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QST

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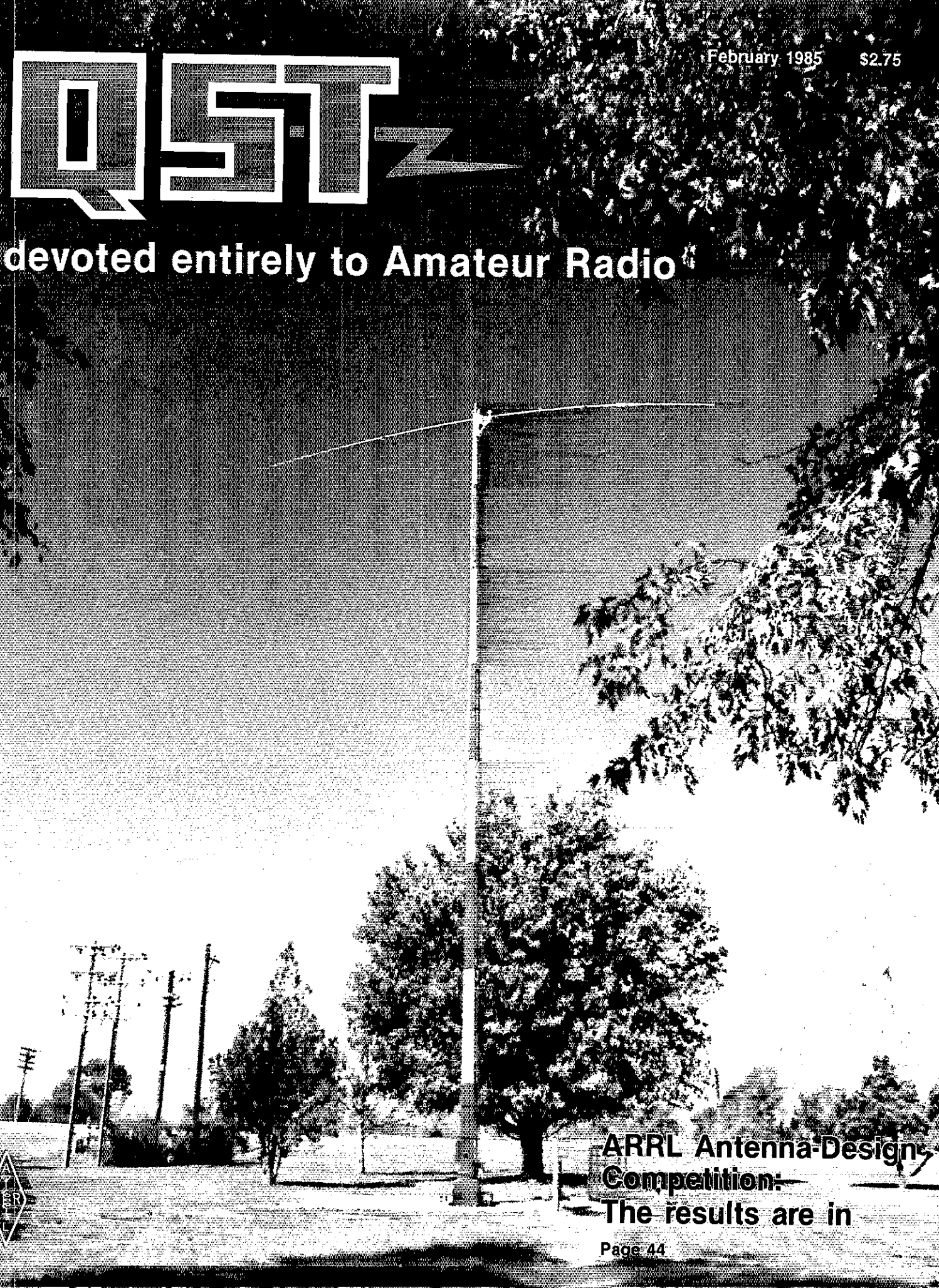

ARRL Antenna-Design Competition: The results are in

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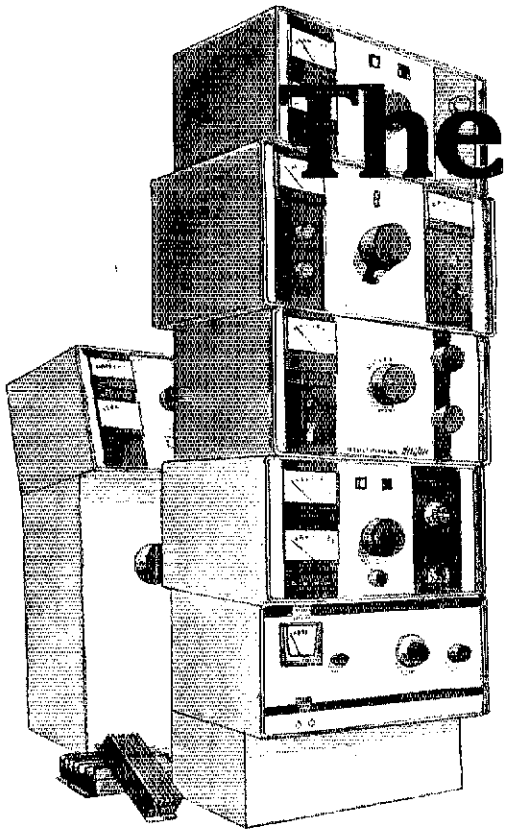

The HENRY REPORT...

"Twenty years and 30,000 amplifiers later, Henry is building the world's broadest line of linear amplifiers and we're convinced we're the BEST!"

At Henry Radio, we wrote the book on quality and value. Choose any model. We believe you will find the finest performance, highest reliability and best value.

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2K Classic...the culmination of more than fifteen years of developing the 2K series into the world famous line that sets the standards for top quality HF linears. A true "workhorse"; built to loaf along at full legal power, trouble free, for years of hard service. Operates on all amateur bands, 80 through 15 meters (export models include 10 meters).

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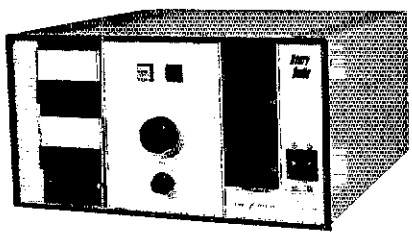
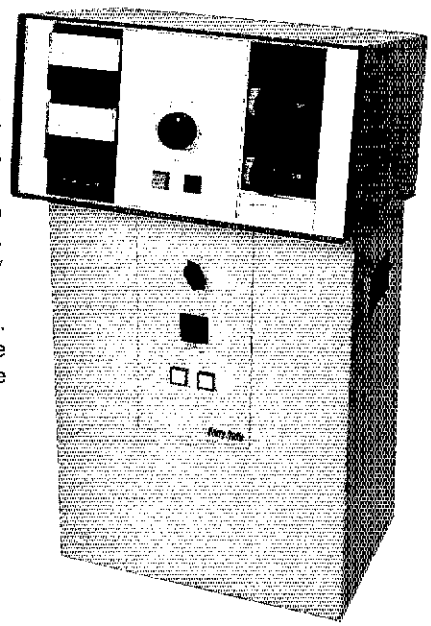
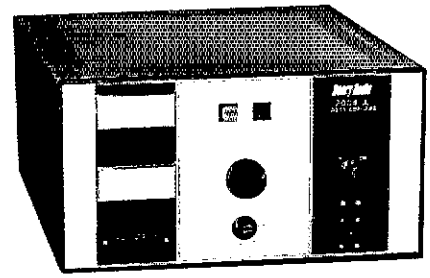
3K Classic...uses the superb Eimac 8877 tube. More than 13db gain. We believe the 3K to be the finest amateur linear available anywhere...the amplifier of every amateur's dreams.



2KD Classic...a desk model designed to operate at 2000 watts effortlessly, using two Eimac 3-500 Z glass envelope triodes, a Pi-L plate circuit and a rotary silver plated tank coil. We challenge you to find a better desk model for even a thousand dollars more.



2002-A...a bright new rework of our popular 2002 2 meter amplifier. Uses the new Eimac 3CX800A7. The RF chassis uses a 1/4 wave length strip line design for extreme reliability. It provides 2000 watts input for SSB and 1000 watts input for CW. Because this tube is rated at an unheard of 15dB gain, only about 25 watts drive is required for full output.



2004-A is identical to the 2002A except that it is set up for the 430 to 450 MHz band. This amplifier uses a 1/2 wave strip line and offers all of the same specifications as the 2002A.

1002-A A rack mount 2 meter amplifier with the same design as the 2002A, except using one 8874 tube for 1/2 power specifications. Rated at 600 watts PEP output and 300 watts continuous carrier output. It employs the same strip line design as the 2002A.

1004-A...a rack mount half-power version of the 2004A. Covers the 430 to 450 MHz band using a 1/2 wave strip line design.

Henry amateur amplifiers are available from select dealers throughout the U.S. and are being exported to amateurs all over the world. In addition to our broad line of commercial FCC type accepted amplifiers we offer special RF power generators for industrial and scientific users. Call or write Ted Shannon or Mary Silva for full information.

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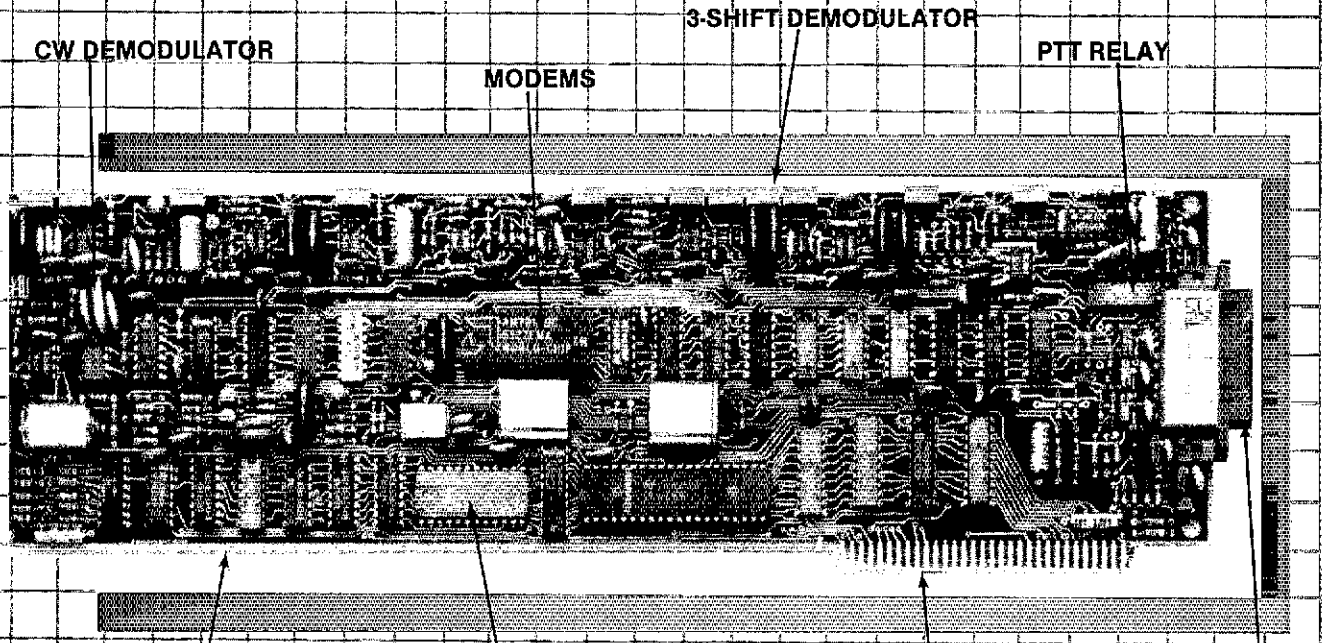

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ICOM HF Transceiver

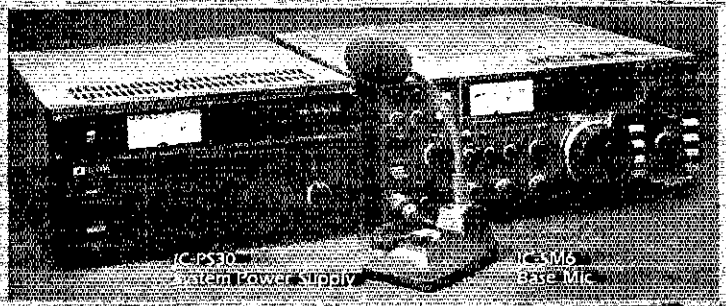
IC-745

High Performance Maximum Flexibility

The IC-745 is a full featured, high performance HF base station transceiver with a 100dB dynamic range receiver. PLUS features usually found only in more expensive units.

Compare these exceptional Standard Features:

- 100KHz ~30MHz Receiver
- 100 Watt RF output / 100% Duty Cycle
- Passband Tuning AND IF Shift
- Adjustable Noise Blanker (width and level)
- Adjustable AGC
- Receiver Preamp
- 16 tunable Memories with lithium battery backup



- Wide selection of filters and filter combinations (opt.)
- Continuously adjustable transmit power
- 10Hz/50Hz/1KHz Tuning rates with 1MHz band steps
- IC-HM12 Microphone with Up/Down Scan

Other Standard Features

Included as standard are many of the features most asked for by experienced ham radio operators: dual VFO's, RF speech compressor, tunable notch filter, program band scan, memory scan, all-mode squelch and VOX.

Options. IC-EX310 speech synthesizer, internal IC-PS35 power supply, external IC-PS15 or IC-PS30 system supply, IC-SM8 two-cable desk mic, EX241 marker, EX242 FM unit module, EX243 electronic keyer, IC-SM6 desk mic, and a variety of filters:

Filter	-6dB Width	Center Freq. MHz
FL45	500 Hz	9.000
FL54	270 Hz	9.000
FL44A	2.1KHz	0.455
FL52A	500 Hz	0.455
FL53A	250 Hz	0.455

The IC-745 is the only transceiver today that has so much flexibility at a surprisingly low price. See it at your local ICOM dealer!

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February 1985 *Volume LXIX Number 2*

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CONTENTS

OUR COVER

Some entrants won, and some didn't, but all amateurs will gain from the designs submitted for the Antenna Competition. The photo shows the 30-meter half-wave reference dipole perched on the motorized carriage atop an 80-foot unguyed rotatable steel pole. For the details, see page 44.

TECHNICAL

BEGINNER'S BENCH

NEWS AND FEATURES

OPERATING

DEPARTMENTS

KENWOOD

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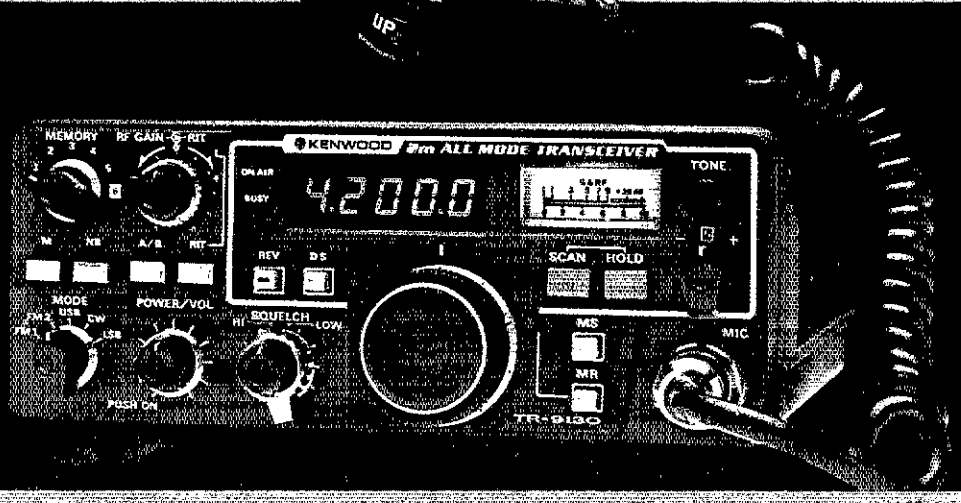
TR-9130

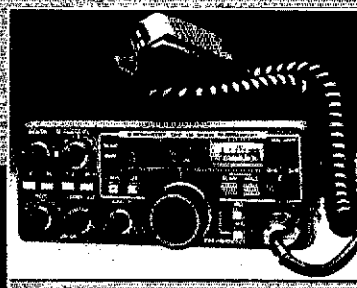
TR-9130 2 meter all mode

The TR-9130 is a compact rig that gives you 25 watts of RF power on all modes!! You can select your tuning steps from 100-Hz, 1-kHz, 5-kHz or 10-kHz. With six memories you can program your favorite frequencies! (FM 1-5 Simplex or ±600-kHz offset, memory 6 non-standard offset, all six for simplex, any mode!) Dual digital VFO's, and transmit frequency tuning enhance OSCAR operations. Internal battery back-up (9.6 V Ni-Cd not Kenwood supplied) retains memories for approximately 24 hours, in case you operate mobile and base! Other convenient features, such as automatic band scan, squelch circuit for FM/SSB/CW, tone switch, repeater reverse switch, CW semi break-in, adjustable high performance noise blanker HI (25) LOW (5), power switch (FM/CW) RF gain control and RIT circuit further enhance this expressive package!

Optional accessories:

- KPS-7A AC power supply
- PS-20 AC power supply (TR-9500 only)
- BO-9A system base with memory back-up supply
- SP-120 external speaker
- TK-1 AC adapter for memory back-up
- SP-40 mobile speaker
- SP-50 mobile speaker
- SW-100 A/B power meters
- MC-55 Mobile Mic w/time out timer





TR-9500

70 CM SSB/CW/FM transceiver

- Covers 430-440 MHz in steps of 100-Hz, 1-kHz, 5-kHz, 25-kHz or 1-MHz
- CW-FM Hi-10 W, Low-1 W, SSB 10 W
- Automatic band/memory scan, search of selected 10-kHz segments on SSB/CW
- 6 memory channels

TM-4000A

TM-4000A

FM "Dual-Bander"

KENWOOD'S TW-4000A FM "Dual-Bander" provides new versatility in VHF and UHF operations, uniquely combining 2-m and 70-cm FM functions in one compact package. It covers the 2-m band (142.000-148.995 MHz), including certain MARS and CAP frequencies, and the 70-cm band (440.000-449.995 MHz), all in a package only 6 3/8 W x 2-3/8 H x 8-9/16 D inches. RF output power measures 25 watts on either band. The TW-4000A features a large, easy-to-read LCD display, front panel illumination for night operations, 10 memories with OFFSET recall and lithium battery backup, programmable memory scan, band scan in selected 1-MHz segments, priority watch function, common channel scan, dual digital VFO's, repeater reverse switch, GaAs FET front ends, rugged die-cast chassis, "beeper" through speaker, a mobile mount, and a 16-key autopatch UP/DOWN mic.

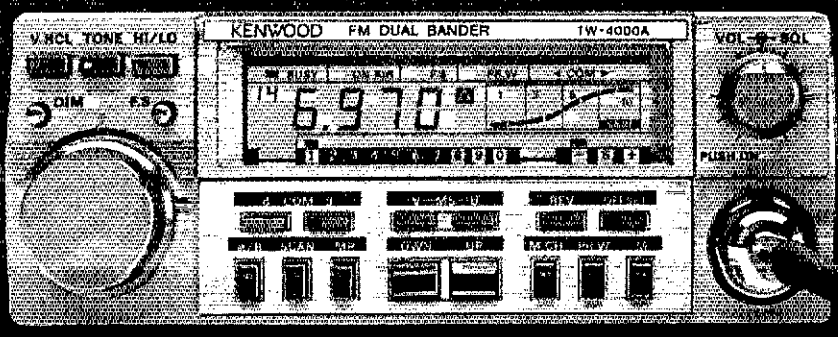
The new optional VS-1 voice synthesizer has everyone talking! A voice announces the frequency, band, VFO A or B, repeater offset, and memory channel number when these functions are selected.

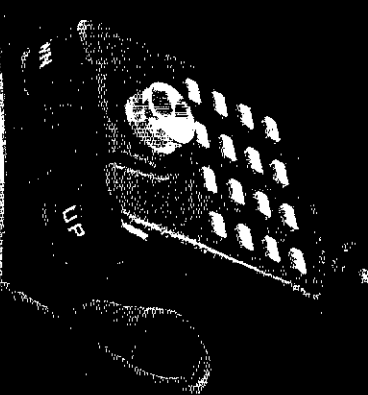
Other TW-4000A optional accessories:

VS-1 voice synthesizer, TU-4C programmable two-frequency CTCSS encoder, KPS-7A fixed station power supply, SP-40 compact mobile speaker, SP-50 compact mobile speaker, MA-4000 dual-band mobile antenna with duplexer, MC-55 mobile microphone with time-out timer, and a SW-100B SWR/power meter.

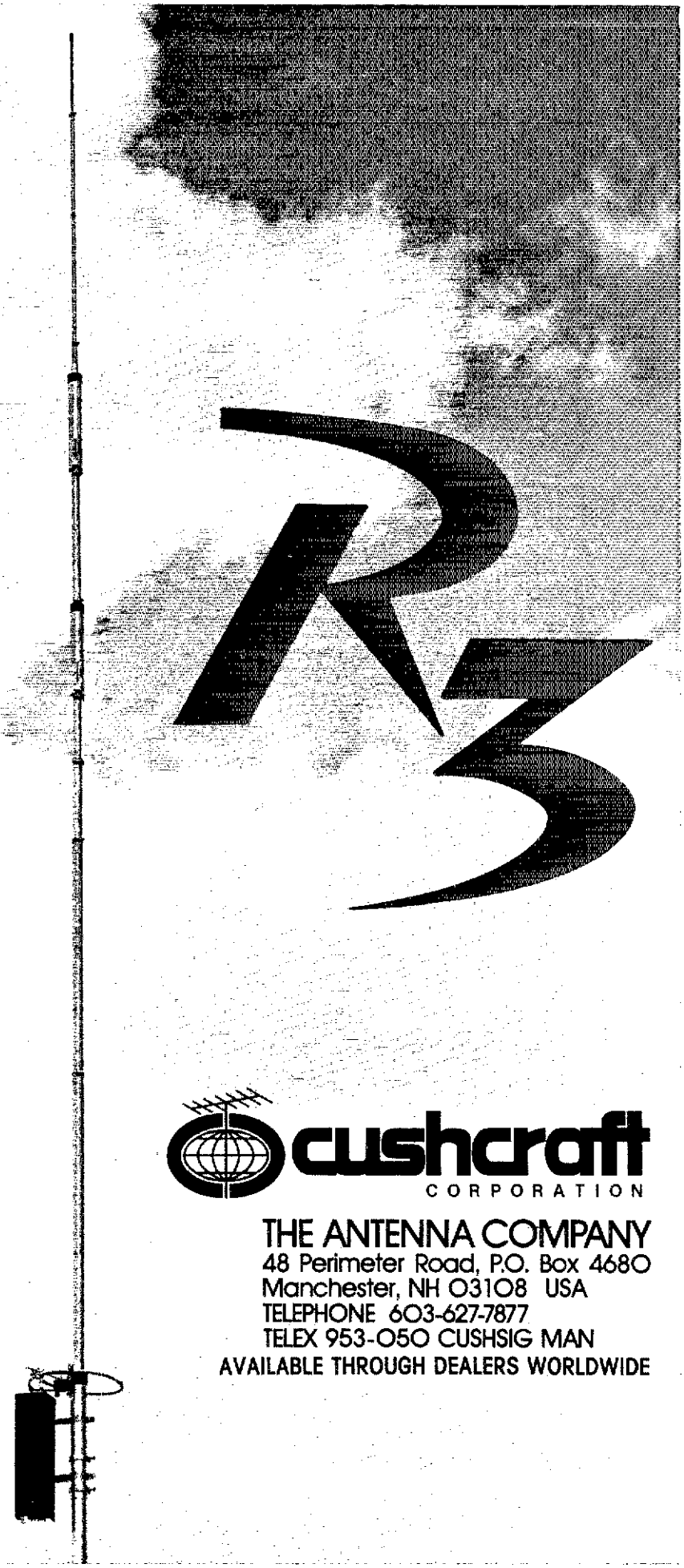
More information on the TM-201A/TM-401A and TW-4000A is available from authorized dealers of Trio-Kenwood Communications 1111 West Walnut Street Compton, California 90220.

Specifications and prices are subject to change without notice or obligation.





OWN THE WORLD WITH THE R3 NO RADIAL VERTICAL 10, 15, 20 METERS



The R3 half wavelength design eliminates the ground radial system required by other verticals. Optimum current distribution gives more efficiency and low angle radiation for DX communications.

R3 brings high performance antenna features to those living in apartments, condominiums or on small city lots. Even if you have plenty of space, R3's combination of neat appearance and DX capability make it ideal for your station. The R3 includes an integral tuner to give a perfect match across 10, 15, and 20 meters. The remote tuning feature allows easy fingertip control as you operate your station.

R3 is a complete antenna system ready to install in virtually any location from ground level to roof top.

FEATURES

[redacted] Gain, ref ¼λwhip
No Radials
360° Coverage
Integral Tuner with
Remote Control Console and Indicator
24 Volts To Tuner
110 or 220 Volt Operation
75 ft (22.9m) Control Cable Included
Only 22ft (6.7m) High
1 sq ft (.09 sq m) Space
Self Supporting
Stainless Steel Hardware
Mount: Sleeve Type Fits Pipe Up To
1¾ in (4.5cm) dia
Can Be Easily Stored and Set Up For
Portable or Temporary Operation

Add up the features—you'll find that you can have ALL OF THIS PERFORMANCE without the need to buy tower, rotator and associated hardware. ***R3 IS ANOTHER PRODUCT CREATED FOR THE ENJOYMENT OF YOUR HOBBY BY THE WORLD RENOWNED CUSHCRAFT ENGINEERING DESIGN TEAM.***

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TR-9130

TR-9130 2 meter all mode

The TR-9130 is a compact rig that gives you 25 watts of RF power on all modes!! You can select your tuning steps from 100-Hz, 1-kHz, 5-kHz or 10-kHz. With six memories, you can program your favorite frequencies! (FM 1-5 Simplex or ±600-kHz offset, memory 6 non-standard offset, all six for simplex, any mode) Dual digital VFO's, and transmit frequency tuning enhance OSCAR operations.

Internal battery back-up (9.6 V Ni-Cd not Kenwood supplied) retains memories for approximately 24 hours in case you operate mobile and base.

Other convenient features such as automatic band scan, squelch circuit for FM/SSB/CW, tone switch, repeater reverse switch, CW semi break-in, sidetone, high performance noise blanker HI (25) LOW (5) power switch (FM/CW) RF gain control, and RIT circuit further enhance this expressive package!

Optional accessories:

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- PS-20 AC power supply (TR-9500 only).
- BO-9A system base with memory back-up supply.
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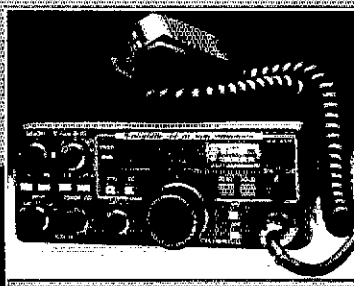
- MC-55 Mobile Mic w/time-out timer.



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More information on the TM-201A/TM-401A and TW-4000A is available from authorized dealers of Trio-Kenwood Communications (111 West Walnut Street, Compton, California 90220).

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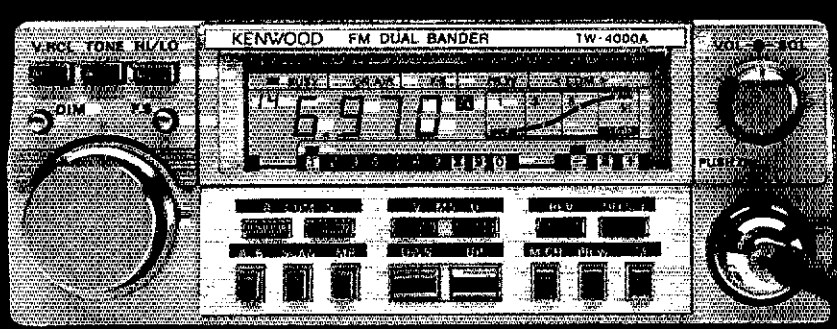

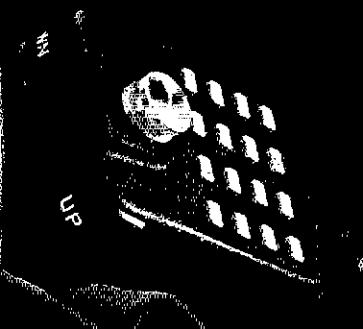

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TR-7950, watts to see!

TR-7950/7930

The TR-7950/7930 has become the unanimous choice of the 2 meter FM operator! It stands alone in features, performance and reliability, with no other rig even close!

The TR-7950/7930 features a large L.C.D. display that is easy to read in direct sunlight and is back lighted for comfortable night-time viewing. It displays TRANS/REC frequencies, memory channel, repeater offset (+, S, –), sub-tone number (F-0, 1, 2, 3) tone, scan, and memory scan lock-out. It includes an LED S/RF bar meter, and LED indicators for reverse, center TUNING, PRIORITY and ON AIR. The 21 multi-function memory channels store frequency, repeater offset, and optional sub-tone channels. Memories 1 through 15 are for simplex or ±600 Hz offset. Memory pairs 16/17 and 18/19 are paired for non-standard repeater offset. Memories "A" and "B" set upper and lower scan limits, or are for simplex or ±600 kHz offset. In MEMORY mode, a circle of light appears around the memory selector knob. When the memory selector knob is rotated in either direction to channel 1, an audible "beep" sounds.

With 45 big watts, the TR-7950 is the most powerful 2 meter FM rig you can buy. The TR-7930 with a modest 25 watts is also available. A HI/LOW power switch allows power reduction to approx. 5 watts.

Other key features include: Programmable band-scan width, Center stop during band-scan, with indicator. Scan stops on busy channel and resume scan is automatic (time 5 sec. adjustable) or carrier operated. A scan delay of approx. 1.5 sec. is built-in. Scanning can also be accomplished with UP/DOWN microphone or "SC" key on front panel. Programmable priority alert can be set into any of 21 memory channels. With Alert switch "ON," a dual "beep" sounds when signal is present. The microprocessor is pre-programmed for simplex or ±600 kHz offset in accordance with the 2 meter band plan, with an "OS" key to allow manual changes in offset. The keyboard functions as a 16-key autopatch encoder during transmit. Frequency coverage is 142.000-148.995 MHz, and it has a repeater reverse switch and mobile mounting bracket. All these features are available in one compact, lightweight rig.

Yes, Kenwood is on top with the TR-7950! Its field proven reliability and matchless performance makes the TR-7950 the rig of tomorrow, today!!

TR-7950 optional accessories:

TU-79, three frequency tone unit, KPS-12 fixed-station power supply (7950), KPS-7A fixed-station power supply (7930), SP-40 mobile speaker, SP-50 mobile speaker, MC-55 mobile microphone with time-out timer, MC-46 16-key autopatch UP/DOWN mic, SW-100A/B power meters, PG-3A noise filter.

More information on the TR-7950/7930 is available from authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, CA 90220.

Specifications and prices are subject to change without notice or obligation.

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RAYMOND B. WANGLER, W5EDZ, 642 Beryl Dr., San Antonio, TX 78213 (512-733-9632 home, 512-684-5111 business)

Vice Director: Thomas W. Comstock, N5TC,
1700 Dominik, College Station, TX 77840 (409-693-1181)

*Executive Committee Member

Section Managers of the ARRL

Reports Invited: The ARRL Board of Directors (see list at left) determines the policies of ARRL. The 16 divisions of the League are further arranged into 73 administrative "sections," each headed by an elected Section Manager. Your SM welcomes reports of club and individual activity. ARRL Field Organization appointments are available covering a wide range of Amateur Radio volunteer interests. Whatever your license class, your SM has an appointment available. Check with your SM (below) for further information. Section boundaries are defined in the booklet *Operating an Amateur Radio Station,* free to members.

Canada

Alberta — E. Roy Ellis, VE6XC, P.O. Box 2, RR 1, Fort Saskatchewan T8L 2N7
British Columbia — H. E. Savage, VE7FB, 4553 West 12th Ave., Vancouver V6R 2R4 (604-224-5226)
Manitoba — Jack Adams, VE4AJE, 227 Davidson Ave. E., Dauphin R7N 2Z4
Maritime-Nfld — Donald R. Welling, VE1WF, 36 Sherwood Dr., St. John, NB E2J 3H6 (506-696-2913)
Ontario — L. P. Thivierge, VE3GT, 34 Bruce St. W., Renfrew K7V 3W1 (613-432-5967)
Quebec — Harold Moreau, VE2BP, 80 Principale, St. Simon Co., Bagot J0H 1Y0 (514-798-2173)
Saskatchewan — W. C. "Bill" Munday, VE5WM, 132 Shannon Rd., Regina S4S 5B1 (306-586-4963)

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Eastern Pennsylvania — James B. Post, KA3A, 15 Monarch Rd., Wilkes-Barre 18702 (717-825-3940)
Maryland-D.C. — Karl R. Medrow, W3FA, 702 W. Central Ave., Davidsonville, MD 21035 (301-261-4008)
Southern New Jersey — Richard Baier, WA2HEB, 1226 Audubon Dr., Toms River 08753 (201-270-9292)
Western New York — William Thompson, W2MTA, RD 1—Rock Rd., Newark Valley 13811 (607-642-8930)
Western Pennsylvania — Otto Schuler, K3SMB, 3732 Colby St., Pittsburgh 15214 (412-231-6890)

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Indiana — Bruce Woodward, W9UMH, 6208 Bramshaw Rd., Indianapolis 46220 (317-251-5606)
Wisconsin — Richard R. Regent, K9GDF, 5003 South 26th St., Milwaukee 53221 (414-282-0312)

Dakota Division

Minnesota — George E. Frederickson, KCØT, RR #2—Box 352, South Haven 55382 (612-558-6312)
North Dakota — Joseph M. Gregg, KNØA, R #1—Box 31, Horace 58047
South Dakota — Fredric Stephan, KCØOO, Box 771—Wind Cave Ranch, Hot Springs 57747 (605-745-6006)

Delta Division

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Louisiana — John M. Wondergem, K5KR, 600 Smith Dr., Metairie 70005 (504-837-1485)
Mississippi — Paul Kemp, KW5T, 3581 Beaumont Dr., Pearl 39208 (601-939-7612)
Tennessee — John C. Brown, NO4Q, P.O. Box 37, Eva 38333 (901-584-7531)

Great Lakes Division

Kentucky — Rose Marie Perciful, KA4SAA, P.O.B. 384, Berea, KY 40403
Michigan — James R. Seeley, WB8MTD, 21615-29½ Mile Rd., Springport 49284 517-857-2013
Ohio — Jeffrey A. Maass, K8ND, 9256 Concord Rd., Powell 43065 (614-873-3234)

Hudson Division

Eastern New York — Paul S. Vydareny, WB2VUK, 259 N. Washington, North Tarrytown 10591 (914-631-7424)
N.Y.C.-Long Island — John H. Smale, K2IZ, 315 Kensington Ct., Copiague 11726 (516-226-4835)
Northern New Jersey — Robert E. Neukomm, KB2WI, 103 Godwin Ave., Midland Park 07432-0060 (201-891-3064)

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Kansas — Robert M. Summers, KØBXF, 3045 North 72nd, Kansas City 66109 (913-299-1128)
Missouri — Benton C. Smith, KØPCK, RFD 1, Prairie Home 65068 (816-427-5319)
Nebraska — Vern J. Wirka, WBØGQM, Rural Route, 81 Capehart Rd., Papillion 68133

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Eastern Massachusetts — Luck Hurder, WA4STO, P.O. Box LL, North Eastham 02651 (617-255-2029)
Maine — Clevis O. Laverty, W1RWG, 17 Fair St., Norway 04268 (207-743-2353)
New Hampshire — Robert Mitchell, W1NH, RFD 4, Blueberry Hill, Raymond 03077 (603-895-3456)
Rhode Island — Gordon F. Fox, W1YNE, 13 York Dr., Coventry 02816 (401-828-6045)
Vermont — Ralph T. Stetson, III, KD1R, P.O. Box 123, Milton 05468 (802-893-4856)
Western Massachusetts — R. Donald Haney, KA1T, RD 1—Box 237, Myrick La., Harvard 01451 (617-772-4126)

Northwestern Division

Alaska — David W. Stevens, KL7EB, POB 103421, Anchorage 99510 (907-274-3051)
Idaho — Lemuel H. Allen, W7JMH, 1800 S. Atlantic St., Boise 83705 (208-343-9153)
Montana — L. C. "Les" Belyea, N7AIK, P.O. Box 327, Belgrade 59714 (406-388-4253)
Oregon — William R. Shrader, W7QMU, 2042 Jasmine Ave., Medford 97501 (503-773-8624)
Washington — Joseph N. Winter, WA7RWK, 819 N. Mullen St., Tacoma 98406 (206-759-9857)

Pacific Division

East Bay — Bob Vallio, W6RGG, 18655 Sheffield Rd., Castro Valley, CA 94546 (415-537-6704)
Nevada — Leonard M. Norman, W7PBV, 1310 Hazelwood St., Boulder City 89005 (601-586-9859)
Pacific — James F. Wakefield, AH6CO, 647 Kunawai La., #201, Honolulu, HI 96817 (808-524-0050)
Sacramento Valley — Ron Menet, N6AUB, P.O. Box 244, Cedar Ridge, CA 95924 (916-272-4873)
San Francisco — Robert Odell Smith, NA6T, 320 Park St.—P.O. Box 1425, Fort Bragg, CA 95437 (707-964-4931)
San Joaquin Valley — Charles P. McConnell, W6DPD, 1658 W. Mesa Ave., Fresno, CA 93711 (209-431-2038)
Santa Clara Valley — Rodney J. Stafford, KB6ZV, 5155 Shadow Estates, San Jose, CA 95135 (408-274-0492)

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North Carolina — Rae Everhart, K4SWN, P.O. Box 41, Lexington 27293-0041 (704-249-8734)
South Carolina — James G. Walker, WD4HLZ, Rte. 1, Box 5395, Marion 29571 (803-423-3645)
Virginia — Claude E. Feigley, W3ATQ, 135 The Main—RR #1, Williamsburg 23186 (804-253-0658)
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Utah — Ronald C. Todd, K3FR, 2112 W. 12060 S., Riverton 84065 (801-254-6051)
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West Indies — Gregorio Nieves, KP4EW, 1390 San Bernardo St., Altamesa-San Juan, PR 00921 (809-782-4375)

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Orange — Sandra Mae Heyn, WA6WZN, 962 Cheyenne, Costa Mesa, CA 92626 (714-549-8516)
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Oklahoma — Dave Cox, NB5N, 1812 S. Umbrella Ct., Broken Arrow 74012 (918-250-2285)
Southern Texas — Arthur R. Ross, W5KR, 132 Sally La., Brownsville 78521 (512-831-4458)

THE AMERICAN RADIO RELAY LEAGUE, INC.

The American Radio Relay League, Inc., is a noncommercial association of radio amateurs, organized for the promotion of interest in Amateur Radio communication and experimentation, for the establishment of networks to provide communications in the event of disasters or other emergencies, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

ARRL is an incorporated association without capital stock chartered under the laws of the State of Connecticut, and is an exempt organization under Section 501(c)(3) of the Internal Revenue Code of 1954. Its affairs are governed by a Board of Directors, whose voting members are elected every two years by the general membership. The officers are elected or appointed by the Directors. The League is noncommercial, and no one who could gain financially from the shaping of its affairs is eligible for membership on its Board.

"Of, by, and for the radio amateur," ARRL numbers within its ranks the vast majority of active amateurs in the nation and has a proud history of achievement as the standard-bearer in amateur affairs.

A bona fide interest in Amateur Radio is the only essential qualification of membership; an Amateur Radio license is not a prerequisite, although full voting membership is granted only to licensed amateurs in the U.S. and Canada.

All membership inquiries and general correspondence should be addressed to the administrative headquarters at 225 Main Street, Newington, CT 06111 USA

Telephone: 203-666-1541
Telex: 650215-5052 MCI.
MCI MAIL (electronic mail system) ID: 215-5052 (user name: ARRL)

"It Seems to Us..."

Headquarters Regroups to Serve You Better

The ARRL Headquarters organization chart has a new look! We've regrouped to serve League members better, and to address our ambitious goals for increases in the number of licensed amateurs and League members.

In addition to the five immediate staffers of the General Manager, the Headquarters staff is now organized into the following five groups:

Publications
Membership Communications Services
Volunteer Resources
Development
Administrative Services

The Advertising, Circulation, Production and Technical Departments comprise the Publications group, headed by Paul Rinaldo, W4RI. These departments are responsible for *QST* and other League publications. Theirs is an important function: The quality of our publications is vital to our mission as an educational organization and to our efforts to attract and train new amateur licensees. *QST* is the most visible of the many benefits of League membership. Finally, the income from our publications activities is essential to the League's ability to accomplish its objectives.

The 1985 *ARRL Handbook* has set a new standard for Amateur Radio technical publications. Outstanding teamwork is what made the 1985 *Handbook* possible. In the coming months, the Publications group will be working to add to this record of accomplishment.

Providing the wide variety of benefits and services that members enjoy in addition to *QST* is now the work of Membership Communications Services under John Lindholm, W1XX. These functions previously were handled by the Communications and Membership Services Departments: information services such as W1AW, the *ARRL Letter*, and the news sections of *QST;* awards programs, contests, the QSL bureau, the insurance program, legal and regulatory assistance, and our program to assist the disabled in Amateur Radio.

Volunteer Resources under Steve Place, WB1EYI, will provide support to the thousands of volunteers who carry on the work of the League at the local and section levels. Here, the job is done with "volunteer power" — and an important resource it is! By centralizing the support function for volunteers, we hope to do a better job across the full range of volunteer activities. Within Volunteer Resources there will be two departments: one to perform the function of Volunteer Examiner Coordinator on behalf of ARRL, and a new Field Services Department to minister to the needs of the Field Organization (including public-service activities), affiliated clubs, and ARRL-sanctioned conventions and hamfests. This brings our Headquarters structure into line with the 1983 restructuring of the Field Organization, which expanded its responsibilities beyond its traditional Communications Department role.

Taking on the hefty responsibility of Development Manager is Bill Lazzaro, N2CF. Bill has served the amateur-satellite community well as the first Executive Director and General Manager of AMSAT, and we're grateful that he has agreed to apply his experience, talent and enthusiasm to the even greater challenge of increasing the amateur and League-member populations.

In something of a departure from past practice, the Development Office will be located away from our Newington facility. Bill and his staff (including a newly hired public information officer, a position which is now open) will be based in Washington, DC. There are several advantages to this arrangement, including the opportunity to raise our visibility in the Washington area.

Administrative Services, under the direction of our able Controller, Mike Zeigler, provides the internal administrative, accounting, purchasing and central computer services for ARRL Headquarters. Actually, "internal" is something of a misnomer: we number the pieces of incoming and outgoing mail in the hundreds of thousands annually, and each piece is handled by this group! We rely increasingly on an in-house minicomputer to maintain our membership, accounting and other records, and this function (as well as others that are common to a number of departments) is the job of Administrative Services.

During the holiday period we've had quite a game of "musical offices" going here in Newington, but as you receive this the period of turmoil should be about at an end and you should begin to see some of the fruits of our efforts. Right now, when they show visiting members around the building the tour guides are learning as much as the visitors! Probably the members who will notice the greatest change in the coming months — and we hope they'll see it as beneficial — are the active volunteers in the field, who now have a corner of the Headquarters to call their own. As Manager of the Field Services Department, Rick Palm, K1CE, has put together a staff whose whole purpose is seeing that our field volunteers have all the motivation and support they require. Effective communications between Headquarters and the field is a top priority!

Our goals for new-amateur recruitment and membership promotion are ambitious, and if we're to be successful will require a new approach. Turning an organizational structure from something that looks nice on paper into something that actually works requires people. Entering 1985, the League has the right people in the right places on its staff to get the job done — with *your* help! — *David Sumner, K1ZZ*

Cards and plaque courtesy W6TC

EIMAC's new DX champion! The 3CX800A7.

Varian EIMAC continues to commit its development of reliable tubes for HAM radio.

The new, rugged 3CX800A7 power triode provides 2 kW PEP input for voice service or 1 kW cw rating up to 30 MHz. Two tubes will meet the new, higher power ratings authorized by the FCC.

Designed for today's low profile, compact linear amplifiers, the 3CX800A7 powerhouse is only 2½ inches (6.35 cm) high. Cooling requirements are modest and a matching socket, air chimney and anode clamp are available.

A data sheet and more information is available from Varian EIMAC. Or the nearest Electron Device Group sales office. Call or write today.

Varian EIMAC
301 Industrial Way
San Carlos, California 94270
Telephone: 415-592-1221

varian

UP FRONT in QST

Restructuring of ARRL Hq.

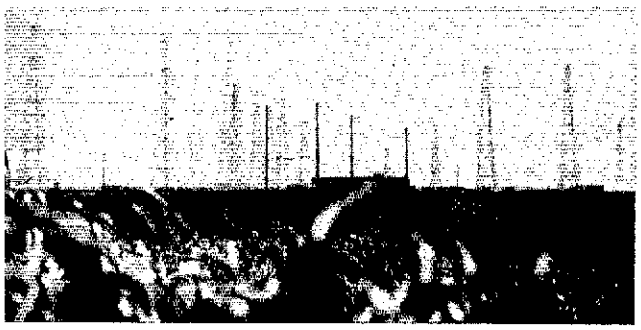
As the new year begins, we're putting finishing touches on a **major overhaul of Headquarters operations.** ARRL General Manager David Sumner, K1ZZ, implemented the plan to improve service to members and Hq. efficiency. In addition, it will allow the staff to more effectively address recruitment and membership promotion goals. As a result, **the departments at Hq. have been realigned and consolidated into five offices:** publications, membership communications, volunteer resources, development and administrative services. See page 9 and *The ARRL Letter* for further details.

Burbank Antenna Case Settled

It's all over but the shouting in Burbank, Illinois — and Amateur Radio has come out on top. It's been two years, but amateurs and CBers who filed the class action suit over their **right to erect antennas** have finally come to terms with the City. In their suit, the amateurs alleged that the City's antenna ordinance and its enforcement violate their rights under the Constitution, particularly the First Amendment. See Happenings, this issue, for details of the settlement of this landmark case.

Red Cross Supports PRB-1

Add the American Red Cross to the list of those who have come out in support of the League's request for federal preemption of local and state zoning ordinances affecting amateur antennas (PRB-1). In a letter to the FCC, the Red Cross echoed amateurs' concerns about "actions undertaken that will interfere with their (amateurs) ability to provide service to their fellowman." Favorable FCC action on PRB-1 will make it easier for amateurs involved in local antenna-ordinance cases to establish a federal interest in maintaining effective Amateur Radio antennas. See Happenings, this issue, for the complete text of the letter.



Some operators know just how to get their signal out. These directional curtain-array antennas at Radio Netherlands's new Flevo transmitter site will be used during the operation of special-events station PA6FLD February 16-17. The antennas are thought to comprise one of the largest shortwave arrays in the world. Amateurs at Radio Netherlands petitioned the Dutch PTT licensing authorities for permission to use the rare PA6 prefix. The station, located in Hilversum, The Netherlands, is built on a polder, or land reclaimed from the sea. See Special Events, this issue, for operating times.

Elmar Compans, DF4GV (left), recently fulfilled a dream he's had for the past three years: to obtain a U.S. amateur license. A graduate student in physics from Rastatt, Fed. Rep. of Germany, Elmar was traveling throughout the Western U.S. when he heard of the WIMU Hamfest — and the volunteer exams being given in Jackson, Wyoming. He found his way to Jackson, applied for the tests when he arrived, and went from no U.S. amateur license to Extra Class in one sitting. He is **believed to be the first foreign national to achieve Extra Class under the Volunteer Examining Program.** ARRL Utah SM and WIMU Hamfest Chairman Ron Todd, K3FR, did the honors of presenting Elmar with his certificate of successful completion. Recently, Elmar received his new U.S. call sign — AA4EK.

V85PM — Brunei's First Ambassador to the U.S.

Amateur Radio is making its presence felt in Washington, DC — via the tiny nation of Brunei. Less than a year into independence after 96 years as a British protectorate, Brunei has appointed a radio amateur as its first ambassador to the U.S. — Pengiran Haji Idriss, V85PM.

