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Amateur Radio

CQ

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OH6RM (left) and OH4EA at PJ9.

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THE RADIO AMATEUR'S JOURNAL

KENWOOD

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Introducing the TM-742A and TM-942A—high-performance mobile transceivers with innovative 3-way convenience

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Mobile Transceivers

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The TM-942A can receive three bands simultaneously, with all three frequencies displayed on the LCD panel. The TM-742A can be upgraded to tri-band status with one of four optional band units (28MHz, 50MHz, 220MHz, and 1200MHz).

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TS-50S
HF TRANSCEIVER

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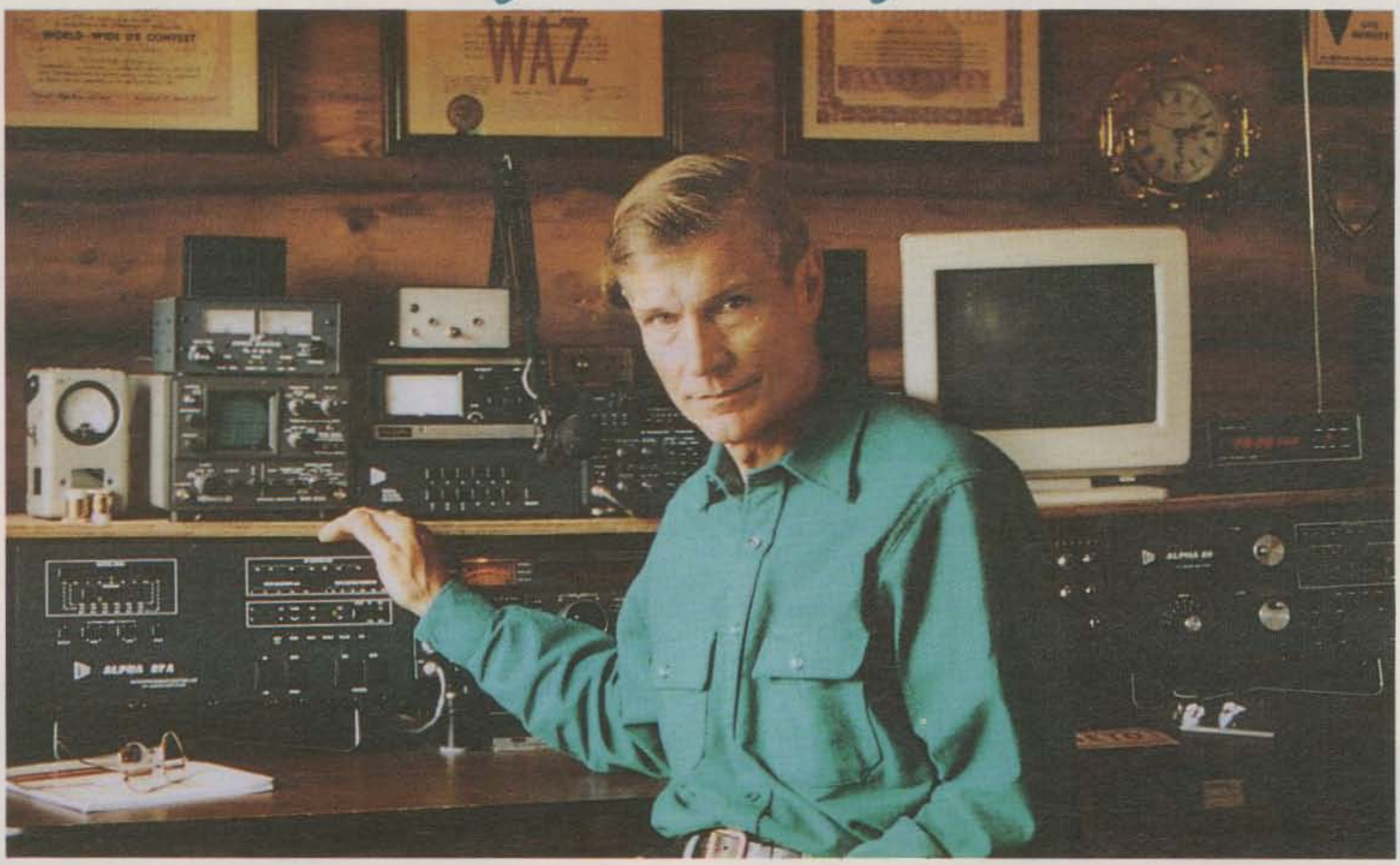

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A publication of

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Hicksville, NY 11801-2953 USA.

Offices: 76 North Broadway, Hicksville, NY 11801. Telephone: (516) 681-2922. FAX (516) 681-2926. CQ (ISSN 007-893X) is published monthly by CQ Communications Inc. Second Class postage paid at Hicksville, NY and additional offices. Subscription prices (all in U.S. dollars): Domestic—one year $22.95, two years $43.00, three years $63.00; Canada/Mexico—one year $25.00, two years $47.00, three years $69.00; Foreign—one year $27.00, two years $51.00, three years $75.00; Foreign Air Mail—one year $80.00, two years $157.00, three years $234.00.
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 Allow six weeks for change of address. Printed in the United States of America.
Postmaster: Please send change of address to CQ Magazine, 76 North Broadway, Hicksville, NY 11801.

The Radio Amateur's Journal

ON THE COVER: You'd have to have been residing in a cave in Tibet for the past several CQ WW DX Contests to be unaware of the Super Station assembled by OH6RM and crew in Curacao. Some have questioned the heavily-funded approach to contesting, but few are un-awed by the magnitude of the project. Here we see Touko Kapanen, OH6RM/PJ9M at the 10 meter station, with Vesa, OH4EA/PJ9V in the background on 160. (Photo by Larry Mulvehill, WB2ZPI).

OCTOBER 1993 **VOL. 49, NO. 10**

FEATURES

DEPARTMENTS

ZERO BIAS

EDITORIAL

Most of us, whether we like to admit it or not, are very competitive. We compete for DX, awards, for position in contest results, and, yes, sometimes for just a bit of spectrum space. We all want our chance and our moment—right now. This month all of amateur radio's titans, junior titans, and titan "wanna-bes" will be vying for everything imaginable the weekend of the 29th. Over 1,000,000 amateurs worldwide will be taking part in amateur radio's biggest operating extravaganza, the CQ World-Wide DX Contest. During this time period if you can't work it, it just isn't there. Every single station taking part in this event is a desired contact. Every signal, no matter how faint or weak, becomes a target of opportunity to increase our totals. We listen for everything and want everything.

Most people who do take part in the contest do so for individual reasons, whether to help someone out with a contact, work some DX, or pick up a few new islands, prefixes, counties, or whatever they need for some ongoing awards program. Some inadvertently form a sub-competition by being at loggerheads with the contest, and simply (and vehemently) compete over spectrum space. The overwhelming majority of operators taking part in the contest actually do not submit a log, but simply do it for the great rush of excitement it generates and to see what they can do. It's fun at any level you choose to participate. It's also a great way to learn what it takes in the way of skill, dedication,and expertise to win or place significantly in one of these events. You will also notice that even though a contest can be a cutthroat affair, amateurs will stop to instruct a newcomer on technique or what is required for logging purposes.

Many clubs, teams, or other groups will travel to places where they can get an edge with multplier credit or use an exotic call or prefix for bait. Don't expect mundane chit-chat on what it's like from these folks. You can (and will) read about all of the details in subsequent DXpedition articles, including all of the pertinent scatological habits of bats, penguins, and other inhabiting fauna. I generally start to listen about an hour or so before the contest starts. The big guns are already jockeying for certain frequencies, and some of the other participants are testing and checking gear. I find it helpful to locate where some of the players will be and to note any QSL info given.

It doesn't take too much exposure to get caught up in some of amateur radio's more active pursuits and to make hunters of us all. Although we pride ourselves on communicating with others, it's really radio of the mind, whereby we delight in racking up totals of arbitrary classifications, countries, states, islands, counties, prefixes, and many other categories. We continually compete, sometimes if only with ourselves, to try to better what we have previously done. Most things we choose to compete in have no time limit other that what we select for ourselves. A contest, though, especially the CQ World-Wide DX, has the limits clearly drawn with respect to how, when, and for how long. I know amateur radio is supposed to be a hobby that we enjoy and have fun with, and that it ideally reduces the stress and strain of everyday life. I also know that all the stress and strain the World-Wide produces is thoroughly enjoyed by over 1,000,000 amateurs throughout the world.

"And they're off. . . ." In this view, Bill Raymond, WRØF, takes the lead.

Fred Doob, WA2KKA, of Solder-It crosses the finish line easily in second place.

Dan "Rambo" Mitchell, N9APA, checks his watch as he sets the course record.

Here's Ronie Rosenbaum of W&W Associates crossing the finish line.

Chris Lougee, N7TJM, crosses the finish line alongside Dave Rosenbaum.

Bill Raymond, WRØF, finishes a few steps ahead of Jim Newcomb, N7MBA.

On Your Toes

Speaking of things competitive, at the ARRL National in Huntsville this past August, *CQ* sponsored the first annual modified 4 mile run. Arnie had T-shirts made up for the event (mine said "Coach"). About a dozen people showed up in front of the hotel for the 6:30 AM start.The race was designed mainly for exhibitors to keep them in shape after consuming hamfest food. We did have a few non-exhibitors running, too. The run started promptly at 6:30 and traversed the hilly part of Huntsville and some of the historic landmarks. Besides *CQ*, the companies represented were ICOM, The Ham Station, Radio Center USA, R&L Electronics, Solder-It, and W&W Associates.

The winner of the run was Dan Mitchell of The Ham Station doing about a 7.8 minute mile.

At the Winners Circle Gary Hext, WB4FLB, is all smiles as he hears he won the "Over 50, Under 5'5"" category. And CQ's Arnie Sposato, N2IQO, thunders in for a strong finish.

In the women's category Ronie Rosenbaum of W&W Associates won handily. In the non-industry group Gary Hext, WB4FLB, took best of class in the "Over 50, Under 5'5"" category. It should be even bigger next year. See you there.

73, Alan, K2EEK

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- Processors used: Zilog 64180, Motorola 68HC05C4, Motorola 68HC05B4
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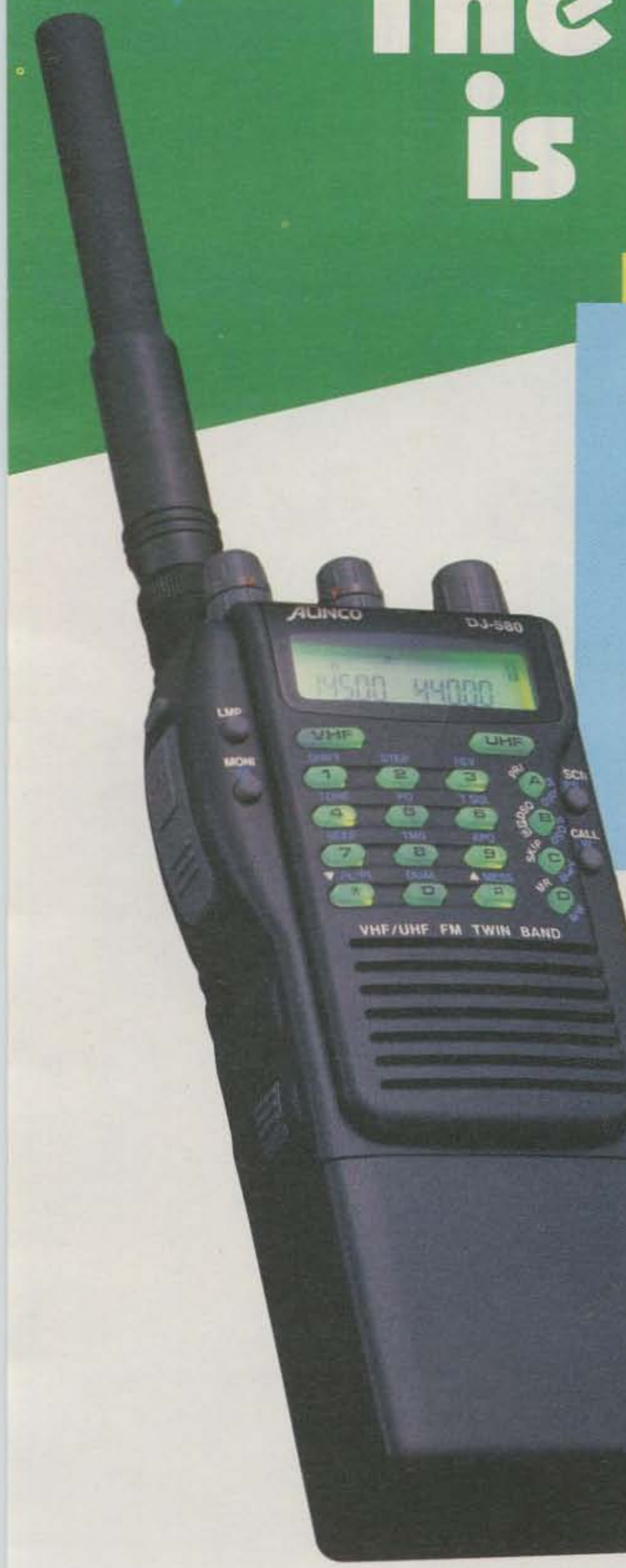

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Both of these models feature 40 memory channels, extended receive range (including AM aircraft), CTCSS encode, Superior audio quality, "battery save" function, and a backlit keypad.

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ANNOUNCEMENTS

•The following Special Events will take place in October:

N2PSL, from founding of North Country ARC, St. Lawrence County, New York; Oct. 15–16 (no times given); lower 25 kHz of general portion of 80, 40, 20 meters and 10 meter Novice subband. For QSL send QSL and SASE to NCARC, c/o Pete Baltradis, N2IJW, Rt. 1 Box 206, Norwod, NY 13668.

AA2KS, from Edison, New Jersey celebration of Edison's discovery of the light bulb; Piscataway ARC; 1300–2200Z Oct. 23; General portion of 40, 20, 15 meters and Novice 10 meters. For QSL send QSL and SASE to Piscataway ARC, P.O. Box 1233, Piscataway, NJ 08854.

WB2JKJ, from 13th anniversary of Junior High School 22 ARC and EDUCOM, New York, New York; on 7.238 MHz from 1200–1330Z and then on 21.395 until 2000Z, Oct. 20–22. For QSL and surprise package, write to RC of JHS 22, P.O. Box 1052, New York, NY 10002 (or FAX 516-674-9600).

KB1AW/3, from First Annual IOTA Day, Kent Island, Maryland; Kent Island ARC; 1600–2400Z Oct. 23; 14260 (±5), 7260 (±10) SSB. For QSL send QSL to KB1AW via 93 *Callbook*.

W3XX, from *USS Requin SS481* submarine; Breezeshooters ARC; 1400–2100Z Oct. 2–3; phone 28.450, 21.350, 14.250, 7.250, 146.52; CW 28.150, 21.050, 14.050, 7.050. For QSL and certificate send 8.5 × 11 SASE to Ron Berry, WB3LHD, 326 Sunset Drive, Bethel Park, PA 15102.

W4ZCB, from Halloween celebration, Devil's Courthouse, Transylvania County, North Carolina; Transylvania County ARC; 200Z Oct. 31 to 0200Z Nov. 1; 7.234, 14.295, 21.365, 28.335 SSB and 146.52 FM simplex. For certificate send 9 × 12 SASE to Harold Johnson, W4ZCB, 115 Kindy Forest Drive, Hendersonville, NC 28739.

4-land, from bicentennial of founding of University of North Carolina at Chapel Hill; stations will sign /UNC; 2300–0300Z Oct. 6–8 General portions of 80, 40, 20, 15 meters SSB; 1200–0000Z Oct. 9–10 SSB lower 50 kHz Novice portion 10 meters (propagation allowing) plus above band segments. For 8.5 × 11 certificate send SASE to David J. Snyder, N2MLU, 600 S. Churton St., Apt. 66, Hillsborough, NC 27278.

K8SCH/4, from Chincoteague Island, IOTA NA 83, Accomack County, Virginia, during CQ WW DX SSB Contest; OH-KY-IN ARS; Oct. 30–31; all bands. QSL K8SCH/4 via the *Callbook*. (Also, K8SCH/4 will be on from Assateague Island, NA 139, Accomack County, Oct. 28. QSL via *Callbook*.)

K4CO, from Salt Festival, Big Bone Lick State Park, Union, Kentucky; Northern Kentucky ARC; 1400– 2200Z Oct. 15–17; 40, 20, 10 meters, 146.375+ repeater. For certificate send contact number and 4 × 9 SASE to NKARC, P.O. Box 1062, Covington, KY 41012-1062.

W5MS, from Abbeyfest III, Corpus Christi Abbey, Live Oak County, Texas; 1900Z Oct. 23 to 2359Z Oct. 24; lower 25 kHz of General phone and CW subbands 40, 20, 15, 10 meters, and 145.05 packet. For QSL certificate send large SASE with QSL to Br. Dominic Mazoch, OSB, N5TCB, Corpus Christi Abbey, HCR 2 Box 6300, Sandia, TX 78383.

K5PXP, from 1993 Globalfest, Russellville, Arkansas; 1400–2400Z Oct. 8; 14.290 ±QRM. For certificate send QSL with QSO number and SASE to ARVARF Inc., P.O. Box 582, Russellville, AR 72811.

N5TBQ, from National Quality Month, Alcatel Network Systems, Inc., Richardson, Texas; Alcatel ARA; 1500–2100Z Oct. 2; General phone 40, 20, 15, 10 meters. For QSL send contact report to Alcatel Network Systems, Inc., AARA, M/S 401-212, 1225 North Alma Rd., Richardson, TX 75081-2206.

5-land, from Menasco Aerosystems' 37th year, Fort Worth, Texas; Oct. 16–23 (no times given); 28.425 and 21.060 or 21.125 ±QRM. For 8.5 × 11 certificate, SASE to control op.

WA5IPS, from International Space Hall of Fame, Alamogordo, New Mexico; Alamogordo ARC; 1500– 2300Z Oct. 2; 1500–1600Z CW Novice bands, 1600–1800Z SSB on 28.480/490 MHz. For QSL send QSL to International Space Hall of Fame, Route 2001, P.O. Box 533, Alamogordo, NM 88311-0533 (no SASE).

KE5TC, from WW II submarine *USS Batfish* for Columbus Day; eastern Oklahoma hams; 1400–2200Z Oct. 9–10; on 3.873, 7.250, 14.250, 21.350, 28.450. For QSL send QSL and SASE to KE5TC, P.O. Box 436, Keota, OK 74941.

W6JBT, from Patton State Hospital, San Bernardino, California; 1500Z Oct. 16 to 1500Z Oct. 17; phone 7.270, 14.270, 21.350, 28.350, 145.850, 224.860. For certificate send QSL and 9 × 12 SASE to Citrus Belt ARC, P.O. Box 3788, San Bernardino, CA 92413-3788.

KN6JN, from Torrance Air Fair, southern California; South Bay ARC; 1700–2400Z Oct. 9–10; General phone portions 15 and 20, Novice portion 10 meters, 145.77 simplex, 224.38 repeater. For certificate send QSL and 9 × 12 SASE to SBARC, P.O. Box 536, Torrance, CA 90508.

KI6GD, from March AFB Open House, Riverside, California; Moreno Valley ARA, Team March ARC, March AFB MARS station; 1600–2200Z Oct. 30–31; lower 25 kHz General subbands, Novice 10 meters, phone and CW. For USAF certificate send QSL and $1.00 to MVARA, P.O. Box 7642, Moreno Valley, CA 92552.

W7AW, from Camano Island, Washington (Island County), Slug, Oyster and DX Festival, Seattle, Washington; West Seattle ARC; 1500–0400Z Oct. 9 and 1500–2100Z Oct. 10; CW 21.052 and 7.045 MHz, SSB 14.235 and 3.930 MHz. For certificate send QSL & large SASE to W7AW *Callbook* address.

WY3Q/8, from Detriot Free Press/Mazda International Marathon, Detriot, Michigan; Wayne County ARPSC; 1400Z Oct. 16 to 2200Z Oct. 17; General 80–15 meter phone subbands, Novice phone subbands on 10. For QSL send QSL and SASE to Bill Gilbert, 222 Cleveland, Trenton, MI 48183.

W9BIL, from Chocolate Harvest Celebration, Mattoon, Illinois; Moultrie ARC; Oct. 2 (no times given); General 40, 20, 15, Novice 10 subband. For certificate send QSL & SASE to KB9BWS, Byron Abrams, P.O.B. 242, Findlay, IL 62534-0242.

WBØMNW, from 50 year commemoration of Camp Atlanta, Nebraska; 1300–2200Z Oct. 9–10; SSB 3.975, 7.275, 14.275 MHz (±5 kHz), plus some CW and digital to be announced. For QSL send QSL and #10 SASE to WBØMNW, 1111 Sherman St., Holdrege, NE 68949.

WBØAUQ, from Midland Historic Railroad, Nowhere, Kansas; Douglas County ARC; 1400–2100Z Oct. 16; lower General subbands plus 28.495. For certificate send QSL and 9 × 12 SASE to Bob Rainbolt, WBØAUQ, 986 E. 1587 Rd., Lawrence, KS 66046.

NØCWP, from Pumpkinfest, Anamosa, Iowa; Jones County ARC; 1500–2000Z Oct. 2; lower 50 kHz General subbands. For certificate send QSL to Jim McClintok, NØCWP, Box 462, Morley, IA 52312.

CG2 Special Prefix, from 10th anniversary "Centrale Gentilly 2" (nuclear plant), Gentilly, Quebec, Canada; Oct. 3–16; all bands CW, SSB, Digital modes. For QSL send QSL and SASE to Jean-Francois Maher, VE2JFM (QSL MGR), C.P. 352, Gentilly, Quebec, Canada GØX 1GØ.

FJ, St. Barthelemy Island, for CQ WW DX SSB Contest, Oct. 30–31; ops FJ5AB, FJ5BL, K2IBW, N2HIG; plus several days before and after contest there will be RTTY operation. QSL route (with SASE): non-USA direct to FJ5BL CBA; US ops and DX RTTY direct to N2HIG CBA.

OH2EW/OHØ, from DXpedition to Aland Islands, OHØ, IOTA EU-002 for Scandinavian Activity Contest; Oct. 24–26; SSB all bands 80–10, single band at a time. For sked call before contest starts +358-400-416-891. QSL CBA.

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

Oct. 2, **Indiana Tri-County Hamfest**, Miami County Fairgrounds, north of Peru, Indiana. Contact Indiana Tri-County Hamfest, P.O. Box 1092, Logansport, IN 46947.

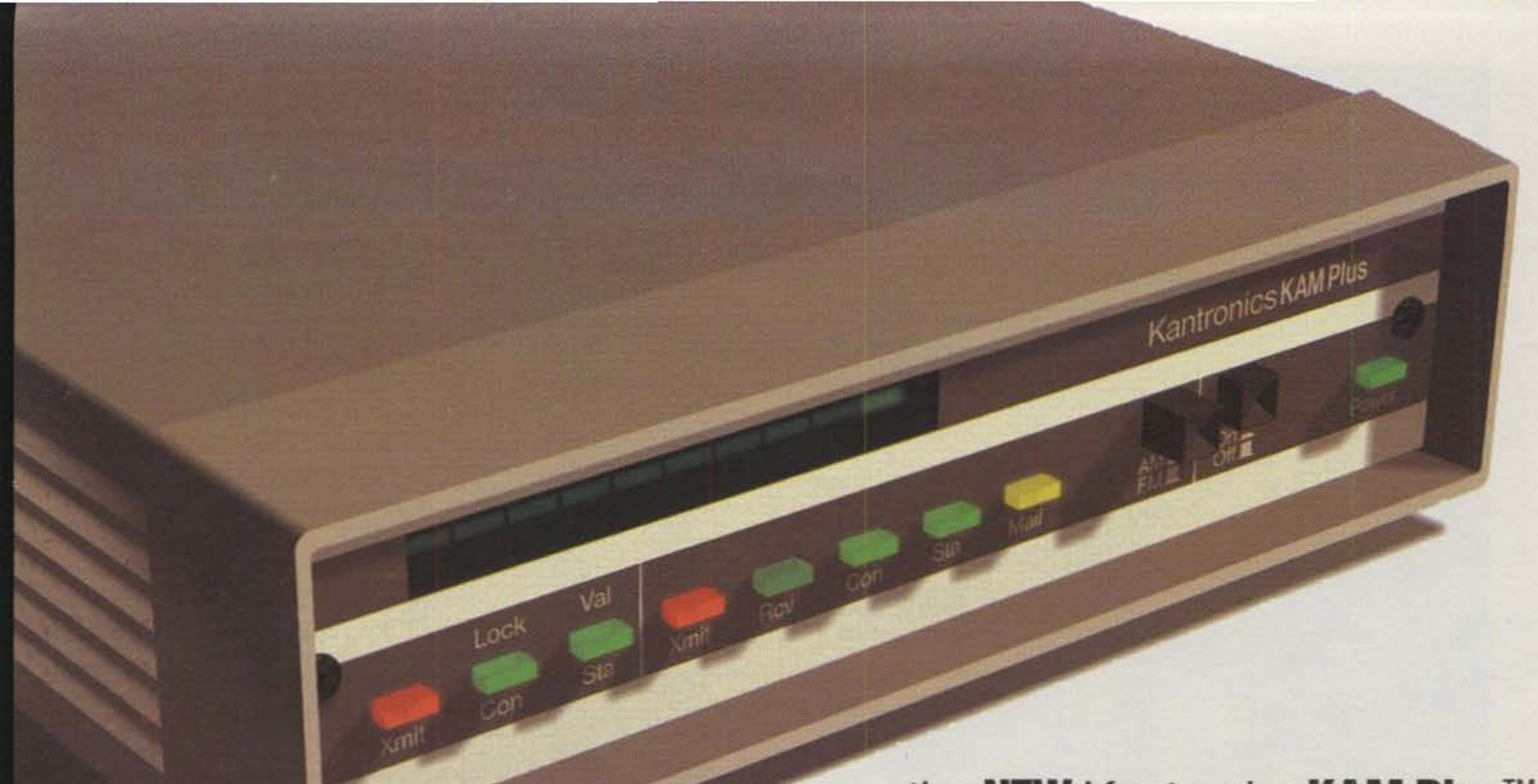
Oct.2, **Mid-Atlantic VHF Conference**, Days Inn Motel, Horsham, Pennsylvania. Contact John Sorter, KB3XB, 215-270-3185.

Oct. 2, **North Kitsap ARC Hamfest & Electronics Swapmeet**, Kitsap County Fairgrounds, Silverdale, Washington. Contact Gerry, 206-638-1440.

Oct. 2–3, **Virginia Beach Hamfest & Computer Fair**, Virginia Beach Pavilion, Virginia Beach, VA. Contact Manny Steiner, K4DOR, 804-340-6105. (Exams.)

Oct. 2–3, **Greater Louisville Hamfest**, Commonwealth Convention Center, Louisville, Kentucky. Call 502-551-4118.

Oct. 3, **Hamarama 93**, Bucks County Drive-in, Warminster, Pennsylvania. Contact Al Boblitt, K3EOD, 215-742-3312.



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Oct. 3, **North Central Ohio Hamfest**, Ashland County Fairgrounds, Ohio. Call Wally Green, W3YXS, 419-281-3903.

Oct. 3, **Huntington ARS Hamfest**, PAL Club, Huntington, Indiana. Contact Ray Tackett, KC9DZ, 219-786-0057. (Exams, handicapped accessible.)

Oct. 3, **Springfield, Ohio Hamfest & Computer Show**, Clark County Fairgrounds, west of intersection of Ohio Rt. 41 & Interstate 70. Call Carl Patterson, KA8LGS, 513-323-6680.

Oct. 3, **Hall of Science ARC Hamfest**, New York Hall of Science lot, Flushing Meadow Park, Queens, New York. Call, evenings only, Arnie Schiffman, WB2YXB, 718-343-0172.

Oct. 3, **Mt. Airy VHF RC Hamarama**, Rt. 611 Drive-in, Warrington, Pennsylvania. Call K3EOD, 215-742-3312.

Oct. 8, **ARC of Augusta Hamfest & Computer Show**, Augusta College Sports Complex, Augusta, Georgia. Contact Ed Butorajac, KM4QQ, 706-798-1918. (Exams preregistration 12 noon, exam at 1; handicapped accessible.)

Oct. 9, **NOARC Hamfest**, Allen County Fairgrounds, St. Rt. 309E, east of I-75, Ohio. Contact WD8BND, P.O. Box 211, Lima, OH 45802. (Exams, preregister, contact W8TY, 1370 N. Stevick Rd., Lima, OH 45807; handicapped accessible.)

Oct. 9, **Titusville ARC Hamfest**, Sandpoint Park, Titusville, Florida. Contact John Lowe, KE4BBC, 407-267-2000.

Oct. 9, **Ham-Expo 93**, Bell County Expo Center, Belton, Texas. Contact Eric, N5WFU, 817-986-1257. (Exams 1 PM; handicapped accessible.)

Oct. 9, **Bergen ARA Fall Hamfest**, Fairleigh Dickinson University, Teaneck, New Jersey. Contact Jim Joyce, K2ZO, 201-664-6725. (Exams, call 201-797-0151, before 10 PM.)

Oct. 9–10, **International Hamfiesta**, Texas National Guard Bldg., El Paso, Texas. Contact Milly Wise, W5OVH, 915-751-4160.

Oct. 9–10, **Greater Memphis Amateur Radio and Computer Show**, Shelby Farms Show Place Arena, Memphis, Tennessee. Contact Nita Wofford, N4DON, 901-363-4971. (Exams Sat. & Sun. 9 to 2 PM.)

Oct. 10, **Kettle Moraine RAC Ham & Computer Swapfest**, Waukesha County Exposition Center, Waukesha, Wisconsin. Contact KMRA Swapfest, P.O. Box 411, Waukesha, WI 53187-0411 (SASE). (Exams.)

Oct. 10, **Maysville Hamfest**, Maysville, North Carolina. Contact Jo Ann Taylor, 919-393-2120. (Exams 9 AM, walk-ins only, call W4ULD, 919-726-5924 or 919- 247-0967.)

Oct. 10, **Nutmeg Hamfest**, Fairgrounds, Durham, Connecticut. Contact Jim McCandless, N1IZF, 203-349-3353 (6-9 PM). (Exams.)

Oct. 10, **Shore Area Ham & Computer Fest**, Allaire Airport, Wall Township, New Jersey. Contact Al Jackson, NK2O, 908-922-8121. (Exams; all code at 9:30 AM.)

Oct. 16, **RAGS Hamfest**, Academy Green American Legion Hall, Syracuse, New York. Call WA2PUU, 315-469-0590.

Oct. 16, **Waycross Area Repeater Assn. Hamfest**, Waycross Ware County Fairgrounds Exchange club bldg., Waycross, Georgia. Contact Don Minchew, KD4CEX, 912-283-9553. (Exams 9 AM.)

Oct. 16, **FARC Hamfest**, Grand Forks Civic Auditorium, Grand Forks, North Dakota. Contact Bob Smith, ND1H, 701-746-9498. (Exams 10 AM, walk-ins okay.)

Oct. 16, **Tri-Cities Hamfest**, Appalachian Fairgrounds, Gray, Tennessee. Contact P.O. Box 3682 CRS, Johnson City, TN 37602.

Oct. 16, **Fort Venango Club Ham Auction/Fleamarket**, Venango County 4-H Fairgrounds, between Franklin and Polk, Pennsylvania. Contact Jerry Almes, W3DTW, 814-432-3647.

Oct. 16–17, **Odessa Hamfest/Convention**, Holiday Inn Convention Center, Odessa, Texas. Contact West Texas ARC, Box 7033, Odessa, TX 79760-7033.

Oct. 17, **MIT/Harvard Clubs Fleamarket**, Albany & Main St., Cambridge, Massachusetts. Call 617-253-3776.

Oct. 17, **Centralia Wireless Assn. Hamfest**, Kaskaskia College Gym, NW of Centralia, Illinois. Contact Bud King, WA9U, 618-532-6606.

Oct. 17, **Tucson Hamfest 93**, De Anza Drive-in, Tucson, Arizona. Contact A.J. Pawlowski, KB7KZ, 602-742-2605.

Oct. 23, **Sumter ARA Hamfest**, Sumter County Exhibition Center, Sumter, South Carolina. Contact Dan Mask, WB5SGH, 803-775-9106. (Exams.)

Oct. 23–24, **Palm Beach Repeater Assn. Hamfest**, Palm Beach County Fairgrounds, Palm Beach, Florida. Contact Ted Herrman, AE8G, 407-586-7940, FAX 407-586-3466. (They will also sponsor their first High-Speed CW Contest beginning at 1 PM Oct. 23; call above number for more info.)

Oct. 23–24, **Hamfest Chattanooga**, Chattanooga-Hamilton County Convention Center, Chattanooga, Tennessee. Contact Charles Curle, AD4F, 615-344-8447 nights (Exams.)

Oct. **USECA Swap**, Student Community Center, Macomb Community College, South Campus, Warren, Michigan. Contact Bill, N8CVC, 313-468-8345. (Exams, preregistration.)

Oct. 24, **Mason-Dixon Computer & Hamfest**, Carroll County Ag Center, Westminster, Maryland. Call Gary Viands, KE3FN, 717-259-7342. (Exams, preregister, 717-359-7610.)

Oct. 24, **1993 RMRL Hamfest**, Jefferson County Fairgrounds, Golden, Colorado. Contact Joe Dickinson, WTØC, 303-795-3397. (Exams.)

Oct.29–30, **QCWA National Convention**, Clearwater, Florida. Contact James Keyes, K4FCW, 813-822-1699.

Oct. 30, **Hamfest Minnesota & Computer Expo**, St. Paul Civic Center, St. Paul, Minnesota. Call 612-535-0637. (Exams.)

Oct. 30, **Franklinfest 93**, Franklin, Kentucky. Ed Schwab, KA4REF, days 502-843-4389, evenings 502-843-4389.

Oct. 31, **Boone & Clinton County Hamfest**, Boone County 4-H Fairgrounds, Lebanon, Indiana. Contact Tim French, KA9WDJ, 317-324-2618. (Exams.)

Oct. 31, **Heart of Ohio Hamfiesta & Computer Show**, Marion County Fairgrounds Coliseum, Marion, Ohio. Contact Steve Eckard, WS8S, 614-499-3565.

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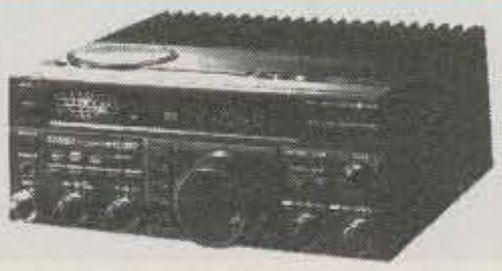

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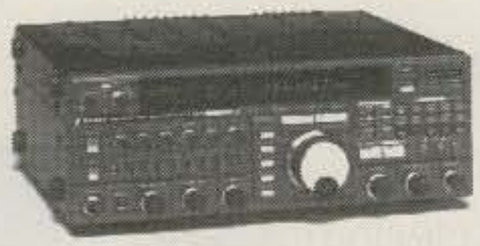

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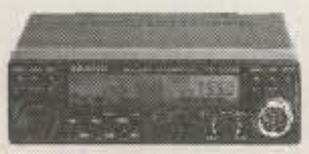

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Results of the 1992 CQ World-Wide DX CW Contest

BY LARRY BROCKMAN*, N6AR/4, AND BOB COX**, K3EST/6

What a fantastic surprise the 1992 CQ WW DX CW Contest turned out to be! The specter of declining sunspots loomed over all of us ominously, yet in the end, old sol came through with some of the finest propagation ever for the CW section, almost on a par with the SSB section. In some areas all six bands were open at the same time, making it difficult to choose an operating pattern. Those who mastered this wonderful predicament were richly rewarded with record-breaking efforts and some milestone performance achievements, specifically, 19 new records in all for the record books.

Some of the most significant achievements do not necessarily pop out of the tables and listings, though. We therefore will spend a few moments up front pointing them out.

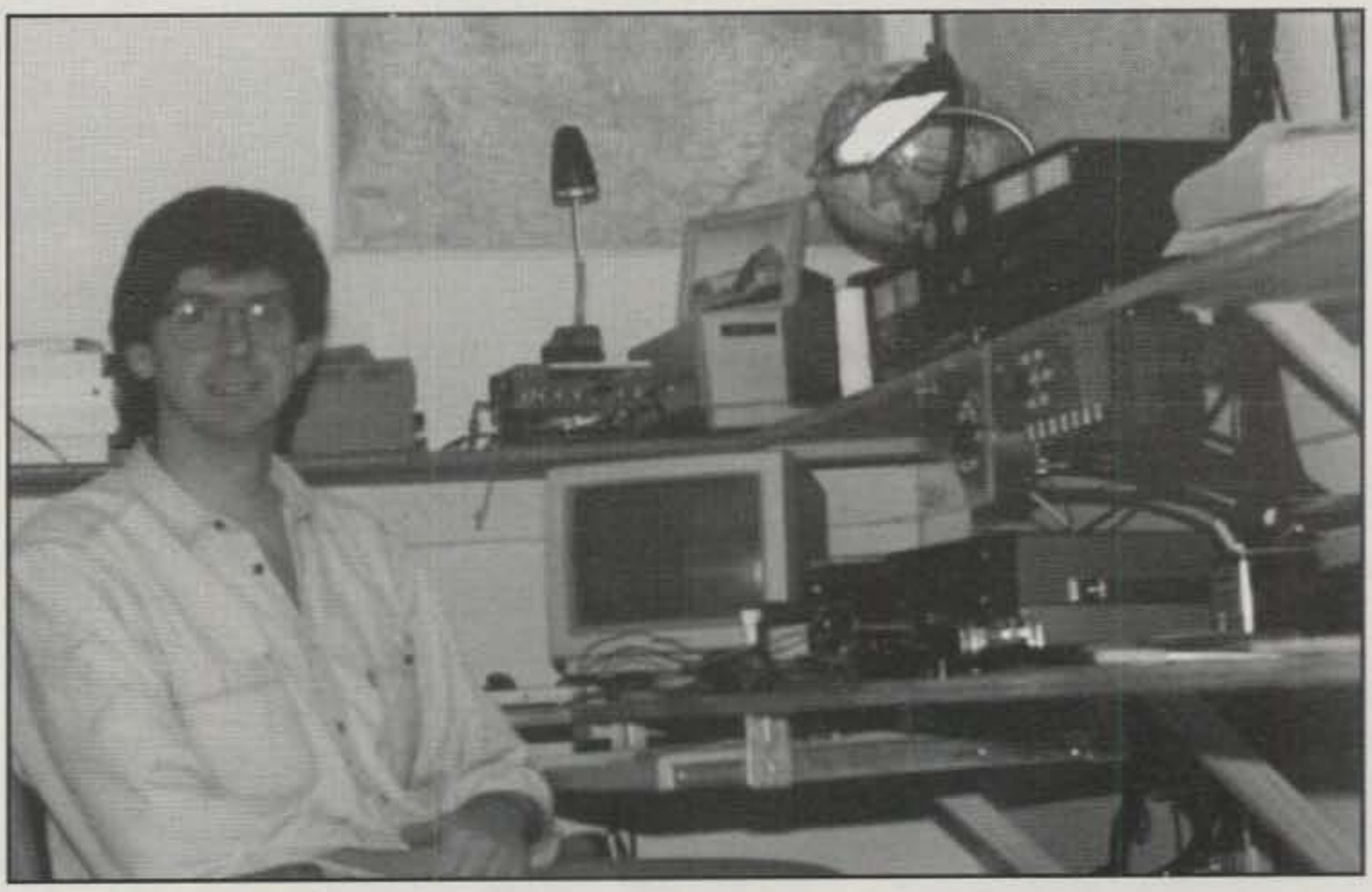
The first area of achievement of note is multiplier mastery. Five-band DXCC has finally been achieved from the USA in a single weekend! John Dorr, K1AR, accompanied by K1EA, K1GQ, K1MM, K1MEM, and W1RM, logged 107, 141, 156, 154, and 136 countries on 80 through 10, respectively, for the first 5 Band DXCC ever in a weekend from the USA. This matches the first-time effort by 1991 Multi-Single entrant RZ1A, a feat almost matched this year by the Multi-Single team at IQ4A, which missed the fifth band, 80 meters, by just two countries. We quickly researched our records, and we believe that 5 Band DXCC has never been achieved before by a single operator entry either. Well, this year it was done by N6AR. Of course, 8 of the 10 top Assisted entrants also did it this year as well.

The second set of notable achievements is in the "clean log" category. For the last three years the CQ Contest Committee has done some extensive checking with our computerized data base. This year there were 333 participants whose logs were entered into the data base—most of the top logs in all of the categories plus a number of others. This represents over 658,000 contacts with 51,000 different calls, of which 20,000 were common to more than one entrant. From this data base we discovered that the mean rate of unique contacts in the top Single Operator, All Band logs was just 3.4% (with 1.9% standard deviation) for the non-US contingent. For the top US All Band logs, the mean unique rate was just 2.8% (with a 2.1% standard deviation). The unique rate for World and US top entrants where the unique calls were just one character from a matching call in the data base was 2.7% (1.61% SD) and 2.2% (1.5% SD), respectively. These mean rates show that uniques are down significantly from the last several years. Could be we've been getting everyone's attention!

Much has been said at Dayton and in the *National Contest Journal* about the relevance of uniques and one off matching calls as a measure of logging accuracy in the last couple of years. However, the committee has been spot cross-checking uniques found in our logs, and the data shows that well over half of the uniques are, indeed, bad calls! So if you have a low unique rate, you probably have a very clean log. If not, well . . .

This year we would like to honor the "cleanest logs" submitted in the contest using the unique criteria. For the US entrants, the most outstanding competitive submittal was by Dave Sumner, K1ZZ. Dave had an incredible .2% unique rate, yet finished in the top 10 in the USA. With over 2300 contacts logged, Dave's uniques boiled down to just 5 calls! This compares to others in the top 10 who had 200

Here's the KHØAM team on top of the Saipan Diamond Hotel, complete with their two YL operators and antennas. Congratulations on a new Oceania Multi-Multi record!



VD2ZP, sported this fine station to finish in the top 10 worldwide in the Low Power category.

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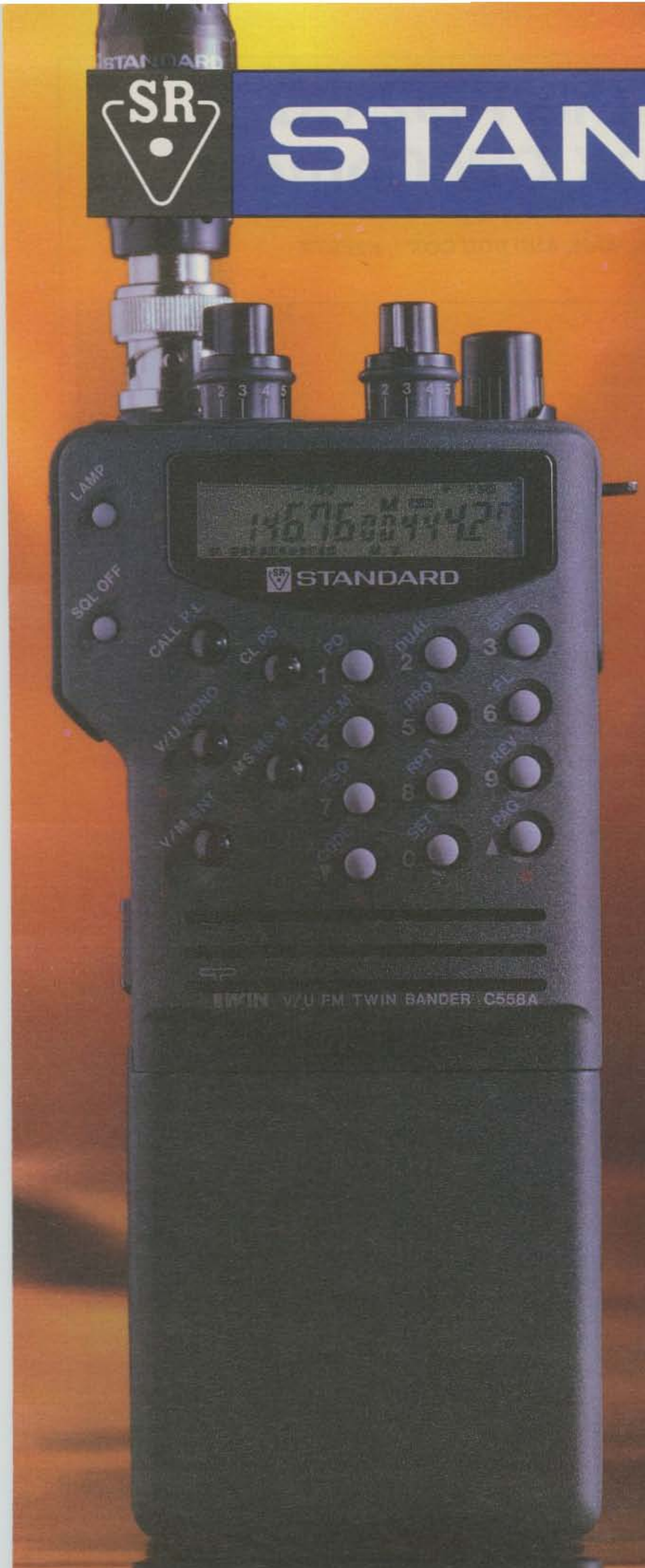

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Donor: Gene Walsh, N2AA

U.S.A.
N4RJ (Opr. Bill Fisher, KM9P)
Donor: Frankford Radio Club

Canada
John Sluymer, VE3EJ
Donor: Canadian DX Association

Caribean/Central America
8P9Z (Opr. John T. Laney III, K4BAI)
Donor: Larry Brockman, N6AR

Europe
Tine Brajnik, S52AA
Donor: Edward Bissell, W3AU

Africa
EA9LZ (Opr. Phil Goetz, N6ZZ)
Donor: Gordon Marshall, W6RR

Asia
JY8VJ (Opr. Bernd Laenger, DL1VJ)
Donor: Japan CQ Publishing Company Ltd.

Japan
Shigeyuki Hasegawa, JHØKHR
Donor: Japan Crazy CQ Contesters

Oceania
9M6NA (Opr. Saty Nakamura, JE1JKL)
Donor: Maui Amateur Radio Club

South America
HC8N (Opr. Trey Garlough, WN4KKN)
Donor: Venezuela DX Club

SINGLE OPERATOR, SINGLE BAND
World—28 MHz
D68GA (Opr. Don Jones, N6ZV)
Donor: Joel Chalmers, KG6DX

World—21 MHz
CR3W (Opr. Manfred Loos, DF5UL)
Donor: Don Busick, K5AAD
N5JJ Memorial

World—14 MHz
FY5YE (Opr. Arno Martin, OH7XM)
Donor: North Jersey DX Association
W2JT Memorial

World—7 MHz
PJ9U (Opr. Seppo Sisatto, OH1VR)
Donor: Alex M. Kasevich, VP2MM/W4

World—3.5 MHz
Jeff Briggs, K1ZM
Donor: Fred Capossela, K6SSS

World—1.8 MHz
Riki Kline, 4X4NJ
Donor: Kenneth Byers, Jr., K4TEA

USA—28 MHz
Joel Rubenstein, KA5W
Donor: Robert Clark, K6JYO

USA—21 MHz
Dave Donnelly, K2SS/1
Donor: Wayne Caroll, W4MPY

USA—14 MHz
John Yodis, K2VV
Donor: Northern Illinois DX Association

USA—7 MHz
Paul Obert, K8PO/1
Donor: Jan Perkins, N6AW
W6AM Memorial

USA—3.5 MHz
Jeff Bouvier, K1IU
Donor: N7BG and AA7FM

USA—1.8 MHz
William Gioia, K2EK
Donor: Peter Hutter, WW2Y

Canada
VE6JY (Opr. Joel Weiner, VE6WQ)
Donor: Canadian Amateur Radio Federation

Caribbean/Central America
ZF2TG (Opr. George Benoit, WQ5W)
Donor: Thomas Wall, K2TW

Europe—28 MHz
Jeff D. Morris, 9H1EL
Donor: Southern New England DX Assn.

Europe—21 MHz
OH2BH (Opr. Pasi Luomo Aho, OH6UM)
Donor: Robert Naumann, KR2J

Europe—14 MHz
Erkki Korhonen, OH4NRC
Donor: Maud Slater
G3FXB Memorial

Europe—1.8 MHz
John Devoldere, ON4UN
Donor: John Crovelli, W2GD

Japan—21 MHz
Tadao Katsuta, JH7DNO
Donor: DX Family Foundation

MULTI-OPERATOR
SINGLE TRANSMITTER

World
ZC4Z (Ops. G3SXW, GM3YTS, K5VT, K7GE, KC7V, N7BG)
Donor: Anthony Susen, W3AOH

USA
N3RS (Ops. N3RS, N3RD, N3ED, WA3LRO, NW3B)
Donor: Douglas Zwiebel, KR2Q

Canada
VD7SV (Ops. VE7AGC, VE7AHA, VE7CT, VE7VR, VE7CC, VE7SV, VE7XR)
Donor: Eastern Canadian DX Association
10

Caribbean/Central America
K3TEJ/KP4 (Ops. K3TEJ, WA3WSJ, W8HNI)
Donor: Ralph Bellas, Jr., K9ZO

Europe
IQ4A (Ops. I4EAT, I4ICT, I4IKW, I4IND, I4LCK, I4TJE, IK4DCT, IK4EWK)
Donor: Friends of K3AO
K3AO Memorial

Oceania
KH2S (Ops. JA8RUZ, JF3EIG, JH4RHF, JHØUSD, JI3ERV, JI3OPA, JJ1JMC, JR4DUW, JR4ISF, JR4PMX, JR7MZC, JRØBQD, KH2D)
Donor: Junichi Tanaka, JH4RHF

MULTI-OPERATOR
MULTI-TRANSMITTER

World
EA9EA (Ops. EA1AK, EA4BB, EA4KA, EA4KR, EA5RS, EA7PN, EA7TL, EA7CEZ, EA7GZJ, EA9EO, EA9GK, EA9TY)
Donor: Hazard Reeves, K2GL Memorial

World—SSB/CW Combined
9A1A (41,416,918)
Donor: Ehrhorn Techological Operations

USA
K1AR (Ops. K1AR, K1EA, K1GQ, K1MM, K1MEM, W1RM)
Donor: Bob Ferrero, W6RJ
N6RJ Memorial

Europe
9A1A (Ops. 9A2SD, 9A2PA, 9A2MP, 9A2RA, 9A3FI, 9A2YW, 9A2NO, 9A2CT, 9A2QS, 9A2EU, 9A2HO, 9A2NJ, 9A2AW, 9A2OS, 9A2MY, 9A2NJ, 9A2DQ, 9A2MM, 9A2OH, 9A6ABX, 9A3GW)
Donor: Finnish Amateur Radio League

Japan
JA3ZOH (Ops. JE3MAS, JF3DRI, JG3KIV, JG3ODG, JH4IFF)
Donor: CQ Magazine

CONTEST EXPEDITIONS

World, Single Operator
P4ØW (Opr. John Crovelli, W2GD)
Donor: Yankee Clipper Contest Club

World—Multi-Operator
KHØAM (Ops. JE1CKA, JI1QPU, JK1GRI, JP1OGL, 7K1PTT, AHØK, JE2JCV, JK2PNY, JL2TZC, JA7RHJ, JE7BIZ, JR7OMD, JA9SSY, JA9VDA)
Donor: Bill Schneider, K2TT

SPECIAL SINGLE OPERATOR AWARDS

World—All Band Most QSOs
HC8N (Opr. Trey Garlough, WN4KKN)
6028 QSOs
Donor: 14270 kHz Group
KV4AA Memorial

CLUB
World, Combined SSB/CW
Frankford Radio Club (389,564,535)
Donor: CQ Magazine
W1WY Memorial

Non-USA—Combined SSB/CW
Rhein-Ruhr DX Association (99,148,797)
Donor: Northern California Contest Club
N6AUV Memorial

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- Full QSK, variable CW pitch with
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- 200 Memories, computer interfaceable
- Built-in Heavy Duty power supply, 110/220V
- IF notch tracking
- JST-145 same specs, no 6 meter coverage

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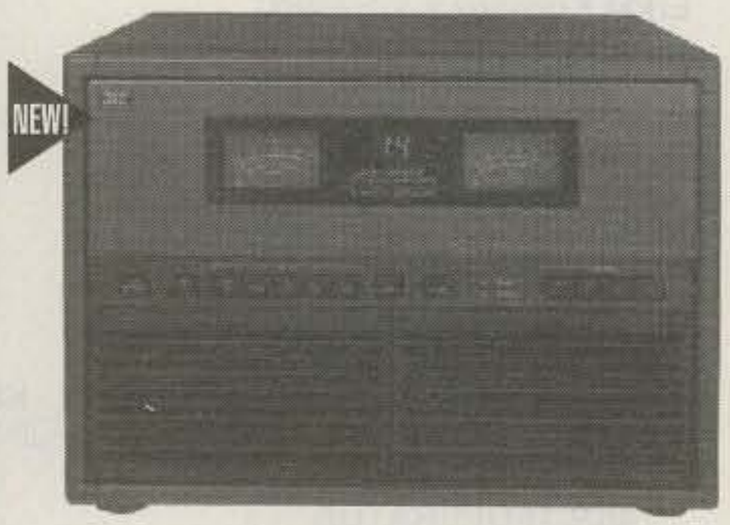
JRL-2000F Linear Amplifier



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  CW 1KW 100% duty cycle
- Exiting power required 100W
- Automatic band antenna selection
- Full QSK
- Built-in automatic antenna tuner
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- Weight approx. 61 lbs.
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- Scanning

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2M/440

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DTMF Pad Included
no keyboard entry of frequency
Scanning

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Cross Band Full Duplex

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7Q7XX 's QTH, good enough for top worldwide in the Low Power category.

uniques out of 3000 contacts, most of which were calls that closely matched other calls in our data base. Honorable mention goes to W1KM and K8GL, who were in the vicinity of .9% uniques. Great performances, guys.

For the DX entrants, the "cleanest log" honors go jointly to Ville, EA8EA, and John, 8P9Z, both of whom were in the region of a .9% unique rate. These statistics are just mind-boggling when you consider that both EA8EA and 8P9Z were in the top four in contact totals in their categories, with over 5000 contacts each.

Now, let's get to the results proper.

Single Operator, All Band

Ville, OH2MM, operating at EA8EA, led the pack this year with 11.97 million, shy of his 1991 World record, but well ahead of second-place challenger Trey (WN4KKN) at HC8N, and John (W2GD) at P4ØW. It was the US competition that was particularly heated this year, as three stations smashed the old 1989 mark set by Randy (K5ZD) at K3TUP. Bill Fisher (KM9P), guest operating at Val, N4RJ's station, made 5.85 million and squeaked by Andy, N2NT (5.7M) and Bob (KQ2M) at KM1H (5.67M). It was the multipliers that made the difference for Bill, with Andy concentrating on the contact total. In fact, Bill had almost 100 more multipliers this year than the previous record holder, K3TUP.

This year we have included a new table with the results summarizing the top 5 performances in the Single Operator, All Band categories for all six continents by score, multiplier total, and contact total. Note how the continental leaders EA8EA (Africa), JY8VJ (Asia), S52AA (Europe), 9M6NA (Oceania), and HC8N (South America) show balance between multipliers and contacts, the mark of the true expert.

Our compliments to Trey, HC8N, on toppling John, P4ØW's 1991 South American record, with John fighting valiantly to retain the prize. Also, we can't help but comment on the fine improvement by Bernd, JY8VJ (operated by DL1VJ), who improved his score by a couple of million on his way to a new Asian record. Hats off to Tine, S52AA, who won both in SSB and CW for Europe. Last, Shig, JHØKHR, is the proud owner of a new Japanese record in the All Band category; JA is a tough location for the CQ WW.

For the popular Low Power category, 7Q7XX amassed 3.25 million to lead the pack worldwide, while N8II (2.0M) stole the show in the USA. Henry, AA2U, ended up as QRP kingpin for the US and the World with a fine 1.19 million, besting his own US record of 1990. That's a lot of hunting and pecking!

Speaking of power categories, we kept track this year, and for what it is worth, 55% of all US single operator entries were high power, 41% were low power, and 4% were QRP. For the DX, the trend is just the reverse—30% were high power, 64% were low power, and 6% were QRP. From the letters and comments we got with the logs, we know how the Low Power category is growing in popularity. The VKs, VUs, JAs, and others have commented on how they appreciate the opportunity to compete with others on an equal footing when they are limited to low power by their license. To alleviate problems with your power entry being misinterpreted, please mark your entries clearly as to low power, with no more than 100 watts output power. Note that there are no power categories in the Assisted or Multi-Op categories. Your directors do their best to pick up the right category on the logs, but with thousands of logs to process, we sometimes have a problem finding the call on the logs much less the power category. We actually had to do a couple of crosschecks on one log this year to find out what the entrants call was!

Single Band Categories

As we mentioned earlier, good propagation was observed on all bands this year, making the Single Band categories ripe for record-level performances from the high bands to the very low bands.

On 28 MHz the World high slot went to CXØCW (CX8BBH operating) with 1.8 million, just shy of his own 1990 record. USA top honors went to Joel, KA5W, who led a close pack of W's with 464K. 9H1EL topped the Europeans with 794K, a new European record. Congratulations to Don Jones, N6ZV, whose fine 1.28 million set an African record on that band and was second worldwide this year. Don sent in a blockbuster SSB log from D68GA last year, but it arrived just a few days before our publication deadline, too late for us to include it in the results. We're glad Don got things in early this year. Our hats are off to 5NØZKJ, WB4TDH, and ON4RU for great Low Power performances on 10 meters.

Manfred, DF5UL, took top World honors on 15 meters and set a new African record with 1.65 million at CR3W. Dave Donnelly's K2SS/1 entry won it for the Stateside boys with 691K. The Low Power winners were 8P9DF (523K) and N4MO (345K). Congratulations for super efforts with just 100 watts!

Meanwhile, as John Yodis commented in the

YU7AV sent along this photo of his station complete with homebrew 2000 watt PEP linear!

TOP SCORES

WORLD

SINGLE-OPERATOR HIGH POWER

All Band

EA8EA	11,966,372
HC8N	10,773,628
P4ØW	9,554,775
8P9Z	8,047,212
JY8VJ	8,031,168
9Y4H	7,960,980
EA9LZ	7,901,415
6V6U	7,760,740
D44BC	7,755,895
P4ØI	7,214,236

28 MHz

CXØCW	1,818,656
D68GA	1,281,660
P4ØX	1,174,032
CX5BW	988,410
XR3A	982,500
A22MN	812,413
9H1EL	794,846

21 MHz

CR3W	1,652,170
ZD8LII	1,560,405
9Y4VU	1,087,804
FM2GO	997,600
J33A	930,340
OH2BH	757,520

14 MHz

FY5YE	1,331,307
7L1GVE	1,181,937
TU4SR	1,164,934
4M5X	1,145,087
RZ9UA	949,780
K2VV	943,920

7 MHz

PJ9U	1,171,864
ZF2TG	1,087,862
S59UN	971,049
K8PO	821,473
4N1Z	802,536
W7XR	794,992

3.5 MHz

K1ZM	416,160
G3KDB	360,822
OE3GSA	359,915
CT3FN	344,698
K1IU	315,826
SN3A	297,815

1.8 MHz

4X4NJ	150,880
ON4UN	118,772
9A1HCD	82,904
ON7TK	81,470
UA9AT	60,984
UF6QBA	57,664

LOW POWER

All Band

7Q7XX	3,257,128
C6AHJ	2,716,862
9V1YC	2,679,948
NP2I	2,349,901
VD2ZP	2,346,096
OG6NIO	2,296,625
N8II	2,008,982
W2TZ	1,986,240
5Z4TT	2,014,530
OA4ZV	1,954,555

28 MHz

5NØZKJ	597,624
H27W	568,624
ON4RU	464,758
JH2QXG/2	334,866
G3KHZ	319,340
CX4SS	261,000

21 MHz

8P9DF	522,750
S57DZD	347,060
N4MO	345,693
U5WF	315,980
KH6XT	298,860
SP5JTR	244,180

14 MHz

4M5X	1,145,087
7Q7TA	206,752
YL2GN	174,960
PAØLVB	138,300
PA3ELD	125,742
JF6OJX	119,840

7 MHz

VK6LW	533,696
JH7PKU	513,110
F1MXH	266,772
LZ6L	245,481
LZ1ZX	245,480
JA1LZR	171,212

3.5 MHz

UV3WU	91,605
OK1DUG	89,440
LY2BIP	79,242
S59ZZ	75,594
OK3CND	66,994
UB5PCU	65,190

1.8 MHz

T32AF	49,210
SP5ZIM	37,027
OG3MMF	30,745
OH1KF	22,176
PAØVDV	18,411
SM6OLL	18,368

MULTI-OPERATOR SINGLE TRANSMITTER

ZC4Z	11,091,918
IQ4A	9,197,700
LZ9A	8,859,468
N3RS	8,585,380
K1KI	8,207,816
UW2F	8,049,966

MULTI-OPERATOR MULTI-TRANSMITTER

EA9EA	30,038,639
KHØAM	23,951,385
K1AR	19,473,615
9A1A	18,450,820
N2RM	18,408,663

EUROPE

SINGLE-OPERATOR HIGH POWER

All Band

S52AA	5,195,440
G4BUO	3,983,382
EA6ZY	3,946,019
YU7AV	3,709,604
G3MXJ	3,270,278
YT1AD	3,218,072
YU7BW	3,208,920
OH6WZ	2,949,503
OZ1LO	2,949,492
UB7W	2,709,504

28 MHz

9H1EL	794,046
9A1CCY	673,524
S59AA	608,796
ON4WW	460,149
S51QZ	443,750
EA2IA	426,092

21 MHz

OH2BH	757,520
LZ5W	675,635
OK1ALW	563,316
IR4T	526,792
G4CNY	462,985
S57EK	445,632

14 MHz

OH4NRC	864,058
9A7A	752,388
4N5M	639,220
ES5MC	622,557
S57DX	620,412
OG8LQ	602,390

7 MHz

S59UN	971,049
4N1Z	802,536
I3JSS	718,080
OK3RM	682,970
LY5R	598,671
YL2KL	585,120

3.5 MHz

G3KDB	360,822
OE3GSA	359,915
SN3A	297,815
S59KAB	289,050
OK3TPV	245,523
SM6MCW	221,570

1.8 MHz

ON4UN	118,772
9A1HCD	82,904
ON7TK	81,430
CT1AOZ	56,214
OY9JD	52,710
G4PIQ	50,410

LOW POWER

All Band

OG6NIO	2,296,625
LZ3FN	1,904,750
UB5QMA	1,870,086
EA5WU	1,844,525
F6FGZ	1,717,644
GD4UOL	1,609,647
DL2SCJ	1,417,680
HA1CW	1,330,608
OE2VEL	1,298,355
OH3LIM	1,149,120

28 MHz

ON4RU	464,758
G3KHZ	319,340
EI5DI	238,784
S57AL	233,632
LY1DW	180,561
S57JZ	177,004

21 MHz

S57DZD	347,060
U5WF	315,980
SP5JTR	244,180
ON6CW	190,890
LY1CM	165,960
UC2OIY	162,864

14 MHz

YL2GN	174,960
PAØLVB	138,300
PA3ELD	125,742
SP6PAX	111,150
HA5LZ	108,395
UB5RAF	96,092

7 MHz

F1MXH	266,772
LZ6L	245,481
LZ1ZX	245,480
RB5QCV	123,970
IO9AF	97,524
PA3AAV	79,696

3.5 MHz

UV3WU	91,605
OK1DUG	89,440
LY2BIP	79,242
S59ZZ	75,594
OK3CND	66,994
UB5PCU	65,190

1.8 MHz

SP5ZIM	37,027
OG3MMF	30,745
OH1KF	22,176
PAØVDV	18,411
SM6OLL	18,368
DJ9LJ	17,568

MULTI-OPERATOR SINGLE TRANSMITTER

IQ4A	9,197,700
LZ9A	8,859,468
UW2F	8,049,966
DLØWW	7,998,770
TM9C	7,937,423
OK5W	6,767,465

MULTI-OPERATOR MULTI-TRANSMITTER

9A1A	18,450,820
HG73DX	17,812,935
GW8GT	17,487,927
OHØW	17,040,051
DLØCS	12,118,804
UX1A	11,977,597

USA

SINGLE OPERATOR HIGH POWER

All Band

N4RJ	5,851,152
N2NT	5,705,000
KM1H	5,675,756
KN8Z	5,436,795
W1KM	5,394,604
K3ZO	4,949,992
N2LT	4,723,894
W3BGN	4,257,147
N6BV/1	4,107,368
K1ZZ	4,055,069

28 MHz

KA5W	446,439
K8CX	426,717
KT4W	416,760
N4ZZ	358,239
K5RX	347,626
W6YA	315,892

21 MHz

K2SS/1	691,185
WØUN	647,168
N4CT	577,638
N3KK	540,662
K8MFO	519,750
W5VX	511,187

14 MHz

K2VV	943,920
KW8N	815,948
N2BA	765,525
K5MR	505,225
N5CR	481,929
NQØI	424,461

7 MHz

K8PO/1	821,473
W7XR	794,992
K4XS	683,459
KBØG	636,720
W2UP/3	521,076
K1UO	493,580

3.5 MHz

K1ZM	416,160
K1IU	315,826
W1MK	275,600
KT3Y	205,683
WE3C	153,930
KØRF	139,072

1.8 MHz

K2EK	34,522
K5UR	25,612
KVØQ	16,272
N6SS	13,112
K4TEA	11,880
WB9Z	11,328

LOW POWER

All Band

N8II	2,008,982
W2TZ	1,986,240
K7SV/4	1,335,780
KM1X	1,266,515
WA2VYA	1,249,246
KG1D	1,200,600
K1EBY	1,195,821
N8RR	1,185,845
N4YDU	1,095,578
N5AW	1,062,400

28 MHz

WB4TDH	250,962
W7ZR	165,834
WA6KUI	164,864
K2MFY	155,241
N3JT	66,736
WA6FGV	53,676

21 MHz

N4MO	345,693
W9HLY	194,600
AA7RN	125,112
KW8J	123,786
KK4SM	120,171
WT8P	94,142

14 MHz

K2AW	118,430
KD5IA	98,171
WQ7R	33,945
KW3M	28,296
W8UMR	23,568

7 MHz

W9CH	100,050
K2POF	83,752
KO9Y	77,982
KIØI	40,500
K9UIY	37,036
K1HBX	35,002

1.8 MHz

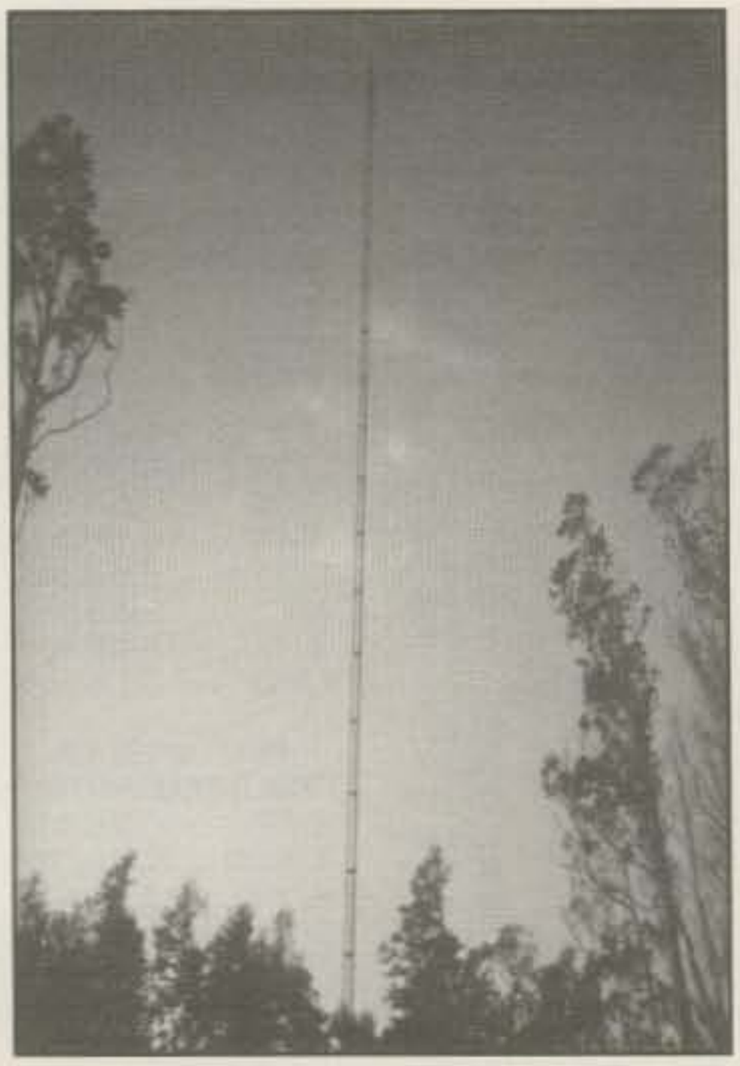
AA9AX	2,709
WØRT	561
N4UZ	392

MULTI-OPERATOR SINGLE TRANSMITTER

N3RS	8,585,380
K1KI	8,207,816
K1DG	7,751,014
WW2Y	6,062,210
N4WW	5,821,605
W5WMU	5,361,675

MULTI-OPERATOR MULTI-TRANSMITTER

K1AR	19,473,615
N2RM	18,408,663
W3LPL	16,702,372
AD1C	12,690,432
AA6TT	9,460,602
KY1H	7,821,044



CT3FN was strong here on 80, a credit to the 57 meter high tower shown here.

QRM section, 20 meters sustained fantastic openings day and night this year, making it a fun band to operate. This motivated John to post a new USA record with 943K, toppling K2EK's 1989 mark. John logged 50 more multipliers on 20, but had 200 less contacts. My, how rich the field of multipliers was on 20 meters this year. FY5YE took the worldwide high with 1.33 million. 4M5X captured the top Low Power score, and 4th in the World as well. K2AW's 118K Low Power US entry was tough going, but USA high.

This year 40 meters sounded like 20 meters usually does. As we examined the logs, it was strange to see so many good DX contacts as late as 11 AM in the morning and as early as 2 PM in the afternoon from entries all over the World. Such great propagation enabled PJ9U to set new World and South American records with a fine 1.17 million. He was followed by WQ5W's ZF2TG score of 1.09 million, also a new record for North America. Elsewhere, S59UN's 971K was third worldwide, and a enough for a new European mark. VK6LW managed a fantastic 534K in the Low Power category for World high, with W9CH leading the States in the 100 watt category on 40.

On 80 meters Jeff Briggs, K1ZM, worked all day and all night to log extra VE and European stations, and managed a fabulous 416K total for World and US high, setting a US record along the way. Low Power honors go to UV3WU with 91K worldwide, but strangely, there were absolutely no US entrants on 80 in the Low Power category.

On the bottom band, Riki Kline, 4X4NJ, posted a fine 151K for the top score. Riki complained to us about the low level of US activity. Wow, Riki, you should have heard all the W's calling you that you couldn't hear! John Delvodere, ON4UN, fell just 4 points below his 1990 European record, but finished second worldwide at 118.7K. Bill Gioia, K2EK, managed 34.5K from the States, edging out Rick, K5UR. Low Power mention goes to SP5ZIM with 37K.

As with the SSB section, we have included a new table this year showing the top 5 performers by band independent of the category entered. This data shows that the Single Band entries are largely the top single band scores, besting the Multi-Multi efforts on the single bands most of the time.

Assisted Category

As was the case last year, the Assisted category grew to almost 250 logs, but was dominated by the Stateside faithful. Tom Lee, K8AZ, led the field with 4.7 million, followed closely by K3WW, K5NA, and KC1XX in that order. All four top entrants posted over 100 countries on 40 through 10 meters, with total multipliers of 708, 726, 794, and 736, respectively. The top entrant from outside of the States was 4U1ITU with 4.1 million, who finished 5th worldwide. We noted some real interest in Germany developing in this category, perhaps fueled by the packet networks really beginning to catch on there.

Multi-Operator Categories

The multi-national team at ZC4Z won the Multi-Single category this year worldwide with 11.1 million, while the team at N3RS topped the US field with 8.5 million in a closely contested race with K1KI's gang. Our congratulations to the operators at KH2S who set a new Oceania record in Multi-Single with 7.25 million. The IQ4A team amassed 871 multipliers on their way to 9.25 million for first place in Europe.

In the Multi-Multi competition, the team at EA9EA led all comers with 30 million. Our best regards to second-place finisher KØAM, a 23 million effort that set a new Oceania record; and to the team at VS6WO, which logged 18 million to set an all-time Asian record. My, how excited the 160 meter operator Lew, K4VX, got as he described the experience of working 160 meters from Hong Kong at Dayton this year! We already commented on the K1AR Multi-Multi 5 Band DXCC accomplishment. Suffice it to say that the 945 multipliers they logged in one weekend, an average of 158 per band, led them to top US honors with 19.47 million, a new US record. Second-place finishers at N2RM (18.4M) also broke their own 1990 US record of 17.3 million.

Team and Club Competitions

This year the club competition heated up with six entries from five diverse groups (The Southern California Contest Club fielded two teams). The five-man SCCC team #1 (D44BC, EA9LZ, PTØF, 4M2BYT, and 9Y4H) had 37.5 million, narrowly edging the four-man Global Team (8R1K, EA8EA, JY8VJ, and P4ØI) with 33.9M. (The global team was actually three Finns plus one). A special word of welcome to the New England WW Team, Team Japonica, and the Russian Baby Bears for fine entries this year as well.

Perennial winner Frankford Radio Club again captured the coveted Club Trophy this year with an incredible 389 million. They were pressed some by the Yankee Clipper Contest Club, which kept it interesting with 302 million. In the non-USA Club category, the Rhein-Ruhr DX Club posted nearly 100 million to top the field, with rival Bavarian Contest Club at the 94 million mark.

Comments

Last month we published the rules for the 1993 contest and commented in the SSB write-up on a few key points. We will emphasize some of these points again this month. It seems that many of you comment to us, with your replies to our special requests, that you did not know about this or that provision of the rule, so it doesn't hurt to repeat some of the changes.

Please note that the CQ WW requires submission of paper copies of your log, even when you send us a diskette with your log on it. We must have paper copies to process the results as explained in last month's issue. The paper copies should be arranged so that there is a separate log for each band. For all contestants who have competitive entries in their category, we can require the submission of the log data on diskette as well. K1EA.BIN, N6TR.DAT, and DBASE.DBF file formats are preferred. To emphasize this point, the preferred K1EA file is the .BIN file, not the .RES file, not the .10 through .160 files.

Please try to understand that the contest results require countless hours of time from the committee, most of which are volunteers. Our goal is to assure that all competitive entrants are checked for validity and accuracy. To do that, the paper logs must be in hand for us to scan; a computer file is not very easy to scan, and it is too expensive for us to print them all out. In addition, all of the top logs must be checked with our computerized data base using the same uniform process. Most of the top entrants submitted diskettes with their logs. However, about 80 stations had to be notified that a diskette was required for the CW mode. Of these, 75% complied with our request, which is very much to their credit. The remaining 25% leaves the committee with a real dilemma. We are currently reviewing a number of options to deal with this problem.

This past year our checking made some significant differences in the order of the finishers in a number of categories. As with any "Olympic" quality competition, the margin of victory can be very small. We are committed to certifying that the right entrants win. It's the least we can do when you put so much time, effort, and assets into the contest.

Credit

The hardworking members of the committee this year deserve a special word of thanks from all of us. First, thanks to the crew at *CQ* magazine for accelerating the delivery of the logs to K3EST and N6AR. Then, when the logs are sorted and categorized, KRØY, W9RE, WA8YVR, N3ED, K1DG, W2RQ, W7EJ, K6NA, N6AW, KR2Q, N6AR, and K3EST do the checking. Oh yes, we almost forgot the work that N6AA did using N6TR's software support to put the data base together from the hundreds of diskettes we get. Our thanks, also, to special advisors K1AR, N2AA, and K3ZO; and to the overseas consultants, S52AA, OH2BH, OH2MM, OH2KI, CT1BOH, OK2FD, and PY5EG.

That about wraps it up for this year. See you in the '93 contest.

73, Larry, N6AR/4 and Bob, K3EST/6

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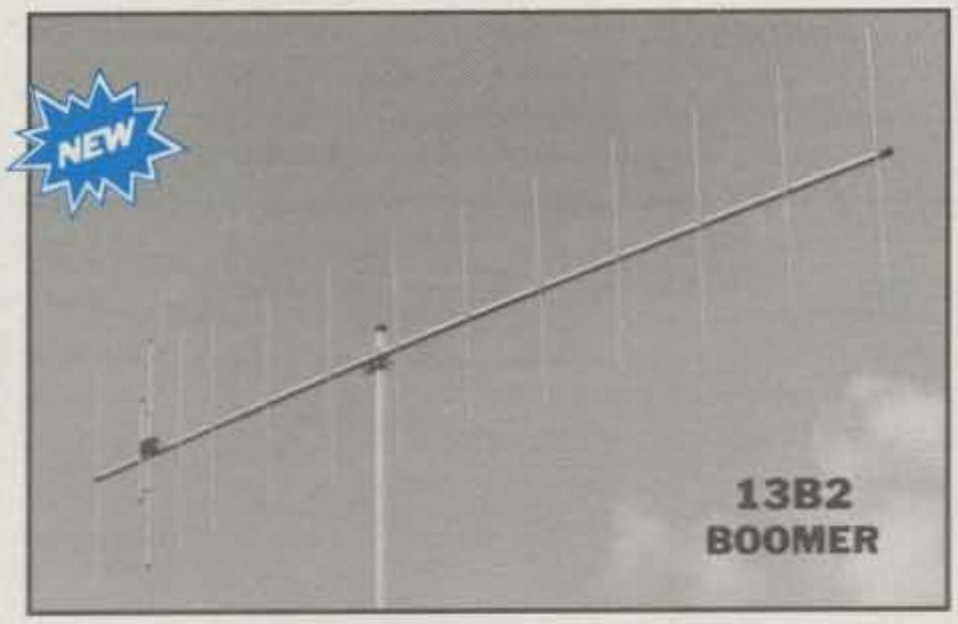
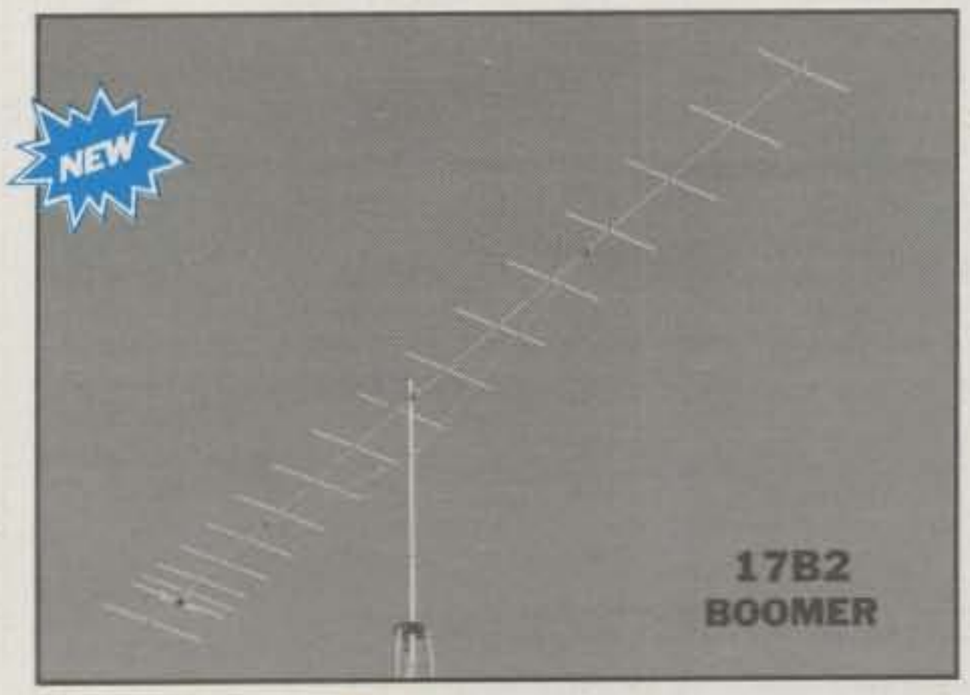
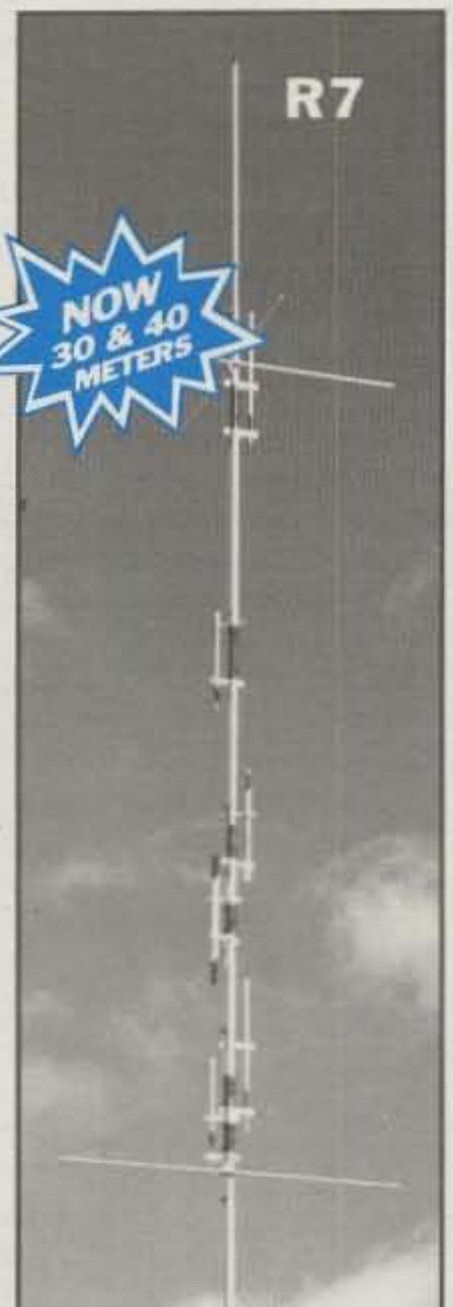
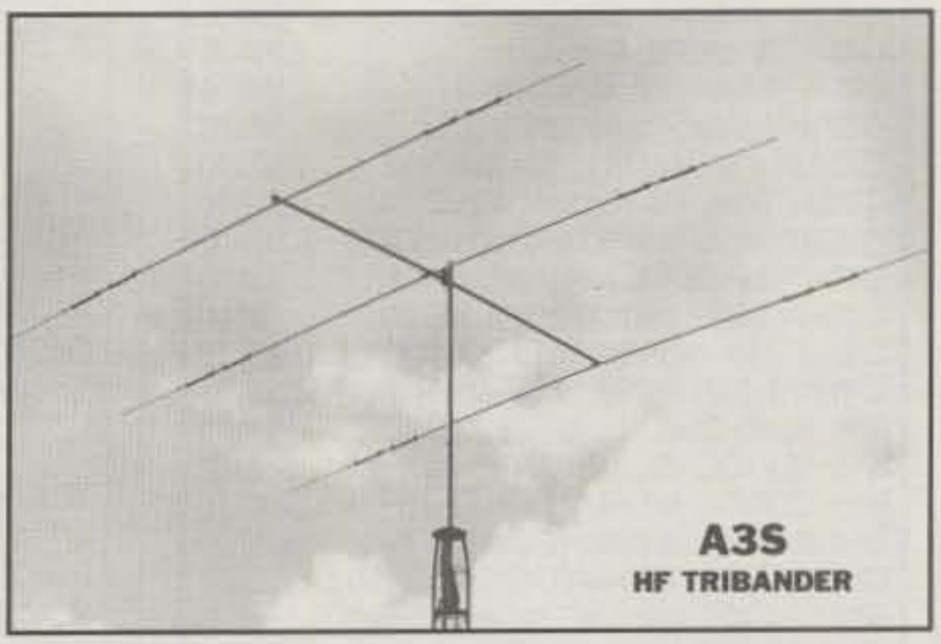


BOOMERS. Two new models. The contest winning 17B2 for EME, Tropo, SSB, CW or the 13B2 for FM, Packet or SSB over the whole 2 meter band. Both models have the new UltraMatch balanced feed system. Computer aided design gives you the cleanest pattern and the highest gain available.



SKYWALKER MONOBANDERS. 10, 15, 20 and 40 meter Yagis for more contacts, less waiting and a better signal. Preferred by contesters and DX-peditions worldwide.





