 (1) 15-17 (2) 17-18 (1)	06-08 (1) 15-17 (1) 17-19 (2) 19-22 (3) 22-00 (2) 00-01 (1)	03-06 (1)

Time Zone: PST (24-Hour Time) WESTERN USA TO:

Reception Area	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Western	08-10 (1)	07-08 (1)	06-07 (1)	18-20 (1)
& Central Europe & North Africa		08-10 (2) 10-12 (1)	07-09 (2) 09-10 (1) 10-14 (2) 14-16 (1) 23-01 (1)	20-22 (2) 22-00 (1) 19-23 (1)*
Northern Europe & CIS**	*Nil*	07-10 (1)	06-07 (1) 07-11 (2) 11-13 (1) 23-01 (1)	21-00 (1) 21-23 (1)*
Eastern Mediter-ranean & Middle East	*Nil*	07-10 (1)	06-07 (1) 07-09 (2) 09-11 (1) 11-13 (2) 13-15 (1) 21-23 (1)	18-22 (1) 06-08 (1)
Western Africa	09-11 (1)	08-10 (1) 10-11 (2) 11-12 (3) 12-13 (2) 13-14 (1)	07-10 (1) 10-14 (2) 14-16 (3) 16-17 (2) 17-18 (1) 22-00 (1)	18-23 (1) 19-22 (1)*
Eastern & Central Africa	*Nil*	09-12 (1)	06-09 (1) 11-13 (1) 13-16 (2) 16-18 (1) 21-23 (1)	18-21 (1) 06-08 (1)
Southern Africa	08-12 (1)	08-10 (1) 10-13 (2) 13-14 (1)	07-09 (1) 11-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-19 (1) 23-01 (1)	18-19 (1) 19-20 (2) 20-21 (1) 06-08 (1) 18-20 (1)*
Central & South Asia	*Nil*	17-19 (1)	07-08 (1) 08-09 (2) 09-11 (1) 16-17 (1) 17-18 (2) 18-19 (1)	04-06 (1) 06-08 (2) 08-09 (1) 05-07 (1)*
Southeast Asia	15-17 (1)	14-15 (1) 15-17 (2) 17-18 (1)	07-08 (1) 08-10 (2) 10-12 (1) 17-19 (1) 19-20 (2) 20-22 (1)	02-03 (1) 03-06 (2) 06-08 (1) 03-07 (1)*

Far East	14-16 (1)	13-14 (1) 14-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	07-08 (1) 08-10 (3) 10-12 (2) 12-16 (1) 16-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	22-00 (1) 00-02 (2) 02-07 (3) 07-08 (2) 08-09 (1) 23-01 (1)* 01-05 (2)* 05-07 (1)*
South Pacific & New Zealand	12-14 (1) 14-16 (2) 16-17 (1)	09-12 (1) 12-15 (2) 15-17 (4) 17-18 (2) 18-19 (1)	04-07 (1) 07-09 (3) 09-12 (2) 12-16 (1) 16-17 (2) 17-18 (3) 18-20 (4) 20-22 (2) 22-02 (1) 02-04 (2)	21-22 (1) 22-05 (3) 05-08 (2) 08-09 (1) 22-00 (1)* 00-06 (2)* 06-07 (1)*
Australasia	15-17 (1)	11-12 (1) 12-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	12-17 (1) 17-19 (2) 19-21 (3) 21-22 (2) 22-03 (1) 03-05 (2) 05-07 (1) 07-10 (3) 10-12 (2)	02-03 (1) 03-04 (2) 04-07 (3) 07-08 (2) 08-09 (1) 03-04 (1)* 04-07 (2)* 07-08 (1)*
Caribbean, Central America & Northern Countries of South America	08-10 (1) 10-14 (2) 14-15 (1)	07-08 (1) 08-11 (2) 11-13 (3) 13-15 (4) 15-16 (2) 16-17 (1)	00-05 (1) 05-06 (2) 06-08 (3) 08-09 (4) 09-10 (3) 10-13 (2) 13-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-22 (1) 22-00 (2)	18-19 (1) 19-20 (2) 20-03 (3) 03-04 (2) 04-06 (1) 19-22 (1)* 22-02 (2)* 02-05 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina, & Uruguay	09-14 (1)	07-08 (1) 08-09 (2) 09-13 (1) 13-14 (2) 14-15 (4) 15-16 (3) 16-17 (1)	01-06 (1) 06-09 (2) 09-13 (1) 13-15 (2) 15-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-22 (1) 22-01 (2)	19-21 (1) 21-03 (2) 03-05 (1) 20-23 (1)* 23-01 (2)* 01-02 (1)*
McMurdo Sound, Antarctica	*Nil*	08-10 (1) 13-15 (1) 15-16 (2) 16-18 (1)	07-09 (1) 17-19 (1) 19-20 (2) 20-22 (3) 22-00 (2) 00-02 (1)	23-02 (1) 02-05 (2) 05-06 (1) 02-05 (1)*