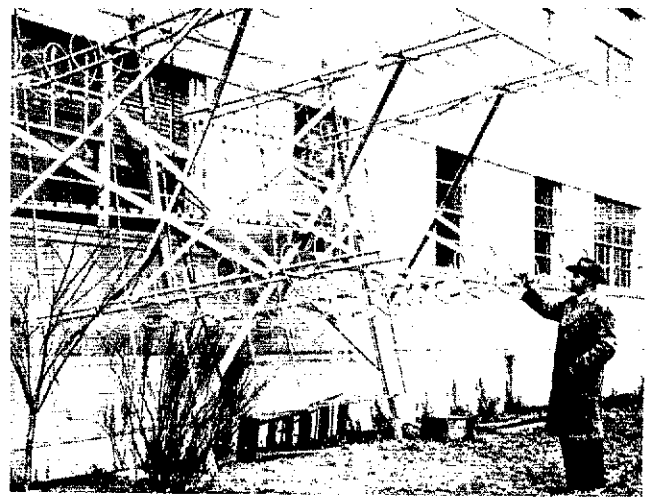
Idriss, a member of Brunei's royal family, joined the civil service in 1964. He transferred to the diplomatic service in 1980, and has held posts as Brunei's high commissioner in Singapore and London. This latest appointment is his first exposure to the U.S. — other than by Amateur Radio. "I think a lot of Americans would be surprised to know that VS5PM (now V85PM) is now an ambassador in Washington," Idriss said. Oil- and gas-rich Brunei, which is about the size of Delaware, is located on the northwest coast of Borneo. *(tnx W6CRL)*

Antenna Inventor W8JK Awarded Edison Medal

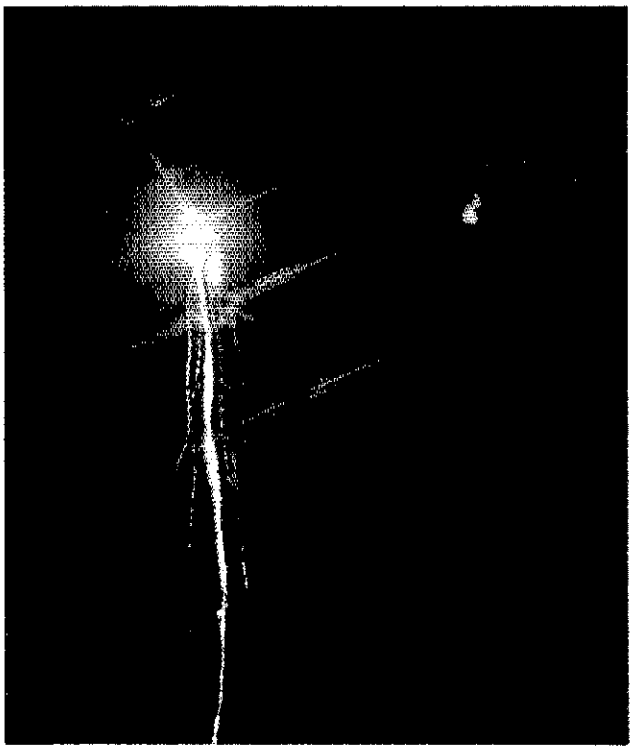
Dr. John D. Kraus, W8JK, can add another to his long list of achievements: The noted pioneer in the field of antenna design and radio astronomy has been named the 1985 recipient of the Edison Medal. The Medal, to be presented June 2 in Philadelphia, reads: "For a sustained career as an innovator, discoverer, and educator in the fields of antennas and radio astronomy." Sponsored by the Institute of Electrical and Electronic Engineers (IEEE), the award is named in honor of American inventor Thomas Alva Edison.

Amateur Radio played an important part in Dr. Kraus's developing an early interest in radio and particularly in antennas. "Now, as a licensed amateur of almost 60 years, I thrill at the tremendous scope of activities available to amateurs, including satellite communication," he said. "I wish that more young Americans would develop an interest in Amateur Radio, which could lead to a professional technological career."

Dr. Kraus is director of the Radio Observatory and Taine G. McDougal Professor Emeritus of Electrical Engineering and Astronomy at Ohio State University. Active in antenna development for more than 50 years, he is the **inventor of many types of antennas**, including the corner reflector, helical antenna, close-spaced (W8JK) arrays, multiwire doublets and steerable beam arrays. He has also written hundreds of technical articles and four books, including two popular textbooks, *Electromagnetics* and *Antennas and Radio Astronomy.*



W8JK in 1951 next to the first section of the 96-helix array he invented that has been used to map about 20,000 radio sources in the universe.



Problems getting — and staying — on the air are familiar to the avid contester, but some are just a little harder to take than others. One evening, just before the November Sweepstakes contest, Ralph Bellas, K9ZO, was alerted by a passerby that his antennas were on fire and lighting up the Bloomington, Illinois, sky. Sure enough, the coax balun was burning and dropping molten plastic to the ground. Ralph didn't relish the thought of climbing the 106 feet to the top of the tower, so there was nothing to do but let the fire burn itself out. He did manage to repair his antenna before the SS started, however — with three minutes to spare!

ARRL/VEC Test Sessions at a Glance September 1-December 1, 1984

The numbers are in for the first three months of the ARRL/VEC program, and the results are encouraging. Nearly 1500 candidates have been served in more than 60 sessions across the country, resulting in an overall pass rate of 47%. (December's figures, not yet official, are expected to more than double the number of test sessions and add 1000 to the number of candidates served.) There has been no significant difference in the overall pass rates for ARRL/VEC and non-ARRL/VEC test sessions. Here is a breakdown of the pass rates by Element, and a tally of license upgrades.

	1A	*1B*	*1C*	*2*	*3*	*4A*	*4B*	*Total*
Elements Passed	45	309	101	60	293	149	59	1016
Elements Given	58	696	191	70	590	357	176	2148
Pass Rate	78%	44%	53%	86%	50%	42%	34%	47.3%

Total Candidates Served by ARRL/VEC: 1482
Total ARRL/VEC Sessions Completed: 61
Average Number of Candidates/Session: 24

Tally of ARRL/VEC License Upgrades Through December 1, 1984

Technician	185	Extra	44
General	246	Total	626
Advanced	151		

Bowdoin Update

Good news to add to the report in this column in November on the *Bowdoin*. Recently, the veteran of 26 trips to the Arctic and pioneering wireless operation from the North Pole was relaunched during ceremonies at the Maine Maritime Museum in Bath. For the Schooner Bowdoin Association, a group of former shipmates and others who own and operate the 63-year-old vessel, it means a happy milestone to four years of restoring the ship to seaworthy life. More work must be done, but if things go according to plan, the *Bowdoin* will soon be sailing to Boston, where it will play an active role in the public school system there.

League Lines...

ARRL has filed comments in PRB-1. League comments underscore two themes in urging that the FCC grant our formal request for the establishment of a policy of limited federal preemption of state and local regulation of Amateur Radio installations. The first is that the FCC does indeed have the authority to preempt state and local regulations, and the authority to issue the desired preemption declaration. The second theme is that this is the appropriate action for the Commission to take.

ARRL Members: Please let your Senator know of your support for Senate Resolution 36! On January 3, 1985, Senator Barry Goldwater, K7UGA, introduced two resolutions. One of them (S. Res. 36), if adopted, will declare the sense of the U.S. Senate that the Federal Communications Commission should affirm that state and local regulations must not unreasonably restrict communications from Amateur Radio stations. The other resolution pertains to the rights of citizens to erect and maintain television receive-only (TVRO) satellite dishes. The Amateur Radio resolution will send a clear message to the FCC that favorable action on PRB-1 would meet with the approval of the U.S. Senate. Your help is needed to ensure it is adopted.

The FCC has released a Second Report and Order in Docket 21006, the cable TV RFI docket. The Report and Order attempts to minimize cable TV interference to aeronautical communication and navigation systems by requiring regular monitoring for signal leakage, and channel restrictions which place the cable channels approximately halfway between the aeronautical communication channels. The National Cable Television Association (NCTA) has filed for reconsideration in Docket 21006, basing its request on the grounds that signal leakage is not the problem that some have made it out to be. The group points to a statement made by the FCC in the Second Report and Order that there were only five allegations of noncompliance with the existing FCC leakage rules between 1976 and 1980. (The context of the FCC's statement, however, was limited to harmful interference caused to the aeronautical and marine radio services.) According to NCTA, the new cable leakage rules will impose unjustifiably excessive burdens on cable operators.

The ARRL/VEC maintains a computerized listing of all test sessions known to us, updated weekly. Just send a business-size s.a.s.e. to the ARRL/VEC office, 225 Main St., Newington, CT 06111, and ask for a printout of test sessions in your state. Persons living near a state line may ask for the adjacent state as well.

Some VE Teams working with the ARRL/VEC are now handling walk-ins. If you know of a session but didn't submit your 610 before the 30-day pre-registration deadline, check with the VE Team anyway to see if they will accept walk-ins. The VE Team has the right to limit the number of candidates because of the number of available VEs or the size of their facilities.

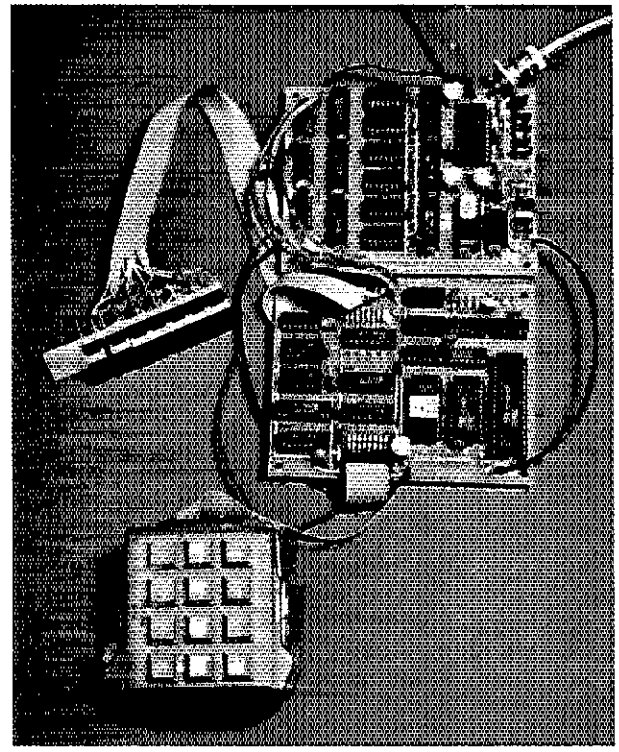
The listing of donors participating in the 1985 ARRL International DX Contest Awards Program will appear in March 1985 QST.

The ARRL DXCC Desk is now taking orders from members of the Honor Roll for the new distinctive Honor Roll Plaque. This handsome red and white on brass plaque mounted on walnut comes engraved with the member's call. A matching Phone or CW sticker denotes mode. This beauty is available for $25, which also covers shipping.

A laboratory technician or engineer position will be opening at Headquarters on April 1. Required is a practical background in electronics, which must include work with digital circuitry. BSEE or ASEE with experience is preferred. No writing experience is necessary, but an amateur license is desired. Contact Chuck Hutchinson, K8CH, at Hq.

The brand new ARRL Tech/General Class License Manual should be available for distribution sometime in February. The Advanced Class Manual is targeted for late Spring, and the Extra Class Manual should be available sometime this fall. For more information on these specialized license manuals, see the article on page 51 of this issue.

A Microprocessor Controller for the Digital Frequency Synthesizer



Take complete control of your digital frequency synthesizer with this project, and have a really clean 1-Hz-step VFO for your rig.

By Fred Williams*

This article is a companion to Fred Williams's April 1984 digital frequency synthesizer article. Stas Andrzejewski, W6UCM, became involved when his firm, A & A Engineering, decided to design circuit boards for the project. He overcame several parts-procurement problems and made a few circuit changes to improve the reliability and operating ease of the synthesizer and controller. The parts and diagrams shown in this article include the changes made by A & A Engineering. Stas also hopes to develop a "dumb" controller for use with the synthesizer in the near future. There were a number of corrections to the original synthesizer schematic diagram published in QST. *A & A Engineering also made a few changes to the circuit, including an improved, more reliable clock circuit. For those reasons, the complete schematic diagram for the synthesizer is presented in Fig. 1.*

My article in the April 1984 issue of *QST* showed how to design and build a frequency synthesizer based on digital-signal-processing techniques.[1] The frequency must be supplied to that synthesizer as a binary number. Although it is possible to enter the desired frequency directly as a binary number by setting 24 switches, that is rather inconvenient. In addition, most people are not capable of rapidly converting decimal numbers into binary ones — nor should they be. This task is best left to inexpensive microprocessors. As a bonus, the computing power inherent in these chips allows extra convenience features to be added at no extra parts cost, and with just the programming effort to tell the unit what to do. This article describes a controller based on the Zilog Z80™ microprocessor, which provides keypad entry of the desired frequency.

A Quick Review of Microprocessors

Any computer system uses a limited number of basic component sections. These are:

1) A central processing unit (CPU), which performs all of the required operations on the information it is presented with.

2) A memory section that stores temporary and permanent information, and also stores the sequence of instructions that tells the processor what to do and when to do it.

3) Some way of communicating with the "outside world" (called input and output, or I/O for short).

Since most microprocessors are inexpensive, the CPU of many small systems is already designed. For most control purposes, there is virtually no difference between the major microprocessors. The Z80, the 6800 family and the 6502 family make up over 90% of all 8-bit processors sold. My decision to use the Z80 was based on having computer help to write programs (an editor/assembler) for that chip, and the fact that I wanted to try using my experience with the 6502 to program a different chip.

Once the CPU is specified, all that remains to build a unit that uses a microprocessor is to design a memory section, the I/O circuits and the interconnections between these sections. My design philosophy on this project was that simple parts should be used wherever possible to reduce the cost and difficulty of debugging the controller.

Before beginning a design, you must know what you want the unit to do. Since you are going to be the operator, it is a good idea to start by describing how the controller should appear to you as a user. In other words, describe how the controller communicates with the world outside the equipment you're designing, since you're part of that outside world!

I wanted keypad entry of the frequency and control information, with a digital readout of the frequency as it is being entered. Since the synthesizer is a wide-range device, covering from low audio frequencies to around 6.5 MHz, the frequency readout will range over several decades. To get around this problem, I could either choose to use range keys or to use an ENTER key. Range keys could be labeled MHZ, KHZ and HZ. For simplicity in program development, and to allow checking an entry before putting out a signal, I chose an ENTER key. This key tells the synthesizer to change to the frequency just

[1]Notes appear on page 20.

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entered. I wanted the keypad and display to work like a pocket calculator.

The second set of outputs are the ones that tell the synthesizer what frequency to provide. Three signals are required to drive the synthesizer: one line for the data bits, another to tell the synthesizer when a data bit is valid and can be loaded into the shift register, and one to tell the synthesizer that all data bits have been transferred from the controller to the synthesizer. The data bits must be sent with the most significant bit first. The load-data line must go from a logic LOW value to a HIGH one after all 24 bits have been transferred to the synthesizer. Fig. 2 shows how these waveforms should look. This description of what I wanted the controller to do was translated into a circuit and program design during the development process.

Circuit Design

Microprocessor Requirements

For the Z80 chip to work properly, it needs a signal to tell it when to perform each operation. This signal is called a clock. There are specifications both on the frequency (minimum 100 kHz, maximum 4 MHz for the standard part) and voltage of the clock signal. To avoid the cost and trouble of providing a separate oscillator, I obtained the signal by taking the 16.7-MHz synthesizer clock signal, using a 74LS193-counter IC to divide this frequency by eight (shown on the oscillator portion of Fig. 1), and then using the driver circuit that appears in the Zilog data sheet, as shown in the clock-input portion of Fig. 3.

Memory Circuit

Two kinds of information are stored in the memory section. One kind is temporary data. Examples of temporary data held in memory are the present operating frequency, recorded in both decimal and binary forms, and intermediate results of calculations. The other kind is permanent data, such as the sequence of instructions that tells the controller what to do, or the information that specifies which segments of the LEDs to light for each display digit. It isn't surprising to find that different kinds of memory chips are often used for different kinds of data. The temporary data is stored in memory that can be changed. This kind of memory is referred to as read/write memory (RWM) or random-access memory (RAM). Despite the name being less descriptive, the term RAM is normally used. The permanent data (which includes the program or sequence of instructions to tell the processor what to do) is stored in memory that cannot be changed. One kind of memory that does this is called erasable, programmable, read-only memory (EPROM). I chose this type of program memory for the controller. The information stored in an EPROM does not "go away" when the power is turned off, unlike information in RAM memory.

For convenience, chips that store data in 8-bit "chunks" can be used to simplify design, because they match the 8-bit groups that the microprocessor handles. These 8-bit chunks are called "bytes" or "words" in computer jargon. The cost of these chips is so low that a designer of a simple, not-mass-produced device like this controller can make the task much easier just by using chips that are larger than needed. Each of the chips used in this controller is capable of storing 2048 eight-bit numbers.

The single RAM chip (U2) is a 6116-type static memory, but a 2016-type memory IC would also work. The EPROM (U3) is a 2716 IC. Each of these memory ICs almost forms a complete memory subsystem in itself. The CPU needs to have some way of distinguishing between these memories, which it does by using different addresses for the two memory chips, and different I/O addresses for the I/O chips. A simple gate circuit selects which memory is used, as shown in the memory portion of the Fig. 3 schematic diagram.

Interconnection Circuitry

Interconnections between the three different sections (CPU, memory and I/O) fall into four different categories:

1) Connections that carry information to and from each section. A set of wires that carries information is called a *data bus*. The Z80 uses a set of eight lines to carry data, because it handles information in 8-bit chunks. Because this bus carries instructions to the microprocessor from the memory, all eight lines must be used.

2) Connections that tell a section where to find or put information. This set of lines is called an *address bus*. The Z80 provides a set of 16 lines to carry the address, but not all of these lines need to be used.

3) Connections that tell a section what to do. This set of lines is called a *control bus*. This bus tells each section whether it will receive or send information, and what it should do with the information. Control signals in a Z80 system all come from the microprocessor.

4) Miscellaneous connections that provide power and other signals necessary for proper operation.

A single-step program-advance circuit, used to debug the software, and a power-on-reset circuit are shown on the schematic diagram. The power-on-reset circuit is needed to ensure that the microprocessor always goes to a known state when the power is applied.

I/O Circuitry

At specified times, the processor has to communicate with a keypad, a display and the synthesizer itself. The Z80 has special instructions for performing I/O operations, but these instructions still must be matched to the circuitry that surrounds the processor.

The keypad I used was originally built to be part of a calculator, and was purchased as surplus. The keypad was wired up as a set of SPST switches in a rectangular array, as shown in Fig. 3. The keypad is scanned by grounding one row at a time and seeing which (if any) column has a ground on it. If no column has a ground present, then no key is pressed. If a column is grounded, the key can be identified by which column the ground appeared in, and which row was grounded when that happened. By scanning the keypad at such a high rate that any delay in recognizing the key will be unnoticeably small, you get the feeling that the computer is continuously watching the keypad.

Likewise, the LED display will have only one digit lit at a time, but multiplexing gives the impression that all digits are continuously illuminated by using a high scanning rate to take advantage of the persistence of human vision. Both the keypad- and display-scanning techniques are widely used in pocket calculators.

To communicate with the synthesizer, the three output lines must each be able to change independently of the times that the other lines change. This function is handled quite simply by three flip-flops that hold the data-bus contents when an output occurs. This is shown in the synthesizer-output section of Fig. 3. The synthesizer circuit itself does not provide any information back to the controller, so the only input comes from the keypad.

There are four I/O chips in the controller. The CPU needs to have some way of distinguishing each one. It does this by using different I/O addresses for each of these chips. Two 74LS138 3- to 8-line decoder chips are used to direct the chip-enable commands to the right IC.

Miscellaneous Circuit Details

To aid in troubleshooting the controller, a small circuit has been included to perform one instruction, and then to wait for a pushbutton to be pressed and released before performing the next instruction. This single-step circuit is shown connected to pin 24 of the microprocessor in Fig. 3.

Program Design

A program is a list or sequence of instructions that the computer follows to perform a specific task. Unlike humans, microprocessors can only do one thing at a time, but they can do each operation rapidly.

The best programs, like the best circuits, are put together from sections that do not have a lot of connections. In transceiver design, for example, different circuits are often placed in different metal boxes, with only the inputs and outputs connected, so that interaction among sections is minimized. Likewise, programs are best designed with simple modules that can then be strung together to perform the desired function. Instead of wires or coaxial cable to connect different modules or sections,

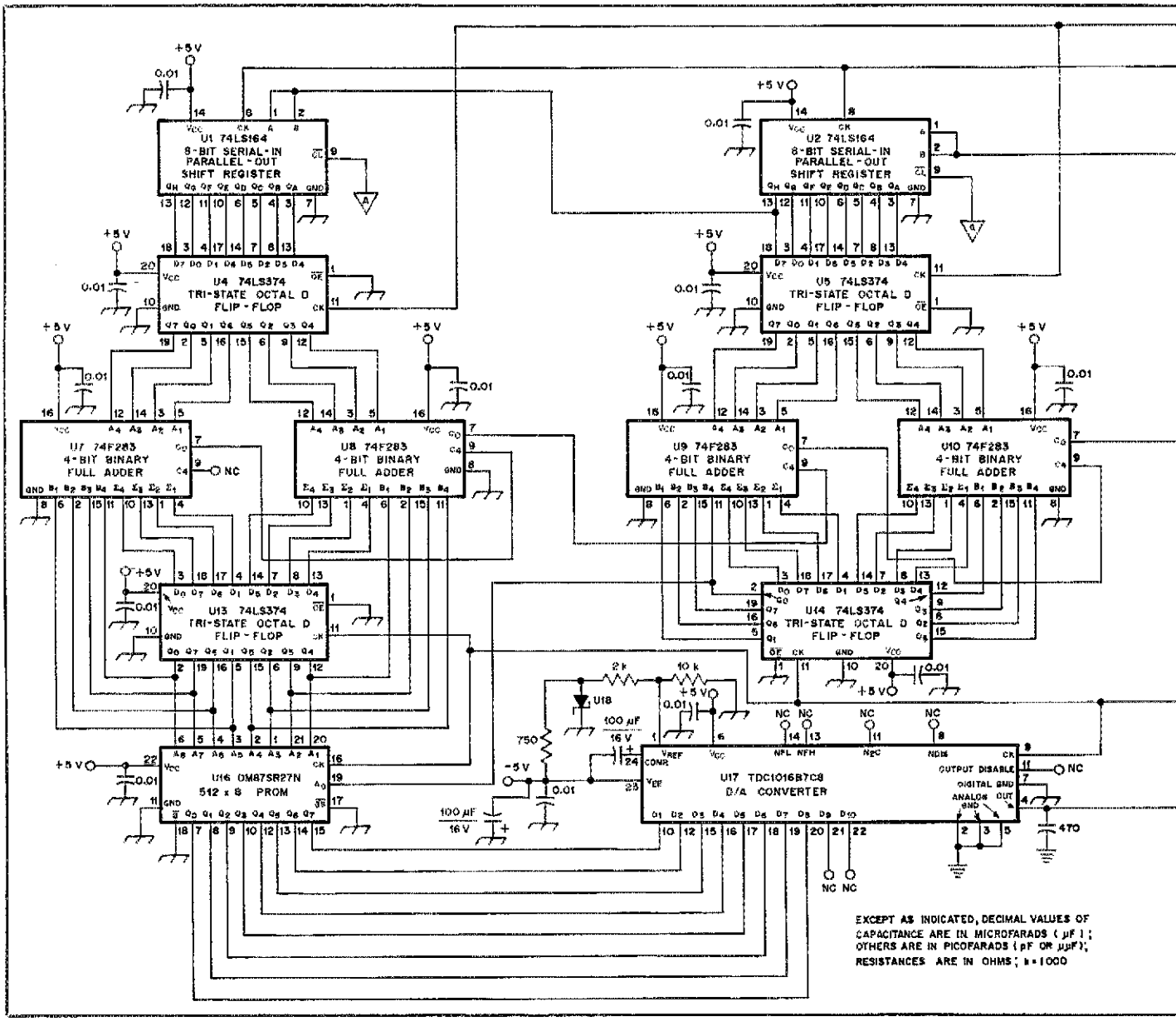


Fig. 1 — Revised and corrected synthesizer schematic diagram. See April 1984 *QST* for more information.

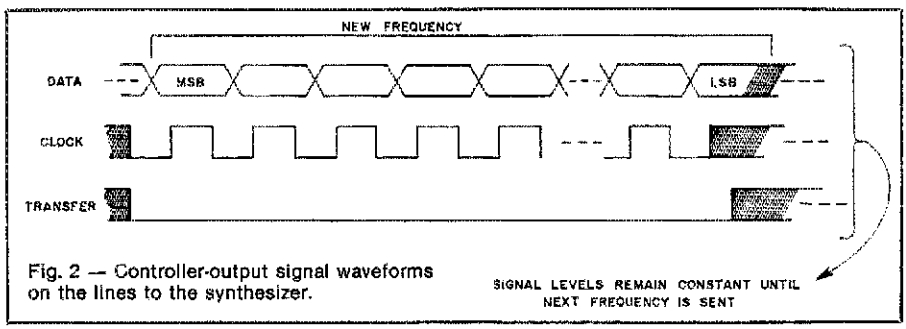


Fig. 2 — Controller-output signal waveforms on the lines to the synthesizer.

program sections communicate by placing numbers in certain memory locations, somewhat like communicating with your neighbors by leaving messages at their doors.

There are several major program modules used in my controller:

1) Main program — selects which of the other modules is used.

2) Memory-clear module — makes sure that we start with zeros in every RAM location used.

3) Display-driver module — sends one digit to the LED display.

4) Keyboard-scan module — checks to see if a key is pressed; if so, it reports which one.

5) Decimal-to-binary conversion subroutine.

6) Module to send frequency data to the synthesizer in binary form.

Each of these modules is composed of smaller sections. For example, the module that sends the frequency to the synthesizer uses one section to send a "zero" to the synthesizer, and another to send a "one" to the synthesizer. In turn, each function is built up out of individual instructions.

With this idea in mind, look at Fig. 4. This diagram is the programming equivalent of a block diagram. It's called a flow chart. Unlike a block diagram for

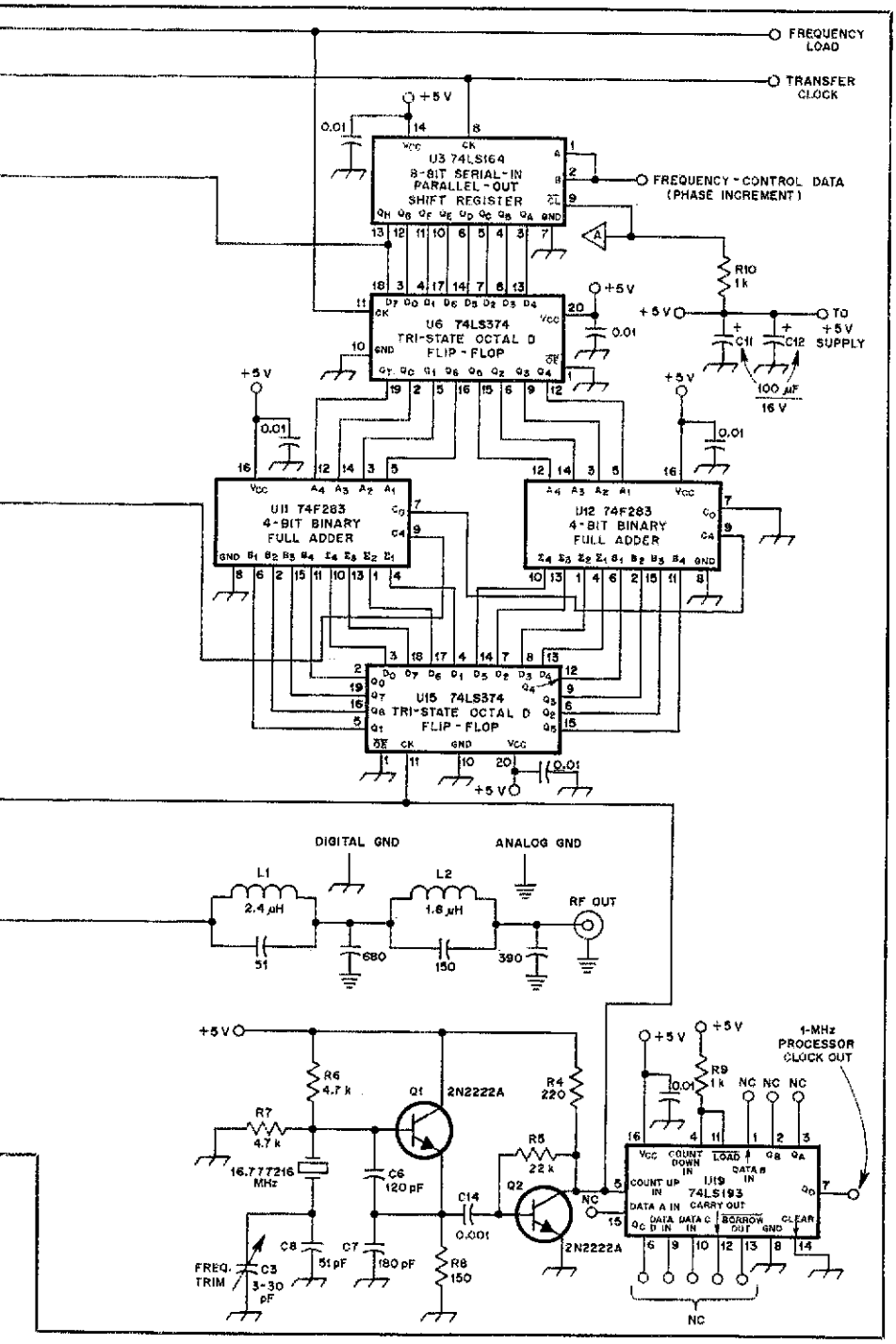


Table 1
Controller-Program Memory Map

Address Range	*Contents*
$0000-$07FF	ROM (program and tables)
$0000-$0037	Main program
$0100-$010D	Memory-clear subroutine
$0200-$0218	Display-scan subroutine
$0300-$033B	Keyboard-scan subroutine
$0380-$03A7	Subroutine to convert keystroke to decimal
$0400-$0412	Subroutine to convert decimal to seven-segment display
$0480-$04AA	Subroutine to shift display digits during entry
$0500-$0535	Subroutine to send binary frequency data to synthesizer
$0600-$060E	Delay subroutine
$0620-$0687	BCD-to-binary conversion subroutine
$0700-$07AF	Unused ROM space
$07B0-$07C4	Decimal-to-binary conversion-factors table
$07D1-$07F0	Keycode translation table
$07F1-$07FF	Seven-segment display translation table
$0800-$0FFF	RAM
$0800-$0807	Display memory
$0808-$080F	BCD frequency memory
$0810-$0816	Intermediate results
$0817-$0819	Binary frequency data
$0820-$0FFF	Unused RAM space

a piece of electronic equipment, only one block can be working at any instant. Since only one block can be working, the computer has to store the results at each block, so that they will be available when needed. Where is each number stored? The diagram that gives this information is called a "memory map," and the map for this controller is shown in Table 1. I have attempted to make much of this program "table driven" so changes will be relatively easy to implement if you want. ("Table driven" means that all the information the program uses for a particular function is stored in a single, unbroken area of memory.)[2]

Construction

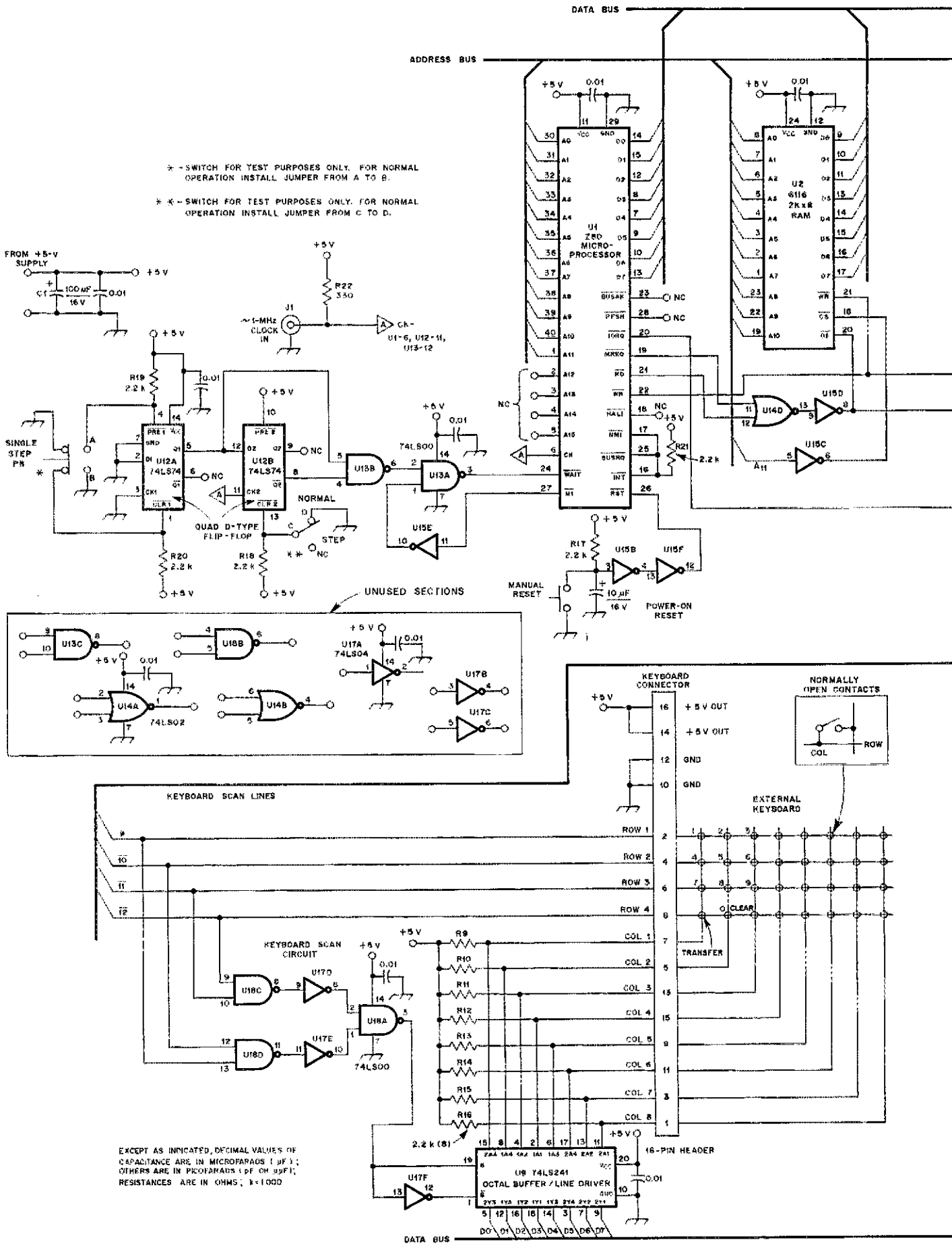
Like the digital frequency synthesizer this unit controls, my controller uses wire-wrapped construction.[3] The keypad and displays were built on separate boards to make it easier to mount them where I wanted when I put it in a chassis. Preassembled flat cables with dual-in-line-package (DIP) plugs connect the keypad and display to the main computer board. I bought these at the local Radio Shack store. The supply voltage for each IC is bypassed with a 0.01-µF capacitor. No other special construction techniques are required.

Access to an EPROM programmer is necessary if you plan to program the EPROM yourself. Many distributors of electronic components offer programming as a service, and computer stores will also often perform programming services for a fee. You might even find a local computer hobbyist who would be willing to program the EPROM for you. Alternatively, you can purchase a preprogrammed EPROM from A & A Engineering (see note 3).

One possible problem area is the keypad. If your keypad has different connections for the various keys, the table in EPROM that tells which key was pressed for each possible code will have to be corrected to match your keypad. Since there is no standard, you will either have to write your own conversion table to replace KCTBL, or use individual keys and wire them according to the diagram shown in Fig. 3.

Debugging

Ideally, the controller will work perfectly the first time you turn it on. In the real world, it seldom turns out that way, however. I debugged my unit largely with the help of a logic probe and pulser manufactured by OK Instruments, with occasional use of a triggered oscilloscope. If your unit does not work when first turned on, verify that there is +5 V at the


DATA BUS
ADDRESS BUS
* - SWITCH FOR TEST PURPOSES ONLY. FOR NORMAL OPERATION INSTALL JUMPER FROM A TO B.
* * - SWITCH FOR TEST PURPOSES ONLY. FOR NORMAL OPERATION INSTALL JUMPER FROM C TO D.
FROM +5-V SUPPLY
+5 V
C1 100 µF 16 V
0.01
J1
~1-MHz CLOCK IN
R22 330
CK - U1-6, U12-11, U13-12
R19 2.2 k
SINGLE STEP PB
U12A 74LS74
U12B 74LS74
QUAD D-TYPE FLIP-FLOP
NORMAL
STEP
R20 2.2 k
R18 2.2 k
U13B
U13A
74LS00
U15E
U1 Z80 MICRO-PROCESSOR
U2 6116 2K x 8 RAM
NC
R21 2.2 k
U14D
U15D
U15C
R17 2.2 k
U15B
U15F
MANUAL RESET
10 µF 16 V
POWER-ON RESET
UNUSED SECTIONS
U13C
U18B
U14A
U14B
74LS02
U17A 74LS04
U17B
U17C
KEYBOARD CONNECTOR
+5 V OUT
+5 V OUT
GND
GND
NORMALLY OPEN CONTACTS
COL
ROW
KEYBOARD SCAN LINES
EXTERNAL KEYBOARD
ROW 1
ROW 2
ROW 3
ROW 4
CLEAR
TRANSFER
KEYBOARD SCAN CIRCUIT
U18C
U17D
U18A
U18D
U17E
74LS00
R9
R10
R11
R12
R13
R14
R15
R16
COL 1
COL 2
COL 3
COL 4
COL 5
COL 6
COL 7
COL 8
2.2 k (8)
16-PIN HEADER
U17F
U8 74LS241 OCTAL BUFFER / LINE DRIVER
DATA BUS
EXCEPT AS INDICATED, DECIMAL VALUES OF CAPACITANCE ARE IN MICROFARADS (µF); OTHERS ARE IN PICOFARADS (pF OR µµF); RESISTANCES ARE IN OHMS; k=1000

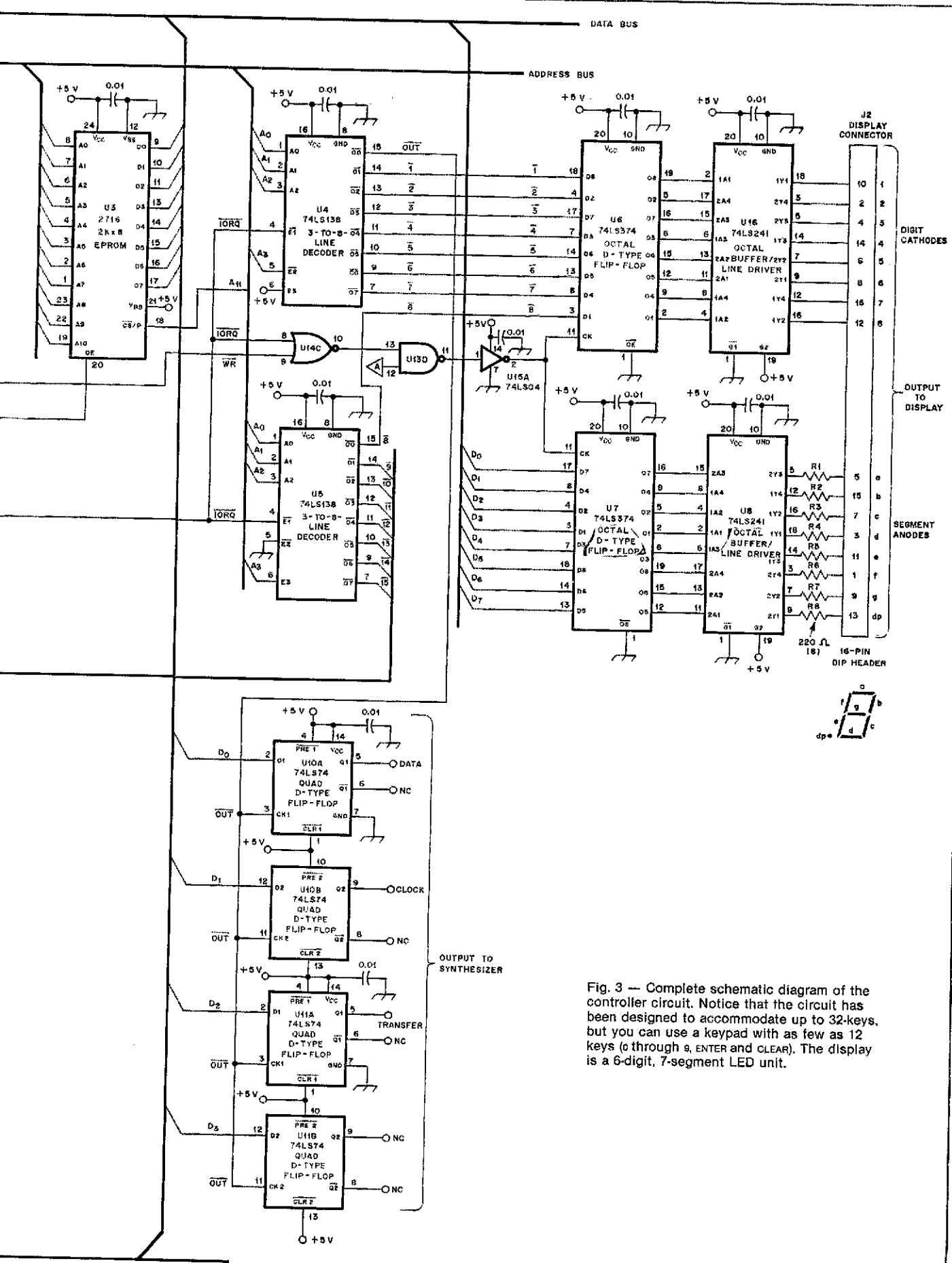


Fig. 3 — Complete schematic diagram of the controller circuit. Notice that the circuit has been designed to accommodate up to 32-keys, but you can use a keypad with as few as 12 keys (0 through 9, ENTER and CLEAR). The display is a 6-digit, 7-segment LED unit.

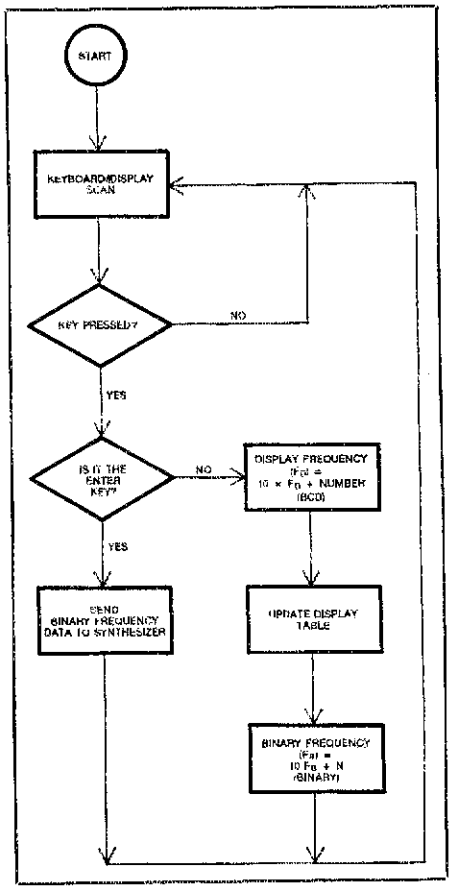


Fig. 4 — A simple flow chart for the controller program.

supply pin of each IC. Next, be sure the clock waveform is present on the Z80 clock-input pin, and that it is of the proper voltage.

Once the required driving signals are present, proper operation of the CPU must be checked. To do this, use a logic probe or scope to verify the presence of a negative-going pulse at the keypad. If this is missing, use the RESET and SINGLE-STEP controls to check for the presence of the proper signals on the address and data buses. If these are not the same at each chip, check the bus connections to those chips. Once the keypad strobe is present, verify the presence of strobe pulses at the display. If the keypad can enter numbers correctly into the display, output can be checked either on a scope or by using a logic probe to check the signals at the output of the serial-to-parallel shift registers in the digital frequency synthesizer. A reminder, so I don't scare you away by all this talk of debugging: Knowing that you have a functioning program in EPROM to begin with provides an immense advantage in debugging.

Conclusion

There are unused keys on the keypad and a lot of unused memory space in the program memory chip (U3), so several features could be added for just the cost of reprogramming the 2716 EPROM. These include a scan feature, the ability to store a large number of frequencies (for nets, skeds, and the like), or the ability to use a dial similar to that of traditional rigs. Only your imagination and programming skills need limit what you can do with the synthesizer. This project is a good way to improve both.

The combination of the digital frequency synthesizer and controller enables an amateur who enjoys construction to obtain the benefits of a high-quality, low-phase-noise, stable signal source that is convenient and easy to use. There are many applications for this system. I hope my articles generate interest in experimentation with the digital frequency-synthesis technique and some further refinements in the equipment.

Notes

[1]F. Williams, "A Digital Frequency Synthesizer," *QST*, April 1984, pp. 24-30.

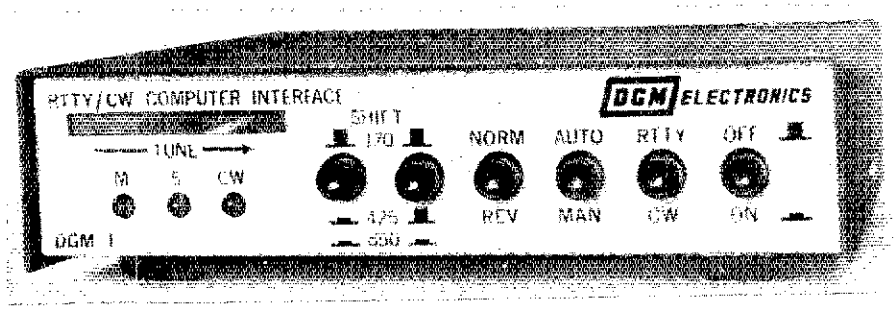
[2]A commented assembly-code listing is available from ARRL for $2.50. Circuit-board etching patterns are also available for $2.50. If you want both packages, the cost is $4.00. Send your request to ARRL Technical Department, 225 Main St., Newington, CT 06111. Mark the outside of the envelope: Williams Synthesizer. Be sure to specify whether you want the program listing, the etching pattern, or both. Please print your name and address clearly on your request.

[3]Circuit boards and complete parts kits for both the synthesizer and controller projects are available from A & A Engineering, 7970 Orchid Dr., Buena Park, CA 90620, tel. 714-521-4160. A complete synthesizer kit costs $156.75, and a complete controller kit is $59.65. A double-sided FR-4 epoxy circuit board for the synthesizer costs $16.40, and a board for the controller sells for the same price. A & A has programmed EPROMs for both projects, and will sell just the parts you need. Prices subject to change. Contact them for current pricing information.

New Products

DGM ELECTRONICS DGM-1 RTTY/CW COMPUTER INTERFACE

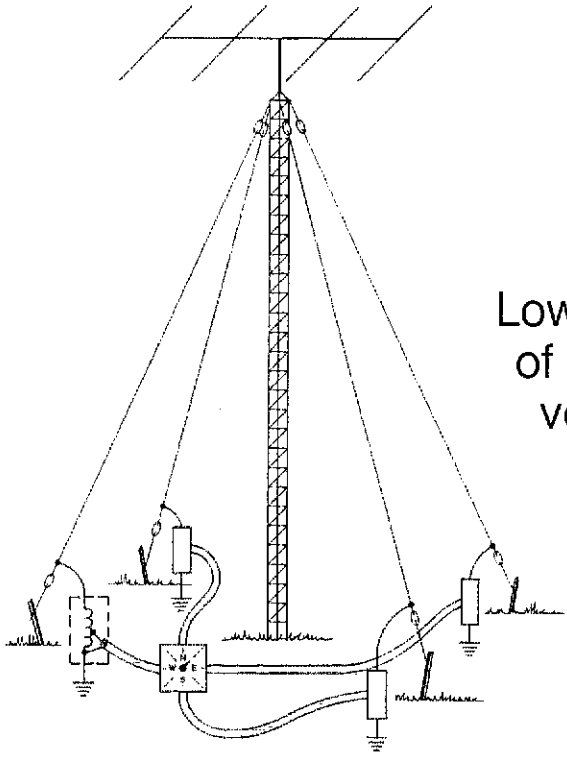
☐ This modem is designed to connect between your radio equipment and computer to provide RTTY and CW reception. According to the manufacturer, the DGM-1 will work with almost any RTTY/CW software available. The unit uses active audio filters for the mark and space frequencies, and the demodulator section is preceded by a band-pass filter to provide adjacent-signal rejection. The CW-filter center frequency is about 800 Hz. A three-pole post-detection filter improves the signal-to-noise ratio of the incoming signal.



Front-panel push-button switches are used to select one of three shifts: 170, 425 or 850 Hz. The shift sense is reversible. An LED bar graph and mark/space LED indicators are used as tuning indicators; scope outputs are also available. A function-generator IC produces a stable, sine-wave AFSK output, and the DGM-1 can also key FSK inputs. Automatic or manual PTT control can be selected by a front-panel push-button switch.

The rear panel has positive and negative CW key-line outputs. There's a five-pin I/O connector for TTL-level interfacing, and provisions for RS-232-C level interfacing as well.

The DGM-1 is housed in a 1½ × 7 × 7-in (38 × 178 × 178-mm) HWD aluminum enclosure and powered by a 117-V ac wall transformer, included with the interface. Price class: $150. For more information, contact DGM Electronics, Inc., 787 Briar La., Beloit, WI 53511, tel. 608-362-0410. — *Paul K. Pagel, N1FB*



Build a 4X Array for 160 Meters

Low-angle radiation and electrical rotation of directivity are the features of this vertically polarized top-band antenna. If you are interested in 160-meter DX, this system could be your secret weapon.

By Riki Kline,* 4X4NJ

Is your lament a common one — no room for an effective DX antenna on 160 meters? This complaint is voiced frequently by amateurs who live in urban areas, or who are programmed toward horizontal wire antennas. But, a number of successful top-band operators have adopted the philosophy, "If you can't go out, go up!" It is no secret that a physically short vertical antenna is generally more effective than a horizontal antenna that is close to the ground electrically, at least for DX work.

My 4X array is electrically rotatable. It is compact and is effective as a low-angle radiator. Let's examine how my antenna evolved from some basic designs. I will also cover the practical details of construction and system performance.

The Tilted Ground-Plane Look

The tilted ground plane is almost identical to the usual vertical. The physical format of this antenna resembles a four-conductor ground plane. The major difference is that the radiating elements tilt up toward the supporting structure. The 4X array contains four sloping ground planes. Each of the slope wires is 100 feet long.[1] They are supported at the high end by an 80-foot tower. A four-element, 20-meter Yagi antenna is atop the tower.

Each of the sloping wires is fed separately near ground by means of a tapped-coil matching device (Fig. 1) that is returned to radial wires and ground rods. In effect, each radiator is a ground-plane vertical antenna that is slightly less than 0.25 wavelength. The matching inductor provides resonance and effects an impedance match to the coaxial feed line.