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TOP 5 PERFORMANCES BY CONTINENT
(World High in Bold Print)

AFRICA

SCORE		MULTIPLIERS		CONTACTS	
EA8EA	**11,966,372**	EA8EA	682	EA8EA	5890
EA9LZ	7,901,415	D44BC	545	6V6U	5298
6V6U	7,760,746	ZS6EZ	538	EA9LZ	4959
D44BC	7,756,895	EA9LZ	535	D44BC	4783
ZS6EZ	5,878,726	6V6U	491	ZS6EZ	3698

ASIA

JY8VJ	8,031,168	JY8VJ	573	JY8VJ	4900
A61AC	5,847,840	A61AC	558	A61AC	3736
7Z2AB	4,946,500	7Z2AB	500	BV/K1RX	3543
4X/S59PR	3,928,380	JA5DQH	494	7Z2AB	3416
JHØKHR	3,755,376	4X/S59PR	466	4X/S59PR	3022

EUROPE

S52AA	5,195,440	S52AA	643	EA6ZY	3466
G4BUO	3,983,382	RB5QF	609	S52AA	3208
EA6ZY	3,946,019	G4BUO	587	G4BUO	2854
YU7AV	3,709,604	YU7AV	578	OZ1LO	2586
G3MXJ	3,270,278	YT1AD	572	G3MXJ	2331
		YU7BW	572		

NORTH AMERICA

8P9Z	8,047,212	**N6AR**	**695**	8P9Z	5298
N4RJ	5,851,152	N4RJ	681	VP5T	4903
N2NT	5,705,000	KM1H	646	VD7SZ	3625
KM1H	5,675,756	KN8Z	637	VE3EJ	3308
KN8Z	5,436,795	N2NT	625	N2NT	3140

OCEANIA

9M6NA	5,814,765	9M6NA	495	NH6T	4287
NH6T	5,761,254	NH6T	453	9M6NA	3960
H44IO	3,115,575	VK3DXI	374	H44IO	3477
VK3DXI	1,867,762	VK8AV	366	VK3DXI	1706
VK8AV	1,730,814	YE2C	320	YE2C	1634

SOUTH AMERICA

HC8N	10,773,628	P4ØW	573	**HC8N**	**6028**
P4ØW	9,554,775	HC8N	571	P4ØW	5605
9Y4H	7,960,980	P4ØI	566	9Y4H	4886
P4ØI	7,214,236	9Y4H	554	P4ØJ	4819
8R1K	6,652,614	8R1K	547	4M2BYT	4783

TOP 5 PERFORMANCES BY BAND
(Regardless of Category Submitted)

160 Meters		80 Meters		40 Meters	
4X4NJ	150,882	EA9EA	494,901	EA9EA	1,347,356
ON4UN	118,772	K1ZM	416,160	PJ9U	1,171,864
9A1HCD	82,904	HG73DX	370,062	ZF2TG	1,087,862
ON7TK	81,430	G3KDB	360,822	9A1A	1,063,431
HG73DX	70,960	OE3GSA	359,915	K1AR	975,796

20 Meters		15 Meters		10 Meters	
KØAM	1,391,852	CXØCW	1,818,656	D68GA	1,281,660
EA9EA	1,336,600	CR3W	1,652,170	P4ØX	1,174,032
FY5YE	1,331,327	ZD8LII	1,560,405	EA9EA	1,123,938
7L1GVE	1,181,937	KØAM	1,264,172	CX5BW	988,410
4M5X	1,145,087	EA9EA	1,194,702	XR3A	982,500

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	87/13/43	482/25/65	1155/34/93	1342/36/102	1240/34/96	1584/35/106
HC8N	89/11/26	318/19/46	797/26/62	883/34/84	1826/36/102	2115/33/102
P4ØW	185/13/27	379/19/42	1103/28/82	902/32/89	1388/30/92	1648/29/90
8P9Z	95/12/27	448/20/59	1057/22/76	1395/33/94	1147/31/91	1150/27/81
JY8VJ	53/6/28	251/12/50	1537/27/86	997/31/89	1036/33/90	1026/32/89
9Y4H	223/9/26	350/21/55	1052/33/91	877/31/71	1011/27/77	1373/28/85
EA9LZ	121/6/29	601/17/58	1157/26/80	927/29/75	1087/27/84	1066/29/75
6V6U	23/7/12	243/15.35	823/24/67	1271/29/78	1197/30/85	1740/23/86
D44BC	44/11/21	163/18/42	430/23/75	1030/34/81	1350/32/87	1766/29/92
P4ØI	70/11/21	426/23/63	642/27/76	1032/34/91	938/30/79	1195/30/81

WORLD MULTI-OPERATOR SINGLE TRANSMITTER

ZC4Z	158/9/48	290/16/67	2132/31/100	981/35/118	1236/36/107	749/35/96
IQ4A	65/10/64	274/28/94	1452/40/140	817/39/121	719/38/122	1195/38/126
LZ9A	231/14/68	378/31/98	1593/39/125	893/38/124	1157/37/126	534/35/109
N3RS	44/15/41	138/26/82	1035/36/137	848/39/145	683/37/137	730/33/132
K1KI	48/11/35	304/26/92	1051/36/134	583/38/143	612/36/134	758/33/125
UW2F	314/11/63	848/28/87	936/36/123	1092/37/103	616/33/107	811/36/114

WORLD MULTI-OPERATOR MULTI-TRANSMITTER

EA9EA	318/12/56	1672/20/79	2701/38/129	2745/38/125	2408/36/130	2461/36/117
KHØAM	252/16/21	1095/28/64	1962/35/113	3042/37/117	2818/38/113	2084/36/99
K1AR	106/16/59	726/29/107	1862/37/141	1721/39/156	1584/37/154	1128/34/136
9A1A	530/11/58	1579/27/88	2948/38/131	2076/37/123	1861/39/114	1446/36/118
N2RM	99/18/53	654/30/97	1521/37/143	1688/39/153	1643/37/151	1175/34/139
HG73DX	765/14/66	1557/30/96	2047/40/121	1905/39/138	1774/39/120	1287/38/135

USA TOP SINGLE OPERATOR, ALL BAND

Station	160	80	40	20	15	10
N4RJ	34/13/27	170/21/65	687/34/104	696/27/114	709/35/107	670/32/92
N2NT	38/14/25	297/17/65	922/29/95	587/35/103	610/30/94	686/28/90
KM1H	37/11/26	339/23/64	727/31/94	491/33/92	603/33/107	856/32/100
KN8Z	35/12/24	227/27/66	670/31/90	634/37/103	655/34/98	706/30/85
W1KM	23/9/16	523/30/81	737/31/96	542/33/91	586/31/84	601/28/84
K3ZO	16/7/9	429/24/72	800/36/93	553/32/80	585/30/82	596/28/85
N2LT	25/9/16	171/19/54	717/32/102	402/35/89	736/31/99	631/31/85
W3BGN	47/15/35	263/19/58	593/30/94	432/34/83	593/29/86	553/28/82
N6BV/1	20/9/12	413/19/57	705/25/81	425/35/93	658/27/80	419/25/73
K1ZZ	28/9/18	220/20/58	423/26/91	449/33/96	525/33/104	659/32/99

USA MULTI-OPERATOR SINGLE TRANSMITTER

N3RS	44/15/41	138/26/82	1035/36/137	850/39/145	683/37/137	730/33/132
K1KI	48/11/35	304/26/92	1051/36/134	583/38/143	612/36/134	760/33/125
K1DG	40/14/37	255/23/82	1081/37/130	625/39/125	749/36/135	531/33/122
WW2Y	43/14/41	514/22/83	604/34/117	479/38/121	598/35/119	532/32/114
N4WW	42/16/40	79/24/77	658/36/125	765/39/124	641/33/123	449/33/113
W5WMU	31/13/25	87/24/56	500/35/122	666/38/127	694/37/120	587/33/107

USA MULTI-OPERATOR MULTI-TRANSMITTER

K1AR	106/16/59	726/29/107	1862/37/141	1721/39/156	1584/37/154	1128/34/136
N2RM	99/18/53	654/30/97	1521/37/143	1688/39/153	1643/37/151	1175/34/139
W3LPL	88/18/50	586/28/96	1579/38/144	1587/39/155	1377/37/153	1003/35/138
AD1C	47/12/31	492/19/82	1243/35/119	1478/39/148	1305/36/141	853/34/120
AA6TT	93/23/25	289/25/52	947/35/123	1337/37/122	1184/37/126	861/33/103
KY1H	84/9/27	454/26/85	969/36/126	891/39/123	770/33/118	484/31/104

USA QRM

Looks like there is still some life left on 10 meters . . . *K2MFY*. Had a great time! Difficulty my first time as single band 7 MHz, but had fun . . . *WA2ASQ*. Working from a two-story apartment and not a single TVI complaint! . . . *K7SP*. Although using low power mainly calls for search and pounce, it was a fun challenge trying to hold a frequency to run stations . . . *WA6KUI*. CQWW still the best even for grey beards like myself . . . *N4MO*. Band conditions were great and JA signals were good for a change . . . *WT8P*. First DX contest after being off the air for 10 years. Will computerize the log next year . . . *KW8J*. Too many USA stations calling CQ test and drowning out the DX ststions . . . *W8UMR*. Fifteen meters was great, but where was zone 12? . . . *KK4SM*. Good to QSO so many old friends again . . . *AA7FK*. Using the CT program can really make a difference in the long haul . . . *WB8YSF*. After 27 years I finally break 1 million points and still low power . . . *WA1FCN*. First BV on 80 meters! . . . *W6JTI*. The new Low Power category is great fun for us zoning restricted types . . . *W2TZ*. Computer showed memory full at QSO 526! . . . *W3HVQ*. My last contest as a W3—no rotator, had to run the coax back up the tower to get on . . . *K5ZD*. QSO JA and JT on QRP! . . . *N2CQ*. I got WAC in 2 hours on 40 meters with 5 watts and a rotatable dipole at 30 feet . . . *W8QZA*. I sure admire QRPers. Don't know how they have the patience . . . *KQ1V*. Breaking several pileups with 5 watts and a dipole . . . *K3TW*. Where do they come up with all the strange prefixes? . . . *WAØRPI*. Worked KG6DX long path on 20 meters with 5 watts . . . *N7IR*. QRP with low wire antennas is tough . . . *KY5N*.

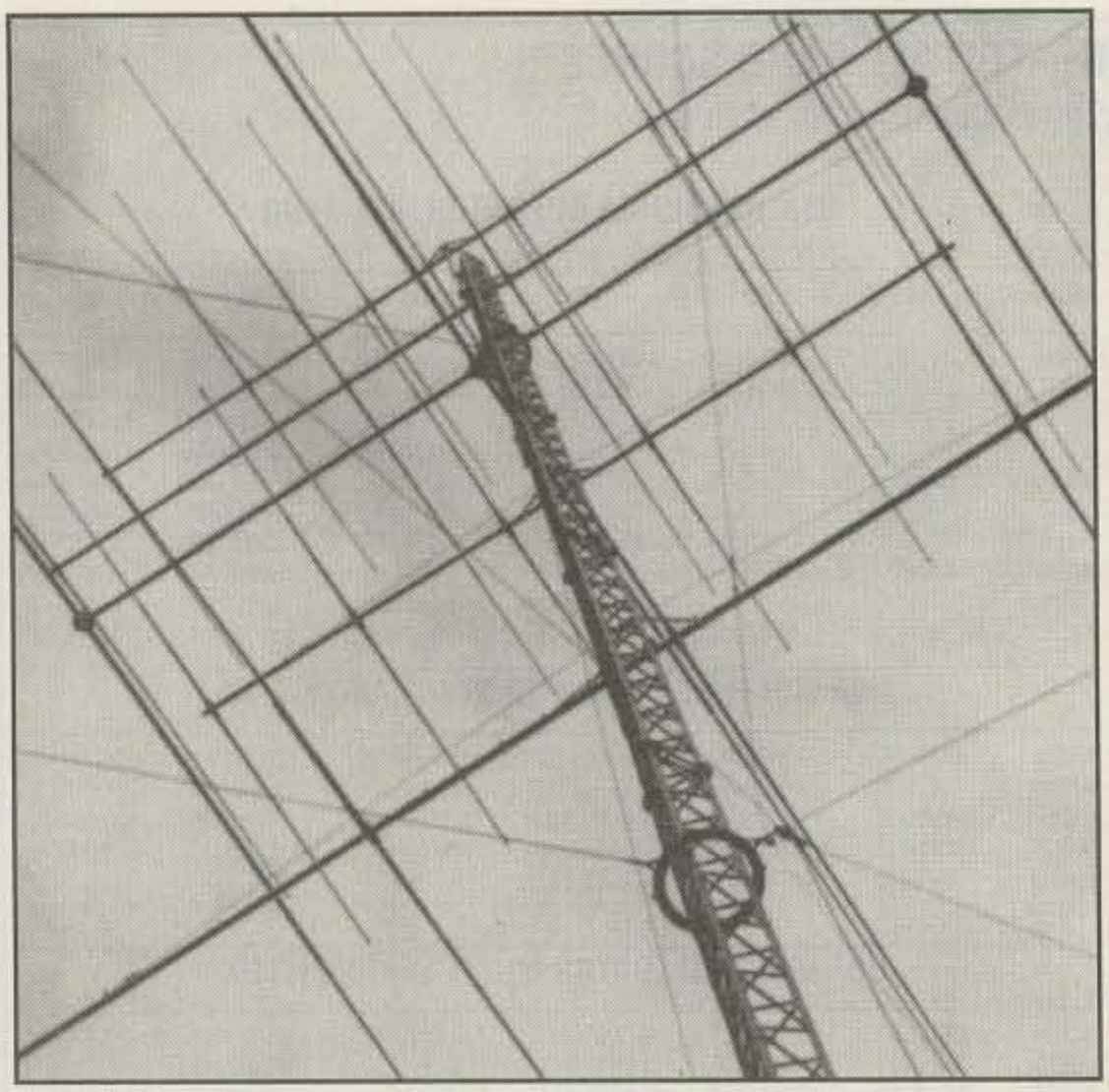
Many thanks for the patience and skill of the operators on the other end of the 20 QSOs I made on 20 meters using less than one watt to a dipole . . . *WB2CPU*. Goodbye old sol; we're going to miss you sorely . . . *NØAX*. Excellent as usual. Need a bigger antenna on 40 meters . . . *K8GL*. For a descending sunspot cycle, this one sure is hanging in there with good conditions . . . *K3ZO*. Conditions were so good that I got caught up with DXing on 80 meters when I should have been running Europe on 15 meters . . . *KM1H (Opr. KQ2M)*. Sure wish Europeans would come through on 160 meters as strongly as the JAs do . . . *K5GN*. Band conditions were great; the less sleep you can live with, the more contacts to be made . . . *W3BGN*. Good conditions again, but not quite as good as during the phone contest . . . *W3VT/4*. Best weekend ever; great time, "Thank you K1EA" . . . *K3JGJ/2*. The best time I've ever had in a contest—5 band DXCC from the USA single operator! . . . *N6AR*. High point: VS6WO calling me during my first ever JA run on 80 meters. Low point: Absence of perennial beacons LU8DQ and G3FXB . . . *W1KM*. It was great to be able to work Europe on 40 well after sunrise . . . *W9UP (Opr. NØBSH)*. Reworking my antenna system was a summer well spent . . . *W1OO*. We are getting closer to being competitive . . . *W8BI*. Couldn't believe the conditions on 160 meters; we had pileups of JAs calling us. Worked 33 JAs on 160 in 26 minutes . . . *W6GO*. We all had adequate rest to be refreshed for the entire contest . . . *N3RS*. Was great to avoid signing portable this year . . . *KN5H*. I'm really surprised by the improved CW operating skills worldwide . . . *KT4W*. How do you spell relief in three words or less? 250 Hz filter . . . *W8SD*.

Thank you, K8UR and W1FC . . . *K1ZM*. Conditions were really down this year on 10 meters. European openings were shorter and the band was closed about 1-1/2 to 2 hours after sunset . . . *W6YA*. Decided two days before the contest to do a single band 80 meter effort. What a great choice. Excellent conditions . . . *K1IU*. Wow! First time in years that single band 20 meters has been fun . . . *K2VV*. Sure am rusty on CW . . . *K1UO*. What a marvelous outpouring of CW from Germany. There must be some live-wire radio clubs to encourage so many new hams . . . *K8MFO*. Why don't more VK/ZLs enter the contest? . . . *N4CT*. It was a thrill to work over 100 countries on 4 bands thanks to the packet network . . . *W1PH*. It wasn't bad enough that I had the flu, Murphy decided that 5 minutes before the contest was the perfect time to eliminate my new super VGA monitor . . . *AA2DU*. Still being able to do the full 48 hours at age 48 . . . *K3WW*. I should have called CQ more and done less DXing the first day . . . *K1VR*.

DX QRM

Too many problems with antennas (after several wind storms) and linears made me to quit the single operator category after 5 hours in the contest . . . *F6BEE*. It was hard to work without a CW filter in the contest, but lots of fun for me . . . *5NØZKJ*. Called VS6WO for 3.5 hours without an answer. Funny, eh! . . . *ES1CW*. Used linear only at daybreak—TVI problems . . . *CX9AU*. Excellent conditions for DX contacts; poor conditions inside Europe so as to increase maximum possible number of contacts . . . *ON4RU*. Conditions were not so good, but enjoyed it very much . . . *JE1REU*. Local QRM the second night made the band very noisy . . . *VK6LW*. My friend WS4E (Scott) and I had planned a large MS operation with the Caracas DX Group, but a military coup the morning of the contest cancelled our plans . . . *4M5X (Opr. WM2C)*. First contest after three years of no activity. It was hard work . . . *T32AF (Opr. KH6UR)*. Thirty years since my first CQWW entry as GI3OTV . . . *EI5DI*. As with each year, a fantastic contest and a crazy battle against propagation and big gun QRM army in which I lost the chance to complete KH6 and zone 31 for my total, but lots of fun . . . *SP5JTR*. Conditions superb on 40 meters on Saturday afternoon, like one of the high bands. KHØ, KH2, and KH9 available at once. Pity I didn't work any of them! . . . *G4ZOB*. Glad to work T32BE for a new one . . . *PA3ELD*. Worked all 40 zones on 40 meter band—broke old European record. Failed 5 band DXCC by only 3 countries on 80 meters . . . *IQ4A*. Our first entry on CW. Had much fun and almost no sleep . . . *DLØCMA*. This year the "big one" was not that big for us . . . *PI4COM*. Best score ever . . . *DJ4AX*. The conditions on 10 meters were good, but not the low band conditions . . . *7Q7XX*.

Lack of power resulted in such a low score on 160/80 meters. Heard a lot of stations, but no QSOs even after schedules from high bands . . . *5Z4TT*. Last-minute entry, but lots of fun . . . *VK3DXI*. I decided at the last minute to put up a quarter-wave longwire for 160 meters—made 71 contacts in 31 countries . . . *DA1AM*. Wow! Smashed my own record and more than doubled my intended score . . . *VO1SF*. It was great fun being called by T32BE, an all-time new one for me on CW, running just 100 watts . . . *OE2VEL*. Test was hard work with only 100 watts, but my strategy of concentrating on multipliers and USA contacts improved my score from last year . . . *GD4UOL*. 8R1K was the easiest multiplier I got. I was eating and listening on a clear frequency when he came on calling CQ . . . *F6FGZ*. Finally the CW section also had extremely good conditions . . . *OZ8AE*. Enjoyed the contest in spite of the fact that I missed lots of multipliers because I could not break the pileups . . . *UX3D (Opr. UA3DBS)*. My apologies to those who were patient on Sunday when my ears were not working anymore . . . *NP2I*. Work a few hundred, go to the beach; come back and work a few hundred more, then go to



The 5 over 5 at 46 meters explains OH4NRC's booming signal on 20 meters—good enough for tops in Europe on that band.

the beach again—tough contest . . . *VP2EST*. My 25-year-old SB200 gave up recently, and a replacement FL2100Z broke down the day before the contest started. Had to go low power with the FT barefoot . . . *PAØLOU*. As usual, the solid wall of big guns sending CQ with too short a pause could not be contacted by low-power stations . . . *C6A/N4RP*.

Thirteen hour power breakdown during 48 hour contest—incredible . . . *KH2S*. First time as a Multi-Single on CW—a lot of problems but big fun . . . *LU7DP*. Thanks to all who copied my weak signal and bad callsign on CW . . . *HA8LKE*. Cut my tendon to my left thumb on Thursday, so I was "single handed." Awkward, but okay . . . *G3LHJ*. Thanks for organizing the contest. Enjoyed it very much . . . *GM4HQF*. Another battle against the big guns has finished . . . *OK1DKR*. Excellent conditions on the top band. Could work almost everything I heard with 5 watts . . . *OK1CZ*. A difficult job between a lot of big QRM cannons . . . *YO5BQ*. My thanks to all the DX stations who responded to me in the middle of a pileup . . . *VE3RHJ*. QRPp is very fun . . . *JH2WIC*. With 4 watts output, nobody heard my CQ . . . *DL1EFW*. First South America from this QTH . . . *JA4XHF/3*. CQWW is different. Due to the large number of powerful signals from all continents, a low-power station must search for the QSOs . . . *G3DYY*. Second day, good conditions on 40 meters . . . *PAØTA*. I think I should try more contests in QRP on 20 meters . . . *DL4OBJ*. Very QSB and QRM in test . . . *ZZ4W*. I have to use a lot of willpower to copy these high-speed CW signals . . . *PA3FSC*. Seven hour power outage didn't help . . . *D44BC (Opr. N6TJ)*. Jane was born 3 days before WW and operating time had to be reduced to 18 hours only . . . *H21A (Opr. 4N4OO)*. This was my first WW contest from my new country and new call . . . *9A2AJ*. Never had so equally good conditions on all bands in the 30 years of my participation in the CQWW DX Contest . . . *DJ5JH*.

Strategy to QSY to get new multipliers. It was very important and interesting to me . . . *5U7M*. Very good conditions on the low bands . . . *YU7AV*. First time using a computer for the contest. It is very useful, hi . . . *YU7BW*. I enjoyed contesting with a new high tower for low bands, but I didn't stay up two nights after a business trip . . . *JA8RWU*. I am very pleased that someone remembered my name on CW . . . *JF1SEK*. I was on DXpedition to Moldavia from my home callsign RB5FF . . . *ROØF*. It's good to be needed—KHØ and TU asked me to band hop . . . *XE1/AA6RX*. It might be a help to list the multiplier prefixes when announcing the contest . . . *HZ1HZ*. Twenty-six thousand kilometers by train for 20 days . . . *JT1/UA3DK*. Pleased to make new JA all-time record . . . *JHØKHR*. P4ØI will come again! . . . *P4ØI (Opr. OH3JR)*. Great conditions and great competition in a great contest . . . *P4ØW (Opr. W2GD)*. What a fun event! Conditions this year, especially on 40 and 80 meters, were probably the best I can ever remember . . . *G3UFY*. Thanks a lot to Klaus (JY9VC) and Heidi (5B4TE) for their great hospitality . . . *JY8VJ (Opr. DL1VJ)*. Conditions were better than last year . . . *JR1IJV*. God probably had a celebration—new prefix, new country, perfect conditions in Slovenia . . . *S52AA*. Coup d'etat in Venezuela Friday morning prevented me from sleeping, which caused me to fall asleep several times on Sunday morning . . . *4M2BYT*. Mr. Murphy suddenly visited me on Saturday afternoon after about 4 years' absence when my 4-element Yagi for 10 meters was destroyed . . . *UT4UZ*. What a thrill making contest QSOs on 80 and 160 meters for the first time for BV on CW especially . . . *BV/K1RX*. The contest was overshadowed by the death of Al Slater, G3FXB, a couple of weeks earlier. Had a half hour conversation with him on the evening before he died, and there was much talk of plans for this contest . . . *G4BUO*. The biggest thrill was to finish scoring by hand in time (CT logging not available in time) . . . *JA1NUT*. Never thought a trap vertical could be so much fun . . . *FS/AI7B*. What are we going to do for an encore in 1993? . . . *VE3EJ*. Too much DX on all the bands. Hard to to decide where to go . . . *DL7MAE*. Superb conditions on all the bands . . . *EA6ZY (Opr. N6RA)*. Worse than the pileups were the flea invasions I had to fight during the afternoons . . . *ZV5A*. A 48 hour CW paradise . . . *ZS6NW*. The DX signals of LU8DQ and G3FXB will always be missed . . . *KG6DX*. This is my record on 7 MHz . . . *JAØKAZ*. I think the CQWW is the best contest . . . *UL8GO*. Didn't figure on S-5 power-line noise in paradise . . . *J33A (Opr. KJ4VH)*. I think I worked a pileup for the entire first night (16+ hours) . . . *V73C*. This is my second DXpedition and I hope to make many more . . . *ZF2TG (Opr. WQ5W)*. My first ever DX contest expedition, and I broke the old World record by 190,000 points! . . . *PJ9U (Opr. OH1VR)*. I always enjoy the contest . . . *LY1DS*. Before the test started, I bet a dinner with EA7TH, but his neighbor made him change his mind (lots of TVI) . . . *EA7KW*. I really wanted to go on 40 meters, but the fear of missing a new country on 160 meters kept me on that band . . . *ON4UN*. Too bad that many stations were not active on the top band . . . *4X4NJ*.

No conditions on Sunday morning . . . *OH2BA (Opr. OH6UM)*. Conditions were excellent the first night . . . *VE6JY*. CQWW still the very best . . . *OZ7HT*. Many thanks for this fine contest with rare DX and new friends who are contest men . . . *UA9AT*. The vertical and beverages are really working well . . . *ON7TK*. Conditions were great, but I didn't find a recipe for how to get through the USA and JA pileups to the Pacific . . . *S59UN*. First CW contest I have entered for some 20 years . . . *G3KMA*. It's a pity I broke my linear Sunday morning. I finished barefoot . . . *FM2GO (Opr. FB1MUX)*. Unbelievable—40 meters was like 20 meters . . . *DF3CB*. Big multipliers always a big pleasure, and I felt it . . . *UT2L*.

STATION OPERATORS
Multi-Operator Single Transmitter

AA1K & K3WJVM, WN3K. **BY4SZ**: BZ4SAB, BZ4SBA, BZ4SBD, BZ4SBE, BZ4SBF, BZ4SBG, BZ4SBH, BZ4SBP. **DA1WA**: DA1DC, DL1AO, DJ1MU, DJØHB. **DA2UK**: Club. **OE1XTU**: OE1TKW, YU4JJ/OE. **DFØRR**: DL7AEN, DL7USA, DL7ON, DL7SI, DL7AKC, DL7FV, Y44NO, Y24AO. **DJ4AX** & DF7YE, DJ4PT, DK4TP. **DKØMM**: DJ7IK, DJ8WL, DJ9CB, DL8OBC, 4N4MX. **DLØCMA**: DL4EBN, DL8OBD, DL2EBX, DL1EDB, SWLs. **DLØSSB**: DL1EFO, DK7FP, DL9XY. **DLØTUD**: DL6DVU, DL6MUG, DL6UEG, DL8UWG. **DLØUM**: DL2ZAE, DL6HCO. **DLØWH**: DF4IK, DF6IH, DF3IAC, DF2IC. **DLØWW**: DK3GI, DK9IP, DL1IAO, DL6NCY. **DL1MFL** & DJ1OJ, DL5MFF. **DL2GGA** & DL4GBX. **DL2HTO** & DL6UST. **EA3KU** & EA3LL, EA3FER, EA3DU, EA3AVV, EA3AIR. **EI7M**: EI6BT, EI4BZ, EI3DP, E5HB, EI9HC. **FO/SM5NZY**: SM5NZY, SMØKAK, SMØLCB. **GØFOS**: GØLUJ, GØCLY, G4KIV.

G3LZQ & G4BYG, G4DRS. **G3OZF** & G4DQW, GHØHSD, GØLMX. **G3SSO**: G3LVP, G3ZRJ. **G3XMZ** & G3YBT. **GB5DX**: G3JKS, G3NOH, G3OUF, G3RTE, G3UJV, G4DJX, G4JKS, JA1IST. **GU3HFN**: GU3MBS, GU4WRP, GU4SXM, GUØJCI, GU4EON, GU4YOX, GU4WTN, GUØGWJ, GU7LSX, GU6RWD, GU6TLQ, GU7DHI, GU3NHL. **GX3PRC**: GØIVZ, G4HTD, GØJNZ, G4OFR. **HA3KNA**: HA3OU, HA3OV, HA3NU, HA3NS. **HA8KCK**: HA8EK, HA8FW, HA8KH, HA8DZ, HA8FT, HA8DT. **HG1S**: HA1TJ, HA1DAC, HA1TW, HA1DAE, HA1AH, HA1TD. **HG6Y**: HA6KNV, HA6IOB, HA6OA, HA6OB, HA6NG, HA6OY, HA6OO, HA6OI. **HZ1AB**: SMØCXU, KM4E, W8UD. **II2A** & I2VXJ, IK2EGL, IK2GSN, IK2GXK, IK2MMF, LZ1NS, IK2FYH. **IK3QAR** & IK3DBH, IK3HUK. **IQ4A**: I4EAT, I4ICT, I4IKW, I4IND, I4LCK, I4TJE, IK4DCT, IK4EWK. **JA1ZLO**: JO1LWF, JJ1MED, JN2MRJ, JF3TBL, JG4DDN, JR5KDR.

JA3ZKK: JH4PUL, JR4VQW, JG3SXR, JM3ILK. **JA3ZNJ**: JA3MQY, JA3OMA, JH3KCW, JF3OLL, JN3ANO. **JA6YCL**: JF4CZL, JE6UWK, JF6KPD, JI6MYW, JL6UOM, JL6WED. **JA7YAA**: JF1CKX, JF1PQT, JQ3GKN, JE7JZC, JG7PSJ, JEØAWL. **JE2YHS**: JA2OLJ, JE2WWB, JR2JJR, JG2NUD. **JE6ZIH**: JR6GKT, JF6DEA, JI6BRB, JG4KEZ, JA6QJG. **JH5ZJS**: JA5BJC, JA5CJZ, JA5FDJ, JA5JCC, JH5FXP. **JT1T**: JT1CD, JT1BL, JT1BX, JT1CF. **K1DG** & K1XX, K1TR, K1ETT, W2IR, N1RC. **K1KI** & K1CC, K1TO, W1OD, K5FUV. **K2QMF** & AA2FB. **K2SG** & others. **4U1VIC**: DL6RDR, DJØIP, DL2MEH, DL1GGT. **K2TE** & NE1V. **K3CP** & K3YD. **K3DI** & WD4IEH. **K3TEJ/KP4** & WA3WSJ, W8HNI. **K4FW** & W9VW. **K4LTA** & N8UM, N1CWR, W4TYU, K6SV, WM4U. **K6XT** & N6ND. **K8LX** & N8EA, WA8ZDT. **K9GR** & N9OFD. **KA6NAL** & WK6V, KF6HI, N6NW. **KF7AY** & W7IVB, KG7XC.

KH2S: JA8RUZ, JF3EIG, JH4RHF, JHØUSD, JI3ERV, JI3OPA, JJ1JMC, JR4DUW, JR4ISF, JR4PMX, JR7MZC, JRØBQD, KH2D. **KN2M** & WA2MBM, WB2ABD, KB2NMV. **KO4WE** & others. **N1AU** & WM1K, WC1D, WA1TTV. **KS3F** & NE3F, NK3Z. **KS9B** & NA9J, K9LJN, KS9O, KB9BIB, WEØB. **LA8SDA** & LA4DCA. **LU7DP**: LU2DPW, LU6EF, LU7DW, LU7EE, LW2DFM. **LX/DFØBK**: DL8SCG, DL4SDX, DL4SDW. **LY4W**: LY2BIJ, LY2BKW, LY2BMW, LY2PX. **LZ6G**: LZ2HM, LZ2YF, LZ2XP, LZ2FU, Emil, Dilyan. **LZ9A**: LZ2HE, LZ2DF, LZ2CC, LZ2PO, LZ2WF, LZ2BE, LZ2XA, LZ2II, LZ2FS, LZ3BB, LZ2UU, Stefan. **N3BNA** & KD3CN. **N3RS** & N3RD, N3ED, WA3LRO, NW3B. **N4AR** & N4TY, N4OBW, K4FU, NJ9C. **N4WW** & KØLUZ, WA6DGX, K1ZX/4, WC4E. **N8DPH**: Club. **NCØP** & NUØQ, AJØI, WRØG, NØSM, WAØFLS, WDØGVY. **NK7U** & NI7T, AA7NX, N7BZ.

NN3Q & K3ATD. **OH2BSI** & OH2BSS, OH2MBB. **OH2HE**: Club. **OK2KDS**: Club. **OK2KOD**: OK2BDI, OK2BGR, OK2BNX, OK2PID. **OK3KAG**: OK3CIR, OK3DX, OK3TRU, OK3TWR, OK3TZI, OK3ZFM. **OK3KCM**: OK3NA, OK3CBU, OK3CKX, OK3CBA, OK3TDP, OK3TUC, OK2PZW. **OK3KFO**: OK3PC, OK3TNU, OK3TGT, OK3IQ. **OK3KUN** & OK3CTX, OK3TME, OK3CND, OK3TMI. **OK3KXR**: Club. **LA1K**: LA4OFA, LA7IHA, LA8UGA. **OK5W**: OK1EAZ, OK1CF, OK1TA, OK1WT, OK1JJB, OK1JKT. **OL3A**: OK1AYP, OK1ICM, OK1IMR, OK1VKX, OK1DLE. **ON6AH** & ON5PV, ON6MH, ON6QR,

John, WB8YJF, finished second in W8 land in the All Band, Low Power category.

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Society of Midwest Contesters	52,819,234
Southeast DX Club	51,076,362
North Texas Contest Club	46,947,215
Mile Hi DX Association	45,352,905
Mad River Radio Club	32,237,860
Texas DX Society	25,713,788
Dixie DXers	22,165,966
Minnessota Wireless Association	18,017,458
Kentucky Contest Group	16,587,388
Central Virginia Contest Club	15,120,314
North Florida DX Association	13,479,466
Central Florida DX Association	13,046,403
Western Washington DX Club	11,826,857
River City Contesters	10,985,262
San Diego DX Club	10,900,021
Boiled Owls of New York	10,786,094
Left Coast Contest Club	10,737,450
Hicks	10,619,490
Rochester DX Association	10,196,357
Southwest Ohio DX Association	9,926,377
Grand Mesa Contesters	9,329,994
Snake River Contest Club	9,274,826
Western New York DX Association	9,047,569
Group DX Panamericanos	8,542,139
Mississippi Valley DX & Contest Club	8,498,642
Cascade Contest Club	7,872,124
Willamette Valley DX Club	7,522,328
Southern California DX Club	7,460,138
Eastern Iowa DX Association	7,304,725
Tri County DX Association	7,099,190
Albany Amateur Radio Association	6,228,802
Hoosier Contesters	6,128,768
Salt City DX Association	5,516,767
Northern Ohio DX Association	5,461,226
Kansas City DX & C Club	5,360,131
Blackhawk DX & Contest Club	4,493,246
Long Island DX Association	4,140,295
Falmouth Amateur Radio Association	4,128,353
Northern Illinois DX Association	4,026,490
Lone Star DX Association	3,952,733
South Florida DX Association	3,808,888
Central Arizona DX Association	3,636,451
Sturdy Memorial Hospital	3,242,135
Carolina DX Association	2,967,796
Western Carolina A R Society	2,943,836
Northern California DX Club	2,735,301
Madison DX Club	2,225,545
Splitrock Amateur Radio Club	2,053,923
Shasta DX & Contest Club	1,698,072
New Jersey DX Association	1,565,343
Arrowhead Radio Amateur Club	1,530,455
WACO	1,357,843
Saginaw DX Group	1,253,081
Four Lakes Amateur Radio Club	1,231,856
Metro DX Club	1,056,323
Oklahoma DX Club	1,015,479
Murphy's Marauders	865,003
Wichita ARC	783,623
Amarillo DX Society	771,452
Woodbridge Wireless Association	707,556
Sterling Park Radio Club	634,062
Northern Alabama DX Club	623,252
West Coast DX Ring	514,385
No Dot DXers	495,835
Redwood Empire DX Association	420,147
Middle Tennessee DX Club	408,080
Ocean Monmouth Amateur Radio Club	394,729
Southern Oregon DX Association	383,665
Great Dismal Swamp DX Association	383,308
Dauberville DX Association	355,765
West Park Radioops	291,911
Utica Amateur Radio Club	290,196
Schenectady ARA	214,098
Hamfesters Radio Club	159,764
Santa Barbara Amateur Radio Club	66,317
Code Fignueton Contest Club	63,341

DX CLUB SCORES

Rhein Ruhr DX Association	99,148,797
Bavarian Contest Club	94,274,019
OH DX Ring	32,934,148
Slovenian Contest Club	30,010,266
Kaunas Technical University	24,702,929
Alaska DX Association	21,553,600
Kaliningrad Radio Club	19,777,310
HA DX Club	19,317,945
Lynx DX Association	17,691,521
British Colombia DX Club	17,227,800
Japan Crazy Contesters Club	14,604,126
Chiltern DX Club	13,312,239
Araucaria DX Group	11,148,431
Vojvodina DX Club	10,536,333
Amateur Radio Association of Sept Iles	9,858,795
Kiel Channel Activity Group	8,020,317
Kiev Radio Club	7,654,563
Prie Neries	6,626,186
Moscow DX Club	6,090,679
Kvarnberget	5,811,315
Diego Garcia Amateur Radio Club	5,371,948
Top of Europe Contesters	5,272,064
SP DX Club	4,493,762
YU7BCF	4,193,952
Winnipeg DX Club	3,852,246
Ukrainian Contest Club	3,321,039
French DX Foundation	3,315,939
TUPY DX Group	3,034,962
Bavarian DX Group	2,881,285
Contest Groupe of Oude Maas	2,867,525
Uruguay DX Club	2,861,072
Radio Amateur Soc Thailand	2,753,334
Eastern Canada DX Association	2,670,910
Association of Peruvian DXers	2,550,679
Cuernavaca Amateur Radio Club	2,283,296
Radio Club Varadzin	2,003,983
Radio Club Venezuela	1,874,616
Koryazhma DX Company	1,763,902
Marianas Radio Club	1,717,272
Equator Club	1,559,925
Radio Club Chile	1,441,560
Tartu Radio Club	1,394,899
Veron	1,345,629
Lithuanian Contest Group	1,309,778
Danish DX Group	1,257,892
East Highlands Amateur Radio Club	1,136,921
Santa Barbara Contesters	1,086,126
Northern Lithuania Contest Group	878,956
Mid Bedfords Contest Group	837,417
Perugia DX Club	814,289
Radioamateurs of Luxemburg	802,225
Radio Club Tallinn	725,990
U. of Radioamateurs of Barcelona	609,707
OH3NE	508,821
SKØMK	434,989
OEVSV	374,992
Taganrog Contest Club	351,336
Fox Radio Club	315,238
Noviomagnum Club	269,352
Ham Society of the Philippines	221,528
SP8KEA	173,074
Satsuki Ham Club	162,041
Virgin Islands Amateur Radio Club	133,895
Radio Club Subotica	98,261
YV DXperts	85,050
Tokyo International ARA	81,654
MONS	12,453

ON6VL, ON7ZV, ON7PC, ON9CMB. **OT2D**: ON1AWB, ON4ABW, ON4AEW, ON4ALC, ON4AML, ON4AWU, ON4DB, ON4EX, ON4WD, ON5FF, ON5AT, ON5SH, ON5UM, ON5WL, ON6EV, ON6MR, ON7CS, ON7SF. **OZ5EDR**: OZ1BFM, OZ5ABD, OZ5ABN, OZ5LH, OZ8SW. **PAØKHS** & PA3ENJ, PA3EYZ.

PI4COM: PA3BUD, PA3BBP, PBØAIU, PA3EWM, PA3CAL, PA3DMH. **PI4ZLD**: PA3EOB, PA3GCU, NL-8884. **R6Y**: UA6YHF, RA6YY, UV6ADE, UV6AEW, RA6AX, UA6-1Ø1-29ØØ. **RB4IYJ**: UB5IAN, UB5-Ø73-3972, UB5-Ø73-4364. **RK3A**: UA3ABJ, UA3-17Ø-126, UA3AO, UA3-17Ø-1169, UV3AEV, UA3-17Ø-79. **RK3B**: UA4POL, UA3AGW, UL7IDX, RV3DAZ, Alex, UV3DCX, RV6HM. **RL5P**: UL7PAE, UL7PCZ, UL7PBD, UL7PIJ, UL7PL, RL7PLY. **RW9C**: RA9CU, UW9CK, UW9CZ, RW9CZ. **S55AA**: S53BM, S53EO, S53VV, S55AA, S53WW. **S79S**: K1XM, KQ1F. **SKØHB**: SMØSYP, SMØTHN, SMØHEP. **SKØUX**: SMØDRD, SMØJHF. **SK5AA**: SM5ACQ, SM5FUG, SM5LNE, OK1NR. **SK7JD**: SM5OJH, SM7NAS, SM7SRC, SM7HQD, SM7EWG. **SP3KAU**: SP3SLU, SP3XBB, SP3DAH. **SV1SV**: SV1JA, SV1LV, SV1ME, SV1MF, SV1NA, SV1SB, SV1SQ, SV1BDO, SV1BKE.

TM5SA: F1NYQ, F6EEM, F6IMS. **TM5V**: F8VQ, F6HBR, F6IIE, F1HEW, F1OBK, F1OTZ, F1TFP, FC1PCS. **TM9C**: F5IN, F6ARC, F1LGE, F5QF, F6DZS. **UT4JWC**: UT5-187-168, UQ2-Ø37-391. **UW2F**: UA2FF, UA2FZ, RA2FA, UA2-125-767. **UX1A**: RV1AO, RV1AW, RW1AC, UA1ABR, UA1AIU, UA1ARL, UA1BX, UT5UGR, UV1AA, UW1AE, UA1-169-823, UA1-169-2475. **UZ1AWO**: UA1AQF, UA1-169-2391, UA1-169-9ØØ. **UZ1OWZ**: UA1-113-244, UA1-113-298, UA1-113-63Ø. **UZ3GXL**: RA3GX, UA3GHL, UA3GBC. **UZ3GYM**: RW3GM, RA3GJ, RV3GJ, RA3GAA, UA3GAF, UA3GAV, UA3GFQ, UA3-137-1Ø53. **UZ4HXX**: RA4HRL, UA4HOX, UA4HVX. **UZØCWW**: UAØCHW, UWØCR, UAØCF. **UZ4LXD**: Club. **YT1R**: Club. **GS4TMS**: Club. **UZ9AWN**: RA9AQ, RA9AX, RA9ANR, RA9AMT, UV9AAA, UA9-165-282Ø, UA9-165-2821. **UZ9XWH**: UA9XLZ, UA9XJV, UA9XFY. **VD7SV**: VE7AGC, VE7AHA, VE7CT, VE7VR, VE7CC, VE7SV, VE7XR.

VE1RNS: VE1AI, VE1JMM. **VE6AO**: VE6AMR, VE6AJL, VE6GHM, VE6TFM, VE6GLR, VE6KC, VE6GUN, VE6COD, VE6CIZ, VE6CGY. **VQ9IO**: VQ9KC, VQ9MW, VQ9QM, VQ9RB, VQ9YA. **WØCP** & K9AY, KØEU, N3SL, WØCP. **W1BK** & WA1VAR, K1TXH. **W1OO** & W1FJ, K1JKS. **W1XE/Ø** & KRØU, WØKEA, NØOCC. **W2UI** & N3KR. **W3GG** & WD3I. **W5WMU** & AC5K, K5GA, K5LZO, KZ5D, N5IVF, N5RP, W5ASP, W5XZ. **W6GO** & AA6WJ, KF6A, N6IG, NB6G. **W8BI**: Club. **WD8LLD** & KU8E, N8JEC, W8XM, WD8AUB. **W9KDX** & K9RN, KS9W. **WA6IET** & W2KVA. **WA8TOB** & KK8J. **WE1B** & WF1L, KA1EUX, WA1LNP, WY1A. **WU3A** & NS2K. **WW2Y** & K2WI, N2NU. **Y33VL** & DL2DXA, DL5DQZ, DL6DQB, DL8WAA, Y33UL. **Y38I**: DK9FE, DL1AWI, DL3APO, DL5XU, DL9AWI. **YL1ZR**: YL3AD, YL2QD, YL2IP. **YU7BCF**: Club. **ZA1A:** ZA1E, ZA1J, ZA1M, ZA1S, ZA1Z, ZA1AB. **ZC4Z**: G3SXW, GM3YTS, K5VT, K7GE, KC7V, N7BG. **4N7M**: YT7AC, YT7TY, YU7AM, YU7AL, YT7NW, YU7RW, YU7XL, 4N7MRN. **9A5D**: 9A2FK, 9A2TL, 9A3VM, 9A3AM, 9A2QH, 9A3NY.

STATION OPERATORS
Multi-Op Multi-Transmitter

AA6TT & WA6OTU, AI9X, AA5B, AB5K, OH6DO, F1JTL, N2PC, AD5Q, NØST, N5SDO. **AB2E** & WT3Q, NU3Y, KC3NE, WG3T, WE3E. **AD1C** & K1FWE, K1MNS, K1TWF, K1ZYW, KT1O, NV1J, NW1U, NX1G, NX1H, NX1P. **DF3QG** & DJ1FC. **DF9CY** & DL9LBI, DJ5AZ. **DLØCS**: DD7LO, DF1LX, DF4PA, DF5GX, DF7RX, DF9LJ, DK1PD, DK2OY, DK4LI, DK4VW, DK6WL, DL1LAA, DL2HBX, DL3LAB, DL2LBP, DL3EBY, DL4MCF, DL5LS, DL6LBB, DL6RAI, DL9LBA, UA2FJ, UA2FX. **DLØKF**: DF3LP, DL3LBX, DJ4SO, DJ6TK, DJ7SW, DL8LBM, DJ9MT, DL2KUN, DL8KUA, DJ4FZ, DK7XS, DL2ZT. **DLØWU**: DJ8UV, DL4DAB, DF5JB. **EA9EA**: EA1AK, EA4BB, EA4KA, EA4KR, EA5RS, EA7PN, EA7TL, EA7CEZ, EA7GZJ, EA9EO, EA9GK, EA9TY. **EZ6L**: UA6LC, UA6LV, UA6LFG, UB3IW, UV6LPL, UA6-15Ø-1Ø6Ø, UA6-15Ø-1Ø7Ø, UA6-15Ø-11Ø3, UA6-15Ø-14Ø3.

GB5CW: G3SZA, AA6MC. **GW8GT**: G3OAY, G4VXE, GW4LXO, G4IFB, G3SQX, G4BKI, G4BLX, G3LNS, G3NKC, G3SJJ, G3XTT, G4FAM, DL1EFD. **HG73DX**: Operators from HG3DXC, HG5A, HG6N, and HGØD. **JA1YDU**: JHØNZN, JHØLFE, JO1RUR, Takagi, JRØJFM, JF7TFK, JS1ACQ, JE1REE, JG3AXP, JO1BRW, JI2UYK, JJ3OLZ, 7L1GUE. **JA1YXP**: JQ1UXN, JS1INN, JE1BHJ, JI2KRK, JI7QPV, 7M1DVT, 7N1IAP, JF1QOW, J. Nakamura, JJ1OJG, JS1XEX, 7N1SYP, JP1AEQ, 7K1QOE, JFØEWJ, JS2XHN, JI6WOH. **JA3YBF**: JF3HXJ, JH3NFZ, JL3AKW, JL3RQH, JO3BMB, JO3LDN, JF4FUF, JG4CLV, JA9TOZ, JH9GRM. **JA3ZOH**: JE3MAS, JF3DRI, JG3KIV, JG3ODG, JH4IFF. **K1AR** & K1EA, K1GQ, K1MM, K1MEM, W1RM. **K2TD** & WB2YQF, WB2R, WB2VCV. **K3II** & NA3K.

KHØAM: JE1CKA, JI1QPU, JK1GRI, JP1OGL, 7K1PTT, AHØK, JE2JCV, JK2PNY, JL2TZC, JA7RHJ, JE7BIZ, JR7OMD, JA9SSY, JA9VDA. **KY1H** & KB1W, NQ1R, KJ4KB, NJ1T, KM1P, NB1Y, NT2X, NS1M, WA1ZAM, KR1R, NU1P. **KY3N** & WB3LFZ, WB3FIZ, WU3M, NF2L, NN3C. **LU4FM**: LU5UL, LU5UAI, LU2UDS, LU6EBI, LU6UO, LU5EW. **LY7A**: LY2NK, LY2OO, LY2BFN, LY2BMX, LY2BUH, LY3BN, LY3BBC, LY1DI, LY1DF, LYR-346, LYR-1751, LYR-1853. **N2RM** & N4HY, KA2AEV, WA2STM, KZ2S, N2AA, K2TW, K3UA, KR2J, W2RQ, WM2H, KB2BF. **N6CQ/3** & NY3G, WF3T, WD3U. **N6DX** & AA6AA, AC6T, AD6C, AE6E, KA6LAF, KY7M, N6IC, NY6Y, N8SR, N6VR, WA6CDR, WB6SHD. **NL7G** & AL7BL, KL7PJ, KL7U, KL7Y, KR8V, N7DF, NL7G, NL7GP, NL7VJ, WL7E. **NQ4I** & AA4GA, AA4VD, KB4GID, KC4QCW, WI4R, WØMHS, KØDI, KF4CI, KB4HZ.

OG4NVX: OH4MFA, OH4NWW, OH4NVX. **OHØW**: OH1EH, OH1MDR, OH1NOA, OH6EI, OH6LI, OH6LK, OH6YF, OH8MCT, OH8PF. **OZ4HAM**: OZ2JZ, OZ2ADY, OZ8PER, OZ5ACG. **OZ5WQ** & OZ3ZW, OZ3PE, OZ1BIZ. **RY1I**: RB4IZ, UB3IO, UB3IM, RB4II, UB5IUA. **VE2CSI**: NI8L, K8NZ, WR3G, VE2BQB, VE2XY. **VE7ZZZ**: VE7AV, VE7DP, VE7EQZ, VE7QO, VE7RBL. **VS6WO**: NA9D, WX3N, AG9A, WX9E, K4VX, VS6BG, VS6UW, VS6WV. **WØAIH** & KØFVF, KA9FOX, KØTG, WAØRBW, WBØADO, WWØJ, KMØO, NB9C, WØUC. **W3LPL** & K1DQV, KA1GD, ND3A, N3GB, K3NA, KF3P, WZ3Q, K3RA, N3RR, K3SO, WR3Z, N4QQ, KE9A. **W4MYA** & N4ND, WA4DAI, KD4HEL, K4BAM, WA4PGM, Vicky. **W6BA** & N6AV, N6AW, K7JYE, NF6H, NC6U, N6MU. **W6BA** & N6AV, N6AW, K7JYE, NF6H, NC6U, N6NU. **WB2P** & K3OO. **ZM2K**: ZL2BI, ZL2IN, ZL2IR, ZL4OY, ZL4SS, ZL2ACU, ZL2AGY, ZL1AIZ, ZL2BSJ.

9A1A: 9A2SD, 9A2PA, 9A2MP, 9A2RA, 9A3FI, 9A2YW, 9A2NO, 9A2CT, 9A2QS, 9A2EU, 9A2HO, 9A2NJ, 9A2AW, 9A2OS, 9A2MY, 9A2NJ, 9A2DQ, 9A2MM, 9A2OH, 9A6ABX, 9A3GW.

ZONE LEADERS SINGLE OPERATOR

Zone	Call	Score	Zone	Call	Score
1	AL7CQ	314,160	21	A61AC	5,847,840
2	VO2WL	2,036,438	22	No Entry	
3	VD7SZ	3,955,605	23	JT1/UA3DK	1,789,284
4	VE3EJ	5,011,815	24	BV/K1RX	3,421,748
5	N4RJ	5,851,152	25	JHØKHR	3,755,376
6	XE1/AA6RX	2,723,870	26	No Entry	
7	HP1AC	304,304	27	KG6DX	694,944
8	8P9Z	8,047,212	28	9M6NA	5,814,765
9	P4ØW	9,554,775	29	VK8AV	1,730,814
10	HC8N	10,773,628	30	VK3DXI	1,867,762
11	PTØF	4,971,754	31	NH6T	5,761,254
12	XR3A	982,500	32	ZK1TB	477,615
13	CXØCW	1,818,656	33	EA8EA	11,966,372
14	EA6ZY	3,946,019	34	No Entry	
15	S52AA	5,195,440	35	6V6U	7,760,746
16	UB7W	2,709,504	36	ZD8LII	1,560,405
17	UA9XEN	428,792	37	C9RJJ	3,108,266
18	RWØAB	1,291,980	38	ZS6EZ	5,878,726
19	RAØFB	102,114	39	D68GA	1,281,660
20	JY8VJ	8,031,168	40	JW9XG	1,647,992

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 1992 contest. The 1993 contest and results will reflect political changes since that time.)

CW RESULTS
SINGLE OPERATOR
NORTH AMERICA

UNITED STATES OF AMERICA

KM1H	**A**	**5,675,756**	**3053**	**163**	**483**
					(Opr. KQ2M)
W1KM	**"**	**5,394,604**	**3012**	**162**	**452**
N68V/1	**"**	**4,107,368**	**2640**	**140**	**396**
K1ZZ	**"**	**4,055,069**	**2304**	**153**	**466**
W2SC	*	3,645,008	2274	142	415
W1WEF	*	3,193,664	2009	145	411
K5MA/1	*	2,604,129	1732	138	379
W1BR	*	1,382,829	1000	122	361
N1CC	*	1,186,485	1001	113	302
KA1DWX	*	1,007,453	829	115	306
W1ZK	*	941,216	768	125	314
AK1N	*	800,672	728	105	277
W1EYT	*	789,528	686	107	295
WA3ECT	*	760,200	641	109	311
K1VDF	*	552,133	687	85	196
K1MBO	*	236,376	339	74	178
AI3E	*	138,768	244	53	143
W1FV	*	36,864	134	26	70
K2SS/1	**21**	**691,185**	**1419**	**35**	**130**
KC1SJ	*	455,920	964	35	129
K1VUT	*	266,400	628	34	114
W1YN	**14**	**85,674**	**229**	**36**	**95**
K8PO	**7**	**821,473**	**1692**	**35**	**132**
K1UO	*	493,580	1163	34	111
W1BIH	*	207,242	540	31	100
W1OP	*	92,169	354	28	71
					(Opr. KA1ZRO)
K3FN	*	66,550	193	29	92
AA1M	*	18,696	116	13	44
K1IU	**3.5**	**315,826**	**934**	**28**	**91**
W1MK	*	275,600	948	25	79
***KM1X**	**"**	**1,266,515**	**1044**	**117**	**322**
***KG1D**	**A**	**1,200,600**	**1156**	**117**	**297**
*K1EBY	*	1,195,821	1005	114	309
*WA1FCN	*	1,060,575	938	109	286
*WS1E	*	1,003,408	826	121	313
*K1YRP	*	998,010	900	109	281
*N1HDQ	*	707,328	664	100	284
*K1TN	*	444,864	475	85	246
*K1VWL	*	320,264	395	100	201
*N1HFE	*	299,450	416	85	180
*WØMHK	*	294,021	305	100	259
*W3SOH/1	*	255,235	400	60	161
*KA1WIF	*	233,750	344	72	178
*N1JAC	*	228,984	355	65	167
*KB1AJY/AG	*	165,750	301	62	133
*K8JLF	*	121,912	223	61	135
*WZ1K	"	96,096	264	62	114
*K1VSJ	*	4,185	35	21	24
*KB1KM	28	14,365	82	22	43
N2NT	**A**	**5,705,000**	**3140**	**153**	**472**
N2LT	**"**	**4,723,894**	**2682**	**157**	**445**
K2SIG	*	1,486,956	1178	116	326
N2GC	*	1,282,656	918	128	368
WA2VYA	*	1,249,246	996	114	332
K3JGJ/2	*	1,130,745	1023	108	277
K2ONP	*	1,011,522	996	100	261
K2NV	*	852,852	800	99	265
WA2ASM	*	838,877	808	108	265
KD2YP	*	669,396	654	98	266
WA2ORX	*	629,952	592	112	274
K2JLA	*	582,036	573	101	263
NN2G	*	556,443	594	99	234
W2WD	*	446,652	462	106	236
K2OIY	*	344,610	400	92	223
WA2UDT	*	301,350	430	68	108
K2FL	*	265,430	369	76	178
W2FXA	*	250,458	352	75	172
KK2M	*	222,855	314	76	173
WA2WYR	*	220,188	338	77	159
WB2ZMK	*	129,150	213	69	141
NF2K	*	63,189	133	66	111
KB2SE	*	12,166	62	32	47
WB2YQH	**28**	**176,624**	**458**	**33**	**103**
K2ZJ	*	140,832	445	27	81
K2VV	**14**	**943,920**	**1718**	**40**	**150**
N2BA	*	765,525	1537	39	134
N2MBM	*	612	23	8	10
K1ZM	**3.5**	**416,160**	**1059**	**30**	**106**
N2KW	*	70,470	290	17	70
W2FR	*	42,230	185	19	63
K2EK	**1.8**	**34,522**	**175**	**19**	**63**
W2FCR	*	4,704	42	10	21
***W2TZ**	**A**	**1,986,240**	**1617**	**121**	**359**
***WG3I**	**"**	**841,061**	**750**	**115**	**288**
					(Opr. G4FRE)
*AA2EM	*	575,024	617	92	240
*KE2ZU	*	559,383	561	108	255
*KF2ET	*	510,939	463	111	286
*K2DW	*	436,296	540	89	205
*WA2VZQ	*	321,782	459	80	171
*KA2AOT	*	310,456	370	88	214
*KW2J	*	293,664	375	96	208
*N2JOH	*	224,982	320	85	176
*NA2Q	*	221,112	315	85	164
*K3GYS	*	192,360	308	69	160
*K2SWZ	*	156,323	269	71	152
*K2TCK	*	137,428	276	46	126
*K2UF	*	131,875	231	70	141
*WB9IHH	*	115,753	220	55	132
*W2OMV	*	104,832	290	35	93
*KM2L	*	99,710	209	51	118
*WB2JFP	*	90,420	208	52	113
*N2INN	*	81,663	194	58	105
*WA2VEZ	*	58,725	148	55	90
*WB2SPN	*	39,688	117	38	83
*WY2E	*	20,079	100	16	53
*AE2N	*	19,520	91	32	48
*W2AOY	*	14,328	77	26	46
*KB2NOC	*	7,830	54	21	37
*N2JE	*	1,128	17	9	15
***K2MFY**	**28**	**155,241**	**384**	**32**	**109**
***K2AW**	**14**	**118,430**	**314**	**33**	**97**
*WC2NR	*	5,617	48	14	27
***K2POF**	**7**	**83,752**	**257**	**28**	**88**
*WA2ASQ	*	31,228	151	17	57
K3ZO	**A**	**4,949,992**	**2979**	**157**	**421**
W3BGN	**"**	**4,257,147**	**2481**	**155**	**438**
W3UM	*	2,386,814	1470	145	417
AK3Z	*	2,369,630	1567	142	384
					(Opr. K2PH)
K3MD	*	2,138,304	1668	127	321
W3RJ	*	1,470,924	1142	118	331
K3KO	*	1,059,300	918	99	297
KL7HIR/3	*	701,064	698	104	260
W3GK	*	671,220	600	121	275
W3AZ	*	666,135	599	115	278
WF3L	*	654,831	711	87	220
W3GN	*	518,175	586	95	220
W3NX	*	436,258	471	100	231
WF3M	*	421,950	515	91	200
W3EVW	*	338,112	423	94	194
K4JLD	*	337,280	385	115	205
W3QIR	*	157,850	282	62	143
W3DAD	*	93,396	193	55	119
KM3D	*	79,380	201	37	98
WF3J	*	79,344	174	60	114
WK3V	*	45,440	13	51	77
N3RW	*	27,468	118	23	61
W3FQE	*	21,510	91	34	56
KN5H	**28**	**231,564**	**586**	**31**	**107**
NZ3O	14	1,170	17	11	15
W2UP/3	**7**	**521,076**	**1057**	**37**	**136**
W3GH	**"**	**467,892**	**992**	**36**	**128**
WE3C	**3.5**	**153,930**	**545**	**28**	**77**
KO7V	*	72,980	299	20	69
***KX3Y**	**A**	**1,019,151**	**810**	**118**	**206**
*W3UJ	*	992,670	823	105	301
*W3HVQ	*	963,200	966	96	254
*K5ZD	*	923,286	815	112	287
*KB3MM	*	633,216	594	107	277
*WK3H	*	392,156	444	90	226
*W3GM	*	241,345	370	79	156
*WT3P	*	228,585	338	66	179
*AD8J	*	182,832	314	62	84
*WJ3Y	*	172,538	228	88	185
*W3CPB	*	102,980	207	67	123
*K3ZA	*	101,851	205	62	117
*K3NL	*	15,680	75	30	50
*WI3U	*	1,210	26	11	19
***WK3P**	**28**	**37,284**	**205**	**25**	**53**
*WB6VGI/3	*	21,225	100	26	49
*WW3S	14	22,275	98	23	58
N4RJ	**A**	**5,851,152**	**2966**	**172**	**509**
					(Opr. KM9P)
W4RX	**"**	**3,755,216**	**2246**	**153**	**423**
N6AR	**"**	**3,687,670**	**1873**	**175**	**520**
K4POL	*	3,017,698	1929	141	400
W4XJ	*	2,240,430	1541	142	368
AA4S	*	2,202,839	1646	133	334
WZ4F	*	1,714,552	1273	141	335
W3VT	*	1,497,432	1026	130	386
K7SV	*	1,418,274	1018	136	358
N4ZC	*	1,259,874	786	151	416
N4TO	*	1,200,947	902	129	344
K4GKD	*	875,500	733	132	293
WB4FOT	*	766,692	736	108	264
N4MM	*	333,846	382	96	210
AB4RX	*	297,332	390	96	191
W3FTG	*	253,356	359	85	173
AA4XU	*	222,132	357	63	151
N4UH	*	210,826	289	82	177
W4WKQ	*	198,016	328	76	145
N4BNO	*	177,156	258	82	88
WA3NKO	*	151,008	262	62	146
AC1O	*	148,803	204	81	176
W4GTS	*	124,912	254	73	138
KC2KU	*	71,421	146	63	116
WB8BMV	*	70,650	160	55	102
NO4J	*	48,348	117	53	100
W4LMJ/AE	*	38,868	113	44	79
AC4HF	*	29,853	113	42	65
KT4W	**28**	**416,760**	**958**	**34**	**117**
N4ZZ	**"**	**358,239**	**857**	**34**	**113**
N4UA	*	290,080	677	32	116
WB4UBD	*	72,885	225	30	83
WA4QMQ	*	55,328	171	27	85
K4PIC	*	51,876	193	25	74
N4CT	**21**	**577,368**	**1228**	**37**	**125**
N3KK	*	540,662	1128	37	129
N4IR	*	239,776	700	29	89
NQ4K	*	26,220	101	28	64
K4RZ	**14**	**65,230**	**209**	**33**	**80**
K4XS	**7**	**683,459**	**1437**	**36**	**127**
KBØG	**"**	**636,720**	**1306**	**34**	**134**
W4BQF	*	267,344	932	22	76
WR4K	*	120,978	305	32	109
WB4IUX	*	84,870	272	26	89
NI4Y	*	67,430	219	24	86
KA4RRU	*	60,840	214	29	75
KT3Y	**3.5**	**205,683**	**695**	**25**	**86**
KØØU	*	117,938	391	24	85
WA4SVO	*	44,064	216	17	55
K6ETM/4	*	13,923	100	12	39
K4TEA	**1.8**	**11,880**	**83**	**17**	**43**
KI6MS/4	"	5,848	74	12	31
W4JVN	*	108	7	4	5
***K7SV/4**	**A**	**1,335,780**	**1005**	**136**	**356**
***N4YDU**	**"**	**1,095,578**	**994**	**110**	**308**
*KB3MP/4	*	963,022	970	99	283
*W4OUN	*	660,292	623	109	274
*KN4QV	*	655,473	700	100	243
*KC4TEO	*	491,040	530	98	243
*N4OT	*	313,038	378	94	203
*KA2CDJ/4	*	211,232	276	101	186
*W4PLL	*	203,740	317	83	161
*NK9C	*	201,261	321	66	153
*KC4UH	*	141,440	240	76	145
*WG4F	*	134,757	265	60	129
*W4VC	*	96,922	218	59	102
*AA4KD	*	89,570	198	59	110
*W4YN	*	79,362	162	55	103
*N4KE	*	64,750	133	57	118
*K1FIR	*	32,640	125	35	61
*W4OGG	*	26,410	98	30	65
*AC4JI	*	23,828	93	34	58
*W4OVU	*	14,000	64	28	52
*AC4PZ	*	1,302	56	5	6
*K4KUZ	*	504	10	9	9
***WB4TDH**	**28**	**250,962**	**572**	**34**	**117**
*N3JT	*	66,736	237	22	75
***N4MO**	**21**	**321,539**	**851**	**33**	**104**
*KK4SM	*	120,171	341	30	93
***K1HBX**	**7**	**35,002**	**163**	**20**	**66**
*N4UZ	1.8	392	15	7	7
K5GN	**A**	**3,766,785**	**2161**	**167**	**450**
WM5G	**"**	**1,246,665**	**1086**	**114**	**269**
WE5P	*	962,676	805	129	300
NJ1V	*	674,583	943	95	178
WA5SOG	*	89,745	217	54	101
KA5W	**28**	**446,439**	**1078**	**34**	**113**
					(Opr. KS1G)
K5RX	*	347,626	843	33	113
NA5C	*	205,100	529	34	106
W5VX	**21**	**511,187**	**1063**	**36**	**131**
AA5ZQ	*	340,816	887	35	101
WB5UDX	*	194,180	482	34	106
K5MR	**14**	**505,225**	**1017**	**39**	**136**
N5CR	**"**	**481,929**	**1085**	**38**	**121**
K5NU	**7**	**244,640**	**548**	**34**	**126**
W5UN	*	189,736	443	36	112
K5UA	*	32,480	141	21	59
N5RZ	**3.5**	**92,538**	**347**	**25**	**72**
K5UR	**1.8**	**25,612**	**133**	**22**	**54**
***N8RR**	**A**	**1,185,845**	**897**	**135**	**352**
***N5AW**	**"**	**1,062,400**	**749**	**145**	**367**
*K5KLA	*	890,012	773	119	285
*K5IID	*	534,006	639	100	197
*NN5T	*	313,053	389	111	188
*WT5U	*	223,554	387	75	147
*K5HDU	*	208,951	335	75	148
*N5HB	*	97,272	203	59	109
*WB5B	*	54,404	138	44	90
*N5XUS	*	37,700	133	50	66
*KT5Q	*	31,110	98	47	75
*NZ5O	*	28,574	142	42	49
*W5/JFØVCY	*	8,060	60	18	34
***NY5B**	**21**	**75,438**	**280**	**31**	**68**
***KD5IA**	**14**	**98,171**	**292**	**36**	**91**
N6UR	**A**	**3,729,600**	**2519**	**152**	**366**
					(Opr. KR6X)
W6QHS	**"**	**2,426,052**	**1701**	**163**	**329**
W6EEN	**"**	**2,244,784**	**1691**	**139**	**318**
N6ND	*	2,091,740	1588	152	317
					(Opr. NI6W)
N6EK	*	1,206,290	1211	132	223
N6TV	*	1,063,975	1044	131	234
N6GG	*	837,977	713	134	279
K6PJY	*	809,070	773	126	236
KS6H	*	652,347	712	115	218
W6BJH	*	418,302	491	106	200
W6FSJ	*	345,210	406	114	197
W6NKR	*	340,572	395	106	197
W6ISQ	*	240,867	288	111	186
W6JTA	*	221,946	371	83	130
W6MVW	*	209,124	252	115	199
N6CDA	*	200,005	315	84	137
W6HAL	*	125,736	806	63	93
K6FO	*	110,561	208	88	121
K6HIH	*	106,738	236	67	99
W6VG	*	90,312	201	64	95
N6PYI	*	87,153	147	72	137
K6ZUR	*	83,125	170	68	107
K6DR	*	80,595	222	60	75
KG6AO	*	60,372	178	60	69
K6OXU	*	39,996	111	58	74
NF6R	*	31,100	113	46	54
N6AZE	*	21,384	86	42	57
N6KT	*	19,502	76	43	55
K6LRN	*	13,132	70	24	43
NØDJJ	*	1,881	19	14	19
W6YA	**28**	**315,892**	**759**	**35**	**116**
N6ZB	*	168,948	539	33	81
K6LEB	*	90,000	259	31	89
W6BIP	*	57,800	205	30	70
NV6O	*	28,424	149	24	44
K4TKM/6	**21**	**445,005**	**945**	**36**	**129**
N6MZ	*	261,083	717	35	96
WZ6Z	*	220,100	653	33	91
W6BSY	*	171,500	476	33	92
K2LE/6	"	5,424	42	20	28
N6RO	**7**	**392,615**	**925**	**35**	**114**
K6XV	*	191,268	537	32	94
K6KM	*	164,000	462	33	92
K5KT/6	*	33,280	116	31	73
KT6V	**3.5**	**87,032**	**351**	**28**	**64**
N6DX	**1.8**	**5,070**	**61**	**14**	**25**
K6GNX	*	1,296	33	8	8
***W6JTI**	**A**	**873,624**	**774**	**132**	**277**
***W6UQF**	**"**	**719,946**	**777**	**15**	**218**
*K4UVT/6	*	243,750	353	88	162
*W6NNV	*	115,774	197	82	132
*WD6DXH	*	114,210	262	65	97
*AA6DX	*	91,683	215	72	95
*N6GL	*	70,305	210	55	74
*K6UO	*	69,360	144	70	100
*N6NF	*	41,808	130	60	74
*W6KNB	*	40,515	138	50	61
*W6RCL	*	39,530	134	53	65
*AA6EE	*	38,664	145	53	55
*N6KI	*	10,184	54	35	41
*KA6SGT	*	900	28	9	6
***WA6KUI**	**28**	**164,864**	**492**	**31**	**97**
*WA6FGV	*	53,676	230	28	56
***AE9F**	**21**	**68,902**	**200**	**32**	**62**
*KU6T	7	2,000	34	12	13
NN7L	**A**	**2,392,716**	**1905**	**144**	**300**
K7WK	**"**	**1,057,632**	**1029**	**120**	**248**
KE7X	*	1,007,076	917	133	266
K7DZ	*	644,468	596	134	254
W7OM	*	445,224	514	109	203
KT7G	*	316,710	460	98	157
W7HS	*	286,520	392	98	162
AA7JM	*	224,502	372	81	132
N7JXS	*	221,428	412	71	126
W7WHY	*	220,634	370	76	138
KI7Y	*	146,464	280	68	116
K7UOT	*	146,064	262	73	131
WC7Q	*	100,589	359	24	73
W7ZMD	*	94,346	221	56	105
KX7J	*	70,007	108	46	91
KG7DK	*	68,640	153	58	107
AA7FL	*	27,040	126	33	47
W7AYY	**28**	**59,248**	**225**	**28**	**64**
N7RO	**21**	**248,168**	**647**	**35**	**99**
KA7T	**14**	**138,000**	**403**	**33**	**87**
WA7FAB	*	121,975	367	31	88
W7LGG	*	60,424	201	32	72
W7XR	**7**	**794,992**	**1631**	**38**	**138**
					(Opr. K7SS)
K7ABV	*	28,124	124	24	55
K7XX	*	22,932	108	24	54
K9JF/7	**3.5**	**35,226**	**216**	**21**	**36**
N7RK	*	11,025	96	18	27
W7TSQ	*	9,640	113	17	18
N6SS	**1.8**	**13,112**	**114**	**16**	**28**
KG7D	*	364	11	6	8
***K7MM**	**A**	**328,335**	**418**	**106**	**189**
*WA7UVJ	*	295,152	525	82	126
*K6XO/7	*	261,967	389	91	150
*W7QDM	*	234,972	360	97	147
*WN7J	*	221,760	358	85	135
*W7QN	*	216,112	385	82	126
*WA7VNI	*	208,356	409	72	107
*N7EPD	*	198,720	342	89	118
*N7HUS	*	180,720	363	73	107
*K7WA	*	95,004	192	70	112
*W7IIT	*	93,784	217	66	86
*N7LOX	*	39,664	124	62	72
*K7PVT	*	21,093	140	39	40
*W7VIH	*	19,992	105	33	35
*W3AP/7	*	1,025	15	11	14
***W7ZR**	**28**	**165,834**	**595**	**31**	**80**
*AA7FK	*	53,152	221	27	61
*KA7FEF	*	16,626	186	21	30
***AA7RN**	**21**	**125,112**	**432**	**30**	**74**
*K6OMB	*	90,720	345	28	62
*W7KJJ	*	76,440	262	30	74
***WQ7R**	**14**	**33,945**	**163**	**22**	**51**
*NS7K	1.8	286	15	6	5
*K7OA	*	160	10	5	5
KN8Z	**A**	**5,436,795**	**2927**	**171**	**466**
					(Opr. WA8YVR)
K8GL	**"**	**3,027,674**	**1756**	**154**	**444**
N8AA	*	1,395,248	1001	136	360
WA8SAE	*	967,824	740	136	332
KE8M	*	940,400	834	113	287
KV8H	*	867,426	767	111	288
K8OQL	*	863,200	747	121	295
N8LM	*	613,532	677	98	228
K8DD	*	354,384	405	104	217
AG8L	*	328,183	406	102	205
WQ8T	*	316,798	381	97	205
W8LRY	*	274,920	404	74	163
K8SJ	*	23,504	90	44	60
WD9INF	*	16,416	82	22	50
K8CX	**28**	**426,717**	**975**	**34**	**119**
N8AGU	**"**	**210,539**	**548**	**30**	**103**
K8MFO	**21**	**519,750**	**1091**	**37**	**128**
WB8B	*	221,366	508	35	116
KW8N	**14**	**815,948**	**1548**	**39**	**142**
					(Opr. NZ4K)
W8TWA	*	214,064	551	35	101
WG8M	**7**	**112,545**	**332**	**28**	**95**
W8XD	**"**	**101,706**	**270**	**30**	**104**
WA8OSE	*	95,758	270	30	97
W8MHW	*	46,004	157	25	81
W8SJU	*	25,487	131	22	55
W8LKG	*	14,896	69	19	57
W8JGU	**3.5**	**78,642**	**277**	**27**	**75**
***N8II**	**A**	**2,008,982**	**1419**	**135**	**368**
***WB8YJF**	**"**	**1,026,084**	**825**	**124**	**320**
*AA8AV	*	476,700	499	110	240
*K8QWY	*	326,094	415	87	191
*KF8HR	*	262,125	400	71	162
*W8UPH	*	247,018	392	64	162
*W9VNE/8	*	170,041	278	71	152
*W8URM	*	168,272	288	65	143
*KF8TM	*	145,851	278	59	124
*W8IDM	*	132,975	146	67	130
*W8YGR	*	116,382	185	79	159
*N8FU	*	114,522	540	93	175
*N8CQA	*	113,810	233	74	116
*K8QLK	*	93,878	220	43	103
*KV8S	*	82,473	258	27	64
*AF8C	*	69,600	159	59	101
*KA8OUT	*	54,991	151	39	88
*WA8JBG	*	17,628	80	26	52
*WA8IGG	*	11,635	91	35	62
*KE8XK	*	176	11	8	8
***KW8J**	**21**	**123,786**	**375**	**29**	**88**
*WT8P	*	94,142	319	28	75
*KW3M	14	28,296	100	43	65
*W8UMR	*	23,568	240	35	83
W9RE	**A**	**3,611,400**	**2081**	**160**	**440**
K4XU	**"**	**2,416,540**	**1498**	**154**	**420**
W9UP	**"**	**2,036,881**	**1356**	**147**	**392**
					(Opr. NØBSH)
K9MA	*	1,918,476	1393	140	343
WB9HRO	*	897,336	788	128	284
KA6A/9	*	856,080	810	110	259
W9GXR	*	746,405	785	102	229
W9NA	*	529,518	547	102	237
K9UQN	*	485,060	558	98	218
WA9TPQ	*	465,891	572	95	196
N9NS	*	326,230	372	109	214
KS9U	*	253,611	305	109	194
N9CKC	*	234,362	367	81	145
KA1J	*	184,987	264	88	163
W9KIA	*	95,220	165	74	133
W9RN	*	51,546	150	51	70
W9VA	*	42,000	128	52	73
KA9IMX	*	32,219	117	36	65
W9PRG	*	810	38	15	12
K9QVB	**28**	**242,224**	**598**	**32**	**106**
W9GIL	*	142,287	387	31	98
N9KAU	**21**	**321,229**	**811**	**33**	**106**
					(Opr. JF3NRI)
K9CAN	**14**	**301,622**	**675**	**38**	**120**
N9AW	*	260,610	636	37	109
N9ER	*	67,800	202	35	78
N9AU	**7**	**107,778**	**278**	**33**	**105**
K9FN	**"**	**103,600**	**268**	**32**	**108**
K9CJ	*	98,946	255	33	105
WX9U	*	93,696	274	27	95
K9IKP	*	54,351	197	26	73
W9YYG	*	24,150	123	24	51
WW9L	**3.5**	**22,950**	**118**	**21**	**54**
WB9Z	**1.8**	**11,328**	**88**	**18**	**41**
***W9OA**	**A**	**723,086**	**677**	**109**	**268**
*NA1R	*	630,105	645	110	247
*AK9N	*	421,008	509	86	208
*W9HE	*	341,297	467	81	172
*WO9S	*	266,000	379	88	162
*W9WI	*	262,125	406	62	171
*W9IL	*	96,659	212	61	102
*NØFFZ	*	94,308	196	65	109
*W9CA	*	91,015	201	52	115
*N9AIB	*	45,234	133	41	85
*KA9ZZT	*	43,125	134	45	70
*W9LNQ	*	23,515	122	43	88
*KA9HDN	*	16,254	76	39	47
*N9ENA	*	5,170	39	21	26
*W9ILY	*	3,000	28	19	21
*W9IKX	28	9,861	60	13	44
***W9HLY**	**21**	**194,600**	**407**	**35**	**104**
*WD9GGY	14	19,635	93	28	49

***W9CH**	**7**	**100,050**	**258**	**34**	**104**	
*KO9Y	"	77,982	225	32	91	
*K9UIY	"	37,036	148	23	71	
***AA9AX**	**1.8**	**2,709**	**53**	**7**	**9**	
KFØH	**A**	**2,146,552**	**1498**	**148**	**502**	
KØKX	**"**	**1,652,063**	**1131**	**147**	**364**	
WCØY	"	1,061,280	855	129	311	
NIØG	"	801,270	662	138	297	
KØBJ	"	667,290	641	119	258	
NSØB	"	642,208	610	119	257	
WØHW	"	447,474	500	99	222	
KIØW	"	382,270	466	102	199	
KJØG	"	363,090	445	105	189	
WØML	"	206,622	312	81	153	
WØWP	"	191,056	327	64	128	
KCØEI	"	166,635	290	67	140	
KØIFL	"	155,520	267	76	148	
NØGOS	"	115,668	269	61	92	
NNØM	"	100,842	248	54	93	
NRØE	"	25,250	156	59	116	
KIØE	"	21,735	105	25	44	
NØKFE	"	14,195	83	33	52	
AAØA	"	2,040	24	15	19	
WDØAVV	**28**	**51,982**	**266**	**18**	**61**	
WØUN	**21**	**647,168**	**1452**	**35**	**123**	
						(Opr. WØUA)
KZ6E/Ø	"	361,788	870	35	111	
AL7H/Ø	"	236,812	619	34	112	
K9WYI	"	33,440	155	26	54	
NQØI	**14**	**424,461**	**1011**	**38**	**113**	
KCØD	**"**	**423,072**	**963**	**37**	**119**	
WØZV	**7**	**440,316**	**934**	**36**	**126**	
WBØO	"	46,224	155	29	78	
KØRF	**3.5**	**139,072**	**522**	**30**	**76**	
ACØS	"	14,620	134	17	26	
KJØB	"	13,776	102	19	37	
KVØQ	**1.8**	**16,272**	**151**	**17**	**31**	
WØRXL	"	615	20	6	9	
***NSØW**	**A**	**482,202**	**579**	**102**	**199**	
***KSØT**	**"**	**446,224**	**493**	**103**	**231**	
*KEØY	"	442,990	518	95	215	
*KEØUI	"	426,315	528	91	202	
*K3GWA	"	356,108	512	85	169	
*KØIYF	"	306,540	406	90	172	
*KØGSV	"	259,904	364	85	177	
*NØBIW	"	216,240	307	95	170	
*NØFMR	"	180,297	327	71	136	
*K9BQL	"	147,440	276	71	123	
*WBØIEL	"	125,216	256	51	121	
*NIØC	"	84,420	158	70	131	
*KZØC	"	45,508	132	47	77	
*NXØI	"	21,510	82	32	58	
*KKØQ	"	13,080	75	20	40	
*KFØXV	"	11,454	70	31	38	
***NWØF**	**28**	**34,992**	**158**	**24**	**57**	
***KIØI**	**7**	**40,500**	**149**	**29**	**71**	
*WØRT	1.8	561	18	8	9	

ALASKA

KL7UR	A	19,150	190	39	40
AL7CQ	**28**	**314,160**	**1538**	**30**	**53**
KL7RA	**3.5**	**43,272**	**444**	**16**	**20**
*KL7FAP	A	14,852	122	20	27
*AL7MK	28	9,042	182	8	14

ANGUILLA

***VP2EST**	**A**	**1,156,920**	**2101**	**74**	**174**

BAHAMAS ISLANDS

***C6AHJ**	**A**	**2,716,862**	**3235**	**105**	**253**
					(Opr. AA2Z)
*C6A/N4RP	"	851,400	1430	88	176

BARBADOS

8P9Z	**A**	**8,047,212**	**5298**	**145**	**428**
					(Opr. K4BAI)
8P9DH	**28**	**214,656**	**1118**	**24**	**56**
					(Opr. K2BMI)
***8P9DF**	**21**	**522,750**	**1762**	**31**	**94**

BERMUDA

*WA1AWJ /VP9	A	35,607	196	36	47

CANADA

***VO1SF**	**A**	**1,271,726**	**1525**	**87**	**239**
VY2SS	**21**	**194,864**	**1035**	**14**	**62**
VO2WL	**A**	**2,036,428**	**2708**	**84**	**22**
					(Opr. K3TM)
VE1AL	**A**	**1,090,452**	**1197**	**101**	**262**
***VD1NH**	**14**	**162,336**	**618**	**28**	**86**
***VE1HA**	**A**	**227,072**	**717**	**30**	**98**
*VE1RGB	"	71,400	419	54	121
VE2AYU	**A**	**1,012,044**	**1097**	**105**	**269**
VE2AWR	"	222,144	505	62	130
***VD2ZP**	**A**	**2,345,096**	**2089**	**115**	**329**
*VE2LID	"	1,227,910	1775	83	227
					(Opr. VE2LJ)
*VE2NAM	"	277,536	506	70	154
*VE2WAT	"	61,132	200	37	87
*VE2BLX	"	40,740	147	45	60
*VD2MAQ	"	13,800	177	19	21
VE3EJ	**A**	**5,011,815**	**3308**	**164**	**433**
VD3AT	"	1,534,456	1529	99	272
VE3KP	"	1,231,672	1469	111	227
VE3ST	"	824,460	822	99	265
VE3PN	"	746,016	1004	95	209
VE3CWE	"	321,468	501	81	177
VE3FFE	"	62,484	216	47	80
VE3HX	**28**	**115,416**	**377**	**30**	**96**
VE3OTL	**14**	**89,380**	**333**	**32**	**77**
***VE3TEE**	**A**	**158,692**	**334**	**67**	**127**
*VE3YBH	"	106,670	241	62	108
*VE3EQF	"	23,944	109	28	54
***VE3NBE**	**21**	**45,800**	**160**	**28**	**72**
***VE3SMA**	**14**	**79,254**	**305**	**28**	**74**
*VE3DSN	"	45,628	274	21	47
*VE3NJM	"	30,030	183	23	43
***VE3DO**	**1.8**	**11,375**	**151**	**10**	**25**
VD4VV	**A**	**1,324,050**	**1727**	**111**	**239**
VE4JB	"	307,850	483	84	151
***VE4GV**	**28**	**104,420**	**492**	**28**	**64**
***VD5MX**	**A**	**159,744**	**753**	**40**	**64**
*VE5SF	"	35,625	169	42	53
*VE5GD	14	14,040	114	18	34
VE6SF	**28**	**23,722**	**156**	**23**	**35**
VE6JY	**7**	**377,870**	**1100**	**33**	**112**
					(Opr. VE6WQ)
VE6LB	3.5	6,755	89	15	20
***VE6BF**	**A**	**614,496**	**878**	**102**	**194**
***VE6BMX**	**28**	**121,512**	**670**	**28**	**55**
*VE6SH	21	11,742	137	14	24
VD7SZ	**A**	**3,955,605**	**3625**	**145**	**300**
					(Opr. VE7NTT)
VE7IN	"	387,800	737	73	127
***VE7UF**	**A**	**795,429**	**1198**	**106**	**173**
*VE7JO	"	669,370	1071	98	173
*VE7ZAC	"	146,165	400	68	87

CAYMAN ISLANDS

ZF2TG	**7**	**1,087,862**	**2985**	**31**	**111**
					(Opr. WQ5W)

COSTA RICA

***TE1T**	**7**	**116,117**	**617**	**15**	**68**
					(Opr. TI4SU)

CUBA

***CO2JA**	**A**	**140,488**	**475**	**49**	**87**

DOMINICA

***J79MAE**	**A**	**1,389,247**	**2201**	**86**	**197**
					(Opr. DL5MAE)

GRENADA

J33A	**21**	**930,540**	**2378**	**36**	**120**
					(Opr. KJ4VH)

GREENLAND

*OX3RA	A	6,478	64	14	27

GUATEMALA

*TG9AJR	A	9,696	95	26	22

HAITI

***4V2PK**	**A**	**805,200**	**1156**	**96**	**209**
					(Opr. HH2PK)

MARTINIQUE

FM2GO	**21**	**997,600**	**2685**	**34**	**111**
					(Opr. FB1MUX)
FM5BH	**7**	**593,047**	**1886**	**29**	**104**

MEXICO

XE1 /AA6RX	**A**	**2,723,870**	**2807**	**129**	**292**
XE1VV	"	1,153,376	1678	105	199
XE2KB	"	427,680	721	80	118
***XE2 /K9ZO**	**A**	**772,992**	**1874**	**78**	**114**
*XE1 /JA1QXY	"	476,768	1174	77	111
*XE2MX	"	63,081	145	71	92
*XE1AVM	"	45,100	247	41	41
*XE1Y	7	11,121	159	12	21

PANAMA

***HP1AC**	**A**	**304,304**	**736**	**72**	**110**

PUERTO RICO

WJ2O/KP4	**A**	**2,121,350**	**3536**	**85**	**181**
WP4IIW	"	1,780,614	1861	109	282
*W8HNI /KP4	A	49,800	298	27	48

ST. KITTS AND NEVIS

V47KP	**A**	**1,461,129**	**2216**	**84**	**199**
					(Opr. K2DOX)

ST. MARTIN (FRENCH)

FS/AI7B	**A**	**5,412,644**	**4640**	**121**	**337**

TURKS AND CAICOS ISLANDS

VP5T	**A**	**3,974,373**	**4903**	**105**	**246**
					(Opr. W1UA)

U. S. VIRGIN ISLANDS

***NP2I**	**A**	**2,349,901**	**2981**	**94**	**243**
*NP2Q	"	52,808	275	27	55

AFRICA

ANGOLA

*D2EL	A	28,336	112	29	63
					(Opr. EA7EL)

WORLD TOP 10 QRPp
All Band

1.	AA2U	1,188,000
2.	DL3KVR	473,518
3.	N7IR	414,288
4.	SM3CCT	371,460
5.	LY3BA	348,475
6.	N1AFC	290,598
7.	UA4YJ	279,651
8.	JA1GTF	258,770
9.	WB6JMS	248,196
10.	EA3IW	224,343

WORLD TOP 10 ASSISTED
All Band

1.	K8AZ	4,740,060
2.	K3WW	4,664,550
3.	K5NA	4,363,824
4.	KC1XX	4,321,056
5.	4U1ITU	4,111,980
6.	W1PH	4,075,785
7.	WR3E	3,916,080
8.	K2SX	3,704,592
9.	W3XU	3,760,424
10.	KC1F	3,650,733

TEAM CONTESTING

1. Southern California Contest Club—Team 1: 35,671,278. By D44BC (N6TJ), EA9LZ (N6ZZ), PTØF (AH3C), 4M2BYT (CT1BOH), and 9Y4H (K6NA).