* 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.
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.
** Former European USSR.

be heard throughout the Western Hemisphere and other parts of the world as well.

Both the WWV and WWVH solar alert broadcasts are updated every three hours beginning at 0000 UTC, and they contain the latest information concerning geomagnetic and solar conditions, as well as radio-storm warning data. Alert data is also available at any time by calling the "on-duty forecaster" at SESC at 303-497-3171.

There are two worldwide web sites which can provide a wealth of real-time and statistical HF propagation data. This data can be invaluable during the WW Contest periods.

The Solar Terrestrial Dispatch site at <http://holly.cc.uleth.ca/solar> provides a great deal of solar, geomagnetic, and ionospheric data which is well menued. The updated world propagation maps are of special interest.

The NOAA site at <http://www.sel.noaa.gov> provides similar solar, geophysical, and ionospheric data which is also well menued.

You may also tune in to y website for updated hyperlinks that could be useful during the WW DX Contest. You can find me at <http://www.clark.net/pub/gjacobs/gja.html>.

VHF Ionospheric Openings

While the CQ WW DX Contest does not include the VHF bands, some interesting ionospheric activity is likely to occur on these bands during October.

Some fairly good meteor-scatter-type openings should be possible on the VHF bands around October 20th, when the two-day *Orionids* meteor shower is expected to begin. This should be a major shower, with a maximum hourly rate of at least 25 meteors.

Auroral activity usually increases during October, and some corresponding auroral-scatter-type and sporadic-*E* VHF openings can be expected during periods of such activity. The best days to check are those expected to be either Below Normal or Disturbed on the HF bands. See the Last-Minute Forecast at the beginning of this column for the days in October that are forecast to be in these categories.

Computer Programs

There are several good computer programs available for supplementing band-opening predictions contained in the *CQ* DX Propagation Charts appearing on the following pages.

The following is a listing of the more popular programs. All of them contain band opening data. Most of them also contain grayline data, sunset/sunrise times, distance, great-circle bearings, and other useful information. All of the listed programs are well prepared,menu-driven, relatively easy to use, and well documented. This listing does not necessarily indicate an endorsement by this editor or *CQ* magazine. Additional information can be obtained directly from the programs' producers.

Super DX Edge™—Recently upgraded, it can now be used for automatic MUF displays, real-time grayline and sunrise and sunset data, and automatic antenna directions. A computerized version in color is available for IBM DOS compatibles. If computers intimidate you, the old, reliable plastic slide-rule version is still available. For a free flyer, contact Xantek, P.O. Box 834, Madison Square Station, New York, NY 10159 (212-566-8240).

MINIPROP Plus™—For many years this has been a very popular HF propagation program for IBM compatibles (DOS). Predicts received signal levels and all other propagation parameters for any location. Maps display great-circle path and grayline in full color. Also contains comprehensive world atlas with coordinates, and lists beam headings from given QTH. For more details contact Sheldon C. Shallon, W6EL, 11058 Queensland Street, Los Angeles, CA 90034-3029.