I believe that the metal tower and 20-meter antenna may possibly be functioning as a reflector because the Yagi antenna and tower combined with ground wires are resonant slightly below 1.8 MHz.

Two Tilted Ground-Plane Verticals in Phase

I had excellent results with one sloping vertical. Next, I installed a second system in the opposite direction. Switching between the two antennas (north-south sloping radiators) showed considerable front-to-back ratio (a relative reading of 15-20 dB). Subsequently, I connected the two antennas in phase. This gave a bidirectional pattern, east and west. Although I did not gather extensive data on the performance, I observed a 6-dB signal improvement with stations about 700 miles to the east. Some of you may want to explore

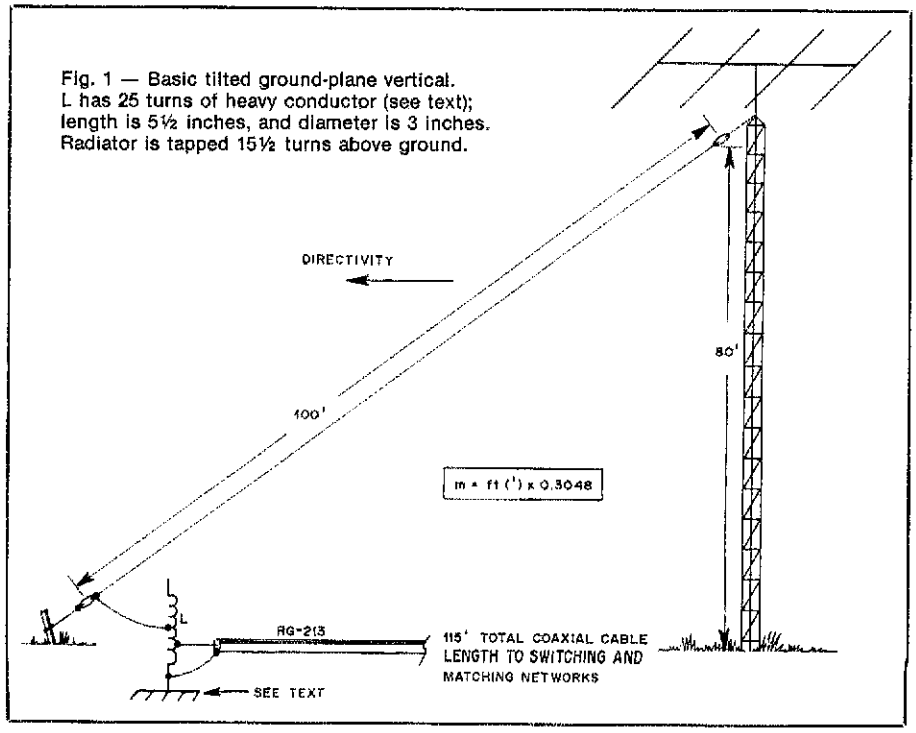


Fig. 1 — Basic tilted ground-plane vertical. L has 25 turns of heavy conductor (see text); length is 5½ inches, and diameter is 3 inches. Radiator is tapped 15½ turns above ground.

[1]Notes appear on page 43.

*P.O. Box 15, Gan-Yavne 70850, Israel

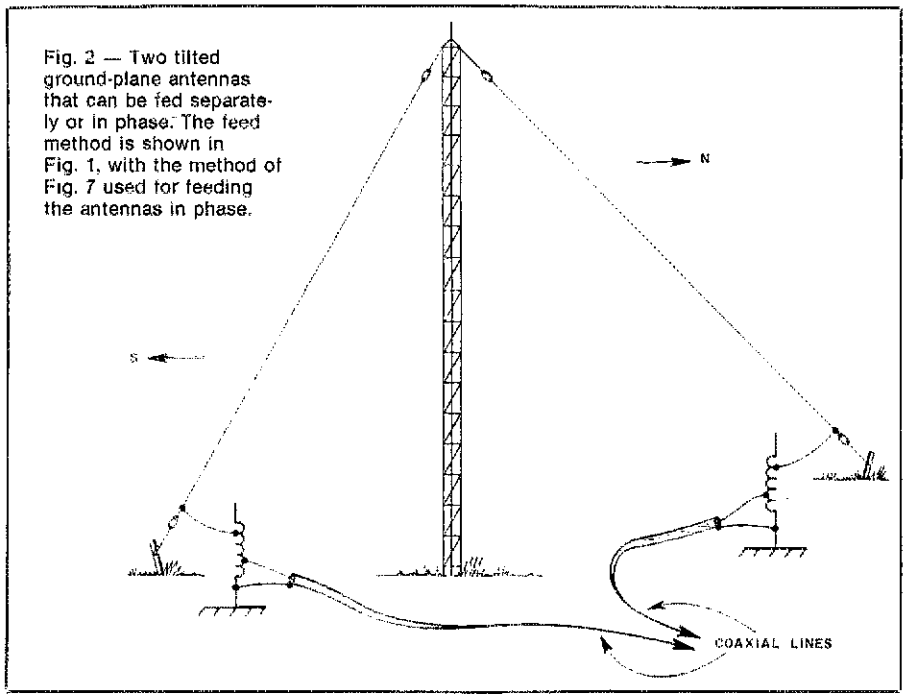


Fig. 2 — Two tilted ground-plane antennas that can be fed separately or in phase. The feed method is shown in Fig. 1, with the method of Fig. 7 used for feeding the antennas in phase.

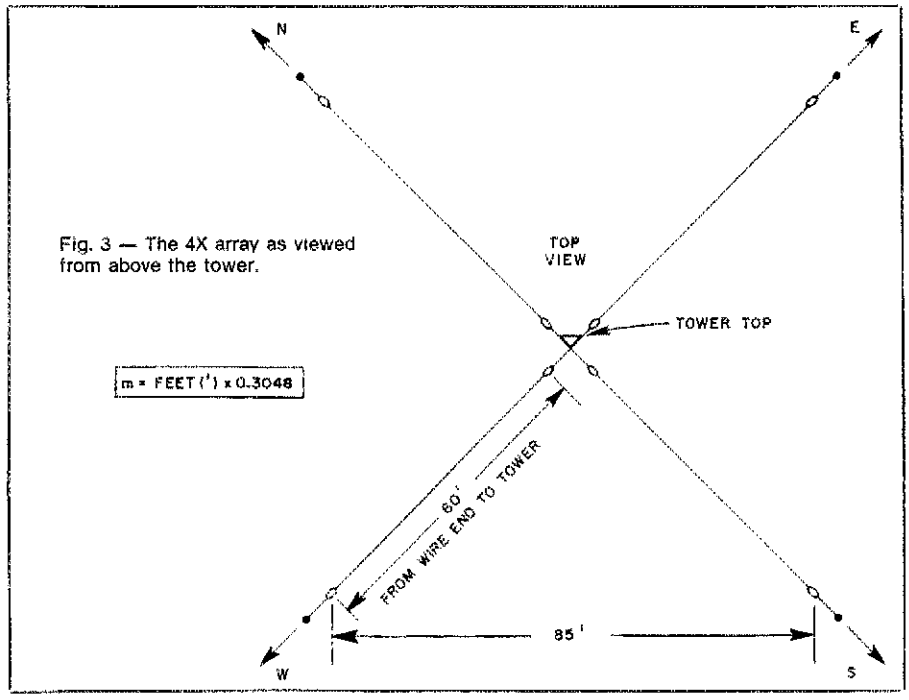


Fig. 3 — The 4X array as viewed from above the tower.

the possibilities further. Fig. 2 shows the details of the two-element phased system.

The 4X Configuration

Two more tilted ground-plane verticals were added, thereby providing east-west sloping radiators (Fig. 3). A switching and phasing arrangement was added to my 4X array. It allows me to feed any of the slope wires separately, adjacent pairs in phase, or all four wires in phase. When using adjacent pairs in phase, maximum radiation is along a line that bisects the angle between the two antennas (NE, SE, SW or NW directions). When I feed all four wires in phase I note that the radiation is essentially omnidirectional. All of the unfed radiators are resonated to serve as reflectors. This concept is described in *The ARRL Antenna Book*.[2] My switching network is shown in Fig. 4.

Phasing Networks

Most phasing methods call for long lengths of non-50-ohm coaxial cable.[3] I found this economically prohibitive. This negative factor inspired the approach I am using.

Each of my radiators is fed by means of 115 feet of RG-213 coaxial cable (formerly RG-8A/U 50-ohm line). The coil at the base of each wire is adjusted for the same resonance and SWR as the remaining three coils. The verticals to be fed in phase have their transmission lines connected in parallel through a suitable network for changing the reflected impedance back to 50 ohms. My networks are shown in Figs. 7 and 8.

Tapped-Coil Matching

By using inductance and no intentional parallel capacitance for my matching coils, I am able to obtain greater effective antenna bandwidth because of reduced Q. Stray capacitance and antenna capacitance to the tower and ground are present, however. All electrical connections are soldered. A simple rain cover is used over each coil to protect it from moisture and dirt. The absence of switches, variable capacitors and rotary inductors enables construction of a highly reliable matching system without the need for weatherproof boxes.

This system is relatively easy to tune to obtain nearly identical performance from each antenna branch. This becomes a necessity when using "brute-force" parallel feed in the phased-pair and omnidirectional modes. Otherwise, the power distribution and phasing would be disturbed. This would distort the radiation pattern. Large-diameter, heavy-conductor, air-wound coils are best for this job. Two of my coils are made from silver-plated ¼-inch-diameter copper tubing. The two remaining coils are made from large, flat conductor material of the kind found in some rotary inductors.

I used a dip meter to adjust the coils for resonance (coaxial cables disconnected). My coaxial cables were tapped initially one third of the way up from the ground ends of the coils. Final tap placement is made while feeding power to the antenna and observing an SWR meter. Alligator clips make this an easy matter to accomplish. When the SWR bottoms out at the same frequency for all four radiators, remove the alligator clips and solder the coil taps in place. Some interaction between the four antennas will occur, so make certain that all of the taps are where they belong before soldering them.

Reflector Tuning

The radiators not being fed are used as reflectors. This is done by switching small inductors in parallel with the ends of the coaxial feed lines. My inductors contain three or four turns of no. 16 wire wound around the center part of a 3/8-inch-diameter ferrite rod from a built-in AM broadcast receiver antenna. The coils are adjusted to give a resonance that is four percent lower than the resonant frequency of the radiators.

Ground Conditions

The efficiency and performance of the antenna depends on the quality of the ground system. Note 3 provides a good reference for ground systems, and a bibliography. Each of my radiators is worked against a counterpoise that contains two or

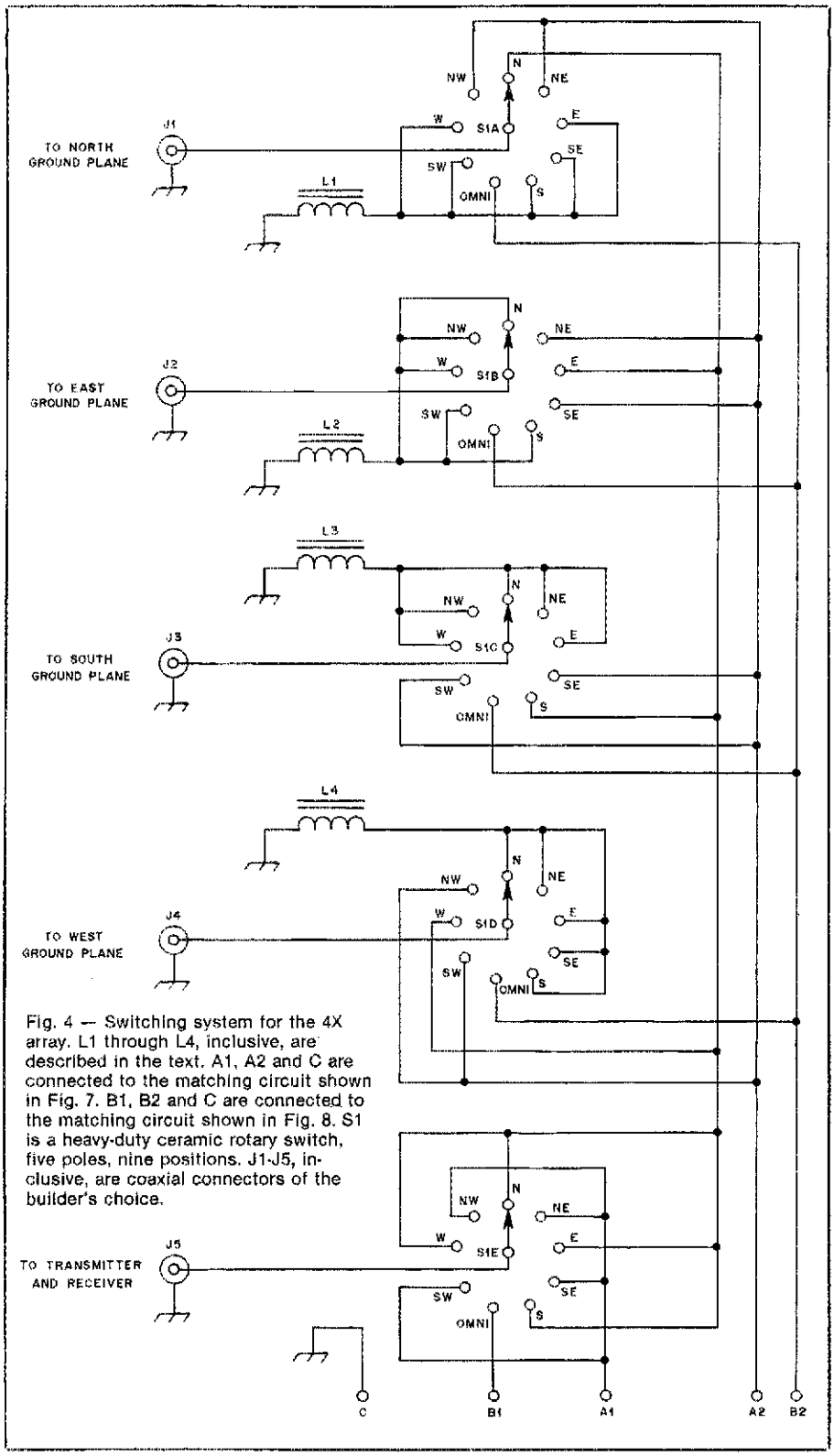
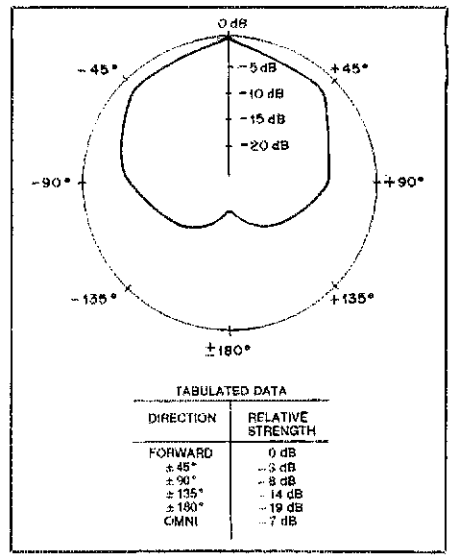


Fig. 4 — Switching system for the 4X array. L1 through L4, inclusive, are described in the text. A1, A2 and C are connected to the matching circuit shown in Fig. 7. B1, B2 and C are connected to the matching circuit shown in Fig. 8. S1 is a heavy-duty ceramic rotary switch, five poles, nine positions. J1-J5, inclusive, are coaxial connectors of the builder's choice.



TABULATED DATA

DIRECTION	RELATIVE STRENGTH
FORWARD	0 dB
±45°	-3 dB
±90°	-8 dB
±135°	-14 dB
±180°	-19 dB
OMNI	-7 dB

Fig. 6 — Directivity pattern of the array. The pattern is a composite average of measurements made while receiving 10 different stations. There is no apparent difference between the two directive modes — single radiator or phased pair.

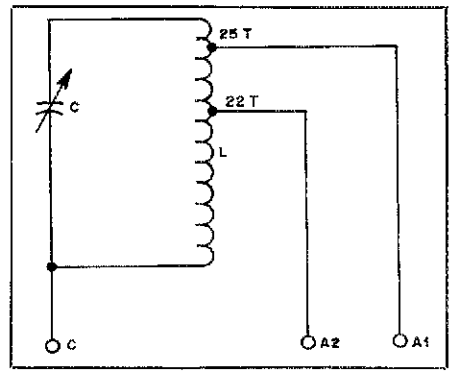


Fig. 7 — Phased-pair matching network. C is a 1000-pF variable, rated at 1000 V or greater. L is 30 airwound turns of heavy conductor (see text), 7 inches long and 3½ inches in diameter.

	SWR VS FREQUENCY				
DIRECTION	1800 kHz	1825 kHz	1850 kHz	1875 kHz	1900 kHz
N	1.4	1.0	1.2	1.8	2.6
NE	1.5	1.1	1.0	1.1	1.2
E	2.2	1.1	1.1	1.4	1.9
SE	1.2	1.0	1.0	1.0	1.1
S	1.4	1.0	1.1	1.4	2.3
SW	1.5	1.1	1.0	1.0	1.1
W	1.4	1.1	1.0	1.2	1.6
NW	1.2	1.0	1.0	1.0	1.2
OMNI	1.4	1.1	1.0	1.0	1.0

Fig. 5 — Chart that shows SWR versus frequency in kilohertz.

three ¼-wavelength wires, bent to fit in the boundaries of my property. In addition, I use a 10-foot rod in the ground. Water pipes and all other available underground metal objects are tied to my ground system. You should try to extend your radials in the direction of the preferred radiation.

Insulators

The top ends of the radiators contain high RF voltage. I use 15-inch-long Plexiglas® strips as insulators, after having problems with 8-inch-long commercial plastic insulators. Moisture and air pollutants caused these problems. The present insulators need to be cleaned periodically. High-quality glass insulators of the type used aboard ships should be excellent and, with luck, should not require periodic cleaning.

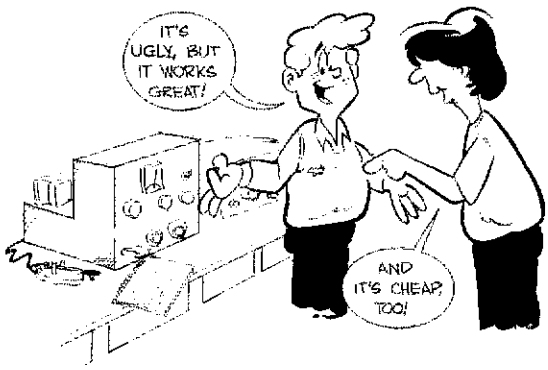
Receiving

The antenna directivity enhances reception by rejecting signals from unwanted directions. I was encouraged when I compared my 4X array to an 800-foot un-

(continued on page 43)

BEGINNER'S BENCH

Beating the High Cost of Parts



Who says home-built gear is too costly? Ingenuity and a bit of craftsmanship can unlock the door to economical projects you can create in your home workshop.

By Doug DeMaw,* W1FB

Has it become too "trendy" to load your operating table with store-bought ham gear? Perhaps you've been wishing for an escape from commercial design, and have been wanting to build something yourself. If so, you have the makings of a true radio amateur! Historically, there have been two sides to the Amateur Radio picture. Experimenting represents one facet of our pastime. Operating, which seems to be the dominant factor today, is the other part.

Newcomers may not be aware that there was a time when most hams designed — or duplicated the designs of other hams — and built most of their station equipment. It was not necessarily through need that this was done. There was pride in having a station that was the product of one's own hands and thinking. Commercial gear was available in those times, and its cost was not prohibitive in the general sense.

I would be derelict in my reporting of events if I did not say that most homemade radio equipment was large — even huge — by today's standards. A so-called all-band HF transmitter often stood in a 6-foot relay rack,[1] even when the dc input power level was only 200 or 300 W. The power amplifier deck generally had a window of glass or screen through which the operator could monitor the color of the tube plates. If they glowed too brightly, there had to be a problem of some type!

Perhaps the trend toward commercial gear was stimulated by the availability of such early rigs as the Collins KWM series transceivers. The influx of other American and foreign transceivers that followed is no doubt a strong factor in the shape of things today. The ham station today is compact and orderly, and transceivers lend themselves readily to portable operation. Furthermore, few amateurs could hope to package a 100-W station in as small a box as the manufacturers do. Even if this were possible, the cost of buying parts in small quantities would far exceed what we pay for a store-bought transceiver. Hams nowadays seem restricted to building accessory gear, such as keyers, Transmatches, antennas and linear amplifiers. I would guess that less than 10% of American amateurs are traditional builders at this time. When I was first licensed (1950), 80-90 percent of the hams built their own stations, exclusive of the station receiver and CW key. Many wound their own filament and plate transformers! A hidden advantage to all of this was constant technical discussions on the air — one could learn new principles and theory from talking to experienced amateurs.

The high cost of small parts, minimum-order fees, unavailability of many common parts and long delays in receiving parts that we order have contributed greatly to the slowdown in home-project building. In an earlier installment, we discussed sources for inexpensive mail-order components. Now, let us examine ways to fabricate many parts at home from ordinary materials. I hope this will help to inspire you to get involved with circuits.

Equipment Appearance

I have talked to some hams who refuse to build equipment because "My homemade gear looks awful." On the other hand, I have seen many pieces of home-built equipment that rivaled the professional appearance of commercial gear. The irony is that the ugly unit often functioned as well as or better than the fancy item! I have built many a dreadful-looking monstrosity in my day, but I was always proud of the way it "played" after the bugs were worked out.

Noted *QST* author Wes Hayward, W7ZOI, prefers what he calls "ugly construction" because it permits fast and economical product development. This can be especially important when we choose to conduct experiments prior to building a final model of a station item. To this end, I believe strongly in the old saying, "You can't judge a book by its cover." Some of us aren't gifted when it comes to doing crafts, but it is still educational and satisfying to assemble a circuit and get it to work. I hope you will not avoid equipment-building simply because you lack artistic inspiration.

What About Cabinets and Chassis?

If you've checked the cost of factory-made metal cabinets I am sure you've been astonished at the high prices! Worse still, most of the lower-cost imported units are fashioned from what seems to be paper-thin aluminum or steel. The panels bend too easily, and it is hard to drill holes in the metal without creating a concave hole with burrs around the edges.

Do we have alternatives to commercially made enclosures? You bet we do! For example, consider the box shown in Fig. 1. I put this enclosure together to show you the simplicity of PC-board construction. PC-board material is readily available, and it costs very little, especially at flea markets.

Variety stores abound with office products and housewares that serve admirably as equipment cases. Metal recipe boxes (Fig. 2) are entirely acceptable as housings for small projects. The cover can help keep dust and moisture from the front panel when the equipment is used afield. A rubber band around the entire recipe box will keep the cover in place during transit.

Numerous sizes and shapes of office file

[1]mm = in × 25.4; m = ft × 0.3048.

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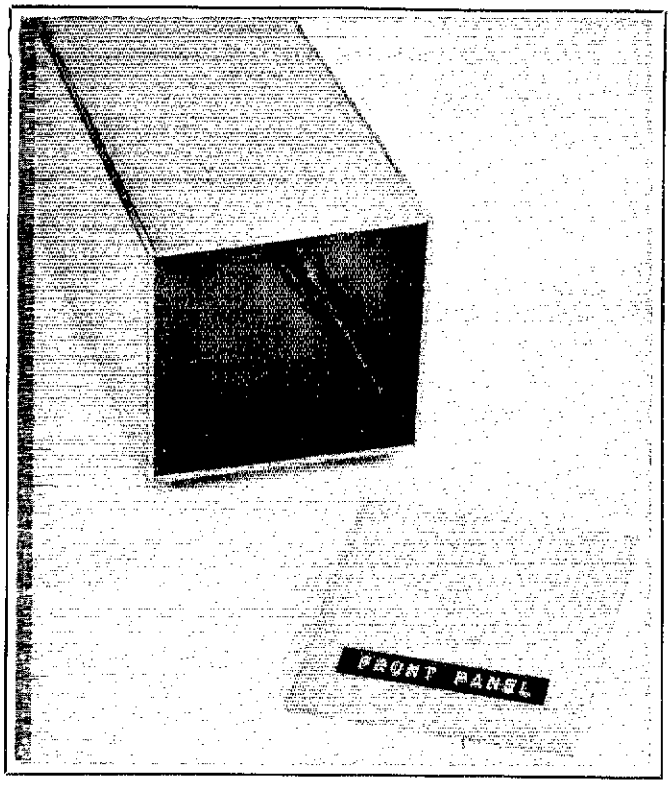


Fig. 1 — A 2¼ × 2¼ × 5-inch cabinet made from double-sided PC board material. The walls are joined by flowing a solder seam along them where they meet one another. Paint, contact paper or Formica may be used as outer decoration. Alternatively, the copper surfaces outside the box can be polished with steel wool, after which a spray coating of clear lacquer may be applied to prevent tarnishing. The example shown here was treated in that manner.

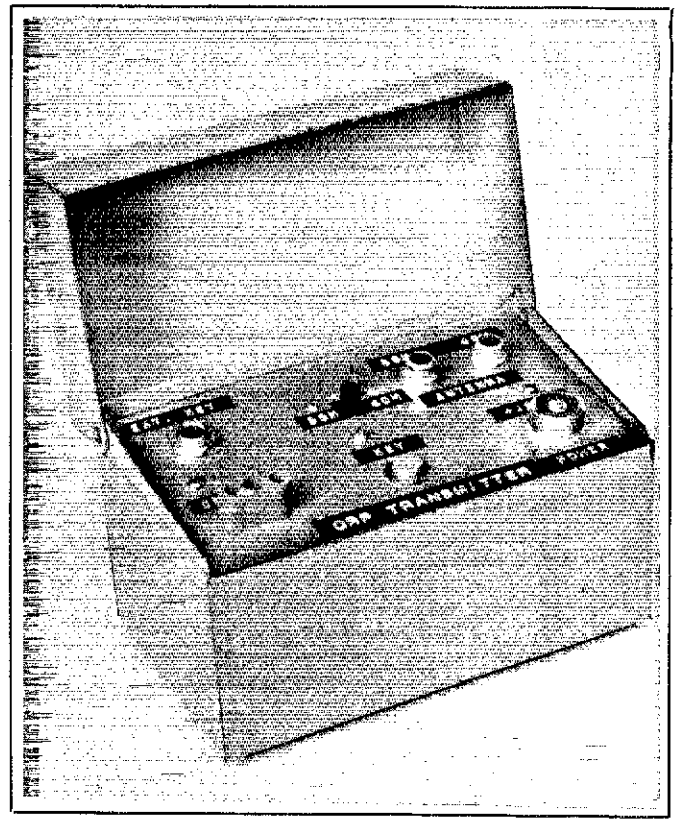


Fig. 2 — An example of a recipe-box cabinet. This unit was built many years ago by the author. It is a two-band, 2-W QRP CW transmitter. The chassis for the circuit is a U-shaped piece of aluminum. The lower chassis lip is affixed to the bottom of the box by means of a sheet-metal screw.

boxes are available at fair prices. The metal is generally quite thick and rigid, which makes the boxes ideal for larger projects — especially those that contain heavy components.

If you need only a metal chassis on which to assemble a project, don't fail to consider one of the many baking tins that are found in variety stores. If a panel is needed, buy an aluminum cookie sheet and cut one to the desired size. Galvanized furnace ducting is also a suitable material for making panels and small boxes. It is not uncommon to obtain scraps of ducting steel from a local plumbing and heating shop. Many times the owner will give them to you free of charge!

I have made many large and small cabinets from wood. If shielding was necessary, I lined the cabinets with hobby copper sheeting or furnace-ducting metal. I have heard of using aluminum foil as shielding: It can be glued to the inner walls of a wooden cabinet.

Improving the Appearance

Methods of improving the outward appearance of homemade cabinets and panels are obvious to some of you. But, if you are just getting into the building of ham equipment, some techniques may not have occurred to you.

Perhaps you may not care for the appearance of raw copper on the outer surfaces of a homemade PC-board box. The options are (1) paint the box; (2) use contact paper on the outer walls; (3) glue pieces of Formica® to the box walls. Free scraps of Formica can often be obtained from a cabinetmaker, or a house builder.

Painting presents some special problems if we are to have a surface that endures. Spray-can enamel or lacquer over a raw metal surface will seldom withstand abuse, and scratches will eventually spoil the appearance. This is the method I have adopted for ensuring a lasting surface:

1) Lightly sand the surface with medium-grade emery cloth or sandpaper. Make sure you apply an even motion in only one direction. Do not use a circular motion. Sand the surface until small grooves appear in the metal.

2) Wash the sanded metal with hot water and soap. Rinse with clear, hot water. Do not handle the clean metal with your bare skin.

3) Dry the metal in an oven, or use a hair dryer. Continue to avoid touching the metal with your fingers (oil prevents paint from sticking).

4) Apply successive thin coats of spray paint to the metal, and allow each coat to become tacky between applications. Hold the spray can at least 1 foot from the work. Apply paint in a slow, sweeping motion to ensure an even application of paint.

5) Allow work to dry thoroughly by inserting it in an oven set to WARM. You may air-dry it in a dust-free room, but this will take longer.

6) A coating of clear polyurethane varnish can be added after the paint is thoroughly dry. This provides a tough outer coat.

All holes should be drilled or punched in the cabinet or panel before it is painted. To prevent paint from reaching the inside of the cabinet through the holes, place strips of masking tape or ducting tape over the holes on the inner walls of the panel or cabinet.

It is wise to select a paint color that matches the colors of Dymo® tape so the function labels will match the panel's color. Tape-label machines make it possible to produce attractive labels quickly and inexpensively. Use a carpenter's square to ensure that the labels are level when affixed to the panel.

The Mechanics of Cabinetmaking

Let's start with PC-board enclosures. How may we cut the material to size? Obviously, few of us have access to an industrial sheet-metal shear, so we must

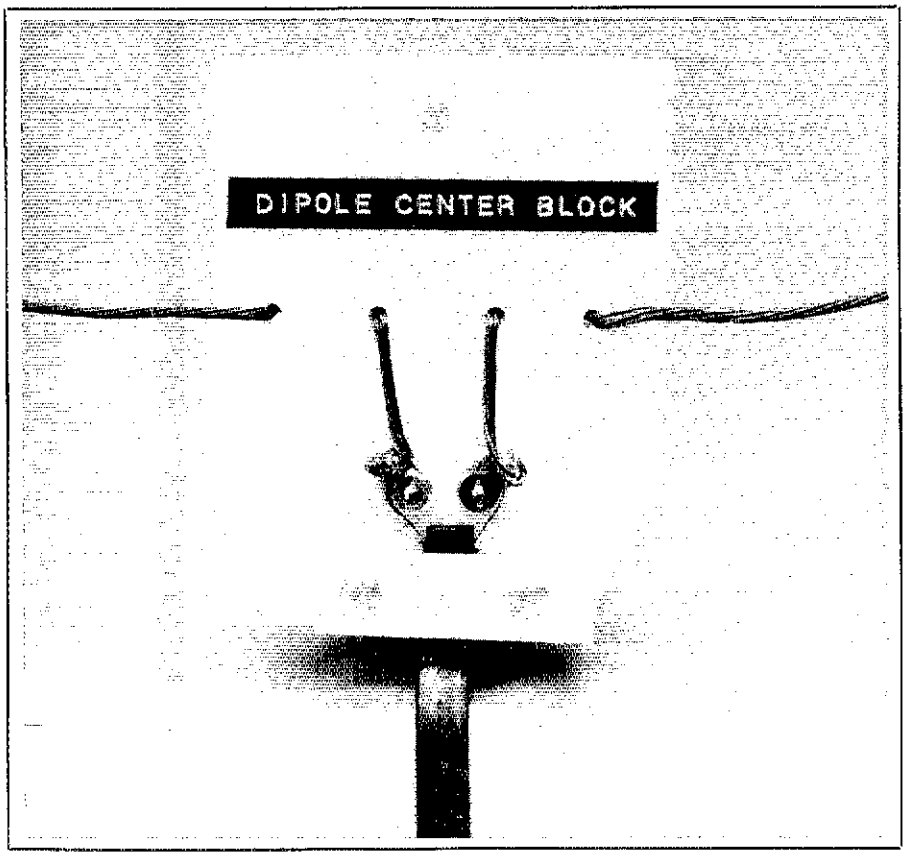


Fig. 3 — A dipole center insulating block made from scrap plastic that was purchased from an industrial plastics supplier. The small section of plastic near the bottom of the unit is used to clamp the 300-ohm TV ribbon to the block. This homemade insulator cost about one fourth the price of a comparable commercial unit.

adopt other methods for cutting PC board. Rule no. 1 is to avoid phenolic-base PC board unless you plan to cut it with a saw. If you try to shear it, it will chip and shatter along the cut edge. Glass epoxy board will not react that way. It is easy to cut, and a smooth edge will result.

I acquired a heavy-duty paper cutter that has a thick blade. It works very well for cutting epoxy PC board, provided the board material is not excessively thick: Too much pressure will damage the cutter mechanisms. Alternatively, a Dremel hobby saw can be used effectively for cutting all types of PC board. I do not recommend the use of a paper cutter for metal work. The hobby saw, however, will do a fine job with metal sheeting. Always use a square to lay out the cabinet sections. Make all measurements to a tolerance of 1/64 inch or less. This will ensure that the cabinet sections match, thereby providing a square or rectangular finished product.

After the PC-board pieces are cut, warm up a 40-W pencil-type soldering iron (a 100-W soldering gun can also be used). Clean all surfaces of the PC-board sections with fine-grade steel wool while the iron is heating. Cleaning will aid the adhesion of the solder.

Mate two walls of the box to be assembled. Try to place them at exact right angles to one another, then place a drop of solder at two points where the seam will be. With the walls attached temporarily, check the 90° alignment with a square. If the angle is not 90°, exert slight pressure on the walls to align them (the solder will bend somewhat). Following this alignment step, apply a thin bead of solder along the entire joint surface of the inner wall. Continue to add box sections while observing the foregoing procedures.

After the completed box has cooled, you may chip away the larger deposits of resin with a knife blade or screwdriver. The thin layer of resin can be washed away with a small paint brush and gasoline. (Use caution!)

The outer seams of the PC-board box will be somewhat ragged and sharp. A medium-grade metal file can be used to slightly round these outer seams. Single- or double-sided PC board can be used for box-making. Double-sided board offers the advantage of double shielding for critical circuits.

A completed PC-board enclosure can be painted, covered with contact paper or finished with Formica. If Formica is used, apply a coating of contact cement to both surfaces before affixing the Formica cover panels. Clamp the sections in place until the glue has dried.

Plastic feet can be added to the bottom of a homemade box to prevent scratching a desk surface. They will also help to keep the equipment from slipping about on the operating table.

Metal Cabinets

Since metal sheeting bends easily, there will be no need to solder each wall to the adjacent one. Three surfaces can be formed from one piece of metal (bottom and two sides, for example). The remaining wall or walls can be soldered to the main assembly. A 100-W (or greater) soldering iron is recommended when making boxes from sheet steel or brass. A propane torch is also suitable for this type of work. In order to ensure squareness, follow the principles of cabinet-making that are listed for PC-board material. Do the same for applying a finished look to the outer portion of a metal cabinet.

Aluminum is not easy to solder, although with special flux and solder it can be done. Therefore, it will be easier to form lips on some of the edges of the sections. These lips serve as connection points for the box walls. Sheet-metal screws can then be used to join the cabinet sections. If perfect shielding is not a consideration, you may abrade the mating surfaces with coarse sandpaper, then glue the surfaces together by means of epoxy cement.

Metal Bending at Home

Here lies another sticky wicket for the ham who wants to make gear in his or her workshop: How to bend sheet metal without access to a commercial bending machine? My most common technique is to place two strips of oak wood (or some equally hard wood) in my mechanic's vise. The metal is placed between the wood strips (and aligned with a square). I exert even pressure on the metal with both hands to form the desired bend. Another technique I have adopted is to clamp the sheet metal to the surface of my workbench, using a piece of hardwood between the metal and the clamp's upper finger. The edge of the bench serves as the lower plate of this homemade bending brake. Two pieces of angle iron can be used to fashion a fine homemade bending brake. If you have mechanical skill, this should be an easy device for you to construct.

Other Ways to Save Money

Take, for example, the matter of antenna center blocks and end insulators. Have you priced a quality insulator lately? The cost is startling! Many amateurs of yesteryear made antenna insulators from wood. The homemade insulator was boiled in canning wax for a length of time to impregnate and protect the wood from moisture and to retard deterioration. There is no reason this method can't be used today. This type of insulating material is especially useful at the center of a single-band dipole, where the impedance is low (low RF voltage point). Wooden end insulators are suitable at the voltage ends of

an antenna if they are made 6 or more inches in length.

Plastic clothespins, hair curlers and a host of other plastic objects are fine as antenna insulators. I have even used ceramic strips that were designed for edging around the tops of bathtubs. I find that this material can be drilled if you don't mind sharpening your drill bit after completing the job.

Many plastic supply outlets have scraps of leftover material that can be purchased at low prices. Check your Yellow Pages for nearby sources. Fig. 3 shows a rugged center block I made from surplus plastic. It is designed to accommodate 300-ohm TV ribbon line as the feeder. A similar format can be followed for coaxial cable. The hold-down plastic strip (for the feed line) can be replaced by a wooden block when using coaxial cable. A groove can be filed in the wood to ensure a snug fit for the coaxial line when the hold-down strip is tightened into position. A center block of this type is satisfactory for inverted-V or horizontal dipoles.

Capacitors and Resistors

It is not unusual to find that we lack a specific value of resistance or capacitance when building a project. To obtain the value we need, we must often buy five or more capacitors or resistors in a package. This is not cost-effective!

If you have a near-value resistor on hand (lower in ohmic value than desired), you may carefully file the side of the resistor until the resistance increases to the required value. You can observe your progress with an ohmmeter. This method applies only to carbon-composition resistors. A drop of epoxy cement will nicely seal the wound on the resistor.

In a similar manner, we may alter the value of disc-ceramic capacitors. To obtain a particular capacitance value, take the next highest value of capacitor and carefully snip away an outer edge with diagonal cutters until the value drops to the required amount. You will need a capacitance checker to perform this feat. Again, the wound can be sealed with cement. A ham acquaintance of mine refers to my altered capacitors as "DeMaw precision capacitors." I'm not sure he is enthralled with my technique, but it *does* work!

Some Final Comments

In effect, this has been an expanded Hint and Kink with the purpose of offering ideas and encouragement for the home construction of amateur equipment. We hams have ingenuity, and this virtue should be exercised routinely in our wonderful pastime. There is no rule that says our equipment has to look professional. The important thing is that we built it, and that it functions correctly.

Aside from the pride that comes with operating homemade gear, we continue to learn about circuits and their performance when we build projects. I hope these suggestions for cabinetmaking and related subjects will help you to cut the cost of your future projects. Examples of your work may be excellent candidates for *QST* Strays. Or, if you know simple procedures that have not been covered in this article, consider submitting your ideas to the *QST* Hints and Kinks editor for possible publication.

Flats, 1/3, Lavelle Road, Bangalore 560 001, India.

1984 ARRL INTERNATIONAL DX CONTEST

☐ These donors to the 1984 ARRL International DX Contest were inadvertently left out of the October write-up: USSR Single-Operator All-Band plaques: CW — W1DA, K1KI, NR4V, NC5K, K5VWW, W6ISQ, K7NW, SVØAA, KØBJ, WØZV; SSB — W1DA, KB1FK, K1KI, WA2VUY, KD4PP, NC5K, K5VWW, KM7E, WD8CRY, WØZV. The low-power (150-W) CW plaque, won by N8II, was donated by the Wireless Institute of the Northeast. The low-power phone plaque, won by WA4PFN/2, was donated by the Rochester DX Assn.

***GATEWAY*: THE ARRL PACKET-RADIO NEWSLETTER**

☐ *Gateway* (No. 9), the newsletter for packet-radio enthusiasts, recently carried these items:

- Automatic packet-radio message forwarding
- Reports on East and West Coast networking
- Report on AMSAT/ARRL packet-satellite experiments
- The latest news on this wonderful mode.

Gateway is edited by Jeff Ward, K8KA, and is published every two weeks. The special subscription rate for ARRL members is $6 for 25 issues; for nonmembers, $9. There are additional postage surcharges for mailing outside the U.S.; write to Headquarters for details.

Next Month in QST

In case you're wondering what you have to look forward to in a month, here's a preview of March *QST*:

- Those who have discovered the joys of the 1296-MHz (23-cm) band (or are waiting for an excuse to do so) will want to build the 250-W-output amplifier described in a March article. (Part 2, covering some accessories, will appear in a later issue.)
- Speech synthesis, now used widely in new cars, will prove useful around the shack, as well. A March article provides all you need to know to put together an easy-to-build speech synthesizer.
- Beginners will find interesting reading in an article giving the straight dope on diodes.
- Those who spent a couple of fall weekends trying to shoot the moon will want to digest the results of the Eighth ARRL International EME Competition.

And, all the regular features you've come to expect (and enjoy) will also be coming your way in March *QST*.

Strays

I would like to get in touch with...

☐ anyone with a schematic diagram or a manual for a Boonton 160A Q meter. James T. Hanlon, W8KGI, 5560 Linworth Rd., Worthington, OH 43085.

☐ anyone with information on modifying the ICOM-720A transceiver for CW at higher speeds. J. F. Smith, Jr., N2DHW, 150-41 32nd Ave., Flushing, NY 11354.

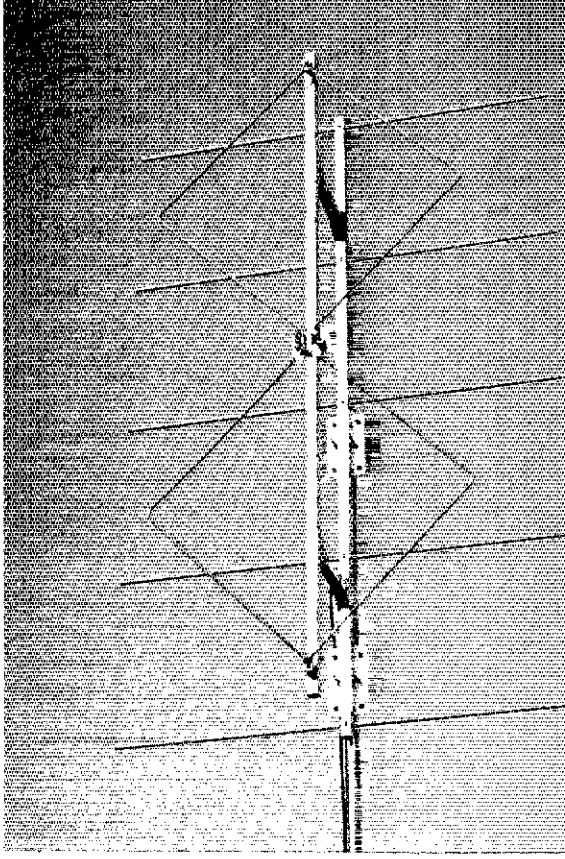
☐ anyone with an owner's manual or schematic diagram for a Cosmo Industries Cosmophone 35 transceiver. Joseph Tourville, WA1SAR, 18 Redwood Dr., Bristol, CT 06010.

☐ anyone with a manual and schematic diagram for a Miller 90505 Secondary Frequency Standard. Keith Petersen, WA9YWK, 817 Minnesota Ave., South Milwaukee, WI 53172.

☐ anyone with a schematic diagram or manual for the Regency ATC-1 mobile ham band converter. Jeff Rininger, KA6ZBU, 920 N. Fifth St., San Jose, CA 95112.

☐ anyone who has a service manual and circuit diagram for a WWII Hammerlund Super Pro 120 Communications Radio Receiver. R. K. Joshi, VU2RWZ, I.T.C.

Try a "Dopplequad" Beam Antenna for 2 Meters



Loop antennas have taken many useful forms in Amateur Radio. Here is still another twist in loop-antenna design. Simplicity, low cost and good performance keynote the K8KK design.

By Keith Kunde,* K8KK

The "Dopplequad," or twin-quad beam, is an interesting variation of quad antenna design that seems to have originated in Germany several years ago. German amateurs have done considerable development on this design.

I became aware of the twin-quad system through a description of it in *The UHF Compendium*, by Karl Weiner, DJ9HO.[1] The twin quad has attributes that make it an attractive choice for the VHF and UHF bands:

1) Horizontal polarization and relatively narrow vertical beamwidth help reduce noise pickup.

2) Fairly broad horizontal beamwidth (over 60 degrees at the half-power points) allows coverage of a large sector while providing the directional qualities of a beam antenna.

3) 9-10 dBd relative gain with good front-to-back ratio.

4) Simple feed requirements allow direct coaxial cable attachment with low SWR.

5) Compact, lightweight and easy-to-build design.

As a newcomer to the 2-meter band, I needed a general-purpose antenna that could also be used in an attempt to contact the Space Shuttle *Columbia* during the STS-9 mission. With its reasonably wide horizontal beamwidth and compact dimensions, the twin quad looked like just the ticket; I immediately began construction.

I will not attempt to explain the theory that went into the original design of the twin quad; that already has been done by others, and a summary of their work may be found in *The UHF Compendium*. I wrote this article for two reasons: (1) to show the construction details for amateurs who might want to build the antenna and (2) to encourage further experimentation and refinement of the design by those with more time and equipment than I have. Here's how I built a twin quad for 2 meters, and some observations on its performance.

The twin quad consists of two vertically stacked quad loops connected in parallel. They are backed by a reflecting plane consisting of three or more horizontal rod-type reflectors. The driven and reflecting elements are supported at their center points by means of a rigid, lightweight frame.

The driven loops are a wavelength in circumference. Each side of a loop is a quarter wavelength at the design frequency. A single one-wavelength quad loop in free space has a radiation resistance at resonance of 100 to 140 ohms. In the twin quad, two loops are connected in parallel, so the radiation resistance should be about half that, or 50 to 70 ohms. In the "real world," the presence of the reflectors, their spacing from the loops, and other environmental factors, all have an influence on the effective radiation resistance of the antenna. More on this later.

When a quad is made of wire that is a tiny fraction of a wavelength in diameter (for example, a quad built for the HF bands), the sides must be made slightly longer than a quarter wavelength because of the lengthening effect caused by forming the wire into a square, as explained by Orr.[2] When building a quad for use at VHF and above, however, it is practical to make the quad loops from copper tubing or heavy-gauge wire that is a much larger fraction of a wavelength in diameter. This seems to cancel out the lengthening effect so the sides can be made exactly a quarter wavelength long.

Calculate the quad loop dimensions by using the following simple formulas:

$$L_{(feet)} = 984/f_{(MHz)}\ 1\ \lambda \qquad \text{(Eq. 1)}$$

$$L_{(inches)} = L_{(feet)}/4) \times 12\ \lambda/4 \qquad \text{(Eq. 2)}$$

If you prefer to work with metric dimensions, the equivalent formulas are:

$$L_{(meters)} = 300/f_{(MHz)}\ 1\ \lambda \qquad \text{(Eq. 3)}$$

$$L_{(cm)} = (L_{(m)}/4) \times 100\ \lambda/4 \qquad \text{(Eq. 4)}$$

Using these formulas, I designed my antenna for resonance at 146 MHz, so each side is 20.22 inches long.[3]

The number of reflectors used isn't critical, but antenna gain will be improved somewhat with a larger number. In fact, a reflecting screen or plate could be used instead of the rods, but the slight increase in gain is probably not worth the added

[1]Notes appear on page 31
*8355 Dalepoint Rd., Independence, OH 44131

complexity in construction. This is especially true for a 2-meter antenna with a large screen. The Germans show designs using three or seven reflectors in *The UHF Compendium* (most of them have three). I decided to use five reflectors; to my eye, a twin quad with only three reflectors just doesn't look right no matter how well it works.

The reflectors are slightly greater than 0.5 wavelength long. Use the following formula to calculate the proper length (the value of L was calculated in Eq. 1):

Reflector length (in) =
$[(L_{[ft]} \times 1.025)/2] \times 12$ (Eq. 5)

For metric dimensions:

Reflector length (cm) =
$[(L_{[m]} \times 1.025)/2] \times 100$ (Eq. 6)

For 146 MHz, the reflectors are 41.45 in (105.3 cm) long.

The vertical spacing between reflectors is not critical. If an odd number of reflectors is used, one can be placed in the center of the rear frame, with the rest evenly spaced from the center one. Some sample reflector-to-reflector spacings (measured on centers) for 2-meter antennas are shown in Table 1. The seven-reflector model built by DB8NP also incorporates director elements mounted in front of the quad loops; the spacing shown would require a longer frame than the three- or five-reflector designs.

The spacing of the driven elements from the reflectors can have a significant effect on the performance of this antenna. I wasn't able to derive a formula for predetermining the proper spacing during my limited experiments. The Germans used driven-element-to-reflector spacings of approximately 11 inches, but I got a lower SWR reading across the band at 12.5 inches. What effects the wider spacing might have on gain, front-to-back ratio and antenna radiation resistance are not known to me, but the overall performance of the antenna is satisfactory.

Table 1
2-Meter Antenna Reflector Spacings

Refl. No.	In	Cm	Builder
3	20.1	51	DL7KM
5	15.0	38	K8KK
7	11.8	30	DB8NP

The Framework

The framework that supports the antenna elements must be strong enough to keep everything in place in a stiff wind. Otherwise, there is nothing critical about it. I think the best material to use in making the frame is 1 × 1 inch square aluminum tubing. You could also try making it of wood. The frame need only be long enough to support the quad loops and the desired number of reflectors. For 2 meters, a frame 62 inches long is about right. This length has the added benefit of allowing the front and rear booms, and both cross members, to be cut from two 6-foot lengths of aluminum stock. Experimentation will be easier if the front-to-back spacing can be adjusted easily. I temporarily substituted 1- × 1-inch wooden cross members of various lengths during the measurements, and replaced them with aluminum stock that was cut to the same length in the final assembly.