2. Global Team 1: 33,864,390. By 8R1K (OHØXX), EA8EA (OH2MM), JY8VJ (DL1VJ), and P4ØI (OH2KI).

3. Southern California Contest Club—Team 2: 23,291,357. By A61AC (N6AA), HC8N (WN4KKN), EA6ZY (N6RA), and AA6RX/XE1.

4. New England WW Contest Team: 22,675,261. By BV/K1RX, KM1H (KQ2M), N6BV/1, W1KM, and W1PH.

5. Team Japonica: 18,248,074. By JH7WKQ, 9M6NA (JE1JKL), 5U7M (JH4NMT), 7Q7XX (JL3LNG), and JH1AEP.

6. Russian Baby Bears: 7,256,140. By UX3D (UA3DPX), UA3AB, RZ9UA, RB5QF, and UB5QMA.

ASCENSION ISLAND

ZD8LII	**21**	**1,560,405**	**3092**	**34**	**131**	
						(Opr. GØLII)

BOTSWANA

A22MN	**28**	**812,413**	**2285**	**27**	**92**	

CANARY ISLANDS

EA8EA	**A**	**11,966,372**	**5890**	**177**	**505**	
						(Opr. OH2MM)
***EA8URL**	**A**	**423,774**	**611**	**65**	**169**	
						(Opr. EA8BIE)
*EA8AF	"	214,800	408	61	118	
*EA8BGX	"	42,036	133	39	74	

CAPE VERDE ISLANDS

D44BC	**A**	**7,755,895**	**4783**	**147**	**398**	
						(Opr. N6TJ)

CUETA AND MELILLA

EA9LZ	**A**	**7,901,415**	**4959**	**134**	**401**	
						(Opr. N6ZZ)

COMOROS ISLANDS

D68GA	**28**	**1,281,660**	**2622**	**38**	**126**	

DJIBOUTI

***J2ØUFT**	**A**	**634,508**	**980**	**64**	**151**	

IVORY COAST

TU4SR	**14**	**1,164,934**	**2704**	**38**	**118**	
TU2MA	**7**	**197,925**	**737**	**22**	**69**	

KENYA

***5Z4TT**	**A**	**2,014,530**	**1882**	**114**	**248**	

MADIERAS ISLANDS

CR3W	**21**	**1,652,170**	**3092**	**38**	**141**	
						(Opr. DF5UL)
CT3FN	**3.5**	**344,698**	**1327**	**20**	**74**	
						(Opr. HB9CRV)

MALAWI

***7Q7XX**	**A**	**3,257,128**	**2798**	**112**	**280**	
						(Opr. JH1ORL)
***7Q7TA**	**14**	**206,752**	**641**	**32**	**80**	

MOZAMBIQUE

C9RJJ	**A**	**3,108,266**	**3253**	**99**	**223**	
						(Opr. WA4WKY)

NIGER

5U7M	**A**	**3,555,240**	**2817**	**123**	**301**	
						(Opr. JH4NMT)

NIGERIA

***5NØZKJ**	**28**	**597,624**	**1803**	**26**	**85**	
						(Opr. OK3LZ)

REPUBLIC OF SOUTH AFRICA

ZS6EZ	**A**	**5,878,726**	**3698**	**151**	**387**	
ZS1AFZ	"	212,764	427	69	103	
ZS6AJS	"	138,807	301	58	101	
ZS6NW	**28**	**619,632**	**1777**	**33**	**84**	
ZS4WD	7	882	17	9	9	
ZS6ANL	**3.5**	**15,602**	**99**	**21**	**37**	

SENEGAL

6V6U	**A**	**7,760,746**	**5298**	**128**	**363**	
						(Opr. K3IPK)
6W7 /F6AUS	**28**	**159,131**	**497**	**33**	**94**	

ZIMBABWE

Z21HS	**A**	**268,842**	**526**	**56**	**117**	

ASIA

AZERBAIJAN

UD6DKW	**A**	**288,342**	**541**	**49**	**144**	
***UD6DF**	**21**	**48,450**	**228**	**21**	**54**	

CYPRUS

H21A	**A**	**2,751,393**	**2424**	**101**	**292**	
						(Opr. 4N4OO)
***H27W**	**28**	**568,624**	**1819**	**29**	**83**	
						(Opr. 5B4WN)

GEORGIA

UF7FXC	**3.5**	**136,800**	**700**	**19**	**57**	
UF6QBA	**1.8**	**57,664**	**385**	**8**	**45**	

ISRAEL

4X/S59PR	**A**	**3,928,380**	**3022**	**122**	**344**	
4X4NJ	**1.8**	**150,880**	**599**	**20**	**72**	
***4X4ZT**	**14**	**119,600**	**409**	**26**	**78**	
***4X4VF**	**7**	**27,140**	**200**	**11**	**35**	
***4Z5BW**	**3.5**	**24,024**	**201**	**9**	**35**	

JAPAN

JH1AEP	**A**	**2,682,720**	**2301**	**138**	**267**	
JA1NUT	**"**	**2,128,944**	**1814**	**136**	**272**	
JR1IJV	"	1,647,846	1493	136	251	
JF1SEK	"	1,512,457	1197	139	298	
JA1RKI	"	240,000	371	91	159	
JR1GRF	"	186,850	285	80	122	
JG1BPS	"	148,601	308	72	109	
JR1GSE	"	97,409	276	59	68	
JH1NXU	"	24,518	109	37	45	
7L1GVE	**14**	**1,181,937**	**2255**	**40**	**139**	
JR1XFS	"	295,603	845	34	87	
JL1BSK	"	74,700	349	25	50	
JA1JKG	**7**	**131,040**	**580**	**25**	**55**	
JQ1VNM	"	10,500	63	20	40	
JH1OGC	**3.5**	**110,600**	**411**	**31**	**59**	
JA1SYY	"	41,748	224	26	45	
JH1HGC	1.8	945	19	11	10	
***JA1IDY**	**A**	**704,064**	**822**	**105**	**199**	
***JK1AJX/1**	**"**	**451,269**	**664**	**92**	**155**	
*JK1GXU	"	429,288	617	96	152	
*JJ3SRU/1	"	256,036	402	85	157	
*JA1WYQ	"	209,190	388	70	120	
*JA1BUI	"	173,524	342	77	111	
*JF1SQC	"	152,805	290	72	111	
*JA1AB	"	115,668	264	62	100	
*JK1LSE	"	108,383	242	62	105	
*JL1MWI	"	87,483	261	43	78	
*JA0XQO/1	"	75,828	196	57	85	
*JF1LKM	"	71,610	234	49	61	
*JA1PUK	"	66,591	138	59	88	
*JE1EUH	"	61,904	208	48	58	
*JA6EET/1	"	59,644	187	53	71	
*JH3PRR/1	"	57,664	154	43	93	
*JH1JGZ	"	50,974	127	75	79	
*JK1BSM	"	42,592	129	48	73	
*JM1AQU	"	40,762	155	38	51	
*JH1HGF	"	39,100	134	49	66	
*JA1IZ	"	38,180	147	45	47	
*JI1EFP	"	22,188	178	19	24	
*JN1FEA	"	12,958	81	28	34	
*JA1JNR	"	6,916	49	23	29	
*JM1QZV	"	6,474	39	24	54	
*JH1UES	"	6,006	56	19	20	
*JE1KDM	"	4,602	46	17	22	
*JH1AOU	"	4,085	35	22	21	
*7N1BIF	"	3,196	38	19	15	
***JA1KFX**	**28**	**155,070**	**598**	**32**	**58**	
***JA1NLX**	**"**	**152,355**	**512**	**33**	**72**	
*JH1BDS	"	87,390	340	32	58	
*JA1SJV	"	53,960	244	"	48	
*JR1UMO	"	7,360	58	17	29	
*JA1VLA	"	6,600	63	17	23	
*JG1RDV	"	4,560	56	12	18	
*JA1XPU	"	3,434	39	15	19	
*JK1NSR	"	3,000	36	13	17	
*JA1BFN	"	2720	54	7	10	
*JE2IFM/1	"	2,366	35	11	15	
*JA1AAT	"	1,560	"	8	12	
*JK1REJ	"	1,144	21	10	12	
*JO1ACW	"	903	15	10	11	
***JQ1NGT**	**21**	**204,880**	**705**	**32**	**72**	
*JE1VTZ	"	197,040	573	35	85	
*JAØBMS/1	"	176,220	559	32	78	
*JE1REU	"	155,754	538	32	70	
*JJ1GQH	"	102,100	368	32	68	
*JA1KI	"	39,664	199	24	50	
*JH1ECF	"	22,570	141	25	36	
*JI1UQB	"	21,080	126	23	39	
*JR1UJW	"	16,524	119	20	34	
*JH1FYC	"	15,150	119	19	31	
*JR1LQK	"	7,943	59	23	24	
*JH1BUB	"	5,032	56	14	20	
*7L1RLL	"	4,961	45	19	22	

*JA9BFA/1	*	4,429	39	16	27
*7L1ILE	*	170	8	5	5
*JF1RMM	*	90	5	3	3
***7K1BWM /1**	**14**	**81,242**	**81**	**32**	**66**
*JA1SKE	*	59,969	242	30	61
*JA1VBW	*	28,888	112	26	56
*JE7MAY/1	*	9,408	66	20	36
*JO1QZI	*	8,820	68	21	28
***JA1LZR**	**7**	**171,212**	**633**	**27**	**65**
*JK1GKG	*	87,690	296	34	77
*JH1HRJ	*	32,690	175	23	47
*JK1OXU	*	20,853	116	24	39
*JA1NYV	*	18,774	108	22	41
*JH1SBE	*	7,783	63	17	26
*JE1HWY	*	1,742	23	10	16
*JE1HXZ	*	1,539	22	11	16
*JA1POS	*	297	13	5	4
***JH1GNU**	**3.5**	**17,700**	**135**	**21**	**38**
*JH1OJU	*	11,766	95	21	32
*JK1QHK	*	6,966	53	21	33
*JA1KAW	*	5,856	54	17	31
*JE1SPY	1.8	357	12	8	9
JH2UVL	**A**	**1,959,408**	**1720**	**131**	**265**
JL2LOR	**"**	**1,798,158**	**1708**	**125**	**241**
JA2EU	*	742,656	1006	77	79
JE2WEN	*	171,612	312	73	116
JA2IVK	*	98,400	283	54	66
JA2EJI	*	70,224	189	59	74
JA2SWF	*	33,602	122	45	61
JR2FKB	*	30,082	102	42	67
JN2AMD	*	2,856	38	14	14
JH2BCN	**28**	**152,382**	**495**	**33**	**76**
JA2AAU	14	10,406	897	23	20
***JA2AXB**	**A**	**506,012**	**669**	**98**	**165**
*JA2PSV	*	434,142	573	101	170
*JA2NNF	*	415,224	519	105	167
*JA2OJ	*	44,528	174	39	53
*7L2PUL	*	26,410	111	46	49
*7K2GMJ	*	21,074	103	37	45
*7K2UVE	*	8,232	56	23	26
*JL2PQV	*	3,420	34	18	20
*7K2DOD	*	2,176	24	16	16
***JH2QXG/2**	**28**	**334,866**	**872**	**36**	**98**
*JA2ODV	*	23,104	132	23	41
*7K2PBB	*	72	5	4	5
***JH2ECB**	**21**	**112,112**	**360**	**33**	**79**
*JH2AMH	*	94,017	426	26	51
*JK2VOC	*	84,022	375	28	58
*7L2UQY	*	65,685	279	26	61
*JF2WXS	*	63,406	228	31	67
*JI2LTS	*	62,831	268	28	55
*7K2MPE	*	51,920	324	20	35
*JH2QYN/2	*	22,156	138	22	36
*JA2YAF	*	667	17	11	12
***JA2DN**	**14**	**43,766**	**196**	**25**	**54**
*JA2BZA	*	3,913	35	14	24
*JA2ODB	*	1,456	25	12	14
***JG2LGM**	**7**	**30,780**	**142**	**26**	**55**
*JA2GTW	3.5	5,928	70	15	24
***JE2LPC**	**1.8**	**1,440**	**31**	**12**	**12**
*JH2QMT	*	861	18	10	11
JA3ARM	**A**	**427,638**	**612**	**92**	**163**
JH3AIU	**"**	**425,855**	**574**	**91**	**174**
JN3SAC	*	353,788	522	83	158
JR3XEX	*	129,280	249	80	122
JR3KQJ	*	55,200	210	50	50
JR3NZC	**28**	**264,537**	**786**	**35**	**82**
JH3CXL	**21**	**332,766**	**842**	**38**	**101**
JG3CQJ	**14**	**49,278**	**208**	**29**	**57**
JA3BCT	3.5	7,930	54	15	46
JA3XOG	*	5,320	61	15	25
JH3CYZ	**1.8**	**4,323**	**66**	**15**	**18**
***JN3TMW**	**A**	**839,130**	**900**	**114**	**223**
***JA1DZC/3**	**"**	**544,491**	**670**	**109**	**194**
*JF3IUC	*	303,953	492	93	134
*JA3CSZ	*	299,472	408	101	171
*JP3LKR	*	283,718	417	90	164
*JA3UWB	"	204,561	393	72	119
*JH3JYS	*	151,920	275	83	128
*JA3DLH	*	105,060	226	65	105
*JA3JOT	*	45,743	167	42	59
*JA3EGF	*	37,026	143	36	61
*JE3GFA	*	22,321	90	45	56
*JA3TBT	*	14,805	223	62	101
*JE3UHV	*	12,956	66	34	45
*JG3EHD	*	6,923	59	17	26
*JE3KGT	*	5,198	39	21	25
*JS3OYA	21	9,360	68	20	32
*JA3VAP	14	21,440	117	21	46
*JI3BFC	*	14,208	73	28	46
*JA3AYX	*	4,680	47	17	22
*JO3JYE/3	7	6,048	70	14	18
*JA3OOS	*	1,275	27	8	9
*JA3FZI	*	189	9	3	4
***JF3LOP**	**3.5**	**12,210**	**102**	**21**	**34**
JA4DUD	A	12,090	67	28	37
JK4KSD	**21**	**121,512**	**355**	**34**	**88**
JA4FCK	*	6,240	56	15	24
JA4CSH	**7**	**61,855**	**261**	**28**	**61**
JA4LKB	**1.8**	**1,274**	**22**	**13**	**13**
***JR4GPA**	**A**	**548,065**	**795**	**87**	**158**
*JE4VRF	*	192,035	363	82	117
*JH4OYA	*	123,066	290	55	104
*JA4RTX	*	92,600	165	80	120
*JA4BAA	*	90,724	229	59	89
*JA4AQR	*	43,371	141	50	73
***JA4ETH**	**28**	**50,760**	**211**	**29**	**61**
***JH4LGA**	**21**	**46,332**	**225**	**30**	**51**
*JR4ISK	*	41,116	200	25	51
*JH4AQB	*	5,776	70	15	23
***JH4JNG**	**14**	**60,590**	**257**	**25**	**58**
***JK4KBG**	**7**	**33,200**	**145**	**26**	**57**
***JJ4CBC**	**3.5**	**13,356**	**88**	**21**	**42**
JA5DQH	**A**	**3,469,362**	**2450**	**156**	**338**
JA5EXW	**28**	**157,375**	**452**	**35**	**90**
JA5CKD	**21**	**345,720**	**910**	**36**	**98**
JA5AF	*	8,802	62	20	34
JA5JGV	3.5	2,500	43	12	13
***JO1WXJ /5**	**A**	**118,872**	**280**	**66**	**90**
*JA5MOO/4	*	48,300	120	55	95
*JH5UVK	*	11,623	77	29	30
*JR5HXU	28	2,952	30	17	24
***JR5SWZ**	**21**	**75,828**	**303**	**31**	**58**
*JR5MTS	7	3,675	40	15	20
JA6BIF	**A**	**395,428**	**586**	**89**	**153**
JA6VU	*	274,108	373	109	169
JR6CF	*	17,544	68	40	62
JR6EZE	**21**	**450,000**	**1284**	**33**	**87**
JH6NBW	*	97,328	456	26	51
JA6SHL	**7**	**160,062**	**516**	**32**	**79**
JF6DFZ	**3.5**	**11,713**	**88**	**20**	**33**
***JH6TYD**	**A**	**507,494**	**613**	**105**	**193**
*JA6HJP	*	25,596	93	38	70
*JA6BWH	*	8,352	56	28	30
*JH6IOM	*	4,743	74	26	37
***JA6CNQ**	**28**	**144,360**	**430**	**36**	**84**
*JA6QDU	*	20,894	123	20	42
*JA6AKV	21	8,211	67	20	31
*JK6ISK	*	3,600	50	13	12
***JF6OJX**	**14**	**119,840**	**371**	**31**	**81**
***JA6WFM**	**7**	**29,850**	**147**	**25**	**50**
JH7WKQ	**A**	**2,938,221**	**2387**	**138**	**291**
JR7UOL	*	942,480	1281	93	162
JH7DNO	**21**	**547,584**	**1364**	**37**	**101**
JE7CZT	*	47,060	254	23	42
JA7FTR	**14**	**499,090**	**1196**	**38**	**107**
JH7QXJ	*	29,504	166	21	43
JA7MSQ	*	11,781	84	19	32
JA7GAX	**7**	**17,225**	**100**	**24**	**41**
JE7RJS	**3.5**	**24,140**	**161**	**23**	**37**
JA7JI	*	7,172	70	17	27
JA7NI	**1.8**	**2,340**	**35**	**12**	**14**
***JI7OED**	**A**	**204,906**	**348**	**83**	**130**
*JA7JND	*	161,964	309	83	115
*JA7ARW	*	151,085	300	83	122
***JA7EC**	**28**	**35,520**	**201**	**22**	**42**
*JA7EDZ	*	10,670	72	19	36
*JA7AXP	*	2,175	33	12	13
***JA7BIJ**	**21**	**44,660**	**224**	**22**	**48**
*JH7CJM	*	18,492	96	25	44
*JH7XVB	14	17,388	120	21	33
*JA7DOT	*	13,867	102	16	33
*JR7CJO	*	1,254	24	8	11
***JH7PKU**	**7**	**513,110**	**1396**	**33**	**97**
*JA7XBG	*	67,023	244	31	68
*JR7CDL	*	17,820	110	22	38
*JA7FFN	*	8,424	78	15	24
*JH7XMO	*	3,040	35	13	19
*JE7JRD	*	2,225	36	12	13
***JE7LHT**	**3.5**	**27,202**	**157**	**25**	**42**
*JH7AFD	*	3,762	41	18	23
*JE7RJZ	*	1,610	33	11	12
JA8RWU	**A**	**2,621,944**	**2085**	**144**	**298**
JA8SW	*	98,982	262	55	86
JA8BRH	*	3,990	66	21	66
JA8KSD	**3.5**	**47,047**	**243**	**26**	**51**
JA8AJE	**A**	**257,229**	**490**	**75**	**114**
JA8HBO	*	76,608	210	62	71
JA8RJE	**28**	**96,162**	**367**	**32**	**62**
JA8CJY	**21**	**86,621**	**323**	**32**	**65**
JG8PBE	7	6,336	70	16	17
JA9CWJ	**A**	**1,184,960**	**1285**	**107**	**213**
JA9JFO	*	813,645	829	130	239
JA9NFO	**14**	**77,175**	**256**	**30**	**75**
JA9BOH	**3.5**	**52,851**	**258**	**27**	**52**
***JA9XBW**	**A**	**109,552**	**261**	**65**	**99**
***JH9KVF**	**28**	**107,880**	**433**	**29**	**58**
*JA9XAT	*	192	7	6	6
***JA9TSI**	**21**	**99,090**	**380**	**30**	**60**
*JH9QJZ	7	11,000	73	21	34
*JA9DOF	3.5	6,888	73	16	25
JHØKHR	**A**	**3,755,376**	**3002**	**138**	**294**
JAØQNJ	*	2,417,628	2156	133	256
JHØFUW	**28**	**217,920**	**633**	**35**	**85**
JEØWJS	21	7,920	83	20	20
JAØKAZ	**7**	**307,944**	**775**	**34**	**107**
JAØYAK	*	236,778	735	32	82
			(Opr. JK2PVL)		
JAØUMV	*	221,696	617	34	94
***JAØEZP**	**A**	**950,794**	**895**	**122**	**255**
*JAØOVG	*	78,374	201	61	88
*JAØBPY	*	76,540	161	64	108
*JFØSGW	*	62,829	203	47	70
*JAØAXA	*	45,147	159	48	53
*JAØHC	*	20,124	99	35	43
*JFØPJZ	*	2,508	28	11	11
***JEØUXR**	**28**	**138,456**	**454**	**35**	**73**
*JAØBQB	14	18,560	104	23	41
*JHØDNX	7	20,605	118	21	44
*JAØGZ	*	144	8	3	3
*JRØBAT	*	136	7	4	4
*JH3LCU/Ø	3.5	3,630	53	14	19
*JAØQWO	*	900	24	9	11
*JHØCZQ/Ø	1.8	414	14	8	10

JORDAN

JY8VJ	**A**	**8,031,168**	**4900**	**141**	**432**
			(Opr. DL1VJ)		

KAZAKH REPUBLIC

UL8GO	**7**	**374,496**	**1121**	**33**	**108**
UL7BAY	*	277,704	771	30	103
UL7BN	**3.5**	**58,170**	**301**	**14**	**56**
UL7TJ	*	26,873	167	20	57
***UL8PC**	**A**	**109,330**	**331**	**43**	**87**
*UL8CWC	*	47,483	171	34	69
***RL7LT**	**14**	**72,072**	**311**	**26**	**65**

KOREA

***HL9UH**	**A**	**167,228**	**400**	**80**	**114**
*HL5AP	*	84,316	312	42	65

MALAYSIA

***9M2FK**	**14**	**37,400**	**251**	**26**	**42**

MONGOLIA

JT1 /UA3DK	**A**	**1,789,284**	**2356**	**111**	**246**
JT1CS	*	1,095,168	1796	97	179
***JT1 /JI2MED**	**A**	**158,623**	**385**	**41**	**86**
*JT1 /UV3HD	1.8	242	19	6	5

PAKISTAN

*AP/WM3C	14	1,457	19	14	17

RUSSIA

UA9XEN	**A**	**428,792**	**562**	**67**	**181**
UA9XM	*	4,205	50	14	15
UA9XF	*	1,296	21	9	15
UA9OOX	**28**	**228,520**	**861**	**27**	**89**
RZ9UA	**14**	**939,080**	**2003**	**38**	**132**
UA9TS	*	714,420	1617	38	124
UW9SW	*	242,880	750	33	87
UA9OC	**3.5**	**58,788**	**336**	**14**	**55**
UA9FGJ	*	28,728	198	12	44
UA9AT	**1.8**	**60,984**	**300**	**15**	**57**
RA9UK	*	12,650	139	13	33
***UA9AKG**	**A**	**171,083**	**407**	**36**	**118**
*EX9X	*	52,243	210	27	62
			(Opr. UA9XC)		
***RA9CEJ**	**21**	**184,896**	**656**	**27**	**80**
*UA9SCX	*	125,164	437	31	85
*UW9TM	*	109,392	394	28	78
*RA9XN	*	7,215	68	11	26
***UA9XW**	**14**	**90,636**	**360**	**23**	**60**
***UA9AS**	**3.5**	**50,813**	**275**	**12**	**49**
RWØAB	**A**	**1,291,980**	**1697**	**88**	**217**
RAØFB	*	102,114	541	30	63
UWØST	*	24,100	132	38	62
RAØFA	7	5,902	94	12	14
UAØSR	**3.5**	**48,777**	**334**	**17**	**54**
UAØFZ	*	24,090	230	21	34
UAØLCZ	*	10,542	143	14	28

SAUDI ARABIA

7Z2AB	**A**	**4,946,500**	**3416**	**134**	**366**
			(Opr. K2XR)		
HZ1HZ	*	2,009,360	1725	110	318

SINGAPORE

***9V1YC**	**A**	**2,679,948**	**2772**	**133**	**320**

TADZIK REPUBLIC

UJ8JMM	**A**	**378,104**	**514**	**97**	**216**
UJ8JA	**7**	**283,456**	**1124**	**28**	**75**

TAIWAN

BV/K1RX	**A**	**3,421,748**	**3543**	**142**	**276**
BV2CR	**21**	**132,010**	**742**	**26**	**60**

TURKOMAN

UH8BO	**21**	**71,712**	**318**	**26**	**70**
RH8AX	**14**	**202,111**	**865**	**24**	**67**

UNITED ARAB EMIRITES

A61AC	**A**	**5,847,840**	**3736**	**148**	**410**
			(Opr. N6AA)		

EUROPE

AUSTRIA

OE5SPW	**A**	**352,186**	**506**	**93**	**200**
OE3EMN/1	*	322,695	427	96	259
OE3RE	*	144,963	346	61	128
OE3DSA	**28**	**280,980**	**781**	**37**	**103**
OE5BWN	**7**	**36,852**	**229**	**16**	**67**
OE3GSA	**3.5**	**359,915**	**1856**	**24**	**77**
OE5JDL	*	31,320	241	17	70
***OE2VEL**	**A**	**1,298,355**	**1255**	**134**	**371**
*OE6CLD	28	11,430	91	18	27
*OE3ICS	7	18,620	120	18	58

BALEARIC ISLANDS

EA6ZY	**A**	**3,946,019**	**3466**	**130**	**409**
			(Opr. N6RA)		
EA6ZS	*	92,352	318	43	105
EA6ACC	**28**	**99,788**	**679**	**25**	**76**
EA6GP	**14**	**42,846**	**337**	**17**	**57**

BELARUS

UC2AFC	**A**	**487,058**	**964**	**78**	**184**
UC2SN	**14**	**143,022**	**600**	**36**	**85**
UC2ADM	7	5,452	77	11	36
***UC2OIY**	**21**	**162,864**	**642**	**31**	**86**
*UC2ADR	14	13,104	158	14	38

BELGIUM

ON4WW	**28**	**480,361**	**1165**	**37**	**126**
ON4UN	**1.8**	**118,772**	**893**	**16**	**76**
ON7TK	**"**	**81,430**	**691**	**16**	**69**
*ON4KFM	A	211,560	439	67	146
*ON5EU	*	49,400	221	33	71
***ON4RU**	**"**	**464,758**	**1026**	**39**	**139**
*ON6TJ	*	36,652	200	21	57
***ON6CW**	**21**	**190,890**	**805**	**26**	**75**
*ON4ZD	*	97,869	414	25	76
*ON4PX	*	28,392	214	16	40
*ON4KRO	*	4,928	79	10	18
***ON4XG**	**14**	**78,012**	**425**	**27**	**72**
*ON6LO	*	5,740	83	11	30
*ON5SV	*	1,248	34	8	18

BOSNIA-HERZEGOVINA

*YU4XA	14	9,016	112	14	35

BULGARIA

LZ3SM	A	98,928	432	80	149
LZ1MC	**28**	**260,117**	**783**	**37**	**106**
LZ5W	**21**	**675,635**	**1797**	**39**	**124**
LZ4IM	*	412,720	1204	37	117
LZ1BJ	*	334,574	1152	31	100
LZ2ZV	*	132,000	572	33	54
LZ1WT	*	2,627	34	15	22
LZ1WL	**14**	**76,032**	**452**	**33**	**75**
LZ5G	**7**	**346,080**	**1176**	**34**	**106**
LZ1CW	*	49,868	261	20	71
LZ2KRU	**3.5**	**38,857**	**419**	**14**	**47**
***LZ3FN**	**A**	**1,904,750**	**398**	**65**	**135**
*LZ1KNP	*	362,210	592	75	215
*LZ3BG	*	68,526	288	49	92
*LZ3AW	*	37,336	152	37	67
*LZ1FJ	*	12,696	129	18	51
***LZ2GP**	**28**	**128,610**	**374**	**35**	**109**
*LZ1FI	*	125,882	485	30	83
***LZ6L**	**7**	**245,481**	**903**	**35**	**106**
			(Opr. LZ3YY)		
*LZ1ZX	*	245,480	918	38	114
*LZ2FM	*	10,382	128	11	42
***LZ2WA**	**1.8**	**4,060**	**114**	**5**	**30**

CROATIA

9A2AJ	**A**	**1,582,212**	**1717**	**134**	**340**
9A2OB	*	1,017,720	2570	106	290
9A1CCY	**28**	**673,524**	**1702**	**37**	**122**
9A7A	**14**	**752,388**	**2246**	**38**	**121**
			(Opr. 9A3ER)		
9A3IQ	**7**	**558,129**	**1663**	**34**	**109**
9A2NW	*	317,664	933	34	110
9A1HCD	**1.8**	**82,904**	**778**	**15**	**71**
*9A3ZG	A	55,870	213	43	108
*9A3ZO	*	1,911	33	15	24
***9A3QK**	**3.5**	**36,840**	**539**	**8**	**52**

CZECHOSLOVAKIA

OK1ALQ	**A**	**157,122**	**414**	**55**	**93**
OK1ALW	**21**	**563,316**	**1420**	**38**	**119**
OK1HCG	**7**	**29,316**	**180**	**18**	**66**
OK1JJF	**3.5**	**100,260**	**785**	**16**	**74**
OK1DRO	*	75,064	591	16	72
OK1JDX	**1.8**	**22,446**	**372**	**9**	**49**
***OK1KT**	**A**	**747,544**	**877**	**117**	**412**
***OK1FMR**	**"**	**579,278**	**892**	**91**	**231**
*OK1VD	*	480,469	650	106	235
*OK1FPS	*	451,080	851	81	199
*OK1KZ	*	371,924	726	70	189
*OK1PG	*	352,728	568	78	198
*OK1PEG	*	347,279	669	77	192
*OK1DUT	*	327,450	790	62	160
*OK1BLC	*	323,348	666	57	172
*OK1DXW	*	270,084	467	86	198
*OK1FPG	*	132,012	273	60	133
*OK1DSZ	*	116,948	385	48	125
*OK1MHI	*	69,696	321	39	105
*OK1EV	*	50,876	257	25	54
*OK1SZ	*	28,072	113	41	47
*OK1FOI	*	27,405	138	41	64
*OK1DMP	*	384	8	8	8
***OK1AES**	**28**	**103,500**	**313**	**34**	**91**
***OK1DJO**	**21**	**121,914**	**464**	**33**	**84**
*OK1FHI	*	85,158	292	33	81
*OK1FKW	*	48,048	256	23	55
*OK1FKI	*	16,297	135	19	24
***OK1MKI**	**14**	**79,712**	**416**	**26**	**80**
*OK1JDJ	*	9,800	109	15	34
***OK1JST**	**7**	**16,926**	**161**	**14**	**48**
***OK1DUG**	**3.5**	**89,440**	**208**	**8**	**43**
*OK1AEH	*	132	14	2	9
OK2TBC	**A**	**1,083,537**	**1405**	**99**	**152**
OK2PAY	**14**	**390,300**	**1230**	**36**	**116**
OK2ABU	**7**	**33,196**	**202**	**18**	**68**
***OK2HI**	**A**	**369,088**	**663**	**73**	**219**
*OK2EC	*	302,736	589	71	158
*OK2QX	*	80,029	197	67	124
*OK2PBG	*	69,733	240	47	96
*OK2BBQ	*	63,063	351	28	89
*OK2SWD	*	61,498	266	33	64
*OK2PPM	*	22,612	412	47	135
*OK2PSZ	*	26,973	99	46	65
*OK2PJW	*	8,050	175	5	41
***OK2PLH**	**28**	**92,568**	**288**	**33**	**81**
***OK2ON**	**21**	**123,585**	**490**	**29**	**78**
*OK2BNF	*	27,216	168	21	42
*OK2PAU	*	20,894	137	19	43
*OK2PSC	7	49,136	274	19	64
***OK2ZBU**	**3.5**	**62,216**	**574**	**14**	**74**
***OK2PWJ**	**1.8**	**13,389**	**213**	**8**	**46**
*OK2BWM	*	6,210	128	8	37
OK3RM	**7**	**682,970**	**1775**	**39**	**124**
OK3TPV	**3.5**	**245,323**	**1139**	**27**	**86**
***OK3IA**	**A**	**550,956**	**818**	**76**	**218**
*OK3PQ	*	520,832	777	87	226
*OK3CCC	*	369,795	639	77	190
*OK3DT	*	277,134	645	63	158
*OK3BA	*	265,558	487	72	179
*OK3CDZ	*	258,780	714	62	165
*OK3TGC	*	37,360	219	24	56
*OK3IF	*	34,762	203	28	63
*OK3CWF	*	25,957	232	25	76
*OK3TBB	*	4,284	51	13	15
***OK3TAY**	**28**	**28,304**	**193**	**24**	**34**
*OK3WST	*	15,569	105	19	44
***OK3CAP**	**21**	**126,730**	**489**	**30**	**85**
*OK3TLI	*	6,148	103	10	19
***OK3CAB**	**14**	**39,973**	**333**	**20**	**51**
***OK3CND**	**3.5**	**66,994**	**567**	**16**	**66**
*OK3TEG	*	18,306	299	8	46
*OK3CDN	*	15,394	241	9	48
***OK3TQX**	**1.8**	**11,550**	**191**	**7**	**48**
*OK3QW	*	5,762	130	6	37
*OK3TYM/P	*	3,700	101	5	32

DENMARK

OZ1LO	**A**	**2,949,492**	**2586**	**140**	**406**
OZ5DX	*	767,536	1017	100	292
OZ2RH	*	10,138	45	27	47
OZ8RO	**7**	**69,904**	**232**	**35**	**101**
OZ7HT	**3.5**	**147,630**	**954**	**19**	**76**
***OZ8AE**	**A**	**1,021,108**	**989**	**127**	**379**
*OZ5MJ	*	959,459	1073	97	324
*OZ1FFG	*	601,002	896	97	289
*OZ1LQH	*	490,356	778	83	235
*OZ5KU	*	464,538	762	86	192
*OZ5ABD	*	38,864	211	39	73
*OZ /SM7GCZ	28	9,163	73	16	33
*OZ1BMA	21	16,132	174	14	23
*OZ5MAY	14	1,485	39	7	20
*OZ7GF	*	576	12	8	8
*OZ1IZB	3.5	546	22	4	17
***OZ5PA**	**1.8**	**2,574**	**51**	**7**	**32**

DODECANESE ISLANDS

***SV5 /W4PRO**	**A**	**1,074,864**	**2142**	**79**	**257**
***SV5 /SMØCMH**	**A**	**827,206**	**2033**	**67**	**207**

ENGLAND

G4BUO	**A**	**3,983,382**	**2854**	**145**	**442**
G3MXJ	*	3,270,278	2331	140	422
G3VHB	*	2,444,160	2625	116	286
G3UFY	*	1,665,348	1703	107	321
G4IVJ	*	658,552	1136	75	188
G3TXF	*	127,788	205	88	188
G3KKQ	*	99,066	279	47	111
G4CNY	**21**	**462,985**	**1304**	**37**	**108**
G4ZKJ	*	2	1	1	1
G3WRR	**7**	**26,588**	**202**	**14**	**54**
G3KDB	**3.5**	**360,822**	**1488**	**28**	**93**
G4ARI	*	92,334	869	14	52
G4PIQ	**1.8**	**50,410**	**580**	**11**	**60**
G3KMA	*	33,361	390	12	61
***G3SWH**	**A**	**1,030,788**	**1252**	**96**	**300**
*G3PJT	*	687,084	850	99	273
*G3ESF	*	612,340	917	73	242
*GØIDE	*	339,273	712	61	146
*G3GGS	*	272,994	433	69	194
*G5MY	*	246,906	461	71	187
*G6QQ	*	236,915	449	71	174
*G3JKY	*	205,567	547	59	140
*G3NKS	*	151,216	383	57	151
*G3XVF	*	145,600	427	53	129
*G4ZME	*	116,998	396	39	83
*G4OBK	*	4,998	46	22	27
***G3KHZ**	**28**	**319,340**	**890**	**34**	**106**
*G4UZN	*	110,502	362	31	95
***G4ZOB**	**7**	**72,700**	**389**	**21**	**75**
***G3BDQ**	**1.8**	**5,808**	**102**	**8**	**40**

ESTONIA

ES1AW	**28**	**56,336**	**228**	**33**	**79**
ES5MC	**14**	**593,181**	**1775**	**37**	**116**
ESØNW	**7**	**34,539**	**231**	**22**	**65**
***ES6PZ**	**A**	**337,084**	**695**	**80**	**246**
***ES1CW**	**3.5**	**28,014**	**430**	**9**	**49**

FAROE ISLANDS

OY1CT	**A**	**1,189,944**	**2009**	**85**	**293**
OY9JD	**1.8**	**52,710**	**663**	**10**	**60**

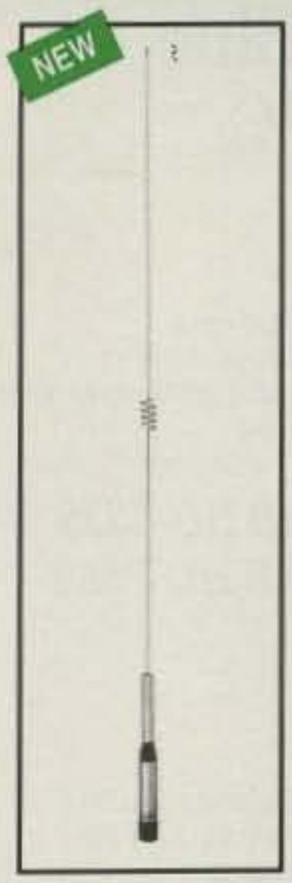
MOBILE ANTENNA PRODUCTS

COMET

MODERN, MULTI-BAND ANTENNA SYSTEMS

Modern, high-performance stations use COMET Antennas, Duplexers, Triplexers and Accessories! COMET products are designed to provide an exceptional level of signal quality and coverage area. Whether operating mobile or from your base station, COMET products make you sound good. No other product line has the selection, convenience, quality and performance!

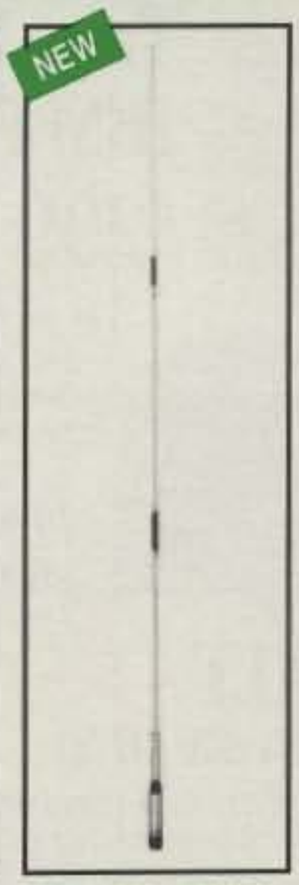
NEW



SB-5/SB-5NMO

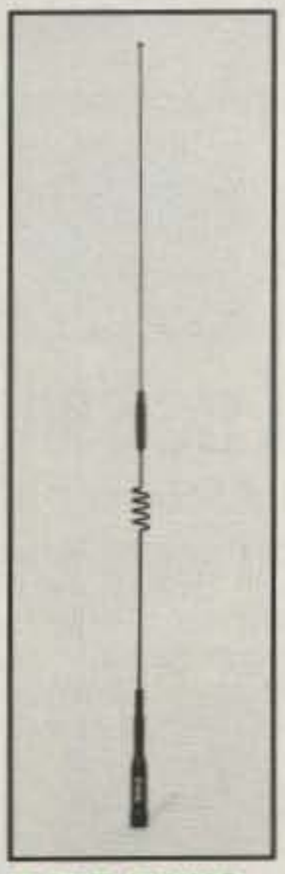
Dual-Band 146/446MHz
Gain & Wave:
146MHz 3.0dBi 1/2 wave
446MHz 5.5dBi 5/8 wave x 2
VSWR: 1.5:1 or less
Max Power: 120W FM
Length: 38"
Connector: PL-259 or NMO style

NEW



SB-7/SB-7NMO

Dual-Band 146/446MHz
Gain & Wave:
146MHz 4.5dBi 6/8 wave center load
446MHz 7.2dBi 5/8 wave x 3
VSWR: 1.5:1 or less
Max Power: 70W FM
Length: 4' 7"
Connector: PL-259 or NMO style

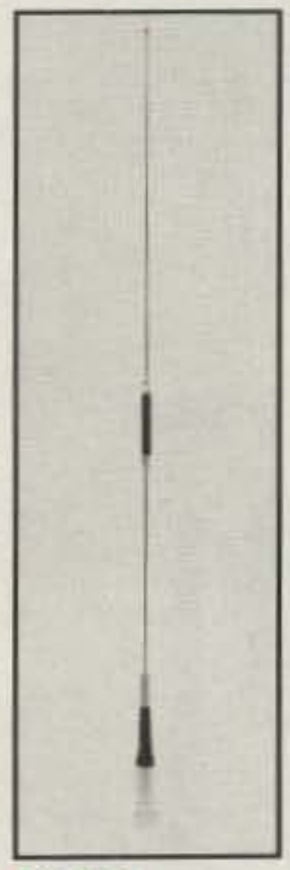


B-20/B-20NMO

Dual-Band 146/446 MHz
Gain & Wave:
146MHz 2.15dB 1/2 wave
446MHz 5.0dB 5/8 wave x 2
VSWR: Less than 1.5:1, 144-148MHz, 440-450MHz
Max Power: 50 watts
Length: 30"
Connector: PL-259 or NMO style
Construction: Black, w/fold-over w/Fold-Over

B-10/B-10NMO

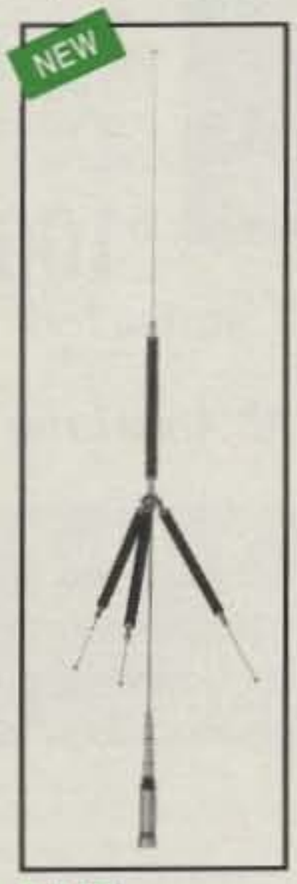
Dual-Band 146/446 MHz
Gain & Wave:
146MHz –dB 1/4 wave
446MHz 2.15dB 1/2 wave
VSWR: Less than 1.5:1, 144-148MHz, 440-450MHz
Max Power: 50 watts
Length: 12"
Connector: PL-259 or NMO style
Construction: Black, cellular look-a-like w/Fold-Over



CX-224/ CX224NMO

Tri-Band 146/220/446MHz
Gain & Wave:
146MHz 2.15dB 1/2 wave
220MHz 3.6dB 5/8 wave
446MHz 6.0dB 5/8 wave x 2
VSWR: 1.5:1 or less
Max Power: 100 watts
Length: 3'
Connector:
CX-224 PL-259
CX-224NMO NMO Style

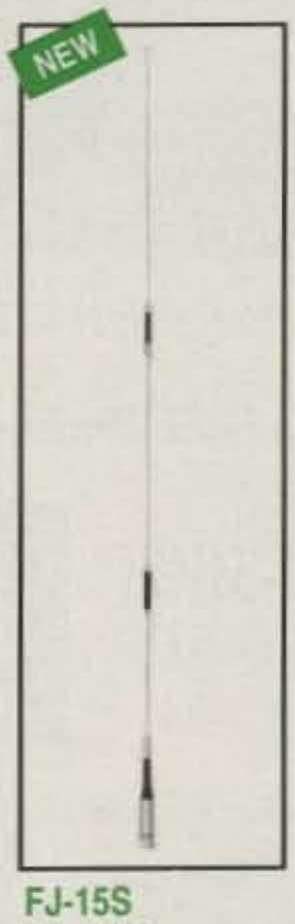
NEW



HA4S

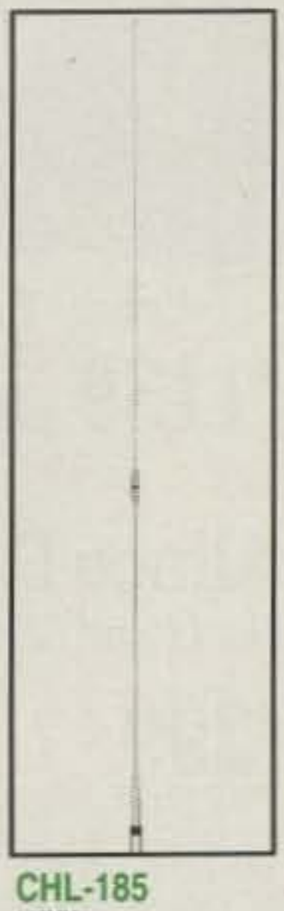
Quad-Band HF Mobile
7, *14, 21, 24, 28MHz
Wave: 1/4 wave
VSWR: Less than 2:1
Weight: 1 lb. 14 ozs.
Length: 4' 4"
Connector: PL-259
Construction: Heavy Duty, w/Fold-Over
***L-14HS:** Optional 14MHz Coil

NEW



FJ-15S

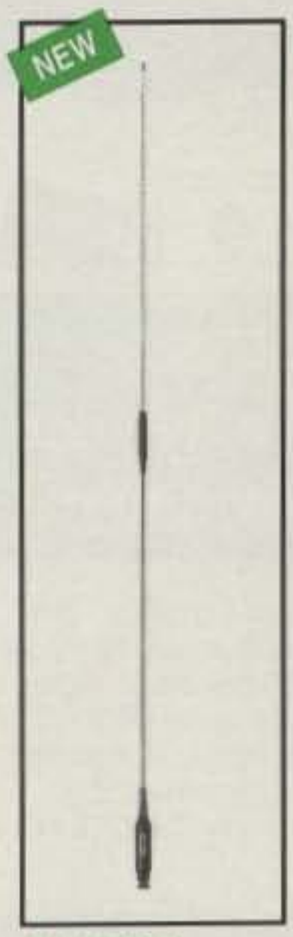
Tri-Band Mobile
50/146/446MHz
Gain & Wave:
50MHz 2.15dBi 1/4 wave
146MHz 4.5dBi 5/8 wave center-loaded
446MHz 7.2dBi 5/8 wave x 3
VSWR: 1.5:1 or less
Max Power: 120 watts FM
Length: 4' 10"
Connector: PL-259



CHL-185

146MHz
Gain & Wave:
4.1dB 5/8 wave
VSWR: 1.5:1 or less
Max Power: 200 watts
Length: 4' 8"
Connector: PL-259

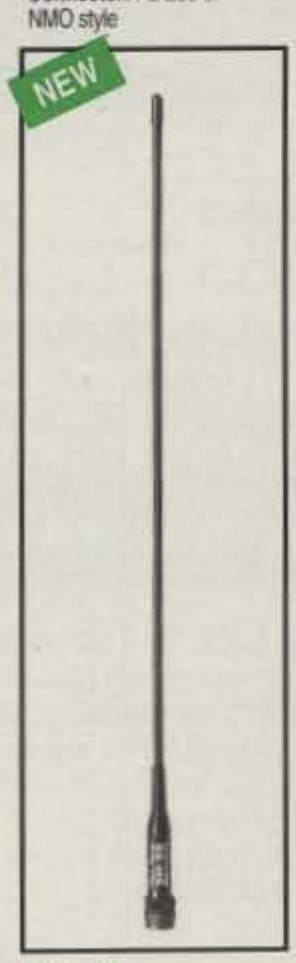
NEW



CH-722SA

146/446MHz HT Antenna
Gain & Wave:
146MHz 3.0dB 1/2 wave
446MHz 5.5dB 5/8 wave x 2
Max Power: 50 watts
Length: 36"
Weight: 3.9 ozs.
Connector: BNC

NEW



SH-55

146/446MHz HT Antenna
Gain & Wave:
146MHz 1.5dBi 1/4 wave
446MHz 3.2dBi 5/8 wave
Max Power: 10 watts
Length: 15.5"
Connector: BNC

CH-32

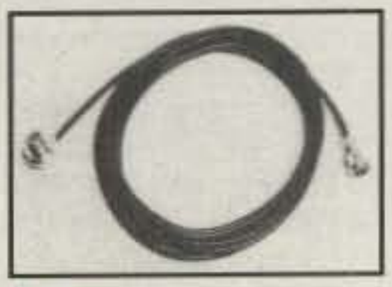
Miracle Baby 146/446MHz HT Antenna. Compact design, the smallest HT antenna available!
Gain & Wave: 0dB
VSWR: 1.5:1 or less
Max Power: 10 watts
Length: 1.75"
Connector: BNC

RS-21

Trunk, hatchback, rear door (van, blazer, etc.) mount. Adjustable to virtually ANY angle. Rubber-coated base protects vehicle paint.

RS-820

Heavy-duty low profile trunk lip or hatch back mount. Rubber coated base protects vehicle paint.



3D4M Standard Cable Assembly
13.5 feet of low loss coax. Gold plated UHF (PL-259/SO-239) connectors.

3D5M Standard Cable Assembly
Same as 3D4M, but 17 feet of coax.

CK-5M Deluxe Cable Assembly
13 feet double shielded very low loss coax. + 12" RG-188 teflon coax. Gold-plated UHF (PL-259/SO-239) connectors. Allows easy entry from a lip-mount w/o causing coax or weather strip damage.

CK-5M5 Deluxe Cable Assembly
Same as CK-5M, but 17 feet of coax.

CF-4160K, CF-4160I, CF-4160J

146/446 MHz
Band Pass, Ins. Loss, Max Power:
1.3-150MHz, 0.1dB, 800w PEP
400-540MHz, 0.2dB, 500w PEP
Isolation: 60dB
CONNECTORS:

	CF-4160K	CF-4160I	CF-4160J
Output:	SO-239	SO-239	SO-239
Low In:	PL-259	PL-259	SO-239
High In:	PL-259	N-Male	SO-239

CROSS NEEDLE METERS

- Separate Meter and RF Sensor allows for convenient placement of the meter.
- Cross Needle Meter provides FWD, REF, and VSWR simultaneously.
- The RF-Sensor is a compact design, and has an extremely low-loss circuit.
- Beautifully illuminated when connected to power supply.
- 6 foot cable standard.
- Optional EKS-3 10 foot extension cable for a total of 16 feet between the sensor and meter.

COMET products are available from most major dealers. For customer service, or a complete catalog, please call us at 800/962-2611. We're confident COMET products and accessories will enable you to enjoy Amateur Radio to its fullest!

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Bundle Up For More Savings!

Ameritron AL-80B

HF Amplifier

Uses Dual 3-500Z tubes to generate 1 kW SSB output, 850 watts CW in a compact desk top unit. Many features including 2 year warranty.

$1069

Bundle Price (with DA173 Wattmeter)

$1139 ***plus FREE Braid - All Ameritron In Stock!***

True Blue IBM PC

$299

- 640K RAM
- 10 MB hard drive
- 360K floppy drive
- Reconditioned Mono Monitor
- Keyboard
- 90-day warranty

30 MB HD - $329

40 MB HD - $369

Alinco DJ-560T

Dual Band (2M/440) HT

We Take Trades...Radio, Computers & Test Equipment

$299

The DJ-560T combines superb performance and features with an incredibly low price in a dual band HT. This unit allows simultaneous reception of both bands for full duplex operation. 40 normal memories and a call channel allow full storage of all local repeaters. Three scanning modes let you easily find repeaters when traveling. All of this combined with code squelch, DSQ, 3 paging functions, an auto-dialer, 5 W output with 12 VDC or optional 12 V battery and much more make this your best choice in a dual band HT.

EBP-12NA 12 V Battery...$54.95

ESC-11 Soft Case...$19.95

All Alinco In-stock!

Alinco DR-592T

Dual Band (2M/440) 50W Mobile...$499

Bearcat BC 890 XLT

200 Channel Scanner-With 800 MHz!

This new item from Bearcat has frequency coverage through 956 MHz with 200 channels of action in 10 banks! The turbo scan feature lets you zip through the channels in lightning speed. 10 priority channels let you scan important frequencies every 2 seconds. It even includes a VFO knob for up-down frequency control. Other features include weather search, auxiliary tape output, weather alert, illuminated LCD display, reception counter, and step select.

- Frequency Range: 25 to 956 MHz

Sale Price... **$275**

Bundle Price (with Hustler Discone Antenna)

$285

VISA MasterCard DISCOVER

FREE! This Month: 10ft. of 1" Size Tinned Copper Ground Braid, a Regular $15 Value, with Purchase of any Radio!

New Tucker Packet Computers

New from Tucker Electronics, your complete source for computers and amateur radios comes a product that combines our expertise in both fields, the Tucker Packet Computer. The Tucker Packet Computer combines a Tucker PC compatible computer with our line of amateur radio equipment to form a complete, ready-to-operate 2m packet radio setup. No longer do you have to worry about buying separate TNC's, radios and a computer, we at Tucker Electronics have done the work for you! Two systems are available. Both combine a Tucker XT compatible computer with 640k, a mono monitor, 3 1/2" 720kB floppy drive, serial and parallel ports, and a keyboard. Packet control for both systems is provided by the DRSI PC Packet adapter 1 which fits inside the case and includes software for easy control. RF is provided by the Alinco DR1200T 2m Data Radio which features 25 W RF output, 14 memory channels and much more. System 1 has the radio mounted internally and features our standard mini-tower case style. It is completely self-powered, just plug in an antenna and go! System 2 has the radio and an Astron RS-1OA power supply external to the computer. The case in System 2 is our unique sub-mini desktop case which measures only 3" x 12" x 14"! Custom configurations are listed below. Get into the exciting world of Packet Radio without all the hassle —order a new Tucker Packet Computer today!

System 1 Only... **$699**

System 2... **$795**

Custom Configurations

Upgrade to 286-12 with 40MB HD, 1MB RAM:

—add $200 to either system

International Sales Welcome! Call or Fax your Order Today!

Full lines available and in stock...

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Add instruments to your Bundle

To celebrate the addition of ICOM to our radio lines we, are offering special prices on selected test equipment until ***Oct. 31, 1993****. The* ***"Bundle Price"*** *is defined as the cost of the unit when purchased with any radio advertised in this month's ad or another test equipment item on this page.*
These units are excellent values at our sale prices...the Bundle Price represents an extraordinary value!

HP 1720A
275 MHz Oscilloscope

The 1720A is a high performance oscilloscope with a 275 MHz bandwidth. For maximum measurement flexibility, the 1720A has a switch-selectable 50 Ω or 1 MΩ input. For general purpose probing, the 1 MΩ setting offers minimum circuit loading. The fully compensated 50 Ω setting provides full use of this oscilloscope's high bandwidth for pulse displays. Includes Delaying Timebase, Hold-Off, cale Illumination, X-Y Display, Auto Focus and Intensity features. The 1720A comes quipped with 90-day warranty and operating manual.

995 *Bundle Price...* **$795** *...You Save...* **$200**

PRD 2020/2021
Vector Voltmeter System

Measures the amplitude and phase relationship of two RF voltages. Frequency range from 1.5 MHz to 2.4 GHz. Sensitivity is 1.5 to 200 MHz; -70 dBm and 200 MHz to 2.4 GHz; -65 dBm. Equipped with the 2021S2 Sampling Head.

$995 *Bundle Price...* **$795** *...You Save...* **$200**

HP 250A
RX Meter

Self-contained bridge, 500 kHz to 250 MHz in eight ranges. Measures resistance (15 Ω to 100 k Ω), capacitance (0 20 pF), and inductance (0.001 µH to 100 mH) with ±2% accuracy.

550 *Bundle Price...* **$475** *...You Save...* **$75**

HP 606A
HF Signal Generator

The widely used and important frequencies of 50 kHz to 65 MHz are delivered by this versatile performing generator. The basic frequency stability of the 606A is excellent , less than 0.005% after warm up. Very fine frequency adjustment is achieved through incorporation of a ΔF control which provides better than 10 ppm resolu- n. To improve frequency accuracy, a crystal calibrator with checkpoints at 100 kHz and MHz intervals is included. The use of feedback in the power amplifier section also yields cellent amplitude modulation characteristics. Up to 95% modulation can be achieved with odulation frequencies ranging from DC to 20 kHz. Internal oscillators of 400 Hz and 1 kHz e also provided. The output level from the 606A is continuously adjustable from 0.1 µV to /RMS into a 50 Ω load. Direct calibration is provided in both volts and dBm (+23 to - 0 dBm) and the output calibration is accurate to ±1 dB.

250 *Bundle Price...* **$200** *...You Save...* **$50**

HP 4260A
Universal Bridge

Digital readout of resistance (10 Ω to 10 MΩ), capacitance (1 nF to 1000 mF) and inductance (1 mH to 1000 H). Also measures dissipation factor (0.001 to 50) and quality factory (0.02 to 1000). Has electronic auto balance and single control null.

Sale Price... **$495**

Bundle Price... **$350** *...You Save...* **$145**

Logimetrics 925/S125
RF Signal Generator/Counter

The Logimetrics 925/S125 is a solid-state RF generator combining a frequency counter and an ultra stable synchronizer which provides outstanding performance and flexibility, all at an economical price. The RF generator supplies -127 dB to +23 dB from 50 kHz to 80 MHz (7 bands) and also has a vernier fine tuning, capable of controlling the frequency to 1 ppm! The built-in counter directly reads generated output frequency and can also be used independently to measure external frequencies to 80 MHz. This is a superb unit, quite capable of handling a wide range of applications.

$695 *Bundle Price...* **$595** *...You Save...* **$100**

HP 5245L/ 5253B
Frequency Counter System

The HP 5245L/5253B Frequency Counter System has been the industry standard for many years and for good reason. This system covers the frequency range of DC to 500 MHz with an input voltage range of 50 mV to 1 VRMS. This versatile, easy to operate system measures period, multiple period, average, ratio and multiple ratio with measurements read directly from an 8-digit display. The timebase has a short-term accuracy of 2 parts in 10^{10}. The mainframe will accept a wide variety of other plug-ins.

$299 *Bundle Price...* **$249** *...You Save...* **$50**

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CIRCLE 96 ON READER SERVICE CARD

FINLAND

OH6WZ	**A**	**2,949,503**	**2157**	**134**	**417**
OH5NQ	*	699,264	1047	82	206
			(Opr. OH1WZ)		
OH2LU	*	366,933	653	81	222
OH2VZ	*	225,766	338	96	180
OH6NEV	*	197,670	320	91	239
OH2AC	*	39,664	113	56	92
OH2BGD	*	32,240	86	55	75
OH1PY	*	18,104	130	23	50
OH2BBT	*	7,790	70	16	25
OG6QU	**28**	**217,560**	**769**	**36**	**111**
OG3MFT	*	202,575	607	38	117
OH5PA	*	4,840	37	20	35
OH2BH	**21**	**757,520**	**1855**	**38**	**132**
			(Opr. OH5UM)		
OG8VJ	*	361,440	1388	33	87
OH3NM	*	84,371	238	31	88
OH3WS	*	41,097	165	27	76
OH4NRC	**14**	**864,058**	**2124**	**39**	**128**
OG8LQ	*	602,390	2376	29	89
OH6NEX	*	474,176	1631	30	94
OG1AT	*	252,306	952	34	97
OH3MC	*	48,048	232	27	64
OH2BCD	*	32,264	196	21	53
OG7MA	**7**	**495,880**	**1474**	**38**	**123**
OH7UE	**3.5**	**218,766**	**1107**	**29**	**85**
OH2PM	*	174,720	956	30	90
OH2BCI	*	174,592	877	30	98
OG3OJ	*	25,872	301	15	51
OH7MEH	*	23,157	120	18	65
OH1MA	**1.8**	**18,910**	**259**	**10**	**52**
***OG6NIO**	**A**	**2,296,625**	**2073**	**121**	**354**
***OH3LIM**	**"**	**1,149,120**	**1392**	**111**	**337**
*OH2BSQ	*	830,304	1080	104	328
*OH3TY	*	690,080	697	112	342
*OH6VR	*	534,225	568	108	311
*OH1TN	*	507,848	611	98	300
*OH6LNI	*	391,590	565	92	250
*OH2UBF	*	364,296	571	85	259
*OH2BJG	*	352,260	626	77	232
*OH5LLR	*	304,128	822	64	200
*OG7NW	*	120,669	361	51	168
*OH4LYX	*	104,152	381	52	136
*OG6YLS	*	83,160	341	39	115
*OH3GZ	*	62,832	232	51	117
*OH2MJW	*	47,995	253	38	107
*OH2VF	*	31,414	100	50	63
*OG6MIL	*	18,490	101	32	54
*OH5NU	*	15,732	96	33	59
***OH7NVU**	**28**	**102,912**	**429**	**31**	**97**
*OH2MPO	*	89,100	310	31	101
*OH6RC	*	69,948	235	33	101
*OH2YL	*	39,220	155	29	77
*OH8MIZ	*	33,338	308	24	55
***OH3MEO**	**21**	**127,420**	**507**	**30**	**85**
*OH4ML	*	103,788	408	32	92
*OH8LC	*	76,320	349	31	59
*OH8NLC	*	75,504	325	27	77
*OH7EU	*	55,545	221	27	78
*OH6MBQ	*	34,816	271	19	49
***OH9UW**	**14**	**74,166**	**386**	**27**	**67**
*OG6UP	*	7,406	75	15	31
***OH5OY**	**7**	**24,050**	**200**	**15**	**59**
*OH7BQT	*	22,620	167	17	61
*OH6LL	*	15,535	149	16	49
***OG3MMF**	**1.8**	**30,745**	**445**	**9**	**56**
*OH1KF	*	22,176	311	9	54
*OG4YR	*	11,368	202	7	42
*OH2BO	*	5,985	74	9	48

FRANCE

F6CEL	**A**	**1,469,400**	**2108**	**84**	**226**
F5IG	*	608,854	1001	77	216
F6HWU	*	225,891	505	56	115
FE1LHI	*	184,494	483	57	137
F6GIN	*	94,848	283	45	83
F3VV	*	47,642	120	66	100
FE1NLX	*	46,872	268	35	73
FE1NEP	**28**	**32,640**	**182**	**24**	**44**
FF6KBF	**14**	**270,072**	**964**	**34**	**90**
			(Opr. F6HSV)		
F1OZF	7	54,000	238	27	81
F6BJC	*	24,900	170	19	56
F2CW	**3.5**	**237,558**	**1394**	**23**	**79**
F1NBX	*	118,266	783	17	52
F6CWA	**1.8**	**28,644**	**373**	**11**	**55**
F6AML	*	10,024	167	8	48
***F6FGZ**	**A**	**1,717,664**	**1580**	**111**	**305**
***F1OIE**	**"**	**714,384**	**1071**	**84**	**244**
*F6EQV	*	309,890	630	66	167
*FD1NQL	*	307,257	674	69	150
*FD1SLQ	*	296,184	624	66	180
*F6EQV	*	286,590	630	66	167
*F1MOY	*	256,434	532	72	165
*F6FII	*	203,229	499	58	135
*F6DZD	*	116,160	338	50	110
*F1JLV	*	103,277	310	48	91
*F6FTB	*	100,594	283	48	98
*F1NKX	*	96,849	211	69	142
*FE1LBG	*	91,632	299	53	131
*FE1MGZ	*	87,248	288	47	105
*F8TM	*	48,480	195	37	83
*F9BB	*	43,608	179	35	103
*F6CYT	*	33,968	165	30	58
*FD1RAB	*	28,980	142	30	75
*FD1SFM	*	28,100	166	28	72
*F9QE	*	23,782	128	33	61
*F5AM	*	10,446	96	13	30
***FD1OQJ**	**28**	**102,917**	**420**	**29**	**68**
*F6AXD	*	540	23	5	5
***FFØXX**	**14**	**82,700**	**443**	**27**	**73**
*FD1PBL	*	23,790	214	17	44
***F1MXH**	**7**	**266,772**	**1289**	**21**	**73**

GERMANY

DJ5JH	**A**	**1,691,687**	**1442**	**137**	**384**
DL1SBR	**"**	**1,561,875**	**1609**	**105**	**320**
DL7MAE	**"**	**1,382,370**	**1076**	**144**	**446**
Y51TO	*	991,743	1190	107	304
DJ6QT	*	948,295	1059	110	335
DL5JQ	*	873,509	1224	83	248
DL1NCT	*	808,640	1052	105	256
DJ7MG	*	798,700	1067	101	249
DJ8CR	*	749,050	1040	87	268
DL1JF	*	746,360	894	105	292
DL8KAW	*	628,895	830	93	272
DK3YD	*	606,298	890	85	256
DL4FJ	*	530,142	837	80	218
DJ7AA	*	491,040	1430	38	122
DK5QK	*	460,591	739	86	225
DF4TD	*	376,380	657	84	222
DL4RU	*	330,395	502	92	207
DL5YAS	*	313,500	660	66	162
DK4TB	*	296,180	500	79	172
DK4RM	*	285,278	501	86	201
DF4PD	*	270,401	400	102	215
DJ5AV	*	258,858	523	63	156
DJ1YH	*	253,588	416	89	203
DL9NCR	*	252,840	507	71	174
DK5AD	*	235,524	504	71	157
DFØIT	*	224,644	533	61	165
DL8UED	*	221,496	365	78	186
DF5BM	*	177,750	441	44	106
DL8UCC	*	177,513	259	104	133
DJ2YE	*	152,092	470	44	144
DF9ZP	*	150,120	225	87	191
DL8CM	*	130,800	270	92	235
DL8WCM	*	92,576	227	64	112
DJ2UU	*	63,888	244	36	85
DL5AKF	*	31,752	178	29	97
DJ8CG	*	26,950	97	45	53
DL4NBV	*	20,648	137	25	64
DF1QQ	*	11,178	102	23	46
DL1SBF	**28**	**56,870**	**201**	**29**	**81**
DL7YS	*	1,166	19	9	13
DLØLR	**21**	**135,110**	**506**	**31**	**87**
DL3BRA	*	110,811	420	34	95
DL7DE	*	46,231	236	26	57
DF7TU	**14**	**25,134**	**251**	**19**	**51**
Y42MK	**7**	**249,990**	**794**	**32**	**98**
DK3KD	*	68,932	378	20	56
DL1HBT	**3.5**	**92,856**	**601**	**24**	**82**
DL1BJL	*	53,690	617	13	52
DF4SA	*	29,376	291	12	56
***DL2SCJ**	**A**	**1,417,680**	**1154**	**142**	**386**
***DA1AM**	**"**	**1,115,154**	**1451**	**92**	**294**
			(Opr. KB8N)		
***Y88VO**	**"**	**986,542**	**1062**	**115**	**339**
***DF4ZL**	**"**	**704,469**	**937**	**102**	**279**
*DJ5GG	*	672,818	873	93	260
*DJ8WD	*	587,487	808	92	247
*DL7CF	*	511,500	696	91	250
*DL4JYT	*	498,261	745	78	229
*DL7QU	*	460,831	719	72	229
*DL1TH	*	425,952	736	78	210
*DF3OL	*	389,400	609	84	211
*DL5DXF	*	376,464	515	93	275
*DF1IAZ	*	345,852	747	62	172
*DL2GBB	*	319,428	656	63	165
*DL6JRA	*	233,810	520	59	168
*Y54NL/A	*	207,466	418	71	132
*DL7BQ/P	*	202,250	484	68	182
*DL6AXI	*	184,912	383	63	145
*DL1ZQ	*	182,938	425	61	118
*DK8FD	*	176,151	369	61	152
*DL5LYM	*	155,760	325	67	109
*DL5SDN	*	153,600	341	64	136
*Y54TO	*	128,544	317	62	137
*Y35WF	*	124,248	391	44	123
*DL2DWA	*	120,615	227	85	102
*DL1ARJ	*	117,436	314	54	103
*DJ8EW	*	112,860	270	67	113
*DL3HSC	*	101,897	322	55	118
*Y57UD	*	97,680	401	44	104
*Y21TO	*	85,212	240	45	117
*DL2DRZ	*	76,201	195	63	118
*DL8UVG	*	69,615	255	40	65
*DL2HTF	*	65,100	190	49	101
*DL9VDQ	*	53,333	196	43	90
*DL6HRW	*	43,785	176	43	96
*DL3DBY	*	34,250	213	38	87
*DF2UU	*	30,956	93	57	97
*DJ3GE	*	28,801	141	23	50
*Y38YE	*	27,132	148	29	47
*DL5JEN	*	22,274	140	28	46
*DL8MKW	*	22,032	112	45	57
*Y23GB	*	18,469	107	26	47
*DL2VLA/P	*	14,718	102	24	42
*DF3QN	*	10,960	80	29	51
*DL8ZWG	*	10,168	70	14	48
*DL3HWW	*	6,386	61	19	43

Thanks to TU4SR, shown here, for giving us all the TU multiplier on 14 MHz.

*DL9GMC	*	4,270	73	13	22
*DL3JRA	*	2,448	36	16	20
***DL8NBY**	**28**	**58,695**	**233**	**25**	**66**
*DL5OBD	*	41,296	172	26	63
*DL4XU	*	37,262	233	21	41
*DF5WN	*	34,500	235	21	39
*DL2HRE	*	31,228	168	22	52
*DL9SDD	*	5,220	63	14	22
***DL5JRA**	**21**	**101,232**	**383**	**23**	**88**
*DL6RDE	*	100,152	424	30	77
*DL2VKA	*	4,680	42	20	20
***DL6UNF**	**14**	**40,455**	**269**	**24**	**63**
*Y71VG	*	3,612	34	18	24
*Y23BF	*	748	12	10	12
*DL1ASZ	7	15,488	145	24	40
*DL1DWT	*	1,820	35	7	21
***DL6MTA**	**3.5**	**21,216**	**288**	**13**	**48**
*DK3LM	*	13,380	159	11	49
***DJ9LJ**	**1.8**	**17,568**	**262**	**8**	**53**
***DJ4KW**	**"**	**17,325**	**253**	**9**	**54**
*Y28AN	*	9,700	199	7	43
*DL2NXC	*	5,243	90	7	42
*Y22AA	*	4,557	78	7	42

HUNGARY

HA9PP	**28**	**359,640**	**975**	**36**	**112**
HA7TM	*	269,392	909	34	79
HA8VK	**21**	**322,924**	**1086**	**36**	**97**
HA5MY	**7**	**234,220**	**864**	**35**	**105**
***HA1CW**	**A**	**1,330,608**	**1539**	**115**	**341**
*HAØHW	*	820,287	1106	99	252
*HAØDO	*	225,155	505	68	177
*HA6VA	*	202,400	464	67	163
*HA5JP	*	40,482	132	43	74
***HA6NW**	**21**	**117,562**	**559**	**24**	**62**
***HA5LZ**	**14**	**108,395**	**348**	**35**	**98**
***HA4EHQ**	**1.8**	**13,359**	**188**	**8**	**53**

ICELAND

TF3CW	**7**	**211,677**	**1004**	**27**	**84**

IRELAND

EI6FR	**14**	**243,226**	**743**	**26**	**83**
***EI5DI**	**28**	**238,784**	**1087**	**25**	**66**

ISLE OF MAN

***GD4UOL**	**A**	**1,609,647**	**1866**	**102**	**345**
*GDØPWW	*	412,542	1167	52	194
			(Opr. W3TB)		

ITALY

I8QFK	**A**	**290,738**	**550**	**78**	**188**
IK1PMR	*	255,136	401	92	180
IC8FBU	*	209,664	561	55	127
I3FDZ	*	159,005	312	83	162
IK3SCB	*	7,370	64	22	33
IØHCJ	**28**	**309,450**	**966**	**37**	**103**
IK3HUG	*	139,965	589	30	63
IR4T	**21**	**526,792**	**1452**	**38**	**123**
			(Opr. IK2HBX)		
I5NSR	*	201,552	766	30	84
IN3NJB	**14**	**376,614**	**1186**	**36**	**111**
IØIA	*	264,040	1212	30	85
			(Opr. IØRKV)		
I5OQV	*	9,405	98	14	41
I3JSS	**7**	**718,080**	**1918**	**38**	**122**
I3VHO	**3.5**	**134,640**	**949**	**21**	**69**
I7ALE	*	80,410	662	17	69
IK1GPG	**1.8**	**6,864**	**126**	**7**	**45**
I2FUM	*	63	8	2	7
***IK2AHB**	**A**	**446,424**	**815**	**79**	**185**
***IKØHBN**	**"**	**372,060**	**561**	**97**	**221**
*IK5TSS	*	297,414	540	66	180
*IKØADY	*	230,910	411	83	175
*IK1OUK	*	158,594	383	71	108
*IK2AIT	*	158,346	421	51	120
*IKØCNA	*	136,950	409	45	120
*I1ZQD	*	116,887	336	50	129
*IØZUT	*	108,331	511	36	91
*IK4IDE	*	96,021	323	47	84
*IKØREH	*	84,672	214	61	107
*I2UIY	*	75,078	245	41	88
*IØFSP	*	18,060	130	20	50
*IK2NVE	*	14,364	87	34	50
*IK2IAR	*	5,544	44	28	35
*IKØJRH	28	19,110	114	26	39
*IK2IKW	*	4,462	54	16	21
***I3JTE**	**21**	**132,787**	**561**	**28**	**79**
*IK2RHE	*	9,154	76	20	26
***I2IFT**	**7**	**56,420**	**317**	**21**	**70**
*IKØFUX	3.5	9,804	113	10	47

JERSEY

GJ/K2WR	**A**	**1,840,125**	**2560**	**82**	**293**

KALININGRAD

*UA2WJ	A	6,678	50	17	36

KARELIA

UA1NDY	**A**	**340,844**	**717**	**73**	**256**
***UA1NFA**	**14**	**28,440**	**261**	**19**	**53**
***UA1NDX**	**1.8**	**3,906**	**116**	**5**	**26**

LATVIA

YL2KO	**A**	**956,384**	**1165**	**106**	**310**
YL2KL	**7**	**585,120**	**1699**	**40**	**122**
***YL2SM**	**A**	**851,596**	**1035**	**114**	**308**
*YL2GVW	"	294,644	722	60	178
*YL2EC	"	198,016	443	61	177
*YL2SB	"	12,500	92	22	28
***YL2HB**	**21**	**65,800**	**320**	**25**	**75**
***YL2GN**	**14**	**174,960**	**805**	**30**	**90**
***YL2UZ**	**7**	**52,185**	**365**	**22**	**83**

LITHUANIA

LY3BU	**A**	**1,117,240**	**1313**	**104**	**320**
LY3BX	*	827,632	1213	99	269
LY2BNC	*	509,760	915	78	242
LY1CJ	*	174,244	496	53	143
LY1CX	**28**	**112,748**	**431**	**36**	**106**
LY2OU	**21**	**150,335**	**637**	**31**	**76**
LY5R	**7**	**598,671**	**1575**	**39**	**132**
			(Opr. LY3BP)		
LY2BN	*	121,618	617	30	89
LY1DO	*	68,265	320	29	82
LY3BS	**3.5**	**164,302**	**960**	**27**	**86**
LY1DS	*	155,268	933	24	90
LY2BCO	*	125,677	740	24	85
LY2PAQ	*	49,680	476	16	64
LY2BIC	*	14,250	207	11	46
LY2BR	**1.8**	**14,280**	**257**	**7**	**44**
***LY1DR**	**A**	**664,048**	**1026**	**100**	**292**
*LY2BRE	*	180,405	466	56	155
*LY2BKM	*	129,470	298	63	179
***LY1DW**	**28**	**180,561**	**533**	**36**	**103**
***LY1CM**	**21**	**165,960**	**622**	**30**	**90**
***LY1BC**	**7**	**38,442**	**268**	**19**	**67**
***LY2BIP**	**3.5**	**79,242**	**556**	**19**	**75**

LUXEMBOURG

LXØRL	**7**	**534,612**	**1972**	**35**	**114**
			(Opr. OH2PQ)		

MALTA

9H1EL	**28**	**794,046**	**2249**	**39**	**120**

MOLDAVIA

ROØF	**A**	**2,659,096**	**2711**	**142**	**394**
			(Opr. RB5FF)		
UO5OA	*	159,576	407	62	121
UO5WU	28	1,344	17	12	16
UO5OIV	**21**	**68,335**	**339**	**24**	**69**
UO5OGB	**7**	**33,620**	**202**	**24**	**65**
***UO5OED**	**A**	**305,844**	**852**	**47**	**84**
***UO5OIS**	**14**	**38,678**	**260**	**25**	**58**
***UO5GR**	**1.8**	**7,691**	**124**	**7**	**42**

NETHERLANDS

PAØADT	**A**	**189,138**	**549**	**49**	**125**
PA3BTH	*	156,992	360	61	162
PAØCLN	*	146,032	354	76	152
PAØUV	*	46,561	178	42	59
PA3BUD	*	7,910	65	21	49
PAØOOS	**28**	**270,153**	**920**	**33**	**84**
PA3BNH	14	900	25	7	13
PA3EBT	**7**	**205,128**	**790**	**31**	**95**
PA3DFT	**3.5**	**206,232**	**1240**	**25**	**79**
PA3ADJ	*	9,729	155	10	37
PAØWDW	1.8	110	11	2	8
***PAØLOU**	**A**	**878,240**	**985**	**117**	**323**
*PA3FNE	*	250,656	650	58	166
SM6LQG/PA	*	193,440	428	59	149
*PAØSNG	*	158,670	359	58	157
*PAØSKP	*	94,720	252	60	125
*PAØGIN	*	79,212	273	44	79
*PAØDIN	*	47,580	162	43	152
*PA2CHM	*	45,064	235	42	75
*PAØYN	*	24,225	285	29	56
*PA3BEJ	*	2,350	40	10	37
***PAØLVB**	**14**	**138,300**	**477**	**38**	**112**
*PA3ELD	*	125,742	572	28	86
*PA3DKX	*	33,899	144	27	82
*PAØPLN	*	25,365	263	12	45
***PA3AAV**	**7**	**79,696**	**265**	**33**	**103**
*PA2REH	*	40,673	250	22	67
***PAØVDV**	**1.8**	**18,411**	**314**	**9**	**48**

NORTHERN IRELAND

***GIØKOW**	**A**	**678,304**	**1172**	**80**	**248**

NORWAY

LA6MP	**A**	**1,023,230**	**1314**	**105**	**337**
LA6IHA	*	281,220	819	51	167
LAØEW	*	256,208	631	70	169
LA4RJ	*	61,019	250	50	111
LA9GY	*	37,146	178	41	82
LA5AP	*	7,198	96	15	46
LA9HFA	7	3,465	55	11	24
LA9HW	**3.5**	**105,370**	**993**	**18**	**64**
LA2UA	**1.8**	**7,155**	**152**	**7**	**38**
***LA2O**	**A**	**299,925**	**680**	**59**	**156**

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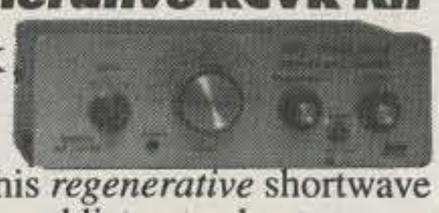
Just plug pre-wired cables into your rig's mic connector and TNC.

Plug-in jumpers let you use nearly any rig with 8 pin mic connector.

MFJ-1272B, $34.95 /MFJ/TAPR TNC2 clones; **MFJ-1272BX**/PK-232; **MFJ-1272BYV**/KAM VHF/KPC3; **MFJ-1272BYH**/KAM HF Port; **MFJ-1272BZ**/PK-88, $39.95 each.

Regenerative RCVR Kit

MFJ-8100K **$59.95**



Build this *regenerative* shortwave receiver *kit* and listen to shortwave signals from all over the world with just a 10 foot wire antenna.

Has RF stage, vernier reduction drive, smooth regeneration, five bands.

MFJ-8100W, $79.95, assembled.

MFJ-1278B Multi-Mode Data Controller

MFJ-1278B **$299.95**

Use this MFJ-1278B, your transceiver and computer to transmit and receive digital communications! You'll discover a whole new world of ham radio and communicate in ways you never knew existed on our ham bands.

The *world class* MFJ-1278B Multi-Mode and MultiCom™ software is packed with features *no other* multi-mode gives you.

You get *10 digital modes* . . . Packet, AMTOR, PACTOR (at no extra cost), RTTY, ASCII, Navtex, Color SSTV, 16 Gray Level FAX, CW and Memory Keyer plus an *enchanced* 32K Mailbox.

You'll have fun joining worldwide *packet* networks and exchanging *color SSTV* pictures with your buddies around the world. You'll marvel at *full color FAX* news photos as they come to life on your screen. You'll see weather changes on highy detailed *weather maps* in all 16 gray levels. You'll eavesdrop on late breaking news as it happens on *RTTY*. You'll enjoy error free HF QSOs on *PACTOR* and *AMTOR* and receiving packet mail in an *enchanced 32K mailbox*. Want to copy some *CW*? Just watch your screen.

MFJ-1289, $59.95, MultiCom™ software and cables.

MFJ *halfwave vertical* Antenna

6 bands: 40, 20, 15, 10, 6, 2 Meters . . . No radials or ground needed!

MFJ-1796 **$199.95**

Operate 6 bands -- 40, 20, 15, 10, 6 and 2 Meters --with this MFJ-1796 *ground independent* halfwave vertical antenna! No radials or ground ever needed!

It's only 12 feet high and has a *tiny* 24 inch footprint! You can mount it anywhere from ground level to the top of a tower -- on apartments, condos, small lots, even on motorhomes. Perfect for vacations, field day, DX- pedition, camping.

Frequency selection is fully automatic -- all you do is transmit. Its *low angle of radiation* really reachs out and brings in DX. Omni-directional. 1500 watts PEP.

Efficient *end loading*, no lossy traps. *Entire length* is always radiating. *Full size* halfwave on 2 and 6 Meters. High power *air-wound* choke balun eliminates feedline radiation. Adjusting one band has minimum effect on other bands. Add $20 s/h.

Easy to assemble -- you'll have it on the air in an afternoon.

MFJ's *world famous* 3 KW Versa Tuner V

MFJ-989C **$349.95**

Here's why the MFJ-989C is the finest 3 KW antenna tuner money can buy . . .

Two *massive* 250 pf transmitting variable capacitors can handle *amps* of RF current and *6000* RF volts. Logging scales.

Precision ball bearing roller inductor, three digit turns counter and spinner knob give you exact inductance control for minimum SWR.

Lighted *peak*/average Cross-Needle SWR/Wattmeter has 200/2000 watt ranges. Super heavy duty *current* balun has two giant 2½ inch powder iron toroid cores wound with *Teflon®* wire.

Six position *ceramic* antenna switch has extra large contacts. Flip stand, dummy load, one year *unconditional* guarantee, aluminum cabinet, tough *baked-on* paint, locking compound on nuts/bolts, handles 3 KW PEP, 10⅛x4½x15 in. Meter lamp needs 12 volts. Add $13 s/h.

MFJ *No Matter What*™ Guarantee

MFJ's famous one year *No Matter What™ unconditional* guarantee means we will repair or replace (at our option) your MFJ product sold in this ad *no matter what* for a full year.

Super Hi-Q Loop Antenna

MFJ-1786 **$249.95**

Tiny 36 inch diameter high efficiency loop antenna covers 10-30 MHz *continuously* with low SWR. Handles 150 watts.

Ideal for home installations where space is limited -- apartments, condos, small lots. Take on trips.

All welded construction.

Remote control has *Automatic Band Selection™*, Cross-Needle SWR/ Wattmeter. No control cable needed. Use batteries or 110 VAC. Add$20 s/h.

No ground or tuner needed.

MFJ-1782, $219.95, like MFJ-1786 but remote control has only slow/fast tune buttons.

Dual Band Mobile Ant.

Mobile Antenna for 144/440 MHz

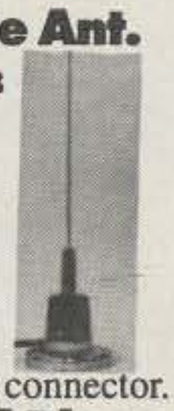
MFJ MFJ-1724B/BB *dual band* **$14.95**

magnet mount mobile antenna for 144/ 440 MHz has 19 inch stainless steel radiator, low SWR. UHF mobile (MFJ-1724B) or BNC handie talkie (MFJ-1724BB) connector.

5/8 Wave Mobile Ant.

Maximum Gain™ 5/8 Wave 2 Meter *magnet mount* mobile antenna has stainless steel radiator, 12 ft coax, low SWR. UHF mobile (MFJ-1728) or BNC handie-talkie (MFJ-1728B) connector.

MFJ-1728/B **$24.95**



5/8 Wave Ground Plane

$19.95 MFJ-1750 **$19.95**

gets you a 2 Meter 5/8 wave ground plane *home station* antenna! You get the highest gain of any single element antenna, shunt fed matching, ceramic insulators.

MFJ-1752, $19.95, for 220 MHz.

Write or call . . . 800-647-1800

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Technical Help: 800-647-TECH (8324)

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CIRCLE 93 ON READER SERVICE CARD

*LA7SI	*	137,335	302	68	159
*LA4BQ	*	120,330	281	64	146
*LA9PEA	*	42,330	161	50	116
*LA5XQ	*	40,576	174	35	93
*LA8GHA	*	38,236	194	37	84
*LA6PB	*	19,864	109	37	67
*LA9WDA	*	15,405	118	28	51
*LA8GK	*	7,840	63	21	28
*LA1VL	28	8,892	96	13	25
*LA1PHA	*	4,840	49	13	27
***LA1B**	**3.5**	**28,404**	**352**	**11**	**43**
*LA8WG	*	23,026	312	14	44
***LA4LN**	**1.8**	**11,610**	**190**	**9**	**45**

POLAND

SP3HC	**A**	**485,254**	**916**	**69**	**205**
SP9CTW	*	435,200	688	83	237
SP4EEZ	*	241,800	281	122	203
SP5FLA	*	29,344	132	31	81
SP7GAQ	*	24,150	100	43	72
SP9RQH	*	1,363	17	12	17
SP5DDJ	**28**	**202,692**	**583**	**34**	**99**
SP6EQZ	*	10,878	78	22	27
SP2BEA	*	3,552	39	16	21
SP7ENU	21	18,483	123	24	37
SP2FOV	**14**	**49,632**	**337**	**24**	**64**
SP7GIQ	**7**	**530,222**	**1542**	**36**	**118**
SP2FAP	*	127,136	557	36	101
SP8TQ	*	123,888	478	28	88
SN3A	**3.5**	**297,815**	**1364**	**29**	**98**
SP6AZT	*	62,780	512	19	67
***SP6EIY**	**A**	**632,632**	**995**	**87**	**221**
***SP9BBH**	**"**	**539,019**	**1107**	**67**	**204**
*SP3FLR	*	277,856	602	85	219
*SP6NIC	*	269,824	562	71	177
*SP1AEN	*	258,420	561	64	172
*SP9WZJ	*	198,896	395	51	197
*SP3FIM	*	166,040	283	74	206
*SP6FVF	*	151,099	343	63	134
*SP8IOD/P	*	147,393	428	44	115
*SP3KB	*	123,327	285	72	121
*SP3MGM	*	73,435	199	63	114
*SP2BKF	*	70,040	203	42	128
*SP2UKB	*	49,896	189	48	106
*SP9MDY	*	41,002	191	33	50
*SP3CNP	*	39,562	118	58	93
*SP3XR	*	39,114	180	37	86
*SP5JCL	*	38,564	121	46	78
*SP6AUI	*	37,950	253	34	116
*SP3FAR	*	37,204	105	57	85
*SP8FHJ	*	33,252	162	38	64
*SP5BLJ	*	28,623	129	41	46
*SP7BCA	*	27,724	217	13	45
*SP3IOE	*	22,689	77	49	58
*SP5CEQ	*	13,065	117	26	39
*SP5FHF	*	9,870	83	15	27
*SP3KPN	*	144	10	4	8
***SP2FWC**	**28**	**165,340**	**485**	**35**	**105**
*SP5YQ	*	119,196	344	34	98
*SP9BRP	*	81,098	168	22	49
*SP9ATE	*	68,728	217	35	86
*SP5MBA	*	25,662	115	29	49
*SP6AUI	*	25,023	155	24	33
*SP3AOT	*	22,703	122	21	52
*SPØCXH	*	18,260	118	22	33
*SP9ZD	*	15,340	93	24	41
*SP9DTH	*	12,415	67	26	39
*SP3DIK	*	9,912	62	24	35
***SP5JTR**	**21**	**244,180**	**698**	**33**	**112**
*SP8LZC	*	152,692	545	32	86
*SP7VCO	*	129,120	474	33	87
*SP6YAQ	*	109,725	429	29	76
*SP6CYX	*	81,247	313	33	80
*SP9QJ	*	52,976	252	20	66
*SP3FPF	*	31,713	138	27	66
*SP8KEA	*	20,382	92	26	60
*SP3JUN	*	10,234	90	15	28
*SP4AVG	*	6,475	73	12	23
***SP6PAX**	**14**	**111,150**	**140**	**15**	**39**
*SP8IOV	*	36,960	253	26	51
***SP3LWP**	**7**	**79,170**	**474**	**23**	**82**
*SP3VAL	*	25,064	94	34	70
***SP9NLK**	**3.5**	**25,550**	**260**	**12**	**61**
***SP4DCR**	**"**	**22,860**	**334**	**10**	**50**
*SO2FCJ	"	19,344	309	11	41
***SP5ZIM**	**1.8**	**37,027**	**559**	**9**	**52**
*SP6GDB	*	16,182	228	9	53
*SP9AAB	*	16,002	232	8	55
*SP5GH	*	6,893	70	7	54
*SP9PT	*	2,832	58	6	42

PORTUGAL

CT1CHU	14	10,176	80	17	36
CT1AOZ	**1.8**	**56,214**	**446**	**17**	**64**
***CR5A**	**A**	**939,774**	**1860**	**84**	**268**
					(Opr. G4ODV)
*CT1ZC	*	58,164	199	49	72
*CT4DX	7	19,688	164	13	33

ROMANIA

YO7LFV	A	74,385	254	42	103
***YO2DFA**	**A**	**591,360**	**1006**	**92**	**244**
*YO8FR	*	287,802	595	68	203
*YO8BNG	*	180,268	373	76	111
*YO6LV	*	100,340	266	54	119
*YO2CMI	*	39,102	161	46	87
*YO7ARY	*	28,431	196	25	92
*YO4FRF	1.8	255	15	4	11

RUSSIA

RV1AB	A	1,554	43	9	28
UA3UCD	**A**	**53,680**	**256**	**63**	**244**
UW3RQ	**7**	**187,953**	**770**	**31**	**98**
***UX3D**	**A**	**1,020,558**	**1299**	**127**	**335**
*UA3AB	*	774,219	935	118	303
*RA3DUT	*	318,696	713	71	223
*RA3PP	*	277,876	733	56	198
*UE3WZ	*	93,562	202	47	116
*RW3QA	*	87,746	342	42	104
*UA3SDN	*	55,909	217	48	115
***UV3ALO**	**21**	**30,940**	**182**	**26**	**59**
*UA3VRP	14	8,556	187	13	33
***UV3WU**	**3.5**	**91,605**	**778**	**21**	**72**
UA4LJ	**A**	**678,632**	**1111**	**92**	**236**
4K4BAT	**14**	**25,704**	**252**	**23**	**45**
UA4NGC	**3.5**	**35,350**	**423**	**12**	**58**
***UA4YG**	**A**	**167,418**	**517**	**54**	**159**
*UA4QK	*	120,604	324	54	116
*RA4HW	14	14,550	121	25	50
UA6HRZ	**21**	**268,051**	**828**	**37**	**112**
UA6LCN	*	84,196	424	29	68
UA6LTI	**7**	**367,140**	**1159**	**36**	**109**
UA6BAD	**3.5**	**59,670**	**504**	**17**	**68**

SARDINIA

***ISØOMH**	**A**	**352,440**	**980**	**51**	**169**
*ISØUWX	14	7,155	95	15	38
***ISØMKU**	**7**	**27,665**	**318**	**9**	**46**

SCOTLAND

GM4SID	**A**	**103,896**	**340**	**48**	**100**
***GMØ /NX1T**	**A**	**466,817**	**1212**	**58**	**183**
***GM3CFS**	**28**	**79,478**	**351**	**24**	**74**

SICILY

IT9TQH	**7**	**583,184**	**1775**	**37**	**127**
***IO9AF**	**7**	**97,524**	**539**	**27**	**81**

SLOVENIA

S52AA	**A**	**5,195,440**	**3208**	**158**	**485**
S51FA	*	1,202,000	1387	102	298
S59AA	**28**	**608,796**	**1485**	**40**	**122**
S51QZ	*	443,750	1418	35	90
S51SO	*	185,598	560	38	88
S57EK	**21**	**445,632**	**1359**	**36**	**96**
S59EKL	*	258,170	1006	30	80
S57DX	**14**	**620,412**	**1798**	**36**	**120**
S59WA	*	517,497	1623	35	104
S59UN	**7**	**971,049**	**2484**	**38**	**135**
S59KAB	**3.5**	**289,050**	**1212**	**29**	**94**
					(Opr. S51IX)
S53EA	*	203,528	1118	25	79
S51QJ	*	172,088	1004	22	76
S51NA	*	149,836	1005	20	74
***S51MF**	**A**	**193,732**	**330**	**89**	**170**
*S51WA	*	179,580	355	67	152
*S52FB	*	73,346	218	68	114
***S57AL**	**28**	**233,632**	**795**	**29**	**83**
*S57JZ	*	177,004	503	36	101
*S52CW	*	60,507	295	22	59
*S53DO	*	55,335	273	30	63
***S57DZD**	**21**	**347,060**	**1066**	**34**	**100**
*S51NM	*	7,518	71	16	26
***S59ZZ**	**3.5**	**75,594**	**647**	**16**	**70**
*S58BKL	*	2,580	80	7	23
***S51RW**	**1.8**	**14,586**	**279**	**7**	**44**
*S51SA	*	5,017	173	5	24

SPAIN

EA1JO	**A**	**884,260**	**1117**	**97**	**261**
EA1FD	*	107,146	293	50	119
EA2CR	*	56,125	235	40	85
EA7HAB	*	27,440	108	39	59
EA2IA	**28**	**426,092**	**1182**	**37**	**112**
EA7CDT	*	7,600	79	17	33
EA7KW	**7**	**452,867**	**1479**	**31**	**100**
EA7BJ	**3.5**	**150,768**	**807**	**25**	**83**
EA7XC	*	14,196	195	11	41
***EA5WU**	**A**	**1,844,525**	**1944**	**110**	**335**
***EA3BOW**	**"**	**374,595**	**643**	**81**	**174**
*EA5GCT	*	295,872	621	58	143
*EC3DEA	*	229,520	709	50	140
*EA1FDO	*	179,361	563	55	134
*EA7JA	*	160,304	397	77	156
*EA3GCV	*	155,844	340	66	156
*EA7FZ	*	110,838	326	55	119
*EC3DDL	*	107,865	484	34	101
*EA3DBO	*	83,430	193	70	92
*EA2CKP	*	79,265	192	64	127
*EA7CA	*	78,432	222	55	117
*EA1EVZ	*	74,930	242	42	85
*EC5CXN	*	63,440	270	34	96
*EC4CPA	*	25,612	166	22	54
*EC3CZS	*	20,303	119	26	53
*EA5EYJ	*	16,951	107	27	40
*EA3DIH	*	15,036	89	34	50
*EA7BY	*	14,430	109	29	45
*EA1AW	*	13,050	101	21	37
*EA7CWV	*	12,191	97	24	49
*EA7HCB	*	12,008	143	15	23
*EA3BHK	*	10,512	57	31	42
*EA7CWA	*	6,405	50	28	33

Bob, KQ2M, shows us his operating position at KM1H. Bob finished third Stateside in the All Band category.