IONSOUND PRO™—Developed by Jake Handwerker, W1FM, this is a sophisticated ionospheric prediction program for IBM PCs and compatibles (DOS). It is well documented, and user friendly menu driven. It produces tabular or graphic times of band openings, as well as great-circle distance and bearing data for any two locations. The program permits comparing data for up to twelve smoothed sunspot numbers or solar flux levels. Updated information can be obtained for IONSOUND.PRO and

several other propagation programs from Skywave Technologies, 17 Pine Knoll Road, Lexington, MA 02173.

CAPMAN™—Stands for Computer Assisted Prediction Manager. The program—developed by Don Lucas, WØOMI, and Jim Tabor, KU5S—utilizes the sophisticated model of the ionosphere used in the IONCAP program, one of the world's standards used by professional engineers and scientists for propagation predictions and analyses. CAPMAN is well documented, user friendly menu driven, and gives accurate results. The choices of output include maximum usable frequency (MUF), frequency of optimum transmission (FOT), signal-to-noise (S/N) ratio, circuit reliability, service probability, angles of takeoff and arrival, field strength, modes of propagation, great-circle distance and bearing, and more. The 32-bit program requires an 80386 or higher microprocessor, and a math co-processor is recommended to speed up results. The program also contains a large assortment of antenna data that can be used in the calculations. Additional information about the latest version of CAPMAN is available from Don Lucas, 552 Wewoka Drive, Boulder, CO 80301 (303-494-4647).

PROPMAN™—This program was released by Rockwell/Collins as the *Collins HF Propagation Software*. It claims to be an easy-to-use frequency propagation and management tool, supported by the Collins heritage of quality HF development. It utilizes the IONCAP propagation program, and offers customization of station parameters, displays current best frequency and propagating frequency, as well as 24 hour plots. Data can be updated with SESC or WWV geomagnetic and solar data. Requires 286 or higher, math coprocessor, DOS 3.2 or higher, and color EGA or VGA monitor and graphics card. Additional information can be obtained from Rockwell, 350 Collins Rd. NE, Cedar Rapids, IA 52498-0120 (800-321-2223).

HFx™—Developed by Pacific-Sierra Research as an interactive Windows program for meeting HF propagation requirements, the program is said to be based on 25 years of the best available ionospheric propagation and ionospheric moise data for determining global band openings and signal strength. The program also contains antenna patterns, a callsign atlas, and other data. Displays can be presented in vivid color. Complete information and pricing can be obtainec from Pacific-Sierra Research Corp., 2901 28th St., Santa Monica, CA 90405 (800-820-4PSR).

SKYCOM—This is skywave propagation prediction software for Windows 3.1/Windows 95. Tell SKYCOM your location, transmitter power, and antenna gain, and enter either the latest sunspot number or solar flux index and the program should instantly give prediction reports and the best time for band openings. You can also obtain a detailed report that lists MUFs, critical frequencies, signal-to-noise ratio, and other transmission parameters. The program also contains great-circle bearing data and an atlas database. Additional information can be obtained from EDCO, 325 Mill St. NE, Vienna, VA 22180 (703-938-8105).

The NEW Shortwave Propagation Handbook would also make an excellent companion during the 1996 CQ WW DX Contest. It contains a considerable amount of additional information concerning propagation, radio storms, do-it-yourself forecasting, and computer propagation programs. Copies can be obtained from CQ by calling toll-free 1-800-853-9797 (for $19.95 plus $4.00 s/h).

CW Contest Forecast

This month's DX Propagation Charts are valid for both the SSB and CW sections of the CQ WW DX Contest. Be sure to keep them handy for use during next month's CW section as well. Short-Skip Propagation Charts for use during October appeared in last month's column.

Experience from the past 45 contest years has shown that DX contests are excellent periods in which to test the accuracy of prediction and forecast methods used in this column. Contests generate a large amount of activity in every corner of the world and on all HF bands. Previous results and observations have helped considerably in improving the accuracy of this column. Comments concerning the 1996 contest and the accuracy of these forecasts and predictions would be apreciated, and should be sent directly to W3ASK at P.O. Box 1714, Silver Spring, MD 20915, or by e-mail to <gjacobs@clark.net>. Good luck in the contest!