Your first task is to make the quad loops. To make the loops in the simplest way, you will need about 15 feet of very-heavy-gauge, solid-copper wire. The Germans used some heavy grounding wire, 5 mm in diameter, which is about the same as no. 4 AWG. The wire can be insulated or bare, but solid-copper wire in this gauge is not available everywhere. I suggest that you try electrical supply houses or scrap-metal dealers in your area.

If no. 4 wire can't be located, you can use ¼-inch copper tubing. This is available almost everywhere, and sells for about 30 cents per foot. The problem with copper tubing is that it will kink if you bend it too sharply. This can be solved with the aid of a spring tubing bender, commonly available at hardware and plumbing stores. These economical tools (I bought one recently for $1) will allow you to make reasonably sharp corners, down to about 1 inch in radius, for ¼-inch tubing. The spring bender is used by slipping it over the tubing so that it overlaps the point where you want the bend. The coils of the steel spring support the tubing walls while the bend is made, and then the bender is simply slipped off. If the bend isn't quite right, you can put the bender back on and make further adjustments.

Quarter-inch-diameter copper tubing is soft, with little structural strength, but it should serve well enough at 2 meters and above. The rigidity of the tubing can be improved, however, if you can locate some no. 6 AWG wire. This wire, alone is a little too light for 2-meter quad loops, but it is the right diameter to slip down the center of ¼-inch copper tubing. A light coating of grease or Vaseline spread on the wire will make this easier; the wire should be bare. If you follow this route, make each quad loop individually and join them later.

With wire-cored tubing, the spring bender is not needed because the wire will prevent the tubing from kinking. But a bending jig of some sort will help you construct square loops. A bending jig can be made of ¾- × ¾-inch wood strips that are spaced exactly ¼ inch apart and screwed to a piece of plywood. One strip should have screws only at the ends, so that a C clamp can pinch the strips together in the middle to keep the tubing from slipping. A short piece of ¾-inch wooden dowel, screwed down at one end of the strips, will help you get a smooth bend in the wire-cored tubing. After bending the tubing around the dowel by hand, place a block of wood along the tubing (after the point of the bend) and tap it with a hammer in order to get sharp corners. Another set of wood strips, mounted at 90° to the first, will help prevent shifting as each bend is made. Make the jig so that the loops conform to dimensions you calculated earlier, as measured to the outermost edges of the loops.

When all four sides have been formed, the ends of the tubing will have to be bent in the reverse direction at a 45° angle with spacing of about ¾ inch center-to-center (Fig 1). The ends should then be cut off squarely, leaving stubs about ½ inch long. The two loops will be spliced together at these stubs later.

Loops made on a jig like this will turn out square and flat, and it doesn't take much time to throw a suitable jig together. Of course, the jig can also be used for solid-wire loops; just change the spacing of the wood strips to fit the wire diameter.

An alternative is to make the quad loops from lighter-gauge wire and to support the

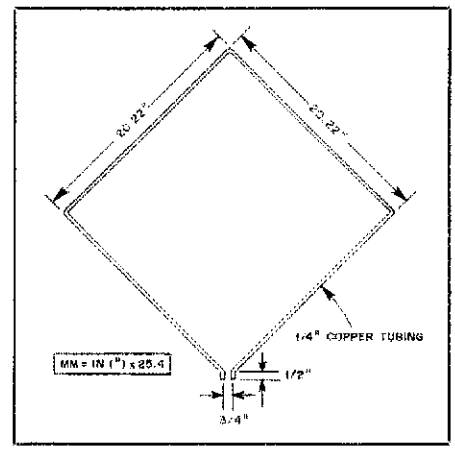


Fig. 1 — Dimensional details for one of the loop elements for the twin-quad 2-meter antenna.

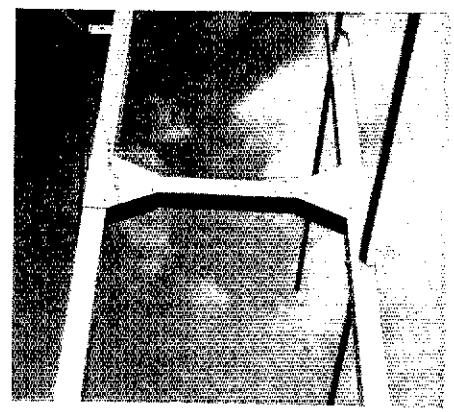


Fig. 2 — Structural data for the aluminum frame used with twin-quad antenna (see text).

outer corners with some kind of crossarm. Be aware that in the twin-quad design the outer corners of the loops are the points of highest voltage, whereas the corners along the boom are the current points. Thus, insulation requirements along the boom are not too critical, but you need good insulation at the ends of the crossarms to minimize losses. You might consider making the entire crossarm from a good grade of insulating plastic or fiberglass. Also, the loops might have to be made slightly larger than one wavelength when using smaller wire, because of the lengthening effect mentioned previously.

Next, make the frame that will support the antenna elements. I made my frame and reflectors entirely from Reynolds aluminum extrusions (Fig. 2). They are available in many hardware stores, but you can make the frame from wood if your budget won't support the more expensive aluminum. Here's a list of Reynolds extrusions you will need:

- 2 — no. 4860 1-inch-square × 0.047-inch wall tubing, 6 feet long
- 2 — no. 1807 3/8-inch-diameter rod, 8 feet long
- 1 — no. 1806 3/8-inch-diameter rod, 6 feet long
- 1 — no. 2420 1 × 1 × 1/16-inch angle, 6 feet long

This list provides for five reflectors. You can omit one piece of no. 1807 stock if you are going to use only three. Also, the last item (angle stock) might not be needed, depending on how you want to mount the quad loops to the boom and the boom to the mast. This is discussed later.

While you are buying the aluminum, you might purchase an aluminum cookie sheet (the kind with no sides) to use for making the gusset plates. A radial-arm saw with a fine-tooth blade is excellent for cutting aluminum. A carbide-tipped blade is even better if you will be doing a lot of cutting. Otherwise, a hacksaw and a pair of snips will do the job. I cut both pieces of the square tubing to a 62-inch length. This left two pieces about 10 inches long to be used as cross members.

Cut the rod stock to length for the reflectors. If you should make a mistake in cutting these, make them a little too long! Drill (no. 29) and tap a hole for a no. 8-32 screw at the center point of each rod. Use plenty of oil while tapping, and remove the tap at the halfway point and brush off the chips. A little more oil, and the job is done.

Cut the cookie sheet into eight 3- × 3-inch plates. Then trim off two corners as shown in Fig. 3 (use tin snips to trim the corners). I decided to use 1/8-inch-diameter × 1/8-inch-grip-range Pop Rivets to fasten everything together. The rivets are available in aluminum and won't rust in contact with the aluminum frame. Center punch and drill one gusset plate with a no. 30 drill. Then use it as a pattern to mark, center punch and drill all eight plates. Unless you plan to make "tons" of these things, don't waste time on them. Deburr the holes with a larger drill, going in just far enough to remove the burr.

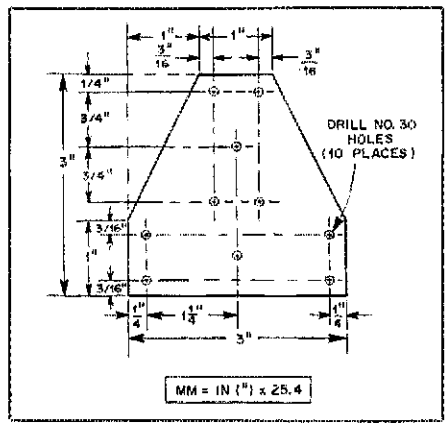


Fig. 3 — Drilling template for the antenna gusset plates.

The placement of the reflectors should now be marked on the rear boom, and 3/8-inch holes drilled completely through from one side. A drill press will help you make these holes square to the boom. Turn the boom 90° and drill clearance holes for the reflector locking screw. You are now ready to mount the antenna to the mast. Just clamp it to the mast with a couple of long U bolts. The mounting bracket assemblies I used can be omitted (these were made from 1-inch angle stock and 1/8-inch-thick aluminum cut from a 3½-inch rack panel). If you decide to skip the brackets, you can now mark and drill the holes for the gusset plates and rivet them in place. Insert the two outermost reflector rods and lock them in with no. 8-32 × ¾-inch stainless-steel screws with lockwashers. The remaining reflectors will be put in after the two booms have been linked together.

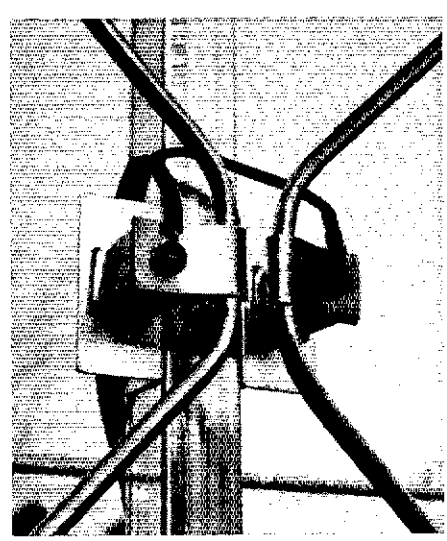


Fig. 4 — Close-up view of the twin-quad antenna feed point.

More Assembly Data

The front boom can now be prepared. Mark and drill the holes for the gusset plates, but do not rivet them in place yet. A satisfactory method of mounting the quad loops to the boom must now be found. The Germans show a sturdy assembly, that has a grooved plastic block with a plastic cover plate that clamps the loops to the boom. These blocks can be built up in layers from ¼-inch Plexiglas if you don't have a source of thicker plastic. This is the method I recommend. But, I had a number of nice ceramic insulators in the junk box (¾ inch square by 1 inch high), so I used them. Always put a cushioning gasket between insulators and their mounting surfaces if there will be any significant weight or stress applied to them. Thin cork sheeting, available from the plumbing department of your hardware store, is an ideal material. The quad loops are fastened to the insulators with brass clamps made of ¾-inch-wide brass-strip stock, such as may be found in hobby shops. The two middle insulators are mounted on brackets of 1-inch angle stock that are riveted to the boom.

The final placement of the insulators should wait until the brass clamps have been made and test-fitted to the loops. Then, bolt everything together, square up the loops to your satisfaction, and solder all four clamps to the loops. If desired, the loops may be joined beforehand by soldering a sleeve of ¼-inch-ID brass tubing over the end stubs. This makes it easier to handle the loops. The resulting assembly is sturdy, but the plastic-block clamps should be even better: They eliminate the need for the additional brackets, insulators and brass clamps.

Final Assembly

At this point, the antenna is ready for final assembly. Only the cross members linking the two booms have to be cut, drilled and riveted in place. This is where you may want to experiment. As stated earlier, the Germans used a loop-to-reflector spacing of about 11 inches. I used 12.5 inches, as measured on centers. Changes in the spacing have an effect on the SWR. If you aren't in an experimenting mood, use the leftover pieces of square tubing, uncut, as cross members. This will give you a spacing close to the 12.5 inches I found to be optimum after trying a number of wooden cross members of various lengths. The total spacing depends somewhat on the height of your loop mounts. Insert the remaining reflectors and lock them in place.

The parallel loops of the twin quad present a close enough match to 50- or 75-ohm

line so that the line may be connected directly to the center point of the two loops (Fig. 4). The shield should go to one side and the center conductor to the other. This will undoubtedly cause a few raised eyebrows, as it is well known that a balanced antenna (like the twin quad) should be fed with a balanced feed system. An unbalanced feed can cause disruptive effects, as documented by Orr, and by Maxwell in his article about baluns.[4,5] I tried feeding the twin quad with a quarter-wavelength coaxial-sleeve balun transformer, but could not get a satisfactory SWR at any loop-reflector spacing. The balun was properly resonant. It showed low SWR when connected to a dummy load. Another experiment involved placing a number of large ferrite beads over the outer conductor of the coaxial cable near the feed point. If there was a lot of RF on the outer shield surface, the beads would choke it off. But again, the system SWR was adversely affected, so I returned to using a direct 50-ohm coaxial feeder.

The Germans also use the direct-feed technique, but have made measurements that show a small shift in directivity (about 6°) occurs with unbalanced cable. I also noted this, with the shift being in the direction of the side where the cable center conductor was connected. This small shift is nothing to be concerned about. But, what about other adverse effects?

There is no doubt that the length of the feed line affects the SWR readings of this antenna. However, I'm not so sure that the potential for radiation from the line impairs antenna performance. For instance, the directivity of the antenna seems to be good, and the Germans experienced little impact on the beam pattern from the direct coaxial cable feed.

One phenomenon you should be aware of is that you cannot make SWR measurements accurately if your SWR meter is too close to the antenna. This may be caused by the effects of RF on the outer shield of the feed line near the antenna. These effects gradually disappear a few wavelengths away from the antenna. The total feed line during my tests was 36 feet 9 inches of new RG-8/U. Measured line loss was about 1 dB at 146 MHz. No "hot-shack" effects were noted at the transmitter end of the line. Do not ground any part of the coaxial line at the antenna end. The cable should be brought straight back from the feed point, then down behind the reflectors. (The photographs were taken during tests, before final connection of the feed line.) Of course, the transmitter end should be well grounded. I suggest using a gamma or T match with the twin quad, but admit that feeding of this antenna definitely needs further exploration.

The SWR curve is shown in Fig. 5. It appears that the resonant point is closer to 144.5 MHz than the intended 146 MHz, but the SWR is within acceptable limits across

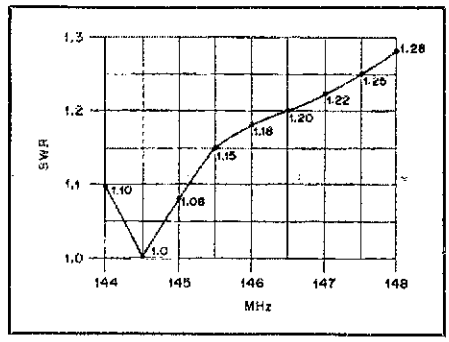


Fig. 5 — SWR curve for the completed antenna.

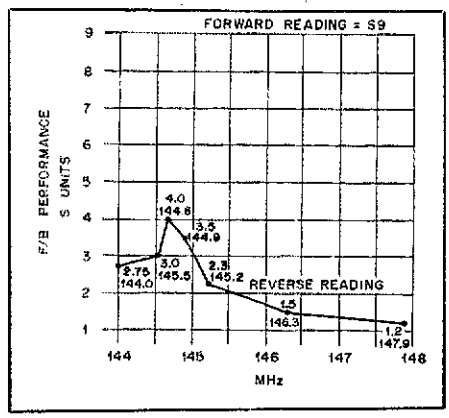


Fig. 6 — Relative front-to-back ratio of the twin-quad beam antenna in S units. (The actual value of dB/S unit of the author's Yaesu FT-726 transceiver is unknown.)

the entire band. (If I were to make another twin quad, I would make the loops about 1% smaller.)

Front-to-back measurements were made by aiming the antenna at a low-power oscillator placed on top of a stepladder in a field about 200 feet away. The receiver RF gain was adjusted to show an S-9 reading. Then the antenna was rotated 180° and another reading was taken off the back. Finally, the antenna was rotated back to the forward position to confirm that the S meter still read S 9. The plot in Fig. 6 shows the front-to-back performance across the band. Rejection of signals arriving from the rear is quite good for an antenna of this simplicity.

Conclusions

I will leave forward-gain measurements to those with the tools and time to make them properly, but I have no reason to doubt the 9-10 dBd that the Germans claim. The antenna performs well, although I did not succeed in contacting the Shuttle. I was able to hear the operator several times, however, and the signals were loud.

The noise level is indeed lower with the twin quad than with a vertical. An ordinary TV antenna rotor will easily handle the twin quad.

If you're looking for a manageable antenna project, the twin quad may be a good choice. It lends itself to a variety of alternative construction techniques, and gives good performance for your investment in time and money. Please see the reference literature for more information on this interesting antenna.

Notes

[1]K. Weiner, *The UHF Compendium*, available from Ham Radio's Bookstore, Greenville, NH 03048.
[2]W. Orr, *All About Cubical Quad Antennas*, available from W6SAI.
[3]mm = in × 25.4; m = ft × 0.3048.
[4]See note 2.
[5]W. Maxwell, "Some Aspects of the Balun Problem," *QST*, March 1983, p. 38.

Strays

I would like to get in touch with...

☐ anyone having a schematic diagram or manual for the Eico tri-band transceiver and power supply. Fred W. West, W2RGD, 45 Sycamore La., Skillman, NJ 08558.

☐ anyone with a manual or a schematic diagram for a General Radio 1570-AL ac regulator. Warren Kernaghan, KCØZJ, 901 E. 108th St., Kansas City, MO 64131.

☐ amateurs using the Franklin 1000 computer. Bill Russell, W7FOF, Rte. 1, Box 139, Star, ID 83669.

☐ the radiomen from the USCG troop transport *USS Samuel Chase*. Andrew P. Sallet, W1TG, 10 Wellesley Rd., Nashua, NH 03062.

QEX: THE ARRL EXPERIMENTERS' EXCHANGE

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- BITS looks at *The Handbook of Bar Coding Systems*, by Harry E. Burke, and a 6-BIT video digitizer that integrates quality pictures with the IBM PC.

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A CW Keyboard Program for Atari Computers

Is that Atari computer you bought for the kids gathering dust? Use this program to turn it into a sophisticated CW keyboard.

By Steve Stuntz,* NØBF

Are you interested in joining the computer age with a ham radio computer application, but haven't done so because of the complications and expenses involved? Why not write a program to convert an inexpensive home computer into a sophisticated CW keyboard? This assembly-language program will convert any Atari computer (models 400, 600 XL, 800, 800 XL and 1200 XL) into a CW keyboard with a 255-character type-ahead buffer and ten 255-character memories.[1] A simple interface circuit is also presented that will key most positively keyed transmitters.

Although created specifically for Atari computers, this program can be used on any computer that uses a 6502 microprocessor, provided that the following routines are modified:

1) I/O control of the peripheral interface adapter (PIA) chip
2) IRQ interrupt routine
3) screen-output routine
4) sound-generation routine
5) keyboard-input routine.

The structure used for this program is a good model to use on any computer with a programmable timer.

The Program

The routines at the heart of this program are the keyboard-entry and the timing-loop routines. These routines are outlined in the flow chart in Fig. 1. The keyboard-entry routine detects keypresses. The timing-loop routine generates Morse code at the selected speed.

Keyboard Input

In the normal keyboard mode, the keyboard-entry routine reads the system key register. If the value in the system key register indicates that a key has been pressed, the routine determines if a normal CW character or a control character was typed. If the key is a CW character, the ASCII code for that character is converted to the Morse code equivalent and stored in the 255-character type-ahead buffer. Then, the keyboard-entry routine repeats the process, waiting for another keypress.

If a control character is entered, the computer program proceeds to a control routine to perform one of the functions indicated in Table 1. Control characters are entered by pressing the CONTROL key and the desired character simultaneously. For example, "Ctrl-T" means to press the CONTROL key and the T key at the same time.

Table 1
Special-Function Keys for the Atari CW Keyboard

Key	*Function*
Tab	Enter a message into one of the 10 available memories ("<" or ">" at the end of a message will cause the message to be repeated).
Escape	Exit message-store mode.
Return	Send message from one of the memories.
Ctrl-T	Key the transmitter for tuning.
Ctrl-uparrow	Increase the CW speed.
Ctrl-dwnarrow	Decrease the CW speed.
Backspace	Delete last character typed.
Delete	Delete entire type-ahead buffer.

Character Generation

The timing-loop routine generates Morse code by using the appropriate number of 1/60-second intervals to build dots, dashes and spaces. The routine sets a system counter to count the correct number of 1/60-second intervals and to generate an

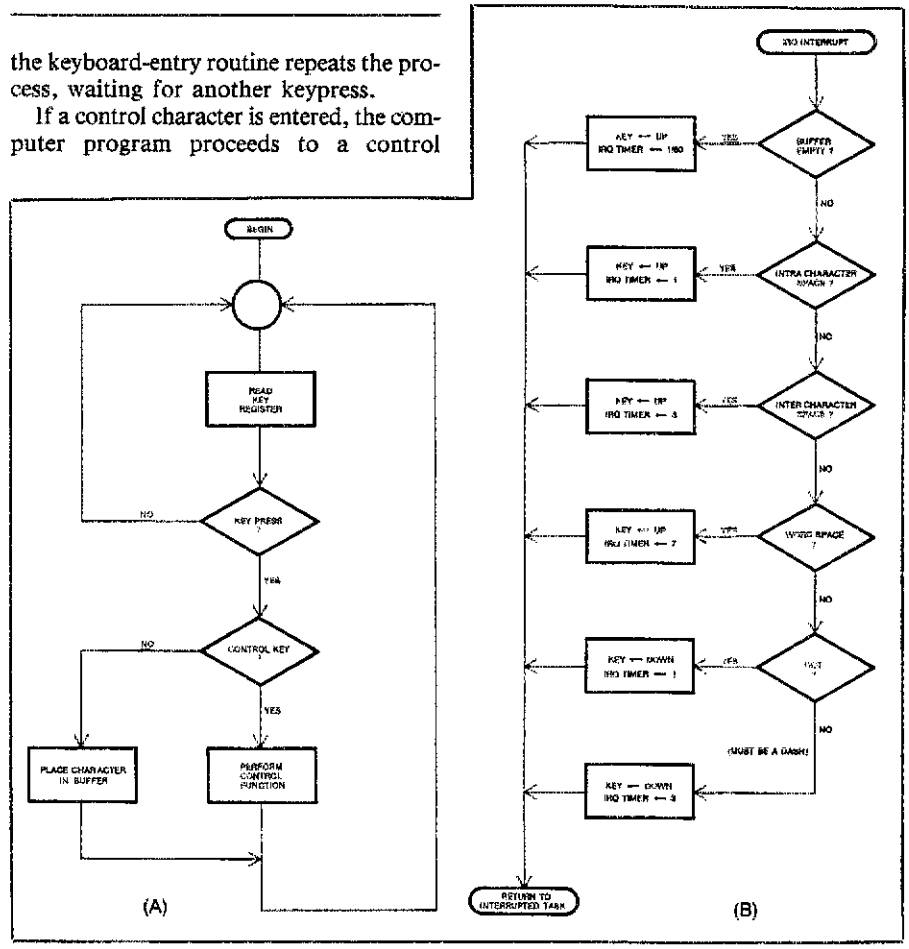


Fig. 1 — The flowchart for the Atari keyboard-input routine is shown at A. At B is the flowchart for the CW timing routine.

[1]Notes appear on page 33.

*1656 S. California St., Loveland, CO 80537

IRQ interrupt when the count is complete.

Each time an interrupt is generated by the system counter, the computer immediately stops what it is doing and calls the timing-loop routine. First, the timing-loop routine reads the byte in the current type-ahead buffer position. If the byte is a CW character, the routine determines which of these Morse code elements is to be generated: a space following a dot or dash, a space after a character, a space following a word, a dot or a dash. The routine then looks up the duration of that element, sets the system counter, and turns the computer interface off (for a space) or on (for a dot or dash). The program then returns to the keyboard-entry loop until the system counter counts down to zero and generates another IRQ interrupt.

If the type-ahead buffer is empty, the timing-loop routine finds a zero in the buffer. The routine then sets the system counter to 1 and returns to the keyboard-entry routine. One-sixtieth of a second later, the system timer generates an IRQ interrupt, and the timing-loop routine checks the type-ahead buffer again.

The program has a table containing the number of 1/60-second intervals required to generate Morse code characters at 13 different code speeds: 5, 7.5, 10, 13, 15, 18, 20, 25, 30, 35, 45, 55 and 70 WPM. The characters have a fixed 1:3 dot-to-dash ratio. Once you understand the program operation, you can easily change this ratio to something that suits you. The Farnsworth method is used for 5, 7.5 and 10-WPM Morse code; characters are sent at 12 WPM, with the spaces between characters adjusted to the slower speed.

Character Representation

The keyboard-entry routine stores Morse characters, in the type-ahead buffer, as 8-bit bytes. Each byte is read from the least significant bit (LSB, usually the right-most bit) to the most significant bit (MSB, usually the left-most bit). Ones represent dashes, and zeros represent dots. The last one encountered when reading from LSB to MSB indicates the end of the character. For example, the byte "00010101" represents dahdidahdit, the letter "C." If you type "C," the keyboard-input routine stores the byte "00010101" in the type-ahead buffer.

Since there must be 1 bit reserved to indicate the end of a character, there are only 7 bits available to represent the character. This means that Morse characters with eight or more elements, such as the "error" signal (dididididididit) cannot be sent by this program. If you feel you must send such characters, you will have to modify the program.

Storing and Running the Program

The program source code (see sidebar on assembly-language programming) requires 17 kbytes of random access memory (RAM) and can be stored on a disk or cassette tape. An assembler/editor program is required to edit and compile the program. The source code requires 10 minutes to be read from cassette tape and 5 minutes to be compiled. These time constraints are acceptable during program development, but are unacceptable during day-to-day operation.

There are several ways to make the program load more quickly. After it has been entered and debugged, the source code can be compiled, and the object code can be stored on a disk or cassette tape. This method of storing the program is more efficient than storing the source code, but still requires an assembler/editor program to load the object code. The program presented here contains a feature for generating a self-boot cassette tape that doesn't require an assembler/editor program and only requires 30 seconds to load.

The most convenient method of storing the program is on an electrically programmable read-only memory (EPROM) cartridge. The cartridge is a circuit board that contains a 4-kbyte EPROM and can be plugged into the Atari cartridge slot. The object code is stored in the EPROM with an EPROM programmer.[2] The CW operator simply plugs in the cartridge, turns on the computer and begins operating. Only a few seconds is required to load the program from the EPROM cartridge.

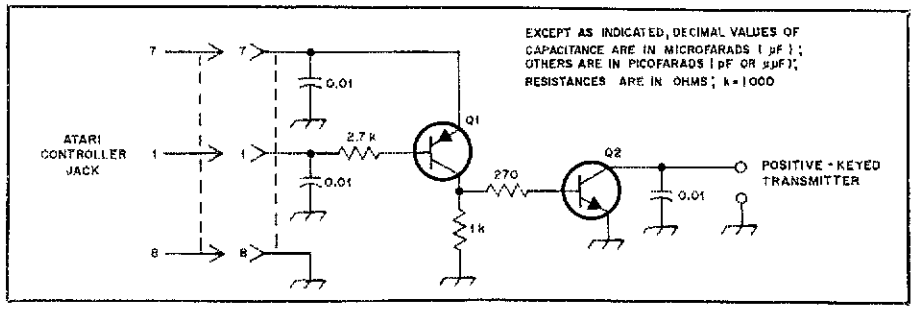


Fig. 2 — Circuit diagram for Atari transmitter-keying circuit.
J1 — DB-9-S (Radio Shack 276-1538 or equiv.).
Q1 — PNP silicon transistor (Radio Shack 276-2034 or equiv.).
Q2 — NPN silicon transistor (Radio Shack 276-2059 or equiv.).

Assembly Language Programs

A CW keyboard program must execute quickly and must interact closely with the computer input/output (I/O) hardware. Programs written in BASIC, while easy to write, are not fast and cannot always perform complicated I/O tasks. Therefore, this program (and most other CW keyboard programs) is written in "assembly language." Assembly language is not as convenient as BASIC, but it can be used to write fast programs that perform complicated I/O tasks.

BASIC programs are simply typed into the computer and run. Assembly language programs go through a more complicated process. First, a "source file" is created. The source file contains the assembly language program as text. The source file is then submitted to an "assembler" program, which converts the text program into a "machine-language" program. A machine-language program is a set of binary instructions and data that can actually be understood by the computer central processing unit (CPU). Finally, the machine-language program is loaded into the computer RAM and run. The process sounds complicated, but is made fairly easy by "assembler/editor/loader" programs that are available for most home computers. — *Jeff Ward, K8KA*

CW Output

The program sends the CW as audio to the computer monitor and controls an interface circuit through pin 1 of controller jack 1. An interface circuit I have used to key positive-keyed transmitters is shown in Fig. 2.

Testimony

As a serious CW operator, I never expected the computer to replace my electronic keyer. Since I started using this program with my Atari 800, I haven't touched the keyer!

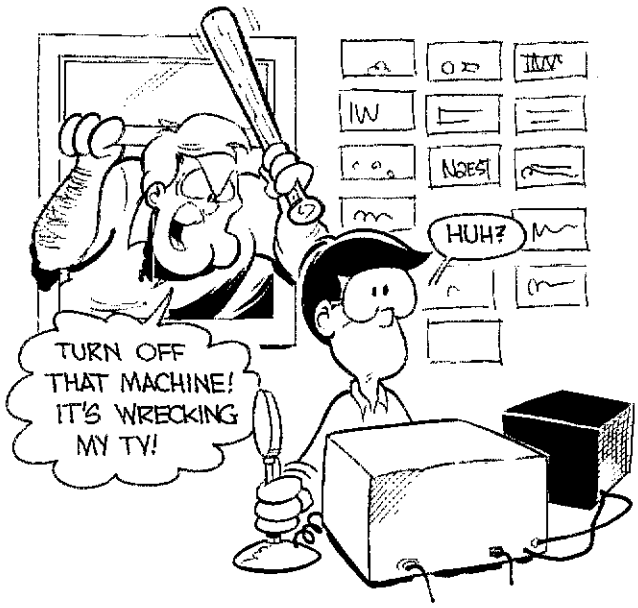
The computer keyboard adds another dimension to CW, allowing the operator much more flexibility and freedom than the keyer provides. You can enter a response while a message is being received. Contesters are given a tremendous advantage, because they can use memories to store standard contest responses. A good typist can enter an entire response into the type-ahead buffer, leave to get a cup of coffee and return to find the computer still sending code.

I have enjoyed using this program and would encourage CW fans to try it. There are also several modifications that interested parties might make to the program. Some I've mentioned, and some are left to your imagination. If you like CW, this program is a fine way to put your Atari computer to work for you.

Notes

[1]Program listings are available from the ARRL Technical Department. Send an s.a.s.e. to ARRL-TD, 225 Main St., Newington, CT 06111, and ask for "Atari CW."

[2]EPROM programmers that will work with Atari computers are available from several companies. Also, the author will sell the program on disk or cassette for $10, or on EPROM cartridge for $40. The ARRL and *QST* in no way warrant this offer.



Understanding TV and Radio Interference

Part 14: Ham radio interference to home entertainment devices is a matter we can't dismiss easily. Fortunately, there are simple steps we can take to solve most problems caused by our station equipment.

By Doug DeMaw,* W1FB

In a recent installment of this series we examined radio-wave propagation with respect to the ionospheric layers. We did not cover the effects of radio-frequency energy in the immediate vicinity of our amateur stations — the region where intense levels of RF energy are generally present when our transmitters are operating. It is not uncommon for these strong fields to create interference in nearby TV, AM and FM receivers. This near-field RF energy can also affect the performance of telephones, computers and other electronic devices found in homes.

Our responsibility as hams is to ensure that our radio equipment is not the fundamental cause of RFI (radio-frequency interference) or TVI (television interference). Often, a large part of the interference problem is the fault of the home-entertainment device, rather than the amateur's transmitter. Unfortunately, the neighbor who experiences an interference problem is hesitant to believe his or her apparatus is deficient. Often the complainant will say, "It has to be you! After all, you have that big antenna in your yard!" Such a person might also say, "It can't be my hi-fi system, I paid $1500 for it."

When the home-entertainment device is responsible for the interference problem, we need to put on a diplomat's hat and assume a new role. Animosity solves no problems, so we must try to cooperate with the irate neighbor in solving the dilemma. Let's look at the basic causes of interference, and learn what the usual steps are toward solving the problems.

*ARRL Contributing Editor, P.O. Box 250, Luther, MI 49656

Keeping Our Stations "Clean"

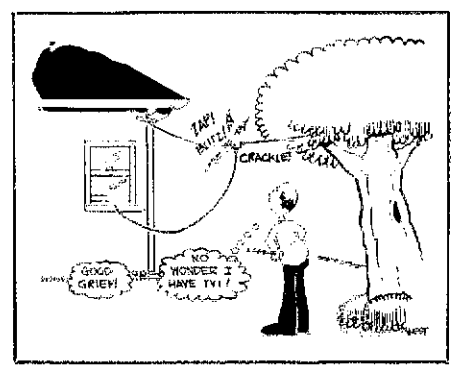
The first responsibility of an amateur operator is to make certain that the transmitter does not radiate harmonic energy. A harmonic is a frequency multiple (odd or even) of the operating frequency. For example, the second harmonic of 3725 kHz is 7450 kHz, the 11th harmonic is 40.975 MHz. The higher-order harmonics fall into the FM and TV bands. If they are strong enough, they can wipe out the TV picture and sound, or blot out an FM station. If these interfering harmonics are radiated by the transmitter directly or via the antenna system, they may be strong enough to cause interference a block or more away!

All transmitters generate harmonic energy. The FCC requires that all commercially made amateur transmitters for the HF bands have all spurious output energy suppressed 40 decibels (dB) or more below the peak power-output level without exceeding the power level of 50 mW. Therefore, if our transmitter puts out 100 W at the desired frequency, all harmonics and other spurious energy must be 10 milliwatts (mW) or less. At VHF, the spurious energy from the transmitter must be at least 60 dB below the peak output power. Proper transmitter design plus suitable harmonic filters can make this possible. Many homemade transmitters do not meet these performance standards, owing to incorrect design procedures and/or a lack of harmonic filtering. The ARRL, however, requires that all published transmitter circuits comply with the FCC regulations before they can appear in *QST*. Similarly, most manufactured transmitting equipment is tested for compliance before it can be advertised in *QST*. These tests are performed at ARRL Hq. in the Technical Department laboratory.

If you have an offensive transmitter, you can add an external harmonic filter to the transmitter. We'll discuss this, and other clean-up measures, later in the article.

Other Interference Causes

It is possible to have a clean transmitter, but your station may still be the cause of RFI or TVI. How can this happen? Let's suppose that somewhere in your antenna or feed line there is a poor electrical joint. In fact, a loose coaxial-cable connector may even be the culprit. A poor solder or mechanical joint can act as a rectifier diode.



When this happens, the diode-like joint generates strong harmonic currents, and these can be radiated by the antenna. A poor antenna connection may simply "sputter" and arc while you are transmitting, and this will raise havoc throughout the neighborhood.

A poorly conducting joint need not be in the antenna system. It might occur between sections of rain gutter, metal fencing or some other nearby conductor. If a sufficient amount of your RF energy is induced into such objects, they can generate and radiate harmonics.

There is a reverse-interference problem that can result from an unwanted rectifying joint: You may hear all manner of unwanted broadcast band or other commercial signals popping up here and there in the tuning range of your amateur receiver! The poor outdoor joint may be rectifying energy from an AM station. The harmonics caused by this action may fall in the amateur bands.

As an example, suppose there was an AM station near you, and the operating frequency was 1240 kHz. The third harmonic would fall at 3720 kHz — right in the 80-meter Novice band! Of course, you might hear the third harmonic anyway, if the antenna tower of the AM station was very close to your location. This would not mean that the broadcast station had a faulty transmitter. Let's consider a typical 50,000-W AM station. By law, the harmonic signal amplitude must be 40 dB or more below peak fundamental output power, and must not exceed 50 mW. This means that the third harmonic of the AM transmitter must be 50 mW or less in power level. A 50-mW signal from a couple of blocks away can be mighty strong in a ham receiver! In fact, transoceanic amateur QSOs have been made at such power levels.

If any of these problems occur at your station, check for loose joints in the antenna system. If this does not resolve the difficulty, look for poor electrical joints in nearby metal objects. Once the bad joint is found, it's a simple task to clean the mating surfaces and solder them. A jumper wire and two clamps can be used to bond joints in fences and other large conductors.

Interference Preventive Measures

We need to ensure that our transmitters have a clean bill of health, so to speak, before we attempt to solve interference problems in our neighbors' or our own home-entertainment equipment. Caution: If you work on a neighbor's home-entertainment device, you leave yourself open for continuing — or worsening — problems if your cure doesn't work exactly right. Fig. 1 shows the prescribed methods for keeping harmonic energy from reaching the feed line and antenna. FL1 is a low-pass filter. It allows amateur signals to pass through it with little attenuation, but frequencies above, say, 40 MHz are attenuated greatly. This filter should be located as close to the transmitter antenna jack as possible, and it should be connected to a quality earth ground. A suitable earth ground might be several 6-foot copper rods driven into the ground near the ham shack, with about 3 feet between each rod.[1] The rods are bonded together by means of a heavy-gauge conductor, such as the shield braid from RG-8/U coaxial cable. The lead from this ground system to the ham station should be as short and fat as you can make it: The shorter the overall ground lead, the more effective the ground system will be for conducting the harmonic energy to ground. Low-pass filters are widely available on the commercial market. Some amateurs build their own filters from data given in the *ARRL Handbook*.

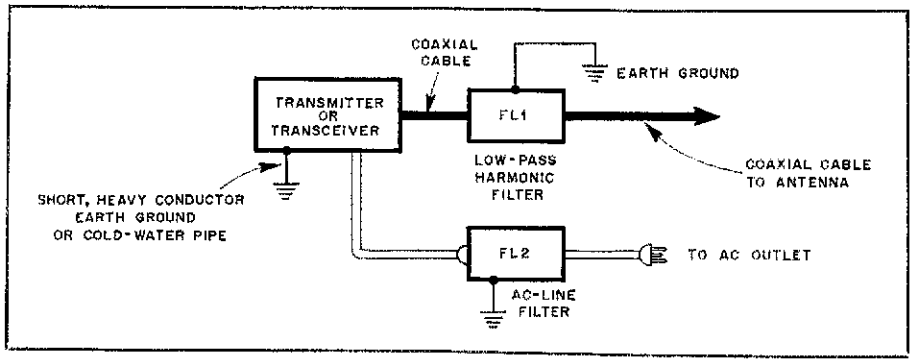


Fig. 1 — Block diagram of an amateur transmitter or transceiver that has a low-pass harmonic filter, plus a brute-force ac-line filter. The filters attenuate harmonic energy to reduce the possibility of TVI and RFI. The ground system should be of high quality (see text), with as short a connecting lead as possible. Frequently, the cold-water pipe system will serve as an effective earth-ground connection.

RF energy at the operating and harmonic frequencies can be conducted along the ac line, then to the power lines for radiation. This unwanted energy may also be conducted into your neighbors' homes and then into their entertainment equipment. It should be standard practice, therefore, to install FL2, an ac-line filter. It will serve also to keep unwanted external noise and RF energy from entering your receiver via the ac line. The *Handbook* has the details for making your own ac filter. FL2 of Fig. 1 should also be located as close to the transmitter as is convenient.

A final word about harmonic radiation is in order. If you mistune the output amplifier of your transmitter (tune it to the wrong frequency), the harmonic output energy level can be quite high. Always tune your transmitter in accordance with the operating instructions. Be sure the amplifier stage is adjusted for correct loading and plate-current dip when using a tube type of output stage. This does not apply to solid-state amplifiers. They are broadband devices, and a harmonic filter is included in the circuit for each operating band.

Dealing with the Neighbor's Problem

Modern solid-state entertainment equipment is more prone to interference than was generally true of vacuum-tube equipment. This is because the transistors and ICs contain diode junctions. These diodes rectify RF energy and cause all kinds of interference problems. Also, many TV and FM receivers have front ends (tuner sections) that are not capable of rejecting non-TV or non-FM frequencies. The amateur signals enter the front end and overload them. This usually blanks out the reception entirely. Interference of this class is referred to as *fundamental overloading*. The most effective cure is the insertion of a *high-pass filter* directly at the tuner of the receiver. (As mentioned earlier, avoid working on a neighbor's home-entertainment device unless you are willing to take responsibility for the modifications you make, and for any future malfunction that could be related to those modifications.) This variety of RF filter allows the TV or FM signals to pass into the receiver, but unwanted energy below the filter frequency (1.8 to 29.7 MHz, for example) is attenuated. A high-pass interference filter (Fig. 2) will not prevent *amateur VHF and UHF* energy from reaching the front end of a TV or FM set, because the filter is necessarily designed to pass all frequencies in that range.

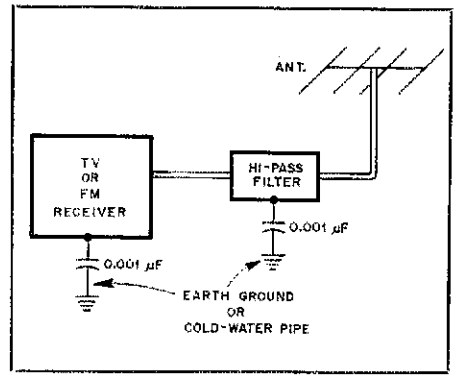
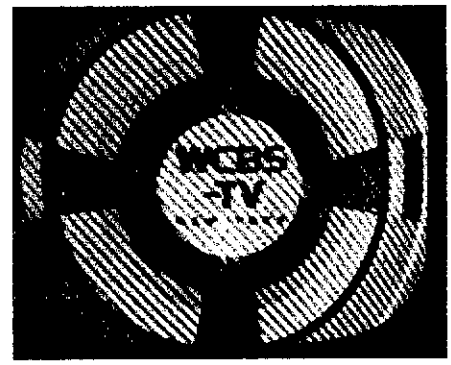


Fig. 2 — A high-pass TVI filter can be attached to the TV receiver near the tuner to prevent fundamental overloading of the TV set from amateur signal energy.

[1]Notes appear on page 37.

How FCC Regulations Affect Our Treatment of RFI-Related Problems

Q. In the eyes of the FCC, who is responsible for RFI?
A. It is the radio amateur's responsibility to ensure that the transmitted signal complies with FCC emission standards regarding the fundamental, harmonics and other transmitted products. If the transmitter is being operated in accordance with FCC regulations, the responsibility of remedying RFI susceptibility in the home-entertainment device lies with the owner of the device.
Q. What is the FCC's view on neighbor relations regarding RFI problems?
A. If a neighbor is experiencing RFI from an amateur's signal on a receiver of good engineering design, and this fact has been made known to the amateur, the FCC may impose quiet hours on the amateur. During these quiet hours, the amateur cannot transmit on the frequencies where the interference exists.
Q. What must an amateur do if faced with a notice of violation?
A. The amateur must reply to the FCC office issuing the notice within 10 days of receipt. If the notice relates to a physical or electrical problem, the amateur must state fully the steps that have been taken to correct the situation. If the notice relates to improper operation of the transmitter, the name of the operator in charge must be given. The FCC will initiate license revocation proceedings should the amateur choose not to respond.



(A)

(B)

Fig. 4 — Cross-hatching is shown at A. This is typical of the harmonic interference caused by amateur transmitters. The picture at B shows what sound bars look like on a TV screen.

High-pass filters are available commercially, or you may want to make your own (less costly!) from information in the *ARRL Handbook*. *Caution:* Do not install any suppression device inside the neighbor's equipment. Make your installation (with his or her permission) to the equipment cabinet externally. Once you reach inside the "works," you're liable if the neighbor decides you were the cause of a subsequent equipment failure.

Fundamental overloading caused by your VHF or UHF signals must be treated in a slightly different manner. A tunable "band-elimination" filter or "band-reject" filter is generally used in the antenna lead of the TV or FM receiver. This filter is capable of rejecting your VHF or UHF signal, but passes the desired TV or FM energy to the receiver front end. This species of filter contains one or two (depending on the use of Twin Lead or coaxial feed line) tuned, high-Q circuits. They are tuned to the operating frequency of your transmitter, which will result in minimum interference to the TV or FM set. A typical circuit for this kind of filter is shown in Fig. 3. The ARRL literature covers this subject and most other items that relate to interference.[2]

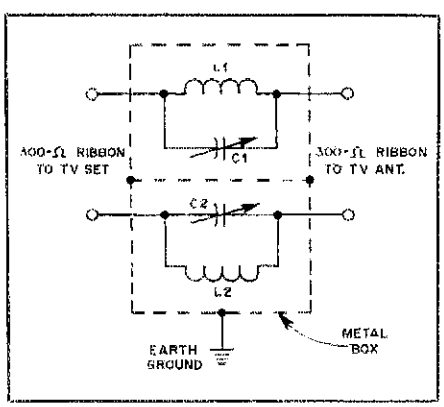


Fig. 3 — A tuned trap, or reject filter, is useful in preventing interference to FM receivers that is caused by amateur VHF or UHF energy. C1 and C2 are adjusted to resonate the traps at the transmitter output frequency.

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We need to be aware that some TV set chassis are "hot" with respect to ground. This can cause an arc or even blow fuses when an earth ground is attached to the chassis. I like to stay on the safe side of things by inserting a 0.001-μF disc-ceramic capacitor in series with the ground wire to the TV receiver or filter case. This will prevent sparks from flying! (See Fig. 2.)

Harmonic Interference

Interference from amateur harmonics shows up quite differently in a TV receiver. Rather than blanking out a TV sound and picture system, harmonics cause lines on the TV screen. Diagonal or horizontal bars may appear on the screen. They may be very wide, or they may be spaced close together. Fig. 4 illustrates two kinds of "cross-hatching." Sometimes these bars appear only while you are speaking into your microphone. These are referred to as "sound bars."

It is unfortunate that we amateurs can do nothing at the TV set to cure harmonic TVI. It boils down to going back to our ham stations and starting from "square one." We must improve the harmonic suppression from our transmitters. This requires a great amount of cooperation with the neighbor while numerous checks are made to learn if progress is being made toward eliminating the problem. If the harmonic TVI occurs from operation on only one band, you should consider not using that band until you resolve your problem.

Ac line filters are recommended for use on TV and FM sets when a tough interference problem prevails. It is possible that harmonic energy is entering the TV receiver along the ac line as well as from the antenna system. No possibility should be overlooked when trying to solve TVI or RFI problems.

Harmonic interference to FM radios must be treated in a manner similar to that for TV sets. The symptoms will show up as buzzing or voice sounds superimposed on the FM station that is tuned in. Hams who operate the 6-meter band (50 MHz) are most apt to cause second-harmonic problems to owners of FM (88-108 MHz) receivers, since the second harmonic from any transmitter is usually the strongest.

Hi-Fi Interference

Perhaps the greatest number of interference problems can be related to audio hi-fi gear. This area includes cordless telephones, electronic organs and hearing aids. For the most part, RF energy is conveyed to the equipment via the speaker leads, which are usually quite long. They act effectively as pickup antennas, thereby

routing unwanted energy into the audio equipment. This difficulty is encouraged especially if the speaker wires happen to be the proper length for resonance at your operating frequency. For example, an 8-foot speaker lead would make a perfect resonant pickup antenna for 10 meters.

The most effective cure for RF energy on the speaker wires is the addition of disc ceramic bypass capacitors from each speaker terminal of the hi-fi set to chassis ground (see Fig. 5). This bypasses the RF energy to ground before it can enter the audio circuit via the back door. Another effective preventive measure is to wrap several turns of the speaker lead through a ferrite toroid core, as in Fig. 6. This acts as a choke to RF energy, but does not impair the passage of audio energy to the speakers. Once again, we should also try an ac-line filter to determine if the unwanted energy is entering the hi-fi unit along that route.

The previous methods apply to organs and other units of audio equipment. Hopefully, the required RFI-suppression components will be voluntarily included by the manufacturers in their attempts to meet the RF immunity standards envisioned by Congress when it passed PL 97-259.

Antenna Placement

It should go without saying that an amateur antenna that is close to a neighbor's house or TV antenna is a potential cause of interference. Our objective when installing an antenna should be to keep it as far from adjacent houses as possible. This is no simple assignment for the urban dweller, but physical spacing is important in preventing unwanted coupling to the nearby entertainment devices and their antennas.

Tidbits

We have not discussed interference to CATV systems. This area of difficulty can be, under some circumstances, the worst of the lot. I can recall while living in Newington, Connecticut, that I had no TVI in my own TV sets while operating the HF bands with 1 kW of power. Our TV set used an outdoor rotatable antenna. The miracle of CATV arrived in my neighborhood, and I became a subscriber. Suddenly I had TVI of the first magnitude. All efforts to cure the problem failed until I discovered that the CATV ground system was ineffective. I installed my own ground rods and solved the problem. The best approach to solving CATV difficulties is to enlist the aid of the CATV operator.

The purpose of this article is to provide you with basic information about radio-frequency interference, along with the procedures for curing RFI and TVI. The subject certainly goes much deeper than this. I recommend that you read the interference chapter in the ARRL *Handbook* and the ARRL book *Radio Frequency Interference.*

Glossary

band-elimination reject filter — a specially designed filter that rejects or suppresses a narrow band of frequencies within a wider band of desired frequencies.
decibel — a unit of relative power measurement that is used to express the ratio between two levels of power. It is equal to 10 times the common logarithm of this ratio. The abbreviation for decibel is dB. The abbreviation dBW is referenced to a power level of 1 W. The term dBm follows the same rule, but is referenced to a milliwatt (mW) rather than a watt (W).
fundamental overloading — the unwanted blanking out of the picture and sound of a TV set, caused by large amounts of RF energy from a nearby transmitter fundamental output signal. This condition is not related to harmonic energy from the transmitter, unless the offending harmonic is unusually strong.
high-pass filter — a filter designed to pass all frequencies above a desired one, while rejecting those that lie below the filter-design cutoff frequency.
low-pass filter — a filter designed to reject all frequencies above a desired one, while passing all below the filter-design cutoff frequency.
peak output — RF output power that is averaged over a carrier cycle at the maximum amplitude that can occur with any combination of signals that may be transmitted. More simply, the maximum instantaneous power output from the transmitter.
QRP — from the International Q code meaning "Shall I reduce power?" Also, "Will you reduce power?" This term is commonly used to denote amateur transmitter power levels at or below 10-W dc input to the last transmitter stage or 5-W output. Many hams are QRP operators by choice for the purpose of meeting the challenge of working long distances with very low power.
RFI — radio-frequency interference. Interference to AM and FM radios as well as to various appliances, such as computers, audio systems and telephones.
TVI — interference to television receivers.