*EA5WX	*	3,404	36	21	25
*EA5GJI	*	3,306	31	18	21
*EA4DUL	*	2,000	30	12	13
*EA3GF	*	1,140	23	10	10
***EA4EP**	**28**	**59,878**	**269**	**26**	**72**
*EA7CP	*	6,225	73	14	31
*EA3GIJ	21	7,448	113	9	29
***EA2IF**	**14**	**85,387**	**466**	**25**	**77**

SVALDBARD

JW9XG	**A**	**1,647,992**	**1915**	**114**	**227**

SWEDEN

SM3PZG	**A**	**1,542,425**	**1562**	**137**	**378**
SM6DHU	*	1,306,692	1391	112	332
SM5CLE	*	754,810	902	108	302
SM5AOE	*	614,768	850	89	215
SM6NJK	*	463,610	638	88	282
SM5RE	*	105,648	390	45	97
SK5SE	*	7,560	66	22	50
SM6BJI	**28**	**298,768**	**845**	**36**	**106**
SMØKV	**21**	**258,248**	**754**	**37**	**115**
SM5AD	*	127,185	355	34	105
SM6BSK	*	121,320	408	30	90
SM5GLC	*	88,008	299	31	83
SM2EKM	**14**	**431,120**	**1350**	**35**	**101**
SMØTW	*	374,535	1105	36	109
SM2JEB	*	130,741	627	28	61
SM6JY	*	9,295	114	15	40
SM2BUW	*	2,628	29	15	21
SM7PKK	**7**	**110,103**	**638**	**24**	**83**
SM6EAN	*	84,072	500	23	70
SM6LPF	*	25,641	167	21	56
SM6MCW	**3.5**	**271,570**	**1151**	**30**	**100**
SM6DYK	*	185,259	1048	26	85
SM6REA	*	6,360	125	8	32
SM6CMR	**1.8**	**13,324**	**205**	**9**	**48**
***SM3CVM**	**A**	**551,525**	**834**	**98**	**277**
*SM6TIA	*	131,580	350	53	162
*SM6ASB	*	130,950	675	52	142
*SM6HVR	*	115,584	403	43	129
*SM7BHM	*	35,256	181	31	73
*SM7HCJ	*	9,116	52	39	47
*SMØBDS	*	4,505	63	14	39
*SM6TOL	*	1,848	21	16	17
*SM5DUT	28	24,806	138	25	54
*SM7LAZ	21	4,320	72	11	13
*SMØCGO	*	2,392	40	9	17
***SM2JVH**	**14**	**64,220**	**325**	**28**	**67**
*SM2CDF	*	37,960	313	17	48
*SM7TV	*	22,950	189	19	56
*SM4SEF	*	6,716	70	14	32
***SM6OLL**	**1.8**	**18,368**	**238**	**11**	**53**
*SM5DXV	*	1,820	52	5	23

SWITZERLAND

HB9AGA	**A**	**657,408**	**1014**	**88**	**233**
HB9FAP	*	311,682	777	50	131
HB9BOW	*	43,872	201	35	61
HB9KC	**28**	**30,480**	**180**	**21**	**39**
HB9DDZ	3.5	2,923	35	11	26
***HB9ZE**	**A**	**333,831**	**701**	**60**	**163**
*HB9QA	*	30,380	136	36	62
***HB9HLE**	**21**	**54,136**	**259**	**26**	**75**
***HB9APJ**	**7**	**38,554**	**353**	**17**	**57**

UKRAINE

UB7W	**A**	**2,709,504**	**2283**	**136**	**430**
RB5QF	**"**	**2,652,195**	**2310**	**146**	**463**
UT4UZ	*	2,478,464	2449	138	406
UT4UX	*	2,199,012	2015	136	398
RY8B	*	1,770,002	2013	121	373
RB5EX	*	728,842	1069	107	266
UB4IX	*	386,688	710	82	236
RB5HY	*	300,195	515	75	240
UB5MLP	*	123,984	225	86	201
UB5XAN	*	42,808	127	40	116
RB5QW	**28**	**319,680**	**1055**	**34**	**110**
RB4EK	*	57,942	288	26	61
UB4HO	**21**	**287,568**	**1003**	**40**	**104**
RB5LJ	*	217,650	678	36	114
UT5UPM	*	11,305	152	9	26
UB5PDM	*	2604	74	6	15
UB5NQ	**14**	**318,790**	**1105**	**37**	**105**
UB5LF	*	246,960	842	37	103
UB5VK	*	30,640	197	21	59
RB5NS	**7**	**320,410**	**583**	**35**	**100**
RB5VM	*	171,912	765	29	75
UT5UIA	*	167,050	607	32	98
RB5PD	*	87,241	409	27	76
UB5NBW	*	77,862	342	29	85
UY5WA	*	21,515	181	19	46
RT5UB	*	11,764	75	20	48
UB5ECO	*	11,684	126	14	32
RB5VT	*	10,638	111	14	40
UB7VA	**3.5**	**120,201**	**802**	**23**	**80**
UB5YAR	*	100,389	619	27	82
UB4QYA	*	70,300	622	16	60
UB5CDX	*	70,110	515	21	69
UB4LCB	*	30,030	366	10	56
UB4ZKG	*	26,040	283	11	60
RB5PE	*	25,806	338	12	54
RB5ELM	**1.8**	**7,920**	**140**	**8**	**40**
***UB5QMA**	**A**	**1,870,088**	**1686**	**141**	**397**
*UB5NBJ	*	469,265	492	102	191
*UY5TE	*	447,876	839	73	224
*UB5IG	*	436,908	880	70	206
*UB5EF	*	369,873	663	79	230
*UB3MP	*	261,840	701	57	183
*UT4JWI	*	149,720	357	62	135
*UB5BCJ	*	133,988	314	61	111
*UB5SBW	*	96,600	230	48	182
*UT5HP	*	66,466	334	69	130
*UB5ISW	*	26,832	120	35	69
*UB5EIT	*	7,777	67	26	51
***UB5NU**	**28**	**80,504**	**266**	**33**	**83**
***U5WF**	**21**	**315,980**	**936**	**34**	**106**
*RB5ESK	*	64,600	398	21	64
*UB4JLC	*	63,315	278	22	83
***UB5RAF**	**14**	**96,092**	**461**	**30**	**86**
*UB5JNW	*	4,968	40	21	33
*RB5ERX	*	1,740	59	8	21
***RB5QCV**	**7**	**123,970**	**643**	**25**	**85**
*UT5BP	*	62,216	401	22	79
*UB5NFR	*	12,150	100	16	29
***UB5PCU**	**3.5**	**65,190**	**620**	**17**	**65**
*UB5EEP	*	6,216	121	7	35
***RB4INR**	**1.8**	**12,582**	**216**	**8**	**46**

WALES

***GW3JI**	**A**	**483,095**	**950**	**67**	**198**

YUGOSLAVIA

YU7AV	**A**	**3,709,604**	**2764**	**143**	**435**
YT1AD	*	3,218,072	2534	138	434
YU7BW	*	3,208,920	2571	146	426
YU7KM	*	157,806	450	63	135
YU1PJ	*	26,625	100	45	80
YT7WW	**21**	**322,915**	**965**	**36**	**109**
4N5M	**14**	**639,220**	**1934**	**37**	**118**
YT1BB	*	483,360	1568	38	114
4N1Z	**7**	**802,536**	**2238**	**39**	**129**
					(Opr. YU4NW)
YU1DHI	**3.5**	**27,018**	**424**	**14**	**43**
***YU1LJ**	**A**	**226,008**	**487**	**59**	**160**
*YU7ZV	*	175,344	424	62	146
*YT7ZV	*	72,200	212	35	70
***YU7SF**	**28**	**77,456**	**316**	**27**	**67**
***YT7P**	**21**	**59,130**	**386**	**20**	**53**
***4N5W**	**3.5**	**63,378**	**121**	**10**	**53**
***4N7MOD**	**"**	**62,868**	**638**	**13**	**65**

OCEANIA

AUSTRALIA

VK8AV	**A**	**1,730,814**	**1625**	**116**	**250**
VK4TT	**14**	**100,560**	**421**	**25**	**55**
***VK3DXI**	**A**	**1,867,762**	**1706**	**120**	**254**
***VK2BQQ**	**"**	**355,384**	**500**	**90**	**158**
*VK2VM	*	218,094	463	61	101
*VK3VT	*	70,680	213	40	74
***VK8SD**	**"**	**44,070**	**216**	**36**	**42**
*VK2NV	*	28,122	120	38	48
*VK2SU	*	3,645	45	13	14
***VK4XA**	**28**	**251,120**	**1014**	**26**	**60**
*VK8BE	*	7,548	74	15	19
***VK6BB**	**21**	**49,714**	**263**	**24**	**43**
***VK6LW**	**7**	**533,696**	**1453**	**31**	**93**
*VK3APN	*	88,176	334	26	62

BRUNEI

V85PB	A	30,179	103	48	55

EASTERN KIRIBATI

T32BE	**A**	**730,418**	**1456**	**71**	**98**
***T32AF**	**1.8**	**49,210**	**474**	**13**	**22**
					(Opr. KH6UR)

EASTERN MALAYSIA

9M6NA	**A**	**5,814,765**	**3960**	**147**	**348**
					(Opr. JE1JKL)

GUAM

KG6DX	**14**	**694,944**	**1641**	**38**	**106**

HAWAII

NH6T	**A**	**5,761,254**	**4287**	**157**	**296**
					(Opr. WØZZ)
AH6JF	*	867,315	1467	93	108
N6VI/KH6	**21**	**695,760**	**1810**	**37**	**93**
KH6CC	**1.8**	**41,217**	**419**	**13**	**20**
***KH6XT**	**21**	**298,860**	**989**	**35**	**67**
*KH6HNT	*	212,520	935	30	47
*NH6DV	14	4,408	56	14	15

INDONESIA

YE2C	**A**	**1,539,200**	**1634**	**106**	**214**
					(Opr. YB2HAP)
YB6AVE	*	629,844	744	98	194
					(Opr. DL8WPX)
***YB3OSE**	**A**	**194,376**	**417**	**60**	**96**
*YB7KD	*	14,582	111	23	23

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- True DCD circuit designed for HF
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- QSO and transfer files simultaneously
- Dedicated MARS mode
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- *Stored* parameters for each mode
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- Call Alert Beeper™
- Built-in packet connect bell
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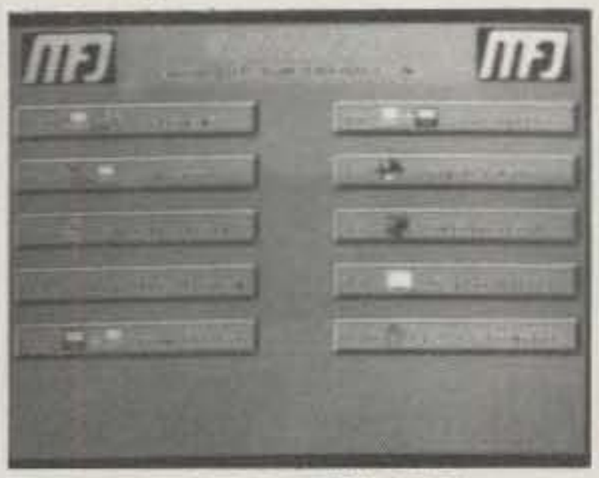
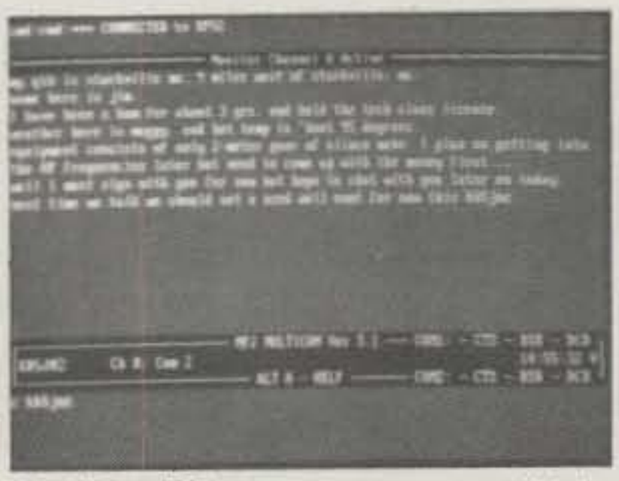


Dedicated MultiCom™ FAX menu. Getting on FAX and SSTV is as simple as pressing one or two keys.



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***YB6TI**	**21**	**183,708**	**763**	**29**	**52**
*YC3FFB	"	86,506	393	24	50

MARSHALL ISLANDS

V73C	**7**	**274,804**	**1010**	**28**	**64**

NEW ZEALAND

ZL3SL	A	8,232	47	22	34

OGASAWARA ISLAND

*JJ2NYT /JD1	3.5	408	34	2	2

PAPUA-NEW GUINEA

P29DK	**A**	**398,738**	**712**	**79**	**114**
*P29JA	A	1,300	18	12	13

PHILIPPINES

***DU3HF**	**A**	**349,650**	**647**	**71**	**114**

SOUTHERN COOK ISLANDS

***ZK1TB**	**A**	**477,615**	**671**	**100**	**155**

(Opr. W7TB)

SOLOMON ISLANDS

H44IO	**A**	**3,115,575**	**3477**	**112**	**193**

(Opr. DL7UCX)

SOUTH AMERICA

ARGENTINA

LW2EUE	A	17,100	93	26	50
LU7EAR	21	16,380	121	26	44
*LU3EAQ	14	11,264	93	18	26
*LU6BEQ	7	13,986	124	15	27
*LU1DOW	1.8	54	7	3	6

ARUBA

P4ØW	**A**	**9,554,775**	**5605**	**151**	**422**

(Opr. W2GD)

P4ØI	A	7,214,236	4304	155	411
P4ØJ	A	6,314,769	4819	136	309

(Opr. WX4G)

P4ØX	**28**	**1,174,032**	**2746**	**33**	**111**

(Opr. N6BT)

BRAZIL

PR1M	A	106,774	281	55	83

(Opr. PY1AJK)

PY3CJI	"	14,464	91	24	40
PY1CE	**21**	**101,619**	**549**	**20**	**43**
PU2KER	"	43,360	189	23	57
ZV5A	**14**	**794,260**	**1781**	**37**	**114**

(Opr. PY5CW)

***PW2N**	**A**	**1,094,373**	**1445**	**83**	**178**

(Opr. PY2NY)

*PY5BLG	"	258,296	537	60	106
*PY2NZR	"	79,170	214	43	87
*PY2YN	"	60,480	199	44	64
*PY2FWA	"	57,138	158	30	59
*PX2A	"	46,561	174	41	60
*ZX4VG	"	44,870	230	35	35
*PY4WS	"	17,430	78	38	45
*PY2ERA	"	13,629	70	35	42
*PY2NX	"	8,211	63	25	26
*PU2VJJ	"	2,277	30	17	16
***PY2NQ**	**28**	**226,197**	**629**	**33**	**90**
*PY2OU	"	179,935	632	25	72
*PY1LJA	"	20,416	114	23	41
*PY2SBY	"	19,992	144	18	31
***PY2YP**	**21**	**127,260**	**435**	**29**	**72**
*PY2HF	"	23,058	134	21	40
*PU2NGL	"	9,102	88	15	22
*PY2CPJ	"	8,288	79	18	25
*PY2APQ	14	8,443	76	17	22
*PY1BVY	1.8	375	14	8	7

CHILE

CE3BFZ	A	19,384	142	22	25
XR3A	**28**	**982,500**	**2551**	**32**	**99**

(Opr. CE3DNP)

COLOMBIA

*HK6LNO	21	6,120	45	18	32

CURACAO

PJ9M	**28**	**350,097**	**1164**	**29**	**74**

(Opr. OH6RM)

PJ9U	**7**	**1,171,864**	**2655**	**30**	**118**
PJ9V	**1.8**	**53,251**	**419**	**14**	**33**

FERNANDO DE NORONHA

PTØF	**A**	**4,971,754**	**3630**	**129**	**337**

(Opr. AH3C)

FRENCH GUIANA

FY5YE	**14**	**1,331,307**	**2818**	**37**	**122**

(Opr. OH7XM)

***FY5FP**	**A**	**421,372**	**962**	**46**	**103**

(Opr. ON4ZD)

GALAPAGOS ISLANDS

HC8N	**A**	**10,773,628**	**6028**	**159**	**412**

(Opr. WN4KKN)

GUYANA

8R1K	**A**	**6,652,614**	**4122**	**148**	**399**

(Opr. OHØXX)

PERU

OA4CWR	**A**	**2,318,316**	**2546**	**100**	**208**
***OA4ZV**	**A**	**1,954,555**	**2032**	**111**	**220**

TRINIDAD AND TOBAGO

9Y4H	**A**	**7,960,980**	**4886**	**149**	**405**

(Opr. K6NA)

9Y4VU	**21**	**1,084,180**	**2434**	**35**	**116**

URUGUAY

CX5BW	**28**	**988,410**	**2358**	**33**	**108**
CXØCW	**21**	**1,818,656**	**3244**	**39**	**145**

(Opr. CX8BBH)

***CX4SS**	**28**	**261,000**	**1011**	**26**	**61**
***CX9AU**	**7**	**95,341**	**488**	**22**	**45**

VENEZUELA

4M2BYT	**A**	**7,081,234**	**4742**	**140**	**363**
YX5A	**7**	**515,816**	**1326**	**28**	**94**

(Opr. YV5ANT)

***4M7A**	**21**	**45,920**	**281**	**19**	**37**
***4M5X**	**14**	**1,145,087**	**2227**	**39**	**135**

(Opr. WM2C)

MARITIME MOBILE

UAØZDA /MM	**A**	**579,744**	**1219**	**88**	**110**
EA1FBJ /MM	**A**	**35,471**	**159**	**30**	**49**
*W7SW/MM	"	26,460	210	23	19

QRP

AA2U	**A**	**1,188,000**	**938**	**118**	**332**
DL3KVR	**"**	**473,518**	**705**	**77**	**246**
N7IR	**"**	**414,288**	**549**	**101**	**173**
SM3CCT	**"**	**371,460**	**701**	**71**	**231**
LY3BA	**"**	**348,475**	**704**	**67**	**198**
N1AFC	**"**	**290,598**	**523**	**61**	**170**
UA4YJ	**"**	**279,651**	**516**	**72**	**219**
JA1GTF	**"**	**258,770**	**402**	**93**	**136**
WB6JMS	**"**	**248,196**	**371**	**103**	**155**
EA3IW	**"**	**224,343**	**555**	**53**	**136**
JA9YAV	**"**	**216,909**	**359**	**87**	**144**
KQ1V	**"**	**185,724**	**266**	**83**	**185**
JA1AA	"	174,085	342	70	115
LX2PA	**"**	**170,766**	**523**	**50**	**129**
WM4Z/5	**"**	**169,747**	**317**	**75**	**124**
KP4DDB	**"**	**158,102**	**410**	**50**	**111**
UB4IM	**"**	**139,101**	**322**	**73**	**160**
DL2RUG	"	130,299	422	45	124
KIBG	**"**	**103,540**	**235**	**77**	**90**
GM4HQF	**"**	**97,664**	**364**	**37**	**72**
NF1J	"	86,292	200	46	107
YO4RDN	**"**	**81,260**	**320**	**40**	**130**
UA9SG	**"**	**80,668**	**285**	**38**	**96**
EA7AAW	"	79,478	343	33	65
WB2CPU	"	77,367	222	32	91
W4IF	"	68,408	172	41	95
EA1GT	"	66,759	343	35	84
VE6GKD	**"**	**58,918**	**306**	**39**	**50**
SM5DQ	"	53,865	210	41	92
VE4GH	"	43,616	150	48	68
WAØRPI	"	37,740	132	34	68
JI2MWH	"	36,410	127	53	57
Y25MN	"	36,288	187	36	101
PAØPUR	"	35,672	158	37	54
DL6ZLG	"	31,122	139	36	42
LY3BY	"	30,174	212	29	78
SM7CZC	"	29,795	131	32	69
ZZ4W	"	25,234	119	26	48
SM6SLC	"	24,638	169	27	70
DJ5QK	"	19,205	167	31	84
VE3RHJ	"	15,525	108	33	36
LY2BB	"	14,328	96	24	48
UA1OZ	"	13,984	87	28	48
VE2ABO	"	11,240	81	24	35
UWØSR	"	6,450	52	9	34
I3DGF	"	5,341	61	19	30
KØGT	"	5,200	37	23	29
JA4XHF/3	"	3,838	39	15	23
WA1WPR	"	3,034	33	14	23
WD9IWP	"	3,034	27	16	25
EA5FX	"	2,160	21	19	21
IK5RUN	"	1,333	20	15	16
AL7OI	"	504	15	9	9
4F3AAL	**28**	**136,234**	**621**	**24**	**50**
N5NMX	**"**	**75,824**	**253**	**31**	**81**
KA1CZF	**"**	**71,116**	**270**	**21**	**71**
4X1IF	**"**	**65,340**	**450**	**13**	**41**
JO1CRA	**"**	**58,562**	**239**	**30**	**59**
LU1FNH	**"**	**30,342**	**264**	**13**	**26**
YO8CMB/P	**"**	**25,088**	**149**	**23**	**44**
OK1DKR	"	13,140	107	18	27
IK8HCM	"	7,632	108	14	22
OK1DZD	"	1,188	44	4	5
KA1UEH	"	276	8	4	8
UL7CN	**21**	**138,504**	**464**	**32**	**84**
WØVX/5	**"**	**121,590**	**341**	**32**	**94**
NØAX	**"**	**93,312**	**311**	**31**	**77**
WAØRJY	"	85,648	302	32	69
G3DYY	**"**	**71,020**	**256**	**27**	**79**
OK3CPY	**"**	**67,914**	**303**	**27**	**71**
K3TW	**"**	**62,118**	**227**	**26**	**76**
I4KRF	**"**	**45,560**	**293**	**23**	**44**
UB5LBX	"	43,168	265	23	53
ES1CR	"	38,776	260	21	53
UA9YC	"	35,340	232	23	39
JH2WIC	"	30,530	169	23	48
KY5N	"	15,744	93	22	44
ON7CC	"	7,525	80	13	22
JR4HCV/1	"	5,984	62	14	20
OK2PXJ	"	1,539	57	5	4
SP5NOG	"	1,020	27	7	13
UB4FXX	**14**	**144,720**	**601**	**36**	**99**
HA8LKE	**"**	**112,840**	**447**	**37**	**103**
W8IQ	**"**	**46,558**	**168**	**29**	**69**
DL1EFW	**"**	**37,440**	**271**	**18**	**60**
9A2EY	"	20,790	218	13	53
OK3TPL	"	16,728	141	19	49
G3LHJ	"	12,314	132	11	36
N2CQ	"	7,181	57	"	29
DL4OBJ	"	6,520	99	11	29
W6DN	"	5,125	46	17	24
SP2UUU	"	1,260	37	7	21
N6XU/6	"	16	2	2	2
SMØDZH	**7**	**26,427**	**216**	**14**	**55**
DL1DQY	"	18,020	169	15	53
YO5BQ	"	11,368	176	10	46
W8QZA/6	"	5,216	63	13	19
PAØTA	"	1,944	41	6	30
EA1FFH	"	1,932	43	"	16
DLØVLT	"	792	16	9	13
SP4GFG	**3.5**	**33,150**	**416**	**13**	**52**
OK3THV	**"**	**11,711**	**226**	**8**	**41**
JA6GCE	"	100	6	5	5
UC2WAF	**1.8**	**27,280**	**369**	**10**	**52**
UC2WM	"	13,780	239	7	45
RA9CTK	**"**	**7,776**	**83**	**8**	**24**
OK1CZ	**"**	**5,192**	**116**	**5**	**39**
UA3XDF	**"**	**2,937**	**70**	**6**	**27**
OK2PAW	"	2,346	71	4	29
ØKHP	"	640	28	4	16

SINGLE OPERATOR ASSISTED NORTH AMERICA

UNITED STATES

KC1XX	**A**	**4,321,056**	**2031**	**165**	**571**
W1PH	**"**	**4,075,785**	**2107**	**156**	**509**
K2SX	**"**	**3,704,592**	**1909**	**162**	**521**
KC1F	"	3,650,733	1881	157	512
K1VR	"	2,950,176	1614	151	481
W1RR	"	1,830,327	1078	145	446
N4DW	"	1,498,310	997	131	399
K1GW	"	1,461,774	959	143	399
N4XR	"	1,368,470	859	140	422
WE1F	"	1,333,605	1021	118	337
W1NG	"	1,179,008	713	154	450
W1XS	"	1,033,500	746	136	364
K1EFI	"	1,000,680	756	116	349
K1KP	"	778,320	608	116	344
W1BIH	"	708,874	535	136	342
NY1L	"	640,332	567	102	294
W1AX	"	620,517	569	102	289
AB1U	"	391,746	436	98	229
WB2DND	"	373,572	414	89	235
KA1CLV	"	266,166	338	73	206
WA1G	"	206,992	280	88	184
WA1S	"	199,230	322	66	163
WS1H	"	163,438	282	64	145
WA1N	"	126,100	234	55	139
K1KNQ	"	93,928	172	61	138
K1FWF	"	15,570	62	34	56
K5NA	**A**	**4,363,824**	**1908**	**174**	**620**
AA2DU	**"**	**3,104,045**	**1655**	**149**	**506**
K2PS	**"**	**2,950,808**	**1621**	**153**	**479**
W2REH	"	2,913,900	1529	158	502
K2WK	"	2,790,061	1460	151	510
W1GD/2	"	1,602,744	985	144	428
K2NJ	"	1,431,060	968	129	381
KF2O	"	1,436,015	822	153	470
K2BU	"	1,337,553	830	135	432
NR2H	"	1,329,032	1003	117	349
N2UN	"	1,186,622	855	133	366
W9NGA	"	835,660	593	135	373
K2OWE	"	729,540	680	110	276
K2DB	"	457,135	483	102	251
N2AIF	"	454,476	449	99	264
KA2HMJ	"	424,274	610	68	165
WR2G	"	407,500	443	84	242
KQ2O	"	390,621	500	73	194
KY2T	"	377,122	353	106	280
W2GMA	"	339,570	380	96	234
WA2MKM	"	331,515	443	83	182
W2GRD	"	323,150	395	70	211
WJ2W	"	278,568	337	96	196
KD2NT	"	259,920	281	102	240
N2SS	"	233,168	282	96	208
WA2UUK	"	186,116	226	85	204
KE2VB	"	91,609	209	47	114
W2XN	"	84,623	187	50	107
NA2M	"	78,996	160	59	115
K2ZH	"	73,416	156	68	116
K2SB	"	64,848	139	55	113
N2DBI	"	29,925	108	31	64
N2VW	"	11,165	59	23	54
W2HG	**28**	**161,330**	**384**	**34**	**112**
W2VJN	**7**	**84,409**	**198**	**35**	**116**
KY2J	**3.5**	**23,644**	**107**	**18**	**69**
K3WW	**A**	**4,664,550**	**2215**	**169**	**557**
WR3E	**"**	**3,916,080**	**1815**	**171**	**585**
W3XU	**"**	**3,760,429**	**1967**	**166**	**495**
W8FJ	"	2,664,512	1485	147	485
W3FV	"	2,284,030	1622	125	362
AA3B	"	2,261,714	1412	138	421
K3VW	"	1,474,560	1002	131	381
K3ND	"	1,430,982	877	145	429
NW3Y	"	1,422,652	1151	118	316
N3II	"	1,377,244	885	136	418
W3OV	"	1,159,772	1013	112	286
N3NA	"	1,116,689	830	122	347
KQ3F	"	1,100,900	887	119	317
K3SA	"	555,753	528	98	265
N3AM	"	541,728	550	100	242
K3RL	"	523,983	420	130	319
W3MM	"	465,660	425	116	282
W3KV	"	448,836	485	100	231
N3ARK	"	416,500	416	90	260
W3MA	"	226,512	281	82	204
NY3C	"	226,048	318	75	181
NM3K	"	212,872	326	72	164
NC3C	"	200,070	255	87	198
NV3V	"	163,237	244	76	163
K3NZ	"	153,387	218	72	175
KU3X	"	136,701	203	74	175
WW3F	"	127,779	223	73	150
K3JLK	"	112,270	197	62	144
N3FDL	"	102,372	159	69	159
WD3P	"	37,665	107	56	79
N3UN	"	34,870	112	35	75
KD2RE	28	9,381	66	18	35
WR3L	21	36,358	122	30	76
N4AA	**A**	**1,952,568**	**1187**	**149**	**428**
K4MF	**"**	**814,104**	**734**	**110**	**282**
W4FDA	"	806,348	716	110	288
K4PB	"	770,847	553	142	355
KN4UB	"	758,368	645	113	330
KS4Q	"	750,712	631	122	306
K8UNP	"	701,344	579	129	305
AA4NU	"	629,648	515	141	323
NU4Y	"	621,355	519	123	310
K4FPF	"	551,650	530	100	274
AB4RU	"	546,312	500	120	288
KX3Q	"	114,760	259	40	112
N4RA	"	111,034	196	66	140
KB4SRE	"	66,470	150	67	103
K4PR	"	40,470	115	57	85
KO4RQ	"	29,440	83	47	81
AB4OH	"	22,932	84	29	69
N3RC	"	22,176	80	36	63
W4MGX	**28**	**109,208**	**283**	**34**	**102**
K4XS	**7**	**663,899**	**1397**	**36**	**127**
N4KG	**"**	**275,706**	**624**	**35**	**124**
NQ1W	"	23,244	109	21	57
K4PI	**3.5**	**115,168**	**347**	**30**	**88**
K5NW	**A**	**2,152,629**	**1399**	**155**	**394**
K5LP	"	1,289,600	908	143	353
KI3L/5	"	783,360	688	126	282
K7GM	"	477,700	509	108	232
W5XJ	"	477,264	516	108	218
N3BB	"	244,737	408	74	139
WB5CRG	"	83,835	146	71	136
AA5ZT	"	54,796	145	47	86
WF5E	"	47,144	122	55	87
K6OY	**A**	**1,403,886**	**1046**	**140**	**338**
W6OAT	**"**	**1,224,520**	**939**	**139**	**321**
K6PU	"	842,586	682	132	311
AA6KX	"	637,590	600	135	266
NI6T	"	628,728	562	135	267
N6DA	"	453,173	561	106	181
W6BJH	"	428,420	497	106	204
N6IP	"	423,894	575	103	155
K6MA	"	309,430	360	117	202
N6OU	"	114,950	217	89	120
AD6E	"	86,193	201	68	89
N6DLU	"	84,524	167	74	113
W6TKF	"	69,888	154	69	99
N1EE/6	"	51,590	169	41	69
N6RFM	"	41,728	121	53	75
K6OZL	**14**	**167,994**	**366**	**37**	**125**
WA6CTA	"	37,136	151	25	63
N7IRR	**A**	**444,132**	**538**	**103**	**189**
KF7YP	"	391,779	481	110	193
KK7A	"	56,056	154	65	78
K7SP	**28**	**97,926**	**306**	**31**	**83**
WJ7R	"	42,700	243	26	35
WA2TMP /7	**21**	**273,093**	**755**	**33**	**96**
K8AZ	**A**	**4,740,060**	**2334**	**171**	**537**
K8MR	**"**	**2,030,506**	**1260**	**147**	**415**
KF8QE	"	1,333,632	1269	113	271
K8BL	"	324,351	410	91	202
KU8U	"	287,300	314	108	220
K8CV	"	282,186	388	79	178
N8JQX	"	230,490	349	76	158
KB3X	"	143,280	225	81	159
W8NJR	"	29,318	96	43	64
AJ8B	"	10,854	55	38	43
AA8U	**28**	**172,815**	**509**	**32**	**91**
W8UVZ	**14**	**302,736**	**624**	**40**	**128**
WB8VPA	"	51,972	153	34	88
W9OP	**A**	**1,168,860**	**894**	**128**	**334**
K8JP	**"**	**1,153,476**	**769**	**155**	**382**

MFJ *halfwave vertical* Antenna

6 bands: 40, 20, 15, 10, 6, 2 Meters . . . No radials or ground needed!

Operate 40, 20, 15, 10, 6, 2 Meters with this MFJ-1796 *ground independent halfwave* vertical antenna -- no radials or ground ever needed!

It's only 12 feet high and has a tiny 24 inch footprint! You can mount it anywhere from ground level to the top of a tower -- on apartments, condos, small lots, even on a motorhome. You can take it anywhere -- vacations, field day, DX-pedition, camping, nearly anywhere you go.

Frequency selection is fully automatic -- there are no moving parts, nothing to adjust -- all you do is transmit. It handles up to 1500 watts PEP. You'll work your share of DX because its *low angle of radiation* really reachs out and brings in DX.

During a contest, you'll love being able to *quickly* work one station after another from all directions because of its omni directional pattern.

It's so easy to put together that you can have it on the air in an afternoon.

How does MFJ achieve maximum efficiency in such a compact multiband antenna?

The key is *end loading* -- the most efficient form of loading known. The *entire length* of the antenna is always radiating power. There are no lossy traps to reduce effective length.

End loading provides multibanding and full electrical half wavelength on each HF band. An *optimum* combination of capacitive hat and inductive end loading delivers a close 50 ohm match without a lossy impedance matching network.

Efficient high-Q loading coils are wound on low loss *ceramic* forms. Large 1-inch diameter aluminum radiators are used to keep losses to a minimum.

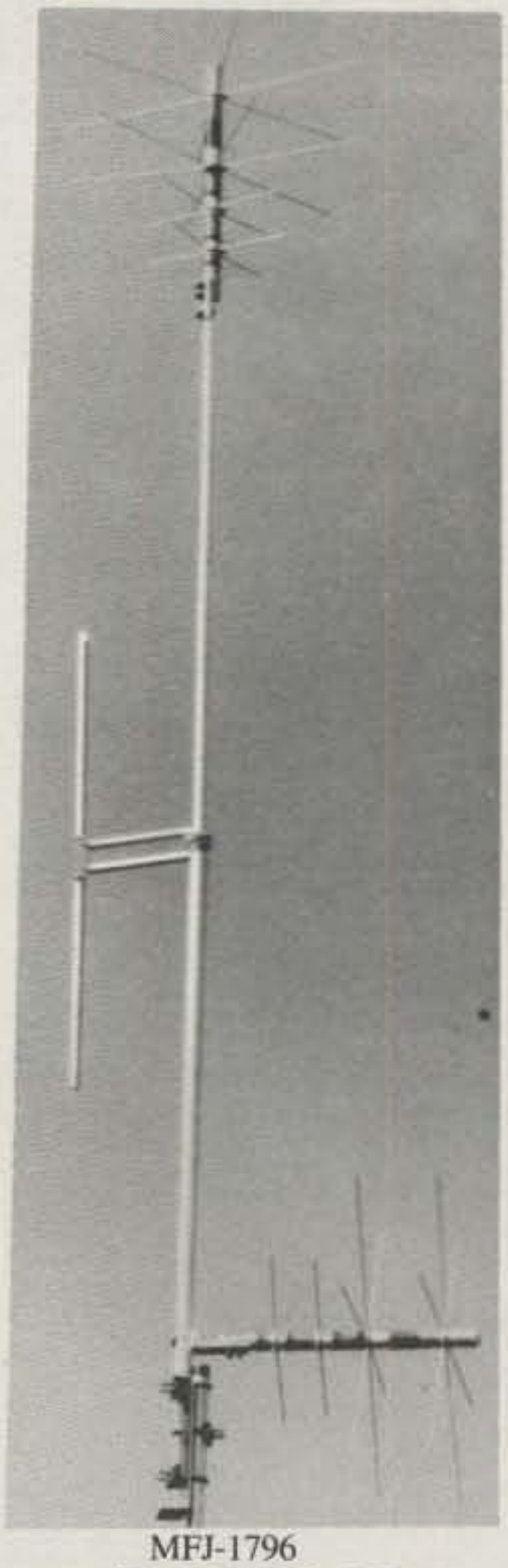
No Radials or Ground *ever* Needed!

The MFJ-1796 is balanced and center fed to totally eliminate the need for radials, counterpoises or a groundplane -- you don't have the kind of ground losses that's common with a quarter wave vertical.

No Feedline Radiation

There is no feedline radiation that causes pattern distortion and wastes power. The 50 ohm Teflon® coax feedline exits through the bottom radiator from a low impedance point -- the loading unit is mounted at right angles to decouple the feedline and to provide a low impedance point.

The feedline is further decoupled and isolated from the antenna with a highly efficient *air-wound* choke balun. This decoupling attentuates RF on the outside of the coax and minimizes feedline radiation that waste useful power.



MFJ-1796

$199.95

Easy to Adjust

It's very easy to optimize the MFJ-1796 for your favorite part of the band. Frequency adjustments are nearly independent -- adjusting one band has minimum effect on the resonant frequency of the other bands -- unlike most other multiband antennas.

Built to Last

You get an antenna built with heavy duty, extra thick wall aluminum radiators, machined aluminum parts and stainless steel hardware.

The coils are wound on tough *low loss* ceramic forms using durable *Teflon®* covered wire that's highly weather resistant.

Full halfwave on 2 and 6 Meters

On 2 Meters and 6 Meters, MFJ's unique stub decoupling and efficient full size halfwave elements really get you out with low angle radiation for lots of DX.

The *most* for your Money

For $199.95, the MFJ-1796 gives you the most for your money – no other multiband, automatic band-switching, ground independent DX antenna even comes close.

No Matter What™ Guarantee

You get MFJ's famous one year *No Matter What™ unconditional* guarantee. That means we will repair or replace (at our option) your MFJ-1796 *halfwave vertical* antenna *no matter what* for a full year.

Continuing Service

MFJ Customer Service Technicians will help you keep your *MFJ halfwave vertical* performing flawlessly -- no matter how long you own it. Just call our toll-free help line 800-647-TECH (8324) -- *an MFJ exclusive.*

Made in USA

MFJ halfwave verticals are made in the USA. Help our fellow Americans by keeping our money here -- buy Made in USA.

Call Your Dealer for Your *Best* Price Today

Enjoy DXing and ragchewing on six bands from your apartment, condo or anywhere. Call your favorite dealer for your best price and order your MFJ *halfwave vertical* today!

Shortwave *Regenerative* Receiver *Kit*

MFJ-8100K

$59.95

Remember hunching over your regenerative receiver for hours with a pair of phones pressing uncomfortably against your ears?

You could hear just about anything that fancy superhets could hear. Sure, you had to play around with the regeneration control just right and have a steady hand to tune but you could hear'em.

Don't you wish you could relive some of this fun and excitement of your youth — share some of it with your kids and grandkids?

Well, you can – with the MFJ-8100 *World Band* Shortwave Radio *Kit.*

Spend a fun evening with your child or grandchild and help him put this simple kit together. When you two finish, watch him glow with excitement as he tunes the world bands -- just like you did -- and remember for life.

This baby performs. It has an RF stage to really pick up the weak ones and it goes into regeneration smoothly without pops or dead spots. Stations all over the world will come in loud and clear with just a 10 foot wire antenna.

Listen to international shortwave broadcasts, hams on SSB and CW, WWV, RTTY, packet and much more. Covers all or part of 75/80, 49, 40, 30, 31, 20, 25, 22, 19, 17, 16, 15, 13 Meters in five bands.

It has vernier reduction drive, bandswitch, volume and RF gain controls, uses a 9 volt battery and is built into a rugged aluminum cabinet.

Two earphone jacks let you and your child or grandchild listen together with your Walkman style earphones or plug-in speakers. 7x6x2½ inches.

Order one as a gift for your child or grandchild . . . or for yourself.

MFJ-8100K, $59.95 kit; MFJ-8100W, $79.95 wired and tested.

Teflon® is a registered trademark of Dupont.

300 KHz-200 MHz Active Antenna

MFJ-1022

$39.95

Wish you could hear everything your expensive general coverage transceiver or receiver is capable of receiving?

Your ham band only antenna does great in the ham bands . . . but plug this new MFJ all band *active* antenna into your general coverage transceiver or receiver and you'll hear strong clear signals from all over the world from 300 KHz to 200 MHz--including low, medium, shortwave and VHF bands.

You'll enjoy up-to-the minute international shortwave newscast, ship-to-shore, airline, commercial RTTY and even military traffic. Use your data controller to receive FAX news photos, weather maps, Navtex and more.

Take it on trips and use it with your mobile or QRP rig to listen.

Also improves weak noisy scanner radio reception from low band to high band VHF — hear signals you couldn't hear before.

A J-310 FET handles strong signals and a new *noiseless feedback* circuit gives you excellent low noise reception. A 4.5 GHz MRF-901 transistor lets you receive weak signals well into VHF.

Detachable 20 inch telescoping antenna. Uses 9 volt battery or 110 VAC with MFJ-1312B, $12.95. 3⅓x1¼x4 inches.

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CIRCLE 179 ON READER SERVICE CARD

KA9LTR	*	745,190	603	122	308
K9MDO	*	301,455	343	100	219
KE9I	*	259,689	293	115	206
KB9CRY	*	151,938	263	67	140
N9XX	*	146,487	218	91	162
W9XT	**28**	**225,360**	**550**	**32**	**112**
WAØPEV	**A**	**1,130,415**	**925**	**127**	**302**
KMØL	*	946,737	866	123	270
KØOD	*	906,378	726	130	313
WYØJ	*	871,112	756	140	278
WØKZV	*	791,600	704	126	274
KØVBU	*	121,877	273	56	105
K1ER	*	40,752	101	52	92
WB8ZRL	*	16,560	75	27	53
AAØCY	*	15,652	72	43	48
WØSR	**28**	**51,700**	**167**	**32**	**78**
KWØA	**3.5**	**29,792**	**150**	**21**	**55**

CANADA

VD7DX	**A**	**1,309,459**	**1388**	**133**	**258**

(Opr. N6HR)

ASIA

JAPAN

JR2BNF	**14**	**169,540**	**428**	**38**	**102**
JL2LPX	*	36,556	176	27	49
JA3VXH	**A**	**340,425**	**529**	**83**	**142**
JG1EIQ/3	*	89,648	159	88	120
JA7SUR	**A**	**440,056**	**604**	**104**	**164**
JA7UES	*	179,728	342	75	113

EUROPE

AUSTRIA

OE1TKW	A	7,992	62	25	49

BELGIUM

ON7RN	**A**	**175,500**	**455**	**50**	**130**

ENGLAND

G5LP	**A**	**681,492**	**1014**	**97**	**269**
G4PDQ	*	175,050	360	67	158
G4BWP	*	155,925	301	76	155

FINLAND

OH2BVM	**A**	**607,620**	**652**	**133**	**359**
OH2BUQ	*	458,616	599	108	280
OH1GI	*	120,666	300	62	120
OH3NLP	**21**	**306,246**	**1063**	**36**	**93**
OH5MPZ	14	7,791	88	15	38
OH3GI	*	5,356	77	11	15

FRANCE

F6BEE	**A**	**1,279,938**	**1156**	**131**	**342**

GERMANY

DF3CB	**A**	**3,156,972**	**1997**	**164**	**522**
DJ2YA	*	**2,479,029**	**1490**	**160**	**519**
DL4MEH	*	976,305	913	129	356
DJ9IE	*	961,376	1142	115	301
DJ5BV	*	893,320	816	133	327
DF8WS	*	675,008	739	105	293
DL8QS	*	672,204	808	107	310
DL8YR	*	612,420	798	93	253
DL8KJ	*	517,313	662	97	264
DL4MFM	*	375,877	626	76	195
DK8FS	*	368,402	570	90	244
DK7ZH	*	356,118	574	81	197
DJ9MH	*	275,968	524	75	181
DL8AAM/P	*	123,114	351	44	98
DJ3WE	**3.5**	**21,321**	**225**	**12**	**57**

ITALY

IKØQDB	A	32,639	182	39	88

ITU GENEVA

4U1ITU	**A**	**4,111,980**	**3494**	**132**	**438**

(Opr. DL5XX)

NETHERLANDS

PI4TUE	**28**	**85,069**	**339**	**32**	**65**

NORWAY

LA7AFA	**A**	**657,775**	**766**	**108**	**307**
LA5M	*	631,540	1033	95	269

SICILY

IT9VDQ	A	42,048	150	41	103

SWEDEN

SM6GDR	A	17,484	100	31	63
SMØDJZ	7	27,707	139	26	77

UKRAINE

UT2L	**A**	**1,897,296**	**1670**	**150**	**414**

(Opr. UB5LCV)

MULTI-OPERATOR SINGLE TRANSMITTER NORTH AMERICA

UNITED STATES

K1KI		**8,207,816**	**3356**	**180**	**662**
K1DG		**7,751,014**	**3332**	**182**	**641**
W1OO		5,337,058	2525	166	573
K2TE		2,279,928	1396	137	437
N1AU		1,897,184	1136	141	445
WE1B		1,087,104	848	113	334
W1BK		225,214	258	98	221
WW2Y		**6,062,210**	**2770**	**175**	**595**
K2SG		4,573,608	2445	153	489
KN2M		4,300,470	2220	162	511
K2QMF		2,617,112	1445	148	484
WU3A		1,566,630	1085	130	377
W2UI		548,475	554	101	254
N3RS		**8,585,380**	**3478**	**186**	**674**
AA1K		4,287,140	2105	160	555
W3GG		3,368,359	1949	150	453
NN3Q		2,818,458	1732	130	428
K3DI		2,159,410	1293	140	446
KS3F		1,528,618	1111	131	350
N3BNA		1,183,578	913	125	329
K3CP		811,740	687	109	306
N4WW		**5,821,605**	**2634**	**181**	**602**
N4AR		4,837,710	2424	173	532
K4LTA		2,148,311	1434	136	405
K4FW		346,338	433	84	187
KD4WE		75,600	152	71	118
W5WMU		**5,361,675**	**2565**	**180**	**557**
W6GO		**5,252,702**	**2739**	**180**	**506**
K6XT		2,379,104	1499	154	405
WA6IET		1,043,238	902	134	279
KA6NAL		940,615	895	129	248
NK7U		**3,075,776**	**2030**	**153**	**391**
KF7AY		140,890	270	79	114
WD8LLD		**3,968,982**	**1995**	**170**	**539**
W8BI		2,942,640	1706	149	461
K8LX		2,747,233	1835	143	378
WA8TOB		823,754	696	124	295
N8DPH		206,901	321	78	159
W9KDX		**2,431,906**	**1510**	**148**	**421**
KS9B		2,016,384	1579	136	336
K9GR		179,826	257	89	169
WØCP		**3,121,965**	**1856**	**162**	**433**
NCØP		2,940,416	1999	145	368
W1XE/Ø		1,812,536	1375	147	326

CANADA

VE1RNS	**729,296**	**964**	**95**	**209**
VE6AO	**349,804**	**917**	**75**	**107**
VD7SV	**5,999,727**	**4132**	**170**	**417**

PUERTO RICO

K3TEJ/KP4	**2,247,552**	**2379**	**104**	**280**

AFRICA

DIEGO GARCIA

VQ9IO	**3,197,428**	**2435**	**131**	**311**

SEYCHELLES

S79S	**5,191,765**	**3367**	**136**	**385**

ASIA

BRITISH CYPRUS

ZC4Z	**11,091,918**	**5537**	**162**	**536**

CHINA

BY4SZ	**544,453**	**1320**	**92**	**125**

JAPAN

JA1ZLO	**1,823,998**	**1728**	**122**	**252**
JE2YHS	**1,269,032**	**1523**	**104**	**188**
JA3ZKK	**942,149**	**1124**	**105**	**194**
JA3ZNJ	866,632	934	119	219
JH5ZJS	**5,032,794**	**3054**	**175**	**396**
JE6ZIH	**2,829,464**	**2063**	**147**	**337**
JA6YCL	**1,462,890**	**1435**	**117**	**246**
JA7YAA	**3,310,420**	**2243**	**162**	**353**

KAZAKH REPUBLIC

RL5P	**6,989,040**	**3663**	**158**	**562**

MONGOLIA

JT1T	**1,451,436**	**2450**	**74**	**185**

RUSSIA

RW9C	**1,939,464**	**1513**	**134**	**358**
UZ9AWN	**1,938,678**	**1620**	**112**	**322**
UZ9XWH	1,193,037	1041	109	308
UZØCWW	**906,015**	**1320**	**104**	**181**

SAUDI ARABIA

HZ1AB	**3,602,776**	**2726**	**125**	**347**

EUROPE

ALBANIA

ZA1A	**2,490,564**	**3241**	**101**	**284**

AUSTRIA

OE1XTU	**367,000**	**824**	**55**	**145**

BELGIUM

OT2D	**3,257,820**	**2729**	**132**	**408**
ON6AH	2,856,708	2705	130	356

BULGARIA

LZ9A	**8,858,468**	**4786**	**194**	**650**
LZ6G	943,590	1270	100	255

CROATIA

9A5D	**1,548,015**	**2722**	**86**	**259**

CZECHOSLOVAKIA

OK5W	**6,767,465**	**3627**	**178**	**607**
OL3A	2,503,314	2266	143	395
OK2KOD	**1,428,350**	**1395**	**123**	**367**
OK2KDS	429,830	798	73	265
OK3KCM	**5,292,284**	**3404**	**167**	**485**
OK3KAG	4,693,335	2943	162	533
OK3KFO	2,194,610	1932	135	427
OK3KUN	255,200	593	61	171
OK3KXR	81,468	329	39	107

DENMARK

OZ5EDR	12,360	119	17	23

ENGLAND

GB5DX	**5,181,192**	**3930**	**146**	**432**
GX3PRC	3,644,900	3404	128	380
G3OZF	3,120,587	2311	144	463
G3LZQ	2,302,510	2012	140	378
G3SSO	916,371	1518	78	183
G3XMZ	617,590	1047	82	220
GØFOS	110,440	503	22	66

FINLAND

OH2HE	**1,918,750**	**2702**	**85**	**122**
OH2BSI	1,001,232	1182	101	398

FRANCE

TM9C	**7,937,423**	**5057**	**164**	**537**
TM5SA	3,306,996	3197	113	349
TM5V	1,968,362	2599	106	312

GERMANY

DLØWW	**7,998,770**	**3938**	**187**	**658**
DJ4AX	6,116,165	3550	162	509
Y33VL	5,888,205	3608	173	558
DLØUM	4,360,500	2877	163	483
Y38I	3,478,626	2612	149	442
DKØMM	2,919,190	2017	161	509
DFØRR	2,840,343	2295	145	416
DLØCMA	2,830,070	2423	129	378
DLØTUD	1,676,960	1665	121	349
DL2HTO	1,499,449	1629	116	315
DL1MFL	1,446,562	1324	127	406
DLØWH	1,356,750	1380	119	331
DLØSSB	1,237,600	1347	101	324
DA1WA	1,099,800	1168	111	357
DA2UK	505,920	1048	70	178
DL2GGA	414,105	691	77	208

GREECE

SV1SV	**1,009,476**	**1853**	**92**	**259**

GUERNSEY

GU3HFN	**2,529,660**	**2967**	**89**	**291**

HUNGARY

HG1S	**6,276,290**	**4566**	**158**	**452**
HG6Y	3,433,954	3285	118	348
HA8KCK	2,738,412	2432	134	415
HA3KNA	2,232,360	2224	131	389

IRELAND

EI7M	**863,525**	**1257**	**79**	**246**

ITALY

IQ4A	**9,197,700**	**4522**	**193**	**678**
II2A	6,571,656	4041	163	551
IK3QAR	1,389,780	1516	108	312

ITU VIENNA

4U1VIC	**5,487,531**	**4446**	**170**	**551**

KALININGRAD

UW2F	**8,049,966**	**4617**	**181**	**597**

LATVIA

YL1ZR	**881,121**	**1114**	**110**	**307**

LITHUANIA

LY4W	**5,611,980**	**3383**	**180**	**593**

LUXEMBOURG

LX/DFØBK	**1,018,080**	**1610**	**105**	**315**

NETHERLANDS

PI4COM	**2,859,615**	**2556**	**142**	**403**
PI4ZLD	768,384	1169	87	261
PAØKHS	470,400	768	86	234

NORWAY

LA8SDA	**2,599,152**	**2348**	**128**	**391**
LA1K	204,288	524	60	164

POLAND

SP3KAU	60,490	345	31	84

RUSSIA

UZ1AWO	**2,303,716**	**4282**	**125**	**413**
UZ1OWZ	1,749,918	1495	137	397
RK3B	**2,430,472**	**2121**	**142**	**426**
RK3A	2,151,996	2114	133	415
UZ3GYM	773,432	1282	92	282
UZ3GXL	369,943	995	70	217
UZ4HXX	**1,243,474**	**1739**	**108**	**260**
UZ4LXD	90,514	340	42	125
R6Y	**1,785,945**	**2003**	**137**	**374**

SCOTLAND

GS4TMS	**495,940**	**1122**	**65**	**209**

SLOVENIA

S55AA	**2,850,730**	**2992**	**111**	**299**

SPAIN

EA3KU	**5,292,828**	**4161**	**170**	**529**

SWEDEN

SKØUX	**2,343,315**	**2041**	**144**	**447**
SK5AA	1,302,786	1315	127	334
SKØHB	1,202,166	1452	118	288
SK7JD	514,052	892	85	223

UKRAINE

RB4IYJ	**700,200**	**1190**	**95**	**265**
UT4JWC	219,504	579	56	148

YUGOSLAVIA

4N7M	**2,955,360**	**2564**	**135**	**389**
YT1R	2,113,310	2401	123	343
YU7BCF	655,200	965	83	253

OCEANIA

FRENCH OCEANIA

FO /SM5NZY	**477,516**	**1045**	**73**	**83**

GUAM

KH2S	**7,249,952**	**4306**	**169**	**399**

SOUTH AMERICA

ARGENTINA

LU7DP	**2,779,200**	**2175**	**142**	**308**

MULTI-OPERATOR MULTI-TRANSMITTER NORTH AMERICA

UNITED STATES

K1AR	**19,473,615**	**7127**	**192**	**753**
N2RM	**18,408,663**	**6780**	**195**	**736**
W3LPL	**16,702,372**	**6220**	**195**	**737**
AD1C	12,690,432	5418	175	641
AA6TT	**9,460,602**	**4721**	**180**	**551**
KY1H	7,821,044	3652	174	584
N6DX	**7,800,895**	**4060**	**189**	**557**
WØAIH	**7,748,370**	**3855**	**176**	**577**
NQ4I	**6,224,188**	**3133**	**174**	**542**
KY3N	6,216,800	2866	164	594
W4MYA	5,868,284	2708	177	587
W6BA	5,721,408	3012	172	503
WB2P	3,715,577	1760	173	560
K2TD	3,525,036	1850	153	515
N6CQ/3	3,233,536	2058	131	413
AB2E	3,054,818	1873	152	434
K3II	1,663,508	1182	127	364

ALASKA

NL7G	**14,485,572**	**9100**	**175**	**458**

CANADA

VE2CSI	**8,184,910**	**6641**	**125**	**396**
VE7ZZZ	**5,404,410**	**4730**	**145**	**332**

AFRICA

CUETA & MELILLA

EA9EA	**30,038,639**	**12305**	**180**	**637**

ASIA

HONG KONG

VS6WO	**17,799,960**	**9841**	**190**	**570**

JAPAN

JA3ZOH	**8,603,448**	**4545**	**187**	**477**
JA1YDU	**7,452,544**	**4158**	**185**	**447**
JA1YXP	6,609,640	3886	172	424
JA3YBF	4,445,376	2859	159	389

EUROPE

CROATIA

9A1A	**18,450,820**	**10440**	**188**	**632**

DENMARK

OZ5WQ	**1,827,837**	**2094**	**121**	**378**
OZ4HAM	477,504	1020	67	221

ENGLAND

G8SCW	**4,355,548**	**3476**	**139**	**415**

ALAND ISLANDS

OHØW	**17,040,051**	**10488**	**194**	**667**

FINLAND

OG4NVX	**675,680**	**1038**	**100**	**312**

GERMANY

DLØCS	**12,118,804**	**6521**	**195**	**671**
DLØKF	6,640,882	4464	166	547
DLØWU	1,348,528	1611	91	265
DF3QG	930,517	1031	113	320
DF9CY	629,993	1003	84	215

HUNGARY

HG73DX	**17,812,935**	**9335**	**200**	**679**

LITHUANIA

LY7A	**8,261,409**	**5720**	**172**	**569**

RUSSIA

UX1A	**11,977,597**	**6073**	**211**	**718**
EZ6L	10,095,894	6110	190	647

UKRAINE

RY1I	**10,320,133**	**6394**	**187**	**640**

WALES

GW8GT	**17,487,927**	**10250**	**184**	**639**

OCEANIA

MARIANAS ISLANDS

KHØAM	**23,951,385**	**11253**	**190**	**527**

NEW ZEALAND

ZM2K	**7,636,830**	**5385**	**150**	**348**

SOUTH AMERICA

ARGENTINA

LU4FM	**6,671,678**	**4558**	**139**	**367**

Check Logs

5Z4FO/A, 7K2GMF, AA4WX, CT1YH, DLØDRS, DL1ARL, DL1DQD, DL1RNE/P, DL1RPR, DL2AKF, DL2BQV, DL2BUT, DL2SZA, DL3JON, DL4LVM, DL4LXM, DL5AMF, DL5AVJ, DL5YSM, DL5YWM, DL6UCI, EA/OH5NR, EA1AUI, EA1EVM, EA1FAE, EA1KW, EA3CUU, EA5ND, EA5OI, EA6EJ, EA7CP, EA7KN, EA8ZS, F2FX, HA1VQ, HA2EOA, HA7PW, IK3SSX, IK3TCJ, IT9AUP, K6FM, K6ZDL/6, LA1B, LA1IO, LA2QM, LA3JHA, LA4IAA, LA4KF, LA4NE, LA4WJ, LA5LT, LA5QC, LA6BG, LA6FC, LA7DHA, LA7IJ, LA8CA, LA8CE, LA8PDB, LA8XM, LA9DFA, LA9FFA, LA9HF, LA9OI, LA9PHA, LZ1HX, LZ1IA, NJ9Z, OE6IMD, OG4MCV, OH1XX, OH2FQ, OH5FA, OH5PT, OH5PX, OH7WV, OH8LAE, OK2PLH, OK3CVX, OY9JD, OZ1EUO, OZ1JLX, OZ4ABH, OZ5UR, OZ7JU, OZ7QB, OZ9HBO, PA3ASC, PA3FSC, PT7AA, PT7WA, PU2ELV, PY2AE , PY2CZL, PY2IAX, PY2IQ, PY2SP, PY3AA, PY3ARD, PY3GSP, PY3MHZ, PY3ZAP, PY3ZH, PY4ZF, RA3DMA, RA3NB, RL7EC, S51VE, SMØBNK, SMØBTS, SMØBXT, SMØCSX, SMØNJO, SM3CBR, SM4ASI, SM4SCK, SM4TRE, SM5ARL, SM5BFJ, SM5LI, SM5MLE, SM5OL, SM5UH, SM6FPZ, SM7ASN, SP1BLE, SP2ERZ, SP2IU, SP3JIA, SP4DZT, SP4IQG, SP4LDT, SP5BWO, SP5BYY, SP5CBA, SP6BEN, SP6BGZ, SP6CPF, SP6FER, SP6JZB, SP6STS, SP6SYF, SP7DTP, SP7VCA, SP8FHM, SP8MCP, SP9DAE, SP9DOW, TF3DX, TU4SR, UAØUDY, UA1CCP, UA1NDX, UA2WJ, UA3DFV, UA3MIF, UA3RAG, UA3TFS, UA6LDF, UB4JMJ, UB4MQV, UB5CEV, UB5FDL, UB5ZBS, UB5ZKG, UC2LB, UC2LDU, UC2LEO, UT5UJY, UT5UOL, UV3DAV, UV3DRU, VE2EM, VE3BR, VE3NBE, W7LR, W8LYT, WA4SSI, WB4BUA, WD8QBP, WL7AFD, Y24OA, Y28YN, Y42CB, YL2GD, YO3FF, YO3FRI, YO3KAA, YO5BFJ, YU7KM, ZZ30053.

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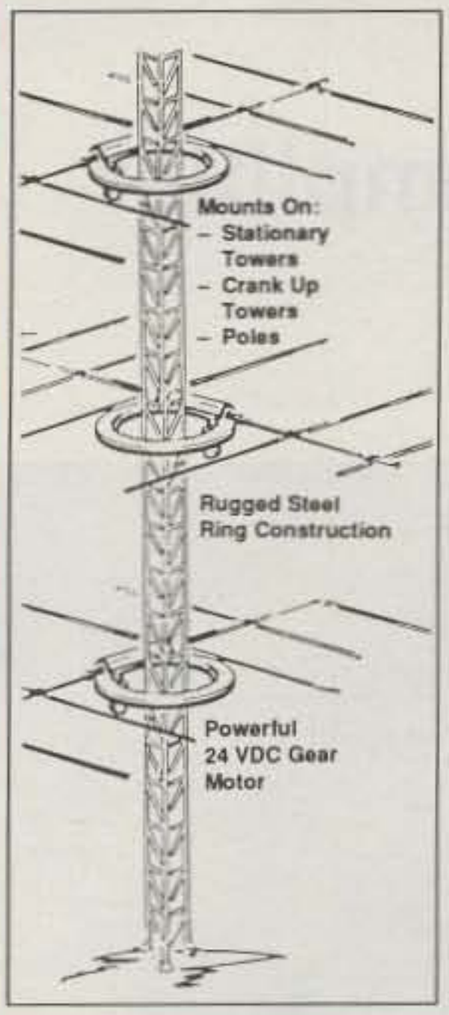

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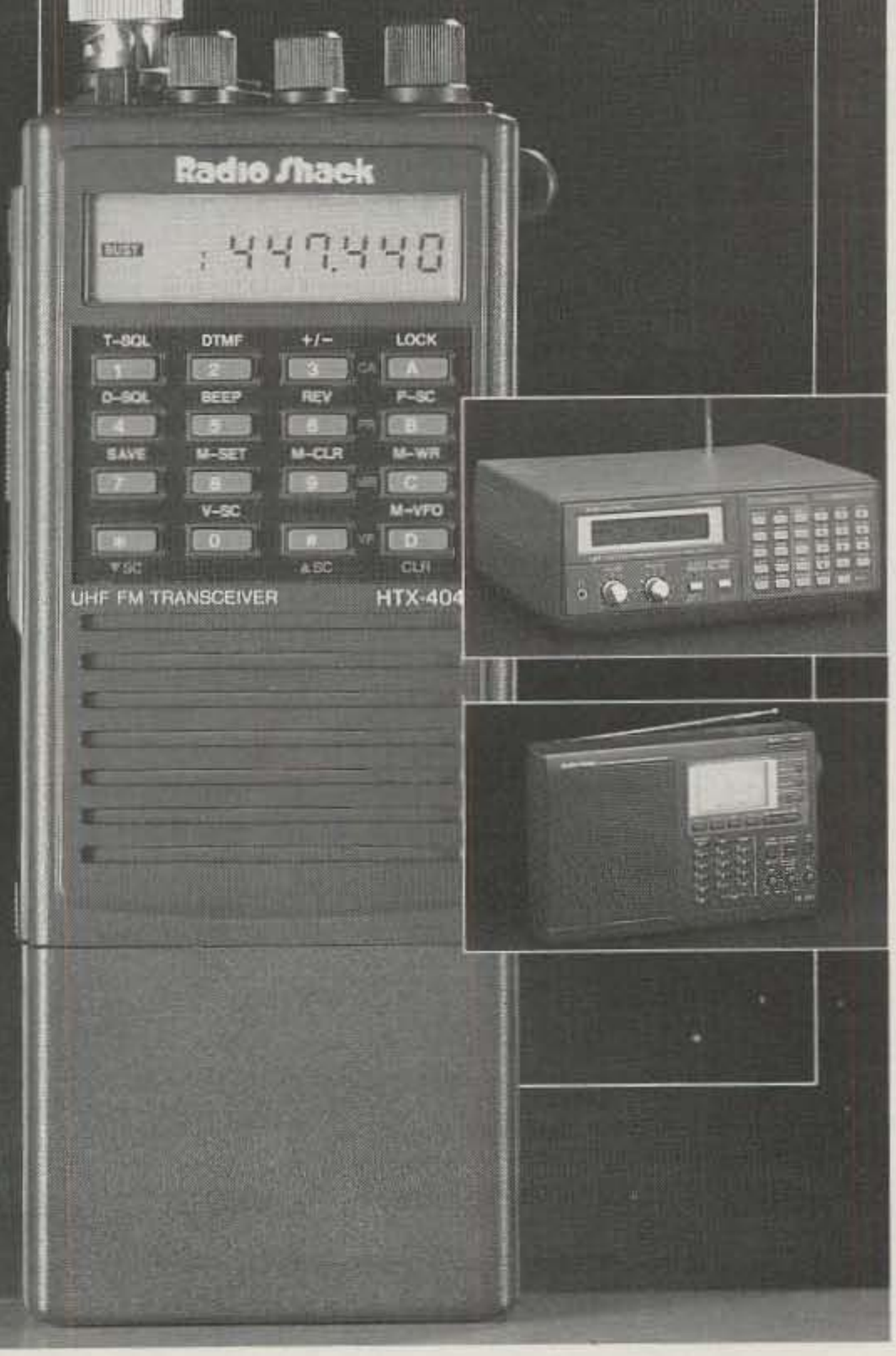


The pace quickens now, and our cabinet is starting to fill up as we add more circuit boards. This month two more boards are added to our project.

The 40 Meter Fun Machine
Part IV
The Product Detector and Audio Amplifier

BY PAUL CARR*, N4PC

I hope that you've been enjoying the VFO from last month's installment. I am sure that you've found that the added versatility produces many more contacts than the crystal-controlled version of the transmitter. In this month's project we will add two more stages and interface with our earlier circuits to produce a stand-alone direct-conversion transceiver. Let's continue.

Circuits Required

We are going to add two circuits this month. First, we need a product detector to change the incoming signals into audio and second, some form of frequency selectivity would be extremely helpful to minimize interference. Electronic switching is also provided to make the circuits behave properly. Now let's take a look at the circuits individually.

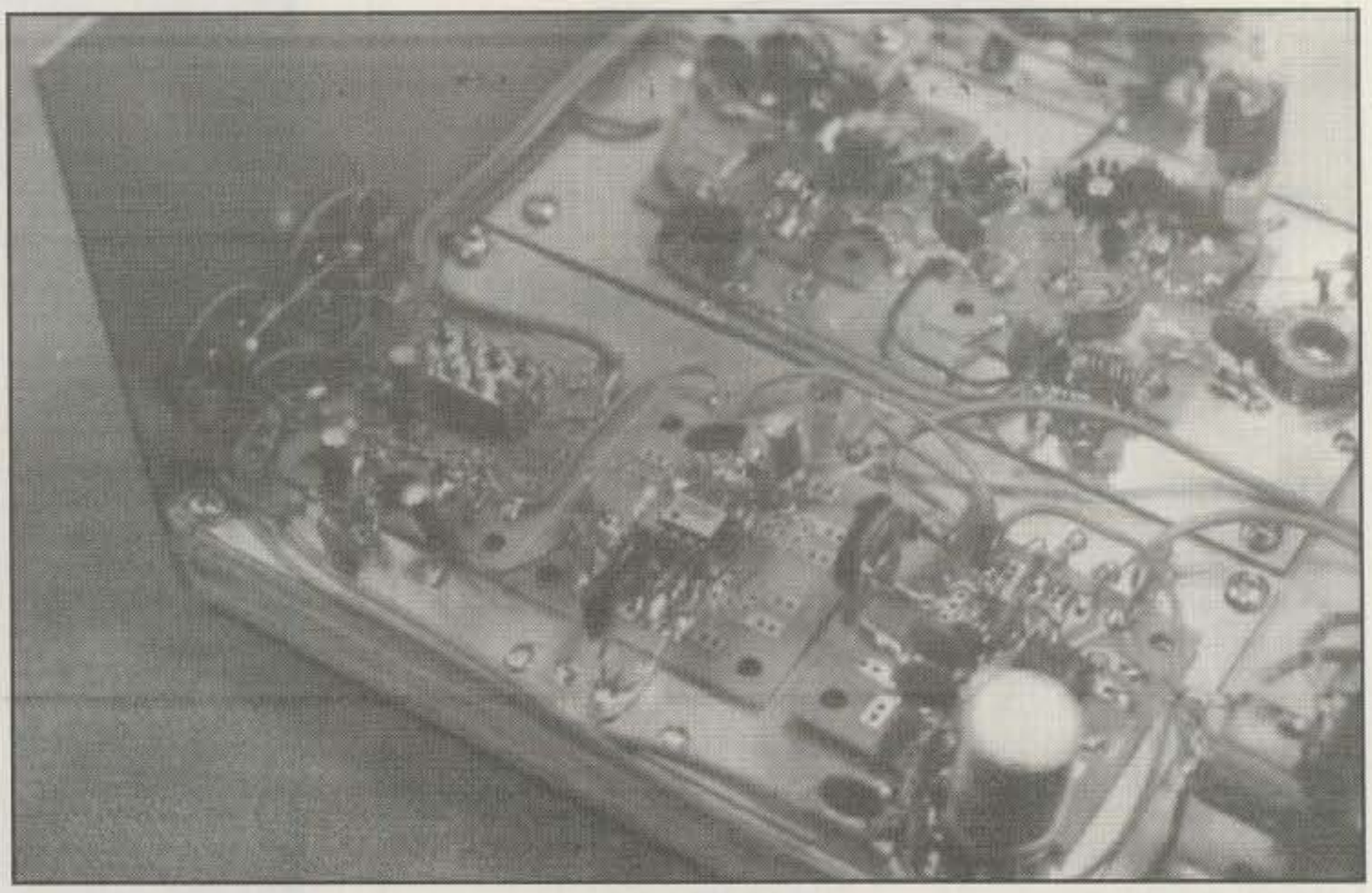
The Product Detector And Audio Preamp

I have chosen a diode-ring double balanced detector for use as a product detector. This is the best circuit that I have found for this application. The particular hardware that I chose was the Mini-circuits Lab SBL-1. It has all the necessary diodes and matching components contained in a single package. If you have trouble locating this item, don't worry. We can construct a suitable substitute at our workbench (see fig. 2). This device along with a 2N3565 audio preamp and an MPF 102 electronic switch are all mounted on a Radio Shack experimenter's circuit board prepared as we did for the earlier phases of this project.

The output of the product detector is about 50 ohms, so a grounded-base

97 West Point Road, Jacksonville, AL 36265

The front panel is now taking shape and beginning to look like a transceiver.



The interior is beginning to fill up with the addition of the product detector and RC active filter boards.

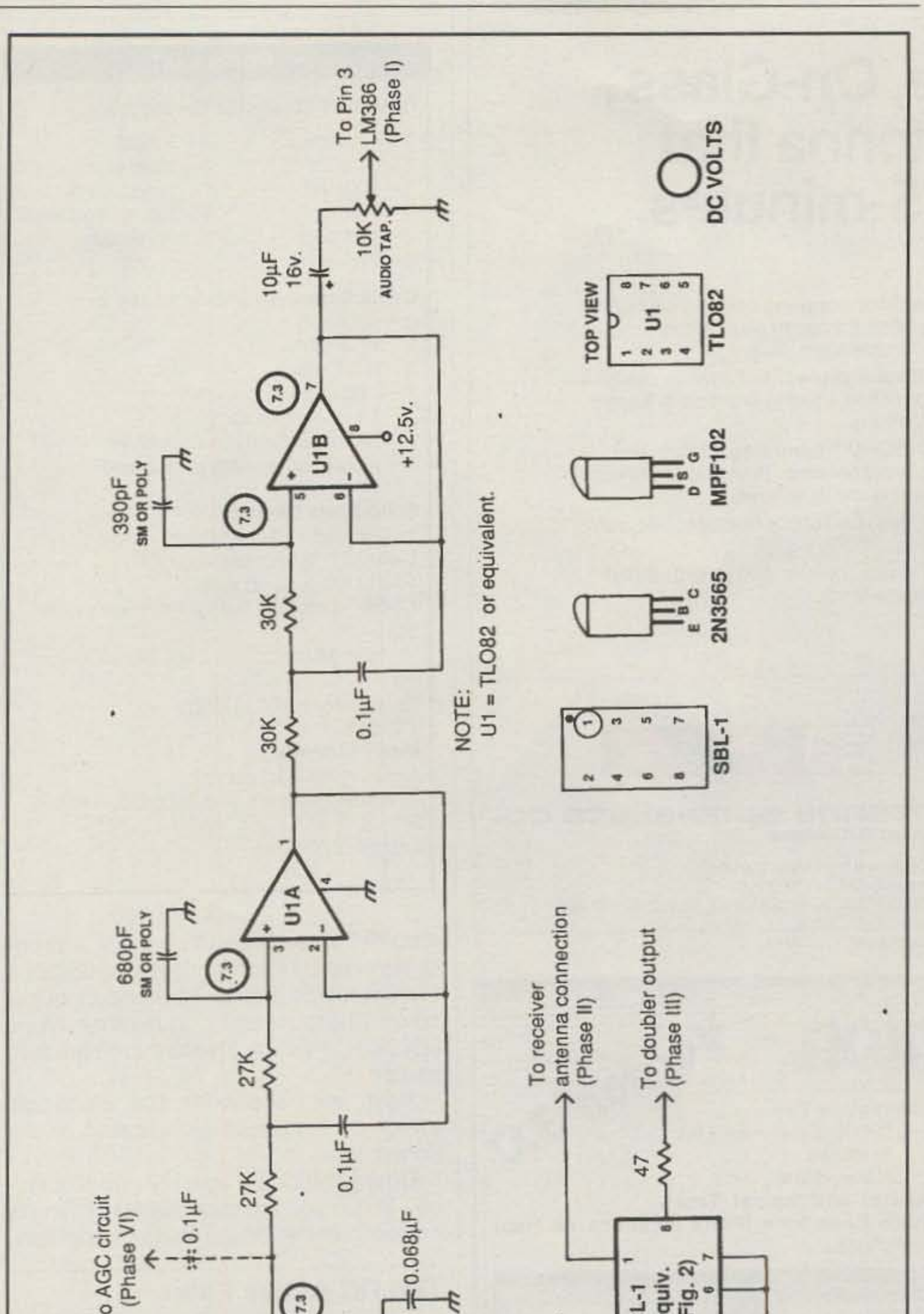


Fig. 1– Schematic diagram for the audio preamplifier and RC active filter.

Parts List

Resistors (1/4 watt or greater 5%)

1—47 ohm
1—51 ohm
1—100 ohm
1—1K ohm
2—10K ohm
2—27K ohm
2—30K ohm
1—100K ohm
1—1 meg ohm
1—10K audio taper with switch

Capacitors (type indicated 16V or greater)
1—33 uF elec.
3—10 uF elec.
1—0.68 uF disc ceramic
2—0.1 uF disc ceramic
1—680 pF silver mica or poly 5%
1—390 pF silver mica or poly 5%

Solid-State Devices
1—2N3565 NPN transistor
1—MPF 102 N-channel J FET
1—TLO82 dual op amp
1—SBL-1 double balanced mixer (available from Microcircuits Lab, 2913 Quentin Rd., Brooklyn, NY 11229)

Miscellaneous
1—8-pin minidip socket
2—experimenter's circuit board, Radio Shack cat. no. 276-159A

amplifier was chosen to provide a proper termination for this stage. The 2N3565 transistor was chosen because of its low noise characteristics, but other types (2N2222, 2N3904, 2N4401, etc.) are also usable.

Next, wire the MPF 102 electronic switch on the board as indicated on the schematic.

Check the board visually and electrically. When you are sure that everything is correct, set this board aside temporarily.

The RC Active Filter

The RC active filter is interesting for two reasons. First, it has a passband that simulates the characteristics of a crystal filter, and second, it produces a part of the gain (about 26 dB) necessary for our purpose. I had never tried an RC active filter with appreciable gain before, but the results are great. Think of it: We are amplifying only those signals within the passband and not the noise and QRN. The two stages are unity gain lowpass filters. The first stage has a cutoff of 715 Hz and a Q of 6. The second stage has a cutoff of 850 Hz and a Q of 8. When the two stages are placed in cascade, they produce the gain and bandpass characteristics that are shown in fig. 3. The results have been very pleasing.

The RC active filter is built on a Radio Shack experimenter's circuit board. The socket for U1 is mounted on the foil side

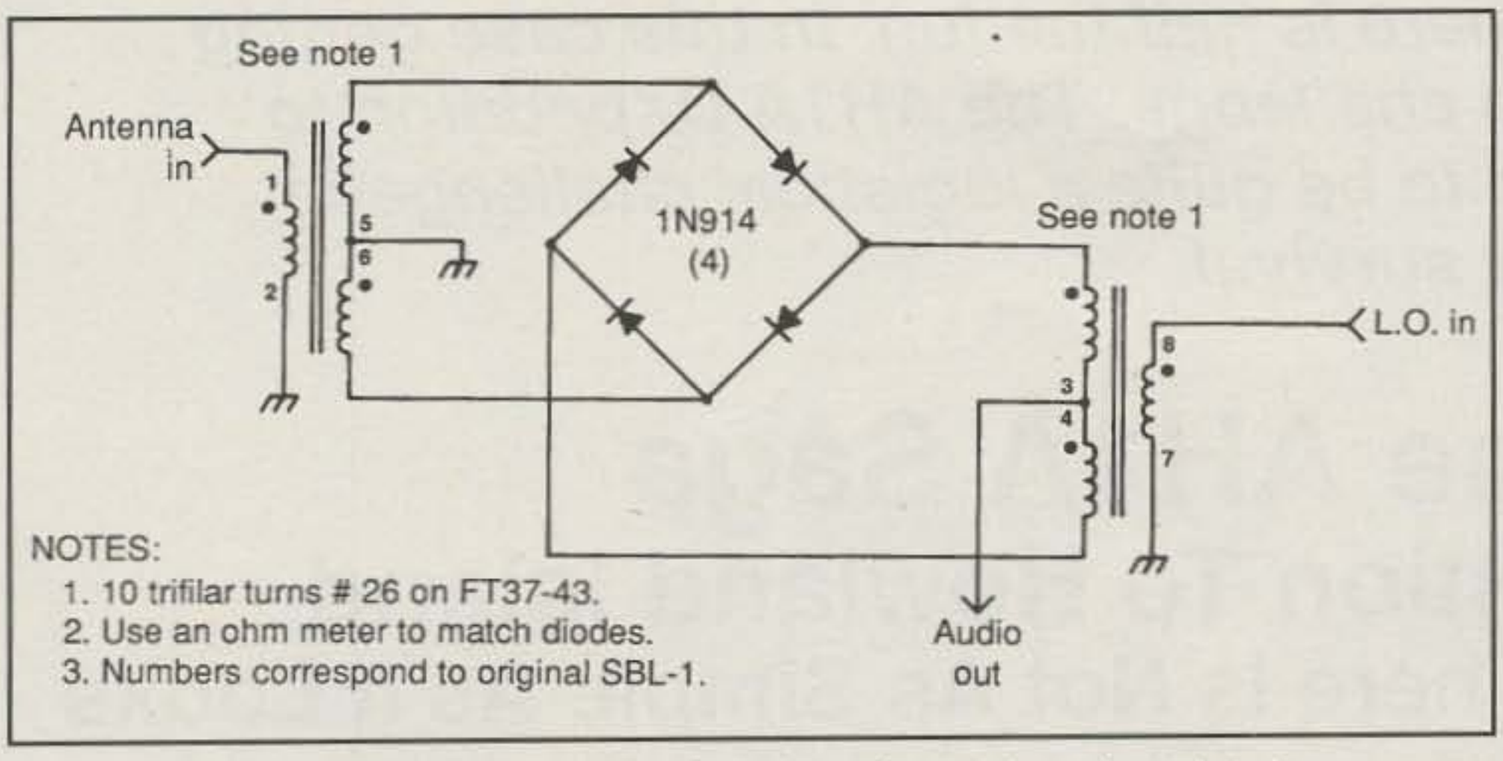


Fig. 2– Schematic diagram of our homebrewed product detector.

of the board in the same manner as we did for the LM386 audio amplifier in Part I. Mount the remaining components in a logical fashion. Visually and electrically check the board for wiring errors. Make any necessary corrections. Set this board aside for now.

Final Assembly

Place the RC active filter on the same ground plane that contains the audio output stage and sidetone oscillator built in Part I of our series. The experimenter's board is held to the 3" × 6" printed circuit ground plane by the capacitor leads and ground leads. Route the output of this circuit through a small, shielded audio cable to a panel-mounted 10K ohm audio control. (The one I used also has a switch that controls the DC supply voltage.) Connect the center of the volume control to pin 3 of the LM 386 audio output stage. The remaining terminal of the volume control should be grounded as shown on the schematic. Next connect the DC voltage to this stage.

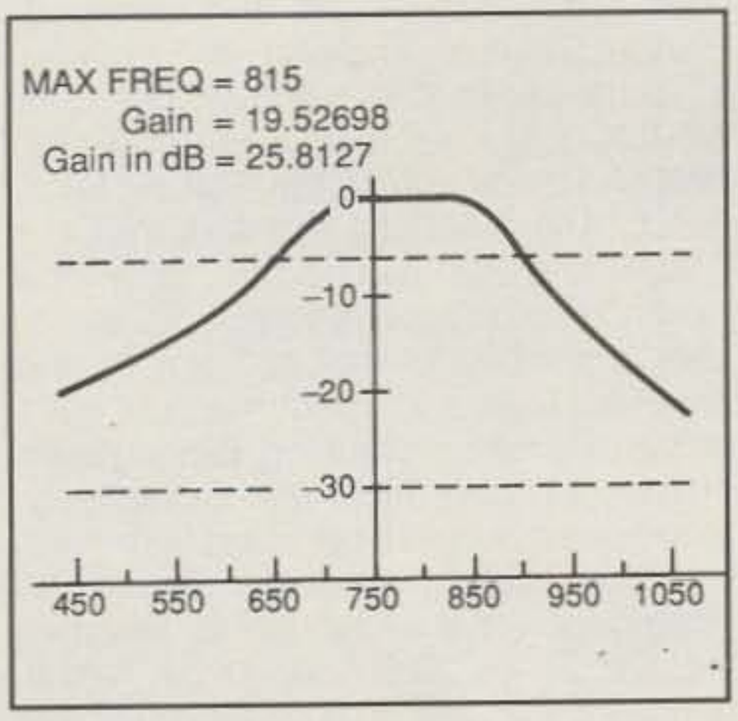


Fig. 3– The plot of the gain and band pass characteristics for our filter.

Mount the product detector/preamp in the remaining space on this ground plane. Secure it to the ground plane as you did with the RC active filter. Connect the DC supply voltage and the output from the MPF 102 to the input of the RC active filter. Test the circuits by touching a metal screwdriver to the output of the product detector. You should hear an increase in the audio output. If you don't, stop and find out why.

There are only two more things remaining to complete the direct-conversion transceiver. Connect the antenna input from the series tuned circuit on the transmitter board. Next connect the output from the push-push doubler to the product local oscillator input as indicated. Both these connections should be made with shielded cable. Finally, set the transmit offset capacitor (the 10 pF air variable) for an output of 750 Hz lower with key down. This can be accomplished by listening to the VFO output on your station receiver. You are now ready to go on the air.

Afterthoughts

With a direct-conversion transceiver you will be able to hear an audio output on both sides of zero beat. You should tune so that you are hearing audio from the upper side of zero beat. This ensures that your transmitter will be on the proper frequency when you answer a call.

You may have noticed that I gave less detail in the construction part of this article. This is intentional. As you become more experienced, less coaching is necessary and that's great!

If you have questions, let me know (SASE please). Next month we will turn our direct-conversion transceiver into a superhet. Sounds like fun, doesn't it? See you then.

(To Be Continued)

They say that getting there is half the fun. In this case getting home proved more of a challenge. The AH1A DXpedition to Howland Island proved to be quite a logistical challenge in operating and certainly survival.

The AH1A Saga

A DXpedition To Howland Island

Part I—Getting There Is Not As Simple As It Looks

BY WALT STINSON*, WØCP

Howland Island, in the fall of 1992, was the second most needed country in Europe, right behind Peter Island, 3Y. It had reached number eight in the eastern USA. Worldwide demand was growing. As we made our plans to travel to this exotic island, my wife, Mary Kay, NØUGX, wondered aloud if this was going to be one of those "dangerous" expeditions. Would it be like Spratley, where they were shot at, or South Sandwich, where they were almost blown off the rock into the freezing sea? We confidently assured her that this one would be a cakewalk, distinguished only by its remoteness—a desert isle with no inherent dangers.

We were wrong. Dangerously high surf delayed our departure from the island for six days and prevented our support vessel from reliably replenishing our supplies of food, water, and fuel. Survival techniques were utilized to help us overcome this hardship.

KH1 formerly consisted of four islands: Canton, Enderberry, Baker, and Howland islands. Of those, only Canton is accessible by scheduled commercial maritime transport. Eric, SMØAGD, operated KH1 from Canton in the early 80s. However, in 1983 the USA turned Canton (now T31) and Enderberry over to the Republic of Kiribati, leaving only Baker and Howland, sister islands about 40 miles apart, in KH1. With this change, activating KH1 became much more difficult.

During her 1937 round the world flight, Amelia Earhart and her navigator, Fred Noonan, headed from New Guinea to Howland Island. Their mysterious disappearance focused worldwide attention on the island. A commemorative daybeacon was built on Howland in her honor. It is in disrepair now, but it remains the most prominent landmark on the island. There is still much interest in Amelia Earhart. As we were making plans to go, we were surprised at how many people had heard of Howland due to continuing efforts to solve the mystery of her disappearance.