73, George, W3ASK

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CERTIFICATE for proven contacts with all ten American districts. SASE to W6DDB, 45527 Third Street East, Lancaster, CA 93535-1802.

HALLICRAFTERS Service Manuals. Amateur and SWL Write for prices. Specify Model Numbers desired. Ardco Electronics, P.O. Box 95, Dept. C, Berwyn, IL 60402.

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

1997 CALLBOOKS: North American, $31.95; International $31.95. Both $59.95. **Callbook 1997 CD-ROM** $39.95. Available late November. 1996 Callbooks $21.95; CD-ROM (Summer) $33.95. POSTPAID. Check/m.o. to AA6EE— Callbook Distributor, 16832 Whirlwind/C10, Ramona, CA 92065 (619-789-3674).

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QSLS—ELEGANT, AFFORDABLE. Samples $1 (refundable with order). Elemental Designs, Dept. C6044, 1639 Fordham Way, Mountain View, CA 94040.

WANTED: HAM EQUIPMENT AND RELATED ITEMS. Donate your excess gear—new, old, in any condition—to the Radio Club of Junior High School 22, the Nation's only full time non-profit organization working to get Ham Radio into schools around the country as a teaching tool using our EDUCOM—Education Thru Communication—program. Send your radio to school. Your donated material will be picked up ANYWHERE or shipping arranged, and this means a tax deduction to the full extent of the law for you as we are an IRS 501(c)(3) charity in our 16th year of service. It is always easier to donate and usually more financially rewarding, BUT MOST IMPORTANT your gift will mean a whole new world of educational opportunity for children nationwide. Radios you can write off; kids you can't. Make 1996 the year to help a child and yourself. Write, phone, or FAX the WB2JKJ "22 Crew" today: The RC of JHS 22, P.O. Box 1052, New York, NY 10002. Twenty-four hours call 516-674-4072; fax 516-674-9600; or e-mail <wb2jkj@juno.com>. Join us on the WB2JKJ Classroom Net, 7.238 MHz, 1100–1230 UTC daily and 21.395 MHz from 1300 to 1900 UTC. Meet us this month at the Southwestern Division Convention in Arizona.

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Join the LAMBDA AMATEUR RADIO CLUB for gay, lesbian, bisexual and transgendered hams and their friends. Monthly newsletter, on-air meetings, DXpeditions and local chapters. For more info write to: LARC, P.O. Box 24810, Philadelphia, PA 19130-2405, or send e-mail to: Larc@net-quest.com

WANTED: Heathkit "Williamson-type" audio amplifier. Bill, W6SAI, 48 Campbell Lane, Menlo Park, CA 94025.

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ASTRON Power Supply, brand new w/warranty, RS20M $99, RS35M $145, RS50M $209. Call for other models, 818-286-0118.

Advertiser's Index

(continued on page 123)

FOREIGN AIRMAIL POSTAGE for successful QSLing! Many countries, monthly bargains, plus **EUROPEAN AIRMAIL ENVELOPES!** Bill Plum, 12 Glenn Road, Flemington, NJ 08822-3322 (908-788-1020 weekdays, FAX 908-782-2612).

SX88 Hallicrafters receiver wanted. Jim, W6OU, 714-528-5652.

DX QSL's. The **GO LIST QSL Manager List** is a monthly publication containing the most current QSL routes. Available on disk, paper, and by BBS. Sample paper $3, disk $12. Subscriptions available. GO LIST, P.O. Box 2306, Paducah, KY 42002-2306. AE4AP/ KB4RGW 502-898-8863, or fax 502-898-8865.

AMERICAN HAM GEAR manufactured between 1930 & 1980 needed to illustrate *CQ* book and calendar projects. Photography can be done at your location. Contact Joe Veras, N4QB, P.O. Box 1041, Birmingham, AL 35201. Tel: 205-328-2661 days, 205-967-0639 evenings and weekends.

THE 59(9) DX REPORT: Weekly DX and Contest bulletin. SASE for sample. P.O. Box 73, Spring Brook, NY 14140.