Many radio clubs have organized TVI committees. If you become the victim of poor relations with a neighbor because of interference, try enlisting the aid of a local TVI committee. It will function as a go-between for you and the irritated neighbor. Finally, don't forget that failure to attempt a peaceful solution to TVI or RFI may lead to a citation from the FCC. Good luck!

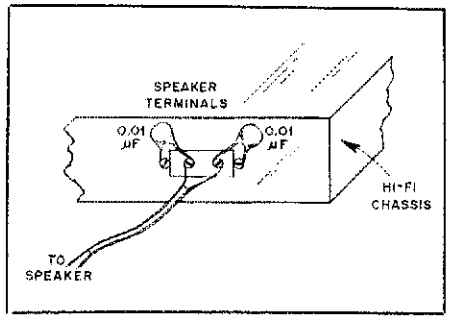


Fig. 5 — Method for reducing unwanted RF pickup by the speaker wires of an audio amplifier. A 0.01-μF ceramic capacitor is connected from each speaker terminal to chassis ground, as shown.

Fig. 6 — Winding the speaker wires on a toroid core can prevent RF energy from entering the circuit of an audio amplifier via the speaker leads. An Amidon FT-140-61 core is suitable if six to eight turns of speaker lead are looped through it.

Notes

[1]m = ft × 0.3048.
[2]C. L. Hutchinson and M. B. Kaczynski, eds., *Radio Frequency Interference* (Newington: ARRL, 1984). QST

Strays

I would like to get in touch with...

☐ anyone with manuals or schematic diagrams for a Knight Star Roamer, a Globe Chief Model 90 transmitter, a Heathkit crystal receiver, Model CR-1, and a BC-454-B ARC 5 military receiver. Shawn Wakefield, KA5UDL, 120 NE Wilshire, Bartlesville, OK 74006.

☐ anyone with information on a VIC 20 computer 24-kbyte RAM Expansion Memory manufactured by MSD, Inc., Dallas, Texas. Rod Chandler, W6VB, 16299 Canelones Dr., Hacienda Heights, CA 91745.

☐ anyone with information on modifying a Kenwood TR-7500 transceiver to work the entire 2-meter spectrum. Dave Stepnowski, KC3AM, 735 W. Birchtree La., Claymont, DE 19703.

☐ anyone with a schematic diagram for a Hooker broadband bilinear amplifier, Model 100 Base. Armand E. Gilone, N4EPM, 1329 Kenlake Ave., Springhill, FL 33526.

Product Review

Conducted By Paul K. Pagel,* N1FB

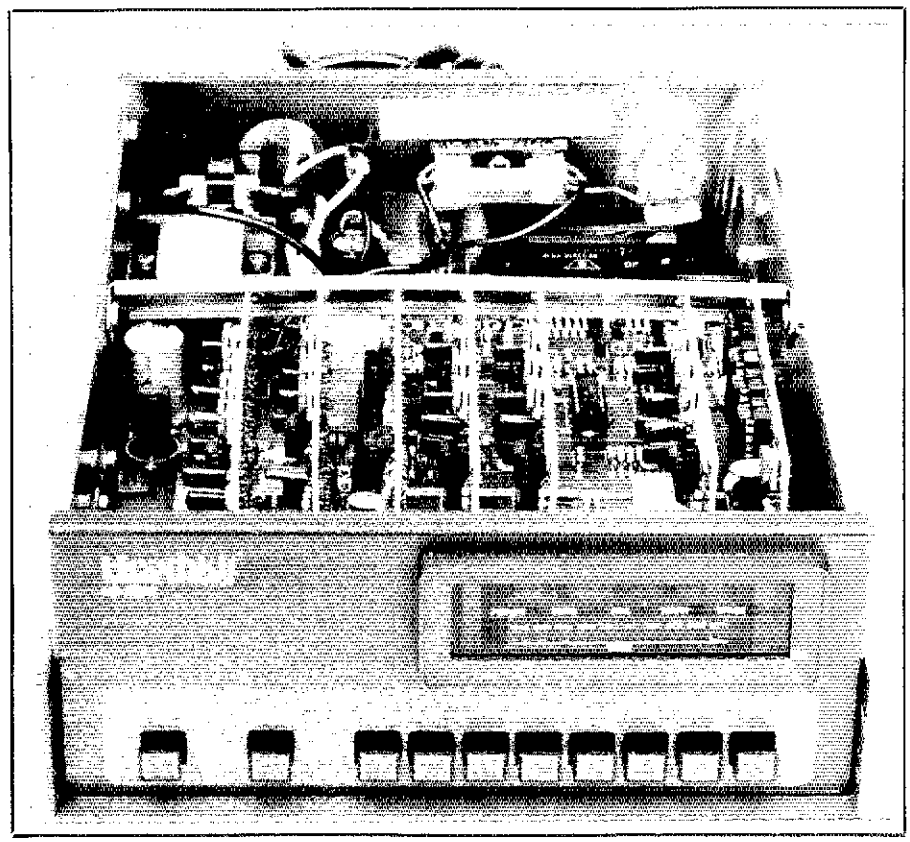
Heathkit HD-3030 Computer Interface

Heathkit's HD-3030 is a versatile interface that can match most any computer or teletypewriter (TTY) machine to any radio. Audio from the radio is converted to sequential signals in RS-232-C, TTL and 20- or 60-mA loop levels. Computer signals are translated into FSK or AFSK for transmission.

RTTY software can be purchased from Heath for their H-8 and H-89 computers. Those of us who own other computers can purchase software of our preference (from other suppliers) and make up the interface cables as required. I own a Commodore 64™, and used the Kantronics Hamtext™ software during the test period.

The HD-3030 circuit design comes from the Flesher TU-470 (Product Review, June 1983 *QST*; Heath markets the kit through an agreement with Flesher), and provides a multitude of features at data rates of up to 300 bauds.

- Space and mark frequencies are detected during RTTY operation. Front-panel switches allow you to reverse the frequency shift for incoming signals or outgoing signals, or both. Rear-panel connections are provided for use of an oscilloscope as a tuning aid.
- The interface provides TTL, RS-232-C and 20- or 60-mA current-loop connections. You enable (and set the level) or disable the current loop during construction.
- Autostart is accomplished with a Received Data Available (RDA) signal on the TTL and RS-232-C lines. A 117-V, 3-A relay-controlled outlet on the rear panel is keyed (by RDA) for activation of a mechanical TTY or computer power supply.
- FSK-control and AFSK (crystal-controlled) signals are provided.
- The HD-3030 comes with a 2125-Hz mark filter and a 2295-Hz space filter for 170-Hz operation. The main circuit board has connectors for 2250-Hz (450-Hz shift) and 2975-Hz (850-Hz shift) optional space filters.
- An optional 170-Hz preselector adds four 2-pole active filters to aid reception under crowded band conditions.
- The RTTY demodulator circuit includes a discriminator, low-pass filter, signal-balance restorer, slicer and mark-hold circuit.
- CW is demodulated by a separate circuit board with a dedicated three-stage filter.



Construction

Heath uses high-quality components throughout the HD-3030. The circuit boards are double-sided with plated-through holes. A heavy-gauge steel chassis and cabinet provide strength and RF shielding. A 117-V power supply and a 20- or 60-mA loop supply (portable operation with a single 12-V supply is not possible) are part of the circuit. The complete interface (3 × 7.5 × 10 inches, HWD) weighs nearly 17 pounds.[1] Red and white lettering over a subtle brown-tone cabinet finish allows the '3030 to fit into any station decor.

The assembly instructions are clear and easy to follow, consistent with Heathkit tradition. A 91-page instruction manual and a 24-page pictorial booklet are supplied with the kit. "X-ray" views of all circuit boards are included in the pictorials, and there are detailed explanations of circuit operation at the back of the manual. Construction takes a modular approach that makes it easy to work in a small area. (I built the kit on a folding tray in about 21 hours in my living room!) Each circuit board and the parts for that board are packed separately. There are few parts involved in any one stage of the operation. Also, most small parts are packed, in order of assembly, on tape strips.

Parts placement is clearly indicated on the circuit boards and in the instructions. Some of the components are placed close together, though, so I recommend use of a soldering iron with a small, conical tip. Alignment requires only a radio and an ac voltmeter with 1.5- and 10-V scales.

Cable preparation and connection of the interface to the station are the most difficult construction tasks. Since the '3030 can work with virtually any combination of radio and computer, there is a myriad of possible connection schemes.

Heath has answered this problem with an interconnection chart. The chart has two columns, each listing the pin numbers for a DB25 connector. One side of the chart lists the connections at the '3030. The builder completes the second column by listing the signals at the computer connector next to the corresponding pin numbers. Lines are then drawn from each signal in the first column to the corresponding signal in the second column. When the process is complete, the builder has drawn a schematic of the interconnection cable (provided that the computer uses a DB25 connector).

At this point, I faced some decisions about interface arrangements. The HD-3030 uses XMIT

*Senior Assistant Technical Editor

[1]mm = in × 25.4; kg = lb × 0.454.

(N and P) to control the PTT and CW-keying lines to the transmitter. I checked two transceivers (Kenwood and Yaesu) and found that the CW line of each is effective in the CW mode only (although voltage is present at all times in the Kenwood). The PTT line, however, is active at all times in both radios. Neither transceiver is meant to operate QSK. Also, heavy switching duty can quickly age a relay. Therefore, I decided to use the XMIT output for CW keying only, and VOX or manual transmitter switching. This probably is the most common station-control arrangement. (Heath describes this setup under "Sending CW" on page 71 of their manual.)

The second decision concerns software/hardware compatibility. TR, CW and RTTY CW-ID operation of the HD-3030 require one line each for TR (SEND), tone-shift control (KEY-N) and AFSK (AFSKIN), with CW keying signals on the TR line and RTTY CW-ID keying on the AFSK line. To accomplish RTTY CW-ID, TR must be in the transmit state, the tone-shift line must be "pulled" low and CW-keying signals must be applied to the AFSKIN line. Kantronics Hamtext provides separate TR and CW keying lines with the TR line keyed for RTTY identification. No line is provided for tone-shift on ID. This situation makes it impossible to use the full features of the hardware and software together. Happily, the FCC has eliminated the CW-ID requirement on RTTY/ASCII transmissions. My solution is to wire the Kantronics TR and CW-key lines together (with isolation diodes; see Fig. 5) and do without the RTTY CW-ID function. Complex logic or manual switching would be required to recover the feature when using this hardware/software combination.

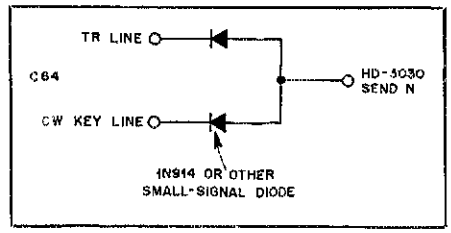


Fig. 1 — C 64/Hamtext to Heath HD-3030 control connection for TR and CW keying.

Circuit Operation

In the receive mode, audio (100 mV) from the receiver enters the '3030 through pin 13 of the DB25 connector. The signal is routed to the preselector or directly to the audio amplifier as determined by the PRESELECT/BYPASS switch position. Preselect is active only for 170-Hz shift and when the optional preselector board is installed. Two transistors amplify and two diodes clip the audio signal.

The signal is then supplied to the inputs of all filter boards. Each board contains three 2-pole, low-gain, low-Q stages that are cascaded to provide a very sharp and stable filter. Diodes on each board select the proper AFSK signals for transmission. The 2295-Hz space filter includes a phase-shift network to ensure the proper space/mark shift for the scope outputs (pins 7 and 8, DB25). Filter output is placed on the main-board bus for use by the decoder boards.

An RTTY decoder board is the heart of the HD-3030. A discriminator, low-pass filter and signal-balance restorer "clean up" and balance the space and mark signals. The slicer hysteresis (positive feedback) level prevents slight signal fluctuations from producing erroneous output signals. The mark-hold circuit returns the demodulator output to the mark state whenever a space signal exceeds 150 ms in length. More on this later.

The CW demodulator contains a separate filter, as opposed to using the RTTY filter as with some other modems. The filter center frequency is set to the sidetone frequency of your radio during alignment of the '3030. Thus, as long as the sidetone matches the receive offset of the transceiver, tuning is near zero beat when the incoming signal is in the filter passband. Unfortunately, the signal processing "magic" performed by the RTTY demodulator is not possible when working with one signal only.

The demodulator output goes to the RDA threshold circuit, display, RS-232-C output, and level-shift circuits for TTL output and loop control. If the mark level exceeds the setting of the RDA-threshold control (the control is inside the case and adjusted only during alignment), an RDA signal is placed on pin 1 of the DB25 connector and the autostart relay is closed. Mark and space signals are displayed by separate LEDs and the bar-graph display. Once through the filters, all signals in the '3030 are −10 V (mark) or +10 V (space). These levels are supplied as RS-232-C out (pin 4 — this and all subsequent pin numbers refer to the DB25 connector). A single transistor is keyed to provide TTL out, and a combination of three transistors keys the current-loop supply. (Do not leave the loop circuit open during operation with the loop supply enabled. Damage to the supply may result.)

The interface is placed in the transmit mode by pressing the SEND button on the front panel, supplying an RS-232-C (+3 V send, −3 V receive, to pin 25) or a TTL signal (low = send, pin 9). All send signals also switch the positive (pin 10) and negative (pin 11) outputs, which are used for PTT and CW keying. Loop keying is changed to TTL by a transistor, and supplied to the TTL input (pin 5), which keys CMOS logic circuits through another transistor.

Once in the CMOS logic circuits, signals from TTL follow the same path as RS-232-C signals, which enter the CMOS circuitry directly at pin 6. AFSK keying signals (±10-V) are then fed to the divider-program diodes of the selected filter to key the appropriate frequencies. AFSK output (pin 12) is adjustable (from inside the cabinet) from 0- to 2-V RMS (600 Ω). FSK control (−6 V mark, +6 V space, 3-kΩ load: pin 14) is achieved by a comparator driven by the mark/space switching circuits.

The AFSK board contains a 5.08-MHz crystal oscillator, two programmable-divider ICs (together they divide the oscillator frequency by any integer from 2 to 256) and one divide-by-16 IC. The oscillator is effectively switched on or off by enabling or disabling the final divider. This system can provide frequencies from 1240 Hz to 158,750 Hz. Worst-case resolution for AFSK is 28 Hz at 2995 Hz. Any frequency change because of temperature is divided by at least 212 to reach AFSK frequencies. AFSK tones from the '3030 should be very stable.

A TTL CW-ID signal (pin 2) selects the CW frequency from the AFSK board and disables the mark/space switching circuits. This input is used with AFSKIN for CW identification on RTTY only. Normal CW keying is applied to the SEND lines (pin 9 TTL, pin 25 RS-232-C).

Controls and Connections

Control functions on the HD-3030 are clearly labeled, and operating instructions are almost unnecessary. The display is comprised of an LED bar graph to show signal strength, and separate LEDs to indicate POWER (on), SEND, RDA, MARK and SPACE. Incoming signals are tuned by adjusting the receiver frequency for a maximum bar-graph display with the MARK and SPACE LEDs flashing alternately. The SEND indicator lights when the modem is in the transmit mode. Autostart activity is indicated by the RDA light. (RDA level is adjustable, but Heath recommends that it be set for about half scale on the bar graph.)

An assembly of flag-type, push-button switches provides all front-panel control. These switches have small color plates in the buttons that appear when the switch is active. It is easy to tell which functions are selected with a single glance. From left to right, the functions available are POWER, STANDBY/OPERATE, SEND/RECEIVE (can be software controlled), CW/RTTY, REVERSE SHIFT (one button for SEND, one for RECEIVE), PRESELECT/BYPASS and AUDIO FREQUENCY SHIFT (one button each for 170 Hz, 425 Hz and 850 Hz).

Rear-panel connections are provided for LOOP — ¼-inch phone jack for connection to current-loop controlled equipment; AUX POWER — 117-V ac connector (with ground) keyed by the autostart circuit, for control of computer or mechanical TTY; GROUND — RF ground; I/O INTERCONNECT — DB25 female receptacle for connection of TTL, RS-232-C and audio signals.

Operation

Once the connections are made, operation is simple and straightforward. Tuning is easy with the indicators provided; for those who want more indicators, 'scope outputs are provided at the DB25 connector.

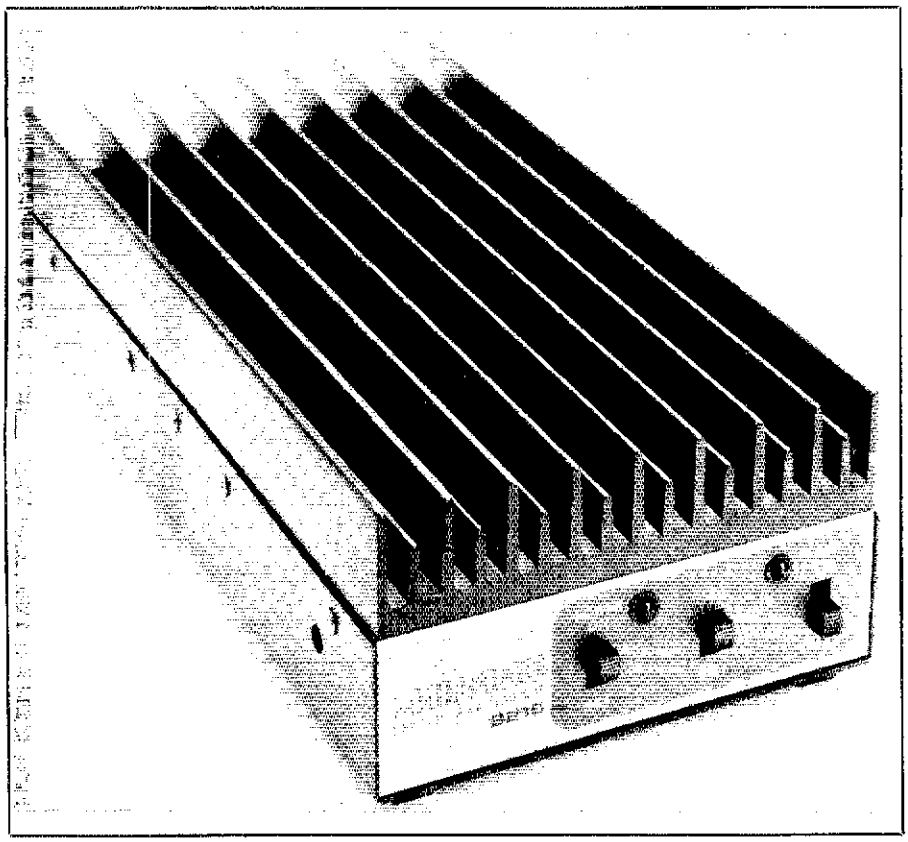
Upon completion of the interface, I wired some cables and proceeded to perform some output-voltage checks before connecting it to my computer. The voltage levels were correct, but there seemed to be a problem. Although the DMOUT-TTL line was (logic) high (+5 V) for mark, it was also high for space. I puzzled over the problem for quite some time before I read the manual again and understood the mark-hold feature. Each time I keyed the space frequency, DMOUT-TTL went low for 150 ms (not long enough for my analog voltmeter to react), then returned to 5 V.

After my misguided testing, I connected the HD-3030 to my radio and tuned to the W1AW RTTY bulletin. It only took about half a second to tune for perfect copy and to have the bulletin begin printing. After about five minutes, the text became unintelligible. Upon switching the software to the ASCII mode, a second perfect copy of the bulletin slid by.

Heath supplied the test unit with an optional 170-Hz preselector and one optional filter board. I was so happy with the performance of the completed interface that I immediately ordered the remaining filter board to fill the one empty slot. All functions and options work well, and excellent performance is achieved.

The HD-3030 performs well under noisy conditions. Tests show the Heath to have a low bit-error rate with lab-generated noise. I recommend the HD-3030 highly.

The HD-3030 is available from Heath Company, Benton Harbor, MI 49022. Price class for the HD-3030 is $249. Prices for the options are: HDA-3030-2 (optional filter board), $15; HDA-3030-4 (170-Hz preselector), $20. — *Bob Schetgen, KU7G*



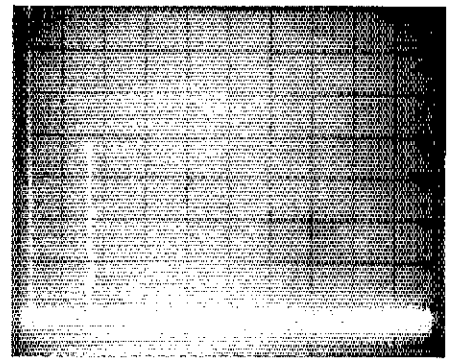


Fig. 2 — Worst-case spectral display of the Mirage B215 amplifier. Vertical divisions are each 10 dB; horizontal divisions are each 100 MHz. Output power is approximately 150 W at 144.2 MHz. The fundamental (pip at the left of the photo) has been reduced in amplitude approximately 32 dB by means of a notch filter to prevent spectrum-analyzer overload. All harmonics and spurious emissions are at least 68 dB below peak fundamental output. The B215 complies with current FCC specifications for spectral purity.

Mirage Communications B215 2-Meter Amplifier, Serial No. 280-684

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency range: 144 to 148 MHz.	As specified.
Power output: 150 W or more for 2-W input. Input power 0.1 to 5 W.	10 W for 0.1-W drive; 110 W for 1-W drive; 145 W for 2-W drive; 150 W for 3-W drive; 155 W for 5-W drive.
Receive preamp: 10-dB gain with 2.5-dB (±0.5-dB) noise figure.	10 dB gain. NF not measured.
Power requirements: 13.6-V dc at 20-23 A nominal.	13.6-V dc at 23 A at 150-W output.
Input SWR: Not specified.	1.42 to 1 (145 MHz)
Size (HWD): 3 × 5.5 × 12 in†	
Weight: 5 lb	

†mm = in × 25.4; kg = lb × 0.454.

MIRAGE COMMUNICATIONS B215 2-METER AMPLIFIER

☐ The Mirage B215 is the perfect companion for a 2-meter FM hand-held or a low-power multimode rig. This amplifier features 150-W output for 2-W drive, along with a receive preamp. TR switching with a variable delay for SSB is a standard feature. An optional remote-control head (model RC-1), which duplicates the front-panel controls, is available if the user wants to mount the amplifier away from the operating position. This option is handy for mobile operation or for mounting the amplifier near the antenna in a base station if feed-line loss is a problem.

The B215 is a linear amplifier. It is always biased for linear operation, whether the front-panel switch is set to SSB or FM. The only difference between these two switch settings is the TR relay drop-out time delay. In the FM mode, the relay drops out instantaneously. For VOX SSB operation, the drop-out time may be adjusted with a screwdriver through a hole in the side panel. Drop-out time may be set anywhere between a few milliseconds and approximately 1.5 seconds.

RF-sensed switching is standard. Whenever approximately 0.1 W or more of RF drive is applied to the RADIO (input) jack on the rear panel, the amplifier automatically switches into transmit. A phono jack is provided on the rear panel for "hard wiring" the antenna relay to control it from the transceiver. Grounding the center pin of this phono jack places the amplifier in transmit.

Three switches and two pilot lights comprise the front panel. The POWER ON/OFF switch controls the power amplifier. As described earlier, the SSB/FM switch changes the time delay. The PREAMP ON/OFF switch controls the preamplifier. The power amplifier and preamplifier may be used separately or simultaneously, as operating conditions dictate.

The rear panel is equally straightforward. There are two SO-239 connectors for input and output, a phono jack for TR control, a six-pin Molex connector for the RC-1 and two heavy wires for dc power.

Two stages of power amplification are necessary to get from the 2-W level up to 150-W output. The first stage employs an MRF240A, while the second stage uses a pair of SRF3417 transistors. The preamp uses a U309. All components are mounted on a PC board that is bolted to the hefty heat sink that forms the top of the amplifier. A built-in thermostat shuts off the B215 if the heat-sink temperature reaches 170° F; it will not come back on until the heat-sink temperature drops below 140° F.[2] The amplifier features SWR protection. A 35-A fuse in the dc power line is located on the PC board. The cover must be removed to replace this fuse.

The B215 requires approximately 23 A at 13.8-V dc, so Mirage recommends using no. 8 wire between the amplifier and power source. If possible, the wires coming out the back of the brick should be connected directly to the battery or ac-operated power supply. At 23 A, there is substantial voltage drop in any length of wire.

I had the opportunity to use the B215 with a variety of rigs, including an IC-2AT FM hand-held transceiver, a Microwave Modules MMT144/28 linear transverter and an FT-726R multimode transceiver. Although the B215 is designed for use with hand-held rigs, using it with higher-power equipment proved to be no problem. With the MMT144/28 transverter, I simply adjusted the internal input attenuator for about 3-W output. With the FT-726R, I adjusted the front-panel DRIVE control for the right output.

It is important to note that the B215 manual cautions that input power must not exceed 5 W. Higher power may damage the driver transistor and will void the warranty. If your rig has more than 5-W output and no reliable means of controlling the power output, you should choose another power amplifier with higher drive requirements.

[2] $°C = \frac{5}{9}(°F - 32)$

I used the B215 for many SSB, CW and FM contacts during the review period in July and August 1984. The prime use was with a low-power FM rig and an AEA PKT-1 terminal node controller on packet radio. Local packet activity is concentrated on 145.01 MHz, and my station was the primary link between packeteers in the Hartford area and WØRLI near Boston. The B215 was left on almost continuously during this period. It functioned perfectly. The power was more than enough for a reliable link to WØRLI and others in the Boston area. The receive preamp often brought marginal signals up to a level that the TNC could copy with few tries. The highlight of this packet operation was working K1HTV near Washington, DC direct one evening when we had enhanced conditions.

On SSB and CW, the 150 W that the B215 provides was more than enough for solid QSOs around New England and into the New York, New Jersey and Pennsylvania area. Because of the convenience and ease of operation afforded by the B215, I rarely had the desire to turn on my tube-type amplifier.

ARRL staffer W1XX uses a B215 for VHF mountaintopping expeditions, especially during VHF/UHF contests. His 2-meter portable station is battery operated, so he uses an ICOM IC-202 SSB/CW hand-held 3-W transceiver for most of the operation. For contacts when the 3 W just won't get through, he switches in the B215. This combination is a real success because it conserves battery power, yet allows occasional high-power operation as necessary.

Mirage offers a five-year warranty on the B215 (except for the power transistors, which are warranted for one year). It is a solid piece of equipment that deserves consideration if you have a QRP 2-meter signal that occasionally needs a boost.

Price class: $290. Manufacturer: Mirage Communications Equipment, Inc., P.O. Box 1393, Gilroy, CA 95020. — *Mark Wilson, AA2Z*

KLM 144-148-13LBA 2-M YAGI

☐ There are many reasons for the universal popularity of the 2-meter band with radio amateurs. Band occupancy is high and there is a variety of interesting activities in which to participate. Propagation modes, repeaters and satellites allow excellent DX possibilities. Commercially built FM and multimode transceivers, transverters, amplifiers and antennas have helped populate the band.

New antenna designs have done much to improve VHF station performance in recent years. A few years ago, KLM announced the 144-148-13LB long boom, 2-meter Yagi.[3] The KLM 'LBA is an improved version of that antenna. A physical lightweight at 9 pounds, the 'LBA is a heavyweight performer.[4]

Assembly

Antenna assembly is straightforward and easy. After unpacking the antenna, I took the time to read the instructions completely — a habit well worth developing. Everything that one needs to know can be found in the eight-page documentation package. Large diagrams clearly illustrate proper assembly of the 'LBA. The next step was to sort the pieces and check them against the parts list. I used an old muffin tin to hold the hardware during assembly.

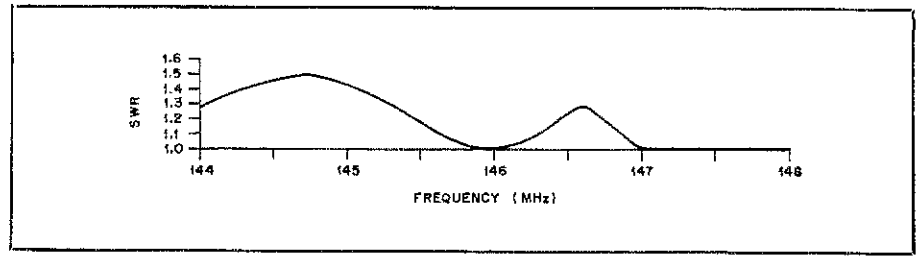


Fig. 3 — SWR curve of the KLM 144-148-13-LBA.

The five-section 'LBA boom is 1½ inches in diameter and about 21½ ft long. Each boom joint is secured with a pair of no. 8-32 screws and hardware. Insulators for the reflector and 10 directors are molded directly on the 3/16-in aluminum-rod elements. Parasitic elements mount in the boom rapidly. Elements are inserted in their predrilled holes and secured with stainless-steel keeper rings.

Multiple driven elements can be found on many KLM antennas — the 'LBA is no exception. It sports two driven elements, each made from 3/8-in tubing and mounted to the boom with sturdy plastic insulators. Dual-driven elements give two desirable characteristics to the 'LBA. The first is broad bandwidth (see Fig. 3). The second is a 200-ohm balanced feed-point impedance. An assembled 4:1 coaxial-line balun is included with the antenna. The 50-ohm coaxial feed line connects to the antenna by means of solder lugs that are also provided by KLM.

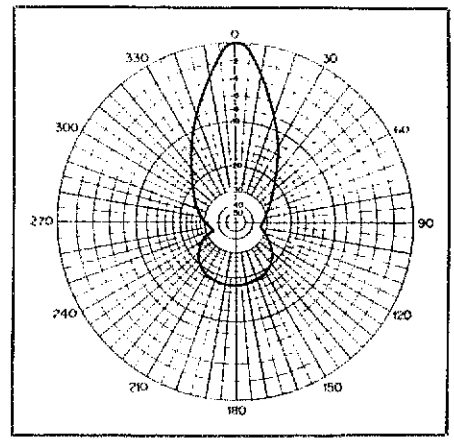


Fig. 4 — Measured radiation pattern of the KLM 144-148-13-LBA. Measurements were made between AA2Z and K8CH, a distance of about 20 miles.

Installation and Results

Installation of the 'LBA is easy. Attach the mounting plate to the boom at the balance point of the assembled antenna. I use a tower leg as a temporary "antenna mast" to ensure proper alignment while securing the plate to boom U bolts. That leaves only the plate-to-mast U bolts to tighten when the antenna is at the top of the tower.

Vertical mounting of the 'LBA is possible. KLM recommends a nonconducting mast that extends at least 6 inches either side of element tips. If you choose vertical mounting, the feed line must be brought off the antenna from the reflector end of the boom. That feed-line routing is important to prevent pattern distortion. Detailed instructions are included with the antenna. I chose horizontal polarization and so can't speak from experience about vertical polarization results — they should be good.

Of course, multiple 'LBAs can be used to form larger arrays. Instructions are given for assembly of two- and four-bay arrays. Stacking frames, power divider/couplers and phasing-harness cables are available from KLM. Spacing in those arrays is 12 to 14 feet vertically and 13 to 15 feet horizontally (horizontal polarization).

Results

During the review period, I raised my transmitted power output from 10 to 80 W. Even with 10 W, I was able to enjoy many CW and SSB QSOs with stations from Maine to southern New Jersey. With more power, I was able to work almost everything I could hear. The radiation pattern of the 'LBA shown in Fig. 4 was measured with the help of Mark Wilson, AA2Z, and a calibrated attenuator from the ARRL lab.

The 'LBA has weathered a hard New England winter; a couple of times it took wind gusts of up to 60 mi/h. During that storm, my tower and antenna system was doing a dance that would rival Antira. Mechanically, the antenna seems just as sound as the day it went up — and it is working just as well electrically, too.

The KLM-13LBA is available from KLM Electronics, Inc., 17025 Laurel Rd., Morgan Hill, CA 95037, tel. 408-779-7363. Price class: $100. — *Chuck Hutchinson, K8CH*

[3]B. Glassmeyer, "KLM 144-148-13 LB Antenna," Product Review, *QST*, October 1981, p. 48.
[4]mm = in × 25.4; m = ft × 0.3048; kg = lb × 0.454; km = mi × 1.609; km/h = mi/h × 1.609.

New Products

SUBLIMINAL CODE LEARNING

☐ Vince Luciani, K2VJ, is offering a different approach to learning Morse code: subconscious or subliminal learning. Said to be prepared by experts in the field of subliminal learning, Subliminal Code Learning is aimed at those who have difficulty initially learning the code or attempting to increase their recognition speed.

On one side of the tape, author Luciani announces the entire code alphabet, complete with the dots and dashes for each letter. But you won't hear any of it. Instead, you hear relaxing music. The code is presented subliminally for only your subconscious mind to hear and learn. The other side of the tape contains the vital affirmations that are meant to help you appreciate the code as fun, and the learning of it as a pleasure. The tape is available from Vince Luciani, K2VJ, P.O. Box 682, Cologne, NJ 08213. Price: $10.95, plus $1.50 for shipping and handling. A money-back guarantee is offered. — *Paul K. Pagel, N1FB*

Technical Correspondence

Conducted By
Bob Schetgen,* KU7G

POWER-LINE GROUNDING: FRIEND OR FOE?

The most important objective of the ground circuits specified by the National Electrical Code is safety for people; their protection from electrical shock and fire.[1] One of the three ac power-distribution wires brought into a house is identified as the "neutral" conductor. The neutral wire, as well as metal conduits, boxes, and switch cover plates bonded to it, shows nearly zero potential with respect to earth-grounded objects.

Unfortunately, the ac-power system often brings a variety of radio interference into the home and ham shack. Two forms of interference are particularly troublesome for hams: Power-line switching transients, from motors, lamps and so on, cause sudden changes in line voltage that generate RF. The worst offender is power-line "hash" (continuous noise pulses), which is synchronized to the ac cycle. This is not only a poor environment for communications receivers, but it can affect TV and some FM-broadcast receivers! A connection from the radio chassis to a wall outlet (third wire ground), or the neutral wire, does not help. It may make the noise worse! Why? Alas, the power-line ground is not necessarily at ground potential. Furthermore, even when all lights and appliances are turned off, there may be current flowing through the neutral and ground conductors, which produces an induction (magnetic) field that penetrates throughout a house.

The three-wire distribution system shown in Fig. 1 illustrates how currents are produced in the neutral wire. A transformer at the power pole reduces the 2400-V high voltage to two 117-V circuits, H_1 and H_2, relative to the transformer center tap, which is the origin of the neutral wire. Note that 234 V is applied to loads connected across both hot wires.

N, H_1, and H_2 represent the low-voltage distribution wires strung on power poles. The resistor symbols represent resistance in the wires. Within house A, the various lights and electrical loads are represented by R_{L1} and R_{L2}. If both loads were equal, current would circulate only through the H_1 and H_2 lines. If the load on the H_2 circuit (4 A) is less than the load on the H_1 circuit (13 A), there will be a 9-A current flowing back to the transformer center tap. The loads are seldom balanced, and thus current is usually flowing in the neutral wires.

The electrical code recommends that the neutral circuit within a house be bonded to the water pipes (points G_A and G_B), under the assumption that they represent a good (less than 3 Ω) connection to true earth ground. One result of that ground connection is that some of the unbalanced load currents in house A and house B also flow through the water main.

Fig. 2 is a recording of current flowing through the water-pipe connection to a water main in a typical residential area. (Fortunately, the watt-hour meter does not charge you for current in the neutral wire.) The bandwidth of the recording is less than 1 Hz and thus does not show the true peak value of the current transients that occurred. Even though a typical water-pipe connection to a water main presents only about 50 milliohms of resistance, lightning from local thunderstorms can produce 10- to 50-V transients on the pipe and neutral conductors, including the third-wire ground jacks in ac outlets!

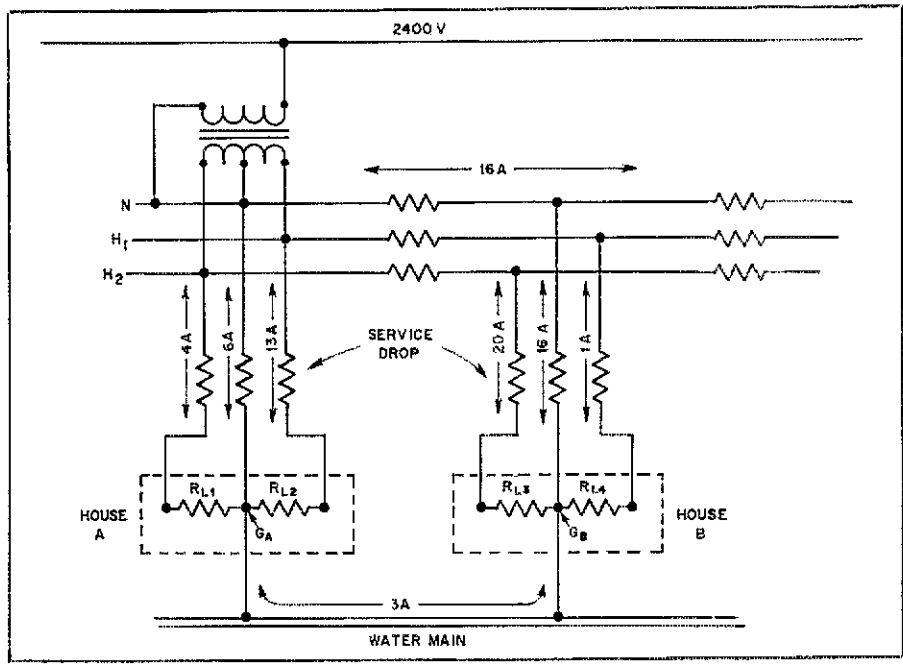


Fig. 1 — Neutral currents produced by unbalanced loads in a single-phase, three-wire, power distribution system. Alley wires: N (neutral), 0 V; H_1, 117 V; H_2, 117 V.

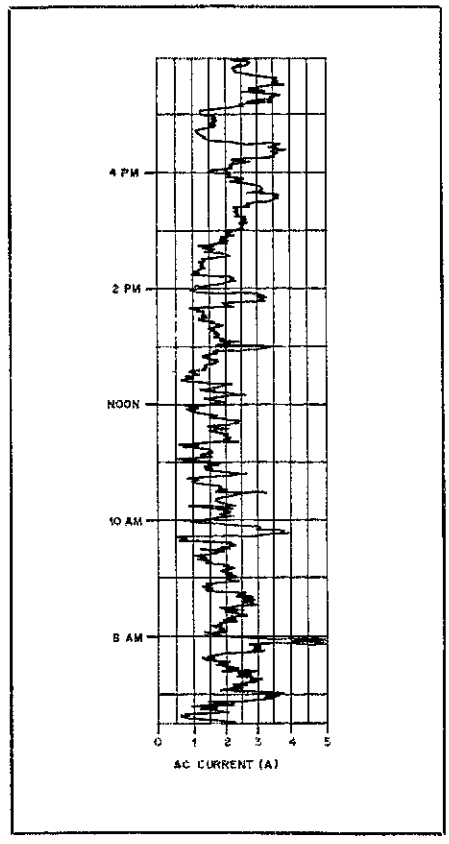


Fig. 2 — Ac currents (plotted against time) flowing in a residential water pipe at the connection to the neutral service wire.

In general, service wires enter the rear of a house and the water pipe exits on the boulevard side, as in Fig. 3. The current flowing from neutral to the water main passes through the pipe. Magnetic flux fills the region surrounding the current path, and this induction field varies with the current shown in Fig. 2. Fast changes of 0.3 A (500 μV/meter field strength) were detected during the recording with a radio, using a ferrite-core antenna, five feet away from a water pipe.[2]

When grounding different units of radio gear, precautions to prevent ground loops may be necessary. For example, consider a transceiver, code translator and active filter, each with a three-conductor power plug, and each connected to the others by coaxial cables. The greater the separation of the power cords, and the longer the interconnections, the greater is the induced interference.

Induction fields may be quite complex. One such case arises from electrical conduits that connect the neutral wire to a gas furnace: The buried gas pipe is another ground path that conducts part of the neutral current to earth.

In many residences served by a city water system, the bonding of the neutral wire in each house forms a large electrical ground network. High-amperage currents circulate that, because of the low resistances involved, can drive the neutral conductors in a house with currents and voltages quite independent of load conditions in the house.

[1]Notes appear on page 43.
*Technical Editorial Assistant

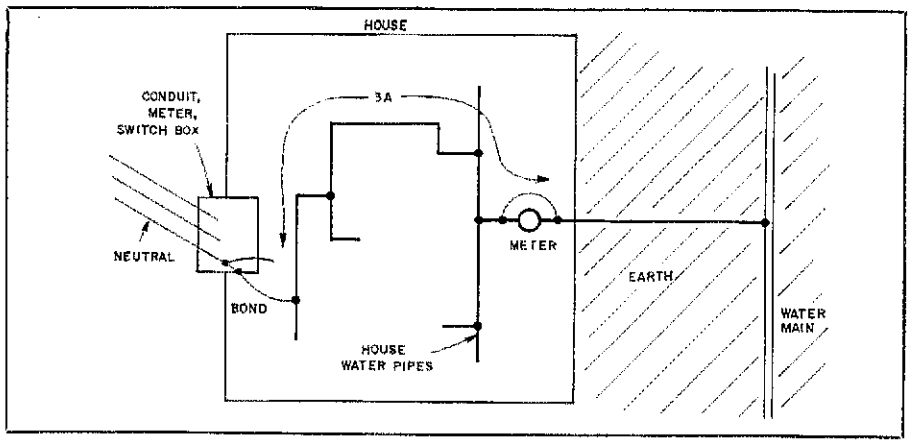


Fig. 3 — The neutral-current component passing through house plumbing produces an induction field, which penetrates the entire house.

It is not unusual to measure 1- to 2-V (peak, corresponding to a 50-A current pulse) fast-rise pulses at the junction of the water pipe and neutral wire (G_A or G_B) when there are severe power-line hash conditions in the house. These noise pulses are applied to the chassis of a receiver when it is "properly" grounded to a water pipe or third-wire ground.

The neutral wires on power poles and the water-main system form an antenna array of surprising efficiency (because of their large physical length). Measurements at G_A and G_B, for example, can show 200 to 600 mV of RF from AM-broadcast transmitters located 5 to 10 miles away. RF energy at higher frequencies or lower power levels may deliver several millivolts to the receiver.

Each home presents a unique situation. Experiments may be required to solve power-line noise problems. Record the receiver noise level at each step of the experiment so that it is easy, and foolproof, to compare an "improved" receiver hookup with the previous one.

First steps toward noise elimination should include an outside ground rod [8 ft, 5/8-inch diameter, minimum — Ed.] for direct connection to the receiver chassis, with the use of an isolation plug to remove the third-wire ground connection to the wall outlet. [As an alternative, an RF choke in series with the third wire effectively blocks RF from entering the radio, while maintaining integrity of the safety ground system — Ed.]

The wide-spread emergence of the computer "glitch" in the recent explosion of digital hardware has brought forth a variety of both power-line-surge and RFI filters. Those filters with a separate ground terminal, or case, can be effective, if that terminal is connected to a separate earth ground.

An antenna tower, with a proper ground for lightning protection, can produce additional power-line noise when the normal third-wire power-cord grounds are retained in station equipment. A tower ground, or buried counterpoise, represents a sufficient ground for safety purposes, if its resistance to true earth ground is 25 ohms or less.[3]

Neutral currents in plumbing, gas pipes, and so on, may cause induction problems, as previously discussed. Use a clamp-on ac ammeter to trace the current paths. It is sometimes helpful to bond the neutral wire to additional ground rods as specified in the Electrical Code.[4]

Be cautious in every step of your experimentation. Remember, safety first, noise reduction second. — *Douglas A. Kohl, WØTHM, Osseo, Minnesota*

Notes

[1]*National Electrical Code;* Boston: National Fire Protection Association, 1981; article 250 — grounding.
[2]m = ft × 0.3048; mm = 25.4; km = mi × 1.609.
[3]Clifford Carr, ed., *American Electrician's Handbook;* New York: McGraw-Hill Book Co., 1961) pp. 8-98,8-99.
[4]See footnote 1.

Feedback

Ernie Meyer, VE3ODV, has informed us of an error in "How Receivers Work" (Oct. 1984 *QST*). Fig. 5 of the October article shows the BFO frequency as 9.007 MHz. A 700-Hz offset, as mentioned in the text, requires a BFO frequency of 9.0007 MHz.

In the New Books column of the November 1984 *QST*, on p. 21, author N. David Larky's call sign is wrong. Printed as WA6DHO, it should read WA6DMO.

The instructor materials that accompany the textbook consist of transparencies, which include many line drawings found in the book, and an answer manual for the problems and exercises.

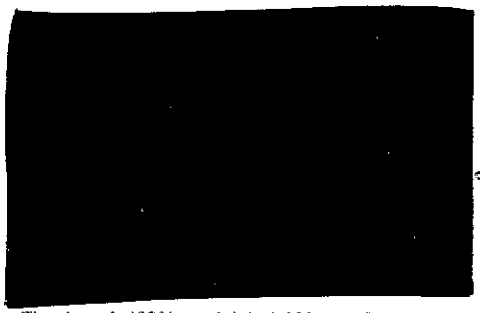


Fig. 4 — A 100%-modulated AM waveform.

Larry Clayton, W4LDB, points out an error in "The Basics of Transmitters" (Nov. 1984 *QST*, p. 40). The photograph in Fig. 7B of the article does not show the output of a fully modulated AM transmitter, as the caption asserts. The sharp "V" shape of the envelope trough identifies that waveform as the output of either an SSB transmitter modulated by two tones of equal amplitude, or a double-sideband, suppressed-carrier transmitter modulated by a single tone. The correct waveform is shown here in Fig. 4.

In the December Product Review of the Yaesu FT-757GX transceiver, the third-order intercept measurements should be swapped to read: +15.5/-5 and +16.5/-3.5. The positive number is associated with the higher two-tone, third-order IMD DR measurement in each case.

(continued from page 23)

terminated Beverage antenna that is bidirectional NW and SE. In the past, the Beverage wire showed an 8-10 dB S/N advantage over the tilted north vertical alone. During long-haul QSOs to North America, the 4X array, used in the phased-pair mode, comes within 3 dB of the S/N ratio provided by the Beverage.

In Conclusion

Many European stations tell me my signals are as strong as local ones. On occasion they remark that I have the loudest signal on the band.

It's a pleasure to have a directional array on top band. I simply turn a knob to rotate the pattern — much faster than a motor can rotate a typical beam antenna! The 4X array is compact and can be supported by the existing HF-antenna tower. I hope that some of you will try this antenna, and I look forward to hearing from you about your results.

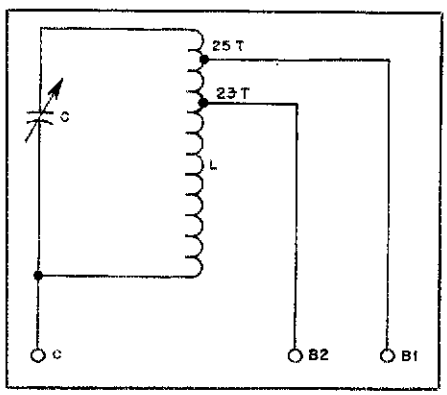


Fig. 8 — Network for omnidirectional use. C and L are the same as for Fig. 7.

Notes

[1]m = ft × 0.3048; mm = in × 25.4; km = mi × 1.609.
[2]G. Hall, ed., *The ARRL Antenna Book* (Newington: ARRL, 1984), p. 8-12.
[3]J. Devoldere, *80-Meter DXing* (Greenville, NH: Communications Technology, 1978).

After earning a BSEE degree with Distinction from the University of Nevada in 1967, Riki worked as a VHF transmitter and receiver designer. He later became an electromagnetic-compatibility specialist. Recently, his professional activity has been in the areas of reliability and quality assurance. Riki was first licensed in 1956, as KN6THN. DXing and contesting, primarily on CW and especially on 1.8 MHz, are his main interests in Amateur Radio. His aspirations to work 160-m DXCC have directed his technical capabilities to antennas and receiving signal processors. His DX achievements include DXCC Honor Roll, 5BDXCC and 1.8-MHz WAC. In addition to his 4X4NJ call, Riki also holds the call K7NJ.

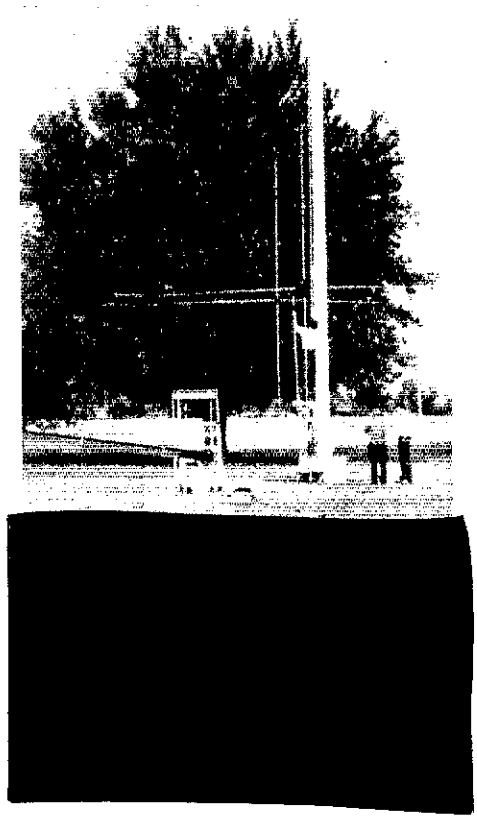
Six Winners Emerge from the ARRL Antenna Competition

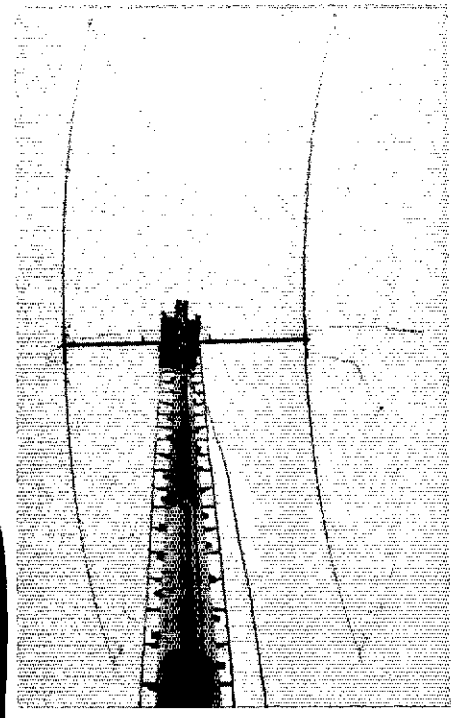
March 1984 *QST* carried the exciting announcement of an ARRL antenna-design contest.[1] The entries are in, the testing and judging completed.