*4150 E. Quincy Ave., Englewoood, CO 80110-5051

The 70 foot schooner Machias, *our means of getting to and from Howland Island.*

Howland Island is a 400 acre, flat coral island about 1.5 miles long. It is located near the intersection of the equator and the International Date Line, about 1700 miles southwest of Hawaii. To get there the team rendezvoused in Honolulu and then flew to Christmas Island, Kiribati (T32). At Christmas we met our ship, the 70 foot schooner *Machias*. On the way from the airport to the dock we stopped briefly at the Captain Cook Hotel, sight of several T32 expeditions, and enjoyed our last cold drinks for a long while.

Our international team was from the USA (Colorado, Illinois, and Georgia), France, Belgium, England, and Holland. It included Mike, K9AJ; Phil, W9IXX; Burt, WØRLX; Bob, K4UEE; Paul, F6EXV; Peter, ON6TT; Randy, KØEU; Ian, G4LJF; Gino, I8ULL; Arie, PA3DUU and Walt, WØCP.

Mike and Burt hatched the idea for a Howland expedition a few years earlier after a successful trek to Palmyra and Kingman Reef and spent much of 1992 on the preliminary planning. Picking team members was a critical task. Collectively, team members have operated from Yemen, Albania, Kingman Reef, Palmyra, Revillagigedo, Tristan da Cunha, Seychelles, Clipperton, Glorioso, Jarvis, Nepal, Maldives, and many more. Several have set records in domestic and DX contests.

Special skills in power engineering, photography, and computers were a consideration in the selection process.

We all left loved ones and jobs for a one month trek across the Pacific to obliterate KH1 from the ranks of the most needed. Two agents from the US Fish and Wildlife Service joined us on the trip: Beth Flint, officer-in-charge, and Dave Woodside. Howland is a restricted access national wildlife refuge administered by the Department of Interior through the USF&WS. Beth and Dave came along not just to supervise our activities, but also to survey the wildlife population, especially the booby birds that would be nesting. Beth had decided that we would be less intrusive on Howland than on Baker, where the nesting population is thicker.

The 1140 nautical mile trip along the equator from Christmas to Howland was beautiful. At night, the southern sky, with its billions of stars and frequent meteor showers, was more exciting to watch than a fireworks show on Independence Day. The sea put on a light show too, as the plankton blinked like fireflies in the wake of the ship. Each da Beth and Dave pointed out the various species of seabirds that roamed the area, far from any land. For those of us who had never spent time at sea, this leg of the trip was an adventure in itself.

It is very difficult to gain permission to land on Howland due to the special role it plays in the breeding of seabirds. It excited us to know that we were among the very few to ever visit this remote ecological outpost. We realized the importance of acting responsibly. Permission for future expeditions would depend on it. We spent our free time asking Beth and Dave hundreds of questions about the animal and plant life of the island. One morning Beth gave us a formal presentation on the island's ecology and how to minimize our impact on it.

We got to know our crew: Captain Bill; the first mate, Big Bill; our cook, Kurt; and mate, Ryan. Captain Bill looks like a Viking with his blond hair, blue eyes, and athletic physique (he is a former LA Ram). He has 30 years experience sailing these waters, and it shows in the way he handles the ship.

The winds were not strong enough for sails alone, so we motored and brought out the sails only when the winds picked up. Captain Bill calls this area "the doldrums," because it is so still. Beth calls it "the desert of the Pacific" because there are so few birds. There were also few people. We never saw another vessel, plane, or boat while at sea. However, there were plenty of flying fish keeping us company. One flew up on deck one day and gave us a first-hand look. It is an amazing creature with a beautiful pair of membrane wings that allow it to skim a hundred yards

or so just above the surface of the water and escape predators.

The *Machias* is outfitted as a research vessel, not a luxury yacht. The quarters below deck can handle 29 people in cramped berths stacked three high. You can hit your forehead on the berth above you if you sit up too fast, as I did several times. We used about half the berths for equipment storage and filled most of the floor space with our duffle bags. We set up a rig on a small table below deck.

Each afternoon we looked forward to our schedule with the Mile High DX Association support team, including WYØJ, K1ER/Ø, and N2IC/Ø. These guys ran many phone patches to loved ones back home. Peter kept a daily sked with ON4WW back in Belgium, and Bob talked to Atlanta, courtesy of K4DLI and K4UPL. We ran a barefoot Kenwood TS-450 to a 20 meter vertical dipole hung off the main mast, with good results.

Captain Bill spent hours in the hellishly hot engine room keeping the six-cylinder diesel Chevy engine and the diesel generators that supplied our power purring contentedly. The engines are electrically started by a bank of marine batteries. Several of these batteries boiled over, reducing the starting capacity of the bank. However, neither the engine nor the generators stalled enroute, so restarting was not required. Phil took a special interest in the ship's power systems and occasionally helped the captain in the engine room. His knowledge of the ship's electrical system proved invaluable later.

The ship's geopositioning gear gave us a continuous readout of our exact location, bearing, and distance to Howland. Ian, who is studying for a mariner's certification, borrowed the captain's sextant and made his own manual calculations each evening. By the end of the trip his calculations were yielding very accurate coordinates for our location.

We reached Howland on Monday, January 25, 1993, shortly before dawn of the seventh day at sea. As we all crowded on deck squinting to catch a glimpse of the island, we realized that we had company. A school of porpoises, perhaps 100 or more of them, was escorting us on the final mile. The excitement was evident on everyone's face when we finally caught sight of the Earhart daybeacon and then the island itself. After a week at sea the land looked very inviting. We were all anxious to get ashore and start making contacts.

Howland is surrounded by a coral reef, which makes landing very tricky. There is no harbor. The ragged edge of the reef exposes itself at the low tide and lurks just a foot or two below the surface at the high tide. The only way to get to shore is by flat bottom boats, and only at high tide. The reef's slippery surface, jagged edges, and sudden drop off (to over 1000 feet!) make it extremely dangerous, especially when there are strong currents. Fortunately, on the

Enroute to Howland Island, Kurt, our cook, caught this large yellow-fin tuna. Several yellow-fin kept us well fed for almost a week.

Beth Flint, PhD, of the US Fish and Wildlife Service briefs the AH1A team on wildlife conditions on Howland Island the day prior to arrival.

NEW!

HAL Announces the PCI-4000 PC-CLOVER System

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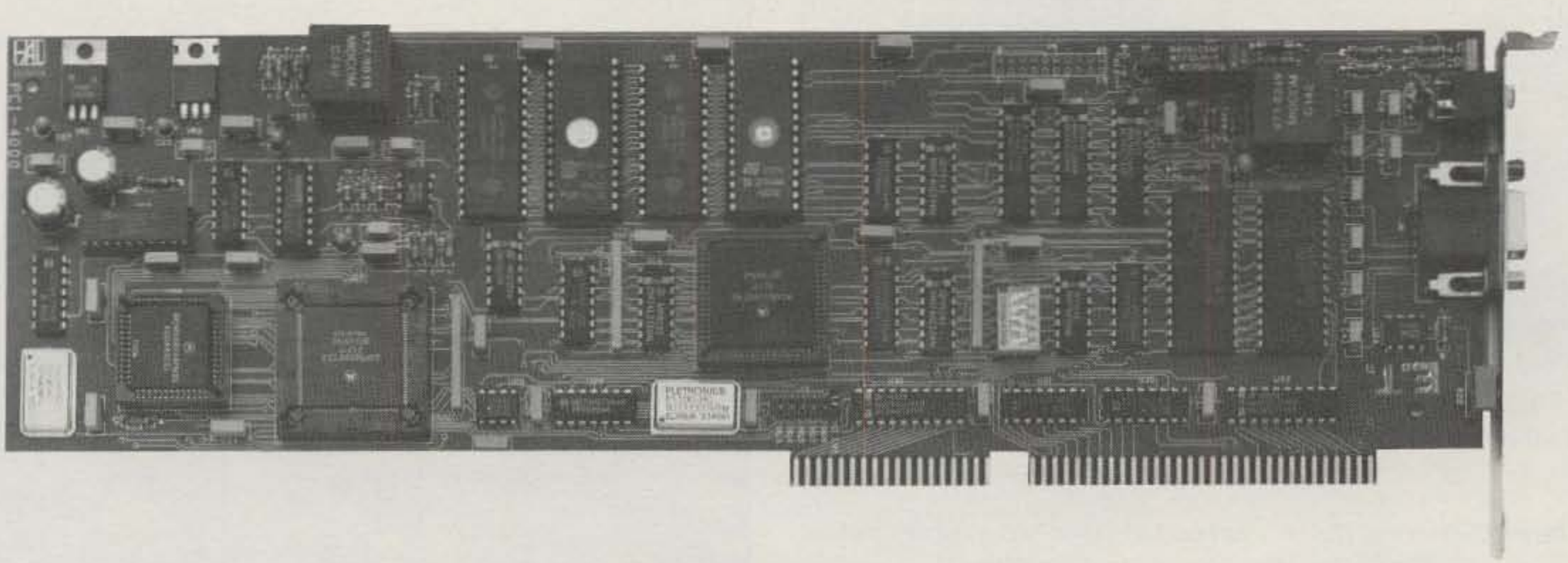

The PCI-4000 uses the latest development in HF data transfer methods–CLOVER-II. CLOVER-II is designed to maximize the amount of data which can be transferred in a narrow bandwidth over HF radio frequencies. It uses a combination of four tone frequencies with phase and amplitude modulation to achieve data transfer rates as high as 60 characters per second–about ten times faster than AMTOR. The PC-CLOVER system incorporates Reed-Solomon error correction, not simply a retransmission scheme. The PCI-4000 is a full-sized PC card which operates in a 80286-based PC or higher.

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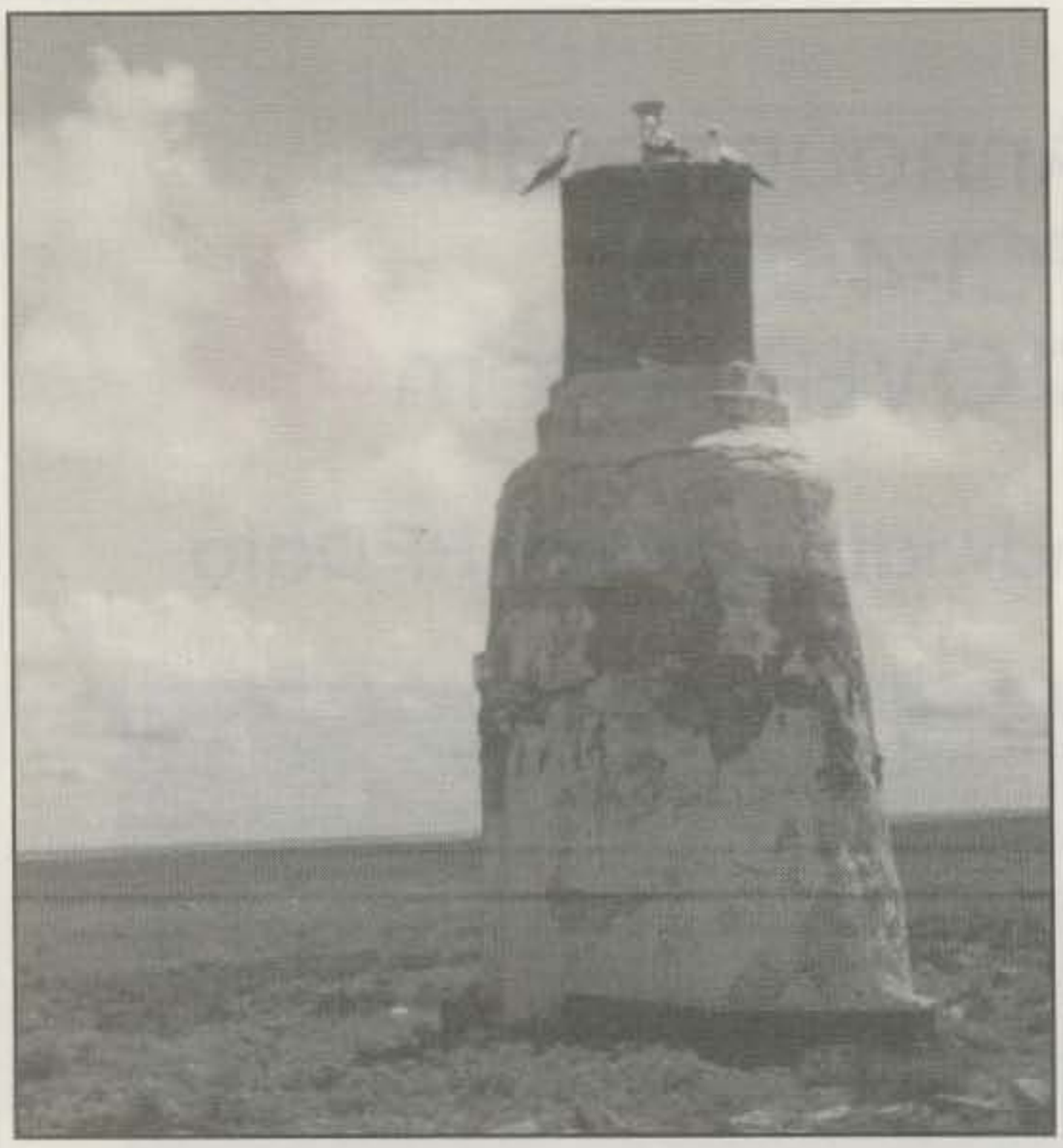


Three local inhabitants perch atop the Howland Island landmark, the Amelia Earhart monument. A plaque on the monument reads ""Earhart Light 1937."

The multi-national AH1A team gathers for a group photo before the flags of their respective countries.

day of our arrival the sea was calm.

The *Machias* carries two Zodiac-style landing craft, which are essentially flat-bottomed rubber rafts with small outboard motors. At 10 AM Randy and some of the crew took a zodiac ashore to establish an anchor. Then Beth, Mike, Burt, and I loaded one of these rafts with a few duffle bags and went ashore to scout for sites. When we got near the reef, the captain pulled up the outboard and let the wave wash us up over the reef. Then we got out and pulled the rubber craft another 50 feet or so over the reef to shore.

We were struck by the gorgeous expanse of fine white sand and the abundance of huge shells scattered around. Here was a beachcomber's paradise! Beyond the water line, though, things looked bleak. There were no trees at all, just a few scruffy bushes and short grass. We could see the surf spray on the other side of the island, about one-half mile away. There were plenty of booby birds too, although not the tens of thousands that we had feared might greet us. Fortunately, there were only a few hundred nesting boobies, one nest every 20 feet or so, concentrated near the shore.

Howland and Baker came to belong to the USA through guano mining by American firms during the 1800s. On occasion, there were permanent populations on the islands. In the mid-thirties a group of Hawaiian men even tried unsuccessfully to colonize Howland. This resulted in the first amateur radio operations from this area by K6BAZ, KF6JEG, KF6SJJ, and KF6OWR, to name a few. Once the guano was mined out, interest in the islands waned until WW II, when they attracted the attention of the U.S. Navy. Airfields, and refueling stations were built on Howland and later moved to Baker. At Howland a section of reef was blasted away to create a harbor, but the work was just half completed. The reef remains a formidable obstacle to any passing vessel that might comtemplate a landing. Today, these islands are again uninhabited safe havens for ocean-going sea birds, as they were for eons. A large sign warns trespassers to stay away.

Beth helped us select two sites about 300 meters apart. She made sure they were clear of booby nests. Then she marked off trails for us to use as we walked to and from the beach. Mike and I immediately went to work assembling antennas, while the rest of the team unloaded the boat and began setting up the tents and generators.

We realized pretty quickly that we had underestimated the heat. We had expected, based on the Fish and Wildlife information, that Howland would be about five degrees warmer, on the average, than Hawaii. It turned out to be about 20 degrees Fahrenheit warmer, with a daytime average high of about 108 to 115 degrees F in the shade. We all wore special time and temperature watches provided by Casio. When we were working in the sun, we would often exceed the maximum reading of the watches. They would blink in disbelief when the temperature exceeded 135 degrees F (60 degrees C).

Mike and I, without shade or shelter of any kind, struggled to put together antennas we had routinely assembled under more normal conditions. We wore long-sleeve shirts, long pants, cotton gloves, and wide-brimmed hats to keep off the sun. Even so, the sun was oppressive, and exposed skin burned quickly. We were thankful that we had arrived on Howland ahead of schedule. The extra time to put the stations together would definitely be needed. One big concern: Would the computers work? They are rated to just 95 degrees F.

Ashore just a few hours, we suffered our first casualty. Dave Woodside laccidently knelt on a coral spike, puncturing his knee joint. Fortunately, two of our team, Burt, WØRLX, and Mike, K9AJ, are both emergency medical doctors, so Dave quickly received professional atten-

tion. Had he been in the States, his knee would have been operated on immediately to reduce the risk of serious infection. As it was, he received topical treatment and high doses of antibiotics. We all were concerned but hopeful that this treatment would be adequate.

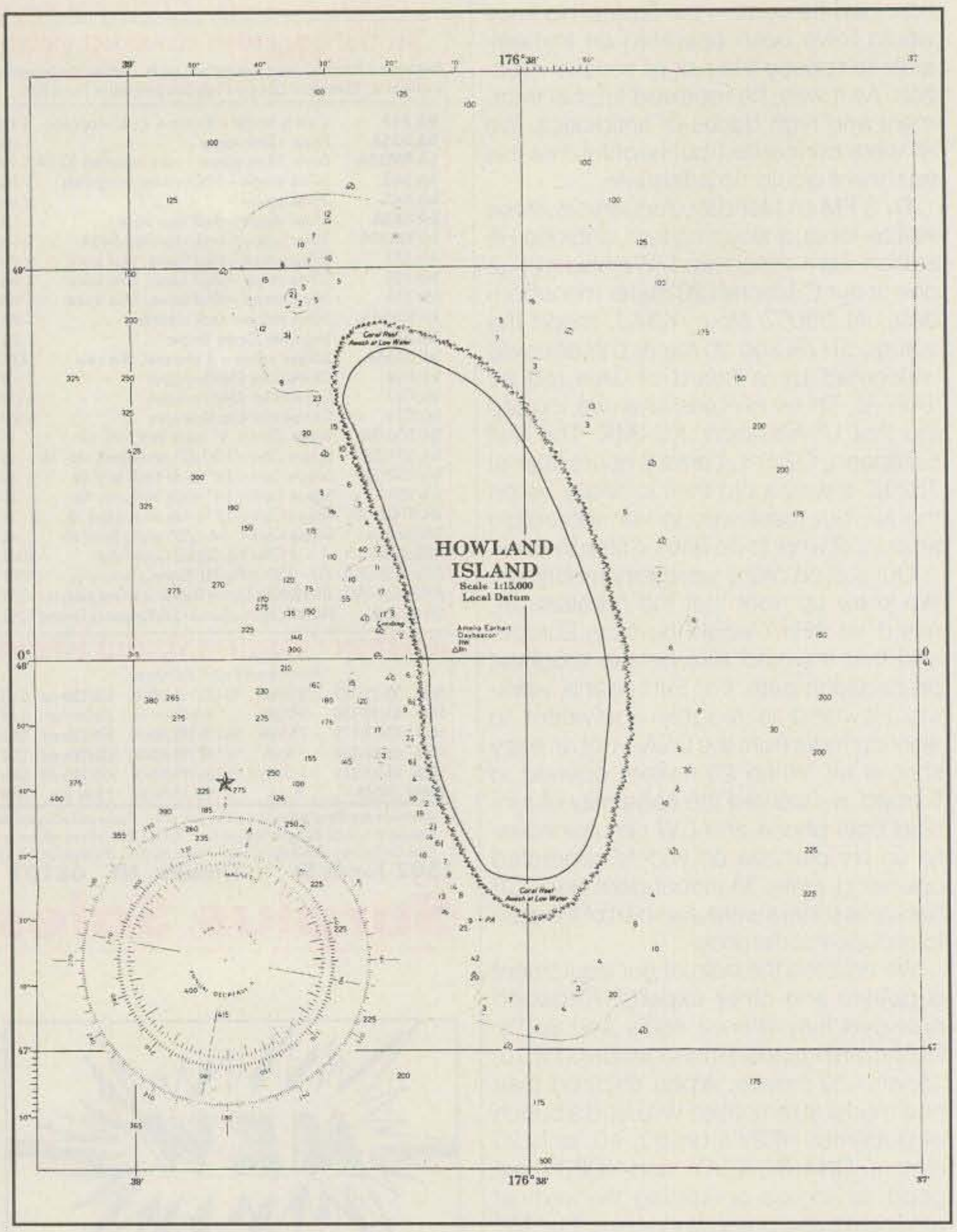
By 8 PM on Monday, January 25, three station tents, a sleeping tent, and one HF station were assembled. We also got up one of our Cushcraft 20 meter monobanders. At 0905Z Mike, K9AJ, made the inaugural QSO on 20 meter CW and was welcomed by a hoard of JA's led by JAØEAI. Three minutes later we logged the first USA station, KC4MK. The first European, OZ7YY, came 6 hours later at 1529Z. It was a big thrill to finally be on the air, but there was still an incredible amount of work to do and no time to relax.

Our station plans were very ambitious. We knew up front that the greatest demand for AH1A would be from Europe, and that it would also be the toughest propagation path. For Europeans, working Howland is roughly equivalent to working India from the USA—not an easy shot at all. When 20 meters opened to Europe, we wanted the capability of running both phone and CW simultaneously, so we planned on widely separated operating tents. Monobanders and ICE bandpass filters were also part of the plan to reduce interference.

We enlisted the help of our equipment suppliers and other experts. Kenwood provided fully filtered 450's and 850's. Cushcraft provided monobanders for 10, 15, and 20 meters. Alpha shipped their new model 89 amplifier. We used a bunch of Butternut HF2V's on 80, 40, and 30 meters. ON4UN, K9AY, and NCØB gave good advice on optimizing the vertical grounding and phasing systems. For 160 meters Mike borrowed the famous Battlecreek special, just back from VP8SSI. The WARC bands would be popular, so we equipped a Butternut for 30 meters and brought along one of Cushcraft's nifty WARC beams for 12 and 17 meters.

One tent was planned for two CW/RTTY stations and another, about 200 yards away, for two SSB stations and a WARC station. A third tent was planned for our VHF specialist PA3DUU, who brought equipment for 2 meter EME, 6 meters, and satellite. All station locations were equipped with laptop computers and loaded with K1EA's CT for logging and W6EL's Miniprop for propagation prediction. WF1B supplied his superb RTTY software, and one of the CW stations was equipped for this mode.

Every last detail was carefully planned in advance. Burt and I are neighbors, so we got many mornings and evenings to draft the equipment manifest. Mike and Burt traveled to Hawaii a month early to finalize travel arrangements and procure



A chart of Howland Island. (The numbers indicate depth in fathoms.)

the basic supplies. Randy handled the cabling and Phil took care of the AC wiring. We wrote a 30-page operator's manual that established the operating guidelines, provided background information on the island, and included information from the captain and the F&WS.

The most important system in any DXpedition is the electrical system. Ours consisted of two Yanmar and two Dayton 3.5 KW diesel generators. These diesel generators are much more expensive than gasoline, but gasoline is not safe to transport by boat due to the fire hazard. Each generator was dedicated to an HF station consisting of a Kenwood transceiver and an Alpha amplifier.

Phil, W9IXX, a power engineer, headed up the newly formed Howland Island Public Service Company. He set up our power system and continuously monitored and refueled it. Almost immediately we had trouble with a generator, which failed intermittently with a load applied. Phil rewired that station, and for the rest of the expedition we ran two CW stations at half power on one generator with no further difficulty. Phil's focus on the logistics was a key component in the success of AH1A.

After helping to unload the gear, Arie, PA3DUU, worked feverishly to get the VHF station going. He quickly put 86 JA's in the 6 meter log. Six meter DXing requires incredible patience and dedication, and Arie showed both in abundance as he continuously monitored 10 meters for a response to his 6 meter beacon. Unfortunately, just two more JA's contacts were made in the following days.

(To Be Continued)

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 catergory.

Single Operator/Single Band
WORLD RECORD HOLDERS

1.8	UG7GWO('87)	255,852	1,327	12	57
3.5	P4ØR('87) (Opr. K4UEE)	552,786	1,628	23	91
7.0	PJ9E('92) (Opr. OH5BM)	992,068	2,183	31	123
14	VP2KAA('81)	2,011,185	4,186	37	150
21	P4ØR('90)	2,719,336	4,972	37	147
28	ZV5A('91)	2,984,166	5,154	37	156

AFRICA

1.8	IH9/IV3PRK('89)	81,344	447	9	53
3.5	CT3BZ('79)	235,113	772	22	87
7.0	EA8RCT('87) (Opr. OH2MM)	859,362	1,959	32	115
14	5Z4BI('92)	1,478,932	2,752	39	143
21	EL2CX('89)	2,242,968	4,445	34	135
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	RFØFWW('87) (Opr. UF6FFF)	1,447,128	2,894	40	147
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	ZF2RJ('92) (Opr. N6RJ)	917,316	2,245	35	131
14	VP2KAA('81)	2,011,185	4,186	37	150
21	FM6A('91) (Opr. F6HMQ)	1,934,659	4,535	36	137
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	V7MHZ('92)	680,720	1,759	36	98
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	YV2IF('92)	18,700	191	9	25
3.5	P4ØR('87) (Opr. K4UEE)	552,786	1,628	23	91
7.0	PJ9E('92) (Opr. OH5BM)	992,068	2,183	31	123
14	PJ9P('92) (Opr. OH6MW)	1,875,300	3,614	36	139
21	P4ØR('90) (Opr. K4UEE)	2,719,336	4,972	37	147
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	EX6F('84)	6,362,000	4,648	113	387
EU	S52AA('92)	7,134,192	4,378	151	473
NA	FG5R('90) (Opr. W7EJ)	12,192,368	7,006	154	510
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.	WM5G('92) (Opr. KRØY)	6,631,513	2,800	171	662

WORLD RECORD

Station	Band	QSOs	Zones	Countries
HC8A (Opr. N6KT) (1992) 16,316,568	1.8	125	11	25
	3.5	357	20	51
	7.0	638	28	74
	14.0	1,166	34	111
	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('91)	21,214,809	9,418	162	596

WORLD RECORD

Station	Band	QSOs	Zones	Countries
PJ1B (1991) 21,214,809	1.8	20	8	18
	3.5	144	15	50
	7.0	740	27	92
	14.0	2,020	39	149
	21.0	2,796	37	148
	28.0	3,698	36	139
	Total	9,418	162	596

Multi-Operator/Multi-Xmtr.

AF	EA8CR('77)	21,351,898	10,290	153	544
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
PJ1B (1990) 57,610,400	1.8	531	19	50
	3.5	1,335	24	99
	7.0	2,104	31	117
	14.0	4,860	38	179
	21.0	5,395	38	176
	28.0	5,430	39	182
	Total	19,655	189	803

CQ World-Wide DX Contest All-Time CW Records

BY FREDERICK CAPOSSELA, K6SSS

Single Operator/Single Band

WORLD RECORD HOLDERS

1.8	UG6GAW('90)	164,430	851	15	55
3.5	NP4A('88) (Opr. K1ZM)	808,640	2,243	31	102
7.0	PJ9U('92)	1,171,864	2,655	30	118
14	P4ØV('91) (Opr. N7NG)	1,883,700	3,521	38	142
21	ZW5B('91) (Opr. LU8DQ)	1,864,372	3,525	40	138
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	OH7JT/CT9('88)	904,038	2,195	35	103
14	ED9ED('90)	1,444,436	3,063	37	121
21	CR3W('92) (Opr. DF5UL)	1,652,170	3,092	38	141
28	D68GA('92)	1,281,660	2,622	38	126

ASIA

1.8	UG6GAW('90)	164,430	851	15	55
3.5	ZC4DX('87) (Opr. 4Z4DX)	430,560	1,318	29	88
7.0	C42A('91) (Opr. YU4OO)	980,490	2,577	33	105
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	ON4UN('90)	118,776	936	16	68
3.5	ZB2X('91) (Opr. OH2KI)	435,456	1,989	29	97
7.0	S59UN('92)	971,049	2,484	38	135
14	OH2BH('90) (Opr. OH6UM)	915,136	2,454	36	122
21	OH6MCW('89)	775,620	2,208	37	102
28	9H1EL('92)	794,846	2,249	39	120

NORTH AMERICA

1.8	K5UR('85)	47,005	219	25	60
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	VP2KAA('80) (Opr. N4PN)	1,244,782	3,111	37	117
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('90)	60,352	494	17	24
3.5	VR3AH('76)	178,560	956	24	40
7.0	VK6LW('92)	533,696	1,453	31	93
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	P4ØR('86) (Opr. K4UEE)	576,725	1,682	25	90
7.0	PJ9U('92)	1,171,864	2,655	30	118
14	P4ØV('91) (Opr. N7NG)	1,883,700	3,521	38	142
21	ZW5B('91) (Opr. LU5DQ)	1,864,372	3,525	40	138
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('89) (Opr. OH2KI)	5,450,761	4,402	146	429
NA	PJ7A('91) (Opr. K1TO)	8,357,236	5,799	135	421
O	AH3C('90)	6,798,363	4,539	172	335
SA	HC8N('92) (Opr. WN4KKN)	10,773,628	6,028	159	412
QRP	HI8A('91) (Opr. JA5DQH)	3,316,768	3,320	117	325
Low Pwr. Asst.	7Q7XX('92) (Opr. JH1ORL)	3,257,128	2,798	112	280
	K1DG('89)	5,048,802	2,904	155	438

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	NP4A('82)	11,648,565	6,881	168	515
O	KH2S('92)	7,249,952	4,306	169	399
SA	PJ2X('88)	8,948,660	5,257	152	422

WORLD RECORD

Station	Band	QSOs	Zones	Countries
TA5KA (1990) 13,915,044	1.8	181	10	49
	3.5	962	23	69
	7.0	2,037	31	84
	14.0	1,231	38	96
	21.0	1,518	36	112
	28.0	1,272	37	112
	Total	7,201	175	527

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

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	WB9HAD('87)	27,181	157	23	54
3.5	W1ZM('92)	223,971	742	28	93
7.0	W7XR('92) (Opr. W7WA)	363,900	834	34	116
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	K5UR('85)	47,005	219	25	60
3.5	K1ZM('92)	416,160	1,059	30	106
7.0	K1ZM/2('90)	839,520	1,783	34	125
14	K2VV('92)	943,920	1,718	40	150
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

K1DG('89)	5,048,802	2,904	155	438

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 Team ('92) 53,779,847
CW—Southern Calif. Contest Club #1 ('92) 35,671,278

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A 200 watt HF XCVR with dual RX, automatic antenna tuner, power supply, and more! Deluxe and standard models available. An excellent performer ..... **Call**

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FT-650	12-6m XCVR	**Call**
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TM-732	2m/70cm mobile	**Call**
TR-751	2m all mode mobile	**Call**
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DOUG'S DESK

BY DOUG DeMAW, W1FB

CONSTRUCTION PROJECTS, TECHNIQUES, AND THEORYs

Solid-State Amplifiers For Beginners

Vacuum-tube and solid-state RF amplifiers must be biased properly for the class of operation chosen. Linearity is essential for the amplification of SSB and AM signal energy. This means that the output waveform from a linear amplifier should be a faithful reproduction of the input waveform without distortion being added. Linear amplification requires that the amplifier be biased for Class A, AB1, AB2, or B operation. This is accomplished by applying the appropriate positive (forward) bias or voltage to the base of bipolar transistors or to the gate of MOSFET amplifiers. This bias establishes a specific resting or idling collector or drain current for the selected class of operation.

Class C (nonlinear) amplifiers are satisfactory for CW and FM operation. In a like manner, the final amplifier of an AM transmitter may operate Class C if the modulation is introduced at that stage of the transmitter. If the excitation signal is amplitude modulated, we must use a linear amplifier to increase the magnitude of the signal. With these ground rules established, let's examine some simple procedures for obtaining proper performance from solid-state RF power amplifiers.

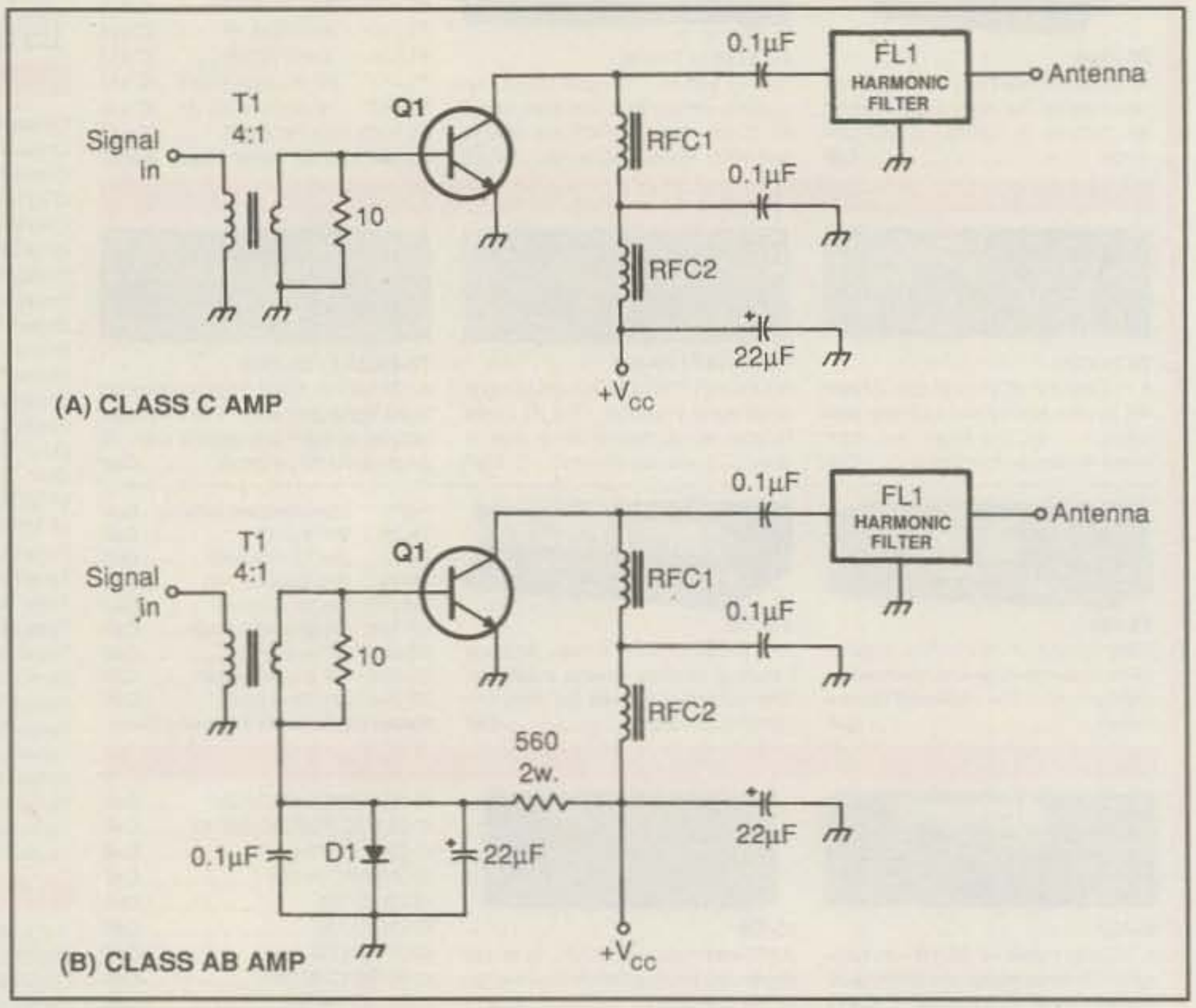

Fig. 1– Examples of simple Class AB and C RF amplifiers. No forward bias is applied to the base of Class C amplifier (A). At (B) is an AB linear amplifier that uses D1 to establish 0.7 volt of forward bias for Q1 to set up Class AB conditions. A 10 ohm resistor across the T1 secondary winding acts as a Q killer to aid stability. D1 is a 1 amp, 50 PRV diode.

Class AB versus Class C

Fig. 1(A) shows a typical Class C transistor power amplifier. Note that the base of Q1 is returned to DC ground through the secondary winding of T1. In effect, this is a zero-bias condition. But when the circuit has excitation applied, the base swings negative during part of the sine-wave excursion to cause the amplifier to be driven into the Class C mode. Some enhancement of efficiency can be realized by using a low-value emitter resistor to make the base negative with respect to the emitter. I have seen increases of efficiency from 60 to 70 percent through the addition of emitter bias, but the emitter must be bypassed effectively at RF to prevent gain loss caused by degeneration. Proper bypassing is also necessary to ensure circuit stability.

Figure 1(B) shows a single-ended transistor RF amplifier that is set up for Class AB operation. You can see that the base now has a forward voltage (positive bias) applied to it to establish a standing or static collector current when no drive is applied. The simple biasing technique is often used by amateurs, whereas elaborate regulated, variable bias circuits are usually preferred by commercial designers. The variable bias voltage enables the designer to select the best standing collector or drain current consistent with minimum distortion. Various transistor types require different biasing to ensure optimum linearity. I have used the diode-bias method of fig. 1(B) for much of my amateur gear and found that the third- and fifth-order distortion products were always 30 dB or greater below peak output power. The absence of voltage regulation did not seem to cause any problems.

D1 of fig. 1(B) conducts at 0.7 V when the Vcc is applied to D1 through the 560 ohm series resistor. This +0.7 volts reaches the Q1 base through the secondary winding of T1. The 10 ohm resistor across the T1 secondary is merely a Q-killer that aids circuit stability. The 22 µF capacitor across D1 charges and provides acceptable regulation for the bias voltage.

Keep The Transistors Cool

Heat is an enemy of semiconductors. The internal (junction) temperature of a transistor must be maintained below the specified maximum value in order to prevent damage to the device. This becomes an especially important consideration when power transistors are operated with an established idling current, as with linear amplifiers. The transistor draws current at all times, even when no excitation is applied to it. Greater current flows during excitation, but even during the no-signal period the device continues to draw current. This prevents the transistor from cooling completely. This is not the case when operating transistors in Class C. Generally, the device draws only microamperes of current in standby. Although Class C power amplifiers still require heat sinks,

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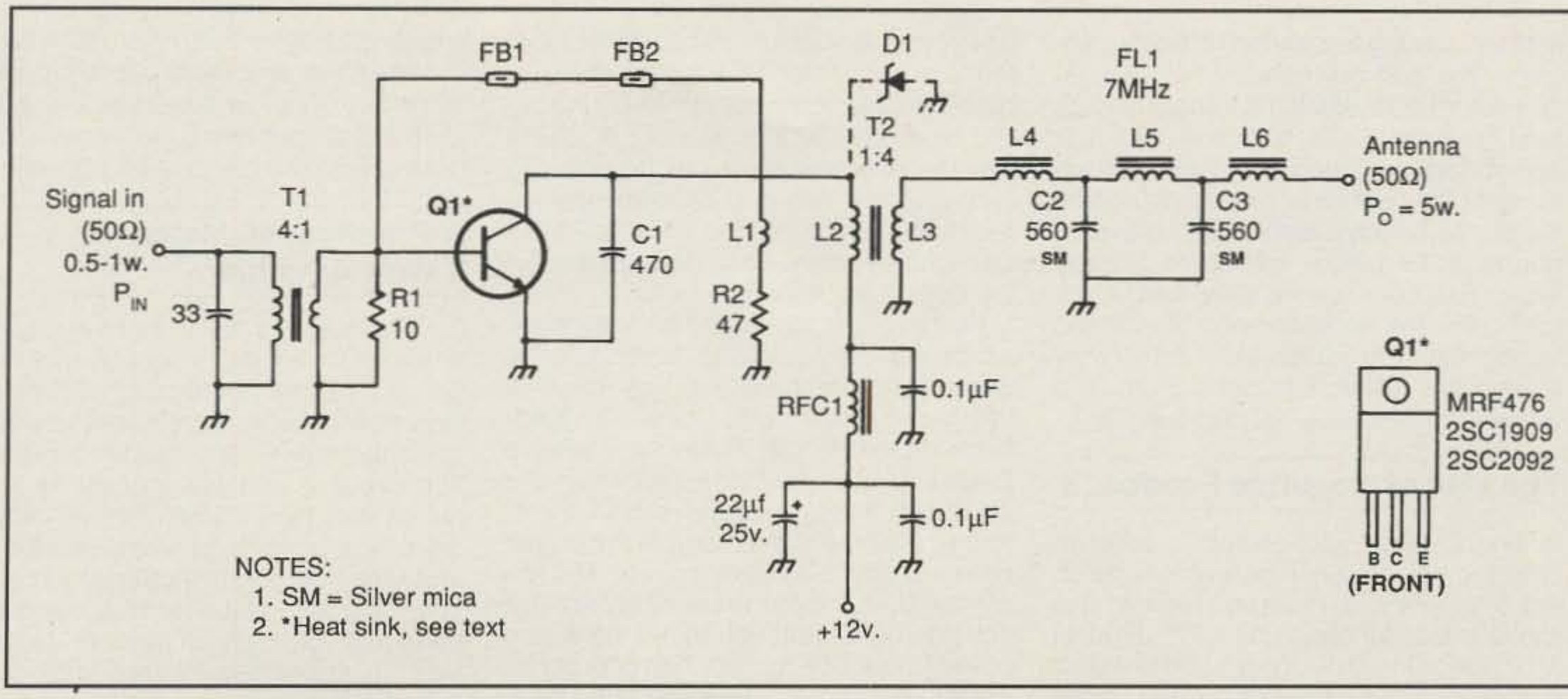

NOTES:
1. SM = Silver mica
2. *Heat sink, see text

Fig. 2– Practical circuit for a Class C broadband amplifier. Circuit constants are for 7 MHz operation. Capacitance is in pF unless otherwise noted. Resistors are ¼ watt carbon film. SM means silver mica. FB1 and FB2 are 850 µ mini-ferrite beads. See text for data concerning D1. L4 and L6 are 0.8 µH inductors (14 turns of no. 26 enamel wire on Amidon T37-2 toroids). L5 is a 1.67 µH inductor (20 turns of no. 26 enamel wire on an Amidon T37-2 toroid). T1 uses 12 primary turns of no. 26 wire on Amidon FT-37-43 ferrite toroid (850 µ). The T1 secondary has 6 turns of no. 26 wire. For T2, use 6 turns of no. 24 wire for L2 and 12 turns of no. 24 wire for L3. T2 is wound on an Amidon FT-82-43 ferrite toroid. The C11 value is for 40 meters. Use 820 pF for 80 meters, 220 pF for 20 meters, and 100 pF for 10 meters.

the physical area of the heat sink can be substantially smaller than that used to cool a linear amplifier of equivalent output power.

You may ask, "How hot is hot?" Industrial designers have sophisticated test gear for determining the internal temperature of transistors. Few amateurs have access to this type of equipment. I use the "feel" method. I apply driving power to the amplifier and allow maximum safe current to flow for two or three

minutes. During this period I place my finger on the heat sink near the transistor at 10 second intervals. If the transistor or its heat sink becomes so warm that it is uncomfortable to the touch, I increase the mass of the heat sink. At no time should the device become more than quite warm during a 10-minute key-down (steady carrier) period. I use the same rule for ensuring that the ferrite cores in broadband transformers do not run too warm. If they are hot to the touch, I rewind them on a larger core of equivalent permeability.

The Use of Negative Feedback

In theory, a transistor exhibits 3 dB of increased gain for each octave its operating frequency is lowered. Hence, if a power transistor has a gain of 10 dB at 14 MHz, the gain will become 13 dB at 7 MHz and so on. This depends largely on the particular transistor that is chosen and the fT (frequency at which its gain is 1 or unity). As the effective gain increases so does the possibility of instability (self-oscillation). This phenomenon can, over a period of time, cause degradation of the transistor. In a worst-case situation a transistor can be destroyed immediately.

Feedback circuits stabilize the amplifier gain over a wide range of frequency (i.e., 1.8 to 30 MHz), and this is how we develop a broadband amplifier. This, plus the use of broadband transformers, ensures relatively flat gain across the chosen spread of frequency.

When applying negative feedback, we use a small portion of the amplifier output power as feedback to the amplifier input terminal (collector to base or drain to gate). The feedback to the input of the circuit must be 180 degrees out of phase with the energy sampled at the amplifier output. If not, we end up with positive feedback, which causes self-oscillation. Oscillators require positive feedback for the reason just stated.

We never get something for nothing, so when we use negative feedback we degrade the amplifier gain by virtue of using part of the output power as feedback power. Fig. 2 illustrates a simple feedback network. A one-turn winding is added to the broadband output transformer (T2) in order to sample the output power across a 47 ohm resistor. The ferrite beads in the feedback network allow considerable feedback at the lower end of the frequency range while offering increasingly greater opposition to the feedback energy as the operating frequency in MHz is increased. This stabilizes the amplifier gain per octave as the frequency is lowered.

Other feedback methods are used by designers. For example, we may use a network that contains a capacitor and a resistor (and sometimes in combination with a small inductor) in the shunt feedback leg of the circuit. This requires careful choices of component values to ensure a flat amplifier response across the desired operating range.

When using the feedback method in fig. 2 we can vary the amount of feedback by changing the value of R2. The higher the resistor value the lower the feedback energy and vise-versa. All broadband solid-state linear amplifiers use feedback of some form. Narrow-band amplifiers (single band of operation) don't require feedback unless they tend to be unstable.

A Practical 40 Meter, 5 Watt Amplifier

Let's go back to fig. 2. Here we see an amplifier circuit that I have used a number of times for 160 through 20 meters. Only minor changes are necessary when tailoring the amplifier for a different band. The circuit is suitable for QRP use (requires less than 1 watt of drive) or as a driver for a more powerful solid-state amplifier. The circuit modifications entail changing the values for FL1, the output harmonic-suppression network. Normalized tables for changing the filter frequency are available in *The ARRL Handbook*.

The fig. 2 amplifier is shown for Class C operation. You can change it for linear operation by employing the bias circuit shown in fig. 1(B). This will establish Class AB operation.

The size of the heat sink for Class C should be 3/4 × 2 × 2 inches (extruded aluminum sink) or greater. Double the area for linear operation.

Toroid cores for the fig. 2 amplifier may be ordered from Amidon Associates (2216 East Gladwick Street, Dominguez Hills, CA 90220). A transistor and other parts for this circuit may be obtained from Oak Hills Research (20879 Madison Avenue, Big Rapids, MI 49307); catalog available.

For Class C operation the circuit in fig. 2 requires a minimum of 0.5 watt of drive. Up to 1 watt of driving power may be used safely.

In Conclusion

In-depth discussions about amplifier design and other RF topics are provided, along with practical circuits, in *W1FB's Design Notebook* and in the second edition of *W1FB's QRP Notebook*. These books also describe low-power exciters that are suitable for driving this amplifier.

The fig. 2 amplifier is designed to operate into a 50 ohm resistive load. Always match the amplifier to the antenna before using full excitation power. You may add an SWR-protection circuit by connecting a 33 or 36 volt, 1 watt Zener diode between the Q1 collector and ground. This diode will clamp on dangerous RF or DC voltage peaks to protect the transistor. The Zener diode cathode connects to the Q1 collector.

Measured harmonic output from this amplifier was 40 dB or greater below peak power when terminated in a 50 ohm load and delivering 5 watts of output power.

73, Doug, W1FB

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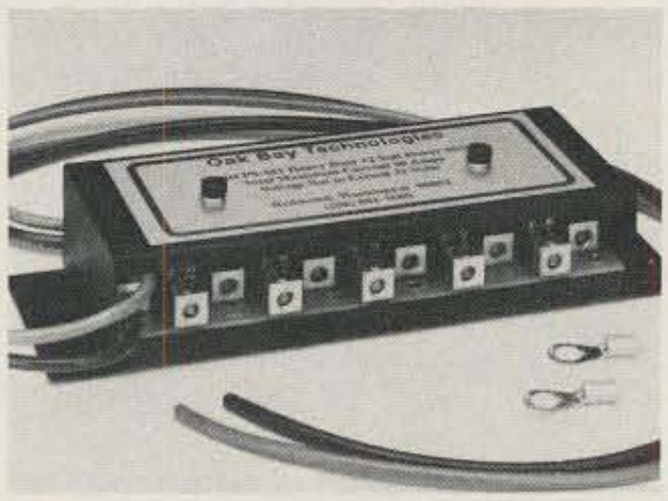

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ANTENNAS & ACCESSORIES

A LOOK AT THE SHACK FROM BOTH ENDS OF THE COAX

BY KARL T. THURBER, JR., W8FX

New Stuff '93—Part V

Continuing on with this series, this month we present some new and updated antenna products, plus software and books that should be of interest. We begin on the hardware end.

Antennas, Etc.

W1JR AntennaKits. ANTENNACO, founded by Joe Reisert, W1JR, is devoted to state-of-the-art antennas from HF through microwave. Joe has addressed the problems experienced by the homebrewer in trying to obtain suitable designs and materials to build VHF and UHF Yagis. As he notes, the cost of parts can be prohibitive as is the finding of materials that generally only commercial firms have on hand. Further, it's often difficult to work with the round tubing commonly used for antenna booms, with drilling and attaching elements presenting a number of problems, along with tricky feed system mechanics.

To overcome these problems, ANTENNACO offers the W1JR AntennaKit, which provides all materials to construct a 3- or 4- element, computer-optimized Yagi for 140 to 500 MHz. With the kit you can build your own Yagi or duplicate one of the recommended designs in the kit. The sealed antenna feed system minimizes feeding and matching problems; it requires no tuning and features a ferrite bead current-type balun to prevent feedline radiation. The kit comes with stainless steel hardware, a 6061-T6 square aluminum boom, preformed element mounting brackets, and a flexible feedline interface.

Two basic models are offered. One is the Model 140-3, a 140–300 MHz, 3-element VHF Yagi; the other is the Model 400-4, a 300–500 MHz, 4-element UHF Yagi. Either is $24.95 plus $5 shipping/handling from ANTENNACO, Inc., P.O. Box 218, Milford, NH 03055 (603-673-4347).

H-TENNA Line. Recently, Electron Processing announced new amateur VHF and UHF antennas for mounting at either the top or the side of masts. Internally, the antennas are ordinary dipoles, but their configuration makes them good choices for anyone needing an antenna that doesn't require the very top tower spot.

Available in 6 and 2 meter, 70 cm, and dual-band 2 meter/70 cm versions, the H-TENNAs provide near omnidirectional coverage when mounted aside most towers. A dipole radiator is fully encapsulated in a CPVC "radome" and can be configured for either vertical or horizontal polarization. You can stack the antennas for additional gain or for customized radiation patterns. Overall size varies depending on band, and is slightly more than one-half wavelength at the design frequency. The H-TENNAs connect to your feedline via your choice of BNC, N, or PL-259 connectors using a 2 ft. pigtail. The antennas range in price from $25 to $45.

Additional encapsulated VHF/UHF scanner models also are available. The H-TENNA-SCN receives all frequencies from 25 to 1200 MHz and is 44 inches long overall; it's $55. The SUPER-H-TENNA-SCN is similar, but includes an antenna-mounted, 16 dB gain low-noise preamplifier; it's $90. Add $5 shipping/handling to all orders.

For more details, contact Electron Processing, Inc., P.O. Box 68, Cedar, MI 49621 (616-228-7020).

"Pill Bottle" Antenna Tuner. DWM Enterprises offers several inexpensive accessories for the back-to-basics buff. One of the more interesting items is the "Pill Bottle" antenna tuner. The inductor is made from a pharmacy pill bottle; an alligator clip connects to taps for operation on 80 through 10 meters, including the WARC bands. A variable capacitor is used for tuning, Fahnestock clips are used for all connections, and a cedar wood base completes the "good old days" style construction. The unit handles 150+ watts and is $29 assembled, plus $3 shipping/handling.

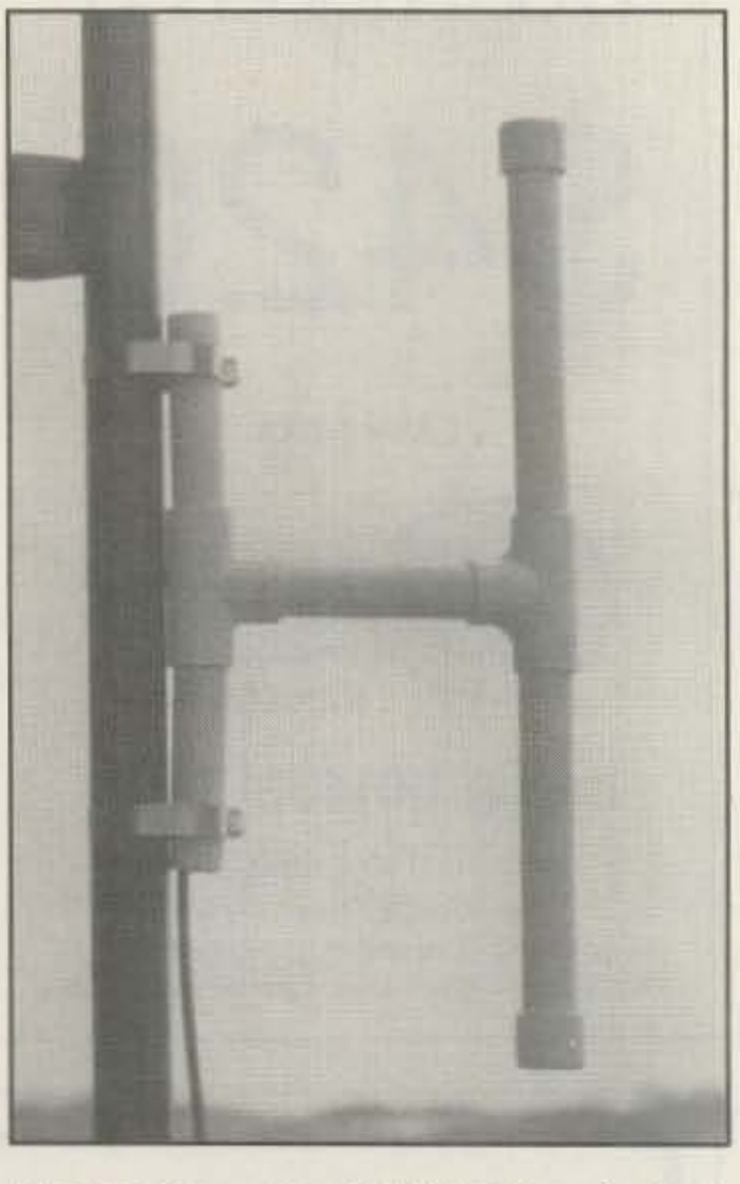
DWM's flyer shows several other assembled and tested units, plans sets, and monographs. Included are a 40 meter QRP (2.5 watt output) transmitter ($25 plus $3 shipping/handling) and a battery-powered all-band active antenna for LW through VHF/UHF reception ($19.95 plus $3 shipping/handling). Plans alone are $3 for each project.

For a flyer, write DWM Enterprises, 1709 N. West Avenue, Suite 103, Jackson, MI 49202 (1-517-563-9022).

Texas Towers Tubing. Recently Texas Towers announced that they were expanding into the aluminum tubing market and now stock reasonably priced tubing. Their stock includes many popular telescoping sizes that should prove excellent for amateur antenna construction. Drawn and extruded tubing are available.

The drawn tubing is of 6063-T832 alloy having a typical yield strength of 40,000 psi. The tubing has a bright finish. It's available in 1/8 inch increments designed to telescope, in 6 ft. and 12 ft. lengths. The former are UPS-shippable.

The extruded tubing is of 6061-T6 alloy with a 40,000 psi typical yield strength for large antenna booms. A smaller solid size is for use as elements for VHF and UHF antennas. Six, 12, and 24 ft. lengths are available. Contact Texas Towers, 1108 Summit Ave., Suite #4, Plano, TX 75074 (214-422-7306). (Texas Towers sent me samples, which have bright surfaces comparable to what commercial antenna manufacturers provide in their kits.)



Electron Processing H-TENNA line. Available for 6 and 2 meters, 70 cm., and dual-band 2 meters/70 cm use, the H-TENNAs provide near omnidirectional coverage when mounted aside most towers. A dipole radiator is encapsulated in a CPVC "radome" that can be configured for either vertical or horizontal polarization. Wideband scanner versions also are available. (Photo via Electron Processing, Inc.)

Mobile-Mark Antenna Catalog. The 1993 Mobile-Mark™ amateur antenna products catalog is billed as "for the amateur operator who's going places." Most of the MobileAm™ antennas described are for mobile HF, VHF, and UHF installations.

Products in the 17-page catalog include the Heliwhip and Kilowhip (high power) molded fiberglass 6–160 meter; VHF/UHF roof/body mount; On-Window VHF/UHF; dual-band VHF/-UHF/800 MHz; triband (10-15-20 meter) Heliwhip; and CV/CVS omnidirectional mobile antennas. Also offered are Heliwhip dipole base station antennas for 10–40 meters and CV series broadband base station VHF/UHF antennas. Mounts and accessories also are available.

Perhaps the most interesting antenna in the current catalog is the classic HW-3 triband Heliwhip mobile antenna for 10, 15, and 20 meter operation. The HW-3 was one of the first multi-frequency, automatic bandswitching mobile antennas, having been marketed for more

289 Poplar Drive, Millbrook, AL 36054

than 30 years. The antenna consists of three helical sections or elements. The elements are preadjusted to demonstrate proper resonance when installed at the center of the trunk lid, roof top, or fender. Additional elements are available for 40 and 75 meters, or by special order for any frequency from 3.5–30 MHz. No traps or switching devices are required. The HW-3 produces a nominal 50 ohm match at each resonant frequency. Bandwidth ranges from 900 kHz on 10 meters to as low as 35 kHz on 75 meters. Pricing depends on band coverage.

For a catalog, contact Mobile Mark, Inc., 3900-B River Road, Schiller Park, IL 60176 (312-671-6690).

Texas BugCatcher Update. Last year we profiled the Texas BugCatcher. To recall, it's a center-loaded HF mobile antenna offered by Henry Allen, WB5TYD, that you can custom configure mechanically and electrically over the range 3–30 MHz. Several different loading coils covering 10 through 160 meters are available. The BugCatchers are offered with several different masts, whips, matching coils, mounts, quick disconnects, coil clips, whip adapters, corona balls, and other custom components.

Several new accessories are offered. These include a $75 fold-away trailer hitch mount for Explorers, Blazers, Broncos, mini-vans, and other vehicles with a lift-up or fold-down rear door. The mount holds a BugCatcher or other large mobile antenna and folds down to allow the vehicle's door to be opened fully. Also new are high power 10–80 meter and 10–40 meter coils, a heavy-duty matching coil, and coil tap kits. Details are available from Henry Allen, WB5TYD, at GLA Systems, P.O. Box 425, Caddo Mills, TX 75135; 1-800-LUV-BUG-1 (1-800-588-2841).

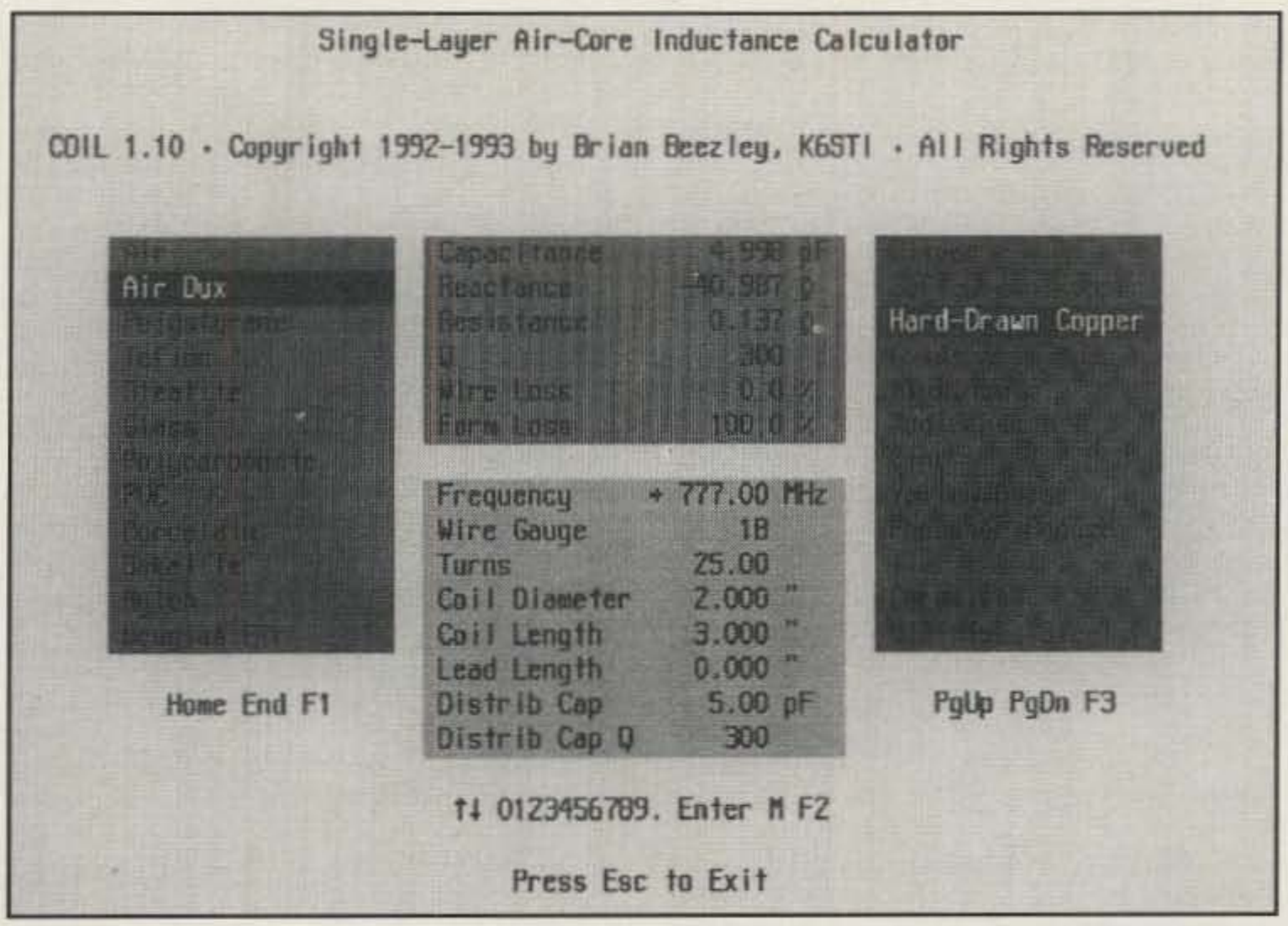


Fig. 1– COIL.EXE is software designed for high-accuracy inductance calculations. The program simplifies the complex equations normally required to properly calculate the inductance and other properties of single-layer air-core coils. COIL.EXE takes into account many variables, including the effects of form and wire losses. It's offered by Brian Beezley, K6STI (see text).

M² Antennas Update. In the December 1991 column we noted the antenna products of M² Enterprises, which include a variety of high-quality HF, VHF, UHF, and cross-polarized antennas. Recently, they consolidated

their brochures into a single, ten-page catalog that describes their antenna and accessory product lines.

A number of HF Yagis and log periodics are offered, as well as 6 and 2 meter, 222 MHz, and 70 cm models. Several crosspolarized designs cover 2 meters and 70 cm. Also sold are the 2 meter and 420–450 MHz "Eggbeaters," used to produce an omnidirectional horizontal polarity at the horizon—above the horizon, the pattern transforms to right-hand circular polarization, making the Eggbeaters suitable for OSCAR use.

Several new antennas were developed for 1993. These include 6-element Yagis for 15 and 20 meters; a 23-element stacked OSCAR Yagi; the 16.7 dBd gain 2 meter "Big Mama"; and no-trap HF log periodics for 6–10 and 40–10 meters.

For a catalog, contact M² Enterprises, 7560 N. Del Mar, Fresno, CA 93711 (209-432-8873).

New Software '93

COIL.EXE. We've watched the evolution of Brian Beezley, K6STI's high-accuracy IBM PC antenna modeling software over the past several years. Recently Brian sent me an entirely different program, COIL.EXE, that's designed for high-accuracy inductance calculations. The research Brian conducted simplifies the complex calculations that are normally required to properly calculate the inductance, "Q," and other properties of single-layer air-core coils. His research combines the work of Hank Meyer, W6GGV, and others since the late 1940s into a single, easy-to-use program. COIL.EXE accounts for a large number of variables, including the effects of form and wire losses (see fig. 1).

Brian came up with a novel distribution scheme for COIL.EXE. Since he wanted to price it low, yet neither give it away free nor become involved in distributing it directly to users, he posted the program on bulletin boards (BBSes) that cater to amateur radio applications. The freely distributed version is fully functional, letting the user play with it. But the results are calculated incorrectly until the user registers the program. He reads the unique "machine code" for his PC as displayed on the screen; sends the code, a $10 bill, and a SASE to Brian; and receives in return a custom activation code from him. Correct activation of the program thus is keyed to a specific computer system, and it won't calculate correctly on other PCs.

Predictably, many readers will take exception to this method of distribution. However, Brian cites bad experiences with pirating of his antenna software. He estimates that as many as 95 percent of users never pay for programs. He's even found that his copyright antenna programs have been pirated to two CD-ROMs!

For a flyer of currently offered antenna design and modeling programs, contact Brian Beezley, K6STI, 507½ Taylor St., Vista, CA 92084 (619-945-9824 from 0700–1800 Pacific time). Please note that COIL.EXE is not available from him directly; you'll have to find it on a ham-oriented BBS.

As we went to press, we learned that Brian also has developed a VGA font editor, called FED.EXE, to customize your own screen font. The program can be used by any DOS application in text mode that doesn't load its own fonts. Like COIL.EXE, the font editor is distributed by BBS and requires payment of a $10 registration fee to work properly.

Shortwave Database. Charles Bolland of Orchid City Software offers Shortwave Database, of interest to SWLs. It's for IBM and compatible PCs and contains thousands of radio station records and listings. Each station file contains the station's name, frequency, and schedule; language used; country; continent; a field for remarks; and the date the record was last updated. Fast, on-screen sorting or sorting of data to printer can be accomplished in several different ways.

The author notes that the program is neither one in which you are unable to change basic data nor one in which you must enter all data yourself. Rather, the program is furnished with up-to-date station data that you can change, update, delete, or add to, depending on your needs and uses. It's $19.95 from Orchid City Software, P.O. Box 18402, West Palm Beach, FL 33416.

Other SWL-oriented programs are available. These include the Shortwave Log Report Database ($29.95), which includes a logging utility, and the DXer's and SWL's Program Database ($9.95).

IMCT Morse Code Trainer. In the January 1986 and March 1989 columns we examined the International Morse Code Trainer (IMCT), first for the Commodore 64/128 and later for the IBM PC. IMCT is a menu-driven Morse Code trainer, adjustable from 1 to 20+ WPM. It guides beginners step-by-step, starting with basic sound recognition and covering each

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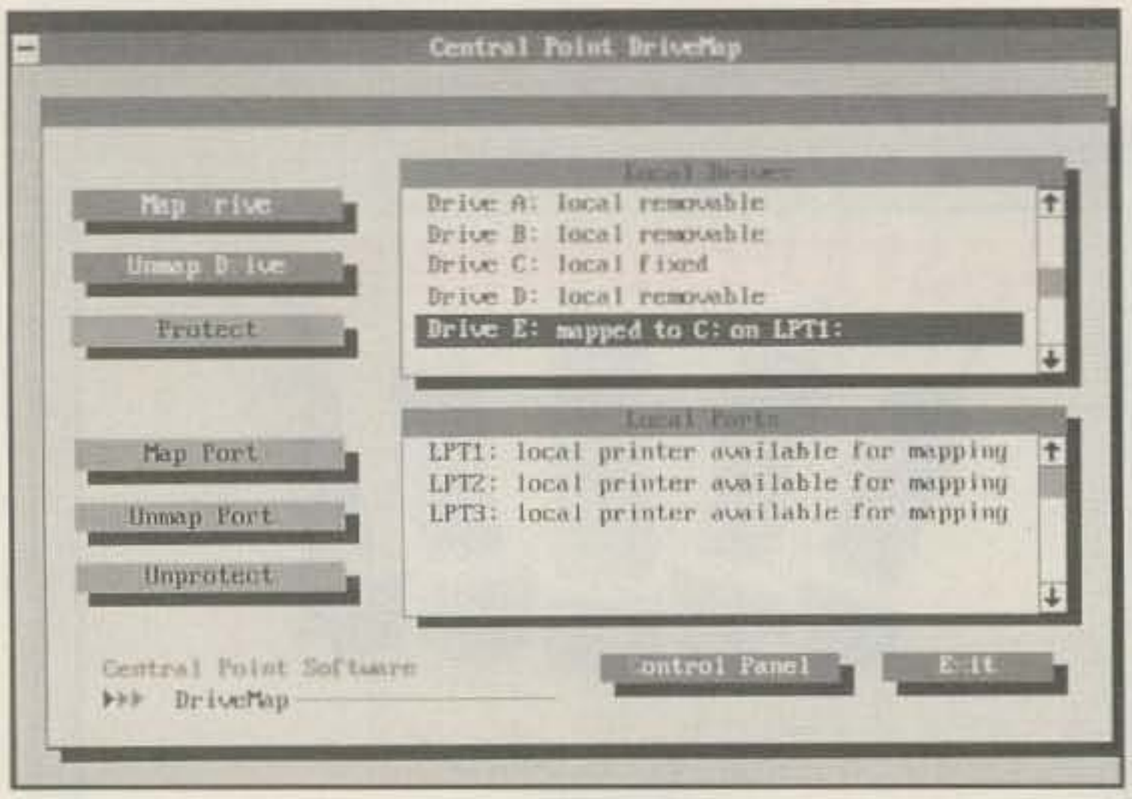
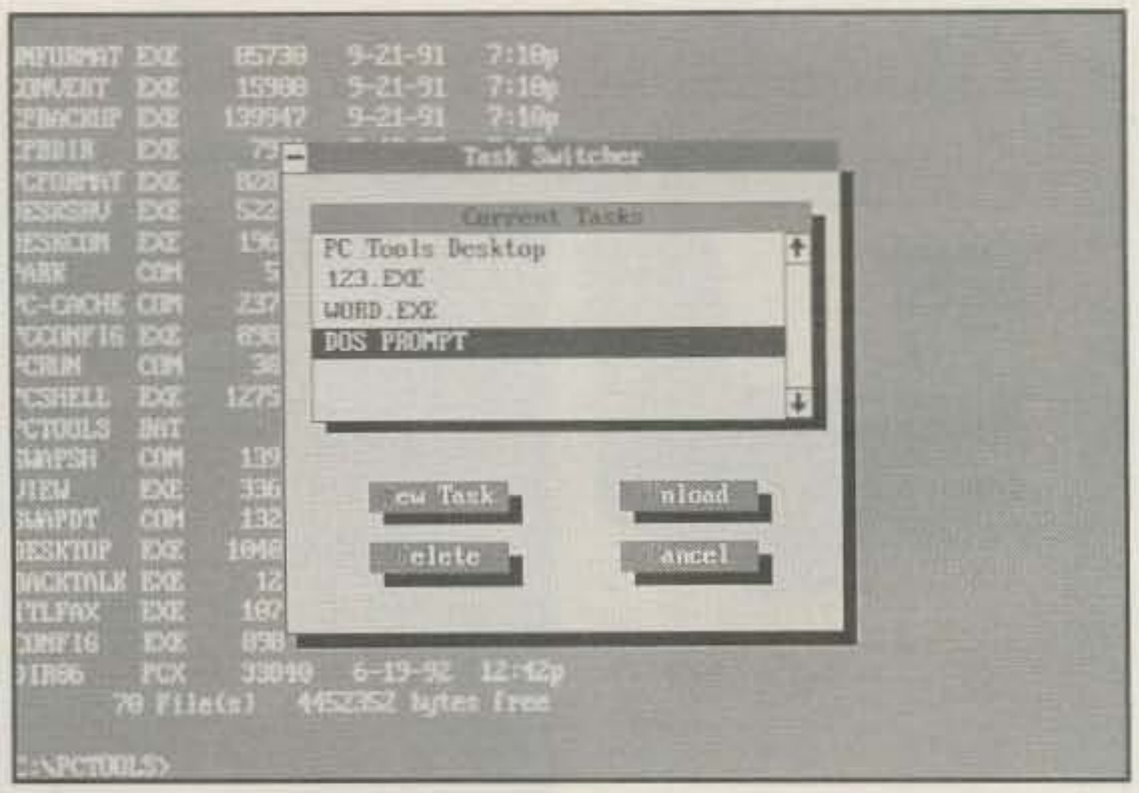


PC Tools Version 8 is a comprehensive, DOS-based utility package that offers data protection and recovery, hard disk backup, file management, desktop organization, performance enhancement, and other features. MS-DOS 6 prompted a "maintenance update" in the form of V8.0a. The DriveMap utility, shown here, lets remote devices and printers appear as local resources on a network or direct PC-to-PC connection, acilitating file transfers. (Photo courtesy Central Point Software, Inc.)



PC Tools for DOS task switching utility. The DOS-based PC Tools V8.0a includes an integrated task switcher that makes working with multiple programs much easier and more efficient than before. You can hot-key among several applications and use the PC Tools clipboard to cut-and-paste data between files. It's not hard to imagine the usefulness of a task-switching utility in juggling a variety of DOS-based hamshack software programs. (Photo courtesy Central Point Software, Inc.)

character. For the advanced student, the program allows letters to be typed and the code heard. Several testing methods are included. IMCT also has an on-screen "radio" that simulates contests, QSOs, and "tuner-uppers."

Program author Ed Oros, AC3L, recently updated me on the program's status. He says that IMCT now is available both on the *73 Amateur Radio* and ARRL BBSes. The program registration is $10 if taken by BBS download, or it can be purchased direct from the author for $19.95. For further information, contact Edward Oros, AC3L, 2629 Sapling Dr., Allison Park, PA 15101.

The Norton Desktop 2.2 for Windows. Microsoft Windows 3.1 isn't a complete operating system. Rather, it's an operating environment that rides on top of, and provides a shell for, plain old MS-DOS. And we all know that there still are some rough edges to both Windows and MS-DOS, even in their latest incarnations.

We profiled The Norton Desktop for Windows (NDW) V2.0 in the December '92 column. To recap, NDW was designed as a combined file-launcher and manipulator for Windows, to replace the awkward Windows Program and File Managers. NDW offers an expanded suite of features and utilities that optimize the Windows environment and make it easier to use. NDW allows full "drag-and-drop" support across the entire desktop.

Symantec has issued NDW 2.2 to align NDW with, and enhance, MS-DOS 6.0 and Windows 3.1. Besides the intuitive and powerful desktop manager, other new features include automatic data recovery for MS-DOS 6.0 compressed drives; the ability to read and restore MS-DOS 6.0 backups; a backup utility that's three times faster than the MS-DOS 6.0 backup program; virus detection for over 1500 viruses; an antivirus scanner that's reportedly two to three times faster than that in MS-DOS 6.0; "drag-and-drop" Email capability; and more. Besides the included backup program, NDW 2.2 also offers several popular utilities such as Norton Disk Doctor and a "fix-it disk" you can use to recover data and repair files even if you can't run Windows.

NDW 2.2 lists for $179, though it's available for less "on the street." Upgrades are $19. Contact Symantec Corporation, 10201 Torre Avenue, Cupertino, CA 95014-2132 (1-800-441-7234).

BOOTCON 2.0. One of the most frustrating things about DOS is the way the CONFIG.SYS file works. If you make a change to the file, you have to reboot to have the change take effect. Keeping up with the AUTOEXEC.BAT file is almost as bad, and maintaining multiple configurations is a pain and confusing. What's needed is a simple means of selecting the desired system setup at boot time, without having to manually manipulate configuration files.

Several utilities address configuration control. One such product is BOOTCON, which we profiled in August 92; it's recently been upgraded to Version 2.0. The new version is compatible with MS-DOS 6.0, supports a mouse, and is much easier to use than the previous version. The program lets you predefine many different PC system configurations for various tasks. Once you have set up the configurations, you simply boot the PC and select the proper configuration from the BOOTCON menu. BOOTCON then loads the appropriate configuration. If you want to change configuration, you simply reboot and select a new configuration.

The new version lets you create up to 100 different (gasp!) system configurations and easily choose between them at boot time (the previous version allowed 26 setups). The real advantage, of course, is that you no longer have to juggle multiple AUTOEXEC.BAT and CONFIG.SYS files to create the proper working environment for specific applications. You can, for example, have one configuration for DOS applications, another for Windows, still another for graphics, and even one for your favorite set of amateur applications—without manually reconfiguring your PC.

BOOTCON 2.0 can serve as a "front end" for the MS-DOS 6.0 configuration manager, and it's compatible with most disk compression software and DR-DOS. Many "bells and whistles" have been added which let you set passwords, create standalone configurations to work with memory optimization and management software, manipulate file sets other than AUTOEXEC.BAT and CONFIG.SYS, and even switch between MS-DOS and IBM's OS/2 operating system (if you also use OS/2 on your PC).

The $79.95 program is from Modular Software Systems, 25825 104th Avenue SE, Suite 208, Kent, WA 98031 (1-800-438-3930). Registered users can upgrade for $28.

PC Tools for DOS V8.0a. As we noted in a recent column, Central Point Software has "done it again" with its PC Tools for DOS, Version 8. It's a powerful group of integrated utilities designed to make computing simpler and faster, and provide insurance against data loss. As we pointed out, Version 8 is integrated in a single graphical desktop that provides complete access to all applications and files. The package includes hard disk backup and disaster recovery; virus protection; a memory optimizer; a remote device mapper; a task switcher; and more.

The release of MS-DOS 6 threw both opportunities and monkey wrenches into many utility packages, including PC Tools. The new DOS prompted Central Point Software to issue a "maintenance update" to PC Tools as V8.0a. The update resolves known configuration conflicts resulting from the new DOS and offers several features that enhance the operating system.

PC Tools programs that were updated in V8.0a include Compress, DiskFix®, RAM-Boost, DiskEdit, and PC Cache™, as well as the installation routines. The changes allow you to take full advantage of new MS-DOS capabilities, such as memory management, Flexboot, and disk compression, while offering comprehensive alternatives for several entry-

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level utility programs that Microsoft included with the new operating system.

At $179 list price PC Tools isn't cheap, but represents good value in terms of the features it offers. Best of all, if you bought PC Tools for DOS V8.0 after February 15, 1993, you can upgrade to V8.0a free; previous PC Tools users can upgrade for $14.95 plus $5 shipping/handling. Contact Central Point Software, 15220 N.W. Greenbrier Parkway, #200, Beaverton, OR 97006 (1-800-445-4208).

Postscript: Earlier this year, Central Point issued PC Tools for Windows, which is designed to work closely with MS-DOS 6 and supports it without modification. The new product is billed as a fundamental extension to the operating environment, designed to make Windows much easier to use. Key features of the 14-module package include MultiDesk™, which organizes work and simplifies file access; File Manager, which manages data faster and easier; WinShield™, which protects Windows data and includes what's reportedly the only Windows disk repair tool available; Optimizer, which uniquely optimizes hard drives from within Windows; and System Consultant™, which analyzes and suggests peak performance configurations. The new product is $179.95; PC Tools for DOS users can upgrade for $49.95.

Cipher-Ace Update. In January 93 we discussed cryptanalysis and the Cipher-Ace series software. Charles W. Stewart, WA2NZX, markets IBM PC compatible programs for the computer-assisted purpose of making and breaking secret ciphers in hobby, professional, and educational contexts. Charles offers an updated series of six disk packages (V2.2) for $35 each. The programs let you enter cipher text messages for decrypting or enter plain text from the keyboard or a disk text file for enciphering.

A recent flyer shows many new and classic book titles on cryptography, intelligence, spycraft, and some intriguing historical topics. Also offered are several titles on Mayan studies as well as several inexpensive workshops and seminars offered in the Orlando, Florida area.

For more particulars contact Charles W. Stewart, WA2NZX, 1197 Pickerel Circle, Orlando, FL 32839 (407-855-6148).

New Books '93

Gordon West Advanced Class Book. Gordon West, WB6NOA, well-known radio author and educator, offers a new, 173-page FCC license preparation book for amateurs wishing to upgrade to the Advanced class. *Gordon West's New Advanced Class License Preparation* covers all examination questions, four possible answers to each, and a unique explanation for each question. The book eliminates the need to jump back and forth between the front and back (common in license study books) to find out the solutions and correct answers.

The book has an introductory section that's devoted to bringing the reader up-to-date on changes in the amateur service, and a chapter is devoted to guiding the test-taker through testing procedures. The book also tells you exactly what you need to bring to the test session. It also covers each question with a view of why the right answer is correct, provides tips on solving the math questions, and shows formula shortcuts.

The book is published at $9.95 by Master Publishing. For more information, contact Gordon West's Radio School, 2414 College Drive, Cosa Mesa, CA 92626 (714-549-5000). The book also is available by mail order from the W5YI Group (1-800-669-9594), and through Radio Shack stores as catalog no. 62-2415.

America Online Membership Kit & Tour Guide. Most readers are familiar with CompuServe, which offers a breadth and depth of services that are unmatched by any other online service. I'm a member and enjoy CompuServe's many features immensely, although I find it somewhat difficult, complex, and expensive to use.

There are several competitors: Prodigy, Genie, Delphi, America Online (AOL), and others. These services have a great deal of catching-up with CompuServe to do. Nevertheless, I recently discovered AOL, which, while not providing quite the depth as CompuServe, is very slick and much more "user friendly" (and less expensive). AOL has begun to challenge CompuServe in many areas, especially with its superb messaging features and attractive GEOS-based graphical user interface (GUI). It's also challenged the growing Prodigy service by slashing rates and increasing the free hours you get with your $9.95 monthly fee.

Amateurs, SWLs, and scanner buffs will appreciate AOL's amateur radio club, which features an American Radio Relay League (The ARRL) section where you can access the ARRL Information Service (INFO), a mail server that lets you tap information files on various aspects of amateur radio. You can retrieve the files by sending an Email message to the ARRL: each file you request is Emailed to you automatically online, usually within a few hours.

You also can Email ARRL staffers, use several specialized message boards, download shareware and public domain software, and participate in online conferences. The host for the AOL Ham Radio Club is Terry Stader, KA8SCP; co-host is Luck Hurder, KY1T. *Note:* Don't confuse ARRL's AOL connection with HIRAM, which isn't part of AOL but rather is the ARRL's landline BBS. Access the HIRAM BBS with data parameters 8-N-1 at (203) 666-0578.

Okay, back to what we started out to describe, *The America Online Membership Kit & Tour Guide*, a comprehensive 400-page guide to using the Vienna, Virginia based online utility. The book is an "official" handbook and comprehensive guide to the service. The $34.95 package includes the proprietary AOL operating software and ten hours of free time for new and current users. The clearly written *Tour Guide* escorts members through the service's many attractions and points of interest, including Email, interactive forums, software, computing support, online classes, news, stock quotes, and other information. The book is especially useful to the new user since AOL, being GUI-based, doesn't publish a paper-based user's guide but instead relies on extensive on-screen help and a small welcome guide for members.

The DOS edition is by Tom Lichty and Kathy Parks; separate Macintosh and Windows editions are available. I enjoyed the DOS book and use it mostly while online to supplement the on-screen help. My only reservation is that since the book is "authorized" by AOL, there aren't many criticisms of the service by the authors. Also, bear in mind that you can join AOL directly and, depending on the particular offer you respond to, receive the startup software free along with some complimentary hours to sample the service; you can reach AOL at 1-800-827-6364.

The *Tour Guide* series books are available at most retail booksellers, or contact Ventana Press, P.O. Box 2468, Chapel Hill, NC 27515 (919-942-0220).

DOS: The Complete Reference, Fourth Edition. In March 1992 we noted an excellent DOS book, *DOS: The Complete Reference*, by Kris Jamsa. It's now been updated (again) to cover all versions of DOS through DOS 6, with emphasis on Microsoft's latest, MS-DOS 6. First published in 1987 as a 17-chapter book, the book definitely has something going for it since it has sold over 350,000 copies so far. The new edition has 46 chapters and includes a complete command reference. Each chapter is organized in a consistent manner so that the beginner and advanced user alike can pull out what they need. The 1100-page desktop reference is $29.95 from Osborne McGraw-Hill, 2600 Tenth Street, Berkeley, CA 94710.

Wrap-Up

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

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73, Karl, W8FX

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MATH'S NOTES

BY IRWIN MATH, WA2NDM

WHAT'S NEW AND HOW TO USE IT

The More Things Change—V/F and F/V Circuits

We all are familiar with the rate at which our analog world is rapidly becoming a digital one. Audio is converted to digital bits in a CD and DAT player, and the result is sound that is not only indistinguishable from pure analog, but even better, as some people might feel. Even video, one of the most complex of the "commercial" waveshapes, is now digitized (with 10-bit accuracy to boot), and the result is incredible special effects in the movies and eventually HDTV in our homes. It seems that as long as you have the luxury of millions of components, anything can be digitized.

The topic this month is not quite as complex, although it will serve as a simple introduction to how an analog signal, DC voltage, can be transmitted as a digital signal, TTL pulses, and then converted back again into an exact replica of the original analog signal. The technique described here is V/F and F/V, or voltage-to-frequency and frequency-to-voltage.

In fig. 1(A) is shown a DC input that changes from one level to another. I have chosen a few steps for this example, but it can be anything, including steady DC levels. Fig. 1(B) shows how we can represent this variation with a series of pulses, the rate of which is a function of the DC level. If we choose a factor of 1000 pulses per volt, for example, then 1 volt would be 1000 pulses/sec.; 1/2 volt, 500 pulses/sec.; 0.3 volts, 300 pulses/sec.; and so on. We only need to count the pulses to have a pretty accurate idea of what the analog voltage is.

Fig. 2 is a schematic of a circuit using the National Semiconductor LM331. This device is an 8-pin V/F, F/V converter that is capable of very accurate analog-to-frequency and frequency-to-analog conversion. In fact, the circuit of fig. 2 can convert 0 to 10 volts to 0 to 10 kHz (and back again) with a linearity of ±0.3%, which should be accurate enough for any amateur application. When building this circuit, be sure to use high-quality components such as mylar capacitors and metal film resistors where noted. The final accuracy depends on these.

Once the V/F circuit is built, you must

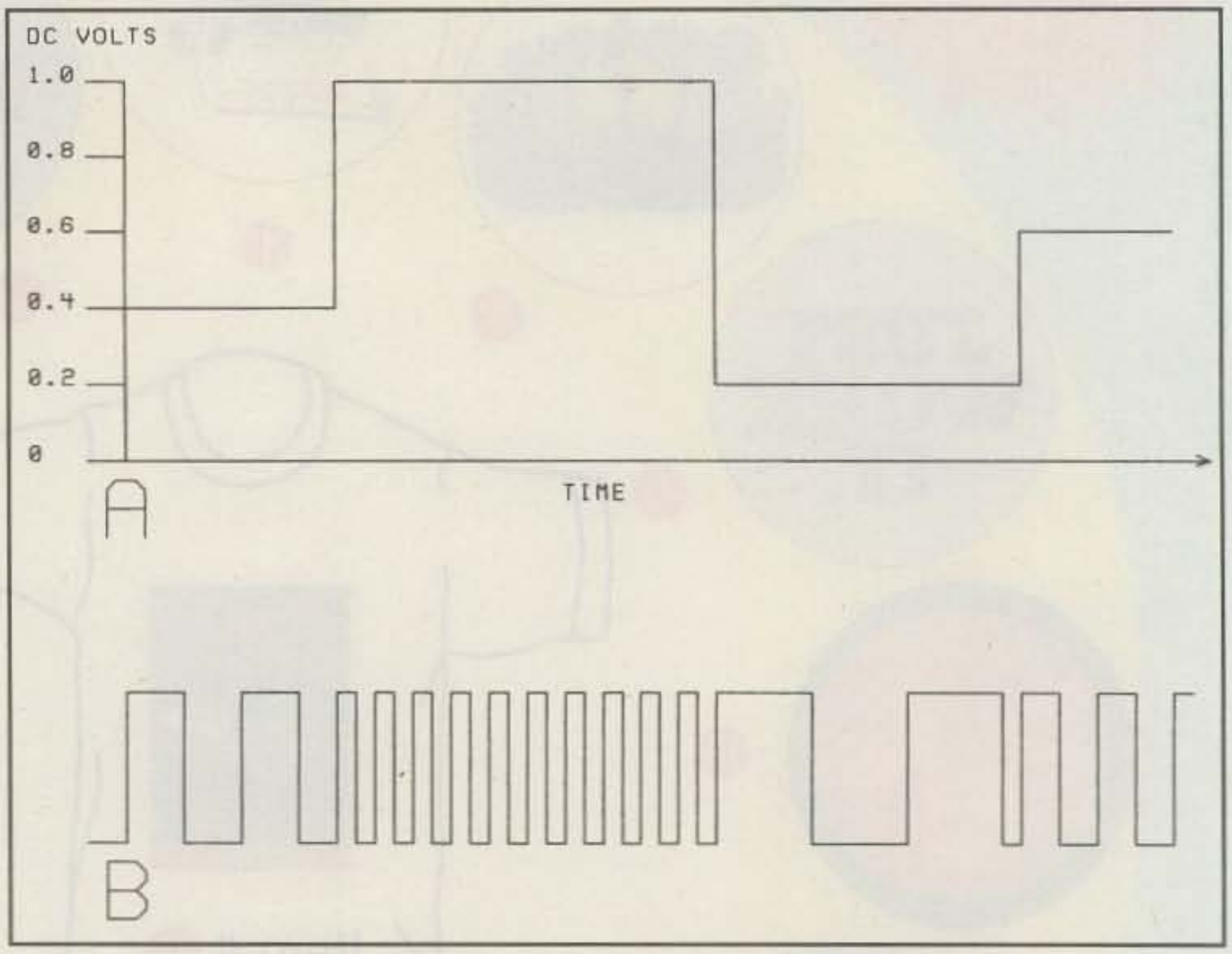

Fig. 1– DC voltage and encoded digital pulse train.