DIGITAL JOURNAL: Published 12x per year, features everything for the digital communicator—Rigs, Operations, Computers, Software, News, and Reviews. $25 U.S., $42 DX-Air. Mail orders (with payment—U.S. Funds ONLY) to IDRA, Dept. C, P.O. Box 2550, Goldenrod, FL 32733-2550. Or fax to 407-671-0194. VISA/MC accepted.

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W7FG Vintage Manuals and Telephone filters! Most manuals in stock. SASE for Catalog. Telephone RFI Filters $12.95. VISA/MASTERCARD accepted. 3300 Wayside Drive, Bartlesville, OK 74006 (telephone 918-333-3754 or 800-807-6146; or http://eigen.net/w7fg).

FREE HAM RADIO GOSPEL TRACTS: Christian youth leaders needed for out-reach areas. Membership is free. Send #10 SASE with call letters for details. Ray Bohmer, W1REZ, P.O. Box 8, Harmony, ME 04942.

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ISLAND HUNTERS read the Island News. Sample #10 SASE to P.O. Box 701, Fernandina Beach, FL 32035-0701.

TELEGRAPH KEY COLLECTOR/HISTORIAN Buys/Trades. K2DCY, 11 Squirehill, N. Caldwell, NJ 07006.

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TRANSCEIVERS: Kenwood TS-530 SP, $500; TS-430S, $600; Yaesu FT101ZD, $450. K1BW, 413-538-7861.

FREE DISK CATALOG! Ham Radio, IBM Shareware and CD-ROMs. MOM 'N' POP'S SOFTWARE, PO Box 15003-HE, Springhill, FL 34609-0111 (1-352-688-9108).

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FOR SALE: Money back guarantee on classic Xmtrs, Rcvrs, Trancvrs, Accessories. SASE list. Ed Clink, WA9PFB, 1285 New Salem Church Rd., New Berlin, IL 62670.

HEATH, DRAKE, MORE. Radios, manuals, parts. Used tubes $7.00. List $1.00, SASE. Joseph Bedlovies, POB 139, Stratford, CT 06497.

SALE: Voice mailbox (DCI) for PC, incl. PC-card and software, $130. E-mail: lt@wineasy.se Fax +46 8 4110943. SMØTGU/Lars.

FOR SALE: Alinco dual-band HT and mobile rig. More info send SASE to P.O. Box 518, Whitehouse, FL 32220, or fax 1-904-778-4638.

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KEYS: Military-flameproof, thighs – J-45 and Vietnam, etc. 18 page illustrated revised list my surplus telegraph related. $3.00 plus 2 stamps ($5.00 refund $20.00+). CQ Jacobs, 5 Yorktown Place, Fort Salonga, NY 11768 (516-261-1576).

WANTED: ARRL Advanced class video good condition, low price. Bill, N1SGI, 13 Kennedy Road, Foster, RI 02825 (401-397-5917).

WANTED: Your extra rig, CB, test equipment, working or not. Your donated equipment will be appreciated to assist in training a student. I will pay shipping. Phone me collect, Eric, 604-868-0131.

RADIO SHACK 45 watt 2M FM transceiver, $250.00; HTX-202 2M FM handheld, $150.00; PRO-25 scanner, $150.00. MFJ Tuner 941E, $75.00. KDK 2M transceiver, $90.00. Kenwood 850AT/S, $1700.00; HD P/S, $225.00; MC60A mic, $100.00; speaker SP 31, $75.00. Yaesu G800 rotator, $250.00. Moseley 10-15-20 senior beam, $175.00. 15 foot tower $50.00. Turner hand mic SR-90D-5 HI-2, $25.00. Heathkit monitor scope model HO-10, $40.00. All equipment new or as good as new, and in excellent working condition. Bill 516-796-4858 (evenings, please).

SELL: Bencher RJ2 with cord and plug, $65.00 shipped. W6PRI@Juno.com or Callbook address.