By Jerry Hall,* K1TD, and Bob Schetgen,** KU7G

Not long ago, a triband beam would serve quite nicely as an antenna for all HF amateur bands above 10 MHz. But with a new 10-MHz band now authorized for U.S. amateurs and with the 18- and 24-MHz bands on the horizon, this is no longer true. There will be six amateur bands in the spectrum where we formerly had three. The conventional triband beam isn't going to cover all those frequencies. Thus, the ARRL Antenna Competition was born, to stimulate thinking about antenna designs that would cover the new bands. The contest closed on July 30, 1984.

Two categories of antennas were submitted by designers — 5-band designs (14 to 30 MHz) and 6-band designs (10 to 30 MHz). Six cash prizes have been awarded to the three top entrants in each of the two categories. A brief announcement of these six winners appeared in January League Lines. The features of the winning designs are highlighted in the paragraphs that follow. You'll be seeing additional information with construction details on some of these antennas in future issues of *QST* or other ARRL publications.





And the Winners Are ...

1st place, 6-band category: Eugene C. Sternke, K6AH, of Sequim, Washington, for his four-element phased array; awarded $500. See Figs. 1 through 3. Despite appearances, Gene's array is not a two-element quad, even though the elements are supported by fiberglass spreaders. The four elements are actually in a V configuration, two inverted and two upright. The ends of each element are insulated at the tips of the horizontal spreaders. All elements are driven. The system is fed with open-wire line. Sternke also used open-wire-line construction of the radiator elements, seeking a broad-band SWR response with a particular setting of a balanced matching network. The array has gain over a dipole on each band, and unity front-to-back ratio. (It is bidirectional in the direction of the boom.)

2nd place, 6-band category: G. A. "Dick" Bird, G4ZU/F6IDC, of southern France, for his eight-element array; awarded $250. See Figs. 4 and 5. This array consists of six driven elements, plus a dual-band parasitic element and a 10-meter director. To reduce wind loading and weight, Dick's array uses some wire elements. These are supported by nylon line attached to the ends of tubing elements. Although the array resembles a log-periodic design, it is not; rather than covering all frequencies in its range in true log-periodic

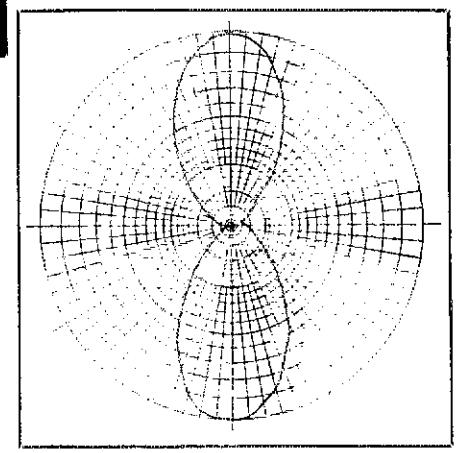


Fig. 3 — Measured pattern plot of the Sternke four-element array at 29 MHz. For the first 15 divisions, from the outside in, each concentric grid division represents 1 dB; inner divisions represent 5-dB steps. Minor bumps on the lobes are caused by shifting of the elements in the wind with rotation.

[1]B. Schetgen and D. Lusis, "Announcing the ARRL Antenna-Design Competition," *QST*, March 1984, p. 56.

*Associate Technical Editor
**Technical Editorial Assistant

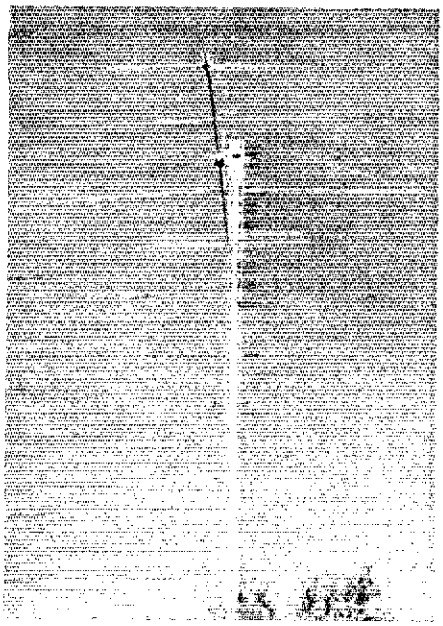


Fig. 4 — Bird's eight-element log-periodic look-alike takes 2nd place in the 6-band category. Some elements are of wire and are not visible here. The two rear elements are constructed of tubing and wire, the wire ends being brought forward and supported by fiberglass extensions on the longest element. This provides the necessary physical length for a full quarter wavelength, but reduces the weight and turning radius of the array.

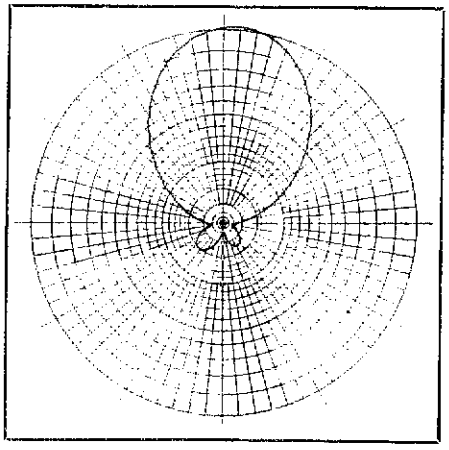


Fig. 5 — Measured pattern of the 2nd-place winner, 6-band category, at 21.0 MHz. Bird's array exhibits a respectable front-to-back ratio. Patterns at lower frequencies were much broader with significant minor lobes, probably caused by the feeder arrangement. Bird is working to perfect an improved feed system.

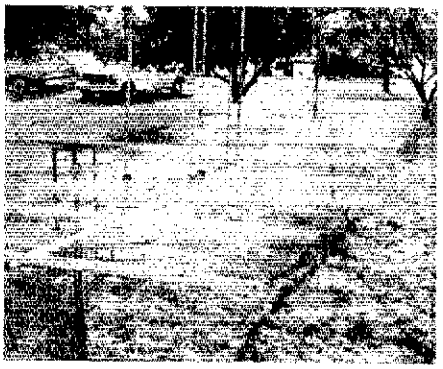


Fig. 6 — Hauff's "trailer-mounted" vertical array takes 3rd place in the 6-band category. The roof of the travel trailer was simulated with "poultry netting" (as it was termed by one of the Hy-Gain engineers), supported by furring strips on a 24-foot boom.

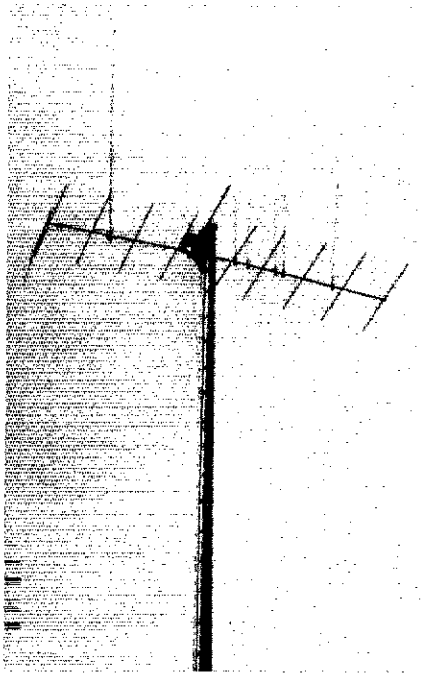


Fig. 7 — The "travel trailer" at the top of Hy-Gain's 80-foot steel pole. The taller element at the left is the radiator, containing traps. A separate electrically loaded reflector is used for each band. (The element at the right is a dual reflector, for 10 and 14 MHz.)

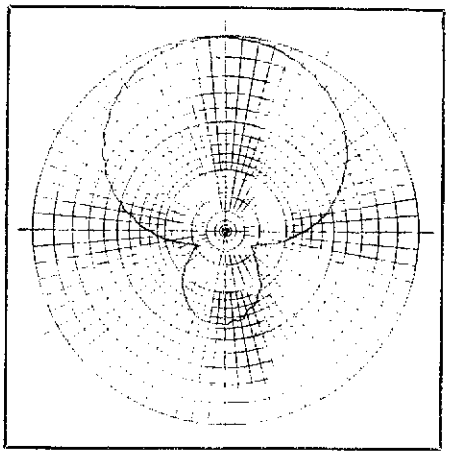


Fig. 8 — The pattern response of Hauff's system is typical for a vertical parasitic array. This pattern was recorded at 10.1 MHz.

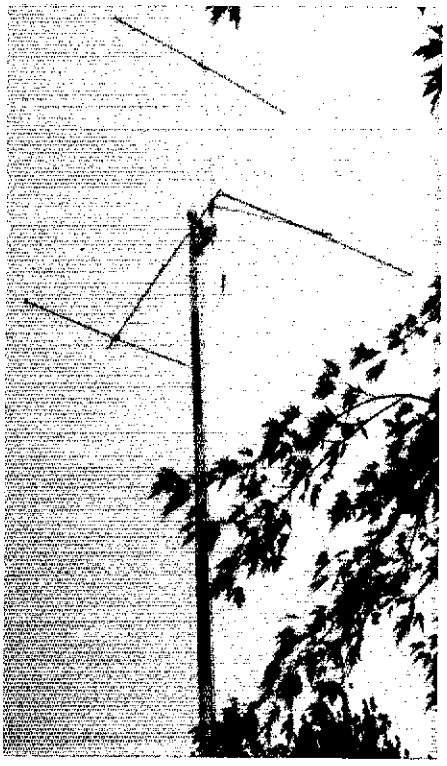


Fig. 9 — First-place winner in the 5-band category is Milbert's array of 15 delta-loop elements. They are suspended inside aluminum supports.

fashion, its performance is optimized for the amateur bands.

3rd place, 6-band category: Frederick A. Hauff, W3NZ, of Royersford, Pennsylvania, for his trap-vertical six-band radiator with parasitic reflectors; awarded $125. See Figs. 6 through 8. Fritz built the array for operation on the aluminum roof of his travel trailer. For range testing, the trailer roof was simulated with an 8 × 30-foot ground screen made of galvanized chicken wire having a 1-inch mesh, and supported on 1 × 2-inch furring strips.[2] The entire assembly was supported on a 24-foot boom.

1st place, 5-band category: Robert Milbert, KFØP, of South St. Paul, Minnesota, for his delta-loop array; awarded $400. See Figs. 9 and 10. This array consists of five 3-element delta-loop antennas that are nested, but in a unique mechanical arrangement. The spreaders are of aluminum tubing, supporting three side rails that, when viewed from the end, are mutually 120° apart. The 15 nested elements are suspended inside the side-rail structure. The director and reflector spacing is not the same physical distance for any two bands. The array exhibits gain and a front-to-back ratio on each band.

2nd place, 5-band category: Robert T. Hart, W5QJR, of Melbourne, Florida, for his tuned vertical copper loop; awarded $200. See Fig. 11. Ted's antenna, constructed of 1-inch copper tubing and seven 45° elbows, is approximately 6 feet in diameter. The loop is shunt fed at the bottom with 50-ohm coaxial line; the feed

[2]mm = in × 25.4; m = ft × 0.3048.

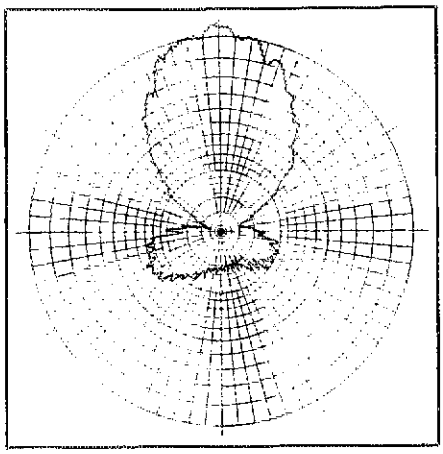


Fig. 10 — Pattern response of the Milbert array at 24.9 MHz. The irregularities in the pattern are caused by the elements shifting in the breezes during pattern recording. Pole rotation took approximately one minute.

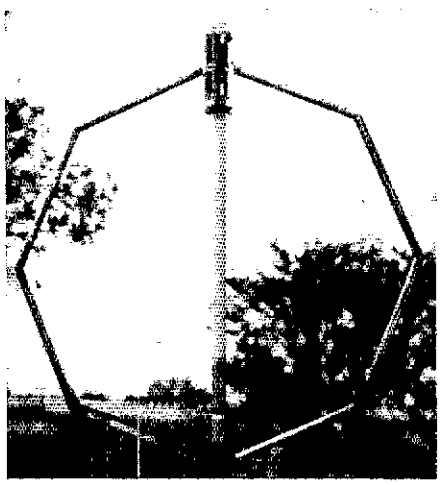


Fig. 11 — Hart's tuned copper loop takes 2nd place in the 5-band category. The vertical support is of fiberglass. The tuning capacitor at the top would normally be tuned remotely, but for these tests was tuned manually for the band of operation.

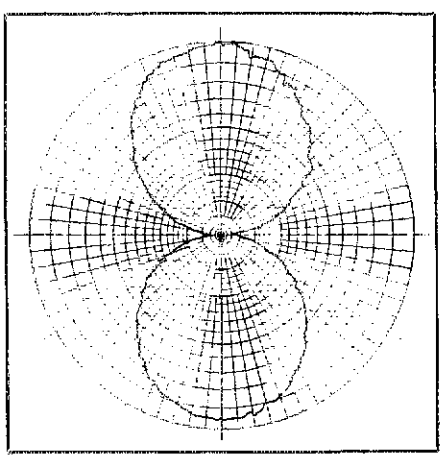


Fig. 12 — The 18.1-MHz pattern response of Fisher's 3rd-place winner, 5-band category. The 10-element system is a quad-log-periodic array mounted on a single set of spreaders. Movement of the elements in the breeze accounts for the lumpy lobes.

arrangement resembles a gamma match, but has no series capacitor. The tuning or resonating capacitor is placed at the top of the loop. The gain performance of this loop approaches that of a dipole on the higher frequency bands, and is somewhat lower where it becomes smaller in terms of a wavelength. It is vertically polarized and bidirectional, with lobes in the plane of the loop. The copper loop is worthy of consideration for a limited-space antenna.

3rd place, 5-band category: James W. Fisher, W8JF, of Emmaus, Pennsylvania, for his 10-element quad-log-periodic array; awarded $100. See Fig. 12. Our apologies for not having a suitable photo of this array. (Appearing at the top of the pole used for testing, it is almost invisible in the photo.) The array consists of 10 wire elements interlaced on one set of fiberglass spreaders. Thus, the entire array is contained in a single plane. Each element is driven at two opposite corners. Horizontal polarization of the array offers better directivity than vertical polarization. The pattern is bidirectional, with lobes broadside to the plane of the loops. It has modest gain over a dipole.

How Were the Winners Determined?

The finalists in the competition were chosen by a panel of ARRL Technical Advisors on antennas and propagation. These are volunteers who are active in or retired from professional work with antennas. Based on papers submitted by the contestants, preliminary judging of the antennas considered anticipated gain, front-to-back ratio, SWR bandwidth, ease of duplication and cost to build.

Final judging was based on measured performance, ease of duplication as ascertained by assembling the array, and cost and availability of materials used in the construction. Each finalist was asked to ship his array to Lincoln, Nebraska, for testing on the antenna range of the Hy-Gain Division of Telex Communications, Inc.

Hy-Gain/Telex is a well-known manufacturer of amateur antennas, as well as of antennas for commercial and industrial applications and for the armed services. Hy-Gain literally lent their entire antenna range to the ARRL for these tests. Performing the tests were Mike Hiehle, W6RZ, an ARRL Technical Advisor on antennas and a professional antenna consultant for many years, and Jerry Hall, K1TD, Headquarters staff member and editor of *The ARRL Antenna Book*.

Roger Cox, WBØDGF, a Hy-Gain project engineer, and Joe Gillam, a Hy-Gain technician, familiarized us with their range testing procedures and equipment. Then they merely advised and observed intermittently as we did the testing. The testing consisted of three main procedures: (1) SWR measurements, (2) gain measurement and (3) front-to-back measurements through the recording of directional pattern plots.

Range Measurements

Each antenna was assembled and placed on a motor-driven carriage that took it to the top of an 80-foot rotatable steel pole, manufactured by Hy-Gain. Through a 50-ohm feed-line system, the return loss (Smith Chart definition) of the antenna was measured with a Hewlett-Packard 8505A network analyzer, an 8501A storage-normalizer, a 9816 computer with 9121 disk drive, a 7470 plotter and an 82905B printer. Compensation for cable losses was made by the analyzer equipment, so the plotted information showed what existed at the antenna feed point. The SWR can be calculated directly from the return-loss figure. Imagine the convenience of measuring the SWR automatically over the range from 10 to 30 MHz! This was *our* range of interest, mind you. The equipment is capable of operating from LF well into the UHF region.

Pattern plots were recorded next. These were taken with the antenna under test illuminated by an antenna system of appropriate polarization, located approximately 2200 feet away. The signal source was a remotely controlled synthesized signal generator, a Wavetek model 3000, driving a broadband RF amplifier. The amplifier output level was about 5 watts. For two of the horizontally polarized arrays, we also turned the antennas 90° and made pattern measurements with a vertical source antenna. This gave both E-plane and H-plane responses.

For pattern measurements, the test antennas were used for receiving. Two Hewlett-Packard step attenuators, 10- and 1-dB steps, were inserted in the line ahead of the receiver. The receiver consisted of another Wavetek model 3000 signal generator as a local oscillator, feeding a specially made Hy-Gain receiver. The receiver detector is a crystal bolometer manufactured by Scientific Atlanta, with a signal-strength meter calibrated in decibels. The plotting table is a Scientific Atlanta polar recorder, series 1530.

With the test antenna illuminated and oriented for maximum response, attenuation was inserted, and the gain of the receiver was adjusted to show 0 dB on the signal meter. This corresponds to 0 dB on the plotter. The pattern was recorded while the pole was rotated through 360°. The front-to-back ratio is read directly from the pattern plots. In addition, these plots give a general idea of the expected gain of the array.

Any mechanical instability became clearly evident in the pattern measurements. One or two of the severely serrated patterns remind one of a slightly distorted circular saw blade. Such patterns undoubtedly resulted from impedance changes in the array with mechanical vibration of some antenna component. The

cure, of course, was to find the offending component and make it mechanically secure.

Gain measurements were made last, using the same receiving system as for recording the pattern plots. The test antenna was rotated for maximum response from the illuminating source. The receiver gain was set to maximum, and attenuation adjusted for a near-zero-dB reading on the signal meter. Then the attenuator settings and the meter reading were logged. This was done for each frequency at which the antenna was being tested.

The test antenna was then removed from the pole and replaced with a half-wave reference dipole for each band. The dipoles were prepared in advance by Hy-Gain, and were of telescoping aluminum tubing sections. The same coaxial line that was used for the test antenna was connected to the dipole antennas. Each dipole was placed atop the 80-foot pole and oriented for maximum response to the illuminating signal. Again the step attenuators were set for a near-zero-dB reading on the signal meter, and the attenuator settings and meter reading were logged. The difference in attenuator settings plus meter readings is the gain (or loss) of the antenna under test, referenced to a dipole.

The most important factor in antenna pattern measurements, by far, is the quality of the range. Unwanted reflections from nearby objects can produce pattern distortion, invalidating the data. When the Hy-Gain people weren't looking, we ran some of our own tests on their range by making a pattern plot of each of the six dipoles. Our conclusion — the Hy-Gain range is *clean*. Fig. 13 shows the response of the 29-MHz dipole, a classic textbook plot. This is the most critical of all frequencies we used because it is the highest. The effects of small reflecting objects will show up here because the objects are larger in terms of a wavelength than at lower frequencies. Patterns for each other band were equally clean.

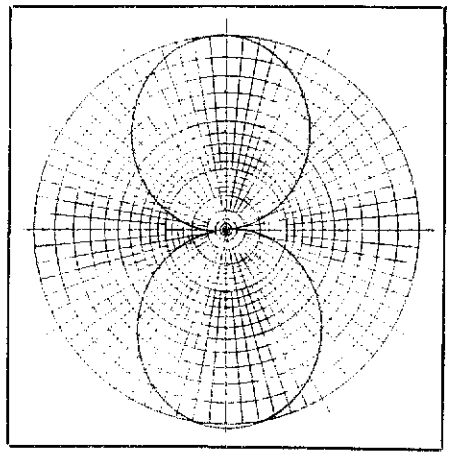
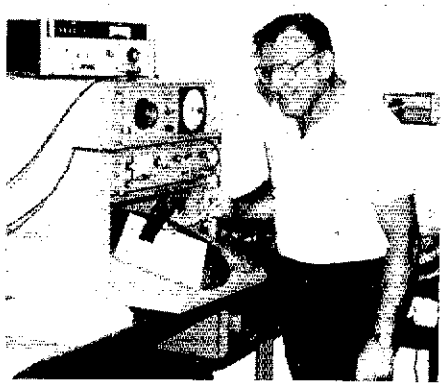


Fig. 13 — The measured pattern response of the 29-MHz reference dipole shows a classical textbook plot, with no perturbations from unwanted or stray reflections in the Hy-Gain range.

Roger Cox, left, and Joe Gillam of Hy-Gain demonstrate the use of the Hewlett-Packard analyzer equipment. Among the various capabilities of this equipment is the automatic measurement of the return loss in decibels, a value that is related to the SWR.



Jerry Hall seems to be pleased with the results obtained at the Scientific Atlanta polar recorder. The turntable rotates in synchronism with the steel pole as it turns through 360° while a recording pen plots the antenna response to the illuminating signal.

Conclusions

What was gained as a result of the competition? Were there any earth-shattering new designs? It was evident to the judges that most contestants had devoted a considerable amount of time to developing their entries. Some of the entries were obviously being developed even before the competition was announced in March of 1984. Startling new ideas? Perhaps not at first glance, but from these ideas it seems likely that a new breed of multiband antennas will evolve. The groundwork has been laid. And even though the formal deadline for submitting contest entries has passed, the need remains for multiband antennas that offer optimum performance in the 10- to 30-MHz frequency range. In that sense, the contest is an ongoing event.

As representatives of the sponsoring organization, we at ARRL Hq. have gained much in the way of experience from this event. First, the time given to contestants to perfect new designs was insufficient. Our original timetable spanned a period of one year; in retrospect, two years would have been more satisfactory. We learned, especially, that building a reliable antenna requires much more time and effort than merely throwing some parts together. Even though the antennas entered in the contest had been built and tested, we found it necessary to devote a considerable amount of time to making adjustments and, sometimes, minor alterations here and there, searching for and correcting mechanical problems, and so on. We also learned that accurately measuring the gain of an array is a very complex procedure, even with the proper equipment. This is especially true if the antenna is not matched to the feeder system. We came to appreciate the amount of work that manufacturers devote to developing a suitable antenna for the market. Believe us when we say that the reliable antenna manufacturers earn what they charge for their amateur products.

We wish to express our sincere thanks to Hy-Gain/Telex for lending us their antenna range in late September and October 1984, and to Roger Cox, who was instrumental at Hy-Gain in arranging all the details. The cooperation we received through Roger was outstanding. Special thanks go to Joe Gillam, who was our right-hand man in rounding up all the brackets, fittings, tools, test equipment and similar items we needed, and who also helped in moving all the assembled antennas here and there. Without the assistance of the folks at Hy-Gain, the ARRL Antenna Competition would not have reached a successful conclusion.

Strays

HAM RADIO BUG

☐ Somewhere in the Volkswagen graveyards of America there lies a '65 VW "Bug" with dashboard controls marked VOLUME, SQUELCH and CHANNEL SELECT. Back about 1965, my friend WA2INM, having mounted many different 6-meter rigs of that era into his VW, hit upon a novel idea. He disassembled an old "Benton Harbor 6-Meter Lunch Box," cut the necessary chassis holes between the front trunk and the passenger compartment, and rebuilt the Sixer as an integral part of the car. He used that "built-in" for years, eventually adding a multiple-channel crystal switch for more flexibility. I'm willing to bet that this is the first, last and only rig of its kind in either 6-meter AM or Amateur Radio history. What did WA2INM think of his invention? "Well," he used to say, "most of the parts were cheap, but the chassis was sure expensive!"

— *Bill Pasternak, WA6ITF, Saugus, California*

1984 — The Year in Review

From Volunteer Examining and an ambitious membership drive to packet radio and antenna zoning — the goals have been set.

By Andrew Tripp,* KA1JGG

The ARRL reached a milestone in 1984 just by being there: the 70th anniversary of its founding. There were no marching bands, no formal ceremonies, but it did give radio amateurs some time to look back on the many roads taken in the past seven decades, and to make preparations to meet the challenges that lie ahead.

Along League Lines

At its two meetings during the year, the ARRL Board of Directors fine-tuned some programs and set the agenda for many others, including Volunteer Examining, membership and Canadian autonomy. Among the actions taken at the March meeting were:

- the election of leaders: Larry E. Price, W4RA, President; Leonard Nathanson, W8RC, First Vice President; Gar Anderson, KØGA, and Jay Holladay, W6EJJ, Vice Presidents; Richard L. Baldwin, W1RU, International Affairs Vice President; David Sumner, K1ZZ, Secretary; and James E. McCobb, Jr., K1LLU, Treasurer:
- a decision that the ARRL would become a Volunteer Examiner Coordinator in all 13 FCC-defined regions when the VEC reimbursement rules took effect;
- changes to the ARRL Articles of Association and Bylaws to permit greater autonomy for the Canadian Radio Relay League;
- several measures to build on news media recognition of Amateur Radio.

From the October meeting came:

- actions encouraging the use and development of packet radio;
- a directive that the League petition the FCC to permit an applicant to retake a failed test element after 27 days;
- an ambitious goal to bring the number of radio amateurs to 600,000 by decade's end and to increase ARRL membership; and
- a study of the feasibility of the ARRL's assisting the FCC with amateur license records, especially in the administration of call signs.

In November, two League publications took on a distinct new look. The 1985 *ARRL Handbook for the Radio Amateur* was seven months in the making, but the 1024-page offering of technical wherewithal is a product all League members can take pride in. Up Front in *QST*, a four-column, full-color section of news and features without the fine print, brought readers the most dramatic change made to *QST* in several years.

The 1983 Hiram Percy Maxim Memorial Award, to be given each year to a young radio amateur with an outstanding record of accomplishment and contribution to Amateur Radio, went to Jon J. Willis, WDØAIT, of Littleton, Colorado. Paul Sargis, KI6U, of Modesto, California, became the first to receive the ARRL Scholarship Honoring Senator Barry Goldwater. The annual award is given to a deserving young amateur pursuing a higher education in electronics.

Successfully meeting the challenge of teaching Amateur Radio as part of an electronics curriculum in junior high school helped Peter Kemp, KA1KD, of Bethel, Connecticut, win the 1983 Herb S. Brier Instructor of the Year Award. By incorporating the Novice class and code practice in his electronics industrial-arts course, Pete has ignited an interest in Amateur Radio among many of his 7th- and 8th-grade students.

The ARRL Interference Reporting System (AIRS), a revitalization of the Intruder Watch, chalked up nearly 10,000 reports of nonamateur stations causing harmful interference on the HF bands. Operating since the beginning of the year, AIRS presently consists of 25 Volunteer stations who report violations to ARRL Hq., which compiles the information and sends it to the FCC for follow-up.

Since the first ARRL/VEC test session, on September 1, more and more of these posters cropped up across the country as the Volunteer Examining Program got into full swing. By year's end, the number of test sessions offered reached about 150, with nearly 2500 candidates being served.

Regulatory Scene

It was some time coming, but the ARRL/VEC program went into effect in 1984. On September 1, the first test session under the program was conducted at the ARRL Pacific Division Convention in Santa Clara, California. A large team of examiners handled the testing for the more than 100 amateurs who participated in the historic event. By year's end, the ARRL/VEC program had served nearly 2500 candidates in about 150 sessions across the country, with an overall pass rate of about 50%.

Earlier, in March, the FCC approved the reimbursement of out-of-pocket costs for Volunteer Examiners and Volunteer Examiner Coordinators — paving the way for the League's becoming a VEC. A $4 ceiling was put on recoupment of costs incurred in preparing, distributing and processing exams in 1984.

Later that month, the ARRL Board authorized an agreement with the FCC for

*QST Features Editor

the League to become a VEC for the FCC-defined 13 regions, to begin after the recoupment rules took effect. In a related matter, the FCC appointed its first VEC — the Anchorage (Alaska) ARC, which coordinates volunteer exams in the 13th region. By year's end, two dozen more VECs were named, with the ARRL/VEC being the most active.

On another front, there were some major developments in the issue of overly restrictive antenna ordinances. In Burbank, Illinois, amateurs gained a victory in this arena with the settlement of a 1982 class-action suit filed by amateurs and CBers over their rights to erect antennas in the city. Under the terms of the settlement, a new, more reasonable antenna ordinance was enacted, existing towers "grandfathered," and tower height permitted to 65 feet (see Happenings, this issue, for details).

Meanwhile, the ARRL was working on another avenue to get help for amateurs involved in antenna cases. In July, the League petitioned the FCC for a declaration of limited federal preemption in antenna regulation (PRB-1), attempting to stem the encroachment of municipalities on the right of amateurs to erect antennas. Many groups have since filed comments in favor of the proposal, arguing that amateurs' public-service activies would be severely hampered by overly restrictive antenna ordinances. The National League of Cities, on the other hand, is on record as being opposed to PRB-1. A favorable response to PRB-1 would make it easier for amateurs involved in local zoning cases to establish a federal interest in their being able to maintain effective antenna systems.

In other regulatory matters, amateurs moved closer to occupying bands gained as a result of WARC-79 when the FCC proposed rules to implement use of the bands. In Docket 84-960, the Commission seeks to allow amateur use, on a permanent basis, of 10.10-10.15, 24.89-24.99 and 902-928 MHz.

RM-4040, the League's request to prohibit cable television systems from operating on amateur frequencies, was denied by the FCC, a setback in our long battle by the ARRL to get federal help in stemming CATVI. The FCC did issue a reminder that in cases of harmful interference, the cable operator is obliged to cooperate with amateurs to eliminate the problem or face a fine.

In July, the FCC expanded the HF phone bands (PR Docket No. 82-83). In effect, the Commission adopted ARRL's band plan as filed during the comment period (see June 1983 *QST*, page 59). General, Advanced and Extra Class operators gained new privileges in the 80, 15 and 10-meter bands, and those in Alaska and the Pacific gained the benefit of a phone band in 7075-7100 kHz.

In other action, the ARRL opposed 220-MHz takeover attempts by the land-mobile radio services, arguing that the petition second-guesses the outcome of a detailed planning study yet to be completed on the band. Also, the ARRL asked the FCC to put on hold its proposal to allocate the 1900-2000 kHz band to nongovernment radiolocation users on a primary basis until a study of the present use of the band has been completed. In its motion, the League argued that radiolocation users' need for additional spectrum is unsubstantiated, and that such a relocation should be based on a technical basis and not merely on the claims of the users.

Public Service

From the 4000-mile Torch Run to the closing ceremonies of the 1984 Olympic Games in Los Angeles, Amateur Radio was very much in evidence to officials and participants in the Summer Games as millions of television viewers tuned in. Months of work went into the plan that saw more than 700 amateurs provide communications support like clockwork for the many Olympic events stretched over 23 cities, from Palo Alto to San Diego. Also, special-events stations NG84O (at the UCLA Olympic Village) and K84OG (at the Stanford University soccer site) passed daily results of the Games and third-party messages back home for some of the foreign participants, and provided memorable QSOs for many of those unable to attend. And, of course, there were archery gold medalist Darrel Pace, N8FTS, and kayaker Sheila Conover, KB6CZX, who did Amateur Radio — and their country — proud with their performances.

Several other times during the year, amateurs were instrumental in providing communications in the public interest. In South Carolina, in March, the quick response by ARES operators alerted residents in Bennettsville of an approaching tornado and helped avert a greater loss of life. Amateurs provided communications in the wake of the disaster as well. Hams across the country helped out in other life-threatening situations, including a flood in New Jersey, tornadoes in Texas and Pennsylvania, and Hurricane Diana, which first hit Florida then moved up the East Coast to North Carolina.

The event may have been different and the names and call signs changed, but amateurs, as usual, were up to the task at the Louisiana World Exposition in New Orleans from May to November. Thanks to several clubs working under the umbrella of the Louisiana Amateur Radio Exhibition, Inc. — and special-events station K5WF — thousands of visitors to the Expo were treated to a world-class look at Amateur Radio's past, present and future.

In a public service coup, ARRL President Price and the Federal Emergency Management Agency (FEMA) Director signed a Memorandum of Understanding between the two agencies. This agreement

Across the country during the year, radio amateurs answered many a call for emergency communications. Here, Dauberville (Pennsylvania) DX Association members N3CIX (left) and N3CHL report an overturned trailer to Red Cross headquarters in the wake of one of three tornadoes that hit the area in July. *(photo courtesy WA3VUE)*

provides substantial evidence of official FEMA recognition of amateurs' emergency preparedness, particularly ARES readiness, and helps pave the way for ARRL volunteers to play a significant role in federal emergency communications plans.

In March, two of the oldest and most respected organizations devoted to communications in the public interest joined hands. The presidents of ARRL and the Associated Public Safety Communications Officers, Inc. (APCO) signed a cooperative agreement that established a framework within which ARRL field volunteers may coordinate with APCO members for disaster communications.

During the year, ARRL and FCC organized the Amateur Auxiliary to the FCC's Field Operations Bureau, in keeping with the tradition of amateur self-regulation. Within this framework, made possible by Public Law 97-259, FCC is authorized to enlist the aid of amateur volunteers — most significantly the League's dedicated force of Official Observers — in monitoring the airwaves for rules violations.

Early in 1984, the FCC adopted rules to make additional frequencies (particularly standard 2-meter repeater pairs) available to the Radio Amateur Civil Emergency Service during an emergency that causes the President to invoke certain War Emergency Powers. This action came in response to a request from the Department of Defense, which had reviewed the role of RACES in a national emergency and concluded that additional frequencies would be needed under "war emergency conditions."

To help amateurs become more effective in their public-service mission, ARRL published the *Emergency Coordinator's Handbook*, probably the most comprehensive treatment of Amateur Radio emergency communications ever published. The *Handbook* was compiled by Hq. staffer KX1B following cross-country travel to personally meet with the real experts in emergency preparedness — the League's Field Organization volunteers.

Operating highlights included new

records. In June, a new 1296-MHz DX record was set with a contact between Chip Angle, N6CA, and Paul Leib, KH6HME, at a distance of 2472 miles (3955 km), besting the old record of 1422 miles (2275 km). A new 24-GHz record was set in August when IØSNY/IC8 and I8YZO/8 established a two-way CW contact spanning 206 miles (331 km).

Technical Developments

The year's events in this area are illustrated by some amateur achievements in familiar territories and others in as yet uncharted Amateur Radio technology. Packet radio continued to develop as a viable communications mode for amateurs. What are believed to be the first successful amateur packet meteor-burst communications tests took place in August between WØRPK near Des Moines, Iowa, and W3OTC in Rockville, Maryland, on 50 MHz. Subsequent 2-meter packet tests involving K1HTV/3, W3IWI, WØPN and WØRPK also showed promise for the new mode.

In March, several stations demonstrated the viability of interconnecting packet stations through terrestrial repeaters and via OSCAR 10.

A third ARRL Amateur Radio Computer Networking Conference was held, in Trenton, New Jersey, in April, with a fourth planned for March 1985 in San Francisco. Other packet gatherings illustrated great interest among amateurs in utilizing packet technology in amateur communications.

In October, the ARRL Board of Directors approved AX.25 as the standard amateur packet radio link-layer protocol (see Dec. 1984 *QST*, page 35). One of seven protocols needed for packet radio, this is a step toward achieving basic communications compatibility for the mode throughout the world.

At year's end, amateurs were testing the waters with yet another new communications mode: amplitude compandored single sideband. While relatively new, ACSSB shows great promise for use in amateur communications. Tests of ACSSB conducted at W1AW and by several other amateur stations through OSCAR 10 indicated significantly better signal-to-noise ratio and overall intelligibility than with single sideband.

CRRL Affairs

The major news in Canada is that the ARRL and CRRL have embarked on a five-year plan to make the Canadian Division completely autonomous. Among the moves underway:

- replace "Canadian Division" with "CRRL" or "Canada";
- conduct Section Manager elections entirely within Canada;
- implement a section-level restructuring, modified to meet Canadian needs;
- develop a CRRL affiliated-club program; and
- at a future date, collect and retain all dues from Canadian members in Canada. Ultimately, the CRRL is to be separate and autonomous from ARRL.

In other news, Doug Lockhart, VE7APU, was named 1984 CRRL Amateur of the Year. Through his leadership in the Vancouver Amateur Digital Communications Group, Doug helped make packet radio technology available to amateurs all over North America and beyond.

IARU News

In May, the membership of IARU made a strong bid toward meeting the challenges facing Amateur Radio on the international front. They ratified a new constitution by an overwhelming majority of 98 votes (80 votes, a 2/3 majority, were needed for passage). Begun five years ago, this restructuring has given amateurs a modernized framework for the protection, promotion and advancement of Amateur Radio worldwide.

Two new members joined the ranks of the IARU during the year — the Chinese Radio Sports Association, representing the People's Republic of China, and the Vanuatu Amateur Radio Society, representing the Republic of Venuatu. This brings the total membership to 121, representing nearly all of the countries in which the world's 1.5 million radio amateurs reside. In October, IARU President Richard Baldwin, W1RU, returned to China as the guest of the Chinese government. The Chinese Radio Sports Assn. will send a delegation to the IARU Conference in Auckland, New Zealand, later this year.

In India, the assassination of Prime Minister Indira Gandhi thrust her son, Rajiv Gandhi, VU2RG, into the leadership of the second-most-populous country in the world.

Space Communications

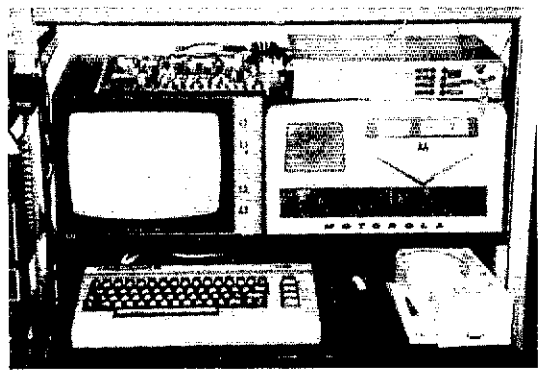
Good news on the scheduled Tony England, WØORE, Space Shuttle operation came in November when NASA gave the go-ahead for the amateur mission. In a letter to the presidents of ARRL and AMSAT, NASA accepted the proposal put forth by the two amateur organizations for England's operation from space. The 51-F/Skylab-2 mission is scheduled for sometime later this year.

Just as ARRL and AMSAT are cooperating in the upcoming amateur space mission, their Japanese counterparts are going through final preparations for the country's first amateur satellite, JAS-1. Scheduled for a January 1986 launch, the spacecraft will provide amateurs with a reliable means of communications as well as a host of research opportunities.

In March, UoSAT B was successfully launched from Vandenberg AFB. Designed and built by amateurs at the University of Surrey, England, the spacecraft (called UoSAT-OSCAR 11 since its launch) had some initial problems with its beacons. Once those problems were resolved, the satellite was given a clean bill of health.

Looking Ahead

To the casual observer, 1984 may not be considered to be a "banner" year. After all, 1983 was a tough act to follow. But a closer examination of the year's events reveals several worthy accomplishments — and the makings for a solid foundation on which to build in the years to come. The Volunteer Examiner Program got off on the right foot. A new membership drive, with ambitious but ultimately realistic goals, will bring new blood and ideas into Amateur Radio down the road. A victory in the arena of antenna ordinances, and the hope of federal preemption, helped amateurs to assert their right to erect effective antenna systems. Packet radio and other technical innovations cast light on new frontiers to be explored. The die is cast for Amateur Radio's future. It is now up to today's amateurs to make good on it. QST



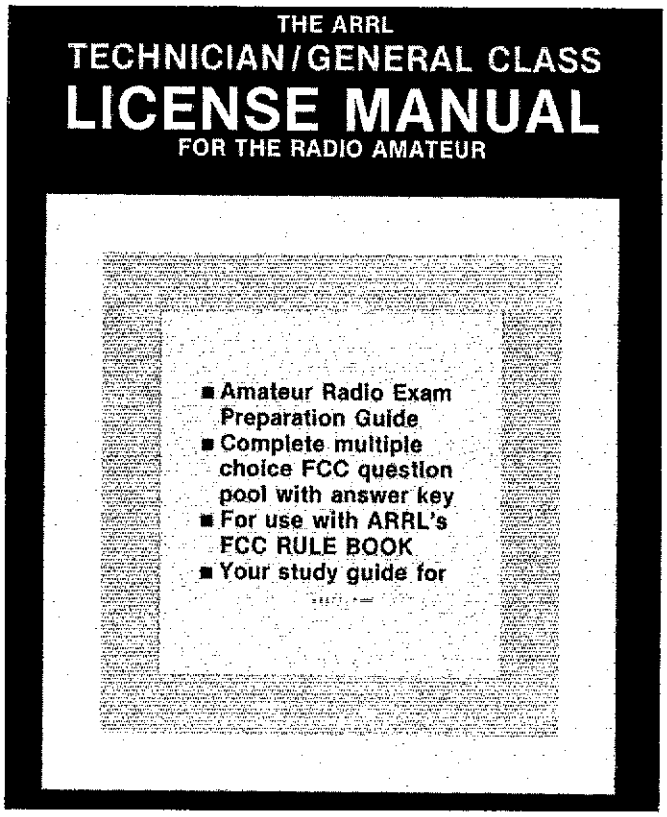
Packet radio as a viable mode of communications for Amateur Radio was a popular topic of discussion wherever hams gathered. At this technical seminar in the ARRL Iowa Section, Lyle Johnson, WA7GXD, president of Tucson (Arizona) Amateur Packet Radio (TAPR), discussed the concept of packet networking. Shown at the right is WØRPK's packet station. *(K8KA photos)*

Announcing the All-New *ARRL License Manual* Series

By Larry Wolfgang,* WA3VIL

The *ARRL Radio Amateur's License Manual* series is probably the best known and most respected training material available for prospective amateurs or those wishing to upgrade their license class. The manuals have been revised regularly (there have been 80 editions!), and the format has been changed over the years to conform to the latest FCC study guides. Now, with the Volunteer Examiner Program in full swing, hams are faced with new exam questions, some changes in the material covered by the examinations, and new procedures for taking the tests. All of this has led to the most exhaustive revision of our *License Manual* ever attempted.

We will continue to offer our *Tune in the World With Ham Radio* package for aspiring Novices. But when you are ready to upgrade, you will be able to take advantage of a whole new set of publications. Each license class will be covered by its own complete study manual. Used in conjunction with *The FCC Rule Book*, you will have at your fingertips every bit of information needed to pass the written portion of the exam. The all-new *ARRL Technician/General Class License Manual For The Radio Amateur* is now available. The text has been completely rewritten to be the best study guide your money can buy. It includes a complete multiple-choice version of the FCC question pool — all 500 questions are listed with the correct answer and three distractors for each one. An answer key allows you to check your understanding of the material before moving on to the next section.



Selecting the Right License Manual

- To prepare for Technician/General class examinations given by VECs using the new FCC Question Pool, use the new *ARRL Technician/General Class License Manual*. The 80th edition (green) ARRL *License Manual* contains the question pool currently in use by most VECs. See In Training, page 65 in this issue for timing details.
- Continue to use the 80th edition *License Manual* to prepare for Advanced class examinations until this summer, when the new *ARRL Advanced Class License Manual* will be available.
- Use the 80th edition *License Manual* to prepare for Extra Class examinations until this fall, when the new *ARRL Extra Class License Manual* will be available.
- Continue to watch the In Training column for information about when the ARRL/VEC will begin using the new question pools for Advanced and Extra exams.
- After this fall, the 80th edition *License Manual* becomes a collector's item.

The ARRL Advanced Class License Manual For The Radio Amateur will be available in a few months, with *The ARRL Extra Class License Manual For The Radio Amateur* to follow shortly after that. These study guides are also being rewritten completely, and will provide a fresh approach to learning and understanding the more complex electronics concepts of our hobby.

As with the *Technician/General Class License Manual*, our Advanced and Extra Class manuals will include complete multiple-choice versions of the FCC pool for elements 4A and 4B, respectively. Multiple-choice answer sets for these versions of the FCC question pools have been written and edited by the ARRL staff and highly qualified volunteers. They are the questions being used by many VECs, including the ARRL/VEC, on their exams.

The FCC plans to update the questions for each element once a year, with a new set of questions being released approximately every three months. Each book in *The ARRL License Manual* series will be updated once a year, to include the latest FCC revisions to the question pools. The release dates for these books will be timed to follow the preparation of revised answers for the new FCC question pools. They will be available in time to allow you to review the new questions before they are used on exams.

Of course, the new *ARRL License Manual* series can't be completed overnight. It takes time to produce quality material. We go through many steps to ensure that ARRL publications are of the highest possible quality. Until the complete series is available, we will continue to offer the 80th edition of *The Radio Amateur's License Manual*. This book was revised in December 1984 to include the latest FCC questions for license elements 3, 4A and 4B. So, if you will be studying for the Advanced or Extra Class exams now, you will want to have a copy of this book. We will not update the 80th edition *Radio Amateur's License Manual* when new question pools come out, but as each book in the new series becomes available, it will supersede the corresponding section of *The Radio Amateur's License Manual*.

*Assistant Technical Editor, ARRL Hq.

Happenings

Conducted By Bruce S. Hale,* KB1MW

- *ARRL and AMSAT Ask for New Satellite Frequencies*
- *Red Cross Supports PRB-1*
- *ARRL Files Comments For 160-Meter RTTY*
- *Vic Clark Youth Incentive Program*

Amateurs Win in Burbank

It took two years, but the lawsuit involving radio amateurs and the City of Burbank, Illinois, has finally come to an end. On November 30, 1984, Federal Judge Nicholas J. Bua accepted a settlement between the City and the named plaintiffs in the class-action suit. The attorney for the plaintiffs, ARRL Volunteer Counsel James C. O'Connell, W9WU, announced the terms of the settlement. These are the highlights:

1) Within 30 days of the entry of the decree in the court records, the City of Burbank will enact a new ordinance that will provide for Amateur Radio and Citizens Radio antennas.

2) The ordinance will specifically define and permit "antenna," "antenna support structure," and "antenna height." "Antenna height" shall mean the overall vertical length of the antenna support structure above grade and not include the antenna itself.

3) A permit shall be required for all antenna installations except those where the antenna support structure is 12 feet or less (not counting the building on which it is mounted).

4) An application for a building permit will require a copy of the plans, manufacturer's specification sheet, copy of homeowner's insurance policy and fee ($10 or $15, depending on the type of antenna).

5) Antenna support structures in a residentially zoned district may be erected to a height of 65 feet under the ordinance.

6) Any denial of a permit to erect an antenna by the City must be in writing and reasons must be given. Also, for a period of two years, copies of written denials of building permit applications for the erection of an antenna support structure must be sent to the plaintiff's attorney for review.

7) *All* prior-existing amateur/CB antennas are "grandfathered" with the condition that such antennas comply with electrical safety requirements.

The lawsuit would not have been possible without the plaintiffs' assistance and willingness to be part of the litigation in suing their city government. The plaintiffs were: Roger Borowski, WA9EKA; Dan Burba, AF9C; (Francis) Rita Burba, KB9ZL; Paul Giffey, KA9MNL; Jim Katocs, KC9U; Dennis Misner, KD9A; the Rev. Les Van Essen, N8DRN/9; Dan Weber, WA9MMQ; Robert O'Keefe and Chuck Seaton (CB operators).

Attorney O'Connell, a resident of the Chicago suburb of La Grange, adds this favorable result to a long list of achievements representing amateurs in antenna zoning cases. An ARRL Life Member, Jim's association with the League's Volunteer Counsel Program and this favorable result in a heavily publicized case has given a much-needed boost to morale among hams. — *W. Dale Clift, WA3NLO*

ARRL ASKS FCC TO EXPEDITE NEW SATELLITE FREQUENCIES

The ARRL and AMSAT (the Radio Amateur Satellite Corporation) have filed a joint petition asking the FCC to bring the list of frequencies allocated to the Amateur Satellite Service in Part 97 into line with the new frequencies allocated to that service at WARC '79. The final acts of the 1979 World Administrative Radio Conference allocated numerous new frequency bands to the Amateur Satellite Service on a worldwide basis, including the two new 18- and 24-MHz bands also allocated to the Amateur Radio Service.

Recognizing that the 1971 Space WARC did not provide Amateur-Satellite frequency allocations between 438 MHz and 24 GHz, WARC-79 granted six new allocations in that part of the spectrum. In addition, it added new Amateur Satellite frequency allocations above 47 GHz. Here is a list of new frequency allocations made available by the final acts of WARC-79:

18.068-18.168 MHz
24.890-24.990
1.260-1.270 GHz (earth-to-space direction only)
2.400-2.450
3.400-3.410 (Regions 2 and 3 only)
5.650-5.670 (earth-to-space direction only)
5.830-5.850 (space-to-earth direction only)
10.450-10.500
47.000-47.200
75.500-76.000
76.000-81.000 GHz
142.000-144.000
144.000-149.000
241.000-248.000
248.000-250.000

The 18-MHz band is not yet allocated to the Amateur Radio Service, and the Commission has recently indicated that the band is presently unavailable for amateur use (see Happenings, Dec. 1984 *QST*). The Commission has proposed to allocate the 24-MHz band to the Amateur Service in the Notice of Proposed Rule Making in Docket 84-960. The ARRL and AMSAT ask the Commission to allocate these frequencies to the Amateur Satellite Service at the same time they are allocated to the general Amateur Service.