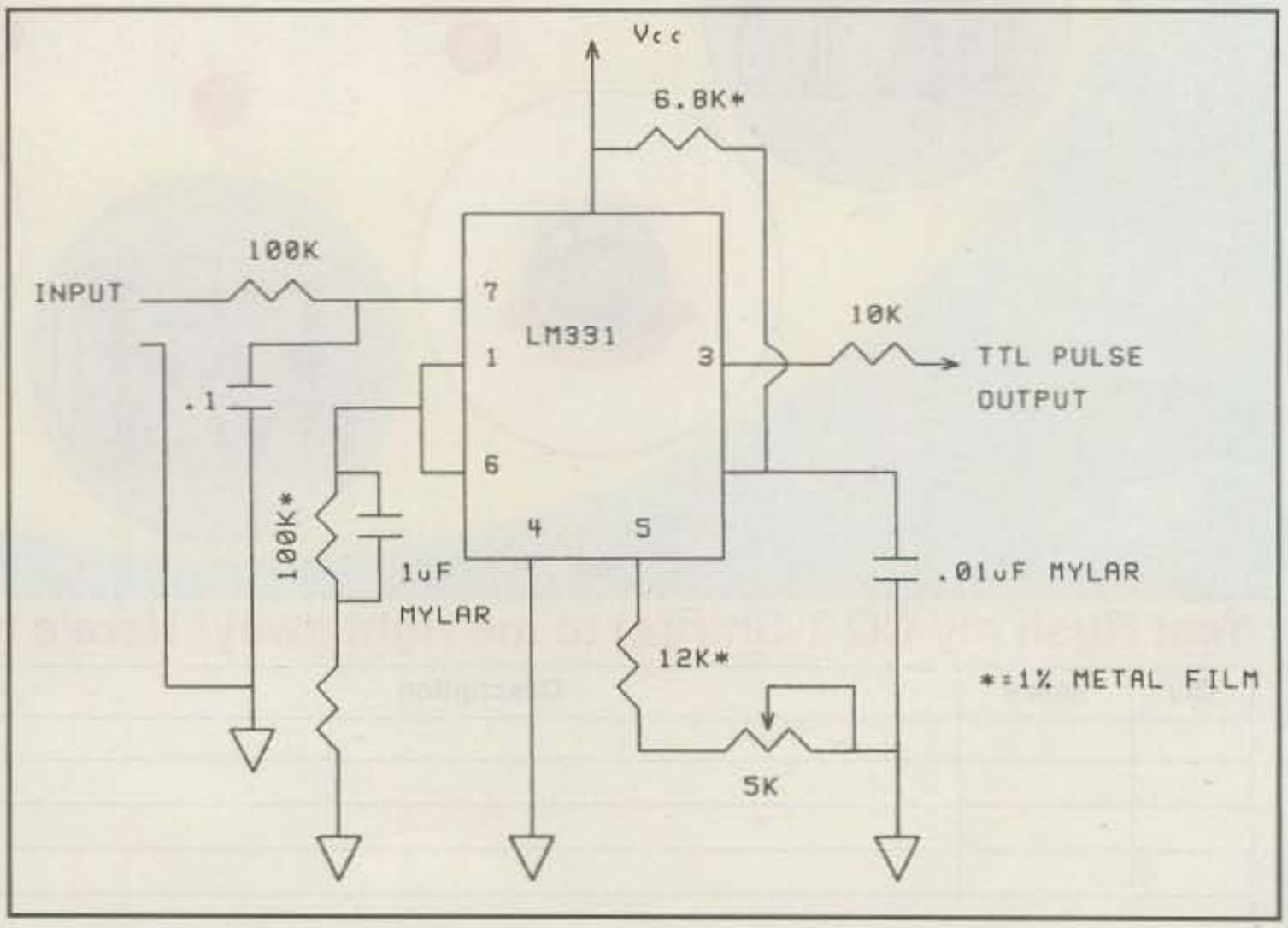

Fig. 2– Zero to ten volt voltage-to-frequency converter.

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calibrate it. Connect a 10.0 volt voltage to the input and a frequency counter to the output. Adjust the pot until the counter reads exactly 10.00 kHz. Now check the operation by varying the input, in steps of one volt at a time, until you reach 1 volt. The counter should track each step, and when you reach 1 volt, it should indicate 1000 Hz. Note that you have actually built a simple digital voltmeter at this point. Since you cannot produce 0 pulses per second at 0 volts, the circuit will only be usable to a few tens of millivolts at the low end. Within the 1 volt to 10 volt range, however, you should easily be able to resolve 10 millivolts. Not bad for a few parts.

Once we have produced the "digitally encoded pulse train," we can transmit these pulses via our radio, a length of shielded wire, or any other method that offers enough bandwidth to handle 10 kHz or so. Now we must convert the digital signal back into a replica of the original analog one.

Fig. 3 shows the same LM331 connected as a frequency-to-voltage (F/V) converter. This circuit has an accuracy of ±0.6% and is a good choice for use with the V/F converter of fig. 2. Again, be sure to use precision components where shown. Alignment of this circuit is also simple. Connect the pulse train from the V/F to the input of the receiver. Set the DC input voltage to the V/F to 10.00 volts and connect an accurate voltmeter to the output of the circuit. Be sure to use a high-impedance voltmeter to avoid loading the LM331.

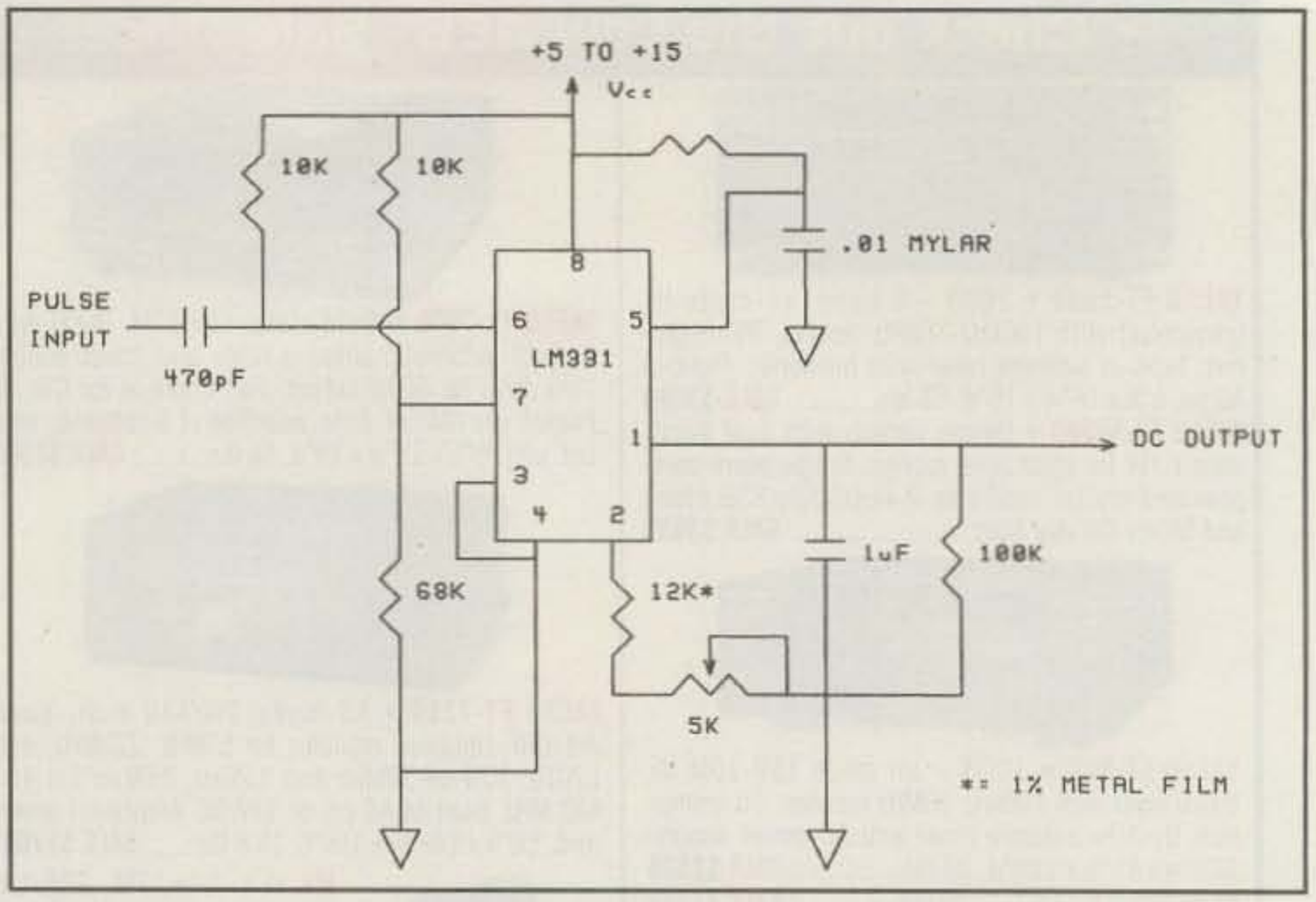

Fig. 3– Zero to 10 volt frequency-to-voltage converter.

Adjust the pot in the F/V so that the meter reads 10.00 volts. Now check the overall operation by again varying the input in 1 volt steps, making sure that the output also varies by the same amount.

Once everything is working, you will have a digital transmission system with a range of almost 0 to 10 volts and an overall accuracy of better than 0.1%. If nothing more, at least it will give you a feel for what the digital world is all about.

Needless to say, audio and video systems are much more complex, but the idea is the same, and analog voltage is converted to a digital "code" of one type or another, transmitted and then reconverted back into a replica of the original input voltage.

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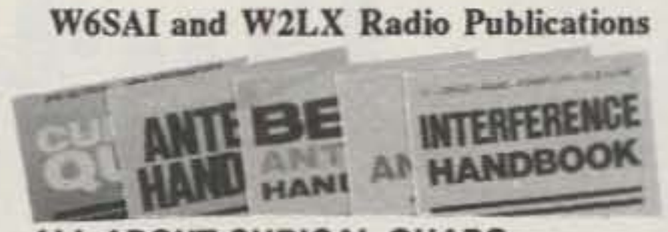

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The W21AT includes innovative features not found on any other handhelds. The V/V and U/U feature allows you to receive 2 signals simultaneously on the same band as well as normal cross-band repeat and duplex. In the innovative whisper- mode, the W21AT transmits constantly on one band while receiving constantly on the other. A microphone in the battery pack gives you true telephone-style full duplex for the first time in a handheld! Your most often used functions are automatically assigned to the Ai key in priority of use- another Icom exclusive! All of this plus "standard" dual-bander features such as 70 memory channels, 4 DTMF memories, numerous scanning modes and much, much more combine to make this the ultimate choice in a dual band HT.

ICOM IC-2iA $309

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BILL'S BASICS

BY BILL WELSH, W6DDB

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

Code Operation—Part I

I spend a lot of time operating in the Novice band code segments. I have done this every year since the Novice bands were established in 1951. My Novice band code operation has disclosed several areas wherein improvements are needed. The following paragraphs contain information which could help many amateurs. I have listed them in what I believe is their order of importance. The comments and suggestions contained in this article reflect five decades of experience. However, they are no more than my opinions regarding these subjects. You are welcome to accept the ones you like, and to reject the others.

Listening. It is important to check a band before you operate on it. Listen to find out which areas you are hearing, and make certain there is no station using the frequency you intend to use.

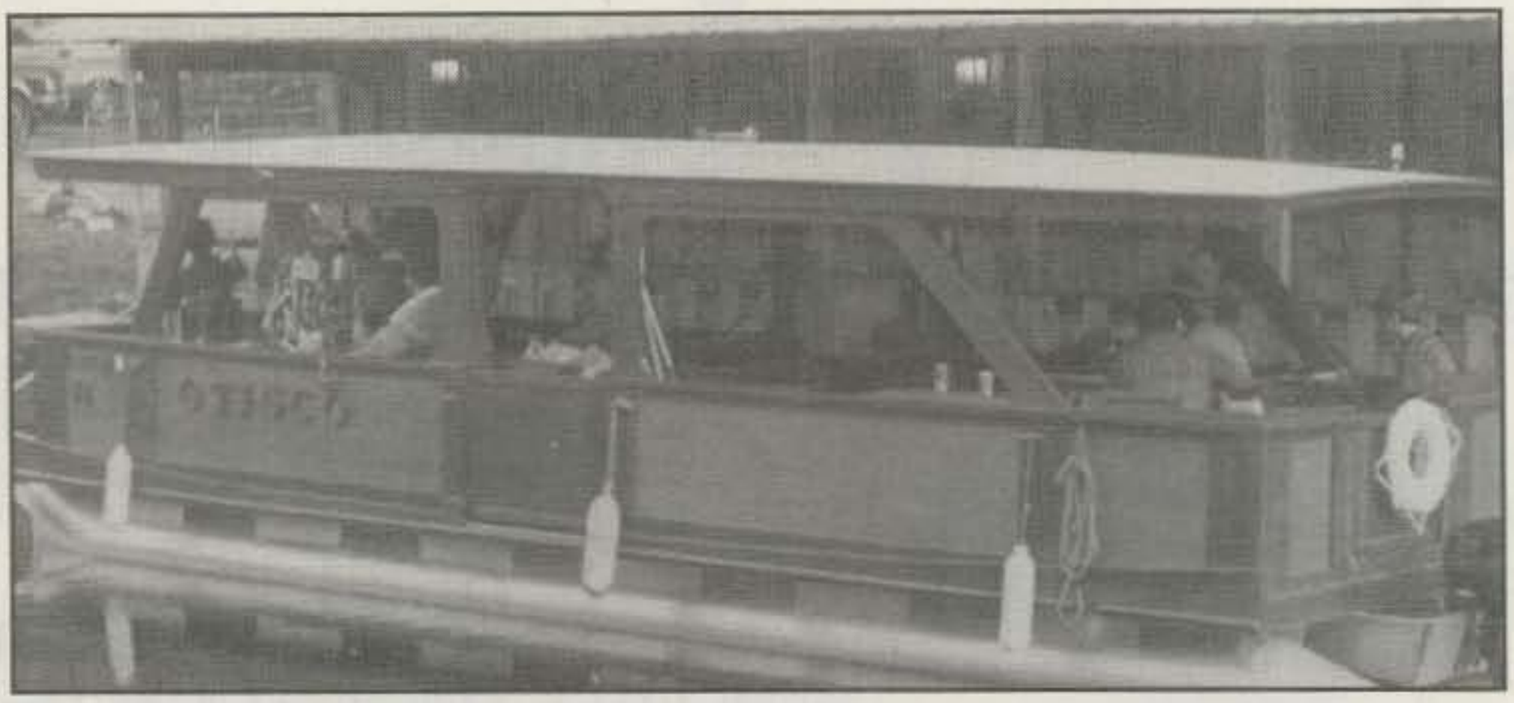
Filters. If you intend to operate A1A code, use a 250 or 500 Hertz filter. There is nothing to be gained from listening to six to twelve times as much QRM and QRN as you need to hear. Narrowband code filters are readily available, and they are easy to install. Using a good filter goes a long way toward making code operation much more pleasant.

Same Frequency Use. If you are going to answer another amateur's general call to all stations (CQ), you should zero your receiver incremental tuning (RIT) control or turn off your RIT before you answer the CQ call. This should be done to make sure you will be on (or close to) the same frequency as the station calling CQ. If both stations are not on the same frequency, inadvertent interference (QRM) may occur when other amateurs find one of the two frequencies not in use while that amateur is listening and not transmitting. Your RIT may be identified as offset tuning (OT) clarifier, or some other similar name. Failure to have both stations operate on the same frequency is the major reason why man-made interference (QRM) occurs in a crowded band. If you do not zero this offset control, you are transmitting on a frequency different from the frequency of the station calling CQ. I commonly have stations answer my calls one or two kiloHertz off the frequency I am using.

Multiple Identifications. When sending a CQ call, or answering one, it is advisable to send your callsign two or three times. It seems that amateurs who answer CQ calls the furthest off frequency are the same ones who routinely just identify a single time, making it difficult to catch their callsigns.

Bands and Times. Fundamentally, the 10 and 15 meter bands are optimum bands during the day, even though both of them are not particularly good at this point in the sunspot cycle. Despite their present decreased usefulness, it remains advisable to try these bands during the day. The 40 and 80 meter bands are optimum for long-range contacts at night, with minimum contact distances available about noontime. Unfortunately, during the evening hours high-power foreign broadcast stations cause serious interference to 40 meter Novice band communications.

45527 Third Street East, Lancaster, CA 93535-1802.



Here are members of the Dill's Landing Wireless Society operating field day aboard the Otisco on the Canal Museum in Camillus, New York.

Speed. Be careful to avoid sending code at a faster rate than you can receive it. Almost everyone can send code faster than they can receive it. If you send code at your fastest rate, the amateur with whom you are in contact will probably match your rate, making it difficult for you to copy what is sent. One way to slow down your sending is to emphasize the spaces between words. If you have trouble doing this, take your hand off your key (or paddle) at the end of each word. Doing this will quickly get you in the habit of leaving spaces between words. Once good spacing is established, there is no longer a need to remove your hand from the key between words.

Dah-To-Dit Relationships. Most publications state a dah-to-dit relationship of 3-to-1, respectively. That ratio is correct at a code speed of about 13 words per minute. The ratio is about 7-to-1 at about 5 wpm, and it is approximately 5-to-1 at around 10 wpm. At a code speed of about 50 wpm this relationship is reduced to about 2-to-1. Using longer dah lengths at low speeds is a good way to make marginally poor code sound relatively good and be easier to copy.

Accuracy. Speed increases rapidly as you operate. Do not not make a conscious effort to increase your sending speed, because receiving and sending speeds will increase naturally as you operate. Concentrate on sending good code that is easy to copy. If you are not sure about the quality of your sending, record text (from a separate magazine or paper) and then copy what you recorded.

Keys. It is best to use a manual (hand) key until you have developed a code sending speed of about 13 wpm. It is easier to achieve proper spacing technique using a manual key, which enables you to continue using good spacing when you shift to a high-speed keying device. The manual key also allows you to send the longer dahs that are appropriate when sending slow code. Once you achieve a code receiving (not sending) speed of about 10 wpm, it is advisable to start using a high-speed keying device. I use a manual key, a bug (semi-automatic key), and a paddle with an electronic keyer in my station. I am most proficient using a bug, since that is the device I have used for half a century. However, I do not recommend that new amateurs switch to a bug from a manual key; it is much better to make the change to a paddle with an electronic keyer. This combination is easier to master than a bug, and the electronic keyer does a lot of things a bug cannot do. Whether you switch to a bug or an electronic keyer and paddle, practice using your high-speed key off the air. Tape your sending and copy it later to determine its readability.

Short CQ Calls. Do not use long CQ calls because they reduce your chances of getting a reply. A series of brief CQ calls is more effective than a simple long one. It is aggravating when the listener has to wait a long time for an amateur to finish his/her CQ call. The standard CQ calling sequence is CQ sent three times, followed by DE (from) sent once, and the sender's callsign sent three times. This 3 by 3 sequence is repeated three times and the invitation to transmit (K) is sent at the end of the third repetition of this sequence. Another popular sequence involves sending CQ five times, DE once, and the callsign once; then reduce the number of CQs by one and increase the callsign by one, sending CQ (4), DE (1), and the callsign (2). The third (last) call is CQ (3), DE (1), and the callsign (3), followed by the invitation to transmit (K). This sequence initially emphasizes that you are sending a CQ call, and it ends emphasizing the callsign.

Tune about 2-kHz above and below your transmit frequency. If no reply is heard, repeat the CQ calling sequence. Do not hesitate to make CQ calls. It is more productive to make CQ calls than it is to answer them. Several amateurs may answer your CQ call, whereas you may be one of many amateurs answering another amateur's CQ call. If you make calls, you will get results.

RST Reports. Most amateurs appear to use the RST reporting system correctly. Amateurs who fail to use this system properly usually fail to realize that each part of this report is completely separate from its other two parts. The readability (R) part is just that—how readable the received signal is to you. If it is perfectly readable, it is R5. The readability report has no direct relationship to the strength (S) and tone (T) of the received signal. Signals are often R5 despite being weak and/or poor tone.

Similarly, the strength (S) of the signal is independent of readability (R) and tone (T). A typical received signal is S7. There are fewer S9 signals. It is unlikely that a new operator will answer a signal lower than S4, even though they often send S reports below S5.

Most of our new rigs produce an RF output which is very constant; therefore, the vast majority of correct tone (T) reports should be T9. If you hear poor tone on a received signal, send an appropriate lower tone report. Most reports below T9 are incorrect.

If you hear a sound like a bird chirping while listening to a signal, add the letter C to the RST report you send. Chirp is due to oscillator instability, which is usually just associated with old transmitters. If you hear key clicks far above and below a station's transmit frequency, add the letter K to the RST report you send to the offending station. Key clicks are caused by an improper keying circuit, which is more likely to be associated with older equipment than newer gear.

The suffix letter X has been used to denote that the received signal has the extreme frequency control that was originally associated with crystal (xtal) control of the oscillator. Since all modern amateur radio gear produces extremely stable outputs, the significance of the X suffix is greatly diminished. Consequently, very few amateurs now add the letter X to the RST reports they send. No matter which suffix letters you do (or do not) use, please send honest RST reports. Incorrect reports are useless.

Q Signals. We use three-letter Q signals to make statements and to ask questions. Learn many of the Q signals, but it is not wise to use them as a weapon against other amateurs. When working new amateurs, it is preferable to use only the most well-known Q signals.

Summary. This completes the first part of this two-part series. The second part covers bad practices, code practice, code tapes, confusing names, contact data, foreign codes, Phillips code, punctuation mark usage, QSL cards, UTC, and work/ending signs.

USA QSL Bureau

Bill Cummins, KB4TOX, is offering to help exchange QSL cards between American amateurs. This item is intended to provide a brief introduction to Bill's bureau. If you want additional information regarding the USA QSL Bureau, send an SASE to USA QSL Bureau, P.O. Box 309, Magnolia Springs, Alabama 36555.

This picture of Chris Kent, N1PJK, of Dunstable, Massachusetts, was taken the first day he was on the air. Chris is shown in his Uncle John Kent's (AA2DY) shack. Chris is also interested in aviation and computer programming. He recently successfully completed his freshman year atthe Lawrence Academy.

The rules applicable to using this bureau are simple. Use only standard business size (4 by 9 inch) #10 envelopes. Print your callsign prominently in the upper-left, front corner of each envelope and address each envelope to yourself. Before sending cards to this bureau, presort them by call area and in alphabetical sequence within each area group. If you are not sure of how cards should be sorted, refer to how callsigns are listed in a callbook. Basically, the number (one through zero) provides the primary sort point. The callsign suffix is secondary. The callsign prefix is third (last) in sorting cards. Print the callsign of the station to receive your card very clearly and prominently on each QSL. That callsign should be face up in the stack of cards being submitted. Individual amateurs should not submit more than 25 cards at a time to this bureau, but clubs/groups are allowed to combine cards to approach this maximum figure.

Postage-due mail is not accepted. The bureau is not responsible for the theft or loss of cards. Cards are being retained pending the receipt of SASEs from the amateurs to whom they are directed. It seems advisable to send a couple of SASEs whether or not you intend to submit outgoing cards to this bureau. There is no set charge for making use of this service. However, it costs money to provide this service, and donations are appreciated.

Printed Aids

My previous columns contain information that is useful to new and aspiring amateurs. Many of these items have been reprinted for distribution to students of licensing courses I instruct. For ease of use, these printed aids have been separated into six categories. These categories are introduction, code, theory, station, operating, and miscellaneous. Outdated items are continually replaced with newer material. Fifteen dollars brings a complete set of current printed aids, including shipping costs. A list of these printed aids will be sent to anyone who requests it and sends a business-size (#10) self-addressed, stamped envelope to my California address at the beginning of this column. Licensing-course instructors are welcome to revise and/or duplicate these items to suit their requirements.

73, Bill, W6DDB

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Written by Peter O'Dell, WB2D, this is a book about ham radio that every beginner can enjoy! If you want to get in on the fun and excitement of Amateur Radio, Ham Radio Horizons is the perfect way to get started. HRH is full of tips from expert hams in: DXing, Contesting, Serving the Public, Ham Radio in Space, Experimenting, Digital Communications — you name it! This exciting book is an excellent gift to a prospective ham or for use in your club's licensing classes and library.
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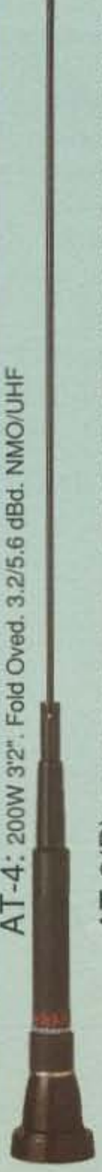

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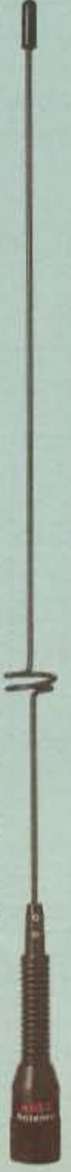
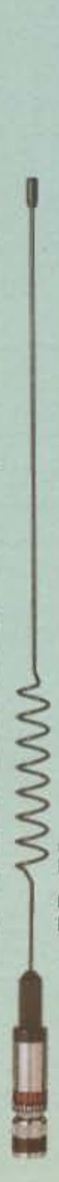


AT-3: 100W 1'5" Spring Loaded 2.15dBi/3.2dBd UHF



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Radio FUNdamentals

BY BILL ORR, W6SAI

THINGS TO LEARN, PROJECTS TO BUILD, AND GEAR TO USE

The Z-Match ATU For 160 Meters

In my last two columns I discussed the Z-Match Antenna Tuning Unit (ATU). This clever little device provides balanced or unbalanced match for the 3.5–30 MHz range—with only two controls and no bandswitching! The basic circuit, shown in fig. 1, achieves this result through the use of a parallel-tuned circuit that covers two frequencies simultaneously. The matching range is computed to be from 10 to 2,000 ohms resistive on all bands. In actual practice, it will match a wide range of complex impedances exhibited by various antennas.

A recent article by Lloyd Butler, VK5BR, in the May 1993 issue of *Amateur Radio*, a publication of the Wireless Institute of Australia, discusses the coil assembly of the Z-match and also provides data to make the unit cover the 160 meter band. The following material is excerpted from that article.

One version of the Z-match was built with the main coil wound on a form cut from a length of PVC tubing. The unit performed in a satisfactory manner, but the PVC material increased the distributed capacitance of the coil, resulting in settings of 10 to 15 pF less than normal in the dual tuning capacitor. The result was that on 7 MHz, with a load resistance around 100 ohms, the capacitor resonance occurred very near to the zero setting of the capacitor. The same minimum margin setting was also observed at the high end of the 10 meter band.

My coil form was a very thin one, of unknown plastic material, right out of the junk box. If I was to rebuild the unit, I would choose an air-wound coil, such as the Barker and Williamson 3061 or the Air-Dux 1604T. The coils are wound of 12 AWG wire, 4 turns per inch. This assures minimum distributed capacitance.

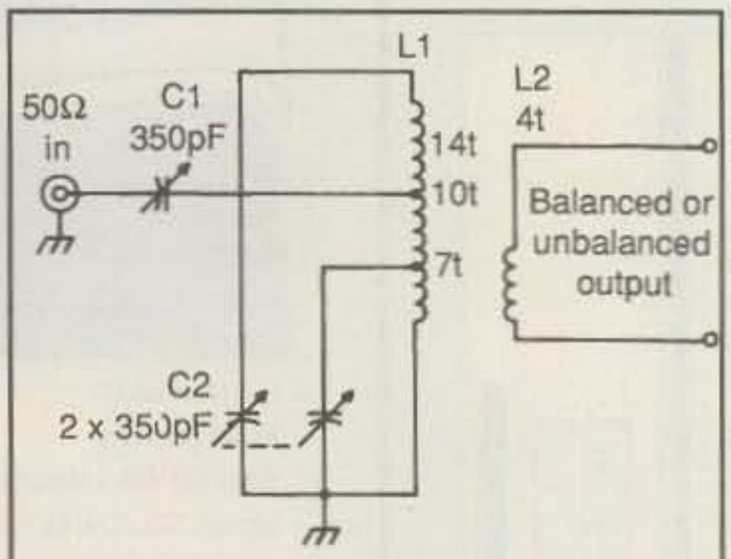
The 160 Meter Z-Match

Lloyd Butler also discussed a modified Z-match in the same article. This circuit is shown in fig. 2. The tuner covers 1.8 to 30 MHz. The extended low-frequency range is achieved by adding capacitance to the two tuning components. A four-position switch does the job.

Position 1 of the switch covers 160 meters for loads ranging from 10 to 50 ohms. Position 2 allows loads in the range of 50 to 200 ohms. Position 3 covers loads between 200 and 2,000 ohms. And position 4 covers the 3.5 to 30 MHz range. If you only require the lower impedance range on 160 meters, two fixed capacitors and a two-position switch will do the job.

VK5BR used 350 volt mica capacitors which stood up under a power level of 200 watts. It might be a good idea to use higher voltage capacitors, however, for an additional safety factor.

48 Campbell Lane, Menlo Park, CA 94025



C1—350 pF, .02" spacing.
C2—two-section, 350 pF, .02" spacing.
L1—14 turns #12 enamel wire, 1 3/4" diameter spaced to 3 3/4" long. Tap at 10 and 7 turns.
L2—4 turns insulated #14 hookup wire wound over "cold" end of L1.

Fig. 1– Up-to-date Z-match (150 watts).

A Multiband Dipole For 10/18/24 MHz

Have you operated the WARC bands? If you don't have an antenna that will do the job, consider a simple and effective design by V. C. Lear, G3TKN/VO1XG (fig. 3). This was described in the June 1993 issue of *Radio Communication*, a publication of the Radio Society of Great Britain. This sky-wire is inexpensive, easy to build, and should require no antenna tuning unit (ATU) in most instances. (Placement of the antenna and the height above ground affects SWR, as is the case with other antennas.)

The G3TKN antenna consists of a dipole with the center portion folded upon itself to form a balanced feedline. The length of one half the flat-top plus one half the open-wire feedline is 64'7". This is equal to 5/8 wave on 18.8 MHz, very close to 7/4 wave on 24.9 MHz, and reasonably close to 3/4 wave on 10.12 MHz.

On the 10 MHz band, the antenna operates as two half-waves in phase, providing a figure-8 pattern slightly narrower than a dipole, with about 0.75 dB gain

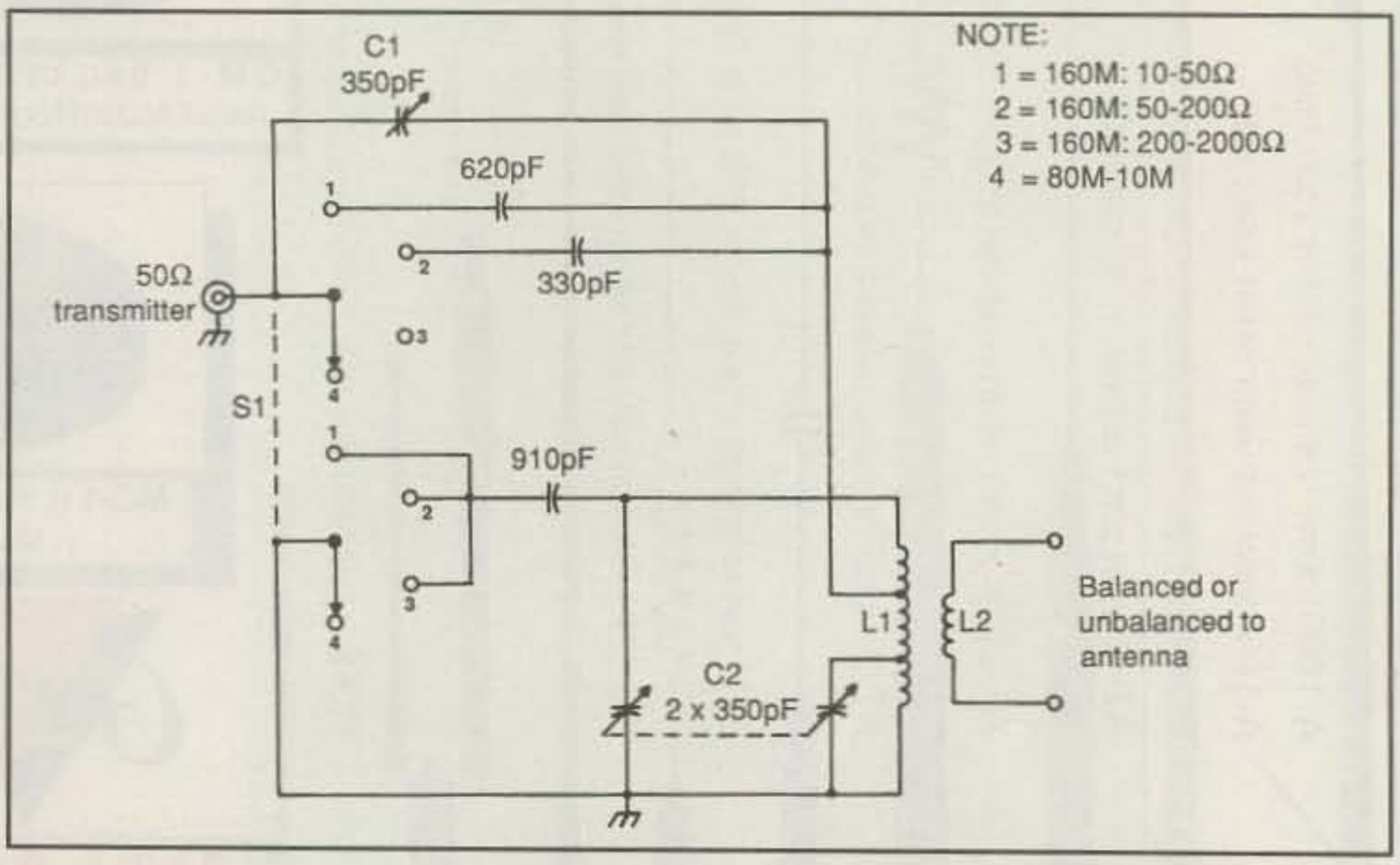


Fig. 2– Modified Z-match for 160–10 meters. C1, C2, L1, and L2 are as in fig. 1. S1 is a two-pole, 4-position ceramic switch.

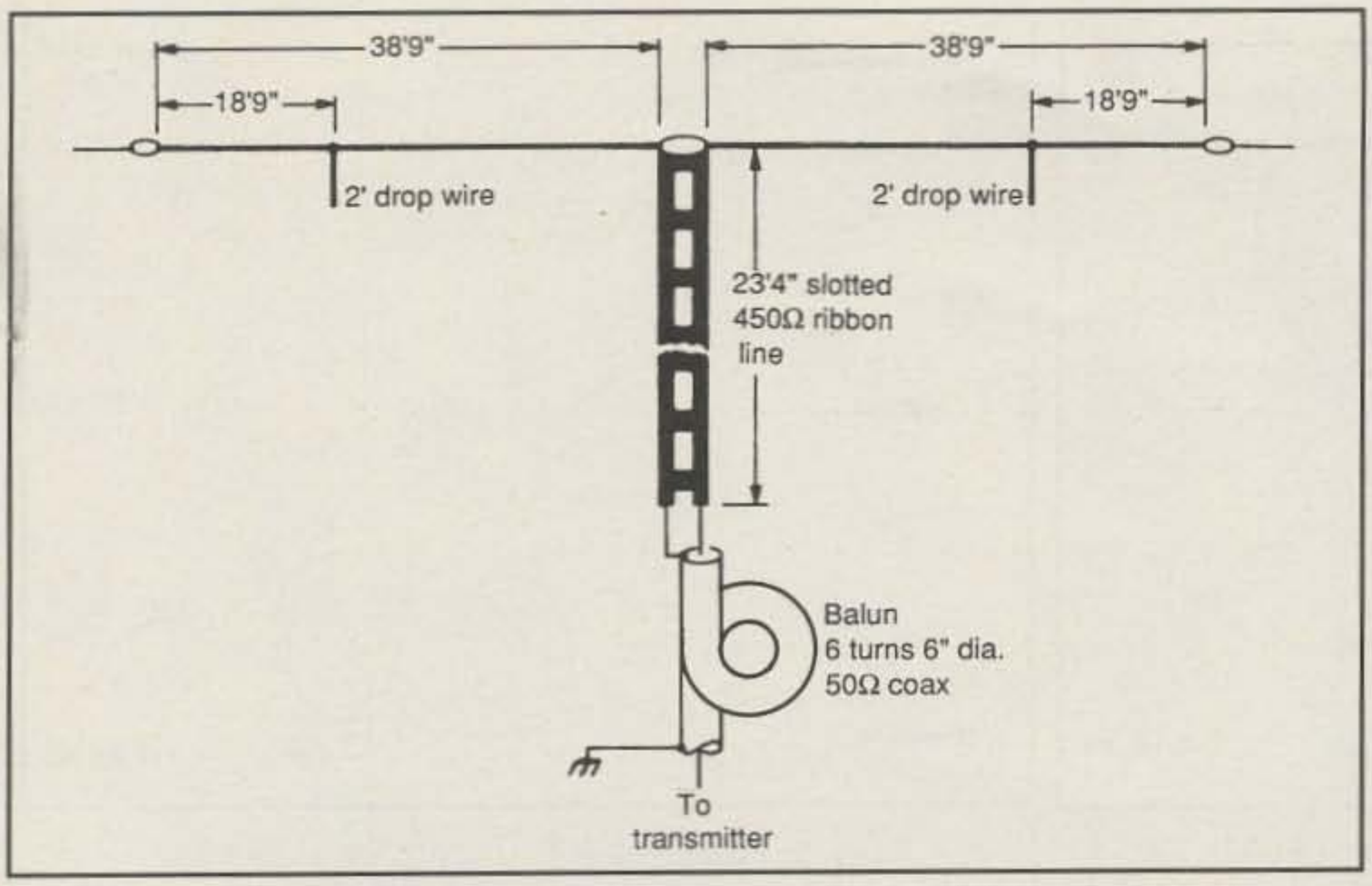


Fig. 3– The G3TKN multiband antenna for 10, 18, 24 MHz.

over a dipole (fig. 4). On 18 MHz the antenna is nearly three half-waves, center-fed, showing six lobes, with about 0.5 dB gain over a dipole oriented with respect to a pair of major lobes (fig. 5). The stub acts as a 1:1 transformer providing a low-impedance feedpoint.

On 24 MHz each antenna leg is about one wavelength long. Short loading wires are added to the flat-top to bring resonance within the band. The wires are placed at high-impedance points for 24 MHz, which turn out to be low-impedance points for the other two bands. As a result, the effect of the wires is minimal on 10 and 18 MHz. The radiation pattern shows four lobes, with a power gain of about 1.7 dBd for each lobe (fig. 6).

The loading wires provide a means of pruning the antenna for a compromise match, if required, depending upon the antenna height above ground, nearby objects, etc.

The Matching System

The two-wire stub can be built with homemade open-wire, but it is a lot easier to use slotted "ribbon line," provided the velocity factor of the line is taken into ac-

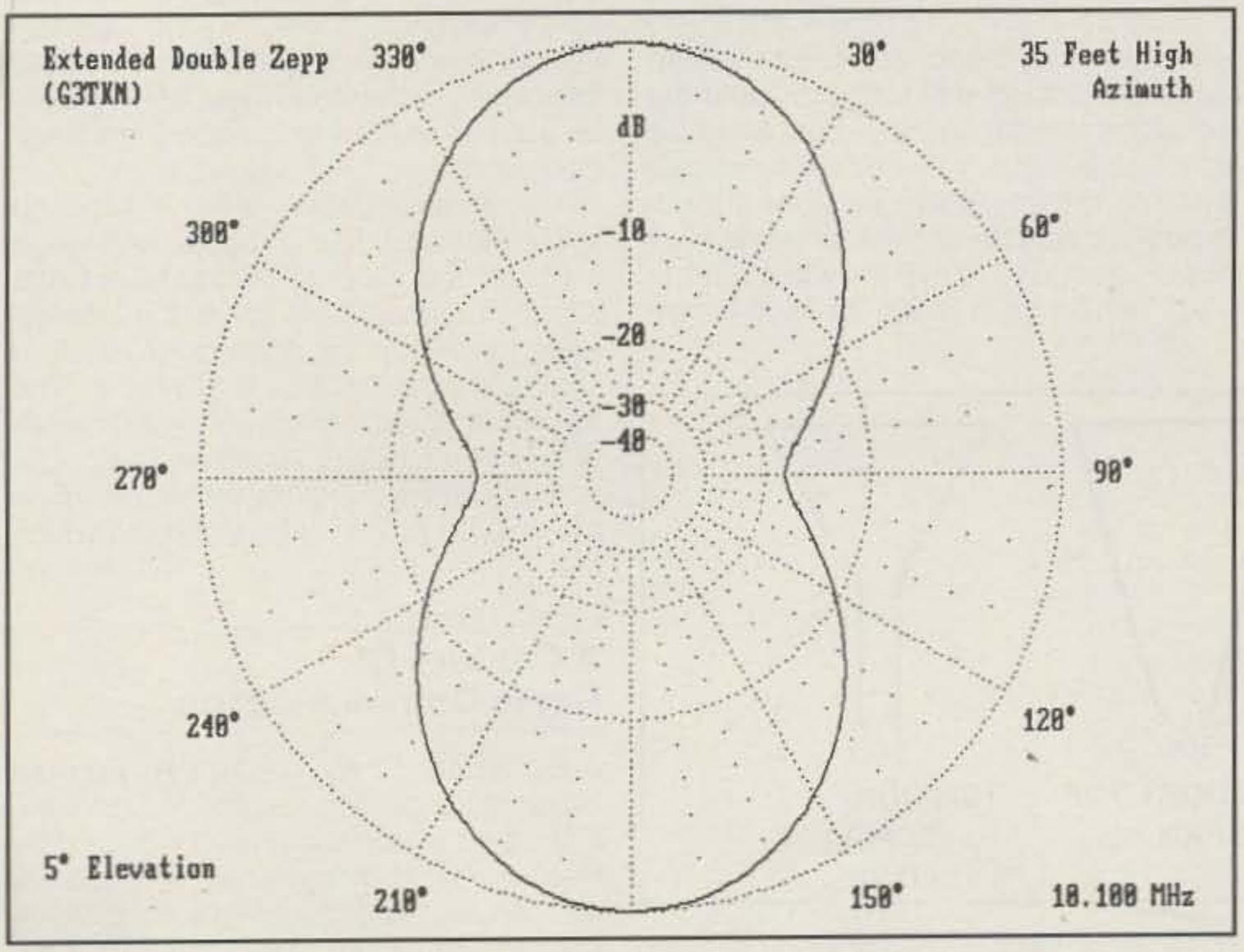


Fig. 4– Pattern of G3TKN antenna at 10 MHz.

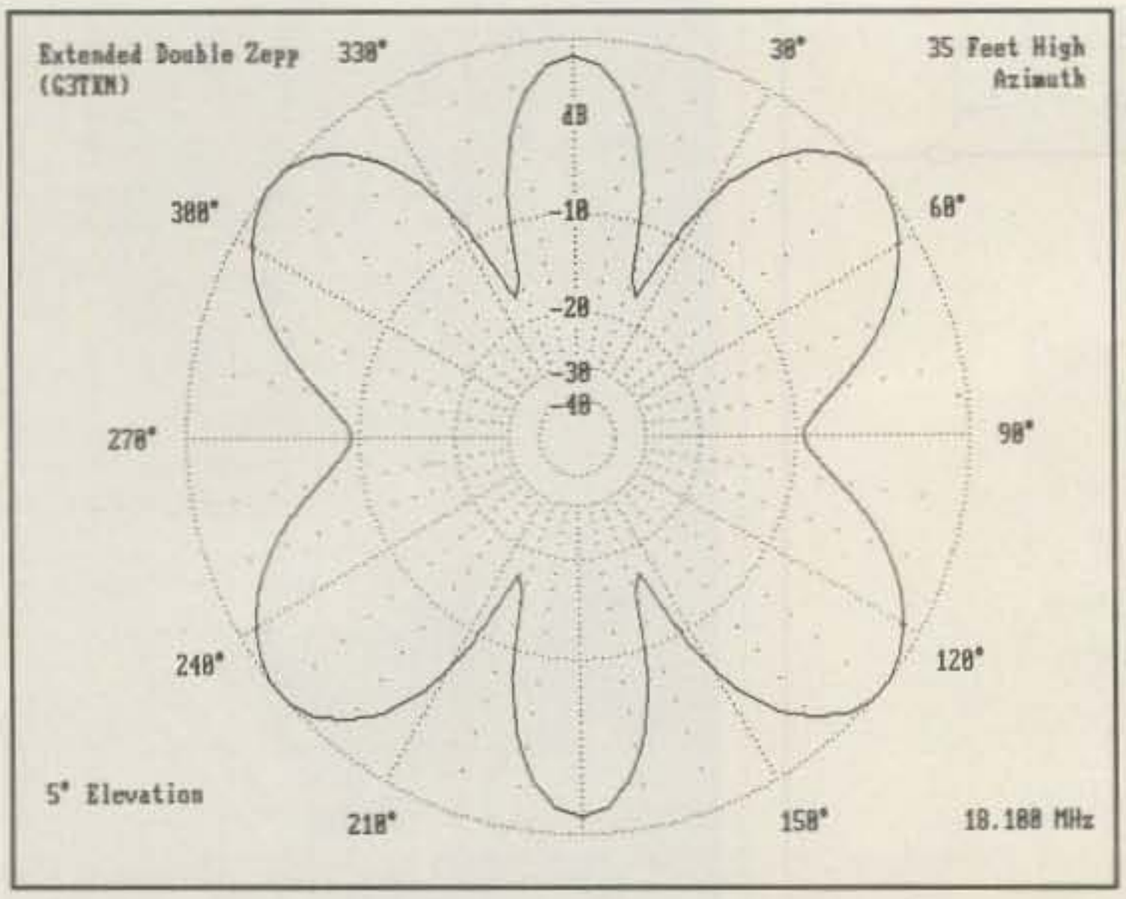


Fig. 5– Pattern of G3TKN antenna at 18 MHz.

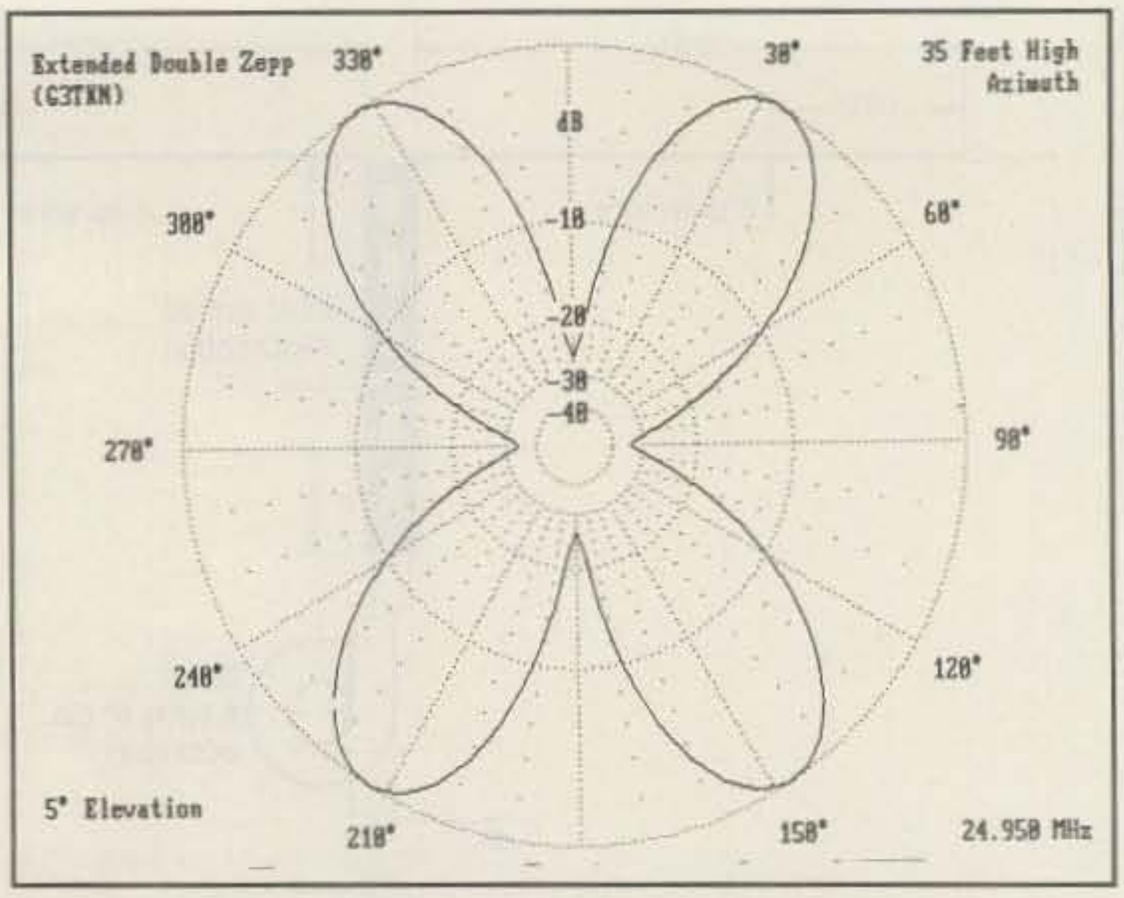


Fig. 6– Pattern of G3TKN antenna at 24 MHz.

count. Either a 450 ohm slotted line (Saxton 1562, or equivalent) or a TV-style, 300 ohm slotted line (Saxton 1563, or equivalent) is satisfactory. The velocity factor of both lines is 0.9. Thus, an open-wire line, spaced two to four inches, is 25'10" long but the equivalent slotted line is 23'4" long. Solid dielectric ribbon line is not recommended because it can be adversely affected by the weather.

A simple RF choke balun is required to isolate the shield of the coax feedline. Simply wind the coax into a choke. Six turns, 6"diameter will do the job. It is best not to jumble wind the coil. A neat trick is to wind the coil on a plastic soft-drink jug, cut off the ends of the jug, and tape the coil in place. That keeps the input and output ends of the coil apart.

The short loading wires provide a means of pruning the antenna for best compromise match on 18 and 24 MHz. A lot depends upon your particular installation. With 24 MHz going belly-up as the sunspot continues its long decline, I'd suggest pruning for best SWR in the 18 MHz band. On the other hand, SWR may be so moderate that you will not have to do any pruning at all!

The 7F Miniloop

My good friend Dick Bird, G4ZU, is at it again! Famous for his minibeam and other compact antennas, he has developed a compact loop antenna that will appeal to those with limited antenna space, or those who desire a small, efficient, easily-erected antenna for Field Day or a vacation QTH.

Dick described his "7F Miniloop" in the July 1993 issue of *Radio Communication*, the flagship publication of the Radio Society of Great Britain. Dick reasoned that a full-size Delta loop has a feedpoint impedance of about 120 ohms and a very wide frequency response. He felt the loop could be scaled down in size until the feedpoint resistance was about 50 ohms without the bandwidth becoming excessively narrow. He resisted the use of loading coils because of their inherent loss, deciding instead to fold the wires back in such fashion as to retain the total length of wire in the loop but accomplish an appreciable size reduction. His line of reasoning is shown in fig. 7.

The next step was to invert the loop so as to get the high current point of the device as high as possible. The final version is shown in fig. 8.

The portion of the loop folded into a transmission line can be adjusted slightly by trimming the length until the minimum SWR falls at your chosen design frequency. The feedline is terminated in a 1:1 balun for 50 ohm coax feed.

The feedline spacing is not critical. Four to six inches will do the job. An open-wire line, as opposed to a ribbon line, should be used.

Dick used a tubular TV push-up mast to support his portable antenna. The vertical strut was made of PVC pipe pushed into the top of the metal mast. The horizontal support arms were made from bamboo poles.

The radiation pattern of the 7F Miniloop is bidirectional, like a dipole, with good nulls off the side. Dick points out that slightly increasing the size of the loop will raise the feedpoint impedance, while a slight reduction in size will lower it. The approximate total length of wire required of any frequency is 1004/f (in MHz). Oh, yes, the name. . . . Well, the name, 7F, is the ASCII code for a triangle (hexidecimal 7F).

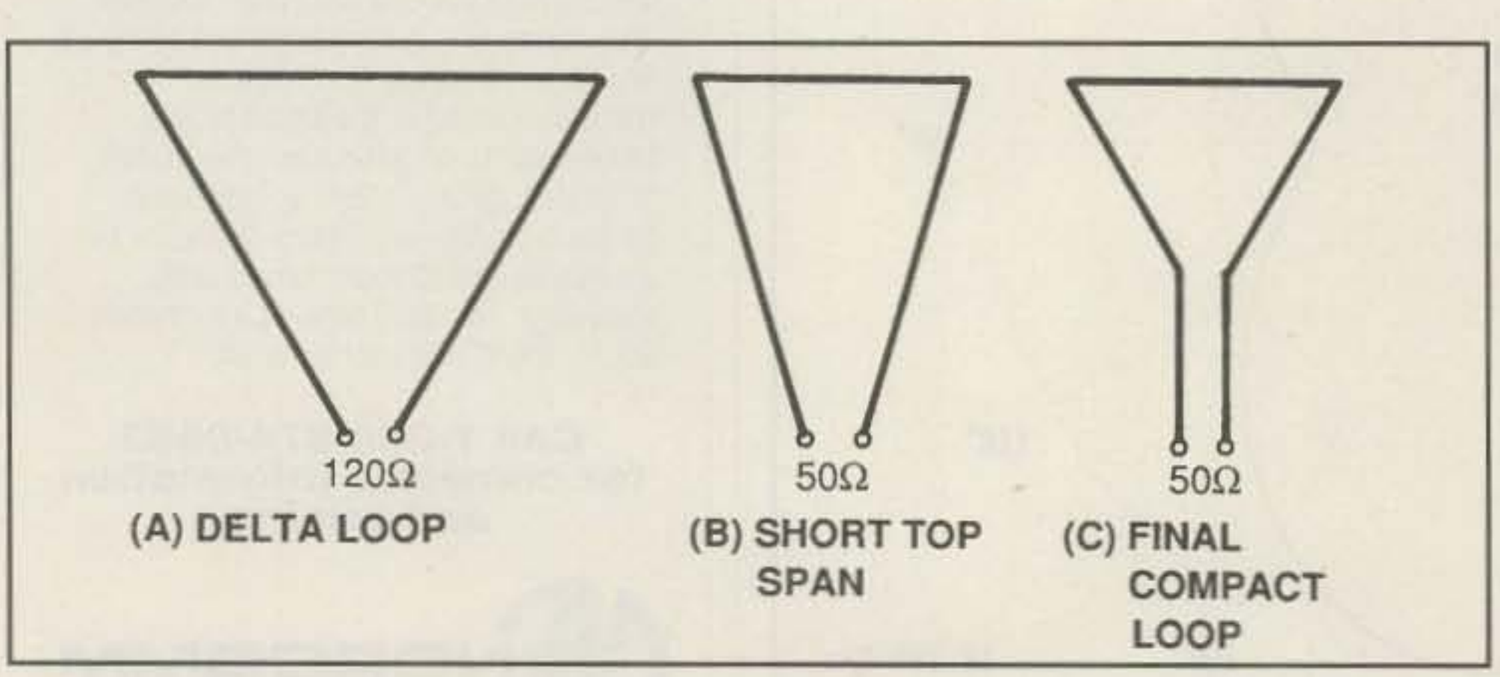


Fig. 7– Using the same length of wire, G4ZU shortened the top span of loop (B), and then pulled the sloping sides together to form the transmission line (C).

A Century Of Radio Communication

About a century ago (1894) a 20-year-old Italian youth of affluent means became interested in experiments conducted by Hertz, Righi, and others concerning electric waves that could travel through space. The youth, Marconi, was convinced that the waves could be used for

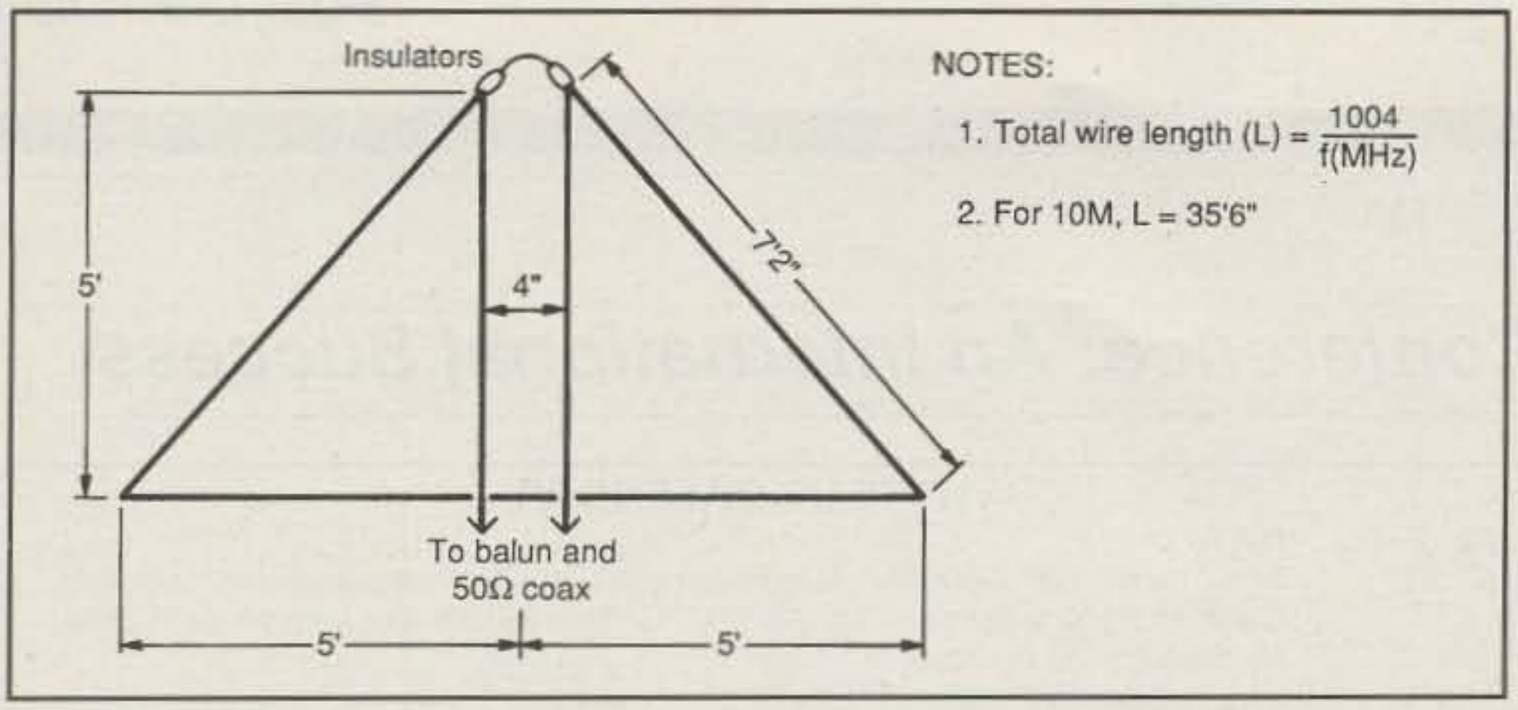


Fig. 8– The G4ZU miniloop. Dimensions shown are for 10 meters. Loop sides and feed line are adjusted to fit the wire length.

telegraphy without wires. He envisioned a radio communication system. The rest of the story is history, and an interesting history it is! It leads from the early spark transmitter and coherer receiver to today's SSB transceiver, VHF equipment, packet radio, beam antennas, and other communication luxuries we take for granted. The road from 1894 to 1993 proved to be a rocky one, indeed.

The formative years of radio from Hertz up to the breakup of RCA in 1932 are covered in two books by Hugh Aitken, W1PN. The first book, *Syntony and Spark: The Origins of Radio,* covers the early period from Hertz up to the early 1920s. This was the period in which the Marconi company dominated the scene with its spark transmitters and seeming monopoly of the point-to-point and marine radio areas. In competition was the arc transmitter, brought to its full flower by the Federal Telegraph Co. of Palo Alto, California.

The struggle between the two systems is an engrossing story which shows the interplay between technological development, legal issues, money, personalities, competition, and international rivalries. All these issues and more propelled the search for a viable radio communication system. It wasn't all beer and skittles, believe me!

The ultimate goal, aside from Morse message handling, was the transmission of speech. Marconi's spark transmitter was useless for this mode, and it soon became clear that the spark transmitter was an idea that had passed its time. The spark could not be modulated, and it took up too much spectrum space.

(Bill Byron, W7DHD, who has painstakingly researched the spark transmitter, states that a semi-modern equivalent of the spark transmitter is the now obsolete 160 meter Loran transmitter. The Loran waveform approximates that of a well-adjusted spark transmitter. Anyone who has ever heard the buzz-saw signal of Loran will appreciate the chaos that would result from a large number of sparks attempting to communicate with each other!)

The second Aitken book, *The Continuous Wave: Technology and American Radio, 1900–1932,* covers the growth and supremacy of the arc and the alternator, and introduces the device that spells the end of these communication systems: De Forest's audion. The evolution of the audion quickly produced a superior RF generator that would provide a continuous wave, operate at higher frequencies, and eventually reach higher power levels than the spark, the arc, or the alternator could economically generate. This technological breakthrough, coupled with strong governmental support, allowed the U.S. to achieve technical and political domination over Marconi and established the dominance of the American radio industry and RCA after World War I.

What no one foretold was the advent and explosive growth of broadcasting—that is, free transmissions to a general audience as contrasted to point-to-point transmission to a known recipient. Broadcasting changed the rules of the game. This is a complicated and fascinating story. The growth of RCA into a gigantic monopoly that hindered, rather than aided, technological advances, and the profound social, economic, technical, and political consequences that flowed from the broadcasting explosion are examined in detail in this book and provide the reader with a solid background leading up to today's encompassing communication media. It is an exciting story.

These two well-researched, engrossing books are published by Princeton University Press, 41 William St., Princeton, NJ 08540. They tell us where we came from, our "roots," and explain how we have approached today's complex mix of communication techniques. The books deserve a honored place in your library.

Thank You's and Corrections!

My thanks to the following who have been most helpful with comments and suggestions: W4LGK, KA1ADF, K4OQK, KD6JUI, W2YYI, W8JK, W6ZF, AI1H, K1KLO, W7KCK, W2CVF, K9BO, W4OVU, W1YG, AA4GR, N4UZ, and WB8SFT.

In the Sept. column we inadvertently left out the reflection gain figure in fig. 1. The 0 dB curve on the plot represents 5.38 dBd gain reference to the dipole. Sorry!

73, Bill, W6SAI

VHF PLUS

BY JOE LYNCH, N6CL

ALL ABOUT THE WORLD ABOVE HF

CSVHF Society Conference: An International Success

Thanks to the cooperation of the governments of Republic of Cuba and the United States, the Central States VHF Society's 27th annual conference, held in Oklahoma City from 29 July through 1 August, was internationally successful. Through extraordinary arrangements made with and between the two governments, Arnie Coro, CO2KK, was the special guest of the conference. More on his visit later in this topic.

The conference began Thursday evening with presentations made by EME operators from the entire spectrum of this form of communications. Sometimes known as the Hatfields and the McCoys for the sportive combativeness between each group, the EMEers on 2 meters nevertheless joined with the EMEers on the higher frequencies to share their accomplishments with each other.

Friday morning found almost all the guys on the antenna range in the back parking lot of the hotel while the gals were loading onto the bus to start their trips to the many family activities offered to them. Kent Britain, WA5VJB, and Marc Thorson, WBØTEM, were the conductors of the antenna measurement tests.

At 12:00 PM the sessions began, with the first presentation being made by Shep Shepard, W7HAH, who, walking pretty well after his fall last year, talked about 6 meters EME communications. Shep was followed by Denise Hagedorn, AJØE, and Tom Bishop, KØTLM, who told us how they operate their many successful grid square Rover trips.

Kent Britain, WA5VJB, then told us how antenna ranges are used to make measurements, and Kent and Al Ward, WB5LUA, gave a demonstration of 24 GHz communications. Your editor then talked on his favorite subject—the *Perseids* meteor shower.

Jon Jones, NOØY, spoke on the subject of multi-hop sporadic-E communications. Then Michael Owen, W9IP, talked about the forthcoming trip to the Algonquin Radio Telescope for the ARRL EME contest (see elsewhere in this column for a description of how to work the station).

The most lively forum of the day was saved for last. Emil Pocock, W3EP, editor of *QST*'s "The World Above 50 MHz" column moderated a forum which included your editor and Jon Jones, NOØY, the VHF contest editor for the *National Contest Journal*. The topics for discussion finally got around to the Rover controversy created during the January ARRL VHF QSO Party.

As one individual after another spoke, more and more interpretations of what happened were put forth. Finally, Stan Hilinski, KA1ZE, stood up and very diplomatically explained just exactly what happened and why he did it. His explanation was both amusing and informative and provided plenty of material for discussion following the session.

The evening found about twenty participants of the conference headed off to a dinner/theater combination worked out between a local restaurant and the Lyric Theater, a local theater that hires equity actors for the principal roles and uses talent from the Oklahoma City University School of Performing Arts and other well-known schools for the rest of the roles. After dinner most of the rest of us gathered in the fleamarket area to make our sales and our trades. At the same time some were making bargains, others were having their preamps and other devices measured for noise figures. Al Ward, WB5LUA, Jim Vogler, WA7CJO, and Tommy Henderson, WD5AGO, were the conductors of the noise-figure measurement tests.

At 10:30 PM Arnie Coro, CO2KK, finally arrived after traveling all day from Havana, Cuba. He was immediately surrounded by many of his amateur radio friends, who kept him visiting with them until 12:30 AM. Your editor then took him out to a late-night dinner and kept him up for another two hours.

Saturday morning sessions started off with Mel Graves, WRØI, describing how to make computerized radio star calculations. Next, Al Ward, WB5LUA, described the use of Hewlett-Packard AppCAD software and gave everyone a free diskette.

Steve Powlishen, K1FO, talked about test equipment used for weak-signal communications. After Steve, Wayne Overbeck, N6NB, told us about electromagnetic radiation and DXing and advised us on how to be safer in the shack.

After lunch Dave Meier, N4MW, discussed transceiver and transverter interfacing. Then Jim Vogler, WA7CJO, discussed how to optimize TWTs. Next, Doug Sharp, WB2KMY, gave a slide presentation on how the W2SZ contest group wins contest after contest, year after year.

The sessions were wrapped up with an hour-long spell-binding presentation by Arnie, CO2KK. Arnie told of his and the other Cuban amateur's accomplishments in spite of having enormous handicaps of lack of equipment and parts. He entertained us with a recount of his history-making EME contact with Gary Crabtree, KB8RQ. Among the items he disclosed was that Cuban national television presented a 10-plus minute story on the contact. The production included showing Gary's QSL card (that has an American flag on its face) on the screen for more than 20 seconds. Arnie received a well-deserved standing ovation for his presentation.

The banquet began with a prayer offered by John Kirkman, W4WDH, in remembrance of Howard Rainey, W5ASH, and Joel Paldino, N6AMG, who became Silent Keys during the year following the last conference.

The banquet entered the second phase where awards were given for various accomplishments. Awards were presented to the winners of the antenna-range and noise-figure measurement competitions. Plaques for last year's CQ WW WPX VHF contest winners were presented to those who were present (the rest have been mailed to their recipients). Finally, the Wilson Award was presented to Rod Blocksome, KØDAS, for his many years of service to the Society, and the Chambers award was presented to Paul Shuch, N6TX, for his many accomplishments in the field of weak-signal VHF communications.

Then it was Arnie's turn to speak to us once again. Arnie spoke of his over 30 years of amateur radio experience. He constantly reminded us of the importance of the roles that Americans played during his and other Cuban amateur radio operators' development. His emphasis on continuing people-to-people contact was stressed over and over again. He thanked the conference organizers for making his trip possible, disclosing to us that he had finally met some of his American amateur radio friends in person after talking with them for over 30 years on the air. He concluded his remarks

P.O. Box 73, Oklahoma City, OK 73010

VHF PLUS CALENDAR

Sept. 30	Full Moon.
Oct. 2	Mid Atlantic VHF Conference, sponsored by the Packrats. See text for details. Canada 50 MHz Sprint, 1000–1400 UTC. (See September column for details.)
Oct. 3	Moderate EME conditions.
Oct. 8	Last quarter moon.
Oct. 9	Draconids meteor shower peak.
Oct. 9-10	First weekend of ARRL EME Contest. (See text for details.)
Oct. 10	Very good EME conditions.
Oct. 14	Perigee.
Oct. 15	New moon.
Oct. 22	First quarter moon. *Orionids* meteor shower possible peak, 0023 UTC.
Oct. 23	Good EME conditions.
Oct. 26	Apogee.
Oct. 30	Full moon.
Oct. 31	Moderate EME conditions.

by saying that he hoped to see some of us in Havana some day at a conference similar to this one.

Following Arnie's talk, the prize drawings took place. A touching expression of good will and friendship was the number of guys who gave Arnie their tickets for their prizes. Arnie went away with a number of items that he promised would be used for the furtherance of the development of weak-signal amateur radio communications in Cuba. And we went away with a better understanding of the importance of the international friendships we create via amateur radio.

Your editor, as president of the Society, could not have put together the conference without all the help of fellow amateurs. Principally, Larry Hazelwood, W5NZS, was always there to take care of the behind-the-scenes problems. Carol King, K5CPZ, and her mother, Barbara King, were the excellent hosts who organized and kept the family activities running along.

Linda Richardson, N5OJP, and her husband Jim, N5OHL, local club members, provided so much support, particularly with running the behind-the-scenes activities of the banquet and assisting as hostess and host for the family activities.

Former Society President, Bill Tynan, W3XO, and his wife, Mattie, were so very helpful to both Carol King, K5CPZ, and me as we took on the responsibilities of the conference. The board of directors—particularly Gerald Handley, WA5DBY, Al Ward, WB5LUA, Rod Blocksome, KØDAS, and Bob Sluder, NØIS—was extremely helpful to me. Their wives, Elizabeth and Carol, were invaluable assistance to Carol King as she prepared the social activities.

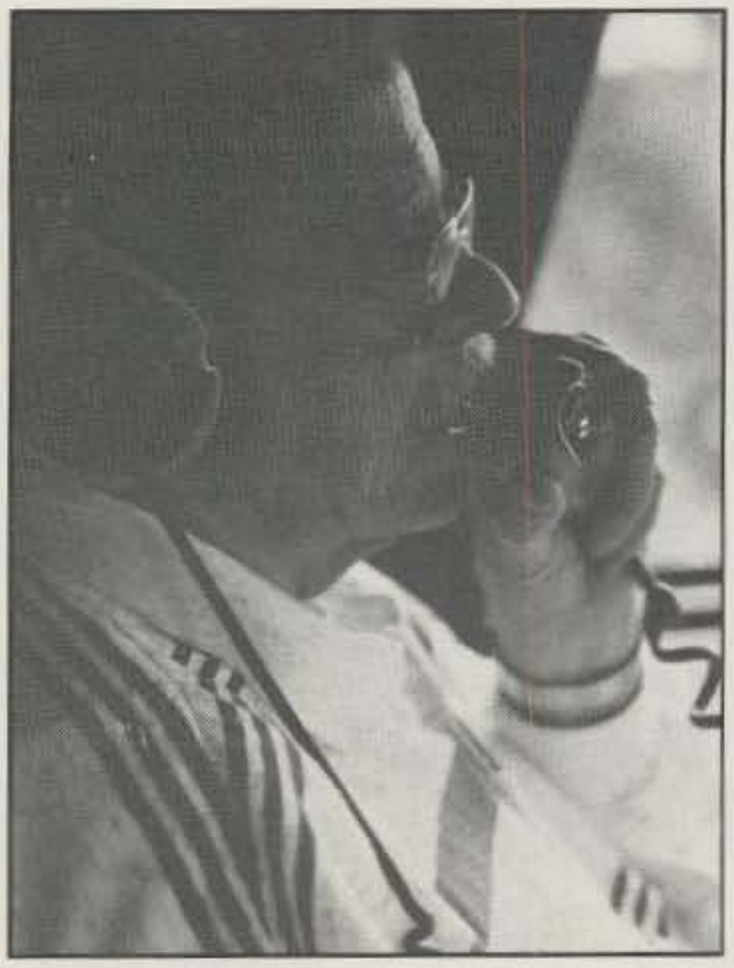
Tommy Henderson, WD5AGO, organized the speakers and assembled the *Proceedings*. Maty Weinberg of the League provided critical support in assembling the *Proceedings*. Tommy Henderson, WD5AGO, and Gary Gerber, KBØHH, acquired the prizes (much appreciation goes to the many manufacturers who donated them). Lt. Stan Van Nort, N5JFQ, of the Oklahoma City Police Department, provided security. Marshall Goldblatt, W4EMB, and Lauren Libby, KXØO, assisted in arranging air transportation for the conference. Roger Townsend, VE3XVK, Tom Moore, K5ZXE, Rene Shaw, WB4MJE, and Steve, KO4HD, provided communications assistance.

Last, I must mention my appreciation of the Cuba Interest Section (at the Swiss Embassy in the U.S.) and Mr. Jose Luis Ponce, the government of the Republic of Cuba, the U.S. State Department, and Ms. Karen Ahuja, at the Cuba Desk, the U.S. Interest Section (at the Swiss Embassy in Cuba) and Dr. Gene Biegler, First Secretary of Cultural Affairs, and the Swiss Embassies in both countries for their assistance and cooperation in making the historical visit of Arnie Coro, CO2KK, possible.

Next year's conference will be held in Memphis, Tennessee, and will be hosted by President Dave Meier, N4MW. The weekend of 24–25 July has been tentatively set aside for the time of the conference. Make your plans now to attend that conference.

Mid Atlantic VHF Conference

The Mid Atlantic VHF Conference is scheduled for 2 October at the Days Inn, 245 Easton Road, Horsham, Pennsylvania. The conference is sponsored by the Packrats in conjunction with the HAMARAMA hamfest on 3 October. For information contact John Sorter, KB3XG, Conference Chairman, P.O. Box 451 Montgomeryville, PA 18936, or call 215-270-3185.



Dave Bostedor, Sr., K8WKZ, shown here on his final grid expedition in June, became a Silent Key on 1 Aug. (Photo courtesy N8NQS)

Preliminary *Perseids* Report

This column is being finished on 12 August, in the afternoon. I have held open the deadline way past the normal time to try to include as much information about the meteor "storm of the century" as possible. It appears that it was definitely *not* a storm. At least not in North America. Nevertheless, Joe Rao, the amateur astronomer whose predictions I reported on in the August column, cautioned that we might pass through a lull in debris. He felt that we could be crossing between two knots of debris that were expelled from the 1737 and 1862 orbits, respectively.

However, in Europe it appears to have been another matter. Reports relayed by Paul Kelley, N1BUG (through Shelby Ennis, W8WN), indicate that there was a definite spike from 0100–0130 UTC on 12 August. Operators in northern Europe noticed much more of a spike, while operators farther south were less affected by it. Also, a smaller spike taking place between 0200 and 0300 was noticed. Additionally, while many amateurs in North America reported little activity, Paul observed many burns during the 0100–0130 UTC time period.

Prpbably the most exciting event of the shower happened between Clarence Humber, VE1HD, of Albert Bridge, NS (FN96wb), on Cape Britain Island, about 5–6 miles north and east of the ocean, and Derrick Hilleard, G4CQM, near Cornwall, England (IO70st). Clarence and Derrick ran at 2200 UTC for 20 minutes on 144.490 MHz. At 2207.15 Clarence heard the end of his call plus Derrick's callsign, recognizing his British accent. Clarence believes that because he was so high in the band, it is next to impossible for anyone to have come across the frequency and "pulled his leg." The path was 2510 miles between the two

The motley crew of the DM90 grid expedition to Pat Rose, W5OZI's ranch included (from left to right) Pat, Nick, W5FUA, John, KB5IUA, and Zeke, W5NFC. (Photo courtesy W5OZI)

stations. They ran three more times, but he heard nothing further.

Clarence runs a pair of K1FO 12-element beams being driven by a Henry 6N2 and an ICOM 970. He also uses a mast-mounted homebrew VE1ALQ designed preamp. Clarence notes that shortly after the event the band opened on tropo down to as far as North Carolina, where he completed a contact with KA4YMY. Additionally, he was able to work north to John, VO1EE, in GN27. To Clarence this indicated that a tropo duct extended northeast into the great circle bearing path between him and England. The question exists as to whether or not the path between Clarence and Derrick was tropo assisted.

Clarence also noted that Roy, VE1AWA, in Sydney could not hear the tropo at first, but was able to work tha stations a few minutes later, at which time Clarence lost the propagation. Clarence noted that the duct drifted between him and Roy for the next three hours.

Clarence and Derrick are planning to run a beacon on alternate days for an indefinite period for the purpose of exploring tropo conditions. Clarence has heard reports of aircraft being heard on VHF in Gander, Newfoundland, that were nearly on the eastern side of the ocean. We will report on what he hears when we hear from him.

Your editor set up the van in a vacant field all night the night of the 11th, both to be able to see the shower and to operate. From my observation position very few *Perseids* rocks were seen. I observed many long burns but also many pings. Curiously, Shelby also noticed long burns, but not as many pings during the course of the entire shower period. It will be interesting to see if this observation of the pings was more prevalent in one area of the country.

Most reported contacts in the range of 800–1000 miles. However, there were some exceptions. Among some of the outstanding contacts reported were: a 432 MHz contact between Mark Hoffman, KA2RDO, and Larry Jones, WB5KYK; a 222 MHz contact between Herman Cone, WB4DBB, and Larry Hazelwood, W5NZS, that lasted so long that they jumped down to 144 MHz and completed again on that band; and Tim Marek, NC7K, worked San Hutson, K5YY, over a 1600 mile path (it took an hour long sked to complete). Hopefully, I will have many more reports next month.

Shelby remarked that for him it was a successful shower. He observed a few spikes, but no peak such as appeared last year. He did, however, work ten new grids, but admitted that some of the contacts were tropo. He, along with others across the country, marveled at the number of operators on the air. Carl Huether, KM1H, and others reported that there a lot of tropo in the east.

Out west Steve, WB2WIK, and Wayne Overbeck, N6NB, set up on Wayne's 6800 foot elevation property in the Tehachapi Mountains (DM05). They reported 31 contacts on 6 meters and only 4 on 2 meters. A couple of the contacts on 6 were long enough to be beyond single-hop range. However, Steve reported that the propagation appeared to consist of a combination of sporadic-E and meteors.

Steve made an interesting point concerning the characteristics of their location. Because of the mountains around their QTH, beam headings were not always what they seemed to be. He said that if he sends a long string of "Vs" to an operator with whom he has a sked and coordinates this transmission on HF before the sked gets underway, they could align their antennas and thereby complete the QSO much more quickly. Steve suggests that this technique might help others in their efforts to complete skeds.

Steve, your editor, and others also observed that the liaison frequencies were often occupied with nonessential communications. All too often these frequencies are used for a complete recitation on the history of the completed contact. I might suggest that an alternate frequency be used for such rag chewing. Possibly even the telephone could be used for such purposes.

Many of the regular operators reported that 144.200 was jammed with new and old operators alike. Most of the new operators appeared to stick with attempting to make random contacts.

It appears, however, that not many heeded our advice of moving off the calling frequency. Operators in major metro areas reported that the calling frequency was "a zoo." Unfortunately, some operators who had no idea what was going on insisted on having long QSOs on the calling frequency. Emil Pocock, W3EP, *QST*'s VHF editor, and I suggested a plan for moving off the calling frequency. It was observed that some operators were trying the plan but would abandon it when they were not successful. It is unfortunate, because the plan can work. If you move to one of these alternate frequencies (jumps in increments of 5 kHz away from the calling frequency), you stand a much better chance of completing a contact.

In practice, it actually works somewhat like a scheduled contact. You hear an operator with a strong signal calling CQ. You answer that operator. If you have a strong, long burn, you complete right away. If not, the other guy may hear something from you and know that you are out there. You can continue calling the other guy and the probability is high that eventually he will hear something from you. This happened to me twice.

For example, I heard a burst from Art Hambleton, K1LL/Ø, who was calling CQ away from the calling frequency. I heard another burst from Art, which convinced me that he was going to stay with that frequency for awhile. I started calling him by saying, "K1LL, N6CL." Notice, I did not say "this is." Sometimes I simply gave my callsign phonetically. Finally, I heard another burst where Art said "QRZ, K1LL." I returned with only my callsign, phonetically. He returned with a report and I did-likewise. Hearing his acknowledgement on the fade of the burn convinced me that I complet-

Mike, N9OGU, and Tim Totten, KJ4VH, are shown here at their chance meeting in Jackson Hole, Wyoming. Tim found that it is a small world after all. (Photo courtesy KJ4VH)

ed with Art and would not have to run our sked later.

I had no other competition for the contact because we were essentially running an impromptu "sked." It would not have mattered, however, that other operators were also competing for a contact with Art because, as few as there were, we could have all made it eventually.

Incidentally, Art made over 60 contacts in nearly 35 states, including giving Ron Ogren, WA6PEV, his 49th state (Ron now lacks only Wisconsin), using his method of working stations off the calling frequency. He commented that most stations found him, except on the west coast, where it appeared to him that no one was looking off 144.200 MHz.

Current Meteor Showers

The *Draconids* meteor shower usually peaks around 9 October. However, because the rocks associated with the Giacobini-Zinner Comet, the originator of the meteor activity, tend to stay close to the comet, showers associated with the *Draconids* tend to occur only around the time of the comet's perihelion, the point when the comet is closest to the sun. The last perihelion was 14 April 1992. At that time the position of the earth's and the comet's orbits were such that not much activity was seen before or after the perihelion date. The next perihelion is 1998, when astronomers have tentatively forecast a possible storm. Nevertheless, it always pays to be listening. You never know when you might run into some independent rocks ready to burn up and produce propagation.

The other shower this month, the *Orionids*, is a far more popular shower because of its higher reliability. It is predicted to peak around 22 October at approximately 0023 UTC. A characteristic of this shower is that it has several smaller peaks both before and after the main spike, beginning around 20 October and ending around 24 October.

On The Air

Probably the most excitement on VHF is the consistent working into Europe on 6 meters so late into the season. On 18 July Pat Rose, W5OZI, Bill Tynan, W3XO, and John Godwin, KB5IUA, all reported working Spain (EH1EH, EH3AQJ, EH7CD) with John reported working CT4KQ. John reported that Rich, K1HTV, gave the guys in Texas a big assist by urging everyone to stand by for the W5s.

On 8 August Carl Huether, KM1H, and others reported a very selected opening into Spain, the Canary Islands, and Portugal. Carl called the opening a sporadic-EA opening. Stations worked include: EH1AST, EH1QU, EH1EH, CQ7CBI, EA8BWT, EH1YV, EH7BVH, and EH7DZI. Carl says that stations in VE1 through W4 and W8 were heard working the Spanish stations. I have received many more reports that will appear in next month's column.

Current Contest

The first part of the annual ARRL EME contest is scheduled for the weekend of 9–10 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, multiband, multi-operator, and commercial equipment. Each contact counts as 100 points. Multipliers include each U.S. and Canadian call district and each DXCC country worked. Conditions for this weekend and the second weekend of the contest, 6–7 November, are expected to be very good. Complete rules can be found in September *QST*.

Algonquin Dish Operators To Try Again

In spite of last year's disappointing attempt at operating from the Algonquin Radio Telescope, the team that made the trip last year will be back there again. Operations on the 150 dish, located in north-central Ontario province (grid square FN05xw), are scheduled to include 432 MHz, 144 MHz, and 1296 MHz operations using the callsign VE3ONT. Michael Owen, W9IP, the team spokesperson, reports that they plan to be ready to go during both weekends of the EME contest, again weather permitting.

Owen gives a few pointers for working the dish. He states that they will only be making random contacts and will only go to any type of sequencing if conditions are poor. If used, the sequencing will be 30 seconds transmit and 30 seconds listen, with VE3ONT transmitting the first sequence.

Owen states that they will use the following schedule for the two weekends. During the first weekend, on Saturday, they will transmit on 432.050 MHz and listen between 432.050 and 432.060 MHz. On Sunday they will transmit on 144.029 MHz and listen between 144.025 and 144.030 MHz. During the second weekend they will again operate on 432 MHz for Saturday. However, on Sunday they will operate on 1296.050 MHz and listen between 1296.050 and 1296.060 MHz. They will maintain a liaison station on 14.345 MHz during the day and either 3.818 or 3.843 MHz during the night over both weekends.

Owen feels that the gain of the dish is adequate for most Mode B satellite equipped stations to work the operation. Because of the desire to attract satellite operators to the potential of an EME QSO, they will be using right-hand circular polarization.

Owen requests that operators refrain from making duplicate QSOs on the same band (this includes working the station on SSB following a CW contact) in order to give the maximum number of stations the opportunity to work the dish.

For more information, you may read his paper in the Central States VHF Society's 27th Conference Proceedings, available from the League for $12.00, plus $3.50 shipping.

New Overland NA 10 GHz Record Set

On 18 July a group of amateurs from the San Bernardino Microwave Society—including Phil, W6HCC, Chuck, WA6EXV, and Dave, WA6OWD—teamed up to set a new North American Overland 10 GHz record. The distance, 537.3 miles, between Mt. Ashland, Oregon (CN82pb) and Mt. Pinos, California (DM04kt) eclipses the old one by 58 miles. Phil and his wife, Marilyn, were stationed at the Mt. Ashland QTH, while Chuck and Dave were at the Mt. Pinos location.

Chuck reports that the contact was made on Sunday morning after successful contacts with stations located on Mt. Vaca, a point that was 253 miles from Mt. Ashland, and 298 miles from Mt. Pinos and Robin, WA6CDR, who was stationed on San Benito Mountain, a distance of 413 miles from Mt. Ashland. Chuck indicates that it was these contacts that were instrumental in helping the stations between Mt. Ashland and Mt. Pinos make the complete contact. Chuck says that signals between Mt. Ashland and Mt. Pinos started coming out of the noise around 8:30 AM PT. At 9:10 AM complete exchanges were made between W6HCC on CW at S-8 signal strength. Moments later reports were exchanged between W6HCC and WA6OWD with signals now over S-9. By 10:00 AM, however, signals had disappeared back into the noise.

Chuck says that much appreciation goes to so many who assisted in the operation. Among them are: Steve, WA6YSM, Rich, KJ6RA, and Bill, N6OLD, who handled 40 meter liaison; Robin, WA6CDR, Jim, W6ASL, Ron, K6GZA, and Frank, K6EOF, who operated from San Benito Mountain and Mt. Vaca; Frank, WB6CWN, who was also at Mt. Pinos, but was not able to complete a contact with W6HCC because of a last minute failure of his 10 watt TWT; and AA7WN, who documented the Mt. Ashland end of the contact with video tape and pictures.

If you live in the high desert area of California and are interested in microwave communication, then contact any one of the principals in this record-breaking contact. I'm sure they will be more than happy to sign you up as a member of the San Bernardino Microwave Society.