JOIN THE RAINBOW Amateur Radio Association, the gay/lesbian ham club with active HF nets. E-mail RARA@EN.COM or mail to P.O. Box 191, Chesterland, OH 44026-0191.

DOC'S QSL CARDS. Free custom design—SASE for brochure & samples. 7914 Gleason Rd., Suite 1147, Knoxville, TN 37919 (423-693-8810). E-mail docs@concentric.net

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Advertiser's Index *(cont'd)*

Only the best companies advertise in CQ. Learn how easy it is to enjoy the benefits the great CQ audience has to offer. Call Arnie Sposato, N2IQO, at (516) 681-2922 or FAX (516) 681-2926.

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."

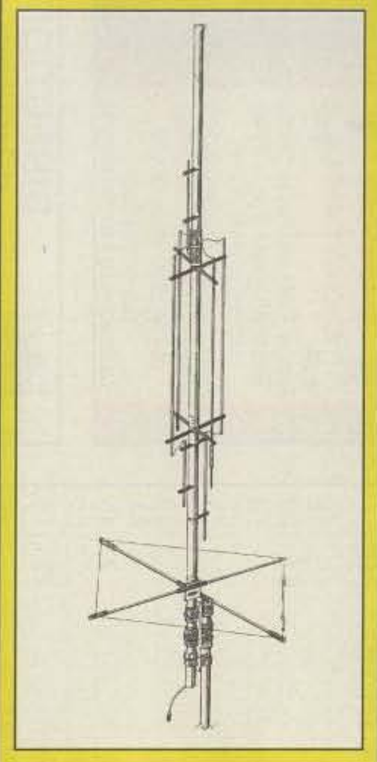
73–"This is a real DX antenna, much quieter than other verticals."

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."

New Release: 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.

MODEL	BANDS OF OPERATION											HT	WT	MOUNT	COUNTER-POISE	COST
	2m	6m	10m	12m	15m	17m	20m	30m	40m	80m	160m					
Challenger DX	■	■	■	■	■		■		■	■		31.5'	21 lbs	Drop In Ground Mount	3 Wires @ 25'	$259
Eagle DX			■	■	■	■	■		■			21.5'	19 lbs	1-1/4" pipe	80" Rigid	$269
Titan DX (Just Released)			■	■	■	■	■	■	■	■		25'	25 lbs	1-1/4" pipe	80" Rigid	$289
Voyager DX							■		■	■	■	45'	39 lbs	Hinged Base	3 Wires @ 57'	$399

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"Yaesu did it again!"

Continuing Yaesu's leading edge engineering philosophy, the FT-8000R Compact Dual Band Mobile introduces industry-first features and no-nonsense operation for today's demanding Amateur. No puzzling key combinations on the FT-8000R; eight clearly marked keys and Yaesu's exclusive Omni-Glow™ display make operation a snap. Want to change bands? Just push the VHF or UHF Volume control!

The FT-8000R is the first mobile to provide superwide receiver coverage – from 110 to 550 MHz and 750 to 1300 MHz*, receiving public safety, marine, and weather channels. Using Yaesu's exclusive Enhanced Smart Search™, the FT-8000R automatically seeks out and loads active simplex channels into up to 50 ESS memory channels in just seconds – ideal when traveling.

Built-to-last, the FT-8000R brings together the most-requested dual band features and a MIL-STD 810 rating for enduring performance. Dual receive (V+V, U+U or V+U), Crossband Repeat (bidirectional or one-way), up to 50 Watts of VHF power output (35 Watts on UHF) with High/Medium/Low selection on each band, and "plug and play" 1200 or 9600 bps packet are just a few.

Clearly a standout, the FT-8000R boasts 110 memory channels (55 per band including one-touch "Home" channels) that store repeater shift, CTCSS encode tone, and packet baud rate. Other essential features include a backlit microphone (another Yaesu first), Time-Out Timer, and an all-new S-Meter Squelch that opens based on the S-meter reading. And, for a programming alternative, the optional ADMS-2C Personal Computer Programming Kit simplifies operation even more.