The petition cites several reasons for expediting the allocation of the listed frequencies between 1.2 GHz and 10.5 GHz. One reason is that AMSAT-OSCAR 10, which was designed in the Federal Republic of Germany and operates under a license granted by FRG authorities, has provisions for an uplink in the frequency band 1.26 to 1.27 GHz. This uplink operation is called Mode L, and when AMSAT-OSCAR 10 is operating in Mode L, it cannot be used by U.S. amateurs since the FCC has not allocated Mode L frequencies to the Amateur Satellite Service.

The League and AMSAT are not presently requesting the allocation of frequencies above 47 GHz to the Amateur Satellite Service because there is no urgent need for those frequencies such as exists for the lower frequencies. Also, these bands are not yet allocated to the Amateur Service, and administrative convenience dictates their initial allocation to the general Amateur Service. The petition states, in part, "The League and AMSAT are, however, certainly not in any manner opposed to the allocation of these bands to the Amateur Satellite Service now if the same will not delay the allocation of the more urgently needed frequency bands discussed above." No RM number has been assigned to the petition as of this writing.

160-METER RTTY COMMENTS FILED

On December 20, 1984 the ARRL filed comments in PR Docket 84-959, the FCC proposal to allow F1, F3, F4, F5, A4 and A5 on 160 meters (see Happenings, Dec. 1984 *QST*, for details on the proposal). This proposal by the FCC came as a result of an ARRL petition requesting that the Commission authorize F1 on 160 based on two premises: (1) that the present limitation to only A1 and A3 emissions is no longer necessary because that limitation was intended to protect LORAN-A operation in the band, which no longer exists; and (2) that the use of radioteleprinter techniques in Amateur Radio communication has proliferated because of the availability of personal computers.

The ARRL comments state, in part, that

> the League has no basis for objection to the Commission's proposal to permit A4, A5, F3, F4 and F5 emissions in addition to the A1 and A3 emissions presently permitted and the F1 emission requested in the League's petition. However, neither does the League possess any evidence that the desire for additional emission modes besides A1, A3 and F1 is widespread in the amateur community. Thus, the League's main interest in this proceeding is limited to the addition of F1 emission authorization in the 1800-2000 kHz band. Should the Com-

*Information Services Assistant

mission decide to authorize the other proposed emission modes as well, the League will develop an appropriate voluntary band plan for assimilation of the newly authorized emission modes.

LEAGUE FILES COMMENTS IN NEW-BANDS DOCKET

The ARRL has filed comments in Docket 84-960, the implementation of the new WARC bands. (See Happenings, Dec. 1984 *QST*, for details.) The comments reaffirm Board policy that the power limit for the 10-MHz band should remain 200-W PEP output, and support the FCC proposal for a 1500-W output limit in the 24-MHz band. In addition, the comments reaffirm support for the subband allocations proposed by the League and the Commission. The ARRL comments ask the FCC to amend section 97.112 of its rules to allow W1AW to be operated by paid control operators if it is transmitting bulletins and code practice on "at least six" medium- and high-frequency bands, instead of the present requirements for "all" MF and HF bands. The League also asks the Commission to clarify the waiver process for amateurs north of "line A" (see Happenings, Dec. 1984 *QST*) near the Canadian border who wish to continue to operate in the 420-430 MHz band. In addition, it asks the Commission to expedite allocation of the 902-928 MHz band.

ARRL FOUNDATION ANNOUNCES VICTOR C. CLARK YOUTH INCENTIVE PROGRAM

At the request of Vic Clark's family, the ARRL Foundation has announced the creation of the Victor C. Clark Youth Incentive Program, with the objective of providing support for the development of Amateur Radio among high-school-age youth. Funded by an endowment, the program will make mini-grants to groups that demonstrate a serious intent to promote this objective. This would not be an award or scholarship, but rather a source of support for efforts to bring young people into Amateur Radio and enrich the experience of amateurs under the age of 18. Groups that might qualify for minigrants will include, but not be limited to, high-school radio clubs, youth groups and general-interest radio clubs that sponsor subgroups for young people or otherwise make a special effort to get them involved in club activities. Minigrants, probably in amounts not exceeding $500, will be made for such projects as securing equipment or antennas for club stations, purchasing training material, supporting local service projects that bring favorable public exposure, and similar activities, preferably by matching funds raised locally.

The Foundation would like to be able to finance several grants per year. Your contribution in honor of Vic Clark, W4KFC, would be very welcome. Address all contributions or inquiries to ARRL Foundation Victor C. Clark Youth Incentive Program, 225 Main St., Newington, CT 06111.

FCC PROPOSES 800-900 MHz SOLUTIONS, OVERLOOKS LMCC PETITION

On November 21, 1984, the FCC adopted several proposals designed to solve the 800-900 MHz allocation issue. Although the LMCC petition, RM-4829, requesting frequencies in the 220-MHz band was apparently dealt with at this meeting, there was no mention of 220 at all. We will not know what action, if any, the FCC plans to take on 220 until the actual release of the Notice of Proposed Rulemaking.

Be a Contributor to the Goldwater Scholarship Fund

Here's your opportunity to thank Barry, K7UGA, for his long-term staunch support of the Amateur Radio Service and to let him know of your appreciation. Send in your contribution *now*.

If your contribution is $25 or more, we will list your name and call in *QST*. If your contribution is $100 or more, in addition to your name and call appearing in *QST*, you will receive a signed photograph of the Senator, suitable for display in your hamshack. And for contributions of $1000 or more, in addition to the above, we'll put your photo in *QST* and you'll receive a personal thank you call from Robert York Chapman, W1QV, President of the ARRL Foundation, which is administering the Goldwater Scholarship Fund.

We welcome *all* contributions, regardless of size. Please help us achieve our goal of building an endowment sufficient to fund the Goldwater Scholarship in perpetuity. What better way to honor a great amateur, a great statesman and a great human being? Please make your check payable to the ARRL Foundation Goldwater Scholarship Fund, and send to ARRL Foundation, 225 Main St., Newington, CT 06111.

Recent contributors of $25 or more include:

In memory of Mike Mutnick, KV0E: Woody Crane, NØCYB, William E. Hughes, MARAC Executive Committee, Dallas Chapter QCWA, the staff of Encomm, Inc., Greater Cincinnati Amateur Radio Assn. (on behalf of Father Marshall Moran, 9N1MM); Frank Parker Heinemann, W1YG; ICOM America, Inc., International Mission Radio Assn., Inc.; William A. Lambert, WD4AIE; Robert J. Sinnett, W9JNB; Sun City Center Amateur Radio Club.

AMERICAN RED CROSS FILES IN FAVOR OF PRB-1

On October 29, 1984, the American Red Cross sent a letter to the FCC in support of PRB-1. It reads:

> We have been advised that the American Radio Relay League Incorporated has filed a *Request for Issuance of Declaratory Ruling* requesting the commission to exercise federal preemptive authority over state and local zoning regulations which affect transmitters and antennas used by amateur radio operators (PRB-1). The American Red Cross supports this request.
>
> The amateur radio operators assist the American Red Cross in providing emergency communication in disaster situations. It would often be impossible to provide effective service without their assistance.
>
> We do not feel that ARRL is requesting to be exempt from measures taken to protect the health and safety of the local citizenry. However, they are concerned about actions undertaken that will interfere with their ability to provide service to their fellowman.

The FCC has also received favorable comments from the cities of Newport News, Virginia; and Port Neches and Groves, Texas; and from the Kane County (IL) Emergency Services and Disaster Agency.

SECTION MANAGER ELECTION NOTICE

To all ARRL members in the Nevada, Rhode Island, Northern New Jersey, San Joaquin Valley, Utah, Maryland-DC and New Hampshire Sections: You are hereby solicited for nominating petitions persuant to an election for Section Manager. Incumbents are listed on page 8 of this issue.

A petition, to be valid, must contain the signatures of five or more Full ARRL members residing in the Section concerned. Photocopied signatures are not acceptable. No petition is valid without at least five signatures *on that petition*. It is advisable to have a few more than five signatures on each petition.

Petition forms (CD-129) are available on request from ARRL Headquarters, but are not required. The following form is suggested:

(Place and date)
General Manager, ARRL
225 Main St., Newington, CT 06111

We, the undersigned Full members of the ... ARRL Section of the ... Division, hereby nominate ... as candidate for Section Manager for this Section for the next two-year term of office
(Signature ... Call ... City ... ZIP ...)

Any candidate for the office of Section Manager must be a resident of the Section, a licensed amateur of Technician class or higher, and a Full member of the League for a continuous term of at least two years immediately preceding receipt of a petition for nomination.

Petitions must be received at Headquarters on or before 5:30 P.M. Eastern Local Time, March 8, 1985.

Whenever more than one member is nominated in a single Section, ballots will be mailed from Headquarters on or before April 1, 1985. Returns will be counted May 21, 1985. SMs elected as a result of the above procedure will take office July 1, 1985.

If only one valid petition is received for a Section, that nominee shall be declared elected without opposition for a two-year term beginning July 1, 1985.

If no petitions are received for a Section by the specified closing date, such Section will be resolicited in July *QST*. An SM elected through the resolicitation will serve a term of 18 months.

Vacancies in any SM office between elections are filled by appointment by the General Manager.

You are urged to take the initiative and file a nominating petition immediately.
David Sumner, K1ZZ
General Manager

SECTION MANAGER ELECTION RESULTS

The following Section Managers will begin a two-year term of office April 1, 1985.

Uncontested

Iowa	Robert McCaffrey, KØCY
Mississippi	Paul C. Kemp, KW5T
Northern Texas	Phil Clements, K5PC
Orange	Joe H. Brown, W6UBQ
Wyoming	Richard G. Wunder, WA7WFC

Correspondence

Conducted By Bruce Kampe,* WA1POI

All letters will be considered carefully. We reserve the right to shorten letters selected in order to have more members' views represented. The publishers of *QST* assume no responsibility for statements made herein by correspondents.

INTO THE TRASH

☐ Isn't it time we scrapped the RST system? How long has it been since you heard other than a T9 report? Rarely do we hear a signal that is T7 or T5. There are a few signals that are less than T9 on the DX bands, but invariably they receive the usual 5NN report from the "Eager for a QSL" amateur.

As for the signal strength (S) part of the report, I never did see much value in advising the other station as to how LOUD his signal was, as a good deal had to do with the amount of audio I had in my receiver. The real test is and always has been in READABILITY, the "R" part of the report.

International rules provide for no RST system, but they do provide a Q signal for READABILITY: QSA. QSA followed by a numeral from one to five denotes the readability of a signal from "I can barely tell your signal is there" to "You are perfectly readable. Nothing can touch you!" Basically, QSA-2 means "I am getting part of your transmission." QSA-3 means "I am receiving most of your transmission but not 100 percent." QSA-4 says "I am receiving all of your transmission but QRM *could* cause a problem." So, what do we need with RST 599 or 5NN?

Let's go back to QSA reports. Then when we work DX we can dispense with 5NN reports of barely audible DX signals. Instead we can send "QSA-5" or just the numeral "5," which in shortened numbers (remember the NN?) will become just a "dit." In this manner the QSO between two DX fans will consist of "Dit," and the reply will also be "Dit." Time and energy will be saved and thousands of hams will get a chance at that "rare DX" out there on that coral reef, and a chance at immortality and DXCC! — *John McKinney, W0AP, Grand Island, Nebraska*

PROOF OF LIFE

☐ Just to prove there is life above 1900 kHz on 160 meters, I stayed on one frequency in that range during the Phone Sweepstakes and talked 72 people through the required exchange of information. So nobody can say we do not use 1900 and up. Please pass this small attempt at saving the top of 160 to the Hq. "staffer" with the duty of amassing evidence. — *Patrick Hamel, W5THT, Long Beach, Mississippi*

A FAMILIAR RING

☐ Over the past 32 years, I have been fortunate enough to have been welcomed into many "shacks" by U.S. hams, and have also been delighted to welcome those hams making a trip to the real "Deep South." I have looked forward every month to keeping in touch with the U.S. scene through the pages of *QST*. But I object being made to pay a sizable sum every year to an organization that is prepared to take my money but specifically forbids me from taking an active role in its activities.

I refer, of course, to the requirement whereby 50 percent of the subscription to *QST* is for membership to the ARRL even though full voting membership is granted only to licensed amateurs in the U.S. and Canada. Now, I do not deny that the ARRL does a good job of representing U.S. (and Canadian) hams, but it does *not* represent me. My interests are safeguarded by my own national organization, the NZART. I readily admit that if a U.S. amateur wished to receive copies of our local ham magazine *(Break-In)*, he would also be required to join the New Zealand association, but *we* would not deny *him* voting or other rights! If our hobby is as international as we claim, and if we are really interested in promoting goodwill and understanding, then we should be actively seeking more ways to promote a greater exchange of ideas and information.

What better way to do this than by allowing membership of *any* affiliated IARU organization to be the basis for receiving any selected national magazine by paying only the cost of that magazine plus, of course, any necessary expenses involved in postage and packing.

"No taxation without representation" should have a familiar ring to all Americans, and on behalf of the thousands of overseas subscribers to *QST* (and the ARRL) I believe it's about time the ARRL practiced what it preached. — *Peter L. Smith, ZL1ARB, Auckland, New Zealand*

[Editor's Note: Subscription to *QST* is one of the many ARRL membership services. The ARRL is the International Secretariat of the International Amateur Radio Union (IARU), which represents the interests of 119 member societies worldwide. The NZART in New Zealand is one such member society.]

THE JOY OF SMITH CHARTS

☐ The *QST* editor who wrote the sub-heading to WA3ZKZ's article "The Smith Chart in BASIC" (*QST*, Nov. 1984, p. 28) should be condemned to a diet of computer printouts. He said: "Tired of struggling with Smith Charts?"

Struggle indeed! The Smith Chart is a joy to use, and anyone who knows how to use it always gives silent thanks to Philip H. Smith, its inventor.

Graphical solutions like the Smith Chart give an insight into and an understanding of engineering problems that no computer program can possibly provide. Anyone who does not understand the Smith Chart does not understand transmission lines.

Long live the Smith Chart! — *Harry R. Hyder, W7IV, Tempe, Arizona*

BEST DEFENSE

☐ I was dismayed to hear that only one-quarter of a percent of the U.S. hams responded to RM4829 and RM4831. I don't understand why people can't do something as simple as writing a letter if it is to their advantage. Because of the lack of response from the amateur community, we may lose the 220-MHz band.

Seventy-five percent of the people I have talked to on HF have sent me a QSL card. If seventy-five percent of the Amateur Radio community took the time to send a QSL card or a letter to their congressman and/or to the FCC, no one would dare to challenge us.

Here is my request: All you have to do is wait for an FCC rulemaking to come out and bring it up at your next radio club meeting, or tell everyone you run across on the air about it until they pass the word.

Whether the rulemaking is good for you or bad, make sure you DO something about it. Don't assume there will be enough support without you. I don't care if you even have a license. MAKE YOUR OPINION KNOWN! — *Richard H. Brant, KA6VRW, Thousand Oaks, California*

BEING UGLY ISN'T SO BAD

☐ I must question the word choice regarding Mr. Billones' "ugly" QRP transmitter project in November *QST*'s Up Front. I, for one, have never seen an "ugly" piece of amateur gear. But, then, maybe I've led a sheltered life. — *Roger Smith, K4PFK, Ruleigh, North Carolina*

AND IT'S FREE, TOO

☐ Both of us recently upgraded to Extra Class before the FCC examiner in New Orleans. Our primary source of code practice was the W1AW daily code practice transmissions. Without this excellent material we would never have been able to increase our code speed enough to pass the 20 WPM code exam. In spite of poor propagation and deliberate interference, we were able to make excellent use of the transmissions.

Thank you. Keep up the good work. — *Betty G. Dobbs, N5DUZ, Eugene H. Dobbs, WA5VFP, Philadelphia, Mississippi*

WHO CARES?

☐ W6BNB's suggestion in November 1984 Correspondence that more Q signals be used (and on phone) is a good one.

However, I suggest an additional Q signal be added: "QWC?" meaning "Who Cares?" I checked the 75-meter band last night and determined that 94.3 percent of the transmissions could be answered with a simple "QWC?"

Think of the QRM reduction possible! Don't like my idea? "QWC?" — *John Wasmuth, W8BP, Marquette, Michigan*

[Hello there! I handled this column a few years ago and it's nice to be back! — *Bruce Kampe, WA1POI*]

*Information Services Assistant

How's DX?

Conducted By Ellen White,* W1YL/4

View from the North

(The following is an open letter to all stateside DX chasers from John Phillip Sagi, KE4SX, formerly portable from Keflavik, Iceland.)

Through the frosted window panes, over miles of crisp snow, I can see the beautiful curtains of aurora dancing ever so softly in the midnight heavens. It's a magnificent sight to behold. Of course, the HF bands are gone, now totally devoid of life. Just an hour ago 20 meters literally teemed with voices from such distant lands as the Allegheny Mountains and the Black Hills of the Dakotas.

Three thousand miles to the southwest of me is New York City, and a short Puffin flight north is the Arctic Circle. I'm a "portable Tango Foxtrot" on the NATO Base, Keflavik, Iceland. My last QSO is finished. My rig gets packed tomorrow morning for shipment home to Virginia Beach, Virginia.

From this vantage point, I've thoroughly enjoyed DX. However, my year in Iceland has given me a different perspective on the hobby. I've become very sensitive to letters now in *QST* about list operations, meaningful DX QSOs, Arctic flutter, dipole inadequacies, and so forth. It seems that everyone has an opinion on something, so I'd like to offer a DX station's comments.

KE4SX/TF was a barefoot-dipole operation. (Unless, of course, the 40-knot winds and the common horizontal snowfalls decided otherwise!) A weak signal, especially one from the higher latitudes, really needs a "sponsor" to cut the crud, so to speak. I virtually depended on list operations for my 120+ countries and "almost WAS." With the list method, more stateside and European stations were able to contact Iceland, and I was able to talk with a greater variety of locations. I had a rule, however, that KE4SX/TF would remain on frequency until all who desired a contact received a chance, or until the band "dropped." More often the latter was the case! Again, list operation helped me greatly.

As for meaningful QSOs ... "For everything there is a season." Sometimes a chat was nice, especially when the band was clear, QRM low, the dinner over, and so forth. But the urge to search for new QTHs and different prefixes sometimes overwhelmed me. Please remember that the certificate hunt is as real for the DX station as it is for the DX chaser! And, since the subject of meaningful QSOs is being addressed, please realize that the weather in San Diego or the height of an antenna is not very interesting to a DX station. To get a stateside operator to talk hobbies, sports, occupations and future plans was extremely frustrating. For example, most of the California stations boasting the new "84" call signs couldn't even say which Olympic events were happening, much less if they had attended any! I was, quite frankly, embarrassed.

Now, may I make some constructive suggestions for the DX chaser that might increase enjoyment of this fascinating hobby.

First, please don't incessantly repeat yourself! If the signal reports exchanged were anywhere from 5-4 to 5-9, there is absolutely no need to spell phonetically every word in your name, your town, etc. Names and places are easy to catch the first time. (Most hams I've met are named Buzz, John or Tex, anyhow!) And, if the DX station is a portable from the United States, don't pass off your QTH as the State of Maryland. Say "near Hagerstown" and you might find that your friend used to live there!

Secondly, if you have the urge to say hello to a DX station which is already in QSO, just state your call during a break in the dialogue. Of course, the DX operator should acknowledge your presence. This method works. Patience is its mentor.

Keep in mind the tremendous time differences when in contact. If you've just gotten home, and the SVØ has just watched his TV station sign off the for the night, please don't expect him to wait too long for your 2-meter repeater friends to tune up. It's just not kosher.

Please, *always*, send an s.a.s.e. with your QSL. Most managers don't respond to postcards (because they don't have the funds). Several thousand QSL cards cost quite a bit of money. The time needed to address each is unbelievably overpowering. Just remember to help the DX station stay on the air and not on the typewriter! Plus, you'll get a card in return.

If you operate SSTV or RTTY with full power, take a second to check the frequencies around your intended "nesting" area. Remember that the DX may be fighting several thousand miles of atmosphere and may not be able to compete with you. A little consideration with this would have been most appreciated by me some months ago.

Finally, the discipline, procedures and talents displayed by the net controllers of the several DX groups on the 20-meter phone band are most commendable. Thank you very much for your assistance.

When you consider that we can throw our thoughts halfway around the world using the power required for a mere lightbulb, our hobby is certainly amazing!

Thank you very much. I'm comin' home!

THE CIRCUIT

☐ **India:** India's new Prime Minister, VU2RG, has been licensed since 1974, and has been active on 15/10 meters, as well as added 2-meter activity. His wife, Sonia, passed her exam in 1975 and holds VU2SON. At the time of this writing their son and daughter (ages 14 and 12) hope to be on the air with their own licenses. It is suggested that any Amateur Radio communications to the new Prime Minister go via the Amateur Radio Society of India, Box 3005, New Delhi 003, India.

☐ **PJ7:** KK9A, John, will be active /PJ7 Feb. 26-Mar. 8 (10-80, CW/phone). John's next stop will be VP2E and, possibly, FS7. QSL via his home call.

☐ **Kerguelen:** During 1985, watch for FT8XB who will be QRV on HF sideband. Check 14,190 or thereabouts. Michel is also active on OSCAR 10, EME on 144 MHz, etc. He is interested in DX and contests, as well as experimental VHF-UHF work. QSL direct to Michel Rousselet, FT8XB, P.O. Box 83, 95101, Argenteuil, Cedex, France.

Troster's Tips for Easy Listening

You hear a DX station. Who is that station working? If that station is, say, in Southern Africa, and that station is working Europeans only, assess just what chance you have to break through the European curtain. Is it worthwhile pumping all that RF into a lost cause? You might try some calls, but if Europe has the "skip," go weed the garden for a while. If you ain't got that skip, you ain't got nothing.

More next month from W6ISQ.

☐ **Father Moran:** The Sheboygan Co. DX Association was one of many groups honoring 9N1MM, a longtime member of their club, during his recent stateside tour. Fr. Moran was presented with a plaque by the club noting his outstanding contributions to Amateur Radio and worldwide DX.

☐ **GJØAAA:** During the recent 48-hour CQWW CW event, the "3 As Contest Group" (members G3s SXW, TXF, WVG) made 3165 contacts (gross) operating on Jersey. Pasteboards via G3TXF.

☐ **CN8ES:** Cards go via WA3NCP, who still has logs for Chuck's past operations as 9L1CA (1977-1980), and 6W8FP/6W8A (1974-1977).

☐ **CEØAA:** The Chilean Radio Club's San Felix operation ended successfully last October 29, with more than 31,000 contacts 160-6 meters, sideband/CW. The only authorized source to issue QSL cards confirming contacts with CEØAA is the Radio Club de Chile, RCCH, P.O. Box 700, Santiago, Chile.

☐ **D4:** There have been several "pirates" on in recent years using bogus D4/D44 calls. Julio, D44BC, and Angelo, D44BS, are the only licensed amateurs from the Republic of Cape Verde and have been the only ones since the 1975

*19620 SW 234 St., Homestead, FL 33031

9N1MM was hosted by the Kansas City DX Club during his recent tour. On the right he is shown at the special Sheboygan County DX Association Dinner. See text. *(KØRWL photo)*

independence of the country. Note that there is no Cape Verde QSL Bureau and WB1DQC *doesn't* handle the cards. All must go direct via the *Callbook*.

☐ **NCDXC:** Kudos to the Northern California DX Club on the appearance of their new membership roster, delineating 397 members, with cover design by N6AN, computer-generated text by N6AUS, and editing and printing by W6VG (who, I might note, is life member No. 1 in the club!). Membership statistics indicate that 248 of the group hold Extra Class, 122 Advanced and 18 General class. NCDXC will sponsor the annual Spring DX bash the second weekend in April, returning again to Fresno.

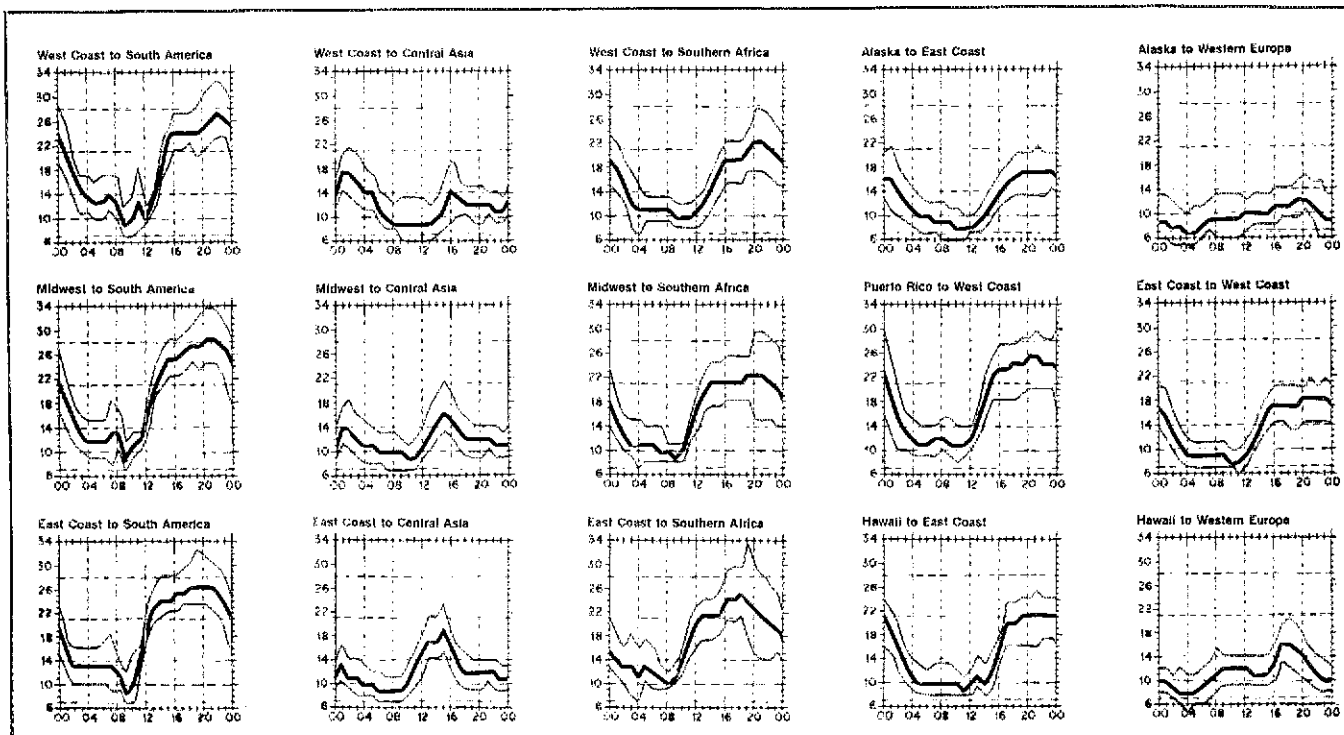
☐ **Help!:** WB4CSK has been unsuccessful in acquiring confirmations from 3D2MD Nov. 1977, TA1AB Dec. 1981, OE5GTL/YK Dec. 1981 and P29PS Feb. 1982. K2OVS is looking for HC1BI/OSCAR 1982, UAØBBN/OSCAR 1983, VP2MGQ and 3B8FG 1983, and HA6ND (a 1981 50-MHz contact).

☐ **Radio:** An interesting article in the September 1984 issue by UW3AX defines Amateur Radio communications very nicely: "Amateur Radio communication on short and ultrashort waves is one of the most interesting pursuits — one to which over a million people on our planet devote themselves. It combines the joy of technical creativity, the romance of travel across countries and continents, and the special sharpness of sensations characteristic of sport." The article continues on to indicate the path to be followed: study of theory, shortwave listening and acquisition of Morse code. Though not "required" for the first two steps, UW3AX indicates that serious shortwaving is impossible without a knowledge of "Morse." (Special thanks to W4KM)

☐ **HL9WM:** W4OGG will be handling cards for John (formerly WM4M of Memphis, Tennessee, who will be in Korea for a year. Note W4OGG's new address at 4520 Macon Rd., Apt. 15, Memphis, TN 38122.

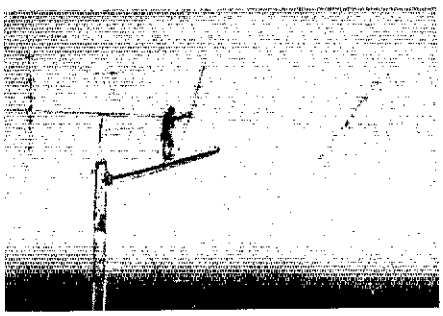
☐ **Midway:** WH6O/KH4 operated on Midway from June 15 to June 21 and needs seven confirmations to complete his WAS — Utah, Wyoming, Maine, Vermont, Rhode Island, Delaware and Idaho. You can reach him via Tom Morgan, 3479 Forward Ave., Honolulu, HI 96819.

☐ **Liberia:** KM8E is manager for EL2EF in Monrovia. Diane schedules her manager, June, every Wednesday around 14,293 kHz at 2200Z. Diane is interested in YL/WAS and is active on both 20 and 15. Cards for EL3EF go to June



When are the bands open? These charts predict this month's average propagation conditions for high-frequency circuits between the U.S. and various overseas points. One chart for East Coast to West Coast is also included. On 10 percent of the days of the month, the highest frequency propagated will be at least as high as the uppermost curve (highest possible frequency, or HPF). On 50 percent of the days of the month, it will be at least as high as the middle curve (maximum usable frequency, or MUF). On 90 percent of the days of the month, it will be at least as high as

K1HDO displays credit no. 290, 5A1TK — received 15+ years later!



TG9VT uses a cantilevered "cat walk" to reach the balun and driven-element connections on his 4-element, 40-meter monobander. John just recently acquired 5BDXCC no. 1715.

Braunz, KM8E, 1218 60th St., Pullman, MI 49450.

☐ **YR6A:** The Radio Club of Brasov County, Romania, operated under that special call during CQWW phone and CW. Cards via Box 98, 2200 Brasov 1, Romania.

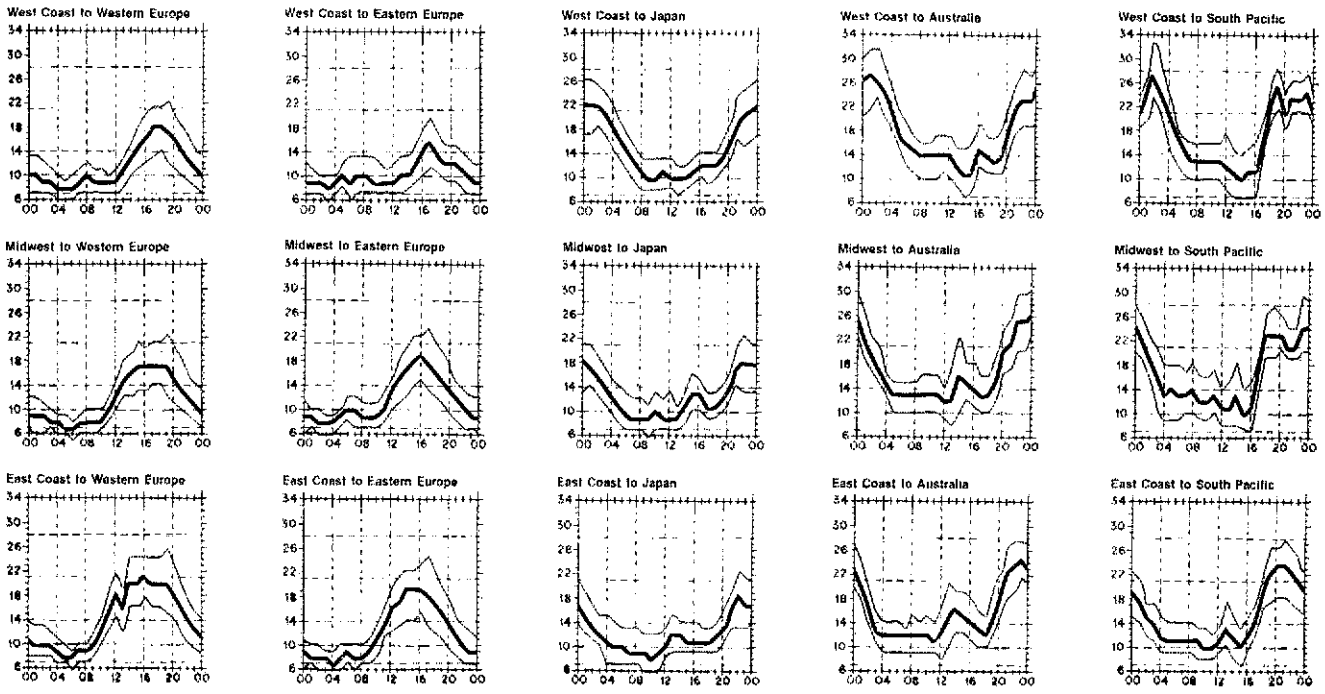
☐ **Balearic Islands:** The Palma Local of the Spanish society, URE, is now active with EA6URP, Box 34, Palma de Mallorca, Balearic Islands.

Strays

GOODWILL HITS HOME FOR CREW MEMBERS

☐ The goodwill efforts of California Amateur Radio operators who came to the aid of an Ecuadorian training vessel with a disabled radio became a news event in that South American country. The *Buque Escuela de Guayas* was anchored in Monterey Bay when NK6H and WB6UES offered to send messages home for the ship's crew. The ship's captain accepted the offer, and LU6DRY/W6 was enlisted as interpreter. NK6H and LU6DRY/W6 are members of the Naval Postgraduate School ARC in Monterey. On a tour of the ship's station, LU6DRY/W6 learned that the ship's radio equipment was inoperable. He corrected the problem with the radio and installed a replacement antenna. While aboard, LU6DRY/W6 collected some 25 messages from crew members and, later that evening, relayed them to HC2AIR, in Guayaquil, Ecuador, with whom he had established a sked the night before. During the operation, local radio and television reporters in Ecuador contacted HC2AIR, eager for news of the *Guayas*, which had been out of touch with home for several days because of the radio problems. The ship's communications were operational when it departed Monterey. — *William E. Webb, NK6H, Monterey, California*

Here's a new twist: a Director receiving a plaque instead of presenting one. Oklahoma SM Ray Miller, W5REC (left), explains to West Gulf Division Director Ray Wangler, W5EDZ, that the "Thank You" plaque he received for appearing in the ARRL forum at the Oklahoma State Convention can be taken home to Texas, even if it is shaped like the state of Oklahoma.



the lowest curve (optimum traffic frequency, or FOT). See April 1983 *QST*, page 63, January 1977 *QST*, page 58, September 1977 *QST*, page 35 and January 1979 *QST*, page 11 for a complete explanation. The horizontal axis shows Coordinated Universal Time (UTC); the vertical axis, frequency in MHz. Data are provided by the Institute for Telecommunication Sciences, Boulder, Colorado. These predictions, for February 15 to March 15, 1985, assume a sunspot number of 34, which corresponds to a 2800-MHz solar flux of 89.

DX Century Club Awards

Administered by Don Search, W3AZD

The ARRL DXCC is awarded to amateurs who submit written confirmations for contacts with 100 or more countries on the official DXCC List. You may also submit cards to endorse your award in 25-country increments through 250, 10-country increments through 300, and in 5-country increments above 300. The totals shown below are exact credits given to DXCC members from October 1 through November 15, 1984. An s.a.s.e. will bring you the rules and application forms for participation in the DXCC program.

New Members

Mixed

A22ME/102 G3MCA/126 JF1WQC/109 OH5MQ/105 SM5AAW/110 YU7KV/301 N2DHZ/209 N4XM/225 WA6GTU/239
DF2LZ/101 G4RCG/112 JN1XWO/155 OK1AXB/124 SM7NDX/104 YV5DEK/107 NG2S/223 NE4H/103 K7BU/105
DJ5FM/149 GM4LHA/184 JH3TKM/311 OK1DAU/107 SMØMLL/122 ZL2UW/318 W2MPI/302 WM4V/102 KA8OUT/100
DL2HAZ/117 HA3KGS/135 JA6TIT/124 OK1JDJ/100 SV1JG/285 ZS1QJ/103 WA2ABN/120 W5EHY/266 KC9ZV/106
DL3WB/109 HB9BMZ/169 JA6YOV/130 OK3KTY/105 VE3LSK/106 4X4IL/165 WB2TKY/282 W5YU/322 W9KGW/216
DL7AET/107 HB9LF/109 JH7MQD/294 OZ1CAH/222 VE7EDA/105 KT1S/103 KA3IUT/100 KA8JTR/104 KAØAND/104
DL9MAC/113 HB9O/126 JA9AA/336 PA3AWW/151 VQ9GD/114 N1ANX/135 N3BNA/211 N6DKN/108 NEØP/105
F6HSI/120 I1YS/214 JA9IRH/239 SKØHS/113 VQ9JC/103 W1CED/144 AK4H/110 N6QS/185 WØYK/298
G3BKG/100 IT9EKI/104 KL7LF/130 SM4DDS/138 VR6TC/115 K2DI/175 KF4L/288

Radiotelephone

A22ME/100 GW4LPA/103 JA2PDS/113 LU1VK/177 VK2DEJ/110 N1CWB/100 W3EE/116 KC5HY/100 W7YAQ/128
A92EB/105 HB9BMZ/152 JF2MVI/107 OE1PPC/109 VR6TC/111 KA2QYL/111 KE4WY/198 ND5H/103 K8NLD/153
C53EK/101 HB9O/118 JH3TKM/306 OE2YMO/162 YV5CMI/106 N2DHZ/209 N4WJ/230 W5EHY/153 N8EHW/107
DK6NP/274 I2KAJ/200 JF7DZA/118 ON6MY/305 ZL2UW/211 W2EEQ/178 N4XM/156 N6AVX/116 W9KGW/215
DL5FD/102 I8IXO/100 JH7GFO/101 PJ8DFS/108 4X4IL/159 KA3HXO/193 WA4TJW/100 WA6EED/103 KØIEW/103
DL6YAU/112 IK8AUC/203 JH7MQD/280 PY2FFW/160 KA1JLK/100 N3BCZ/100 WB4MAI/110 KD7JI/102 KBØXY/102
DL9YH/106 IØJLX/226 JA9AA/297 SKØHS/112 W1CED/135 N3CWD/105 K5DFZ/304 W7CSW/139 WØYK/292
F6FBE/121 JN1XWO/133 LA5BX/107 V2AZM/109

CW

DF6LK/194 DL8ZAJ/120 I2HJD/103 OH2LQ/117 SMØMLL/104 K2DI/144 WA2ABN/105 N4XM/171 KA8EBG/108
DK6NP/251 F6HSI/110 JG1RYQ/140 OK1AXB/106 VE1BLG/120 K2HVM/101 AJ3N/107 W4PBC/101 KØVZR/102
DL5OAI/105 G4LQN/100 JE2KSM110 OK2BVX/105 YC2BDJ/106 KA2GGB/101 W3EE/147 K8NN/201 WØYK/271
DL7AET/105 GM4LHA/119 JR7COO/106 SM4DDS/121

RTTY **160 Meters**

JA1EOD/103 K4AGC/102 OE2SNL/102 PAØLUS/102 WA2JBV/100 WØLYM/108 AA4V

5BDXCC

JA2GBO DF3GY JA1WTZ UW3BF K1HDO AK2H EA3CTI IV3YRN W1WAI
F6AJA SLØZG VE1AXT KB8IZ W1HSB ZL2UW K2EY K5BG K6SD
K2IGW JA1BN UB5JMR JAØDAI KF2X K4XP N4XM KA1ACC W9GSB
EA9FK TG9VT UQ2HO CE8ABF W7ZI KB1BE K2JF

Endorsements

Mixed

DF7VO/254 JE2KSM/200 VE3CWE/293 KA1PF/151 NA2N/125 N4FKZ/HR/248 W5AL/358 K7GM/282 K9RN/309
DFØAFZ/226 JA3UCO/187 VE4SK/326 KE1K/270 W2IIX/207 N4GFI/252 W5DJ/323 K7OVM/157 KA9CFD/152
DJ2MN/310 JJ3AFV/220 VE5UK/250 N1CBM/176 W2LOG/305 N4HH/314 W5MCH/178 K7ZA/311 KA9HTE/142
DJ3TF/292 JR6PGB/215 VE6KY/228 W1COI/203 W2PPG/334 N4RA/326 W5NCB/199 KK7Y/213 KB9JF/279
DJ5VQ/339 JR7COO/240 XE1GBM/309 W1ESN/312 W2TS/277 N4UH/333 WB5CRG/292 KY7M/201 KC9EW/254
DK6NP/304 JA8GTO/136 YO9ANV/130 W1GY/277 W2ZZ/332 W4GIO/250 WB5MJK/176 W7AHX/305 KE9A/300
DL1FBO/228 LA8D/127 YU1EXY/330 W1LQQ/329 WA2AXD/127 W4NKI/338 WB5YKD/279 W7GLU/291 KE9U/297
DL5MBY/224 OE6WK/190 YU1GTU/291 W1JJ/313 WA2VUM/125 W4VWW/275 WB5ZDP/151 W7KR/342 KG9Z/174
DL7MQ/310 OH2LP/225 YU2AKL/308 W1TN/288 K3WGR/207 WA4SNI/242 AB6R/289 W7LYO/275 KI9T/203
DL7SY/312 OH3SG/269 YU2CBM/319 WA1LOU/278 N3AKD/266 WB4EDD/313 K6GWN/312 W7QMU/299 KT9P/189
EA3NC/333 OZ2E/251 YU3DJR/159 WA1UDH/200 N3TA/130 WB4FLB/201 K6HHD/301 W7YAQ/225 N9RS/310
EA4AXW/201 OZ7BG/325 YU3TFC/250 WA1ZLK/290 W3AC/339 WB4MAI/292 K6LEB/340 W7YS/200 NA9A/150
F8HB/180 PT2VE/260 YU7BPQ/316 WB1EMN/302 W3ENL/124 WB4NFO/293 K6TMB/278 WA7MOK/278 W9CA/289
F9GL/349 PY2FNB/305 YU7DX/292 AA2Z/270 W3GG/331 WB4PRU/297 KT6T/272 K8GG/311 W9DDX/299
G2AJB/241 PY6TM/306 YV5DFI/326 AF2O/293 WA3DVO/303 K5FUV/278 KX6C/173 K8IA/317 W9MP/200
G4HYD/128 SK4BX/250 ZP5CE/315 K2MFY/315 WB3CQN/301 K5GK/294 N6AHU/308 K8QYC/169 W9MYJ/132
HB9BIN/125 SK7AX/237 4Z4OL/234 K2POF/175 WB3GPR/299 K5JUC/304 N6HK/269 KN8P/293 W9NYW/271
HB9CMZ/219 SLØAS/275 AA1K/311 K2QF/297 AA4AM/179 K5XE/228 N6JV/319 KZ8I/155 WB9EVH/175
HK3BFU/153 SM4CTT/314 AB1P/258 K2TK/290 K4LRX/250 K5YCP/322 NY6M/214 NI8B/174 WB9ZHS/144
I2CEX/160 SM4EMO/306 K1DFC/335 K2XA/323 K4RIG/301 KB5FU/306 W6GO/316 W8LCU/167 WD9DID/207
I2QEA/235 SM6CST/325 K1ER/296 KC2WQ/201 K4RZ/318 KB5WQ/290 W6MND/252 W8MEP/175 KØJN/314
I5NQZ/251 SM6DEC/203 K1HDO/290 KC2YI/175 K4TEA/306 N5CB/271 W6NLG/299 WB8IGU/311 KAØE/286
IK8AVC/208 SM6DYK/313 K1RB/243 KM2P/328 KA4EMR/186 N5FG/315 W6NPY/314 AF9R/270 KBØU/305
JA1FKY/129 SM7FDO/310 K1YHM/273 KM2V/325 KB4EQR/126 N5TC/305 W6OU/304 K9BG/318 KDØJL/130
JA1WSK/317 SM7HCW/300 K1ZLA/126 N2AC/304 KB4LX/259 NA5U/180 W6SSC/281 K9DDO/260 WØOQK/332
JH1KKT/126 SMØBFJ/317 KA1ED/251 N2CHD/219 KC4MJ/152 NJ5X/180 WA6O/206 K9FN/324 WAØUWS/290
JA2JRG/280 SP6BZ/315 KA1KD/249 NA2G/202 KE4HX/276 NK5Z/230 WB6FDQ/239 K9PNT/DU2/228

Radiotelephone

CE3BBW/267 I1SBU/278 LU7MAJ/291 6W8DY/331 KF2X/264 KC4MJ/150 NK5Z/168 WB6TJW/156 KE9U/293
DJ5VQ/324 I3AAV/249 LU8DPM/162 7X2LS/258 KM2P/325 KD4NZ/251 W5AL/300 AI7M/155 KR9G/266
DJ6FN/315 I3ADI/323 OA4JR/323 K1ER/273 KM2V/324 KE4HX/276 W6DJ/313 KD7PS/132 KS9R/251
DK8JS/250 I4LCK/331 OE8JNK/178 K1HBM/224 N2CHD/190 KE4YD/226 W6YU/321 KX7J/218 KT9P/189
DL3ZQ/130 I4WZK/308 PAØLOU/302 K1HDO/268 N2EGR/168 KF4L/286 WB5CRG/291 N7ABJ/282 KU9I/309
DL7SY/304 I5AFC/317 PY2FNB/280 K1RAW/319 W2IIX/207 N4CFL/273 WD5DBV/305 W7FJE/251 N9RS/304
EA3CCN/208 I5UKA/133 PY6TM/306 K1RB/242 W2LOG/305 N4ETA/266 WD5DHF/201 W7GLU/286 W9CA/259
EA3NC/326 I8IHG/294 SM7HCW/289 K1YHM/262 WB2TKY/280 N4FKZ/HR/229 K6HHD/296 N7KR/341 W9DDX/299
EA5JC/136 I8SAT/316 SMØJOQ/229 K1ZLA/126 K3RPY/255 N4RA/308 K6TMB/270 K8GG/294 W9JT/339
EA5KF/262 I8WES/295 SV1JG/280 KA1ACC/270 KM3N/181 W4DDP/156 KT6T/271 NI8B/166 W9LA/329
EA7AG/295 IØER/280 VE2WA/320 KA1PF/151 N3BNA/201 W4NKI/338 N6AHU/306 N8MAK/198 W9TQ/300
EA8AKN/236 ISØNZA/225 VE3MC/316 N1CBM/176 W3AC/335 W4WMQ/305 N6BLN/250 W8NPF/224 W9ZTP/232
F6CYV/282 J73PD/195 VE5UK/212 W1JJ/313 W3MP/340 WD4KWR/160 N6BXM/163 K9DXO/317 WA9OVU/226
F9GL/341 JA1WSK/311 VO1AW/250 W1LQQ/301 WA3GXI/212 K5GK/286 W6GO/314 K9FN/320 WB9EVH/173
G3CXX/176 JA2JRG/251 VP2AZE/146 W1SIX/187 WB3GPR/298 K5WZ/250 W6NLG/295 K9IKP/312 WB9SYF/290
G3UZM/151 JE2KSM/154 XE1GBM/308 W1TN/272 AA4AM/172 K5YCP/315 W6OU/295 K9LKA/335 WB9ZHS/136
G4GED/229 JA3UCO/154 XE1XM/240 WA1LOU/262 K4RIG/301 KA5DGX/210 W6PGK/290 K9LJN/185 WD9AHJ/305
HI3AMF/200 JR6PGB/203 YS9RVE/309 WA1ZLK/290 K4URK/295 KB5FU/304 W6SSC/279 K9MGF/273 KØJN/285
HI8JO/251 JR7COO/208 YV5DFI/326 AF2O/293 KA4EMR/180 KC5ZA/176 W6TGI/271 KB9JF/268 NØDWU/126
HK8BUT/235 LA4HH/262 ZP5CBL/259 K2MFY/280 KA4FQZ/260 N5FG/311 WA6GTU/231 KB9KB/292 WØGOQ/246
HK8BVN/268 LA4HW/300 ZP5CE/312 K2TK/267 KB4CWO/153 NI5T/138 WA6O/201 KB9KD/300 W6PXM/258
I1POR/307 LU4MEE/292 ZP5CF/356 KC2WQ/201 KC4HN/151 NJ5X/180 WB6FDO/175 KC9YX/150 WAØUWS/275

CW

DF3EP/206 ISØNZA/188 PAØLOU/265 VE3CWE/225 AK2H/175 WB4MAI/240 K6TMB/151 WA7NXL/177 KE9A/260
DF9FM/206 JA1AAT/176 PY2FNB/225 YO3AC/250 K2JF/219 WC4B/150 N6JV/296 KF8N/200 KE9U/267
DJ5VQ/280 JA2JRG/242 SLØAS/274 YS9RVE/288 K2MFY/230 K5XE/227 W6GO/293 KV8Q/131 WD9AHJ/301
DK1GF/125 JJ3AFV/167 SM4EMO/176 4Z4OL/221 K2QIL/200 K5YY/273 W6NLG/151 W8DCH/256 KØJCF/280
DL7SY/271 LA1VL/127 SM6CST/288 AA1K/299 K3WGR/176 N5FG/237 K7GM/189 W8RT/300 KAØE/267
EA4AXW/176 LA3IBA/154 SM6DEC/198 W1LQQ/262 W3GG/250 N5TC/265 K7ZA/280 AF9R/186 WØBW/301
HB9CMZ/210 LA8CE/173 SM6DYK/270 W1LY/180 WB3GPR/215 W5AL/263 W7QMU/253 K9BG/288 WØNQ/179
I2IWM/185 ON5KD/284 SM7FDO/288 W1TN/243 W4MPY/251 AB6R/225 W7YCK/189 KB9KB/296 WØOQK/286
IT9VDQ/230 OZ2E/209 SV1JG/208 WA1AER/301

RTTY **160 Meters**

KA5CQJ/125 K1MM/128 W1JZ/125

Canadian NewsFronts

Conducted By Harry MacLean,* VE3GRO

Meet Your CRRL Directors

[Editor's Note: This is the first of two columns. We'll introduce the other Directors to you next month.]