Southern California 6 Meter Club

Do you live in the southern California area and are active on 6 meters? Then you should be in the Southern California Six Meter Club. The organization has monthly meetings and maintains a repeater on 52.86 MHz (minus 500 kHz offset). They also maintain nets on the repeater on Thursdays at 8:00 PM PT, on SSB on 50.150 MHz on Tuesdays at 8:00 PM PT, and on AM on 50.400 MHz on Sunday at 10:00 AM PT. Additionally they hold transmitter hunts each first Saturday on 50.300 MHz, FM simplex. Membership is just $10.00, and includes their excellent newsletter, "THE SIX PACK." If you are interested, contact the club at P.O. Box 10441, Fullerton, CA 92635.

Alaska Correction

While preparing this column I got a call from Tom Corbitt, NL7OW, about my reporting of the 7 June opening to Mike Staal, K6MYC. It seems that I got everyone's call wrong. So, for the record, the guys (and gal) who worked Mike are: Al Fromm, AL7C, Jan Fromm, AL7FH, Jim Wiley, KL7CC, Roger Hanson, KL7HFQ, Steve Tolley, KL7FZ, and Tom Corbitt, NL7OW. Tom mentions that sporadic-E openings are quite frequent, and that he monitors the top five channels of the CB band, in particular channel 19, which sounds like a continuous whine, as a way of telling that band is open. He also mentions that a transmitter on 46.9 MHz, located in Washington state is another good indicator. For those of you looking northward, you can check 40.69 MHz and 42.4 MHz for propagation indicators from Alaska. Tom should be located in Clam Gultch (BP40) by now. If you would like to run a sked with Tom, you can reach him at 907-262-5678. His mailing address is P.O. Box 132, Clam Gultch, AK 99568. Concerning QSLing, Tom advises me that he is visually impaired and has to wait for someone to help him fill out the cards. So if you work Tom, send him yours (with an SASE, of course) and be patient for the return card.

You Are Never Alone

Have you ever been on a grid expedition and thought that you were all alone out there, only to find out that you are not really? Tim Totten, KJ4VH, had just such an experience during his grid trip through DN55, DN54, DN53, DN52, DN43, DN44, DN45, DN46, DN36, and DN26. On his trip he made a couple of hundred QSOs, giving some old timers as many as four new grids.

During a break in the action he stopped in

Jackson Hole, Wyoming, a place that some feel is quite far from everyone else. He picked up his mike connected to the TS690 and called CQ. Well, Mike, N9OGU, also in Jackson Hole, picked up his mike connected to his TS690 and answered Tim. They got together for an eye-ball QSO at the local Chinese food restaurant and swapped tales of their travels. Tim has learned that no matter where you are, you are never quite alone.

Dave Bostedor, K8WKZ Silent Key

Long-time VHF operator Dave Bostedor, Sr., K8WKZ, succumbed to his battle with cancer and became a Silent Key early on 1 August. Dave was first licensed as K9KLU. His son, Dave, Jr., N8NQS, remembers the day in 1957 when Dave, Sr., brought home the Gonset Communicator III and hooked it up to the TV antenna so he could listen to it. Dave eventually got his father, Les, interested, and he became licensed as W8KYP.

Over the years Dave became known as Mr. Six Meters. He acquired several awards, most notably the first 6 meter VUCC (and actually the first award issued after the ARRL introduced the award program). His additional accomplishments included WAS, WAC, and DXCC on 6 meters. His DXCC certificate is number 7 and was the first in W8 land.

Dave gave back to the hobby much more that he ever acquired. He was a constant source of encouragement to those interested in VHF. In addition, he provided many with new grid squares during his several trips.

In the spring of 1991 Dave, Jr., surprised his dad by announcing that he had passed his ham license test. It was through this common interest that their friendship grew. In 1992 Dave, Jr., again honored his father by traveling to the last four grid squares in grid field EN, thereby providing Dave, Sr., with complete contacts in all grid squares in both the EN and EM fields.

This past summer Dave made his final grid square trip when he, accompanied his wife, Pat, N8PYO, Dave, Jr., and his wife, Linda, to FN17 and FN18. The talk of the band was how consistent they were being heard into the States. Several hundred contacts were made and Dave had an extraordinarily good time.

On Friday, 23 July, Dave went to the hospital for more tests. The doctor advised him that with chemotherapy he could live a couple of more months. Dave declined the additional medical treatment and went home to be with his family for the last time.

Ham radio, particularly the 6 meter operators, will miss Dave very much. Good celestial DX, Dave.

And Finally . . .

The following is an essay that I prepared for another publication. However, in light of the passing of my good friend, Dave Bostedor, K8WKZ, I am including it in this column.

The Shaft of Sunlight: Unlike some who can recall vivid details of their childhood, I remember few events. However, one stands out in my memory as if it occurred yesterday. One day, in the early 1950s, in Chula Vista, California, it had been stormy all morning. In the afternoon the storm finally broke. The remnants of the storm clouds were crossing the sky, alternately blocking and revealing the sun. On one occasion the clouds gathered around the sun so that only a shaft of light shown through. It appeared, though, that the shaft went all the way to the ground.

Mom and I were both outside, she hanging clothes on the line and I alternately playing in the yard and watching the clouds roll by. Upon seeing this shaft of light I asked my mother why the clouds formed such a pattern as to only let a ray of light shine through. Expecting to receive a semi-technical answer, I marveled at what she told me.

My mother explained that the shaft was a pathway for the angels to travel to Earth. When it was time for someone to go to Heaven the angels would travel down this pathway to that person's home and escort that person to his or her new home in Heaven.

The meaning became real to me, when, just a few months later, my mother unexpectedly died from a liver ailment. It was a special comfort to me to know that she, too, was escorted home by the angels.

I know that Dave also had an angelic guide home.

Until next month . . .

73, Joe, N6CL

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76.000 - 107.995 MHz. (WFM)	50.0 KHz.
108.000 - 136.995 MHz. (AM)	12.5 KHz.
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174.000 - 215.995 MHz. (WFM)	50.0 KHz.
216.000 - 224.995 MHz. (NFM)	5.0 KHz.
225.000 - 399.995 MHz (AM)	12.5 KHz.
400.000 - 511.995 MHz. (NFM)	12.5 KHz.
512.000 - 549.995 MHz. (WFM)	50.0 KHz.
760.000 - 823.995 MHz (NFM)	12.5 KHz.
849.0125 - 868.995 MHz (NFM)	12.5 KHz.
894.0125 - 1,300.000 MHz. (NFM)	12.5 KHz.

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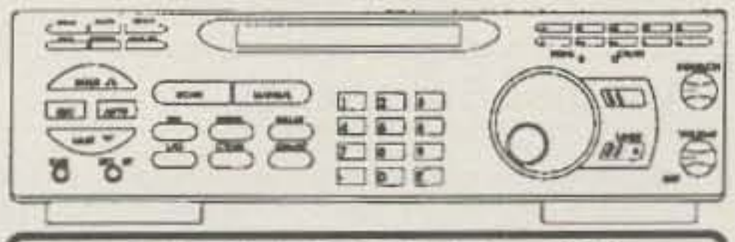

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CONTEST CALENDAR

BY JOHN DORR, K1AR

NEWS/VIEWS OF ON-THE-AIR COMPETITION

Line Noise—Some Practical Advice

Line noise has always been the bane of amateurs, and contesters in particular. It seems that contest operators spend most of their operating time digging weak signals out of the noise. Having said that, nothing is more appealing during a long QSO run of weak Europeans or JAs than the occasional S9 signal that calls in and rocks you out of your chair.

Fortunately, I have never had serious problems with line noise. Of course, there has been the occasional noisy morning after a long dry spell, but I guess I'm one of the lucky ones. Suddenly on a bright sunny morning last year the noise hit—and hit big! Having turned on my rig for its usual morning ritual, I was shocked to hear S9 line noise on 10, 15, and 20 meters. Perhaps you have encountered a scenario like this as well. After settling down from initial outrage, my first thought was "Is this a long-term problem or just something that will go away when I get home from work?" When I got home that night, my noise was still there. In fact, after two weeks of noise it became clear that this was not an intermittent problem.

In my case, it was relatively easy to isolate the problem. By turning my antennas, I could determine with reasonable accuracy from where the noise was originating. I then proceeded to walk down the bordering street to my property with a battery-driven AM radio tuned to the bottom of the band (530 kHz). It's amazing how much manmade noise you discover when using this detection method. As I walked down the street, there was no apparent increase in the ambient noise level. This, of course, made me think that locating my problem was going to be more difficult than I had anticipated. It was at that precise point that the noise level dramatically increased in the receiver. I was in between two utility poles and I quickly discovered that the noise built to a horrendous level as I stood underneath the very next pole. As I walked away, the noise gradually dissipated. Good fortune had come my way again.

Years ago my good friend Fred Lass, K2TR, had a rather drastic method for dealing with this problem once the offending pole was identified. While operating at W2PV, he proceeded to take a sledge hammer and bang away at the pole until the noise stopped, being guided by input from "home base." I still wonder what the neighbors thought about this 6-foot-plus man attempting to knock over a telephone pole in their front yard!

Now that I had the location of my noise identified, it was time to deal with the local utility. Much to my surprise, they were both cooperative and had developed a efficient process (complete with forms) for dealing with consumer line noise problems. Not only did I receive the complaint forms in the next day's mail, but I received a call from the utility the same week to inform me that a work crew had been scheduled for the following week. The person I spoke with was not only friendly and willing to help, but was technically competent and was able to ease my concerns.

A little over three weeks after my initial discovery of the noise, I arrived home from work to discover a noise-free band once again. Magically that day the work crew had discovered some cracked insulators on the pole I identified as well as a few others and some other corroded parts, replacing everything on the spot.

At least in my case, the summary is simple: (1) Not all line noise is difficult to chase down and (2) not all utility companies are bureaucratic and unwilling to help. Perhaps someone should conduct a study to see if cooperation is inversely related to utility rates!

Internet: p00259@psilink.com
Compuserve ID: 71301,424

Calendar of Events

Sept.	**25-26**	**CQ WW RTTY Contest**
Sept.	25-26	Scandinavian Activity SSB Contest
Sept.	25-26	Washington State Salmon Run
Oct.	2-3	California QSO Party
Oct.	2-3	VK-ZL Oceania SSB DX Contest
Oct.	9-10	VK-ZL Oceania CW DX Contest
Oct.	10-11	Illinois QSO Party
Oct.	13-15	YLRL CW Anniversary Party
Oct.	16-17	JARTS WW RTTY Contest
Oct.	27-29	YLRL SSB Anniversary Party
Oct.	**30-31**	**CQ WW DX SSB Contest**
Nov.	6-7	ARRL CW Sweepstakes
Nov.	13-14	Worked All Europe RTTY Contest
Nov.	13-14	OK DX Contest
Nov.	20-21	ARRL SSB Sweepstakes
Nov.	21-21	Ukrainian DX Contest
Nov.	**27-28**	**CQ WW DX CW Contest**
Dec.	3-5	ARRL 160 Meter Contest
Dec.	11-12	ARRL 10 Meter Contest

Another Experience

Not everyone can share the same experience or results as mine. Steve Fraasch, KØSF, had a much greater challenge on his hands which he kindly summarized for us as follows:

Last winter I asked my local utility for help in fixing what I suspected to be a high-tension power-line noise problem. Over the course of the investigation it turned out that my problem was originating from the mid-voltage distribution point in a local sub-station. The true offending source was, in fact, not on the 100+ KV lines 4 miles away, but on the intermediate lines running out of a sub-station 2.5 miles closer to my QTH. Lesson number one was simple: Don't assume you are an expert and know the solution when you haven't even begun to identify the problem!

October's Contest Tip

You will often find that rare DX does not want to be passed to another band. A last resort is to make a schedule with the station. The secret is to make multiple schedules with as many stations as reasonable for the same time/frequency. With 10 to 15 schedules arranged, the odds are good that two or three will actually show up, making the effort worthwhile. Nothing beats having a mini-pile-up of multipliers calling you!

After four months of casual hunting, I finally discovered the noise source. As it turned out, there were three sets of Lapp Co. "bell" insulators that were arcing across through the ceramic glue that holds the tie stud together. Not to anyone's surprise, these were old insulators made in 1954 and 1960, respectively. The crew replaced the bell-insulator type with a one-piece design that did not use the series bell pin and clevis attachment—the bell being the true offender in this case.

I've had a lot of experience working with the utilities fixing power line noise. Taking the aggregate of the good and bad, I've attempted to provide an after-action report of lessons learned over the years. The actual mechanism responsible for the generation of power line noise is a commutating, or rectifying junction such as a loose connection, or insulation arc that generates a square wave at ultrasonic frequencies (500 Hz to 100 kHz). Because the square-wave slopes are very steep, the frequency spectrum of power line noise is rich in harmonic energy, extending well into UHF, if not SHF. In fact, I had recorded a noise source on my 100 MHz oscilloscope, and numerically Fast-Fourier Transformed one pulse on my computer. The energy spectrum, at least to 50 MHz, was nearly flat! The lower frequency components couple very well into the distribution line, which propagate for miles as a traveling wave (similar to the Beverage principle), making low-frequency detection impossible.

Despite K1AR's success, don't be fooled by an HF beam heading. You could very well be listening to the main beam, or side lobe of a power line Beverage "antenna." On the other hand, the VHF/UHF spectrum decays fast (evanescent mode) near the source, because this energy does not couple into the distribution system. Therefore, VHF/UHF detection is nearly true line of sight (e.g., the radiator "is" the source).

Given that the VHF components are stronger, initially you may want to use a 10, 6, or 2 meter AM rig for your search. Once you're in the noise source vicinity, you will find that a 440 MHz AM rig will find not only the pole, but also possibly the offending piece(s) of hardware.

I have found that the most directional, linear polarized antenna available to you is the best

(e.g., a Yagi). Polarization can be used to determined the plane of the electric field, which will be the noise current's vector orientation—hardware orientation—as well. For example, a noise current traveling through a horizontal arcing bell insulator will tend to create a horizontally polarized electric field. By rotating the plane of your antenna, you will notice the noise strength varies sharply. I have used a modified Heath HW-202 and a homebrew 6-element W2PV Yagi design. I can hear weak sources from up to 3 miles away, yet the setup is still useful in identifying the pole, if not the actual hardware.

My experience says that you will save immeasurable time by hunting for the noise source yourself. The power utilities have limited training, time, and resources. I have found that they try hard to find noise, but many times the source they find is not the one you're hearing. Start from your QTH, and work out omnidirectionally from ground zero. Do not discount your own or neighbors' homes (my experience is 10% of all noise is from neighbors' noisy appliances).

If there is heavy salt build-up on power lines following a snow melt, you may have to wait until more snow or rain washes it off. Match the noise source with the interference you hear. Check over time, and correlate that the source is indeed the one you're hearing (most sources stop momentarily after a rainfall or a large change in temperature). Correlation is easy if the arc is seen or heard (large amplitude), but inaudible, invisible arcs generally are much lower in amplitude. If the pole is in a distribution network about your QTH, it could very well be the one, but be absolutely sure before you "cry wolf." If you are more than 2 miles from a low amplitude source, be sure to check carefully for another source that is closer to your QTH.

When you are confident that you've identified the noise location, give your local utility a call. Be prepared to provide the exact location and pole number if available. There should be no need to get the FCC or others involved.

Fixing power line noise can be compared to somewhere between restocking the employee soda-pop machine, and removing "lost dog" signs from power poles. You must be patient, but persistent. Although I reported my problem in late April of this year, the problem was not fixed until early August. I was fortunate to have a service technician who followed up on the problem every 3 weeks or so. He told me up front that fixing the problem would take some time. After all, the ground has been extremely wet in Minnesota and he did not want to get his truck stuck in the mud!

If nothing happens after 3 months and numerous calls, then you may need to write letters (utility management, FCC, and the state utility commission). I've never had to write and involve others, but another amateur in my local area did have to resort to this method to have some *really big* lines fixed.

It is very helpful to be aware of the utilities' work schedule for your job. Check the day of their arrival to make sure noise is present. If the noise is intermittent, and it rained a day before, the noise could be gone, and your credibility is severely compromised. If it's there, *be at the site with your detector in hand!*

I have found that the most successful repairs happen when troubleshooting occurs in the following order: insulators, disconnects, lightning arresters, and line components. Insulators often arc through and can be either continuous or intermittent. Lightning arresters usually arc internally and are continuous noise makers by nature.

The repair technician will most likely have a 300 MHz "super snoop" noise detector, the 3-element Yagi of which is too broad to locate a specific piece of hardware. They will then use a portable "snoop" device or ultrasonic detector from inside the bucket crane and check all of the hardware close-up. You may want to offer to use your 6-element fixture to help. When I showed the crew my setup, they put their equipment away and used my HW-202 because it had an S meter.

Finally, a letter of thanks to the crew's boss after successful completion goes a long way. Can you think of a more thankless job? As of early August things are quiet again. It was fun to hear summer Europeans again from the "black hole" of the central U.S. on 75 meters as well as weak VK sidebanders who continue to be oblivious to DX on the bands.—*KØSF*

Final Thoughts

I hope this month's comments will prove to be of some help to you. As we do the final preparations for this year's contest season, eliminating noise ought to be high on everyone's list!

Don't forget to complete this year's Contest Survey (found in my September column). And as always, please remember that the deadline for the December issue is October 1st.

73, John, K1AR

California QSO Party

1600Z Sat. to 2200Z Sun. Oct. 2-3

This year's party is again being sponsored by the Northern California Contest Club. Effort is again being made to activate all CA countries 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-operators may use the full 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.

Exchange: QSO no. 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 use CA counties (maximum of 58).

Final Score: Total QSO points times the sum of the multiplier.

Frequencies: 160 meters through 2 meters, except WARC bands. CW—1805 and 40 kHz up from band edge. Phone 1815, 3850, 7230, 21300, 28450. Novice—10 kHz up from edge of Novice bands and 28450.

Try CW on the half hours, 147.54 at 2000, 0000, 0400Z, 160 at 0500Z, and 80 at 0300 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 trophies galore, including single operator, top three out-of-state, and CA top three. Also, CA county expedition, and a special award for the CA and out-of-state stations making 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 winner's 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. In addition, 200 special CQP tee-shirts will be awarded to top entrants.

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 hardcopy 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 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. 2–3 CW: Oct. 9–10
1000Z Saturday to 1000Z Sunday

This is the 58th 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: Two points per QSO.

Multiplier: Credit one multiplier for each VK/ZL/O prefix worked per 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 top scorers in each country and each continental winner are available. A participation certificate will be sent on request (2 IRCs, please).

There is an SWL section. Only VK/ZL/O stations are logged. Call of station being worked and RS(T) being sent must be reported. Scoring 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 logs go to the Peter Nesbit, VK3APN, Contest Manager, c/o WIA, Box 300, Caulfield South, Victoria, 3162, Australia, and they must be postmarked by November 15 for CW and November 22 for SSB.

Iberoamericano Contest

2000Z Sat. to 2000Z Sun. Oct. 9–10

Organized by "Seccion Territorial de URE 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 scores 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 dependencies. There are two additional multiplier stations: EG92G and EH92G.

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

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- LOW PROFILE POWER SUPPLY

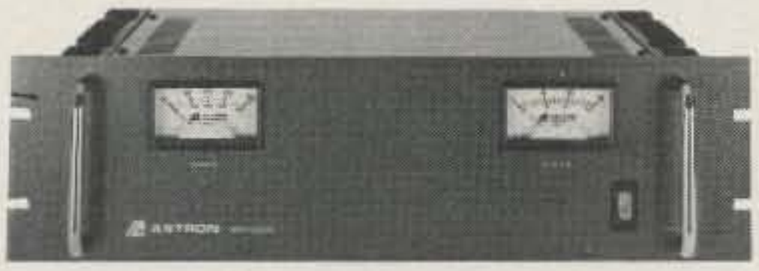
MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
SL-11A	•	•	7	11	2⅝ × 7⅝ × 9¾	12
SL-11R	•	•	7	11	2⅝ × 7 × 9¾	12
SL-11S	•	•	7	11	2⅝ × 7⅝ × 9¾	12
SL-11R-RA		•	7	11	4¾ × 7 × 9¾	13

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-7B	•	•	5	7	4 × 7½ × 10¾	10
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 × 11	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
• 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

RS-S SERIES

MODEL RS-12S

- Built in speaker

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	•	•	5	7	4 × 7½ × 10¾	10
RS-10S	•	•	7.5	10	4 × 7½ × 10¾	12
RS-12S	•	•	9	12	4½ × 8 × 9	13
RS-20S	•	•	16	20	5 × 9 × 10½	18
SL-11S	•	•	7	11	2¾ x 7⅝ x 9¾	12

CS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

amateur radio regulations could result in disqualification.

Awards: Certificates will be issued to the highest scores in each DXCC country. Participating certificates will go to non Latin American stations making 50 or more QSOs. There are plaques for overall winning scores showing at least 4 hours of operation and 100 more QSOs.

Mailing deadline for entries is November 30th to: X-Concurso Iberoamericano, Gran Via de les Corts Catalanes, 594, 08007 Barcelona, Spain.

Illinois QSO Party

1800Z Sun. to 0200Z Mon., Oct. 10–11

This is the 31st anniversary of the Illinois QSO Party sponsored by the Radio Amateur Megacycle Society. It's a shorty, 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 on CW. Illinois stations multiply total QSO points by (state + 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: On CW—3550, 7050, 14050, and 30 kHz above bottom edge of Novice subbands for CW and 28390 for 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 12th to: RAMS, c/o Joe LeKostaj, WB9GOJ, 9134 Ewing Ave., Evanston, IL 60203.

JARTS RTTY Contest 1993

0000Z Sat., Oct. 16 to 2400Z Sun., Oct. 17

This is the second 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 their age.

Scoring: Count 2 points for QSOs in your continent and 3 points outside 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 winner 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 31st. Send logs to: JARTS Contest Manager, Hiroshi Aihara, JH1BIH, 1-29 Honcho, 4 Shiki, Saitama, 353 Japan.

YLRL Anniversary Party

CW: Oct. 13–14 SSB: Oct. 27–28
1400–1359Z, Wed.–Thurs.

This is the 54th 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: On 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 scores 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. Your entry must be received by November 30th, and this year logs go to: L. Carla Watson, YLRL Contest Logs, 473 Palo Verde Drive, Sunnyvale, CA 94086.

CQ World-Wide DX Contest

Phone: Oct. 30–31 CW: Nov. 27–28
0000Z Saturday to 2400Z Sunday

Complete rules 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 from previous years. The detailed trophy list can be found in the rules announcement.

All entries must be postmarked no later than December 1, 1993 for the SSB section, and January 15, 1994 for CW.

All logs must be sent directly to: CQ World-Wide DX Contest, 76 North Broadway, Hicksville, NY 11801. **Be sure to indicate SSB or CW on the envelope.**

AWARDS

BY NORM VAN RAAY, WA3RTY

NEWS OF CERTIFICATE AND AWARD COLLECTING

This month we feature:

Stu Johnson, WU4S
USA-CA All Counties #679
10-25-90

Stu became interested in amateur radio while serving as a Morse Intercept Operator for the 14th US Army Security Agency in Chitose, Japan. The post had an amateur radio atation with the call KA9MF. Because he was serving overseas, Stu was able to obtain a "conditional" license and the call WA6MFY.

After he completed his Army obligation, he returned to California, where he met Darlene Murphy, the future Mrs. Johnson. By 1976 they had had three children and moved to Michigan in the "Great White North." Once settled in Michigan, Stu decided to pursue amateur radio as a hobby. Because of his service experience Stu had very little trouble with the code.

Leroy Campbell, W8JMP, gave Stu the Novice test, and six weeks later he was pounding brass on the Novice bands from a corner of our bedroom using the call KA8GIP. When he worked a new DX he would get excited and his wife would say, "That's nice, dear. Now shut off that thing so I can get some sleep."

Stu studied for his General Class license and a year later passed. Another six months and the Advanced Class license was on the wall. Finally, in the summer of 1982 he attained his Extra Class license and a new call, KX8O.

The next year, 1983, the Johnsons decided that the "Great Frozen North" was not for them. Two of their daughters had married, and so they felt it was a good time to move again. They chose Mount Airy, North Carolina, home town of Andy Griffith and Donna Fargo (you know, "the happiest girl in the whole USA"). The move also included a new call, WU4S.

Stu writes about his introduction to county hunting:

" . . . I had 'put out counties' during a trip from Michigan to California, so I knew about the net on 14.336, but I had never chased counties myself. Then came the fateful summer of '88. Eighty meters was gone until winter. What could I do? I remembered the County Hunting net and a good friend, Mary, NV4Z, was always talking about it on the 'Geritol' Net. I figured it would be a good way to spend the summer months.

"I began to seriously hunt counties in June 1988, and the rest is history, as they say. As most of you know, it's like eating potato chips: you can't chase just one. It becomes an obsession. I was glued to the chair. As soon as I got home from work I'd go into the shack and start chasing those darn counties. Same thing on weekends, only worse, because I had all day. Why, I even missed the entire 1988 and 1989 football seasons!

"My XYL knew that all was not well with her husband. I even put an antenna on the family car and started driving all over the state putting out counties. She would say, 'You're crazy! You don't even know these people.' 'Just be quiet and log,' I'd say.

"Finally, in September of 1990 it happened—the last one, Newton, Arkansas. Gene, N5JRH, was good enough to drive to it, and the rest is history.

"Of course it takes time, work, money (lots of it), and hundreds of people to work all the counties—the mobiles who run the counties, the net controls, and those who assist. I thank all of you. Space prevents me from mentioning all the calls, but there are several I would like to acknowledge here for their unique contribution to my success.

"Galen, KB5FU: I worked him in more counties than anyone else.

"Clark, WA4NBC: He ran all over Virginia to get me my last six in that state.

"George, KD8HA: Ohio has 88 counties, and I worked George in over half of them.

"Dave, KI6YX: He literally drove all over Texas to get me Bandera, then up to Foard for my last in Texas at 0230. It was then that my XYL made that final decision: 'Yes, all county hunters are crazy.' Dave then drove to Mississippi for my last there (Fayette).

"Cecil, WØUM: He telephoned me several times to let me know that one of my last ones was on the road.

"And last but not least, Clay, WD4HRN: He waited several hours for me to get home so that I could work him in Pierce, Georgia.

"To those I haven't mentioned, please don't think that I don't appreciate your efforts, as I certainly do.

"In closing, I would like to say that I feel that without a doubt, as a group County Hunters are the best bunch of amateur radio operators anywhere. For those who are not familiar with County Hunting, just listen to the net on 14.336 MHz and join us."

CQ congratulates Stu, WU4S, on receiving one of amateur radio's most coveted awards.

Stu Johnson, WU4S, USA-CA #679.

Box 76, Pleasant Mount, PA 18453-0076

USA-CA Honor Roll

3000

KV1M	834
W3FG	835

2500

KV1M	912
W3FG	913

2000

WA7JHQ	988
KB4HBH	989
KV1M	990
W3FG	991

1500

WA7JHQ	1078
KB4HBH	1079
KV1M	1080
W3FG	1081

1000

RA6AR	1281
KB4HBH	1282
W3FTG	1283
KV1M	1284
W3FG	1285

500

JAØRHA	2693
N4OH	2694
I6DQE	2695
KJ8F	2696
N9JLT	2697
W3FTG	2698
KV1M	2699
W3FG	2700

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.

Special Honor Roll

Michael A. Zyara, Jr., KV1M
USA-CA All Counties #808
Mixed Band and Mode, 07-23-93

Walt McGugan, W3FG
USA-CA All Counties #809
Mixed Band and Mode, 07-26-93

Awards Issued

Mike Zyara, Jr., KV1M, with the coaching of his XYL, N3DRO, submitted his complete book to pick up USA-CA 500 #2699, USA-CA 1000 #1284, USA-CA 1500 #1080, USA-CA 2000 #990, USA-CA 2500 #912, USA-CA 3000 #834, and USA-CA All Counties #808. I wonder how many husband-wife teams there have been over the years. I know of at least two—NV6I/NV6L and KD8HA/KD8HB. It would be interesting if someone so inclined would research this. It would make for an interesting future column.

Walt McGugan, W3FG, came in two days later with his complete book to pick up USA-CA 500 #2700, USA-CA 1000 #1285, USA-CA 1500 #1081, USA-CA 2000 #991, USA-CA 2500 #913, USA-CA 3000 #835, and USA-CA All Counties #809.

Sterling Whitaker, WA7JHQ, moved up to USA-CA 1500 #1078 and USA-CA 2000 #988 by submitting documentation.

Oliver S. Johnson, KB4HBH, kept pace with WA7JHQ, submitting his book for USA-CA 1000 #1282, USA-CA 1500 #1079, and USA-CA 2000 #989.

Tom V. Stepanov, RA6AR, continued his CW run with USA-CA 1000 #1281 (All CW).

The following attained USA-CA 500 awards: Kunio Nagase, JAØRHA, USA-CA 500 #2693; Lyle Dysinger, N4QH, USA-CA 500 #2694; D'elia Aneelo, I6DQE, USA-CA 500 #2695; Sharon A. Martarello, KJ8F, USA-CA 500 #2696; and Lawrence S. Speyer, N9JLT, USA-CA 500 #2697.

Finally, a special welcome back to William T. "Red" Free, Jr., W3FTG, USA-500 #2698 and USA-CA 1000 #1283. Red wrote that he lost over 1500 confirmed counties to the Agnes hurricane and flood back in 1972. I remember Agnes well. I was working in Lebanon County, PA at the time, so I share his memories of an unpleasant time. He also reports that he is now equipped with HF mobile, so look for him on 14.336.

Awards

TV-FV Award. Pierre Fournier, Versailles, France, announced new rules for this French award. This award is based on the special French prefixes. These can be assigned for special events such as commemorations, contests, DXpeditions to French Islands, etc. The TV-FV Award is available to all licensed amateurs and SWL stations worldwide. The prefix of the callsign must be one of the following: TC, FV, HW, HX, HY, TH, TO, TQ, TW, or TX.

French amateurs must have confirmed contacts with six (6) different stations. DX stations must have confirmed contacts with three (3) different stations to be eli-

Special Event Station

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operating from Plimoth Plantation
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USA

WA1NPO

Communications Officer

President, Plimoth Plantation

The certificate available for contacting Special Event station WA1NPO from the Plimoth Plantation, Plymouth, Massachu- setts, 1400–2100Z, November 27–28 .

gible for the award. Endorsements will added to the award for phone, RTTY, CW, single band, and any other special operating achievements. Separate awards may be requested for each proven operating achievement. There are no date requirements.

Confirmation consists of QSL cards in the possession of the applicant. Verified lists are preferred instead of cards. The list must show all pertinent information, including callsigns, date, time, mode, and band. This list must be verified by two other amateurs or by a radio club official. This validation indicates that you have actually received the cards for claimed contacts and have them in your possession.

The application must be accompanied by US$ 5.00, FF 30, or 10 IRCs. Applications should be sent to: Monsieur Pierre Fournier, F-10095 3 Bis rue Pasteur 7 - 78000 Versailles, France.

Thanksgiving Commemoration. The Whitman Amateur Radio Club, Inc. will once again be operating a Special Event station at the historic Plimoth Plantation, Plymouth, MA on Saturday and Sunday November 27 and 28 from 1400 to 2100Z. The club call, WA1NPO, will be used, and the suggested frequencies are 3.970, 7.270, 14.270, 18.140, 21.370, 24.970, and 28.370 MHz.

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73, Norm, WA3RTY

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RG 8/U FOAM 95%	.30/ft	.28/ft
RG MINI 8X BLK or CLR UV JACKET	.16/ft	.14/ft
RG 58/U MIL-SPEC	.13/ft	.11/ft
RG 11U FOAM MIL-SPEC	.42/ft	.40/ft
ROTOR CABLE		
C4080 STD DUTY 2/18-6/22 UV JACKET	.20/ft	.18/ft
C4090 HVY DUTY 2/16-6/20 UV JACKET	.34/ft	.32/ft
18GA 4/C GRAY JACKET	.15/ft	.13/ft
18GA 7/C GRAY JACKET	.18/ft	.16/ft
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14GA SOLID "COPPERWELD" UNINSULATED	.07/ft	.06/ft
12GA 19 STR FLEXIBLE BC UNINSULATED	.11/ft	.10/ft

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DX

BY CHOD HARRIS, VP2ML

NEWS OF COMMUNICATION AROUND THE WORLD

Pile-up Techniques

On June 16 of this year Romeo Stepanenko, 3W3RR, came on the air from Libya signing **5AØRR** with a booming signal into most of the US. Within a short time he had an enormous pile-up, with literally thousands of DXers calling. Operating split frequency on 14195 kHz, he increased the width of his listening spread until he was listening from 14200 to 14300 kHz! He seemed to be using a near-random listening technique, as few DXers had success with the usual method of attempting to transmit on the same frequency as the last station Romeo worked.

Apparently, Romeo found so many stations were successfully using this method that he would spin the dial to a relatively clear frequency where only a few DXers were calling him "blind." Those DXers who searched for such an open frequency, and patiently called, were rewarded with a Libyan QSO. However, the extremely wide listening spread angered many non-DXers, who found their communications disrupted by DXers calling blind. The 3-hour operation on 20 meter SSB generated so much hostility that one prankster distributed a false packet message, supposedly from ARRL headquarters, saying that the 5AØRR operation was disqualified for DXCC credit. (League officials quickly denied any such ruling.)

During a discussion of some other questions about the 5AØRR operation, Ed Kritsky, NT2X, relayed to Romeo in Libya the negative comments on his wide split range, and the rumors of possible disqualification for same. Ed reported on Romeo's response:

"[Romeo] replied that a 100 kHz spread was used only in the beginning of the operation and only because they absolutely couldn't make out calls otherwise. My suggestion to go by call areas wasn't warmly received, because he feels it will cause excessive jamming from the areas not worked at the moment. Thus a no-win situation: narrower listening range—more signals, slower speed; wider listening range—faster speed, threat of DXCC disqualification. In the 3½ hours they used a 100 kHz spread, they made well over a thousand USA contacts. Try that on 25 kHz! Though a 100 kHz is a bit excessive, I'm not going to question Romeo's judgment; he's a big boy and can make his own decisions. I felt I had to forewarn him anyway. He can probably use other methods of pile-up control, like lowering output power. He did mention that they were forced to shut the amplifiers down, but that order was rescinded. If it becomes necessary they can go barefoot, at their own discretion. And if you can't hear them, who will *you* blame? He certainly doesn't want to see 5AØRR disqualified."

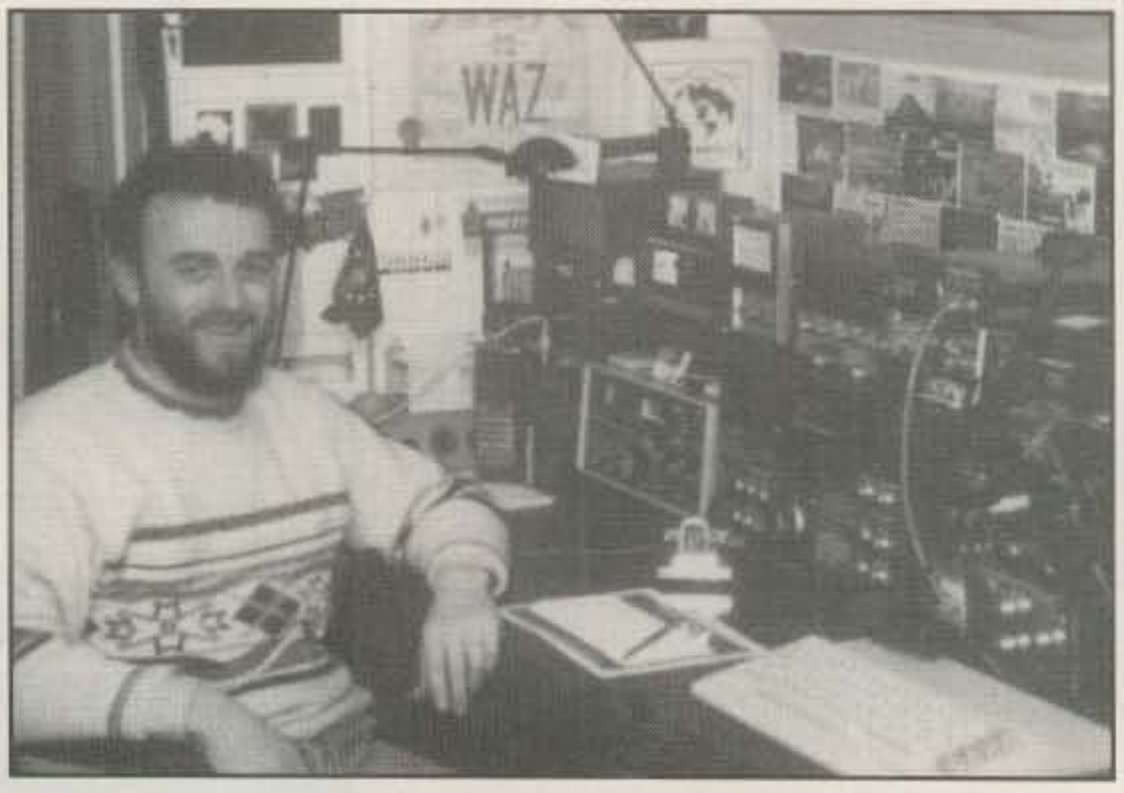
Romeo's response raises an interesting question: Is it in the best interests of DXers and non-DXers alike to use a disruptively wide split spread for a short period of time, to "take the edge off" the pile-up, or to limit the listening spread, at the cost of prolonging the QRM, and causing increased frustration to DXers? A mere 3 hours of QRM once every few months is less disruptive than the occasional solar flare, and can probably be tolerated by most non-DXers. And anyone who can knock off contacts at 300 an hour is obviously working at peak efficiency. (Most contesters would die for a rate like that, even without the difficulties of locating a readable callsign across 100 kHz.)

The DX community as a whole disagrees with Romeo's methods. The vast majority of DXers commenting on pile-up operating techniques feel that listening spreads should be limited to a maximum of 20 to 25 kHz on SSB. When the pile-up gets too big for such a spread, the DXpeditioners should employ alternate means of reducing the number of stations calling, such as limiting output power, using geographic restrictions, or going by call areas. Past DXpeditions to St. Peter and St. Paul Rocks and the 3Y5X Bouvet DXpedition led the ARRL to draft DX operating recommendations (see the March 1993 DX column for more details on this report).

Of the numerous comments directed to the ARRL DX Advisory Committee (and my office) about possible splits, only a handful suggested something other than a maximum 25 kHz SSB listening split.

P.O. Box 50, Fulton, CA 95439

Romeo Stepanenko, 3W3RR, clobbered the 20 meter SSB subband on the first night of his operation from Libya as 5AØRR. (Photo via RC2AR)



Pat Parmentier, ON7PQ, accomplished the very difficult task of working 5 Band Worked All Zones without an amplifier.

Jim Sladek, WB4UBD, is the first DXer to be listed on all three CQ DX Award Honor Rolls. He has 326 countries on SSB, 284 on CW, and 275 on RTTY. He was also the first to qualify for the RTTY Honor Roll. He's been chasing DX since 1977, and credits the support and encouragement from his wife, Jean, for his successes.

Bernardo Garcia, YV8ALW, operates from this shack in Maturin, Venezuela.

These few suggested that "the amount of listening bandwidth used depends on the size of the pile-up," as per N4MM's addendum to the DXAC's report. In other words, they agreed with Romeo: adjust the size of the pile-up to maximize QSO rate. (This technique holds *only* for experienced DXpeditioners; anyone with limited DXpedition experience should *definitely* limit spreads to a maximum of 20 to 25 kHz.)

Romeo's "blind calling" technique recalls the words of one of the first Peter I Island operators—Einar, LA1EE. When he was operating from Peter I as 3Y1EE, he employed the split-frequency technique pioneered by Eric, SMØAGD. Eric preprogrammed his digital radio with discrete listening frequencies every 10 kHz. For example, if he was transmitting on 28450 kHz, he would listen on 28460, 28470, 28480, and 28490 kHz, but *not* in between. When too many DXers discovered which listening "channel" he was using, he'd punch another memory button and start listening on another frequency. Eric contended this provided spectrum for non-DX operations between the mini-pile-ups every 10 kHz, and made it easier for DXers who couldn't listen to their own transmitting frequency when operating split. (They could simply camp on one of the listening channels, and wait for Eric to get to them.)

Einar, LA1EE, defended his use of this innovative technique at the Visalia International DX Convention by explaining that the purpose of any pile-up handling technique is to make it *harder* for the DXer to work the DXpedition. No, that's not a mistake; that really is the purpose of using various split and selective techniques in managing DX pile-ups. The reason is simple: If the DXpeditioner makes it *easy* for DXers to find him or her, many of them will do so, all will call at once, and then nobody will get through. Only by making it *difficult* for the DXer to work the DXpedition can the DXpeditioner reduce the number of stations calling on one frequency to the point where he or she can make out individual callsigns and exchange reports. Romeo's method of spreading the pile-up very wide and then jumping around calling individual signals in the clear admirably accomplished the goal of making him difficult to work.

The combination of a very wide spread in which to search for his last contact, plus a near-random jumping around to find callsigns he could copy, made tradition-

The WPX Program

SSB

2389	JH1IED	2393	KJ8F
2390	EA3KB	2394	K6ZDL
2391	N1KCE	2395	JR9NVB
2392	AC4UM		

CW

2786	KE2C	2787	HP2CWB

MIXED

1600	OH1NOA	1605	N4KWX
1601	OZ1CID	1606	IK6SLE
1602	KE2C	1607	KD1CJ
1603	WQØH	1608	3A2LZ
1604	WAØX	1609	S52QR

ENDORSEMENTS

Mixed: 450 OH1NOA, OZ1CID, KE2C, N4KWX, IK1SLE, KD1CJ. 500 OH1NOA, KE2C, KD1CJ. 550 OH1NOA, KE2C. 600 OH1NOA, KE2C. 650 OH1NOA, KE2C. 700 OH1NOA, KE2C, WWØE. 750 OH1NOA, KE2C, WK3Z. 800 OH1NOA, NJ1T, KE2C, WK3Z. 850 OH1NOA, KE2C, WK3Z. 900 KE2C, WK3Z. 950 JH1IED, KE2C, WK3Z, W4USW. 1000 KE2C, WK3Z. 1050 KE2C. 1100 KE2C. 1150 WØIZV, KE2C. 1200 KE2C. 1250 KE2C. 1300 KE2C. 1350 KE2C. 1400 LU8DY, KE2C. 1450 LU8DY, KE2C. 1500 KE2C. 1550 KE2C, K4RDU. 1600 KE2C, K4RDU. 1650 KE2C. 1700 KE2C. 1750 KE2C. 1800 KE2C, KB4B. 1850 KE2C, SM6CST. 1900 KE2C. 1950 KE2C. 2000 KE2C. 2050 KE2C. 2100 KE2C. 2150 KE2C. 2200 WB2YQH, KE2C. 2250 KE2C. 2300 KE2C. 2850 I1EEW. 3050 W2FXA.

SSB: 350 EA3KB, N1KCE, K6ZDL. 400 EA3KB, K6ZDL. 450 EA3KB, K6ZDL. 500 EA3KB, K6ZDL. 550 EA3KB, K6ZDL. 600 IK6JYY, EA3KB. K6ZDL, WBØGFV. 650 EA3KB, WA3GNW, K6ZDL. 700 EA3KB, K6ZDL. 750 EA3KB, K6ZDL. 800 EA3KB, K6ZDL. 850 EA3KB, K6ZDL. 900 EA3KB, K6ZDL. 950 JH1IED, EA3KB, WB4UBD. 1000 EA5PX. 1050 EA1AX. 1100 EA1AX. 1150 EA1AX, NG9L. 1300 IK2DUU. 1350 IK2DUU. 1400 LU8DY, IK2DUU. 1450 LU8DY. 1600 I2TZK. 1650 I2TZK. 1700 I2TZK. 1850 K5RPC. 2050 LU8ESU. 2500 I1EEW.

CW: 350 KE2C, WK3Z, KJ8F. 400 KE2C, WK3Z, K2LUQ, KJ8F. 450 KE2C, WK3Z, KJ8F. 500 KE2C, WK3Z. 550 KE2C, WK3Z. 600 KE2C, WK3Z. 800 NJ1T. 950 EA6AAK. 1000 W4TYU. 1050 KT2C. 1100 KA1CLV. 1400 KBØG. 1500 KAØZFX. 1600 G3VQO. 1650 G3VQO. 1700 G3VQO, SM6CST. 1750 G3VQO. 1850 W8IQ.

10 Meters: KE2C, DK6AP
15 Meters: JA3WFQ, KE2C, DK6AP
20 Meters: KE2C, DK6AP
40 Meters: KE2C, N7JXS, VE3DUS, DK6AP
80 Meters: KE2C, N7JXS, KA1CLV,DK6AP
160 Meters: KE2C

Asia: KE2C,VE3DUS, DK6AP
Africa: IKØADY, KE2C
No. Amer.: KE2C,WQØH, DK6AP,N1KCE
So. Amer.: IKØADY, KE2C, VE3DUS, DK4NCF, WB4UBD
Europe: KE2C, DK6AP
Oceania: LU8DY, IKØADY, KE2C, VE3DUS

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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.

The WAZ Program

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461 ..... IT9JOF
462 ..... IK4PMA
463 ..... ON6DP

15 Meter SSB

447 ..... KAØZFX

20 Meter SSB

926 ..... UA4CX
927 ..... WB2NQT
928 ..... ON6DP
929 ..... K2AJY

15 Meter CW

247 ..... OE3EMN
248 ..... JR2SHA
249 ..... ON4ACG

17 Meter CW

8 ..... N4MM
9 ..... K3UA

20 Meter CW

434 ..... WZ3Q
435 ..... K4SB

17 Meter Mixed

19 ..... N4CC
20 ..... ON4ACG
21 ..... K3UA

All CW

32 ..... LX2KQ

All Band WAZ

SSB

4087 ..... EA3KB
4088 ..... EA1BCK
4089 ..... IV3NZN
4090 ..... 4X1EL
4091 ..... IT9JOF
4092 ..... JE6KYA
4093 ..... KM6YX
4094 ..... GØFTA
4095 ..... K4SB
4096 ..... KT1H
4097 ..... ZP5YW
4098 ..... DX1DBT

CW/Phone

7352 ..... VE7DK
7353 ..... CT1EEB
7354 ..... JA1QND
7355 ..... DL3EO
7356 ..... G4XPG
7357 (CW) K4SB
7358 ..... W3FTG
7359 ..... JA9KKD
7360 ..... ZL2BRQ

All Phone

617 ..... CT1EEB

160 Meters

WB9Z ..... 37 zones endorsement

WNZ

54—10M SSB KA5OER

Satellite

3 ..... KD6PY
4 ..... OH5LK

Applications and reprints of the latest rules may be obtained by sending a self-addressed stamped envelope (75 cents) size 4¼ × 9½ to the WAZ Manager, Jim Dionne, K1MEM, 31 DeMarco Rd., Sudbury, MA 01776. Applicants forwarding QSL cards either direct to the WAZ manager or to a check point should include sufficient postage for safe return of their QSL cards. The processing fee for all *CQ* awards is $4.00 for subscribers and $10 for non-subscribers. Please make all checks payable to the Awards Manager. In order to qualify for the subscriber rate, please enclose your latest CQ mailing label with your application. Send any questions to K1MEM by mail and include an SASE (please do not telephone).

5 Band WAZ

As of June 30, 1993, 365 stations have attained the 200 Zone level.

New recipients of 5 Band WAZ Award with all 200 Zones confirmed:
I2UIY

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

N4WW, 199 (26)
K6YRA, 199 (34)
PY7ZZ, 199 (34)
KØCS, 199 (34, 40m)
AA4KT, 199 (26)
K7UR, 199 (34)
NAØY, 199 (26)
VE7DX, 199 (34)
WØPGI, 199 (26)
W2YY, 199 (26)
W9WAQ, 199 (26)
K6EID, 199 (34)
IK8CNT, 199 (12)
W1JR, 199 (23)
W8SEY, 199 (26)
N7RT, 199 (34)
VE7AHA, 199 (34)
W1FZ, 199 (26)
IK2GNW, 199 (1)
W9CH, 199 (26)
ACØM, 199 (34)
G3MXJ, 199 (12)
IK8BQE, 199 (31)
SM6AHS, 198 (12, 31)
K1ST, 198 (19, 26)
4X6DK, 198 (4, 6)
ABØP, 198 (23, 34)
UA3AGW, 198 (1, 12)
KL7Y, 198 (34, 36)
VO1FB, 198 (19, 27)
W6TC, 198 (34, 37)
EA5BCX, 198 (27, 39)
KZ4V, 198 (22, 26)

The following have qualified for the basic 5 Band WAZ

YU7FW, 177 Zones
I2UIY, 200 Zones
W9NQ, 156 Zones
WB2JZK, 157 Zones
KG6VI, 151 Zones
AA4EL, 153 Zones
K1JIU, 169 Zones

Award:
Endorsements:
841 Stations have attained the 150 Zone level as of

KØVZR, 192 Zones
KJ6HO, 164 Zones
KZ4V, 198 Zones
KB2FS, 180 Zones
KAØZFX, 161 Zones

June 30, 1993.
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.

al DXing techniques ineffective in working 5AØRR. Alert DXers soon found that parking on one frequency and waiting for Romeo to find you was the best method, and more than 1000 astute DXers made their contact with 5AØRR (a good thing, too, as Romeo was extremely scarce after that first night, and left Libya without making many more contacts.)

At its regular meeting in July the ARRL Board of Directors accepted the recommendation of the DX Advisory Committee to recommend DX operating practices, including limiting SSB split-frequency spreads to a maximum of 25 kHz. (Actually, the DXpedition operating band plans in the accepted report are suggestions for further study, and serve more as starting points for worldwide discussion than anything definite.)

We mentioned above that there are other possible techniques to manage pile-ups and maximize QSO rates without taking over an entire subband. One of the most popular (until recently) has been the

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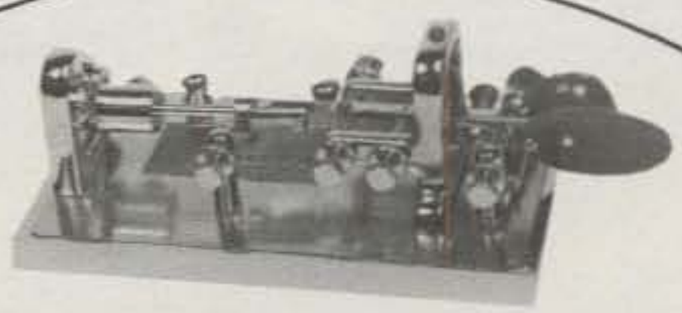


ORIGINAL

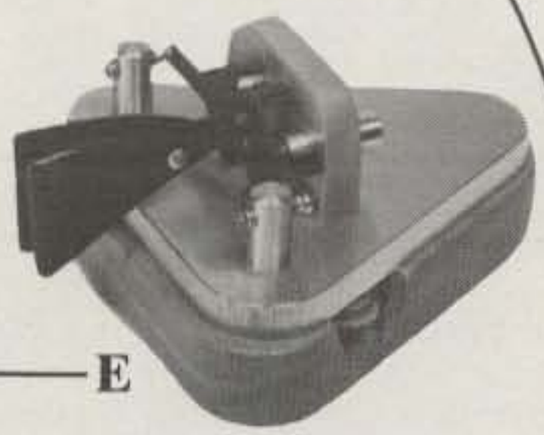
BRASS RACER IAMBIC

N

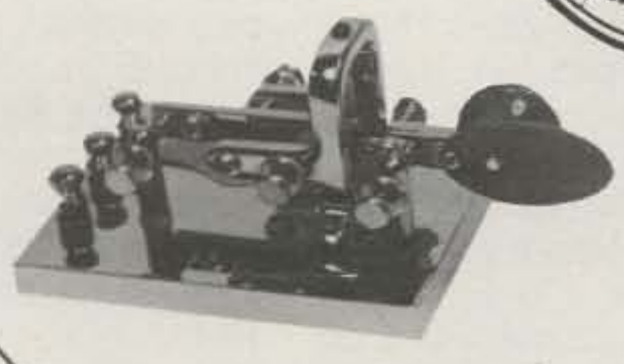
W

THE VIBROPLEX COMPANY INC TRADE MARK

E



BRASS RACER EK-1



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CIRCLE 160 ON READER SERVICE CARD

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 up-dated 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

4512 9N2AA	2924 I2UIY	2652 I6SF	2203 HAØIT	1897 W6OUL	1701 NV9S	1470 WB3DNA	1164 CT3CU	854 VE6BMX
4434 F9RM	2914 N4MM	2628 9A2NA	2202 HAØHW	1893 HA5NK	1688 WB2ABD	1462 S58MU	1161 WØIZV	851 VE7CBH
4137 K2VV	2911 KØBLT	2609 YT7DX	2174 I2EOW	1880 WE2L	1688 W9IL	1452 IØAOF	1160 KØIFL	840 VE32OMM
3476 EA2IA	2904 YU1AB	2604 SM7TV	2163 K2POF	1868 N2AIF	1681 KS4S	1405 DF4ZL	1146 N7JXS	813 WT3W
3365 K6JG	2889 WA8YTM	2556 HA8XX	2147 K5UR	1860 K2OLG	1674 S51NU	1376 LU8DY	1122 K7KBN	770 N3KR
3322 VE3XN	2855 PY4OD	2549 N2AC	2142 I1WXY	1850 YU1GR	1638 VE1RJ	1364 HA9PP	1118 G4SDJ	755 CT1EEB
3234 N4NO	2852 W9DWQ	2536 N4UU	2133 3A2LF	1811 KBØG	1631 W8CNL	1325 KC7V	1104 HP2CWB	753 OZ-2044
3210 K6XP	2818 I1EEW	2530 HAØDU	2097 S53EO	1797 VE3MS	1628 WB8ZRL	1324 I2EAY	1061 HB9DDZ	738 JA4DUD
3156 N6JV	2803 IN3ANE	2525 K9BG	2091 I2DMK	1785 DF6EX	1609 IK2ILH	1318 NJ1T	1060 WK3Z	720 EA3CWK
3127 IT9TQH	2797 ZP5JCY	2449 IT9QDS	2085 W4UW	1782 SM6CST	1546 EA1JO	1298 KI3L	1044 I1-50156	640 JR3TOE
3025 I2PJA	2762 KA5W	2435 K9AGB	2052 KL7AF	1762 WB4RUA	1532 CT1YH	1229 KSØZ	1032 I1ZQD	
3008 SM3EVR	2722 PAØSNG	2339 UA3FT	2049 K8LJG	1740 WA1JMP	1631 KA5TOF	1213 W9IAL	956 JH1IED	
3003 W4BQY	2704 W1BWS	2301 KF2O	2045 WB2YQH	1737 G4OBK	1504 CT1QF	1194 N6IBP	945 W4USW	
2996 N9AF	2682 YU7BCD	2287 K9QFR	2041 DK5AD	1724 W3KH	1484 K5IID	1178 K7LAY	920 WB2PCF	
2962 W2FXA	2674 YU7SF	2274 SM6DHU	1945 N6JM	1714 K5DB	1483 PY2DBU	1165 K9BQL	902 JN3SAC	

SSB

4320 F9RM	2525 I2UIY	2087 YU7BCD	1757 CT1BY	1510 CT1UE	1272 KBØC	1135 OE2EGL	991 YB3OSE	797 EA3EQT
3895 IØZV	2483 F2VX	2065 WF4V	1742 WE2L	1509 YU7SF	1266 KS4S	1130 I1-21171	976 I8IYW	781 GØFWG
3497 K2VV	2480 NJØC	2046 9A2NA	1711 KC8YM	1493 KAØZFX	1258 I8WYD	1117 FE6FNA	962 VE3MS	764 WT3W
3392 ZL3NS	2458 I1EEW	2041 LU8ESU	1708 CX6BZ	1476 IK2DUU	1258 W6OUL	1113 NG9L	956 JH1IED	755 CT1EEB
3338 VE1YX	2437 WØYDB	2004 EA3AQC	1700 EA2AOM	1444 LU8DY	1254 KA5TQF	1112 WA2FKF	951 KBØG	710 JA4DUD
3104 IT9TQH	2398 I4CSP	1993 CT4UW	1687 N4UU	1403 K8LJG	1226 IKØEIM	1098 IK2AEQ	944 EA3KB	693 CE5FSB
3080 K6JG	2395 PAØSNG	1985 PY4OY	1686 SM6DHU	1392 IT9JKY	1206 W5ILR	1073 WB6SRK	919 N4CSF	687 SM6CST
3018 WD8MGQ	2370 KA5W	1969 KF2O	1659 I2TZK	1352 K2EEK	1199 K3IXD	1063 CT4RH	917 KK5P	681 AA4UF
3015 I2PJA	2319 HA8XX	1956 I2EOW	1654 IK5ACO	1341 LU7HJM	1187 CT1BWW	1038 WB6GFJ	910 NH6T	643 JR3TOE
2833 K6XP	2296 W4BQY	1930 EA3FHT	1600 KL7AF	1339 W5AWT	1180 EA9LZ	1036 K9BQL	859 EA1JO	618 VE1RJ
2758 CT4NH	2291 WA8YTM	1925 K5RPC	1586 HAØIT	1337 I2DMK	1174 I3ZSX	1034 HA5NK	851 KF7IO	611 EA8BWW
2676 ZP5JCY	2159 I5ZJK	1914 W4UW	1583 N6FX	1327 CT1DIZ	1162 HP6AYV	1019 KC7V	844 CP1FF	610 KI6PG
2622 N4MM	2129 PY4OD	1856 CT1AHU	1581 IN3QCI	1317 N2AIF	1162 G4OBK	1016 5Z4BP	836 KA9MOM	606 KE4BM
2563 EA2IA	2105 WA4QMQ	1841 4X6DK	1551 KF7RU	1305 WN5MBS	1156 KB2DE	1010 KB4HU	831 IT9JPK	603 HB9DDZ
2558 OZ5EV	2098 W9DWQ	1840 K5UR	1536 K2POF	1287 DK5WQ	1154 K8MDU	1003 DF4ZL	814 KE7UH	600 JA2OCU
2539 N4NO	2087 K9QFR	1811 KD9OT	1535 I6NOA	1274 OE6CLD	1153 K5IID	998 HP2CWB	809 KØIFL	

CW

3498 K2VV	2401 I6SF	1986 N4MM	1700 K5UR	1567 VE1RJ	1402 W6OUL	1195 I2EAY	923 DF4ZL	710 HB9DDZ
3383 WA2HZR	2400 K6XP	1940 I2UIY	1681 SM6DHU	1556 SMØAJU	1398 VS6UW	1179 LU2AY	908 KC7V	688 N5GFX
3134 N6JV	2354 W4BQY	1918 G4UOL	1675 G3VQO	1555 W5AWT	1379 I1EEW	1151 ZP5JCY	907 K5IID	669 NH6T
3124 IT9TQH	2320 N2AC	1856 IKØADY	1673 G4SSH	1555 W9PWM	1364 IK3GER	1133 JA9CWJ	897 W4UW	630 AA6WJ
2835 VE7CNE	2311 W9DWQ	1812 W8IQ	1668 HAØIT	1536 KF2O	1354 DJ1YH	1118 KS4S	852 KA5TQF	611 KI4UZ
2787 N4NO	2284 JH3CXL	1804 KA7T	1668 SM6CST	1519 K8LJG	1324 G4OBK	1110 KA1CLV	847 JN3SAC	
2605 YU7LS	2209 LZ1XL	1801 N4YB	1646 N6FX	1506 N2AIF	1317 G4MVA	1102 IK2ECP	827 WB5MTV	
2577 PY4OD	2196 WA8YTM	1790 EA7AZA	1618 K2POF	1504 I7PXV	1312 DL2HBX	1047 K9QFR	789 KL7UR	
2557 K6JG	2186 N4UU	1770 TI4SU	1599 KL7AF	1503 KBØG	1307 S58MU	1004 AH6JF	787 PY4WS	
2534 EA2IA	2165 VE7DP	1745 9A2NA	1596 HA8XX	1490 OZ5UR	1304 VE3MS	960 EA6AAK	760 EA2CIN	
2491 W3ARK	2146 YU7BCD	1737 I2DMK	1576 S51NU	1461 ZS6EZ	1277 EA1JO	952 W9IAL	758 4X6DK	
2411 YU7SF	2054 KA5W	1721 IT9VDQ	1569 W1WAI	1408 HA5NK	1244 NJ1T	944 FE1JUD	749 VE3OMM	

practice of going by call areas. The DXpeditioner asks for, and works, only those stations from a particular call area of the US. This has two benefits for the DXpeditioner. First, it cuts that number of possible stations calling at one time to only 10%. Second, the DXpeditioner can control the geographic part of the US he or she wishes to work.

When I operated as T32AW from Christmas Island in Eastern Kiribati, for example, I tried to concentrate on the US East Coast when propagation permitted. I reasoned that the opening to the US West Coast would still be open after the path to the East faded out. Thus I worked call areas 1 through 4, 8, and 9, when explaining that I would get to the Midwest (5s and Øs) and West Coast (6s and 7s) after the East coast dropped out. By explaining what I was doing (and by operating from a not-so-rare spot), I was able to maintain a QSO rate of 150–200/hour and give those DXers who had a difficult time working into the Pacific (i.e., the East coast) additional opportunities to work T32, without having to compete with the West Coast stations.

Romeo specifically mentioned that he would *not* use call areas as a means of pile-up management. He cites excessive jamming from call areas not currently being worked. ("When are you going get to the 7s?" That's enough 2s!") Anyone who has listened to pile-ups on particularly rare stations in recent years knows how bad this situation can get. Romeo chose to run the risk of antagonizing non-DXers to work more DXers, who, after all, are his supporters both spiritually and financially. His decision was a controversial one, but in retrospect, many DXers will probably agree that he made a good choice at the time. (Non-DXers will probably *not* agree, of course.)

Although Romeo did not specifically mention the problem of call-area "jumpers," his decision to forgo call-area pile-up management may in part have been influenced by this practice. Call-area jumpers are those unethical DXers who switch their portable designator to whatever area the DX station is calling. For example, W2NQ/7 might sign W2NQ/8 if he misses the contact in the 7s. The DXAC found this practice so deplorable that they recommended in their DX operating practices report that DXpeditions refrain from working portables. In other words, W2NQ may be worked with the 2s, but not in any other call area.

Is the problem of call-area jumpers so severe that refusal to work portables is the only answer? Research by Garth Hamilton, VE3HO, chairman of the DXAC subcommittee that produced the report on recommended DX operation practices, suggests the problem is severe, at least with countries in the top 15 to 20 Most Wanted. Garth spent over 80 hours listening to and logging the pile-up calling P5RS7, a country that no DXer could have confirmed. He reported that fully 75% of those calling shouldn't have been! At times as many as 25% of those calling were using false portable designators. (Since there is no longer a requirement to sign portable in the US or Canada, such actions are not illegal, but they certainly violate DXCC Rule 12: operating ethics.)

Garth's logging of the P5RS7 pileup (which cost him an SSB contact with P5RS7) shows how serious this problem is with rare stations. During a W3 run of

50 stations worked, 209 of the stations heard calling P5RS7 should not have been calling. Fifty-nine of these were using /3 designators, but 50 of these were revealed to be in other call areas, according to *Callbook* records. When P5RS7 went to the 4s, 36 of the unethical /3s began /4s, and 3 of the legitimate /3s were now signing /4! Obviously a high percentage of DXers are badly abusing the "portable" designator in pile-ups on rare stations. Hence the DXAC recommendation that DXpeditions work solely by the number in the callsign.

Romeo didn't feel that refusing to work portables was a practical way of handling the pile-up, an opinion shared by most DXers and DXpeditioners. He chose an even more controversial, but effective, method of spreading out the thousands of stations calling him, to the detriment of non-DXers trying to use the 20 meter SSB subband.

One positive aspect that may come out of this incident is that the non-DXers may help join DXers in educating *all* amateurs to use proper ethics in pile-ups. A major aspect of the ARRL Board-approved DX-pedition operating practices is education of both DXpeditioners and DXers in proper procedures. If those non-DXers whose communications were disrupted by Romeo's wide listening spread help to reach casual DXers and less ethical so-called DXers, everyone will benefit, both DXers and other users of our crowded bands.

Meanwhile, DXers can look to their own operating habits, especially in major pile-ups. Do you call out of turn? Do you switch portable designators to keep calling out of your own call area? Do you keep calling when the DXpeditioner calls a partial callsign? If you do, then you're part of the problem. You're not helping yourself, and you are definitely hurting others, both the DXpeditioner and your fellow DXers. Calling out of turn will not increase your chances of working a rare one, and may even get you black-listed by some thin-skinned DXpeditioners. And it is this sort of behavior that leads the DXAC to recommend that DXpeditions punish many DXers by not working portables.

DX is the highest form of amateur radio art. Shouldn't we strive for the best possible operating procedures and ethics?

Upcoming DXpeditions

One of the rarest DXCC countries is scheduled to be on the air in a big way this month. Yemen 4W should be available Oct. 15–29 thanks to a multi-national group from the US and Russia. Their callsign will be **4W1UA**, and they plan an all-band, all-mode operation, including an entry in the CQ WW SSB test Oct. 30–31. The current DXCC country of Yemen was formed in May 1990 by the merger of the

QSL Information

3D2GG to JS6BLS
3D2RW to ZL1AMO
3V8AS to IK5GQM
3XØHNU to F6FNU
4J4GAT to DL1VJ
4K2/UV6ABL to DK8FS
4K2BY to DL6ZFG
4K3GW to I1SYW
4LØJA to JP1BJR
4L5A to IK3HHX
4L8A to OZ1HPS
4L9A to IK3HHX
4M5I to I2CBM
4O1V to YU1DX
4O4KC to YU1FW
4U1UN to W8CZN
5NØASW to W3HCW
5Z4BI to W4FRU
5Z4JD to F6AJA
6Y5MM to N4YBF
7Q7RM to GØIAS
7Z2AB to AAØBC
8A2OTA to YB2FRR
9G1MR to IK3HHX
9H3GQ to DK4SW
9H3JR to DJØQJ
9J2HN to JH8BKL
9K2ZZ to W8CNL
9M8DB to AA5AZ
9X5AB to DL6NA
9Z4LX to WA2NHA
A35TL to HB9TL
A71BE to OE6EEG
AP2JZB to K2EWB
BVØMM to BV2DD
BZ5HAN to BY5HZ
C56X to DL7UBA
C91J to W8GIO
CJ3AT to VE3AT
CO9VSC to CO7KR
CQ9GU to CT3YW
CS6APP to CT1APP
CU9C to CU3AN
CY9/WA2UJH to NW8F
D2SA to F6FNU
EJ2GSI to HB9ASZ
ERØQ to SP7LZD
ER7Z to I8YGZ
EVØN to GW3CDP
EV5DX to DL5BAC
EV8A to UC2AA
EV9A to F6AML
F1OYT/P to F6ANA
FM5WD to W3HNK
FP/AA8U to NU8Z
FP/N8CC to NU8Z
GBØCI to GIØDVU
GBØOH to GM4KHE
GJ/DF3KT to DF3KT
HC8JG to WA6ZEF
HC8KU to DK5VP
HL93AP to HL5AP
HL93IWD to HL1IWD
HSØZAK to N4TMW
HSØZBI to NW3Y
HV4NAC to IKØFVC
HZ1AB to K8PYD
IO1IOE to I1POR
J5UAI to NW8F
J88AQ to W2MIG
JW6MY to LA6MY
JX3EX to LA5NM
KC6CC to JA3IG
KG4DX to KØIEA
KHØAC to K7ZA
KH2T to W3HNK
KH8/HB9TL to HB9TL
LY/UT3UA to LY1DS
NE8Z/1CØ to K8LJG
OD5/SP7LSE to SP7EJS
OHØBDA to OH2BDA
ORØOST to ON7LX
P29CN to WAØIWF
P4/KB5WWP to P43GR
P4ØWW to KD6WW
PX2A to PY2KP
RM8MW to DL6ZFG
RO4OB to SP7CZB
RV7AA to NT2X
S21ZG to W4FRU
SV9MBC to SV9ANJ
T24JJ to JA2FJP
T3ØJH to VK2GJH
T5/OZ1FJB to OZ1FJB
T94CR to SM5AQD
T97B to DJØQJ
T99A to I4QGU
TA8ZA to TA5C
TN1AT to F6FNU
TR8LC to FD1PYJ
TT8OBO to WA4OBO
TU5DX to F6ELE
UC2LY to UC2AHZ
UD6DKW to DL6KVA
UM8MGM to IØWDX
UN7LC to IØWDX
UN9PYL to OH3MHT
UO5OAL to I8YGZ
USØU to K8YSE
US1U to PA3BUD
UW1ZZ to RA1ZA
V29PE to G3DLH
V63SM to JQ3EEL
VI2AUS to VK2WI
VP2ECW to N6CW
VP2MR to N5DXD
VQ9AC to WN8O
VR2UW to VS6UW
VX3A to VE3FOI
XQØX to CE3ESS
XQ3CJ to JA3GIY
XU3DWC to PAØRYS
YBØARF to N2MM
YB3OSE to W7TSQ
YJ8AB to KC4MJ
YS1DRF to W2PD
YV5ENI to I2CBM
Z24JS to W3HNK
Z31CN to YU5CN
Z31CZ to 4N5CZ
Z31VV to YU5XCS
Z32ET to YU5DRS
Z32GX to YU5GBC
Z32KV to YU5FCA
Z32LM to YU5XLM
Z32MX to YU5KXY
Z32VP to YU5XVP
Z37DRS to YU5DRS
ZA1E to I2MQP
ZA1J to I2MQP
ZA1W to HB9BGN
ZB1ØØJB to EA6BA
ZC4KS to GØPWR
ZD8DEZ to GØDEZ
ZD8Z to VE3HO
ZK1AJJ/ZK1 to JR2KDN
A61AF to P.O. Box 2684, Dubai, United Arab Emirates
ET3YU to P.O. Box 60349, Addis Ababa, Ethiopia

former countries of the Yemen Arab Republic 4W (North Yemen) and the People's Democratic Republic of Yemen 7O (South Yemen). This country is listed in DXCC country lists under 7O, but when the International Telecommunications Union (ITU) asked the new, combined Yemen to relinquish either the 4W or the 7O prefix, they gave up 7O and kept 4W. Look for Yemen under 4W in future DXCC listings.

CW-only operator Luc Glarey, I1YRL, will operate from Monaco as **3A/I1YRL** this month, following his 4U1ITU operations earlier this year. QSL to his home address: Via San Marino 11, 10091 Alpignano TO Italy.

Closer to home, Fred Lucas, **K1EFI**, will operate **/VP9** from Bermuda Sept. 23 to Oct. 5, concentrating on CW. QSL this operation, and the Bermuda stations Fred manages (VP9ID, VP9KG, VP9KR, and VP9KK), via Fred's home address: 72 Long Meadow Hill Road, Brookfield, CT 06804.

Also close at hand is a mini-DXpedition to the Bahamas Oct. 17–20. Look for John, **C6A/W9ILY**, and Ed, **C6A/K2ZDC**, from Treasure Key on Great Abaco Island (IOTA NA-080), on all bands 80–10 meters, CW, SSB, and digital modes. QSL via the W9 bureau to direct to W9ILY, 8728 S. Sproat Ave., Oak Lawn, IL 60453.

Looking farther ahead, the 1994 Peter I Island DXpedition remains on track, with the group already making the down payment on the ship. The operation is still set for Feb. 117 with 10 operators. Contributions are still needed. Send them to Jerry Branson, AA6BB, 93787 Dorsey Lane, Junction City, OR 97448. Donations of $100 or more, for tax deductible credit, may be sent to the Northern California DX Foundation, c/o Bruce Butler, W6OSP, 4220 Chardonnay Court, Napa, CA 94558. (Make checks payment to the NCDXF—Peter 1 Island DXpedition, and include an SASE for return receipt.) QSLs will be handled by AA6BB and Joanie, KA6V, as with the VP8SSI operation.

DX News

The **DX Advisory Committee** voted 16–0 *against* a Southern California DX Club proposal to reduce the distance requirements in DXCC Country Criteria Rule 2 to make more DXCC countries. The SCDXC wanted to lower the necessary mileage separation to 100 miles from 225, but the DXAC found little support for the suggestion. The committee also voted 10–6 against establishing Honor Rolls for band- and mode-specific DXCCs, such as 80 meters and RTTY. The DXAC felt this would benefit only a few DXers, and jeopardize the current smooth operation of the DXCC desk.

Silent Keys

Len Chertok, W3GRF, died on June 24. He was 71 years old. W3GRF was one of the all-time great contest operators and a real ham. Some of the greatest DX contest battles of the 1950s and 60s were between him and former ARRL President Vic Clark, W4KFC. Both of them stead-

CQ DX Awards Program

SSB

2028	EA5FXS	2031	N8PTL
2029	WB2NQT	2032	IT9JOF
2030	G3VTU	2033	N2BJV

CW

882	AB4ZD

SSB Endorsements

320	YV5AIP/328	320	KE4VU/325
320	N6AHU/328	320	N5FW/324
320	K9MM/328	320	KØHQW/323
320	N6AR/328	320	W6DN/322
320	4Z4DX/328	320	W7FP/322
320	N7RO/328	320	SM6CST/322
320	KSØZ/328	320	N4KEL/M/320
320	W7OM/327	310	I1POR/319
320	OE3WWB/327	310	KB7VD/318
320	K2ENT/327	310	EA3EQT/316
320	VE3GMT/327	310	OE7SEL/314
320	K9BWQ/327	310	W3SOH/310
320	VE3MR/327	275	KJ6HO/297
320	VE3MRS/327	275	KJ6GC/294
320	N4JF/327	275	CT1EEB/290
320	W2FXA/327	275	K2EEK/282
320	K2JF/326	275	WB2NT/282
320	EA4DO/326	250	KAØZFX/263
320	WB5TED/326	28 MHz	WB2NQT
320	ZL3NS/326	3.5/7 MHz	WB2NQT
320	WZ4I/325	Mobile	G3TVU

CW Endorsements

320	K9BWQ/328	320	KZ4V/326
320	K9MM/328	320	N5FW/323
320	N6AR/328	320	W6DN/321
320	WA4IUM/327	310	K2JF/316
320	SM6CST/327	310	OH3NM/311
320	K2OWE/327	310	VE7CNE/311
320	N4JF/327	275	OZ5UR/295
320	W2FXA/327	275	KF5PE/282
320	K2ENT/326	250	N4KEL/M/253

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.

fastly stuck to bug-sent CW, and you always could recognize them on CW by their fists.

In his later years, despite poor health, Len's station was a training ground for neophyte contesters. Lenny was a long-time member and former president of the Potomac Valley Radio Club. He was an ARRL Life Member. (Len was also the sixth member of *CQ*'s Contest Hall of Fame, inducted in December 1991.)

Jim Rafferty, N6RJ, died June 13, 1993, at the age of 43, following a long battle with cancer. He was vice president of Ham Radio Outlet. Jim was one of the operators who put Kingman Reef on the air for the first time, joining the group CQ as KP6KR in 1974. He also operated from the Cayman Islands in the CQ WW SSB, first as ZF2FL, then setting 40 meter world records as ZF2JR, and finally getting his preferred call of ZF2RJ. Jim selflessly maintained the .cty files for the popular

CT contest logging program, providing contesters around the world with the most up-to-date and accurate automatic country determination. He translated the W9IOP Second Op cardboard operating aid to computer, marketing it as the N6RJ Second Op. He was a tireless member of the DX Advisory Committee, putting the best interests of DX and DXers paramount in his decisions. Jim was honored at the 1993 Visalia International DX Convention with a special award, and was featured on the July 1993 cover of *CQ*. (Thanks to Jim Cain, K1TN, Senior Editor of *QST* for the above information.)

QSL Notes

SMØAGD has a new address, effective June 1: Eric Sjolund, Vestag 27, 19556 Marsta, Sweden.

QSL **CO2KK** via W9JUV, but expect some delays, as logs are slow in arriving.

QSL **9K2ZW** via Karen McErlane, KD4NDS, 2219 Lime Tree Dr., Edgewater, FL 32141.

WD5B's address is not correct in the 1993 *Callbook;* QSL **VP5/WD5B** via Rich Duncan WD5B, 5 Troxell Lane, Conway, AR 72032.

Eddie DeYoung, VK2KS, has moved again. QSL **C21XX, 3D2XX, VK8XX,** and his wife Mina's calls of **C21YL, 3D2MM,** and **VK8MM** via 1/127 Cardinal Avenue, West Pennant Hills, New South Wales 2125, Australia.

5U7M QSLs 100% of his contacts via the bureau system. He asks that DXers not send cards direct, and not send IRCs nor postage funds. DXers may answer his QSLs via the Japanese JARL bureau.

Ed Schneider, AA7AN, is QSL manager for **VQ9KC, 4F3AAL,** and **UA8TAA**. Ed's address is 6502 Wildcat Drive, Cave Creek, AZ 85331.

FG4FR continues to use F6FNU as a QSL manager, but for those DXers who prefer to QSL direct (or who prefer to avoid F6FNU), his direct address is: M. Frantz Selbonne, Res: Merosier Narbat, Bat. J2-N, 21-Belcourt, F-97122 Baie/Mahault, Guadeloupe, via France.

The Syktyvkar Friends Radio Society has established a QSL bureau for **UA9X** stations: P.O.B. 1526, Syktyvkar 167002, Komi, Russia. The use of this address will avoid the delays, IRC removal, and fees encountered via Box 88, Moscow.

T95X is ex-4N4XX; QSL via Tomislav Dugeo 9A2AA, Box 255, 58001 Split, Croatia, or direct to Staven Galic, P.O. Box 22, Siroki Brijeg, Bosnia-Herzegovina, via Croatia.

QSL **J68BG** via YU1NR.

QSL **JT1CO** via Ch. Chadraawal, P.O. Box 29, Moscow 123514, Russia, while he spends some time in Russia. This avoids the delays and lost mail sent directly to Mongolia. Direct mail to Mongolia should include "via Japan"; mail via Russia is very slow and unreliable.

The QSL cards for the Winter 1992 M-V Island operation of **4J1FM** and the CQ WW SSB operation of **4J1FW** are well in progress and many cards have already been sent out. Send QSL requests to OH2LVG, Vanhaistentie 5 E 73, 00420 Helsinki, Finland.

The **H44IO/XO, FW/Y31XO/Y58IO, T28IO/T25AO/T21XO,** and **3D2AO/IO/XO** QSL cards from the young German team late last year have been delivered in bulk to the US. The 120 pounds of cards were available for DXers at Dayton, with the remainder being sent either direct, or to district bureau managers for distribution via the incoming bureau. The DXpeditioners used this method of distribution because of the recent increases in German postage, which is now DM3, or about US$2 ,for airmail to the US (and two IRCs), or DM2 or US$1.25 for surface postage to the US (or one IRC). With the printing bill for the cards at US$2700, they chose to QSL 100%, and hand carry the cards to Dayton. Anyone still needing a card should send the QSO data (no QSL card needed) to their new address: P.O. Box 73, 10122 Berlin, Germany.

QSL **OD5RAK**'s North American contacts only via Dwaine Modock, WA8MEM, 28265 Gardenia Dr., North Olmsted, OH 44070.

QSL **8P9EA**, **8R1K** CQWW 1992 CW and SSB, **PJ2/OHØXX**, and **8R1RPN** via Olli Rissanen, OHØXX, 1313 So. Military Trail, Suite 599, Deerfield Beach, FL 33442. (QSL the 1991 CQ WW CW operation of 8R1K via OH2BH.)

DL6NA, QSL manager for **9X5AB, P40NA**, and **P40ZJ**, says the recent increases in German postage mean he will have to return many direct QSL requests via the bureau. He needs US$2 or two IRCs for direct airmail return. Address: Harry Wismath, Anne-Frank-Str. 101, 6000 Frankfurt AM 50, Germany.

QSL **T42CW** via P.O. Box 21056, Havana 12500 Cuba. Two IRCs or US$1, please.

QSL **VF3SRE** via VE3SRE, Bob Chandler, 155 Monarch Park Ave., Toronto Ontario Canada M4J 4R5.

QSL Manager Volunteers

Aaron Wrona, KB8MKL, 2256 W. Moore Road, Saginaw, MI 48601 will volunteer for a station in southern Africa.

Tomas Magyla, LY1DF, Biliuno 6-29, Anyksciai 4930, Lithuania offers his services.

David Sachs, AA9GF, W3493 Sievert Road, Seymour, WI 54165.

And Evgeny Tsargorodsky, UA4CD, P.O. Box 83, Atkarsk 412400, Russia, offers reduced-rate QSL managing.

73, Chod, VP2ML

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18M3	YAGI	$ 249.00
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440-18	YAGI	$109.00
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432-13WLA	YAGI	$229.00

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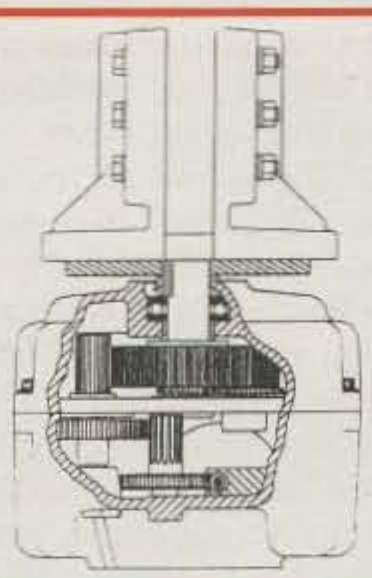
2M7	YAGI	$105.00
2M12	YAGI	$129.00
2M5WL	YAGI	$169.00
2M18XXX	YAGI	$219.00
2M8WL	YAGI	$289.00
2MCP14	YAGI	$149.00
2MCP22	YAGI	$225.00
2M5-440XP	YAGI	$149.00
222-7EZ	YAGI	$ 79.00
222-10EZ	YAGI	$ 89.00
222-10WL		$189.00



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PACKET USER'S NOTEBOOK

CONNECTING YOU AND PACKET RADIO IN THE REAL WORLD

BY BUCK ROGERS, K4ABT

The Buck Stops Here

In the late 1940s and early '50s I enjoyed making DX CW contacts with stations all over the world. Doing so often meant that I would climb out of bed in the wee hours of a cold morning and remove the bank of ashes in the big rock fireplace and stoke the firedogs with another log. I would stand there for a few minutes to warm my body before I made a dash for the little hamshack (a cardboard insulated room) in the barn. In those next few moments I speculated as to which state or country I would make contact with this morning, and maybe, just maybe, there would be more than one or two.

On some of these winter mornings I would even hear a Canadian or some remote Caribbean Island station. The "hearing aid" that I used was a Hallicrafters Sky Buddy receiver, the forerunner of the S-38. This drifting beast with a "see-ya-later" BFO was about to get another workout. (For those latecomers to amateur radio, BFO is an acronym for "Beat Frequency Oscillator.")

In 1949 the Sky Buddy receiver was a cut above a tuned, radio frequency (TRF) or super regenerative (SRG) receiver. It had an analog dial and a band-spread (both about the same vernier sweep), and an IF that was as broad as the door to our old red barn.

The other half of this dynamic duo was my 17 watt, CW, homebrew transmitter. This work-of-art was the remains of my grandfather's Atwater-Kent all-wave radio. I had removed most of the pencil-size, stick resistors and paper and foil condensers. (In 1949 we called a capacitor a condenser if its value was below half a microFarad). This 17 watt wonder was my access to the world of "digital" communications.

Those were the days of CW a la code. Nevertheless, it was still the first step on a long road to digital communications and packet as we now know it.

These were the building blocks that enabled us to ascend to this now facinating hobby of packet radio. No matter how primitive the statement may seem, it is real. Our ancestors began with smoke signals, and then moved to a new technology called a tom-tom (a hollow log with animal skins, stretched tightly over an open end). Later the Iron Horse gave us the means to use the early railroad rails as polarized, telegraph lines. After some years and a lot of copper mining there was enough wire to build telegraph lines from coast to coast.

Since that time no single force has had more impact on our society than the communications field. The reality that looms ahead is the knowledge that it will evolve even further.

In Retrospect

We used every form of ingenuity to add to or improve those communications systems and skills of yesteryear. Every conceivable device was added to the telegraph relays of that era in an effort to make the sound of the the clickity clack louder.

At the L & N railroad station in Attalla, Alabama, I remember watching Haley Williams, a railroad dispatcher, who used a Prince Albert tobacco can with the lid removed attached to the "sounding" relay to raise the sound level about 10 dB.

I used to marvel at the way Mr. Williams could copy telegraph with a pencil in his right hand, while he relayed the same message up the line with his left hand, and at 15 to 20 wpm (seems Al Renfro did that, but the hands were reversed) using a hand key.

CW Learned From The Masters

I can still hear the marks and spaces. Yes, I said, "marks and spaces." I relate to CW as the beginning of the digital communications era. From the clack (long hold, dash) to the click (short hold, dot), this was the signal on, signal off wireless method called CW.

Between these two worlds of communications lie the vast amounts of trial and retrial, test and retest, experimenting and more experimenting, stepping from telegraph to teletype TM (called TTY in the early days), where the mark and space was controlled by a current-on, current-off loop, to the later wireless adaptation of RATT (RATT, the abreviation for Radio Amateur TeleType), now known as RTTY.

Working The Second And Third "Shifts"

In the early days 60 words per minute (wpm) was the industry standard. RTTY/AFSK has largely been 2125 Hz to 2295 Hz with a 170 Hz shift. The demands for greater speed and better methods of data transmission have caused a need for greater shifts between the Mark and Space. Although it would seem the reverse, for speed reasons, the larger shift is necessary for the modulating and demodulating circuits to detect the change in tone and shift as the speed increases, thereby converting the analog tones to digital pulses. In turn they are shifted to 7- or 8-bit characters.

I hope you are beginning to grasp the reason why we have 170 Hertz (Hz) shift for RTTY; 60 and 100 wpm, 200 Hz shift for 300 baud; and 1000 Hz shift for 1200 baud.

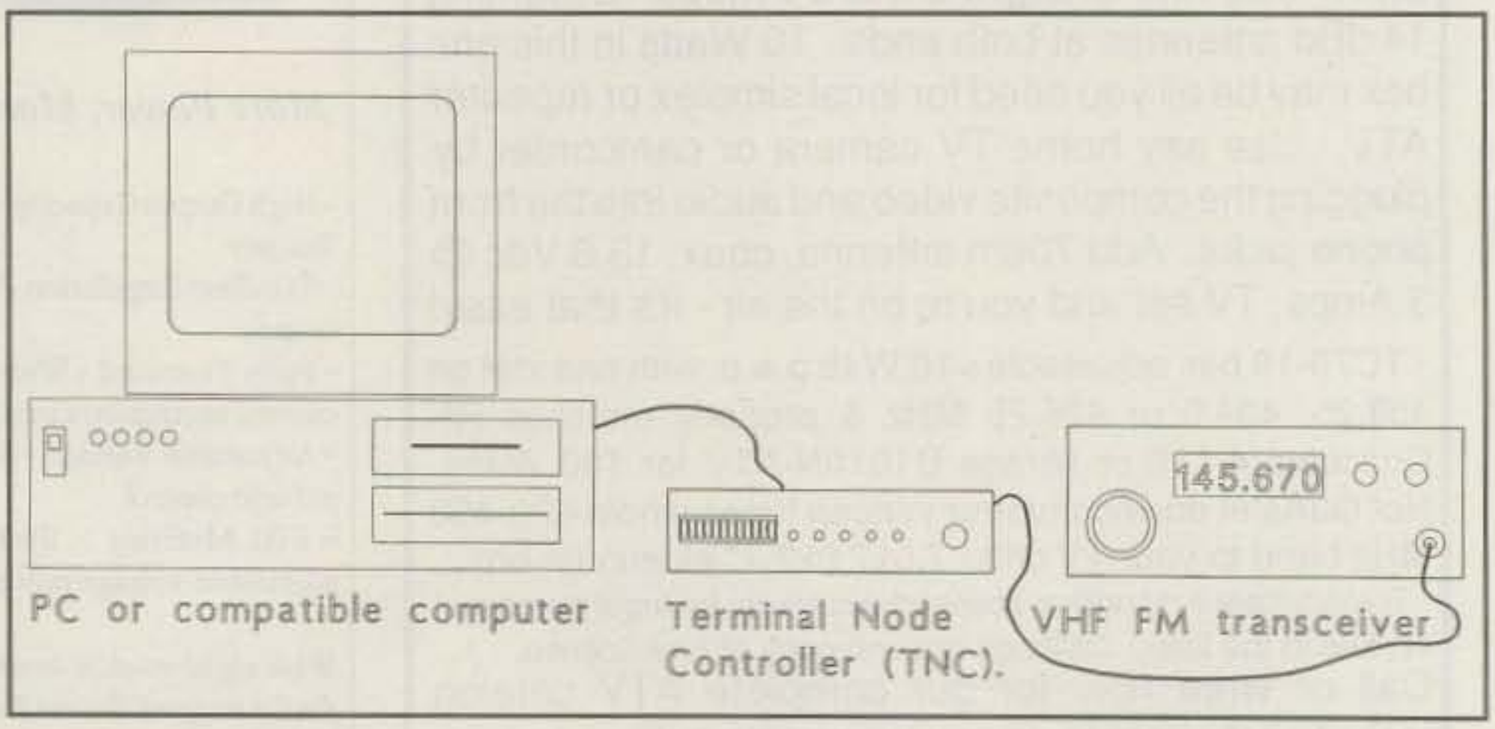

Fig. 1– The basic building blocks of a packet station are a personal computer or dumb terminal, a TNC, and a VHF FM transceiver.