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  70cm 35/10/5 Watt
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- S-Meter Squelch
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- Crossband Repeat (bidirectional or one-way)
- PC Programmable w/optional ADMS-2C
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- Receiver Muting
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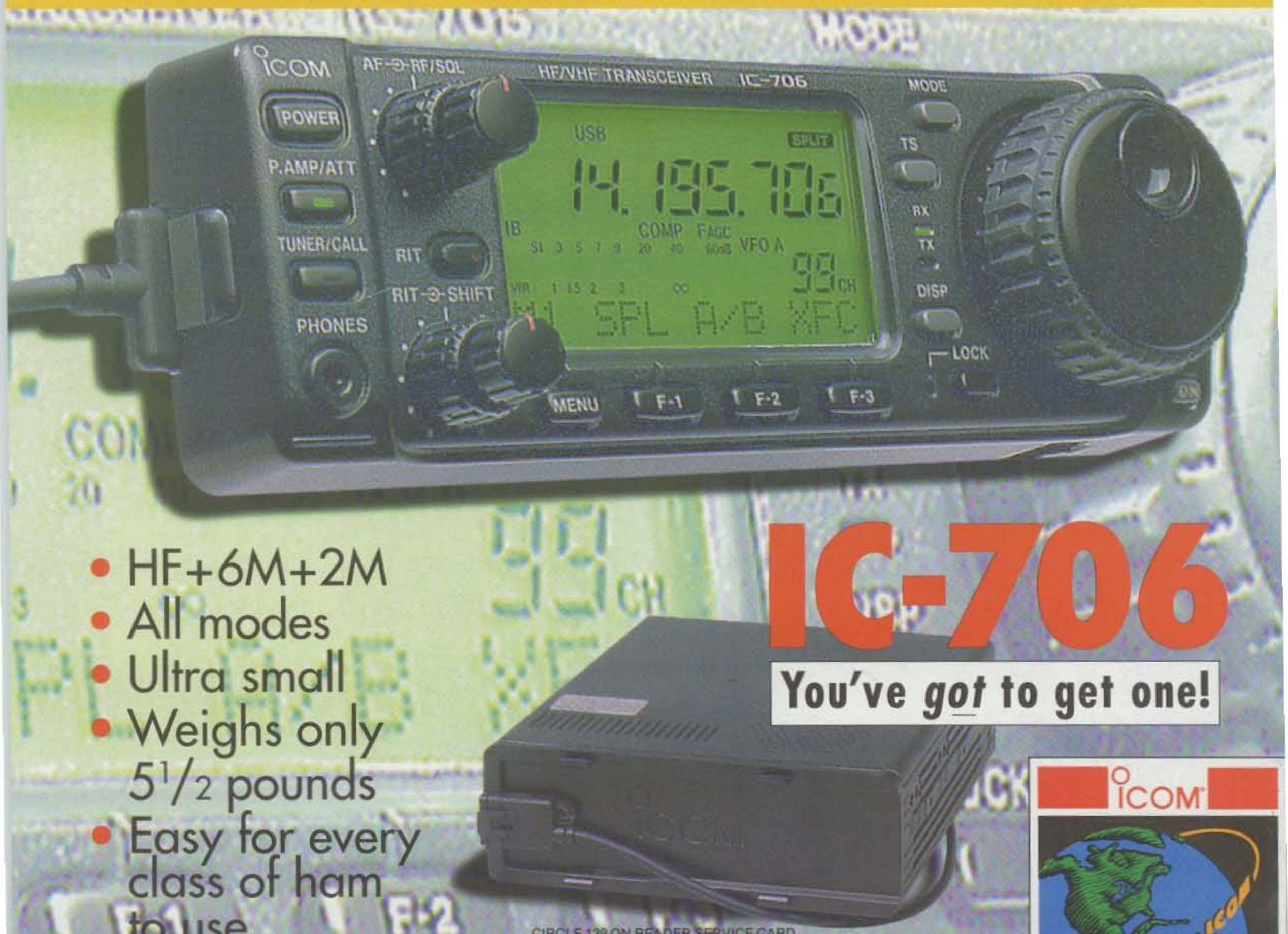

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