*211 Luenburg Drive, Evington, VA 24550

The standards vary, but for the most part, we will use the following for reference purposes:

RTTY 2125 Hz Mark and 2295 Hz Space
300 baud 1600 Hz Mark and 1800 Hz Space
1200 baud 1200 Hz Mark and 2200 Hz Space

Now for my slip of the typing finger. I want to really start you thinking. Where packet is concerned, it doesn't really matter which tone is used for Mark and which for Space. The packet method of returning ones and zeros is accomplished in a slightly different manner.

A change from one tone to the other renders a "zero," while no change in tone signal gives a "one." This is called NRZI, or Non Return to Zero Inverted, meaning a form of bit coding in which a zero bit causes a change in state, and a one bit will render no change.

Here's To The TAPR Pioneers

Here's to all those founders at VADCA, AMSAT, and TAPR. To the CCITT, the Petes, the Bedales, the Toms, and the Howies—the list can go on and on, as there are hundreds who contributed to the best mode of on-voice communications to date, a mode of communications that has surpassed the use of analog voice communications. Oh, yes, just look at the modem attached to your phone, look at the TNC connected to your computer, look at the data on the E-mail system of your company, and that's just for openers. See the encrypted signal from your satellite TV. Digital communications is a worldwide phenomenon, and we are at the hub of this innovation.

Where are we in this complex region of communications called packet? And why have I given you all this background in digital communications? Well, I really want the newcomer to packet radio to love it and enjoy it as much as I do. Moreover, I felt that some history of this wonderful mode of communications might enhance your appreciation of packet.

Welcome To The World of Digital Communications

To the newcomer this will be "required reading" as you take the first step into the fascinating hobby of packet radio. The packet user who has been around for awhile will also find many interesting points and suggestions which you may have overlooked as you moved up through the ranks of packet radio.

Largely developed by AT&T for use in switching or branching communications networks, it was later found to be useful in passing data across country to and from mainframe and host computers to terminals in remote areas. The database would be located in the "mainframe," or host, while the terminal would go on-line and "time share" the database. Meanwhile, other users awaited their turn at the database.

Through a need, or better yet, a requirement, to serve more customers, an error-checking flag was introduced into each field; thus we have the beginning of a "packet" network. As a result, more terminals could be added to the host network and more subscribers could then be served.

We are beginniing to learn the meaning of the "labels" HDLC, NRZI, TCP/IP, CCITT, and the many link layer protocols which are part of the networking schemes used in packet radio. For the moment let's learn to enjoy packet for what it is without complicating our enjoyment of this wonderful hobby.

The Egg Called "CW" Came First

Now that we have put to rest the "chicken and the egg theory," it's time to connect our Packet Assembler/Disassembler (PAD). The PAD is what the TNC was known as in the early days of packet. All packet users now know it as the Terminal Node Controller, or TNC.

Some TNC manufacturers provide a

small wall transformer power supply with the TNC. If you are using a VHF radio which uses an external "regulated" 12 volt DC supply and your TNC also uses 12 volts DC, then I recommend using the "regulated" supply to power the TNC. Remember to observe the proper polarity.

If at all possible, start out on packet using VHF. You will understand why as we make the transition to HF packet. Briefly, VHF will not require tuning the receiver around until the packets begin printing.

While preparing for packet operation, you must decide on the type and model of computer terminal you plan to use. Will it be a computer you can later use as you grow into the more advanced levels of packet such as digitized color pictures and digitized voice? Another consideration is will it have a buffer large enough to allow you to send and receive binary or ASCII files. Will it support "customized" packet terminal programs such as MultiCom, PacFile, KANTERM, PakRATT, PKGOLD, LANLINK, AUTOTERM, BuxTERM, etc.?

In my station I use several kinds of computers, and I try to use the best possible terminal program available. In any case, you should select a terminal program that will make your future packeting easier. Some programs are so complicated that it takes a document an inch thick to explain their use. You will find with time and experience that it is good to choose a terminal program that also allows you to change the ABaud communications without having to reboot the system.

Questions I Hear Most

Once you begin operating packet, you will ask yourself, "What did I do before packet?" Here I hope to answer some of the most often asked questions I hear. The first one is a two-part question.

Q. What is ABaud, and what is the difference between ABaud and HBaud?

A. ABaud is the data speed of the serial I/O communications port of your computer or terminal to your TNC. In most cases and where the terminal will permit, the ABaud rate should be set equal to or greater than the HBaud rate. ABaud is the terminal-to-TNC baudrate, and HBaud is the station-to-station baudrate.

The HBaud setting depends on the amateur band of operation. At present the FCC rules limit us to 300 bps HBaud below 28 MHz. Above 28 MHz we use 1200 to 19,200 bps HBaud, and above 225 MHz we go as high as 56 kb HBaud.

Most operation on 28.105 MHz is still 300 bps, but above 28.150 you will find 1200 and 2400 bauds. At 28.195 there are several HF 1200 baud nodes across the USA.

Q. How can I keep the incoming packet from the station to which I'm connected from appearing in the middle of the current message I'm typing?

A. Two ways. Either use a "split-screen" terminal program, or set the FLOW command to ON. If a split-screen terminal program is used, set the FLOW command to OFF.

Q. I am just beginning, and I don't know the correct settings to use in my TNC. What do you use?

A. If you are just getting into packet radio, you certainly don't want to use the same TNC configuration I use. I have built "macros" (key-stroke multipliers) which allow me to have several setups for my TNC. For the initial setup of your TNC, make as few changes as possible to the parameters. In fact, most TNCs come with everything defaulted to settings that allow communications as soon as you input your callsign. If you only want to monitor for a while, before you jump into the middle of the activity, you should set the MONITOR command to ON (MON ON).

Q. How can I tell which route the local stations are using to connect to the out-of-town stations?

A. Set the MRPT and the MCOM command to ON. This will allow your TNC to collect the "path" information and display it on the receiving screen for you to study. Make notes of the various paths as you become familiar with their orgin and destination. You will later find these "path

maps" useful in building your own routing tables.

Q. What is a "node/digipeater"?

A. Once you get your station on the air, you will discover a command "digipeat," and chances are it will be ON. All packet stations are capable of "digipeating."

A digipeater is a packet relay station. It is similar to a voice repeater, except it does not require expensive duplexers or dual antennas. The digipeater is a TNC and a transceiver (see fig. 1).

Q. How can I find the calls of the local digipeaters?

A. Two ways: call a packeteer friend, or better yet, set the command MBeacon to ON. Digipeaters sometimes send out a "beacon" after they see a disconnect command pass through. This beacon will become visible to you with the MBeacon command on. Again, keep a record of these "digis" for future use.

Packet Commands

There will be some variation in the command structures of different TNC models, makes, and types, but the functions will be the same. You should try to make your first step into packet from the 2 meter (VHF) band. This will help you to cope one by one with situations that arise. HF tends to confront the newcomer with too many problems. These can be eliminated by first learning the procedures on the VHF bands. You need to become familiar with terms associated with data communications, and how each definition describes our equipment. Look at fig. 1. This will define the equipment and its function, or role, in the packet system.

The chain of events taking place in the terminal (DTE) to TNC (DCE) loop is more than we can conceive of at the moment. To bring the data stream into perspective,

we should look at the loop as if it were several cars meeting at each end of a one-lane bridge. There must to be a way to develop a method to this madness. Let's pretend we have a "traffic cop" placed at each end of this bridge. They have a communications link with each other. Enter hardware handshaking!

The cars represent the data, the bridge is the RS-232 buss, and the policemen are the RTS and CTS pins. Oh, yes. We need to define the hardware handshaking process. Most, if not all, TNCs can use hardware handshaking. This requires a five-wire cable from the DTE to DCE. The standard PC or clone to modem/TNC, RS-232 pin numbers, and descriptions are defined below:

Pin	Description	Pin #
2	TXD Transmit data	2
3	RXD Receive data	3
4	RTS Request to Send	4
5	CTS Clear to Send	5
7	SG Signal Ground	7

The car on the left end of the bridge (DTE) needs to go first, because this is the DTE "connect" packet or data stream. The left-end policeman (pin 4) "requests," or asks the policeman on the right end if it is okay to send a car across. The policeman (pin 5) on the right end of the bridge signals to the cars on his side to wait, and he then gives a "clear" to send the car across. This request and clear process continues on and on, until there are no longer any requests from either end. Likewise, we are assured of an orderly passage of data information to and from the DTE and DCE. With hardware handshaking and using the PACFILE terminal program, I configure my terminal (DTE) to TNC (DCE) data communications in the following manner:

Baudrate—9600
Parity—NONE
Stop Bits—1
Data Bits—8

Duplex depends on the setting of my ECHO command. If I am using a split screen, or program with type-ahead capability, then I set the ECHO OFF.

If double letters appear on the screen while inputing data, again set the ECHO command to OFF. By now you are ready to connect your DTE and DCE to the radio.

One of the manufacturing mistakes is the default setting of the TXDelay command. The TXDelay is that period of time between the transmitter PTT activation and actual packet intellegence being sent from the TNC to the transceiver. Most TNC vendors set this parameter far too short. First of all, we may find the transceiver we use is a PLL (phase locked loop) with a 100 millisecond lock-up time. The transmitter may take another 100 milliseconds to come to full power output. If a linear amplifier is in line, this requires another 60 milliseconds. If it is bilateral (has built-in RF pre-amp), then an additional 40 milliseconds is required. Here we stop and look at the default settings and find them set to 30. Each increment of one (1) represents 10 millseconds. Already we find we are in trouble. We total our requirements and find a need in excess of 300 milliseconds.

At once we see we must change the TXDelay to at least 35, or 350 milliseconds ($35 \times 10 = 350$ ms). If you find yourself "retried out" and unable to account for the reason why, you may try setting the TXDelay to 40. Try to find the "happy medium" and leave it there. Setting the TXDelay too long can add to the number of collisions on the frequency. If everyone on the same frequency added extra or unnecessary TXDelay, you would soon see the reason why I advise using only what you need and no more.

Unless you are setting up a digipeater on a mountaintop, leave the DWait command as is. Enough said. I recommend setting the MCON command to OFF. This will assure that you receive only the packets directed to your station after making a "connect." For the first-time user, the MONitor command ON and the MCOM ON can be used to your advantage by watching the paths and packet procedures which are being used by other packet stations.

There are three "states" of packet operation with regard to actual on-the-air use. They are the command, or CMD:, state, the Converse state, and the Transparent state.

As it implies, the Command state is where all commands are issued—i.e., connect, disconnect, or changes to any of the TNC "personality" parameters. The CONMODE should be set, if not defaulted, to CONVERSE.

If you find yourself in the Transparent state and unable to return to the Converse state, there are three ways to get yourself out. First try holding the Control key down while pressing the "C" key three times. Do not press <enter>. The second way to get out of Transparent is by receiving a Disconnect from a "connected" station. The third way is the easy way: Turn the TNC off and back on; this works every time.

The Initial Packet Connect

For your first contact on packet I suggest using the "direct" method. That is, connect directly to a station without using a digipeater. For example, if we were close enough to communicate directly, you would issue a Connect request from the Command state in this manner:

CMD:C K4ABT<enter>

If the connect request is properly executed, and if I am on the air, you would see this screen message appear almost immediately:

CMD: *** CONNECTED TO K4ABT

From here we would enter into a packet dialog. Well, that is, we would as soon as you got over the sudden rush of joy and excitement with your first packet connection. I really enjoy being the first connect station for some of the newcomers. Even the seasoned amateurs who experience packet for the first time seem to relate it to their first contact via CW. The reason I like to be the first connect is the long pause which occurs just after they see the:

CMD: *** Connected to K4ABT

I patiently wait as the new packeteer looks at the screen which displays that first packet connect. I know the warm and fuzzy feeling that is being experienced at the other end of this link. I want that new packeteer to savor every bud of flavor from this moment. To that new packeteer at the other end of the link this is "high-tech ecstasy."

Packet radio is so much fun that it becomes one of those nice things in life which you want to share with others. You find yourself trying to recruit more of your friends into this new wave of communications, and you become involved in other ways to participate, such as digitized voice or digitized pictures.

Having fun already . . .

73, BucK4ABT @ WD4ELJ.VA.USA

Ameritron *no tune* Solid State FET Amplifier

No tuning, no fuss, no worries -- just turn on and operate . . . Incredibly low $1299 includes AC power supply, 700 Watts output, continuous 1.5-22 MHz coverage, instant bandswitching, no warm up, no tubes to baby, fully SWR protected, extemely quiet, very compact

- **Ameritron's** *revolutionary* ALS-600 is amateur radio's *only* linear amplifier that uses four rugged TMOS RF power FETs -- gives unequaled *no tune* solid state performance
- **$1299 includes** Ameritron's *no tune* FET Amplifier *and* a 120/220 VAC, 50/60 Hz AC power supply for home operation

ALS-600
$1299
Suggested Retail
(*Includes* AC Power Supply)

- **Instant bandswitching, no tuning, no warm up** -- just turn on and operate
- **Output Power** -- 700 Watts PEP, 500 Watts CW
- **Continuous Coverage** -- 1.5 to 22 MHz; 10/12 Meters with easy-to-install optional kit
- **SWR Protection** -- prevents amplifier damage if you switch to wrong band, use wrong antenna or have high SWR
- **Over Power Protection** -- if output forward power or reflected power exceeds safe level, output power is automatically reduced to prevent amplifier damage by controlling ALC to exciter
- **Extremely quiet** -- low speed, low volume fan is so quiet you'll hardly know it's there, unlike noisy blowers used in other amps
- **Very Compact** -- 6 x 9½x12 inch amplifier takes up less desktop space than your transceiver and weighs about the same -- only 12½ pounds
- **Illuminated Cross-Needle SWR/Wattmeter** -- lets you read SWR, forward and reflected *peak* power simultaneously
- **Operate/Standby Switch** -- lets you run "barefoot", but you can instantly switch to full power if you need it
- **Front Panel ALC Control** -- *exclusive* Ameritron feature -- convenient front panel control lets you adjust your output power
- **Transmit, ALC, SWR LED indicators** -- keeps you informed
- **12 VDC output jack** -- lets you power low current accessories
- **Separate** ALS-600PS power supply (included) can be placed conveniently out of the way and plugged into your nearest 120 VAC outlet -- no special wiring needed
- **Made in USA**
- **Enjoy** 700 Watts of *no tune* solid state power. Call your favorite dealer for your best price and order your ALS-600 with power supply today

ALS-600PS Heavy Duty Power Supply

ALS-600PS power supply included with ALS-600 amplifier

- **Massive choke input filter** greatly improves voltage regulation and reduces peak AC line current • **Ameritron's** exclusive *Multi-Voltage Power Transformer* lets you compensate for stressful high line voltage and performance robbing low line voltage • ***Step-Start Inrush Protection***™ stops damaging inrush currents and extends life of power supply components • **Illuminated** Cross-Needle Meter monitors voltage and current of 50 VDC line • **Extremely** quiet fan • **Very compact** 6 x 9 ½ x12 inches -- can be placed conveniently out-of-way • **Wired for 120 VAC,** supplies 50 VDC at 25 amps to ALS-600 amplifier • **Also** use on 100-130 VAC and 220-250 VAC, 50/60 Hz • **Draws** less than 12 amps at 100 VAC and less than 6 amps at 230 VAC • **Includes prewired cable** to plug into ALS-600 amplifier • **Made in USA**

Ameritron Mobile *no tune* Solid State Amplifier

Ideal mobile amplifier -- ***uses 13.8 VDC mobile electrical system, very compact 3½x9x15 inches, extremely quiet, 600 Watts output, continuous 1.5-22 MHz coverage, instant bandswitching, no tuning, no warm up, SWR protected***

ALS-500M
$799
Suggested Retail

- **Mobile *no tune* Solid State Amplifer** -- uses four rugged 2SC2879 high power linear RF power transistors
- **Instant bandswitching, no tuning, no warm up** -- just turn on and operate -- makes mobile QSOs safer
- **Very Compact** -- just 3½x9x15 inches -- fits in nearly any mobile installation; weighs only 7 pounds, that's less than some mobile HF transceivers
- **Extremely quiet** --quiet low speed, low volume fan stays off and silent until temperature rises
- **Output Power** -- 600 Watts PEP, 400 Watts CW
- **Continuous Coverage** -- 1.5 to 22 MHz; 10/12 Meters with easy-to-install optional kit
- **Load Fault Protection** -- disables and bypasses amplifier if antenna has excessively high reflected power or if bandswitch is set lower than exciter frequency -- virtually eliminates damage because of operating error; has Load Fault LED indicator
- **Thermal Overload Protection** -- disables and bypasses amplifier if temperature is excessively high; automatically resets when temperature drops to safe level; has Thermal Overload LED indicator
- **Excellent harmonic suppression** -- multiple section output network and push-pull output circuit gives excellent harmonic suppression
- **DC current meter** lets you monitor collector current
- **ON/OFF Switch**-- bypasses amplifier for "barefoot" operation without having to disconnect high current power supply cables
- **Remote ON/OFF Control** -- lets you remotely control ON/OFF function for out-of-the-way mounting of amplifier
- **Exciter Drive** -- less than 100 watts input gives full output
- **Power Supply Requirements** -- requires 13.8 VDC at 80 amperes peak current for PA transistors and seperate line for 12-15 VDC at 4 amperes for control and bias circuits
- **Made in USA**
- **Call you favorite dealer** for your best price and order your ALS-500M today

Exact power output of amplifiers may vary on each band.

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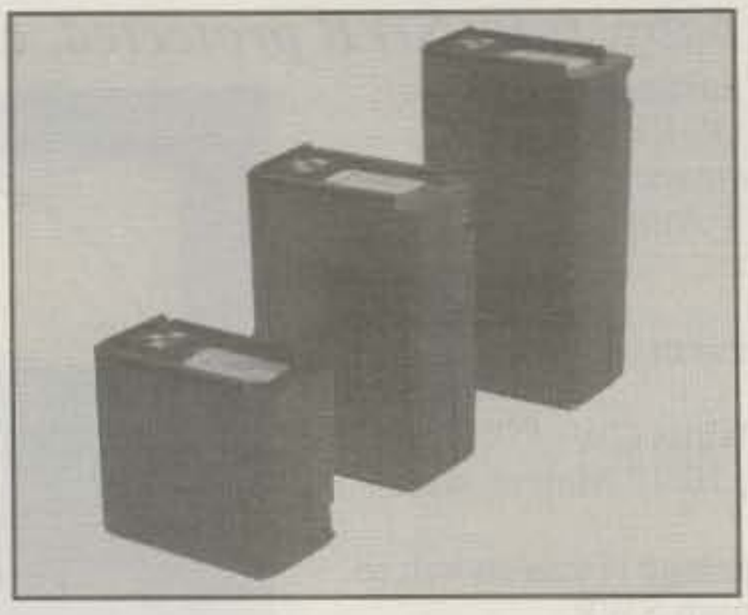
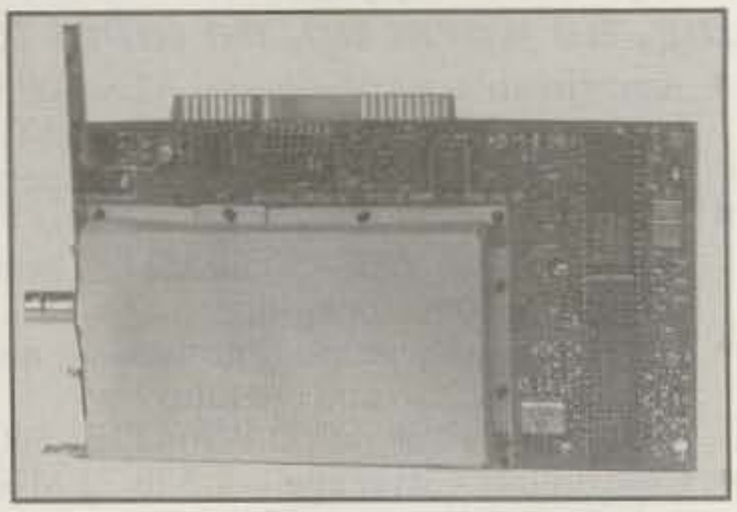
CQ SHOWCASE



Periphex Battery Packs

Periphex has announced battery packs for the Yaesu FT-26, 76, 415, 416, 815, 816, and 530 handhelds. The FNB-25 (7.2 volts, 700 maH), FNB-26S (7.2 volts, 1400 maH) offers a 40% increase in operating time at low power, while the FNB-27S (12 volts, 800 maH) offers a 33% increase in operating time at 5 watts output. Both superpack batteries are priced at $65 and are 3.75 inches tall. The FNB-25 is priced at $39. Also available are the standard FNB-26 and FNB-27 (3 inches tall) for $60.

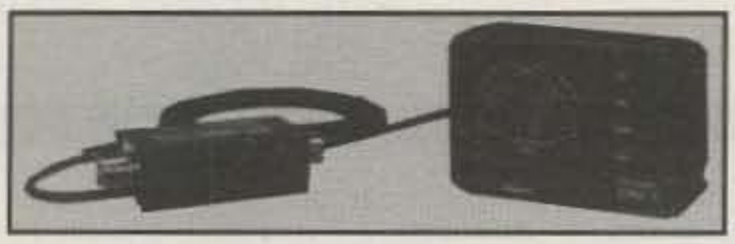
All batteries include include overcharge protection, over temperature protection, short-circuit protection, and a one-year warranty. For more information, contact Periphex, Inc., 115-1B Hurley Road, Oxford, CT 06478 (203-264-3985), or circle number 102 on the reader service card.



PKT PC Packet Station

PKT Electronics has announced the "PC Packet Station," which features a complete packet station containing the software, modem, and a 5 watt, 2 channel, VHF, Motorola transceiver on an IBM PC half card. The product has the VHF antenna connector, earphone jack, squelch adjust, and receive level adjust on its IBM PC bracket. As the radio is on the card and everything is preadjusted, just plug in the card, load the customized Bay Com software, enter your call into the configuration file, and add a VHF antenna (not provided). The PC Station can also be used in any IBM PC (or compatible) portable that has a standard half slot available.

The PC Packet Station is priced at $419. For more information, contact PKT Electronics, 2668 Haverstraw Avenue, Dayton, OH 45414 (513-454-0242), or circle number 101 on the reader service card.



Comet's Cross Needle SWR/Power Meter

Comet's Cross Needle SWR/Power Meter has the meter separate from the RF Sensor. Three models are available for high power HF, low power HF/VHF, and low power VHF/UHF. The Cross Needle design provides Forward and Reflected Power, and VSWR simultaneously.

Each model provides three switch selectable power ranges (30/300/2KW on CMX-1, 20/50 200W on CMX-2 and CMX-3). A fourth switch is available to measure DC voltage from the power supply or vehicle.

The CMX Meter Series is designed for mobile operation with the newer multi-band, remote head mobile rigs. Each meter comes with a six foot cable allowing placement of the Meter head near rig's remote head, and the Sensor near the rig itself. An optional ten foot extension (EKS-3) is also available. For additional information call NCG Company at 800-962-2611, or circle number 110 on the reader service card.

S & S Engineering ARK20 Transceiver Kit

S & S Engineering's ARK20 synthesized QRP transceiver can be used during field day, DXpeditions, camping trips, business trips or in the home shack. The transceiver covers the CW portion of the 20 meter band and tunes in 100 Hz steps. RIT and a 200 Hz wide audio filter are selectable from the front panel.

The kit is complete with all parts, silkscreened front and rear panels, and an extruded, anodized aluminum case. It operates from 11 to 13.8 VDC and provides 3–4 watts of RF power. Output power is adjustable to milliwatt levels. Dimensions are 2 3/4" x 5 1/2" x 8"; weight is less than 4 lbs. The ARK20 is available for $269.95. For more information, contact S&S Engineering, 14102 Brown Road, Smithsburg, MD 21783 (301-416-0661), or circle number 108 on the reader service card.

The Wireman, Inc. X-4XL Coax Cable

The Wireman, Inc. has introduced the X-4XL family of cable. The X-4XL cable offers a double shield (–90dB); an 89% VP and 23pf capacitance; and 50 ohm impedance. The shield is bonded aluminum plus 95% tinned copper and the jacket is black polyethylene. For further information, contact The Wireman, Inc., 261 Pittman Road, Landrum, SC 29356 (800-433-9473 or FAX 803-895-5811), or circle number 109 on the reader service card.

PROPAGATION

BY GEORGE JACOBS, W3ASK

THE SCIENCE OF PREDICTING RADIO CONDITIONS

DX Contest Special

The 1993 CQ World-Wide DX Contest will be held on the following dates:

SSB: 0000 UTC Sat., Oct. 30 to 2400 UTC Sun., Oct. 31
CW: 0000 UTC Sat., Nov. 27 to 2400 UTC Sun., Nov. 28

For the 44th 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 43 contest is considerably greater than 90 percent!

Despite the continuing steady decline in solar activity, the sunspot count could still be high enough during the 1993 WW DX Contest period to permit relatively good propagation on the amateur HF bands. At the time of this writing, early August, all ionospheric, solar, and geomagnetic factors point to at least Low Normal conditions during the SSB Contest weekend of October 30 and 31, with a good chance that they may climb to High Normal or better on the 31st.

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for October 1993

	Expected Signal Quality			
Propagation Index.....	(4)	(3)	(2)	(1)
Above Normal: 4, 13, 16, 19	A	A	B	C
High Normal: 2, 5-6, 11-12, 18, 29, 31	A	B	C	C-D
Low Normal: 1, 7-8, 14-15, 17, 20-21, 23-24, 27-28, 30	A-B	B-C	D	D-E
Below Normal: 3, 10, 22, 25-26	B-C	C-D	D-E	E
Disturbed: 9	C-E	D-E	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 Oct. 1st, good (B) on the 2nd, fair-to-poor (C-D) on the 3rd, excellent (A) on the 4th, good (B) on the 5th and 6th, etc. During the CQ WW DX SSB Contest weekend conditions will be fair (C) on the 30th and good (B) on the 31st.

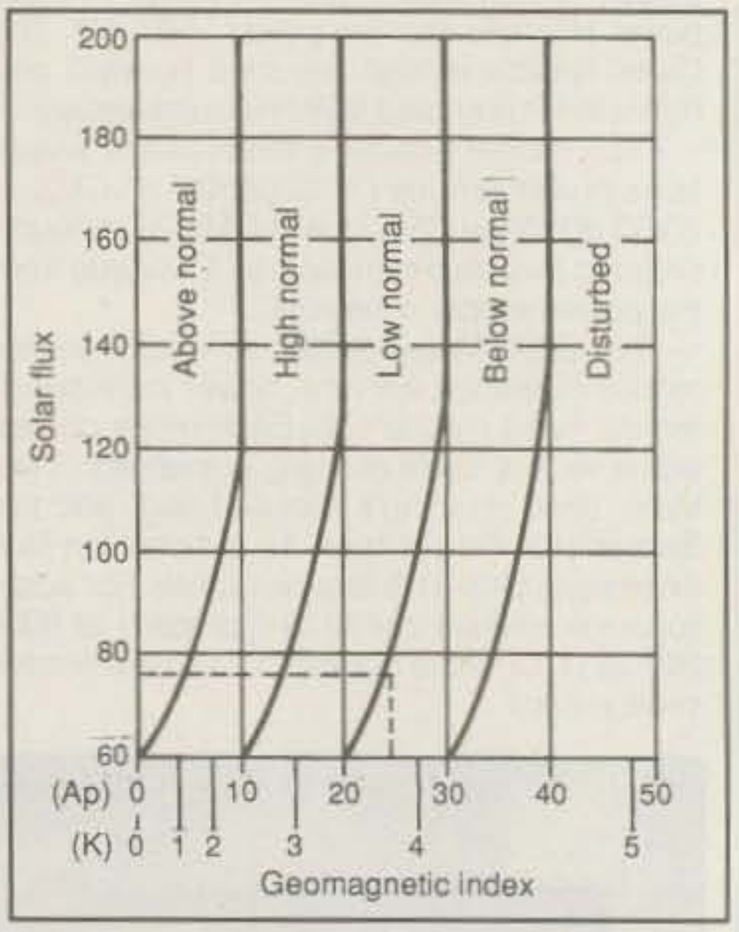


Fig. 1– Intersection of given values of solar flux and geomagnetic activity determine expected HF ionospheric propagation conditions. (Example: Solar flux is 75 and Ap is 25; therefore, expect Below Normal conditions.)

Solar Count For 1993 CQ WW DX Contest

The Royal Observatory of Belguim reports a monthly mean sunspot count of 49.1 for June 1993. This results in a smoothed sunspot number of 73 centered on December 1992. Corresponding values of 10.7 cm solar flux were 109 for June 1993 and a smoothed level of 127 for December 1992. The solar flux levels are those reported by the Dominion Radio Astrophysical Observatory at Penticton, B.C., Canada.2

Cycle 22 is expected to continue to decline slowly but steadily. Smoothed sunspot counts in the lower 50s are forecast for October and November 1993. This would be approximately 25 numbers lower than the mid-70s range which occurred during last year's WW DX Contest period. Solar flux levels in the 110 range are expected. The decline in solar activity will be most noticeable on the 10 and 15 meter bands during the daylight hours. While these bands are not expected to open as often or as good as they did during WW Contest periods of the past several years, solar activity is expected to be high enough to permit a considerable amount of DX activity on these bands during the 1993 WW Contest period. This year, however, will very likely be the last year during Cycle 22 in which these bands will see such activity. By the 1994 WW Contest period Cycle 22 is expected to decline to where few openings will occur on 10 meters, and a considerable reduction in DX openings will be noticeable on 15 meters. Even less attractive DX conditions are expected for the 1995, 1996, and 1997 WW Contest periods!

A long-range *CQ* day-to-day forecast based primarily on the 27-day recurrence tendencies of geomagnetic, solar, and ionospheric conditions indicates a high probability of at least Low Normal propagation conditions during the SSB Contest weekend of October 30 and 31. There is a good chance of conditions increasing to High Normal or better to many areas of the world, particularly on October 31st. At the time of writing there seems to be little chance of a radio storm developing during the SSB Contest weekend. 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.

Expect another good CQ World-Wide DX Contest during 1993, as long as Mother Nature doesn't produce a surprise radio storm!

A more detailed discussion of DX expected during the contest periods on a band-by-band basis follows.

General Conditions Band By Band

The following is a band-by-band summary of general DX propagation conditions that can be expected during the 1993 contest period.

11307 Clara Street, Silver Spring, MD 20902

HOW TO USE THE DX PROPAGATION CHARTS

1. Use Chart approprate to your transmitter location. The Eastern USA Chart can be used in the 1, 2, 3, 4, 8 KP4, KG4 and KV4 areas in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9 and 0 areas; the Western USA Chart in the 6 and 7 areas, and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (10 through 80 Meters) for a particular DX region, as shown in the left-hand column of the Charts. An * indicates the best time to listen for 160 meter openings.

3. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of *days* during the month on which the opening is expected to take place as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual *dates* on which an opening with a specific *propagation index* is likely to occur, and the signal quality that can be expected.

4. Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. Appropriate *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 c.w., or 1 kw, p.e.p. 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.

October 15 to December 15, 1993 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	08-09 (1) 09-11 (2) 11-13 (1)	06-07 (1) 07-08 (2) 08-09 (3) 09-11 (4) 11-12 (3) 12-13 (2) 13-15 (1)	04-05 (1) 05-06 (2) 06-07 (3) 07-09 (4) 09-10 (3) 10-12 (2) 12-13 (3) 13-15 (4) 15-16 (3) 16-18 (2) 18-21 (1)	16-17 (1) 17-18 (2) 18-20 (3) 20-01 (4) 01-02 (3) 02-03 (2) 03-04 (1) 19-21 (1)* 21-23 (2)* 23-01 (3)* 01-02 (2)* 02-03 (1)*
Northern Europe & European USSR	08-11 (1)	07-08 (1) 08-10 (3) 10-11 (2) 11-12 (1)	04-06 (1) 06-07 (2) 07-09 (3) 09-11 (2) 11-13 (3) 13-14 (2) 14-16 (1)	17-19 (1) 19-02 (2) 02-04 (1) 20-03 (1)*
Eastern Mediterranean & Middle East	08-09 (1) 09-10 (2) 10-12 (1)	07-08 (1) 08-09 (2) 09-11 (3) 11-12 (2) 12-13 (1)	06-10 (1) 10-13 (2) 13-14 (3) 14-16 (4) 16-17 (3) 17-20 (2) 20-23 (1) 23-01 (2) 01-02 (1)	18-20 (1) 20-22 (2) 22-00 (3) 00-01 (2) 01-02 (1) 20-00 (1)*
West & Central Africa	08-10 (1) 10-12 (2) 12-14 (3) 14-15 (2) 15-16 (1)	07-10 (1) 10-12 (2) 12-13 (3) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	04-05 (1) 05-07 (2) 07-13 (1) 13-15 (2) 15-16 (3) 16-17 (4) 17-20 (3) 20-22 (2) 22-01 (1)	18-22 (1) 22-01 (2) 01-03 (1) 00-03 (1)*
East Africa	09-11 (1) 11-13 (2) 13-15 (1)	07-11 (1) 11-13 (2) 13-16 (3) 16-17 (2) 17-18 (1)	07-14 (1) 14-16 (2) 16-20 (3) 20-00 (2) 00-01 (1)	19-22 (1) 22-00 (2) 00-01 (1) 22-00 (1)*
South Africa	08-09 (1) 09-10 (2) 10-12 (3) 12-13 (2) 13-14 (1)	07-10 (1) 10-12 (2) 12-15 (3) 15-16 (2) 16-18 (1)	07-13 (1) 13-15 (2) 15-17 (3) 17-19 (2) 19-22 (1) 22-01 (2) 01-02 (1)	18-19 (1) 19-22 (2) 22-23 (1) 19-21 (1)*
Central & South Asia	08-10 (1) 17-19 (1)	07-10 (1) 17-20 (1)	06-07 (1) 07-09 (2) 09-12 (1) 19-22 (1)	18-21 (1) 06-08 (1)
Southeast Asia	09-12 (1) 17-20 (1)	08-12 (1) 18-20 (1)	06-07 (1) 07-09 (2) 09-13 (1) 18-22 (1)	18-20 (1) 05-07 (1)
Far East	08-10 (1) 17-20 (1)	08-10 (1) 16-17 (1) 17-19 (2) 19-20 (1)	02-04 (1) 06-07 (1) 07-09 (2) 09-12 (1) 16-19 (1) 19-22 (2) 22-00 (1)	04-08 (1) 05-07 (1)*
South Pacific & New Zealand	09-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	07-08 (1) 08-10 (2) 10-14 (1) 14-15 (2) 15-17 (3) 17-19 (2) 19-20 (1)	04-06 (1) 06-07 (2) 07-09 (4) 09-11 (2) 11-17 (1) 17-18 (2) 18-21 (3) 21-02 (2) 02-04 (3)	00-03 (1) 03-05 (3) 05-07 (2) 07-09 (1) 03-04 (1)* 04-06 (2)* 06-07 (1)*
Australasia	09-12 (1) 14-16 (1) 16-17 (2) 17-18 (1)	08-10 (1) 10-13 (2) 13-15 (1) 15-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	05-06 (1) 06-07 (2) 07-09 (3) 09-10 (2) 10-15 (1) 15-17 (2) 17-19 (1) 19-20 (2) 20-22 (3) 22-00 (2) 00-03 (1)	03-05 (1) 05-07 (2) 07-08 (1) 05-07 (1)*
Northern & Central South America	07-09 (1) 09-11 (2) 11-13 (3) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	06-07 (1) 07-09 (2) 09-14 (3) 14-16 (4) 16-18 (3) 18-19 (2) 19-20 (1)	07-09 (4) 09-11 (3) 11-14 (2) 14-16 (3) 16-19 (4) 19-22 (3) 22-02 (2) 02-06 (1) 06-07 (2)	18-19 (1) 19-21 (3) 21-03 (4) 03-05 (2) 05-06 (1) 19-21 (1)* 21-03 (2)* 03-05 (1)*
Brazil, Argentina, Chile & Uruguay	08-09 (1) 09-13 (2) 13-15 (3) 15-16 (4) 16-17 (2) 17-18 (1)	07-08 (1) 08-10 (3) 10-14 (2) 14-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	14-16 (1) 16-17 (2) 17-18 (3) 18-20 (4) 20-22 (3) 22-02 (2) 02-06 (1) 06-09 (2) 09-11 (1)	20-23 (1) 23-04 (2) 04-06 (1) 23-04 (1)*
McMurdo Sound, Antarctica	14-17 (1)	06-09 (1) 15-17 (1) 17-19 (2) 19-20 (1)	16-18 (1) 18-20 (2) 20-22 (3) 22-02 (2) 02-06 (1) 06-08 (2) 08-09 (1)	00-06 (1)

**Predicted times of 80 meter openings. Openings on 160 meters are also likely to occur during those times when 80 meter openings are shown with a forecast rating of (2) or higher.*

October 15 to December 15, 1993 Time Zone: CST & MST (24-Hour Time) CENTRAL USA TO:

Reception Area	*10 Meters*	*15 Meters*	*20 Meters*	*40/80* Meters*
Western & Southern Europe & North Africa	08-09 (1) 09-11 (2) 11-12 (1)	06-07 (1) 07-10 (2) 10-11 (3) 11-12 (2) 12-14 (1)	05-06 (1) 06-08 (3) 08-12 (2) 12-15 (3) 15-19 (2) 19-21 (1) 00-02 (1)	17-18 (1) 18-20 (2) 20-22 (3) 22-00 (2) 00-02 (1) 19-20 (1)* 20-22 (2)* 22-00 (1)*
Northern & Central Europe & European USSR	08-10 (1)	06-07 (1) 07-08 (2) 08-09 (3) 09-10 (2) 10-13 (1)	06-07 (1) 07-09 (2) 09-11 (3) 11-13 (2) 13-16 (1) 01-03 (1)	18-20 (1) 20-23 (2) 23-01 (1) 20-23 (1)*

Eastern Mediterranean & Middle East	08-10 (1)	07-09 (1) 09-11 (2) 11-12 (1)	06-08 (1) 08-11 (2) 11-13 (3) 13-15 (2) 15-17 (1) 17-19 (2) 19-22 (1) 01-03 (1)	17-19 (1) 19-22 (2) 22-23 (1) 20-22 (1)*
West & Central Africa	08-09 (1) 09-12 (2) 12-14 (3) 14-15 (2) 15-16 (1)	06-10 (1) 10-12 (2) 12-14 (3) 14-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	06-12 (1) 12-14 (2) 14-15 (3) 15-17 (4) 17-20 (3) 20-22 (2) 22-02 (1)	17-19 (1) 19-21 (2) 21-22 (1) 19-21 (1)*
East Africa	09-10 (1) 10-12 (2) 12-14 (1)	08-10 (1) 10-13 (2) 13-15 (3) 15-16 (2) 16-18 (1)	06-14 (1) 14-17 (2) 17-20 (3) 20-21 (2) 21-22 (1)	20-00 (1) 21-23 (1)*
South Africa	08-09 (1) 09-10 (2) 10-12 (3) 12-13 (2) 13-14 (1)	07-10 (1) 10-12 (2) 12-15 (3) 15-16 (2) 16-17 (1)	07-13 (1) 13-15 (2) 15-17 (3) 17-20 (2) 20-22 (1) 22-00 (2) 00-02 (1)	18-19 (1) 19-21 (2) 21-22 (1) 19-21 (1)*
Central & South Asia	07-10 (1) 19-21 (1)	07-10 (1) 17-18 (1) 18-21 (2) 21-22 (1)	06-07 (1) 07-09 (2) 09-11 (1) 17-18 (1) 18-21 (2) 21-22 (1)	06-08 (1) 18-20 (1)
Southeast Asia	09-12 (1) 16-18 (1)	09-12 (1) 14-16 (1) 16-18 (2) 18-20 (1)	06-08 (1) 08-11 (2) 11-14 (1) 18-19 (1) 19-21 (2) 21-22 (1)	04-07 (1)
Far East	15-16 (1) 16-18 (2) 18-19 (1)	08-10 (1) 15-16 (1) 16-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	06-07 (1) 07-08 (2) 08-10 (3) 10-12 (1) 16-18 (1) 18-20 (2) 20-22 (1)	02-03 (1) 03-06 (2) 06-09 (1) 02-04 (1)*
South Pacific & New Zealand	11-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	08-09 (1) 09-11 (2) 11-14 (1) 14-16 (2) 16-17 (3) 17-18 (4) 18-19 (3) 19-20 (2) 20-21 (1)	06-07 (1) 07-09 (3) 09-11 (2) 11-17 (1) 17-18 (2) 18-19 (3) 19-21 (4) 21-22 (3) 22-00 (2) 00-02 (1)	23-01 (1) 01-06 (3) 06-07 (2) 07-08 (1) 00-02 (1)* 02-06 (2)* 06-07 (1)*
Australasia	09-12 (1) 14-15 (1) 15-17 (2)	08-09 (1) 09-11 (2) 11-15 (1)	17-19 (1) 19-21 (2) 21-23 (3)	02-04 (1) 04-07 (2) 07-08 (1)

	17-18 (1)	15-16 (2) 16-18 (3) 18-19 (2) 19-20 (1)	23-02 (2) 02-04 (3) 04-05 (2) 05-07 (1) 07-08 (2) 08-10 (3) 10-12 (2) 12-14 (1)	03-04 (1)* 04-06 (2)* 06-07 (1)*
Northern & Central South America	07-09 (1) 09-11 (2) 11-13 (3) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	06-07 (1) 07-08 (2) 08-14 (3) 14-16 (4) 16-18 (3) 18-19 (2) 19-20 (1)	06-07 (2) 07-09 (4) 09-11 (3) 11-13 (2) 13-15 (3) 15-19 (4) 19-22 (3) 22-01 (2) 01-06 (1)	18-19 (1) 19-21 (2) 21-02 (3) 02-04 (1) 04-05 (2) 05-06 (1) 19-21 (1)* 21-02 (2)* 02-05 (1)*
Brazil, Argentina, Chile & Uruguay	08-09 (1) 09-12 (2) 12-14 (3) 14-16 (4) 16-17 (2) 17-18 (1)	07-08 (1) 08-10 (2) 10-12 (1) 12-14 (2) 14-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	02-06 (1) 06-08 (2) 08-14 (1) 14-16 (2) 16-17 (3) 17-20 (4) 20-22 (3) 22-02 (2)	19-21 (1) 21-01 (2) 01-03 (1) 03-04 (2) 04-05 (1) 21-04 (1)*
McMurdo Sound	14-17 (1)	07-10 (1) 15-17 (1) 17-19 (2) 19-20 (1)	16-18 (1) 18-20 (2) 20-00 (3) 00-02 (2) 02-06 (1) 06-08 (2) 08-10 (1)	23-05 (1)

October 15 to December 15, 1993
Time Zone: PST (24-Hour Time)
WESTERN USA TO:

Reception Area	*10 Meters*	*15 Meters*	*20 Meters*	*40/80* Meters*
Western & Southern Europe & North Africa	07-08 (1) 08-10 (2) 10-11 (1)	07-08 (1) 08-09 (2) 09-11 (3) 11-12 (2) 12-13 (1)	05-06 (1) 06-08 (2) 08-10 (1) 10-12 (2) 12-14 (3) 14-16 (2) 16-20 (1) 00-02 (1)	18-20 (1) 20-22 (2) 22-00 (1) 19-23 (1)*
Central & Northern Europe & European USSR	07-09 (1)	07-08 (1) 08-09 (2) 09-11 (1)	06-07 (1) 07-11 (2) 11-16 (1) 23-02 (1)	21-00 (1)
Eastern Mediterranean & Middle East	07-10 (1)	07-08 (1) 08-10 (2) 10-11 (1)	06-07 (1) 07-10 (2) 10-14 (1) 14-16 (2) 16-18 (1) 21-23 (1)	18-22 (1) 06-08 (1)
West & Central Africa	08-09 (1) 09-12 (2) 12-14 (1)	06-10 (1) 10-12 (2) 12-15 (3) 15-17 (2) 17-18 (1)	06-10 (1) 10-14 (2) 14-16 (3) 16-18 (4) 18-19 (3) 19-21 (2) 21-23 (1)	18-23 (1)
South Africa	08-09 (1) 09-11 (2) 11-12 (1)	06-10 (1) 10-11 (2) 11-12 (3) 12-14 (4) 14-15 (2) 15-16 (1)	06-12 (1) 12-15 (2) 15-18 (3) 18-20 (2) 20-21 (1) 00-02 (1)	18-19 (1) 19-20 (2) 20-21 (1) 06-08 (1) 18-19 (1)*
East Africa	10-13 (1)	08-12 (1) 12-15 (2) 15-17 (1)	08-13 (1) 13-15 (2) 15-17 (3) 17-19 (2) 19-21 (1)	18-21 (1) 06-08 (1)
Central & South Asia	07-09 (1) 17-19 (1)	16-17 (1) 17-19 (2) 19-20 (1) 07-09 (1)	06-07 (1) 07-09 (2) 09-11 (1) 16-18 (1) 18-20 (2) 20-21 (1)	04-09 (1) 17-19 (1)
Southeast Asia	14-15 (1) 15-17 (2) 17-18 (1)	09-11 (1) 13-15 (1) 15-18 (2) 18-19 (1)	06-07 (1) 07-10 (2) 10-12 (1) 17-19 (1) 19-20 (2) 20-22 (1)	02-03 (1) 03-05 (2) 05-08 (1) 03-05 (1)*
Far East	14-15 (1) 15-17 (2) 17-18 (1)	12-14 (1) 14-15 (3) 15-16 (4) 16-17 (3) 17-18 (2) 18-20 (1)	06-07 (1) 07-08 (2) 08-10 (3) 10-12 (2) 12-16 (1) 16-18 (2) 18-20 (3) 20-21 (2) 21-23 (1)	23-02 (1) 02-05 (2) 05-08 (1) 01-03 (1)*
South Pacific & New Zealand	08-10 (1) 10-12 (2) 12-13 (3) 13-16 (4) 16-17 (2) 17-18 (1)	07-08 (1) 08-10 (2) 10-12 (1) 12-16 (2) 16-18 (4) 18-19 (2) 19-20 (1)	05-07 (1) 07-09 (4) 09-11 (2) 11-16 (1) 16-17 (2) 17-18 (3) 18-20 (4) 20-22 (3) 22-00 (2) 00-03 (1) 03-05 (2)	21-22 (1) 22-05 (3) 05-07 (2) 07-08 (1) 22-00 (1)* 00-05 (2)* 05-06 (1)*
Australasia	08-10 (1) 12-13 (1) 13-14 (2) 14-15 (3) 15-16 (4) 16-17 (2) 17-18 (1)	08-09 (1) 09-10 (2) 10-12 (3) 12-14 (2) 14-16 (3) 16-18 (4) 18-19 (2) 19-21 (1)	17-19 (1) 19-21 (2) 21-00 (3) 00-02 (2) 02-04 (3) 04-06 (2) 06-07 (3) 07-09 (4) 09-10 (3) 10-12 (2) 12-14 (1)	02-03 (1) 03-04 (2) 04-06 (3) 06-08 (1) 03-04 (1)* 04-06 (2)* 06-07 (1)*
Northern & Central South America	07-08 (1) 08-09 (2) 09-10 (4) 10-12 (3) 12-14 (4) 14-15 (2) 15-16 (1)	06-07 (1) 07-08 (2) 08-10 (3) 10-13 (2) 13-14 (3) 14-16 (4) 16-17 (2) 17-18 (1)	07-09 (4) 09-13 (2) 13-15 (3) 15-18 (4) 18-20 (3) 20-00 (2) 00-05 (1) 05-06 (2) 06-07 (3)	18-19 (1) 19-01 (3) 01-04 (2) 04-05 (1) 19-22 (1)* 22-01 (2)* 01-04 (1)*
Brazil, Argentina, Chile & Uruguay	07-08 (1) 08-11 (2) 11-13 (3) 13-15 (4) 15-16 (2) 16-17 (1)	06-07 (1) 07-09 (2) 09-13 (1) 13-14 (2) 14-15 (3) 15-16 (4) 16-17 (2) 17-18 (1)	07-09 (1) 12-14 (1) 14-16 (2) 16-17 (3) 17-19 (4) 19-23 (3) 23-02 (2) 02-04 (1) 04-07 (2)	20-22 (1) 22-00 (2) 00-02 (1) 22-00 (1)*
McMurdo Sound, Antarctica	12-16 (1)	07-14 (1) 14-18 (2) 18-20 (1)	16-18 (1) 18-20 (2) 20-00 (3) 00-02 (2) 02-06 (1) 06-08 (2) 08-10 (1)	00-05 (1)

*Indicates best times to listen for 80 meter openings. Openings on 160 meters are also likely to occur during those times when 80 meter openings are shown with a propagation index of (2) or higher.
For 12 meter openings interpolate between 10 and 15 meter openings.
For 17 meter openings interpolate between 15 and 20 meter openings.
For 30 meter openings interpolate between 40 and 20 meter openings.

10 Meters: Not quite as good as last year, but some fairly good openings should still be possible to many areas of the world during the daylight and early evening hours. Openings to Europe and those in a generally easterly direction should peak an hour or two before noon, while those to South America and Africa are expected to peak during the early afternoon hours. Openings to the Far East, Australia, Southeast Asia, etc., are most likely to occur during the later afternoon hours and the early evening.

15 Meters: Good-to-excellent DX propagation conditions are expected from shortly after sunrise through the early evening hours. Openings are forecast to almost all areas of the world, and exceptionally strong signal levels may occur during many of them. For each geographical area of the world, conditions should peak about an hour or two after they have peaked on 10 meters.

20 Meters: Generally good-to-excellent openings are forecast to one area of the world or another on this band almost around the clock. DX conditions should peak an hour or two following local sunrise, and again during the late afternoon and early evening hours. Excellent openings are also forecast to many southern and tropical areas well into the hours of darkness. It should be a toss-up between 15 and 20 meters for optimum DX conditions during the daylight hours, with both bands expected to open to most areas of the world.

40 Meters: DX openings to Europe and in an easterly direction should begin during the late afternoon hours and steadily improve towards darkness, with signal levels exceptionally strong at times. Openings in a westerly direction are expected to peak shortly after sunrise, just before the band closes for DX propagation. During most of the hours of darkness 40 meters should be the optimum band for DX propagation to many areas of the world.

80 Meters: Some fairly good DX open-

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Henry Radio is the power amplifier specialist. Every one of our 14 models offer superb value, experienced engineering (30 years!) and top quality components.

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2K CLASSIC X console. 2000 W PEP output, 80 to 15 meters, 1.8 to 30 MHz.

2KD classic desk top. 2000 W PEP, 80 to 15 meters, 3.5 to 30 MHz.

3K CLASSIC Mk II console. 2000 W PEP, 80 to 15 meters, 3.5 to 30 MHz.

3K PREMIER console. 2000 W PEP, 160 to 15 meters, 1.8 to 30 MHz.

3KD PREMIER desk top. 2000 W PEP, 160 to 15 meters, 1.8 to 30 MHz.

3KD CLASSIC desk top. 1500 W PEP, 80 to 15 meters, 3.5 to 30 MHz. (10 meters available on export models).

2002-A desk top. 1200 W SSB, 400 W continuous operation, 144 to 148 MHz. (100 to 300 MHz available on commercial models).

2002-A desk top. 1200 W SSB, 400W continuous operation, 220 to 225 MHz.

2006-A desk top. 1200 W SSB, 400 W continuous operation, 50 to 54 MHz. (30 to 100 MHz available on commercial models).

3002-A console. 2000 W SSB, 1000 W continuous operation, 144 to 148 MHz.

3004-A console. 2000 W SSB, 1000 W continuous operation, 430 to 450 MHz.

3KD CLASSIC

1500 W PEP nominal output SSB and CW. 1000 Watts ICAS, RTTY, and FM, covering the 3.5 to 30.0 MHz frequency range. Nominal gain: 15 to 20 times input drive. Tube complement consists of one remarkable new Eimac 3CX-1200D7 ceramic triode. It uses a Pi-L plate circuit with a silver plated tank coil for maximum efficiency and attenuation of unwanted harmonics.

3006-A console. 2000 W SSB, 1000 W continuous operation, 50 to 54 MHz. (30 to 100 MHz available on commercial models).

2004-A desk top. 1200 W SSB, 600 continuous operation, 430 to 450 MHz.

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CIRCLE 168 ON READER SERVICE CARD

Time EST	Areas To Which Openings Should Be Optimum
00–03	A few northern and central South American openings, and perhaps to Antarctica, but not much else. Good time for some sleep.
03–06	Still not much except for some weak openings to Europe and Africa. If you didn't get some sleep before, get it now!
06–09	Excellent period. Good openings in many directions: Europe, north and west Africa, Far East, Asia, New Zealand, South Pacific, Australasia, and South America.
09–12	Fairly good period. Openings to most of Europe, the Middle East, northern South America, and the Pacific area.
12–15	Fairly good period. Openings to most of Europe, the Middle East, some parts of Africa, northern areas of South America. Good time for lunch.
15–18	Fair openings to western and central Europe and the Middle East. Catch them now or you'll miss them. Good openings to most of Africa and South America.
18–21	Good period to pile up points. Openings to most of Africa and South America. Some also to the Far East and other Asiatic areas. Fairly good openings to the Pacific Islands, New Zealand, Australasia, and Antarctica.
21–00	Fairly good period. Openings to the Pacific and Australasia, South America, the Far East, and Antarctica.

Table I- Sample 20 Meter Operating Schedule For Eastern USA QTH

ings should be possible on this band to several areas of the world during the hours of darkness and the sunrise period. Peak conditions are expected around midnight on paths to the north or south, and shortly after sunrise for openings in a westerly direction.

160 Meters: The 160 meter band presents a particular challenge for working DX. Of all the HF bands, DX propagation is poorest on 160 meters, antennas are least efficient for DX, and there are restrictions on the maximum power that can be used. Perhaps it is this challenge which accounts for the increasing popularity of this band during DX contests. Considerably decreased static levels and longer hours of darkness in the Northern Hemisphere should welcome back DX openings in this band during the hours of darkness and also into the sunrise period. Because of relatively high signal absorption and the lower power levels used in this band, openings often will be weak and noisy, but some fairly good ones should be possible. Best bets are for

Time EST	Optimum Band Meter	Areas To Which Band Expected To Be Open
00–02	40	Most of Europe and Middle East; most of South America; a few African countries, possibly Antarctica.
02–04	40	Not much on any band. A good time to eat and catch up on some sleep. Some openings possible to the South Pacific, Australasia, the Far East, and other Asian areas, but generally not too good. Some fairly good openings to South America.
04–06	40	Still time to catch up on sleep. Some openings to the South Pacific, New Zealand, and Australasia. Some also to northern and central areas of South America. A few Far Eastern and Asian, perhaps Antarctica.
06–08	20	Good openings to most of Europe, the Pacific area, Australasia, Asia, and the Far East. Also to most of South America and parts of Africa.
08–10	15	Good openings to all of Europe, Middle East, and most of South America. A possible opening to the Pacific, Australasia, and per haps part of Asia.
10–12	10	Good openings to most of Europe, Africa, and South America. Catch them during this period or you'll probably miss them!
12–14	15	Good openings to most of Africa, South America, and the western and southern areas of Europe.
14–16	20	Good openings to most of Europe, the Middle East, most of Africa, northern and central South America, and possibly some long-path openings to Australasia.
16–18	20	Good openings to most of Africa and South America, with some also possible to the western and southern areas of Europe.
18–20	15	Fair-to-good openings to the Pacific area, Australasia, Far East, and other Asiatic areas. Good openings to central and southern South America, and a possible opening to Antarctica.
20–22	20	Openings to most of Africa, Pacific area, Australasia, Antarctica, and all of South America.
22–00	40	Most of Europe should be possible, as well as the Middle East; most of South America, and some openings to the Pacific and Australasia.

Table II– Sample multi-band work plan for eastern USA QTH.

openings towards Europe and towards the Caribbean and Latin America from the Eastern half of the country, and towards the Far East, Australia, the South Pacific, and Latin America from the western half of the country. DX openings to other areas of the world may also be possible. The best propagation aid for this band (and for 40 and 80 meters as well) is a set of sunrise and sunset tables, since the DX signals tend to peak when it is local sunrise at the easternmost point of a path.

Contest Work Plans

The charts on the preceding page show the times that 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.

The information contained in the charts can easily be reorganized into several different types of operational work plans, or schedules, to then serve as propagation guides during the WW DX Contest period. Experience gained during previous contests has shown that such plans can be extremely useful in piling up a large number of points with a minimum of wasted time.

Table I is an example of one of the many types of plans that can be devised. For each three-hour period throughout the day, it shows areas of the world for which, in this example, 20 meter propagation conditions are expected to be optimum (a rating of three or higher in the charts[1]). An eastern USA QTH has been chosen for this example, but similar plans can be devised for central and western locations and for other bands.

Table II is a typical *multi-band* operational work plan devised from the propagation charts for an Eastern USA QTH. The plan shows the times and bands when propagation conditions are expected to be optimum to various areas of the world for each two-hour period throughout the day.

Radio Storms

The forecasts discussed in this column are based on *normal* propagation conditions expected with a sunspot level in the low 50s. 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

[1]In some cases a rating of (2) or (1) was selected when no higher rating was expected on the particular path.

W3ASK, CQ's Propagation Editor, at the Grand Coulee Dam, Electric City, Washington, where he performed the "salting" of the ionosphere ritual for this year's WW DX Contest. (Photo by Bea)

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, increasing 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 storm conditions there may be an improvement for openings on all bands towards southern and tropical areas, and on 40, 80, and 160 meters during the hours of darkness.

CW Contest Forecast

This month's DX propagation Charts are available for both the SSB and CW sections of the 1993 WW 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.

More radio activity in more areas of the world takes place during the CQ World-Wide DX Contest than at any other time. For this reason the contest offers an excellent opportunity to verify the accuracy and inaccuracy of the *CQ* contest predictions and forecasts. Reports received from participants in previous contests have contributed greatly to improving these predictions during the past 43 years. Comments and observations concerning this year's contest would be appreciated and should be sent directly to W3ASK at the address at the beginning of the column.

Computer Programs

There are several good computer programs available for supplementing band-opening predictions contained in the *CQ* DX Propagation Charts on the following pages. Many of these have been reviewed on a regular basis by my *CQ* colleague Karl Thurber, W8FX, in his excellent column "Antennas & Accessories."

The following is a listing of the more popular programs. All of them contain band-opening data and most of them also contain greyline 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.

Ham Companion™: For IBM compatibles. An updated and revised Version.3 has just been released. Calculates band openings for all locations, presenting MUF, OWF, and LUF in easy-to-read graphical form; shows sunrise and sunset times; shows greyline moving around the world and displays great circle paths, showing azimuth and distance; contains atlas database with information on more than 140,000 locations worldwide; and more. Now in vivid color for EGA and VGA. For more information contact Brinson Microwave Corp., 114 SE Fourth Street, Mooreland, OK 73852 (1-800-874-0771).

Super DX Edge™: Computerized version in color for IBM compatibles. Also available in a large plastic slide-rule version. Reviewed "Propagation" column October 1990. Updated. For a free flyer contact Xantek, P.O. Box 834, Madison Square Station, New York, NY 10159 (212-566-8240).

MINIPROP Plus™: The latest revised version of a very popular HF propagation program for IBM compatibles. Predicts received signal levels and all other propagation parameters for any location. Maps display great-circle path and greyline in full color. Also contains comprehensive world atlas with coordinates and lists beam headings from given QTH. Reviewed in "Antennas & Accessories" column, February 1993. For more details contact Sheldon C. Shallon, W6EL, 11058 Queensland St., Los Angeles, CA 90034.

IONOPROP™: IBM-compatible demo disk available for $3 from Herb Hitney, 712 Tarento Drive, San Diego, CA 92106 (619-222-1056). Reviewed in "Antennas & Accessories" column, June 1992.

BANDAID™: For IBM compatibles. Reviewed in "Propagation" column, October 1990.

MUF-MAP 2™: For IBM compatibles. Reviewed in "Antennas & Accessories" column, October 1990.

For more complete information on each of these programs contact Base (2) Systems, 2534 Nebraska St., Saginaw, MI

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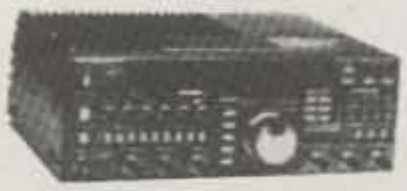

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The listing of the above products does not necessarily indicate an endorsement by the editor of this column or by *CQ*. Additional information and prices should be obtained directly from the producers of the programs.

Ionosphere "Salting"

Each year for the past several years and prior to the start of a CQ World-Wide DX Contest, I have made it a point to visit a key area of the world to "salt" the ionosphere. The "salting" is of course symbolic, but it is part of a ritual that has its roots deep in folklore. While having no scientific basis, the salting ritual amazingly seems to have worked well in providing exceptionally good DX conditions during the contests of the past decade!

This year I returned to Electric City, Washington to harness the power of Grand Coulee Dam. How can one miss at a location with a name like Electric City? Since the sunspot cycle is declining, this year's ritual was reinforced with an additional visit to one of the highest accessible locations in Europe, atop the *Aiguille du Midi* in Chamonix, France. Soaring 12,000 feet by cable car, the observation point is in the shadow of the 15,700 foot high Mont Blanc.

Having done my salting for this year, good luck in the contest!

73, George, W3ASK

R.F. ODOR EATERS

At one time or another every station owner with a transmitter has had to deal with RF interference caused to other services. Whether it's with a neighbor, the family upstairs, or some of your own receiving equipment, there's one thing we can all agree on . . . IT STINKS!

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WASHINGTON READOUT

REGULATORY NEWS IN THE WORLD OF AMATEUR RADIO

BY FREDERICK O. MAIA, W5YI

FCC Relaxes Prohibited Communications Rule

Public service and personal communications with business component now allowed!

The Federal Communications Commission has been trying for many years to accommodate the steady stream of requests it gets from the amateur community to broaden the scope of amateur personal and public service communications. After two years of Government rule making, this proceeding (PR Docket 92-136) has finally reached the Report and Order stage and new amateur communications content guidelines have been enacted into law. Let's get right to the bottom line! Effective September 1, 1993, here is what you can—and cannot—do on the amateur bands! But be aware that there are some exceptions!

What Are The Changes?

Old Rule: No amateur station shall transmit any communications which promotes the business or commercial affairs of any party. If anyone profits financially, it is an illegal transmission.

New Rule: An amateur may not be paid, direct or indirect, for his voluntarily provided communications.

Old Rule: Except for emergency communications, the amateur bands may not be used as an alternative to other authorized radio services.

New Rule: Amateur-to-amateur communications which could reasonably be furnished alternatively through other radio services will now be permitted on the amateur bands, although not on a regular basis. This will allow amateurs to legally participate with the Weather Service, Police and Fire Department, Parks and Forestry Service, and many other local, state, and federal agencies.

Old Rule: Logistical communications including those benefiting sponsors of public gatherings are prohibited. This includes activities such as moving, ordering, supplying, and quartering. All communications must be safety related or benefit the public rather than a specific sponsoring organization.

New Rule: All voluntary amateur communications are permitted unless specifically prohibited (and there are some exclusions). Voluntary logistical communications are now allowed.

Old Rule: Paid teachers may not use amateur communications when they are teaching, since this represents transmissions for material compensation.

New Rule: Classroom Instructors may accept compensation during the period of time when amateur communications are used during their teaching activities.

Old Rule: Personal communications that financially benefit anyone are prohibited.

New Rule: Basically any communication that does not financially benefit the amateur operator or his employer is permitted. Amateur operators may still notify other amateurs of the availability for sale or trade of amateur gear on the bands as long as it is not a regular occurrence.

Old Rule: No station shall transmit music on the amateur bands.

New Rule: Music is still prohibited, but incidental music between a space shuttle and the earth will be allowed.

Old Rule: Other than space shuttle communications, amateur stations may not retransmit radio signals from other radio services.

New Rule: Propagation and weather forecasts originating from U.S. Government may now also be occasionally retransmitted to amateur operators. The key word is "occasionally."

Permissible Amateur Service Communications Content

Any amateur-to-amateur communications are now permitted unless:
a. Specifically prohibited. Includes:
1. Music (except for incidental space shuttle music);
2. Communications facilitating a criminal act;
3. Messages obscured by codes or ciphers;
4. Obscene or indecent words or language; and
5. False or deceptive messages, signals or identification.
b. Transmitted for compensation. The following exceptions apply:
1. Morse code practice and information bulletins (special criteria);
2. Classroom teachers using amateur radio in the classroom.
c. Done for the pecuniary benefit of the station control operator or his or her employer.

The following communications are permitted, but not " . . . on a regular basis" (not defined by FCC)
1. Communications which could reasonably be furnished through other radio services;
2. Notices concerning sale or trade of amateur station apparatus; and
3. Retransmissions of Government provided propagation and weather forecast broadcasts.

What Stayed The Same?

There were no changes to the rule which allows amateur operators to be paid for transmitting Morse code practice and information bulletins. The guidelines still require at least 40 hours of telegraphy and information bulletins to be transmitted on at least six amateur bands between 160 and 10 meters. A schedule of frequencies and times must be published 30 days in advance.

Broadcasting to the public, program production, and newsgathering on the amateur bands remains prohibited unless an emergency exists and no other communications facilities are available.

Press Release Issued By The FCC

The following self-explanatory news bulletin concerning the new amateur service communications content regulations was released by the FCC on July 15.

Restrictions Relaxed on Scope of Permissible Communications in Amateur Service (PR Docket 92-136)

The Commission has amended the amateur service rules in order to allow amateur operators more flexibility to provide communications for public service projects as well as to en-

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National Volunteer Examiner Coordinator, P.O. Box 565101, Dallas, TX 75356-5101 (817-461-6443)

hance the value of the amateur service in satisfying personal communications needs.

The international Radio Regulations define the amateur service as a radiocommunication service for the purpose of self-training, intercommunication and technical investigations carried out by amateurs, that is, by duly authorized persons interested in radio technique solely with a personal aim and without pecuniary interest.

Part 97 of the commission's Rules prohibits amateur stations from transmitting any communications the purpose of which is to facilitate the business or commercial affairs of any party, or as an alternative to other authorized radio services.

The amendment would allow the amateur service to expand its public service capabilities and to provide greater flexibility for personal communications.

The amendment would allow licensees to use amateur service frequencies to facilitate events such as races and parades, to support educational activities, to provide personal communications such as making appointments and ordering food, to collect data for the National Weather Service, and to provide assistance voluntarily even where there are other authorized radio services available.

The Commission was unable to accommodate the American Radio Relay League's request that the Commission provide a list of anecdotal examples of permitted and prohibited communications.

The Commission stated that such a list would necessitate that the FCC intrude upon the day-to-day functioning of the service to a far greater degree than desired. The FCC also said that there would have to be thousands of examples, and declined to devote staff resources to the development and maintenance of such a list.

Report and Order Released By The FCC

Two weeks later, the commission issued the text of the Order on PR Docket No. 92-136. This is what it said:

Report and Order

PR Docket No. 92-136
Released: July 28, 1993

I. Introduction

1. In the Notice of Proposed Rule Making in this proceeding, we proposed to amend the amateur service rules to permit greater flexibility for amateur stations which transmitting communications for public service projects and personal matters without altering in any way the nature and purpose of the amateur service. This Report and Order adopts the rules substantially as proposed.

II. Discussion

2. The international Radio Regulations define the amateur service as a radiocommunications service for the purpose of self-training, intercommunication and technical investigations carried out by amateurs, that is, by duly authorized persons interested in radio technique solely with a personal aim and without pecuniary interest. The essence of this definition is carried over to the Communications Act of 1934, as amended, which regulates the amateur service in the United States, and to various Commission rule sections.

For this reason, Section 97.113(a) of the Commission's Rules, 47 C.F.R. § 97.113(a) prohibits amateur stations from transmitting any communications the purpose of which is to facilitate the business or commercial affairs of any party, or as an alternative to other authorized radio services.

The amateur service community, however, generally desires a relaxation of this restriction to accommodate contemporary communications demands and the operational capabilities of amateur station licensees. Noting that it appears the amateur community appreciates both the benefits and the burdens of such relaxation, we proposed to relax the restriction. Over eighty comments and reply comments were filed in response to the Notice.

3. The comments convincingly support the proposal. Although some comments urge caution to prevent exploitation of the service, they show that the present rules hamper amateur operators from serving the public as well as diminish the value of the amateur service in satisfying personal communication needs.

The vast majority of comments support our proposal to relax the prohibition against using the amateur service as an alternative to other radio services such as the maritime services, land mobile radio services, or the cellular telephone service. They believe that the current prohibition is overly cautious and unnecessary. [Section 97.113(a) states, in part: No station shall transmit communications as an alternative to other authorized radio services, ex-

cept as necessary to providing emergency communications.]

We concur. The capabilities of modern mobile communication services have all but eliminated the incentive to use the amateur service instead of those services. We will relax, therefore, the current prohibition, as proposed, to provide amateur operators greater flexibility for public service and personal communications.

4. The American Radio Relay League notes that it expects no noticeable change in amateur operations as a result of this rule making. This relaxation of the restrictions contained in the rules allows the amateur community to satisfy its contemporary needs for communications in return for greater responsibility for self-regulation and cooperation in the use of its allocated frequencies. This relaxation also will satisfy the desire of the licensees of many amateur stations to retransmit propagation and weather forecast information originating from United States Government stations.

The revised rule provides, therefore, that propagation and weather forecast information intended for use by the general public and originated from United States Government stations can be retransmitted by any amateur station without permission of any government agency.

In addition, as requested by the League, we shall clarify that the rule requiring prior approval for amateur station retransmissions of United States Government communications applies only to communications, including incidental background music, between a space shuttle and its associated earth stations.

5. Some comments suggest even greater relaxation than we proposed. The League, however, states that the proposed rule is a good, workable middle ground offering the requisite protection against exploitation.

The National Association of Broadcasters and The Radio-Television News Directors Association (NAB/RTNDA) request that we eliminate the existing immediacy requirement before amateur operators can become involved in news gathering activities. [See Section 97.113(c)]

The NAB/RTNDA wants amateur operators to be able to disseminate any news information when no other means of communications are available. Mr. Michael Lonneke states, however, that the NAB/RTNDA request is a self-serving idea designed to offset shrinking news budgets and smaller news staffs. The League also opposes the NAB/RTNDA request. It states that NAB/RTNDA is attempting to revisit an issue twice resolved against it and that we should not modify the proposed rule to accommodate NAB/RTNDA.

We do not believe that the amateur service frequencies should be used generally for newsgathering and, therefore, we are retaining the immediacy requirement for news gathering activities.

6. The one detail that we are not able to accommodate is the League's request that we provide a list of anecdotal examples of permitted and prohibited communications. For us to do so would necessitate that we intrude upon the day-to-day functioning of the amateur service to a far greater degree than we desire.

Further, in view of the wide diversity in the types of communications in which amateur operators want to engage, there would have to be thousands of examples. Therefore, we decline to devote staff resources to the development and maintenance of such a list. Rather, we will rely on the amateur service's traditions of self-regulation and cooperation between licensees, the cornerstones of the amateur service, to determine whether specific communications should be transmitted on amateur service frequencies.

We will also include the League's criterion, which we have incorporated in the rules we are adopting in this proceeding, that any amateur-to-amateur communication is permitted unless specifically prohibited, or unless transmitted for compensation, or unless done for the pecuniary benefit of the station control operator or his or her employer.

[The content of messages transmitted between amateur stations located in different countries is subject to international Radio Regulation No. 2732. This Radio Regulation is codified as Section 97.117 of the Commission's Rules, 47 C.F.R. § 97.117. Content restriction on messages between an amateur station located at a place where the amateur service is regulated by the FCC and a station within the jurisdiction of any foreign government is not affected by this amendment of Section 97.113.]

7. In summary, we have decided to amend the amateur service rules substantially as proposed by the League in order to allow amateur operators more flexibility to provide communications for public service projects as well as to enhance the value of the amateur service in satisfying personal communications needs.

Amendment of the rules as the League

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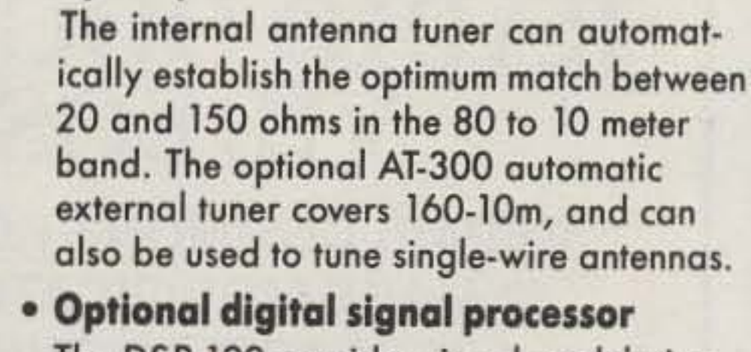
- **Optional digital signal processor**
  The DSP-100 provides signal modulation of unerring precision. In SSB operation, unwanted sidebands can be effectively suppressed, while in CW mode the rise and decay times of CW waveforms can be tailored for optimum clarity.

The TS-450S can be computer-controlled with the optional IF-232C and HamWindows software. See your Authorized Dealer for more details.



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RD-0622

requests will allow licensees to use amateur service frequencies, for example, to facilitate events such as races and parades, to support educational activities, to provide personal communications such as making appointments and ordering food, to collect data for the National Weather Service, and to provide assistance voluntarily even where there are other authorized radio services available.

We believe that this action will expand the benefits derived from the amateur service by the general public as well as amateur service licensees.

III. Ordering Clauses

8. Accordingly, IT IS ORDERED that effective 30 days after publication in the Federal Register Part 97 of the Commission's Rules, 47 C.F.R. Part 97 IS AMENDED as set forth below. Authority for this action is found in Sections 301, 303(1)(l) and (r) of the Communications Act of 1934, as amended, 47 U.S.C. §§ 301, 303(1)(l) and (r).

9. It is FURTHER ORDERED that this proceeding IS TERMINATED.

10. For further information, contact the Personal Radio Branch, Special Services Division at (202) 632-4964.

William F. Caton
Acting Secretary

Appendix

1. Section 97.113 is revised to read as follows:

§ 97.113 Prohibited transmissions.

(a) No amateur station shall transmit:

(1) Communications specifically prohibited elsewhere in the Part:

(2) Communications for hire or for material compensation, direct or indirect, paid or promised, except as otherwise provided in these rules:

(3) Communications in which the station licensee or control operator has a pecuniary interest, including communications on behalf of an employer. Amateur operators may, however, notify other amateur operators of the availability for sale or trade of apparatus normally used in an amateur station, provided that such activity is not conducted on a regular basis.

(4) Music, using a phone emission, except as specifically provided elsewhere in this Section; communications intended to facilitate a criminal act; messages in codes or ciphers intended to obscure the meaning thereof, except as otherwise provided herein; obscene or indecent words or language; or false or deceptive messages, signals or identification.

(5) Communications, on a regular basis, which could reasonably be furnished through other radio services.

(b) An amateur station shall not engage in any form of broadcasting, nor may an amateur station transmit one-way communications except as specifically provided in these rules; nor shall an amateur station engage in any activity related to program production or newsgathering for broadcasting purposes, except that communications directly related to the immediate safety of human life or the protection of property may be provided by amateur stations to broadcasters for dissemination to the public where no other means of communication is reasonably available before or at the time of the event.

(c) A control operator may accept compensation as an incident of a teaching position during periods of time when an amateur station is used by that teacher as a part of classroom instruction at an educational institution.

(d) The control operator of a club station may accept compensation for the periods of time when the station is transmitting telegraphy practice or information bulletins, provided that the station transmits such telegraphy practice and bulletins for at least 40 hours per week; schedules operations on at least six amateur service MF and HF bands using reasonable measures to maximize coverage; where the schedule of normal operating times and frequencies is published at least 30 days in advance of the actual transmissions; and where the control operator does not accept any direct or indirect compensation for any other service as a control operator.

(e) No station shall retransmit programs or signals emanating from any type of radio station other than an amateur station, except propagation and weather forecast information intended for use by the general public and originated from United States Government stations and communications, including incidental music originating on United States Government frequencies between a space shuttle and its associated Earth stations. Prior approval for shuttle retransmissions must be obtained from the National Aeronautics and Space Administration. Such retransmissions must be for the exclusive use of amateur operators. Propagation, weather forecasts, and shuttle retransmissions may not be conducted on a regular basis, but only occasionally, as an incident of normal amateur radio communications.

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73, Fred, W5YI

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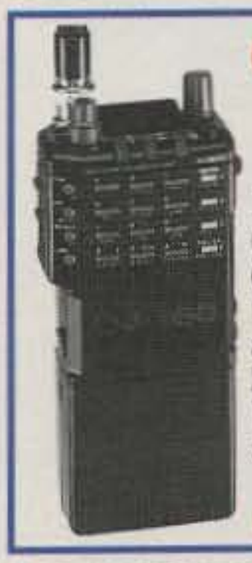

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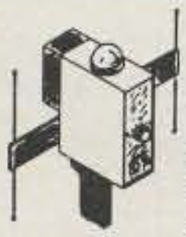

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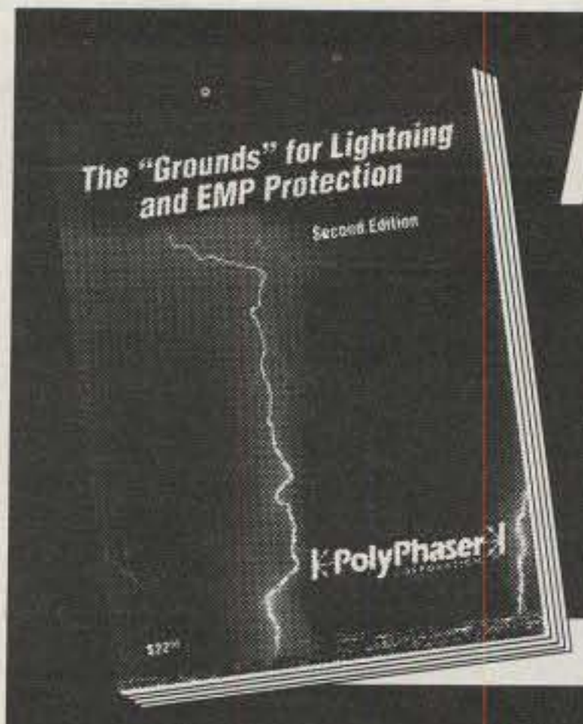

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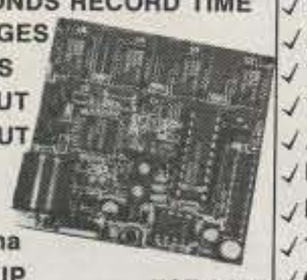

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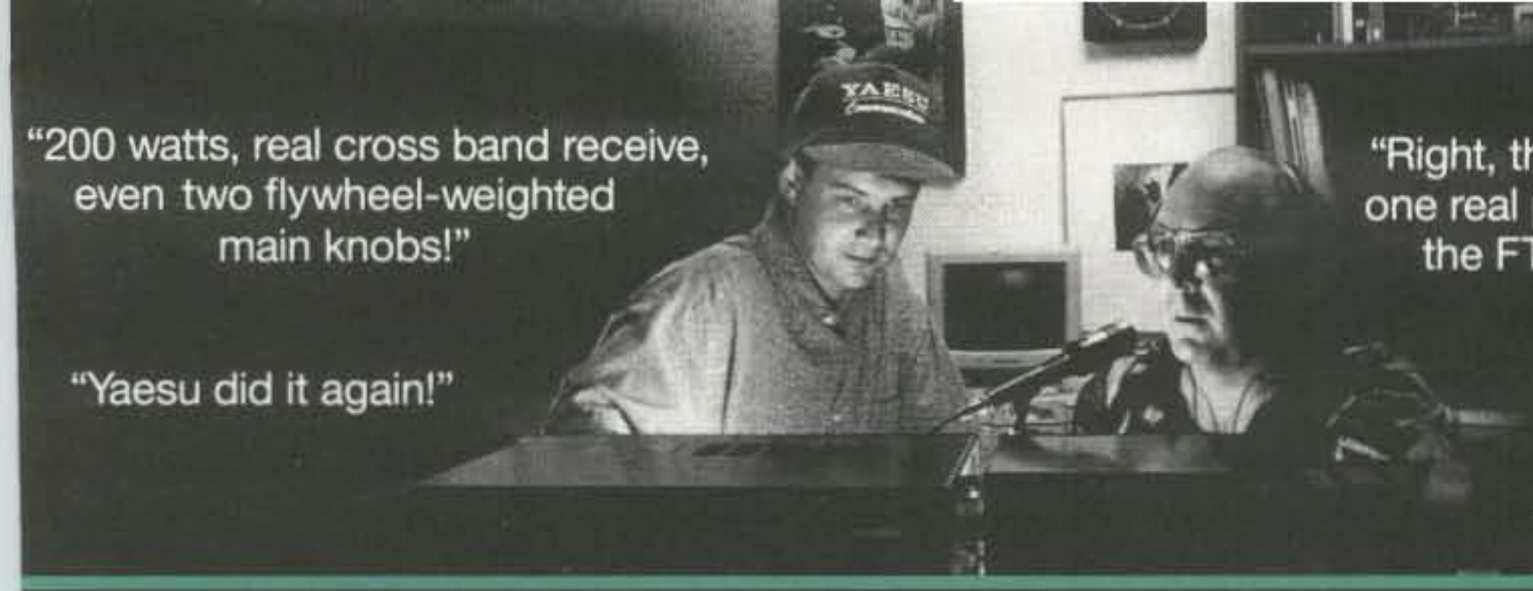

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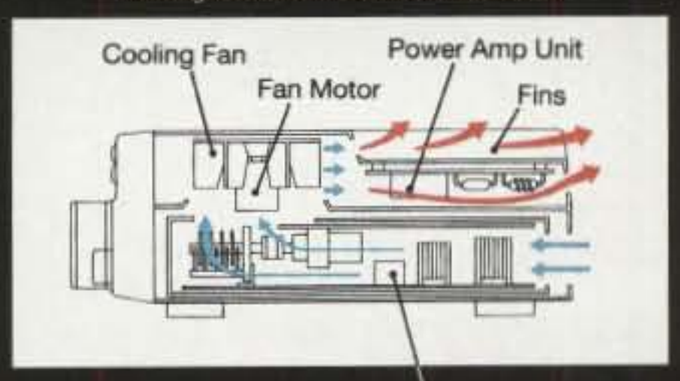

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NEW

"What a great field radio. Mobile, too! I couldn't afford an HF rig until now.."

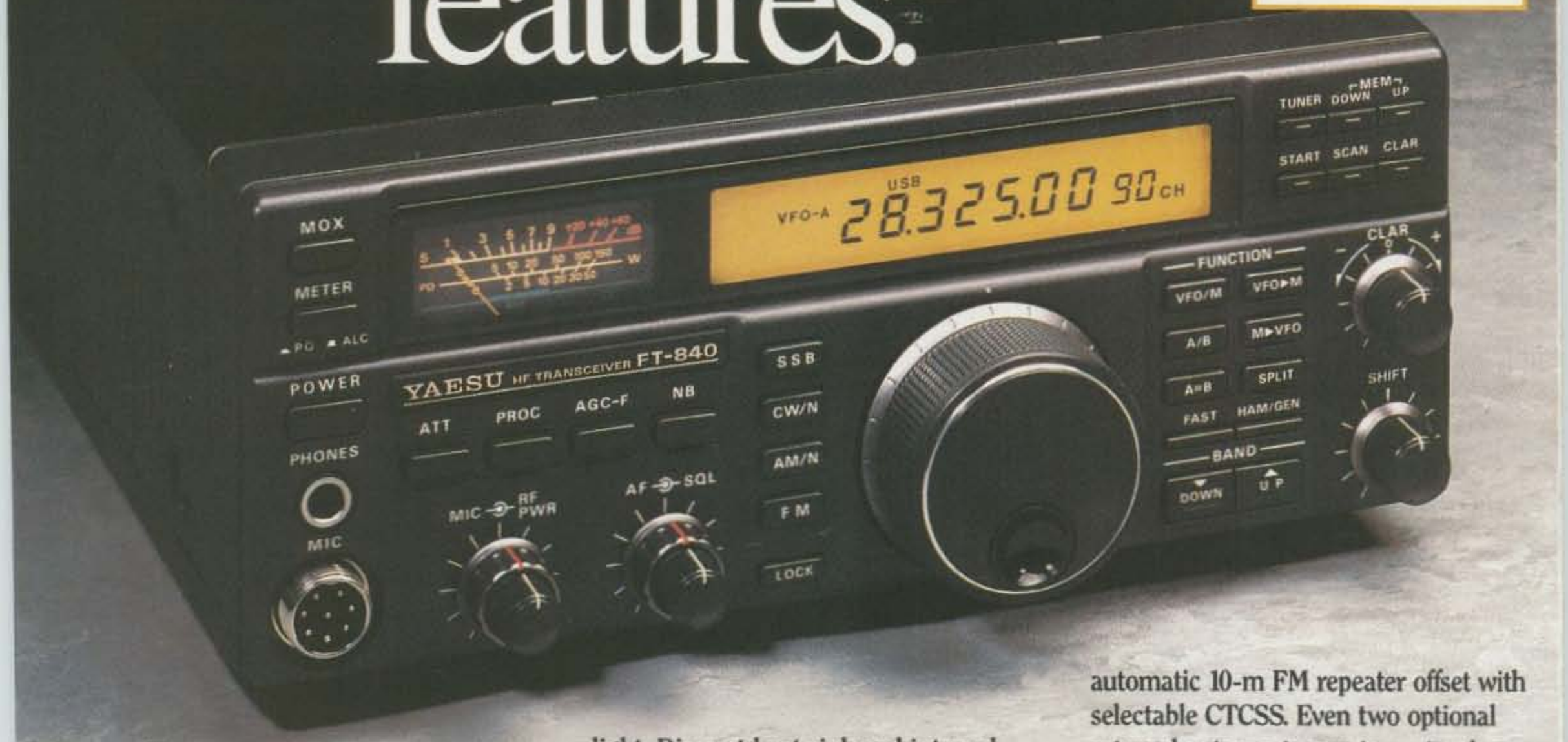
"What a great price! Terrific features, high performance – and within my budget."

"Yaesu did it again!"

It's a small price to pay for such a wealth of features.

FT-840
Compact HF Transceiver

- Direct Digital Synthesis (DDS)
- Frequency coverage:
  RX: 100 kHz-30 MHz
  TX: 160-10 m
- IF Shift
- 100 Memory Channels (Independent TX/RX per memory)
- Twin Band Stacking VFOs
- FM Repeater Operation Automatic 10-Meter Repeater Offset w/Selectable CTCSS Encode
- CW Reverse Feature
- Choice of Two Optional Antenna Tuners:
  FC-10 Matching External Antenna Tuner
  FC-800 External Remote Antenna Tuner
- **Accessories:**
  Contact your Dealer for full details.



If you're trading up from an older rig, but have a budget, you want the most you can afford in top-notch HF. Then the FT-840 is for you. It's right on the money! Considering a mobile HF or field radio and doubt the quality and features of tiny HF rigs? Then the FT-840 is for you. It won't disappoint you!

Built to handle rigorous field operation, the new intense LCD display affords sharp visibility in bright sunlight. Die-cast heat sink and internal thermally switched fan keep the FT-840 running cool. Modular design circuit boards ensure operating efficiency – manufacturing excellence you'd expect in much higher priced radios.

For high performance, the FT-840 features a low noise front end that uses the latest in FET RF amplifier design. Two DDSs and magnetic encoder for silent, smooth tuning and fast switching. Twin band-stacking VFOs. And, automatic 10-m FM repeater offset with selectable CTCSS. Even two optional external antenna tuners to customize your rig.

Top of the line quality and features at a remarkably low price. Just what you'd expect from Yaesu! For high-tech performance, and a wealth of features that won't break your budget ask your dealer about the FT-840.

YAESU

Performance without compromise.℠