Andy McLellan, VE1ASJ, CRRL Atlantic Director; Ray Perrin, VE3FN, CRRL Ontario Director; Bill Gillespie, VE6ABC, CRRL Prairies Director.

Andy McLellan, VE1ASJ. Andy has been CRRL Atlantic Director since expansion of the CRRL Board, late in 1982. Andy is one of the most active amateurs in Canada. First licensed in 1965, he's operated all bands, 1.8 to 435 MHz, CW, SSB and RTTY. He holds numerous contest records, and 50-MHz WAS and WAC. The first North American to complete 4- to 6- and 4- to 10-metre QSOs with the U.K., he's been part of two DXpeditions to Saint Paul's Islands, and was personally responsible for having DOC issue permanent special call signs for DXpeditions to Sable and Saint Paul's.

Andy is a member of FOC (the First Class CW Operators' Club), ISSB, SMIRK and numerous other groups. He is a Life Member of ARRL and CRRL. Besides serving on the CRRL Board, Andy is Manager of the CRRL Incoming QSL Bureau. This bureau processes some 450,000 cards a year, easily 80% of all QSLs that enter Canada.

This year, Andy is Chairman of the Saint John Bicentennial Amateur Radio Convention, to be held in Saint John, New Brunswick, in October. Andy lives in East Riverside, New Brunswick, and works for Saint John Transit. He is 37 years old, is married, and has two daughters.

Ray Perrin, VE3FN. Ray has been CRRL Ontario Director since 1982. He brings a variety of experiences to the job. First licensed in his teens, he holds a degree in electrical engineering from the University of Waterloo. He's worked in Telecommunications Regulatory Service, the branch of DOC that oversees Amateur Radio.

Ray's main interest in Amateur Radio is weak-signal work using CW and SSB on VHF/UHF bands. He's worked stations all over eastern and central North America, and even Bermuda, on the 2-metre or 70-centimetre bands. Lately, he's been trying his hand at moonbounce, with good results.

A past president of Ottawa Valley Mobile Amateur Radio Club, Ray is a member of three Ottawa-area clubs, the Westside Club in Toronto and the Radio Society of Ontario. He is a Life Member of ARRL and CRRL.

Besides serving on the CRRL Board, Ray is CRRL Ottawa liaison. He keeps in touch with DOC officials and keeps everyone on the CRRL Board aware of latest developments. Ray has written drafts for many important CRRL submissions to DOC. He continues to serve as CRRL rep to RABC, the Radio Advisory Board of Canada.

Other interests: old clocks. Ray lives in Nepean, Ontario, and works just over the river, in Hull, Quebec, as a federal civil servant. He is 37 years old, is married, and has one daughter.

Bill Gillespie, VE6ABC. Bill is the new CRRL Prairies Director. He was first licensed in 1976. Right from the start, Bill was attracted to public service work. Some positions Bill has held and still holds are EC — Edmonton area; NM — Alberta Public Service Net (daily phone net); NM — Albert Traffic Net (daily CW net); and STM — Alberta. Last year, Bill was named co-ordinator between Alberta Disaster Services and the amateur community. The job: Make Amateur Radio an important part of Alberta's emergency plan.

A past president of Northern Alberta Amateur radio club, he's a sometimes Amateur Radio Instructor. For the past seven years, he's also conducted on-the-air code practice that has helped countless amateurs in Western Canada get their tickets. He looks after the Alberta Tube Bank, and maintains a depot of ARRL and CRRL books and materials. He holds the licence for VE6QST and is a key Official Bulletin Station. For all this and more, Bill was named 1983 CRRL Amateur of the Year.

Bill lives in Edmonton and works for a company that produces crests, badges and pins. An unbelievably young-looking 55 years old, he is married to Leslie, VE6BBC, and has two daughters.

DOC TO RAISE LICENCE FEES

At press time, CRRL learned that DOC plans to raise fees for Amateur Radio station licences from $13 to $20 a year. Apparently, this is a modest increase compared to the fee hikes planned for some commercial radio services. More details next month.

BANNED-COUNTRIES, THIRD-PARTY-TRAFFIC AND RECIPROCAL-LICENSING AGREEMENTS

DOC has supplied the following updated information:

1) The following countries have notified the International Telecommunications Union that they forbid radiocommunications with amateur stations under their jurisdiction: Burma, Iraq, Libya, Pakistan, Somali, Turkey, Yemen and Zaire.

2) Canada has concluded agreements or arrangements with the following countries to permit the transmission by Canadian amateurs of international communications on behalf of third parties: Antigua and Barbuda, Australia, Bolivia, Chile, Colombia, Costa Rica, Dominica, Dominican Republic, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Israel, Jamaica, Mexico, Nicaragua, Paraguay, Peru, Trinidad and Tobago, United States, Uruguay and Venezuela.

3) Canada has concluded agreements or arrangements with the following countries to permit licensed amateurs to operate radio stations while temporarily in the other country: Antigua and Barbuda, Australia, Austria, Bahamas, Barbados, Belgium, Bermuda, Botswana, Brazil, Chile, Colombia, Costa Rica, Denmark, Dominica, Dominican Republic, Ecuador, Finland, France, Fed. Rep. of Germany, Greece, Grenada, Guatemala, Haiti, Honduras, Iceland, India, Indonesia, Ireland, Israel, Italy, Jamaica, Luxembourg, Malta, Netherlands, New Zealand, Nicaragua, Norway, Panama, Papua New Guinea, Peru, Philippines, Poland, Portugal, Saint Lucia, Senegal, Sweden, Switzerland, United Kingdom, United States, Uruguay, Venezuela and Yugoslavia. [Editor's Note: For information on how to apply for permission to operate in these countries, write to CRRL, Box 7009, Station E, London, ON N5Y 4J9, Attention: Foreign Licensing, Naralon Thorne, VE3LRU.]

SECTION MANAGER ELECTION RESULTS

Congratulations to Larry Thivierge, VE3GT, of Renfrew, Ontario, on being re-elected Ontario Section Manager. Larry's new two-year term of office begins on April 1. Larry ran unopposed, eliminating the need for a balloted election.

NOTES FROM ALL OVER

☐ On October 16, an Ottawa man appeared in Provincial Court and was fined $500 for operating an Amateur Radio station without a licence. The man had been transmitting through an Ottawa-area repeater. Charges were laid after investigations by Ontario Region Spectrum Control, DOC.

☐ Randy Smith, VE1PAC/VE6, was one of about two dozen North American amateurs recently involved in using AMSAT-OSCAR 10 to link terrestrial packet-radio networks.

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The New Frontier

Conducted By Bob Atkins,* KA1GT

WAVEGUIDE ATTENUATION

Waveguide provides a very-low-loss microwave transmission system. Just how low the loss is can be calculated quite easily using the following formula for copper waveguide:

Attenuation (dB/ft) =
(TE_{10} mode)

$$\frac{0.01107}{a^{3/2}}\left[\frac{\frac{a}{2b}(F)^{3/2}+(F)^{-1/2}}{\sqrt{(F)^2-1}}\right] \quad \text{(Eq. 1)}$$

where
a = larger internal dimension of the waveguide (in)
b = smaller internal dimension of the waveguide (in) and
F = (f/fc)
where
f = operating frequency and
fc = cutoff frequency of the waveguide

The factor 0.01107 is a combination of a number of constants, including the resistivity of copper and the dielectric constant of air. The attenuation of waveguide made of materials other than copper may be calculated by multiplying the values obtained for copper by the following factors: Aluminum — 1.28, Brass — 2.0, Silver — 0.97, Tin — 2.58, Zinc — 1.89.

Thus, for example, it can be calculated that for WG90 used at 10.368 GHz the following loss can be expected: Silver (plated) — 3.1 dB/100 ft, Copper — 3.2 dB/100 ft, Aluminum — 4.1 dB/100 ft, Brass — 6.4 dB/100 ft.

This compares with about 12 dB/100 ft for 1/2-in heliax and about 7 dB/100 ft for 7/8-in heliax. The cost of brass WG90 is about $3.50/ft (copper and silver cost more, aluminum less), which is about the same as 7/8-in heliax (about $4/ft). Of course, the heliax can be used over a wide range of frequencies, while the waveguide can only be used over a narrow band (from 8 to 12 GHz for WG90). Waveguide can sometimes be found at surplus equipment suppliers for somewhat lower cost and may be worth considering for a permanent microwave installation. Aluminum waveguide is particularly desirable since it is light, shows lower loss than brass and is less expensive.

2304-MHz SATELLITE IDENTIFIED

For the last two months, I have reported reception of 2304-MHz satellite signals by W4HHK, WB5LUA and others. The source of these signals has now been identified as not one, but two satellites. Vern Riportella of AMSAT, quoting *Amateur Satellite Report*, has sent information that these satellites have been positively identified as having the catalog numbers 84033A and 84107A. The former is positively identified as COSMOS 1547, launched April 5, 1984. The latter is tentatively identified as COSMOS 1604. Both are Russian early-warning satellites in Molniya-type orbits (eliptical, ~37,000-km apogee, 1000-km perigee, period 9-10 hrs) similar to the earlier COSMOS 1217 satellite several European stations heard on 2304 MHz in 1981-82.

The satellites were identified on the basis of observations by W4HHK. Dick Flag, of Texas, a member of the Kettering group (a small, worldwide group of amateur satellite spotters), used these observations to establish orbital elements for the satellites and, from these to identify them.

The signals are probably telemetry data being relayed home as the satellites come on station. When I receive details of the orbital elements for these satellites, I will make them available to anyone who might want to look for these signals and perhaps use them as a beacon or signal source for testing 2304-MHz systems.

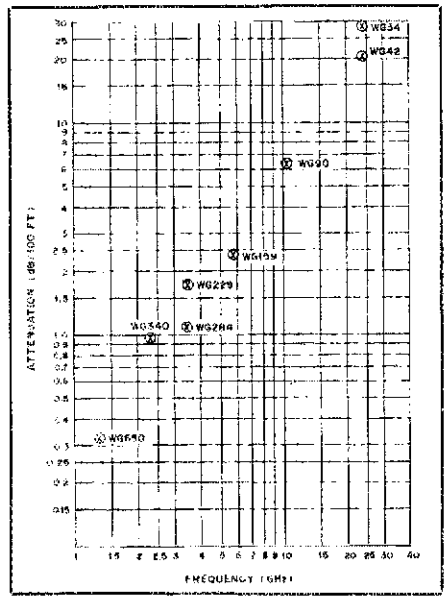
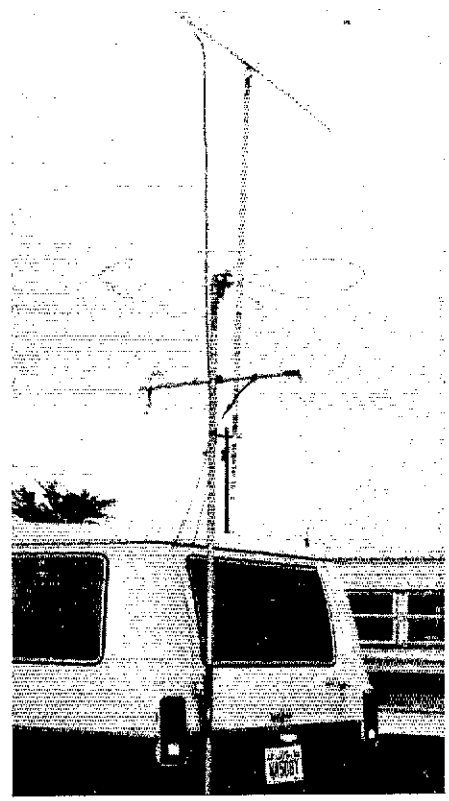


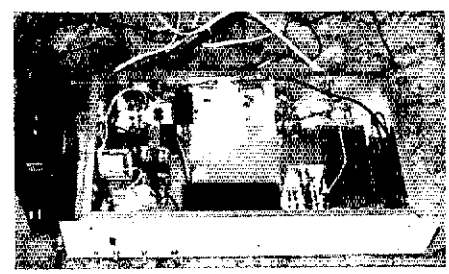
Fig. 1 — Waveguide loss for the amateur microwave frequencies 1.296, 2.304, 3.456, 5.670 and 10.368 GHz in commonly used rectangular brass waveguides (see text for other materials). Meters = feet × 0.3048.



Part of the antenna system: a 1296-MHz loop Yagi is at the top; below it is a "big wheel" used on 144 and 432 MHz; mounted on the lower crossbar is a 1296-MHz dipole (left) and a 2304-MHz loop.

PHOTO FEATURE

Last month I reported on a "grid-pedition" by WA5VJB and WA5DBY to EM14 (Oklahoma). Kent Britain, WA5VJB, has sent along some interesting photos of the trip.



WA5VJB's 2304-MHz station used on the "grid-pedition" to Oklahoma (EM 14).

WA5DBY at the operating position.

*103 Division Ave., Millington, NJ 07946

The World Above 50 MHz

Conducted By
Bill Tynan,* W3XO

ACSSB: What It Is; How to Get Started

Last month, this space was devoted to an abbreviated account of some of the technical contributions made by Amateur Radio over the years. It made a call for participation in the development of yet another advancement in the communications art: a new form of voice communication — amplitude compandored single sideband, or ACSSB. This month I will attempt to explain how ACSSB works and provide some information on how to get started with this promising new technique.

To complicate the explanation, there are two kinds of amplitude compandored single sideband. One is the commercial version, dubbed by its backer, Sideband Technology Inc. (STI), ACSB (One S). The other is an amateur approach, being developed by some West Coast hams associated with Project OSCAR Inc. It provides some of the advantages of the commercial version, but with considerable simplification for our application. It is not yet clear which might become the amateur standard. I will start by describing the commercial version and then explain how it might be simplified for use with our current transceivers without the necessity of modifications.

In its STI-developed commercial form, ACSB involves five elements: preemphasis/deemphasis, spectrum shaping, compression/expansion, AGC and AFC. The last two are made possible by the presence of a pilot tone that is transmitted along with the information signal. The standard is to place this just above the band occupied by the voice, at 3.1 kHz, and to modulate the transmitter at approximately 10 percent, or 10 dB, below the peak signal power. This frequency is far enough removed from the upper range of the voice band to be effectively filtered in the receiver. On the other hand, it is low enough so that it does not cause the RF signal to occupy much greater bandwidth than that of a normal single-sideband voice signal. The pilot tone provides a reference that can be used to automatically make small receiver tuning adjustments to lock it to the correct frequency for proper detection of the voice signal. No "Donald Duck" effect. The pilot also serves as an amplitude reference with which to vary the receiver gain to compensate for rapid signal-level fluctuations of the type often encountered in mobile applications. Those of us who have operated mobile with conventional SSB at VHF frequencies are only too familiar with the rapid QSB frequently encountered. Another amateur application in which tight AGC would be helpful is on the OSCAR 10 satellite, where spin modulation can be a problem at times.

The amateur version of ACSSB provides the first three features but not the final two, the capability for AGC and AFC. In this embodiment, the pilot signal is omitted, which allows all of the processing to be accomplished at audio frequencies and the signal to be fed to and from the transceiver via the microphone and headphone jacks. Because of the filtering action of most modern single-sideband transmitters, the 3.1-kHz pilot needed for the commercial version of ACSSB is not readily accomodated with this type of connection without making modifications to the rig. The processing for the implementation being developed by Project OSCAR Inc. includes audio pre-emphasis/de-emphasis, compression/expansion and a special form of filtering to compensate for the less-than-optimum passband shape encountered in most amateur SSB receivers. Pre-emphasis is a process by which the higher audio frequencies are boosted on transmission to maximize the energy content of the signal. Without such treatment, most of the energy in speech is concentrated at the low-to-mid-frequency range. A compensating deemphasis is applied at the receiver to restore proper frequency balance and reduce high-frequency noise in the audio output. This same process has been used for years in both FM broadcasting and communications. The amplitude compression used at the transmitter is akin to the speech compressors we are familiar with, only more so. The difference in an ACSSB system is that a compensating effect is employed at the receiver to expand the audio signal to restore the original dynamic range and further reduce receiver noise during periods of little or no modulation. It is during these periods that noise is particularly annoying to our ears. At other times, the signal tends to mask the noise so that we are less aware of it. Those who are familiar with high fidelity may recognize that this process is similar in concept to the Dolby™ and DBX™ systems.[1,2] The specific implementation of this compression/expansion process being developed by the West Coast group may include an additional wrinkle in which the audio band is divided into two parts that are processed separately. Thus, for example, the highs need not be compressed at times when there is a large signal only at the low-frequency end. The details on just how this is to be done are still being worked out.

You may be intrigued, as I am, by the challenge of participating in the amateur development of this exciting new technique and are wondering how you can get started. Efforts are currently underway by Project OSCAR, Inc. to produce boards for the approach I have described. It is expected that details will be forthcoming shortly. There is also the possibility that a few complete STI units can be made available for amateur experimentation through ARRL Hq. at a nominal cost. These will be the electronics only, requiring a cabinet, microphone and speaker to make a complete radio. They are single-frequency, crystal-controlled units designed for the 150-174 MHz range, and it will require some ingenuity to employ them as tunable transmitters/receivers for use in terrestrial and/or satellite experiments. Those interested in obtaining one of the STI units should write to Paul Rinaldo, W4RI, at Headquarters stating your request and outlining some of the experiments you intend to conduct.

It is hoped that this and last month's columns have served to excite some experimentally minded VHFers to give ACSSB a try and begin another chapter of Amateur Radio's continuing list of contributions to the communications art.

Notes

[1]Dolby is a registered trademark of Dolby Laboratories.
[2]DBX is a registered trademark of DBX Inc.

ON THE BANDS

6 Meters — As this is being written, the holiday season is approaching, and the first official day of winter is only a few days off. For devotees of 6 meters, the winter sporadic-E season comes along just in time to keep us from resolving to sell our gear at the next swap meet. As usual, one of those with a complete report on the latest propagation happenings is WA5IYX. From San Antonio, Pat writes of 12 days during November and the first week of December that some kind of E_s was noted either on 6 meters or on the lower VHF TV channels. On most of those occasions, the MUF reached into the FM broadcast band. The most outstanding date in the period covered by the report was December 2 when the MUF remained in the FM band for 170 minutes. Pat says that this was the best day for E_s at his location since July 3. Another interesting example was November 25 when the HC2FG beacon was heard from 2135 to 2305Z, apparently via 2-hop E_s rather than F2, which, Pat concluded, was the propagation medium for reception of the beacon a few weeks earlier. He also notes that the keying has returned to its original clean characteristic rather than the fuzzy sound noted when it was received in October.

WB4SLM reports from Georgia that he took advantage of E_s prevailing the evening of December 9 to work WBØYZN DN90 and NØETV EN00. This topped off a good tropo evening on 2 meters and 70 cm, but more on that in the appropriate sections.

From Japan, JA1VOK writes of openings in that part of the world. Hatsuo says that, on November 17, he worked ZL1ADP on 51.1 MHz with 5 × 9 signals and heard the ZL1VHF beacon at 51.02 as well as the 50.74, '75 and '76 TV audio transmissions that were so familiar to many of us a few short years ago. JA1VOK notes that this was the first ZL opening for him since last April.

Information has recently reached me from the Radio Society of Great Britain that the U.K. may not be the only place in Europe to gain amateur privileges on 50 MHz when TV transmitters, presently operating in the range, are shut down. The word is that 25 special permits for operation outside TV hours have been issued to Norwegian amateurs, and that Norway may be considering establishing a permanent 6-meter amateur allocation when that country's low-band TV goes off sometime in 1985. British Band 1 television service was due to be terminated by the end of 1984. Both governments are said to be proceeding cautiously with respect to amateur operation in this part of the spectrum because of TV services still operating in many other European countries and the concern of those governments with respect to possible interference. It is difficult for this conductor to understand how amateurs in Great Britain and Norway could represent a greater potential for interference to television reception than the high-power TV stations they would be replacing.

N5DDB reports success in obtaining a most-sought-after QSL. Mike says that he sent a registered letter containing an s.a.s.e. with Icelandic postage, obtained from a foreign stamp store, to TF3T's 1984 *Callbook* address and received the card in short order. Sveinn told N5DDB in his response that he has moved several times over the past few years, and much of his mail has apparently not reached him. The most recent *SMIRK Newsletter* lists TF3T's address as Sveinn Gudmundsson, Nyjabai, Eyjargotu 88, 820 Eyrabakka, Iceland. I would be interested in hearing if those trying this approach are rewarded with similar good results.

2 Meters — In Europe, one of the pastimes very popular with VHF and UHF operators is going on DXpeditions. A factor that makes this practice so widespread has been the use of the Locator System,

*Send reports to Bill Tynan, W3XO, P.O. Box 117, Burtonsville, MD 20866, or call 301-384-6736 to record late-breaking information.

which provides the incentive to put rare squares on the air. Now that we have such a system firmly in place, even though we call them grids, mounting "grid-expeditions" is beginning to take hold here as well. One such trek was staged by WA3FYJ, Saturday evening, October 27 from FNØI near Clintonville, Pennsylvania. Taking along his IC-211, a 150-W amplifier, a Junior Boomer and a single 10-foot mast, Bob picked out a likely hill on which to set up. He began working stations as soon as he got on, with WA8NPX in Cleveland being the first QSO in the log. As the evening progressed, people wanting FNØI began telephoning stations in his vicinity to get him to listen for them. Best DX turned out to be KD9JQ EN61 near Chicago. When it was over, WA3FYJ/3 had run up 82 contacts in 17 grids. Not bad for a few hours of unannounced operation conducted on a noncontest weekend. K2TXB reports on a grid expedition of his own conducted Monday evening August 27 from 4237-foot Sugarloaf Mountain in Maine (FN45). In Russ's case, he had to haul all of the equipment, consisting of an FT-726R, a 150-W Tokyo Hi-Power amplifier, a Cushcraft 11-element beam, car battery and charger, up the mountain on a ski lift. The operators of the lift were kind enough to transport him and his gear to the top as evening approached and get him down the following morning. Like WA3FYJ's operation, this one was not particularly well heralded. Nevertheless, K2TXB/1, thanks to a slight tropo enhancement, was able to work some 120 stations, the farthest being WB8BKC in Michigan. A number of stations down the coast as far as the Washington area were also contacted. K2TXB also comments on his success at the home QTH since getting on 2 meters from southern New Jersey in May 1984. At the time of his letter, sent in early December, he had managed to work 39 states, two of which were by EME with his nonelevatable array of two KLM 16LBXs. The top beam is at 82 feet. The rig consists of the FT-726R driving a pair of 4CX250Bs. An ARR GaAsFET preamp rounds out the station.

A DXpedition, somewhat more ambitious than those just described, is planned for next summer from the west coast of Ireland. Over a two-week period beginning August 17, a group from the West Kent Amateur Radio Society will be set up with high power and good antennas at an optimum location for a good takeoff toward North America. Their object is to make terrestrial 2-meter contacts with one or more stations on this side of the Atlantic, a first if they are successful. Those located near the East Coast who might be interested in participating in these very interesting tests are urged to contact Dave Green, G4OTV. Mailing address is 13 Culverden Down, Tunbridge Wells, Kent TN4 9SB England. Those preferring to phone may reach Dave at 0892-28275.

The December issue of the *2-Meter EME Bulletin*, put out by KB7Q, contains an interesting account of the trials and tribulations of putting 4U1ITU on 2-meter moonbounce. The station should be in operation by the time you read this. Those wishing a sked may contact G. H. Grayer, G3NAQ, EP Division, Cern, CH-1211, Geneva 23, Switzerland. The same issue includes the informal results of many who participated in the ARRL EME Contest. It is truly amazing to read the accounts of some of these stations. Moonbounce has truly come of age.

1¼ Meters — WB2IEY near Rochester, New York, reports a major improvement in his 1¼-meter station. Tom went from 120 W to an 11-element Yagi to 300-W output from one of the AM-6155s recently available from Fair Radio. He is also in the process of putting up four 13-element WBØTEM Yagis on an Az/El mount. Particularly sought are schedules with stations in New Hampshire, Delaware and North Carolina. WB2IEY can be reached at 716-394-3712. Tom also comments that there are now several stations active on 1¼ meters in the Rochester area, with major operation Tuesday evenings between 1900 and 2230 local time.

Included with the above report is a copy of the Rochester VHF Group's *VHF Journal*, which looks like an especially interesting club newspaper for those interested in the spectrum above 50 MHz. It is available at $3 per year for nine issues.

The Higher Bands — This is not the time of year for tropo reports, but there are a few, nevertheless. WB4SLM says that the evening of December 9 was quite good from his Georgia QTH (EM82). After working WA5ZEP and KB5PX in Louisiana (EL49) on 2 meters, he QSYed with KB5PX to 70 cm and was able to work the station with a 5 × 1 report using 25 W and 25-element beam at 40 feet.

K5DHU (EM23) says that he is active on 70 cm and 23 cm and is looking for skeds. On the higher band, Bob has 50 W to a pair of 40-element loop Yagis providing a reliable working range of about 300 miles. Address is Bob Herrin, 5609 Larry Dr., Texarkana, TX 75503.

W4HHK furnishes one terrestrial and one EME report on his 13-cm activities. The terrestrial work occurred back in November when WB5LUA brought a 13-cm mobile rig to Arkansas. While in motion, Al contacted W4HHK, N4MW and WA4HGN, the latter over a 125-mile path. This gave all three a new state, number seven for W4HHK. This took place just prior to the passing of WA4HGN, reported last month. Paul's other news concerns his first 13-cm EME QSO with Europe. On December 8, he made the grade with OE9XXI with M/O reports. OE9XXI had earlier worked WA4HGN for the first Europe-to-North America contact on the band. W4HHK now has schedules with DFØEME, YU1AW and YU2RGC. This spring he expects to improve his results significantly with a dish-mounted, low-noise preamp and a circularly polarized feed.

Other 13-cm news comes from N3CX. Dave notes that there are now four stations on the band in the Philadelphia area. His first QSO was with WA3AXV, a distance of 28 miles. Despite his low power, 1.5-mW output, Ron was able to copy him about four S units above the noise. The signal was undoubtedly helped by Dave's four loop Yagis at 65 feet. N3CX says that WA3AXV's 1 W was S9 plus 40 dB. Another UHF news item from the same part of the country comes from WA3IAC, Trevose, Pennsylvania. Chuck reports that he is now active on 70 cm, 13 cm and 3 cm, and is looking for business on any and all of these bands. An appropriate marriage of one of our highest-frequency bands with our lowest is cited by WA1JOF. Don notes that an informal net is being held at 2030 Eastern Time, Wednesday evenings, on 1875 kHz to discuss 23-cm matters. An item appearing in the December *432 and Up EME Newsletter*, put out by K2UYH, states that the idea of holding a Spring

The 28-foot dish installed at WA4HGN Savannah, Tennessee. Before his passing, in November, Bill was involved in 13-cm EME and terrestrial work, and has just begun operation on 70-cm EME. *(W4HHK photo)*

EME contest for 70 cm and the higher bands is being discussed. K1FO and WA1RWU have apparently volunteered to handle the paperwork. Those with views on the subject might wish to contact one of them with expressions of interest or offers of assistance.

WØPW writes that he is proposing to sponsor a conference next fall devoted solely to 23 and 13 cm. Don says that plans call for it to be held at Estes Park, Colorado, the weekend of September 20 through 22. Those who might be interested in attending such an affair are urged to write to Donald L. Hilliard, P.O. Box 563, Boulder, CO 80306.

At its November 19 meeting, the ARRL Executive Committee charged the VUAC with the task of generating a proposal for a 13-cm band plan. Following recent FCC action, this band now consists of two segments, 2300-2310 MHz and 2390-2450 MHz. This split assignment certainly complicates the committee's job of coming up with a plan that adequately provides for varied interests from weak-signal moonbounce to ATV. VUAC Chairman Dick Jansson, WD4FAB, requests inputs from all present and potential users of this portion of the spectrum. Suggestions may be sent via VUAC Headquarters Liaison Mark Wilson, AA2Z, at ARRL Hq., or directly to WD4FAB at his *Callbook* address.

1¼ Meter Standings

For WAS holders, listing is WAS number, call, state, call areas worked and grids worked. For others, call, state, U.S. states worked, call areas worked and grids worked. Call areas are the 10 U.S. call areas plus KH6 and KL7 plus each VE and XE call areas plus DXCC countries not located within the continental limits of the U.S., Canada or Mexico. In order to make the standings a true reflection of stations currently active on 1¼ meters, those not reporting activity within the past two years have been dropped. They will be reinstated upon written presentation of continuing activity. It is not necessary to have worked additional states in order to remain in the standings or to be reinstated. Merely indicate that you are still on the band. WAS holders are listed in any case. Compiled December 15, 1984. Deadline for next update is June 10, 1985.

WAS Holders				
1	WØVB*	MN	13	—
2	WØSD*	SD	—	—
2	WBØTEM*	IA	—	—
4	K5FF*	NM	14	—
5	W5FF*	NM	13	—
6	WB5LUA*	TX	—	—
7	VE3EMS*		14	—

W1JR*	MA	41	14	65
K1FO	CT	22	7	—
K1PXE	CT	18	6	—
W1GXT	MA	15	9	—
W1YTW	ME	14	8	—
W1HDQ	CT	13	5	—
W1QXX	MA	13	5	—
K1JIX	MA	13	4	—
K1LPS	VT	12	6	—
WA1JOF	MA	11	5	15
W1AZK	NH	10	3	—
K1BFA	MA	10	3	—
W2CRS	NY	21	—	—
W2PGC	NY	20	9	—
K2CBA*	NY	19	7	—
W2DWJ	NJ	15	6	—
K2DNR	NY	15	6	—
K2YCO	NY	14	7	—
WA2FGK	NJ	14	6	—
WA2FUZ	NY	14	5	—
W2WW	NY	13	5	19
W2SEU	NY	13	5	—
WB2EIY	NY	12	7	24
WA2YWP	NY	6	2	—
W3GPY*	PA	40	12	—
K3HZO	MD	22	10	17
N3CX	PA	18	—	—
W3UJG	MD	15	8	—
W3RUE	PA	14	8	6
W3HMU	PA	14	4	—
W3IP	MD	13	6	—
WA3JUF	PA	12	5	—
K3IUV	PA	12	4	—
W3XO	MD	9	4	—
WA4NMA	GA	25	8	—
WD4DGF	TN	24	8	44
W3IY/4	VA	23	10	—
K4LHB	VA	21	9	—
WA4CQG	AL	20	—	—
WD4IIS	GA	18	7	—
WA4PCS	KY	18	7	—
K4GL	SC	14	6	—
WA4SBC	VA	14	5	—
WA4MVI*	SC	12	7	—
KC4P	AL	9	2	—
WA4LYS*	FL	6	6	6
K4IXC	FL	5	3	—
W5RCI	MS	30	7	—
K5CM	OK	22	—	—
W5HN	TX	21	—	—
K5SW	OK	15	7	—
N4JS/5	MS	13	7	—
N5KW	OK	12	—	—
K5JL	OK	7	4	—
WA5VJB	TX	7	4	—
W5NZS	OK	4	2	—
WB6NMT*		10	6	—
W6WSQ		6	4	—
W4WD/7*	UT	37	10	25
K7NII*	AZ	16	11	—
W7JF	MT	8	5	—
W7CNK	WA	6	3	—
K7ICW	NV	4	2	—
WB8BKC	MI	31	9	55
W8IDU	MI	25	8	—
WA8TXT	OH	20	10	—
WB8PAT	OH	16	8	—
K8AXU	OH	12	7	—
K8HWW	MI	11	7	—
K9MRI*	IN	34	9	—
K9XY*	WI	28	13	—
K9HMB*	IL	23	10	—
WB9SNR	IL	22	9	—
K9KFR	IN	11	6	—
KB9NM	WI	5	4	—
KAØY*	IA	32	11	—
KØDAS	IA	27	10	—
WØPW*	CO	20	8	—
KØALL	ND	17	9	—
KØTLM	MO	15	5	22
KCØQR	NE	14	4	18
KBØQR	NE	8	3	8
WAØNOK	MO	6	2	—
WBØZKG	IA	5	2	—
WAØQLP	SD	4	2	—
KCØW	ND	3	1	—
VE1UT		4	1	—
VE2YU		8	3	—
VE2DFO		7	8	—
VE2HW		5	2	—
VE3DSS		13	7	—
VE3AIB		10	12	—
XE2BC*		2	3	—

*Indicates some contacts via EME.
-Indicates information not furnished.

YL News and Views

Conducted By Jean Peacor,* K1IJV

The King of Antennas — Is It Worth It?

The following was contributed by Clair Lawyer, WB3LGS, of Hanover, Pennsylvania.

It all began about three years ago. A large tractor trailer pulled up in front of our home. The driver asked if there was anyone to help him with the tower. Naturally, I said yes — me. He just laughed. I didn't realize how heavy the tower was. After much grumbling, he finally managed to get it off the truck and onto our front lawn. That was the beginning of our project.

About a week later, the four-element cubical quad arrived and was sitting down in York, Pennsylvania, at the truck terminal. They called to arrange for delivery, but being the overly anxious ham that my husband, Mark, W3ZY, is, he couldn't wait for it to be delivered. We put some rope in the car and headed for York — about 20 miles away. Three giant boxes faced us upon our arrival at the terminal. We finally got them tied to the roof and sides of the car, and headed home. That's when the fun really began.

The Fun Begins

In the process of digging the 6- × 6-foot hole for the tower, we dug up the sewer link and had to have it repaired. Now we had a hole full of water. When we finally got all the water and mud out and prepared to set the tower, it rained for several days, filling up our hole once again. After much frustration, the cement truck arrived. The bottom of the tower was set and the cement poured — six yards of thick, ugly-looking gook. We let it set up for a week, then the crane came and set the rest of the tower on top of the base.

Next came putting the quad together. It was set up on 2 × 4s, off the ground, as my husband and I worked on it. All went well until the day of a big wind storm. The wind blew the half-finished quad off the 2 × 4s. Mark was at work and our three girls were in school. I ran out back and managed to get one end back up, but couldn't get the other end back up. I couldn't let it hang on the ground for fear it would break the fiberglass arms. So for about 45 minutes, until the girls came home, I stood in the yard and held it up off the ground. The girls helped me put it back up on the 2 × 4s. Finally, the quad was finished and up.

It worked very well for about two years. We worked a lot of DX with it, and Mark also used it for SSTV. In 1983, he won the *A5* worldwide SSTV contest using the quad. One week (to the day) after the contest, we had a very bad storm, with winds of up to 100 miles per hour — never touched the quad, but did split a large tree next door. The neighbor decided to take the tree down himself. In the process, a large limb fell across our coax and motor cables, tearing them out. We were out of commission and stayed that way for the winter. When the time came in the spring to repair it, Mark decided to add two more elements and extend the boom to 50 feet.

Once again, the tractor trailor pulled up in front of our home with a giant box of extra parts. I had the driver put the long box beside the house. When our daughter Diane came home from school, we carried it into the house. It went from the living room right through to the kitchen. The excitement began to grow. The work was about to begin.

The boom had to be drilled and fitted as it was extended to 50 feet. New pipe, rope and turnbuckles had to be obtained. The 2 × 4s were brought out once more. Then came the day the big crane came to take the four elements down. Many a night, dinner was ready but Mark was not as we performed the task of taking off elements, building new ones and extending the boom out to 50 feet. He just couldn't stop working on his monster antenna. All parts were checked and rechecked over and over again. When the big day finally came for the crane to arrive, we were up at the crack of dawn.

The straps were wrapped around the boom. It started to lift off the ground; the excitement mounted. They got it to the top of the tower, but the quad was top heavy on one side — it tilted. The pipe wouldn't go into the top of the tower. They lowered it to the ground, retied the straps and added a guide rope on one side of the antenna. Up it went again, and this time we struck pay dirt. The pipe went right into place. The bolts were secured, and we witnessed a dream come true for W3ZY.

Two days later, we had another very windy day. I looked out back and asked Mark if he had turned the quad — it was facing in the wrong direction. We watched as the wind blew and the quad turned completely around with the wind. It was back up the tower the next day to find that the bolt into the motor had sheared off. Back up the tower with drill in hand; a ¼-inch hole was drilled into the plate and pipe. The plate had to be loosened, as a U bolt had also broken off. The pipe slipped out of the motor and got stuck in the tower. It was too heavy to lift back up by hand. There hung the monster, lopsided.

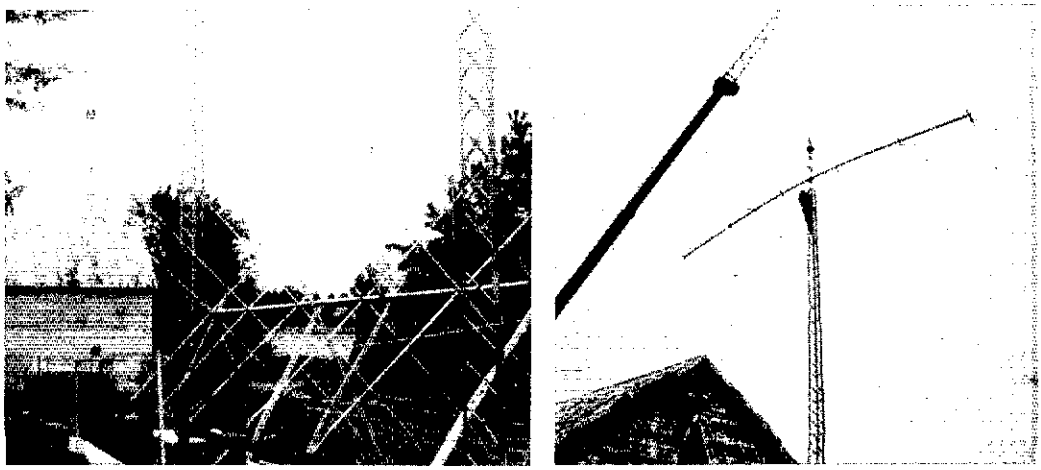
Urgent SOS

An urgent SOS went out to the crane service. After some frantic moments, the monster was put back in place in the motor. We were in business again. That lasted about three days. All of a sudden the motor wouldn't turn the quad. The motor had burned out. The second motor, lasted a little longer; at the time of this writing, the crane arrives again tomorrow to install a prop pitch motor. They say it will turn a house. So if it won't turn the quad, maybe we can turn the shack!

The antenna is fantastic and worth all the trouble and frazzled nerves it caused at times. We have worked countries we didn't even know existed. Would we go through it again? I wouldn't be surprised to see a tractor trailer pulling up in front of the house soon. Mark is now talking about a six-element 40-meter quad. This one will be the challenge of all challenges. If your OM wants to build a monster antenna, or start a large project, by all means get involved. It is an experience you will never forget, and is well worth it.

*Country Club Dr., Monson, MA 01057

Clair Lawyer, WB3LGS



The King of Antennas — on the ground (left) and skyward bound.

On Line

Conducted By Stan Horzepa,* WA1LOU

Packet Radio — What's the Difference?

Recently, I received a postcard that contained the following note:

"Stan — a suggestion. It seems time that AX.25, the VADCG, Tucson, etc. systems be defined in ordinary terms. I simply cannot tell the difference between them ... a simple explanation would really help us all."

That's the assignment for this month's On Line. The differences will be delineated from two perspectives: historical and functional.

A Bit of History

In the late 1970s, the Vancouver Amateur Digital Communications Group (VADCG, 818 Rondeau St., Coquitlam, BC V3J 5Z3, Canada) adopted a set of operating procedures (a protocol) for amateur packet radio operation that became known as the "Vancouver" or "VADCG" protocol. At the same time, Doug Lockhart, VE7APU, designed a terminal node controller (TNC) — that is, the hardware to run the VADCG protocol. VE7APU's TNC became known as the "Vancouver" or "VADCG" board.

In 1981, the Tucson Amateur Packet Radio Corporation (TAPR, P.O. Box 22888, Tucson, AZ 85734) designed hardware that combined a TNC with a modem, and it became known as the "TAPR board."

In 1982, a meeting of U.S. packet radio enthusiasts was called by the Amateur Radio Research and Development Corporation (AMRAD, P.O. Drawer 6148, McLean, VA 22106), and it resulted in the adoption of a new packet radio protocol based on the commercial packet protocol CCITT X.25. This protocol became known as the "amateur X.25" or "AX.25" protocol. (TAPR decided to use both the AX.25 and VADCG protocols in the TAPR board.)

In 1983, the following additions to the packet radio family were introduced:

Bob Richardson, W4UCH (Richcraft Engineering Ltd., 1 Wahmeda Industrial Park, Chautauqua, NY 14722), wrote a program for the Radio Shack TRS-80® computer, Models I, III and IV, that emulated a TNC running the VADCG protocol. This became known as the "software approach" to amateur packet radio. Later, W4UCH used the software approach to emulate a TNC running AX.25.

Bill Ashby, K2TKN (Box 322, Plockemin, NJ 07978), designed an updated and more compact version of the original VADCG board that runs either the VADCG or AX.25 protocol. GLB Electronics (1952 Clinton St., Buffalo, NY 14206) produced a board (the PK1) that uses the software approach to emulate a TNC, but instead of running software on a computer the software is burned into an EPROM (erasable programmable ROM). It includes both the VADCG and AX.25 protocols.

In 1984, Advanced Electronic Applications, Inc. (AEA, P.O. Box C-2160, Lynnwood, WA 98036) introduced a clone of the TAPR board. AEA's PKT-1 is assembled and tested, whereas the TAPR board is a kit.

To date, there are five packet radio boards — VADCG, TAPR, Ashby, GLB and AEA — and two packet radio protocols — VADCG and AX.25. Any TNC can run either the VADCG or AX.25 protocol.

All of the hardware serves the same function — that is, the function of a TNC. The differences are found in the protocols being used by the hardware. The primary differences between the VADCG and AX.25 protocols are described in the remainder of this column.

Addressing

The address is included in a transmitted packet to indicate the source and destination of the packet. In VADCG, the address consists of a single byte (8 bits). In AX.25, the address consists of the stations' call signs and a number (0 through 15) that is the secondary station identifier (SSID).

The disadvantage of the VADCG single-byte address is that if there are a lot of stations operating on the same frequency, more than one station is likely to have the same address, and confusion will result. In AX.25, the address always includes the call sign, and because no call signs are the same, there is never a problem of more than one station having the same address. (In cases where an individual has several packet radio stations on the air under one call sign, the different stations are differentiated by the SSID.)

Therefore, on frequencies with a limited number of users, VADCG's shorter address may be used for quicker information exchange; whereas, on frequencies with a large number of users, AX.25 may be used to take advantage of the unlimited number of addresses.

The ARRL Board of Directors, in October 1984, approved AX.25 as the standard amateur packet-radio link-layer protocol (see Dec. 1984 *QST*, p. 35). Copies of the complete protocol specification are available from ARRL Hq. for $8 ($9 in Canada and elsewhere), payable in U.S. funds only.

Repeater Operation

Any powered-up packet radio station using a TAPR board can be called upon to function as a repeater. For example, if I want to send a packet to a station in the other end of the state and I cannot connect with that station directly, I can use any intermediary station to repeat my packet to its destination. All that is necessary to accomplish this is to know which intermediary stations are on the air and to enter the intermediary station's address into my TNC. As many as eight intermediary stations may be used to get my packet across to its destination. The VADCG board does not automatically become a repeater on command, although it makes a fine repeater with appropriate EPROMs.

Hopefully, that clears up some of the confusion that newcomers to packet radio encounter. If not, write and I will try to get it right next time.

EPSON QX-10 HAM APPLICATIONS?

Bill Files, W3SAY, would like to get in touch with amateurs who use the Epson QX-10 computer and are interested in sharing programs, ideas and other items of mutual interest. Bill may be contacted at 900 S. Glenn Circle, State College, PA 16803.

PX: Apple II and VIC 20™ RTTY

Four new offerings are now available in the PX library:

Program number 64 is a BASIC RTTY reception program for the Apple II computer written by Andre Bedard, VE2FNF. The program requires no external hardware and is capable of receiving 45.45-baud Baudot.

Program number 65 is a machine-language RTTY reception program for the VIC 20 computer. Richard Porter, NB5E, with the assistance of John Wilder, WA5PFJ, wrote the program that is able to receive 60, 75 and 100-WPM Baudot.

Program number 66 is Tom (WA6ALA) and Joe Firestine's contest program for the TRS-80 Color computer. It is written in BASIC and requires 16 kbytes of RAM.

Program number 67 is a BASIC program that calculates intermod. It is written by John Warren, N6BER.

New versions of program numbers 39 and 55 are now in the PX library. The new number 39 is from Ulf-Dietmar Ernst, DK9KR, and it corrects an error in line 1390 (replacing value 0.172 with 0.0172). Ron Klein, WØOSK, provided the new number 55, which now allows the program to respond to desired speed changes by replacing the ± key with the backslash key in lines 150, 260, 300, 310, 390, 890 and 1010.

To obtain a listing of any PX program, send a business-size s.a.s.e. with 37 cents postage to ARRL, Dept. PX, 225 Main St., Newington, CT 06111. Use a separate s.a.s.e. for each program request and write the PX program number of the desired program at the lower left-hand corner of the s.a.s.e. Please do not send correspondence other than PX requests to Dept. PX, ARRL Hq.

*75 Kreger Dr., Wolcott, CT 06716
CompuServe ID no. 70645, 247

In Training

Conducted By
John Foss,* W7KQW

NEW ELEMENT 3 QUESTIONS INTRODUCED

A new set of Technician/General class Amateur Radio exam questions will be used by Volunteer Examiners starting this spring. The FCC released a new version of PR Bulletin 1035B in November 1984. These 500 Element 3 questions are to be incorporated into Technician/General class exams no later than six months after the question-pool release date. The phase-in period will allow Amateur Radio publishers to update study material, Volunteer Examiner Coordinators to prepare new exams and test examinees to study the revised pool. Starting April 1, 1985, the new questions will be used on all Technician/General exams coordinated by the ARRL/VEC. Until then, the original 1035B, dated October 1983, will be used.

The FCC has established a schedule for each Amateur radio question pool to undergo an annual review and possible revision. The Element 3 question pool has now completed its first cycle, and a new list is on deck. According to the *FCC Study Guide* (PR Bulletin 1035), questions for each grade of license may be submitted by qualified radio amateurs. Guidelines are explained in April 1984 *QST*, p. 59. The *FCC Study Guide* has not been revised; therefore, all Amateur Radio exam questions are still based on this topic outline.

Seventy-five percent of the questions in the October 1983 PR Bulletin 1035B were changed in some way. Some syllabus topics show expanded coverage on the test, whereas other topics were cut back. Most questions in the first four subelements were replaced. What differences should you look for in the new PR Bulletin 1035B? Some highlights follow.

All questions on Rules and Regulations have been changed, and this has generally improved question stems. Many questions are now more readable and easier to understand. This improvement can be seen throughout PR Bulletin 1035B. New questions about amateur operator responsibilities in emergency and third-party-traffic situations appear for the first time. Limitations on the use of Amateur Radio frequencies no longer stress television (A5 or F5) emissions. Six questions in that area were deleted, but six questions on digital communications were added to reach a balance in Subelement 3A.

Candidates who are studying Operating Procedures (Subelement 3B) will run across a set of different questions. Full break-in telegraphy and VOX transmitter control are now covered briefly because seven questions were deleted from each topic. New questions on radio teleprinting and operating courtesy were added. A new topic appears under Operating Procedures and, as a result, there are three new questions about Amateur Auxiliary. The FCC Field Office Bureau oversees this new program, which allows radio amateurs to take a more active role in monitoring amateur frequencies. See August 1984 *QST*, pp. 11-13, for details.

Under Radio Wave Propagation (Subelement 3C), another new topic has been introduced. Geomagnetic disturbance is the subject of three new questions on 1035B. Examinees may be asked to define geomagnetic disturbance and describe the effects it would have on radio communication. The questions about sunspot cycle have been replaced with ones on solar flux. Examinees need to learn what solar flux index values represent in relation to radio-wave propagation.

Amateur Radio Practice (Subelement 3D) deals with safety precautions, test equipment and proper use of station accessories. About one-fourth of the original 1035B questions in this subelement remain. Additional questions about household ac supply and electrical wiring safety have been added. Since the FCC now measures transmitter power at the output, all questions have been revised to reflect these changes.

Most major revisions in PR Bulletin 1035B were within the first four subelements. The Signals and Emissions category (Subelement 3H) has a new set of questions for emission type, and six new questions were added. The questions in the remaining subelements (Electrical Principles, Circuit Components, Practical Circuits, and Antennas and Feedlines) were practically untouched during this revision.

The November 1984 release of PR Bulletin 1035B is available from ARRL Hq. To receive a copy, send a business-sized s.a.s.e. to ARRL, Special Requests Desk, 225 Main St., Newington, CT 06111. Please specify PR Bulletin 1035B, November 1984. — *Steve Ewald, WA4CMS, Assistant Training Manager*

*Training Manager, ARRL

Amateur Satellite Program News

Conducted By
Bernie Glassmeyer,*
W9KDR

CAPACITY CROWD HEARS SPACE SYMPOSIUM, ANNUAL MEETING

If crowd size and reaction are satisfactory indications, AMSAT's Second Annual Amateur Radio Satellite Symposium and the 1984 AMSAT Annual Membership Meeting were outstanding successes. More than 200 attended the November 10 meetings at the Los Angeles Amfac Hotel. The daylong program featured speakers from around the world and drew attendees from as far away as Australia (VK5AGR), Tasmania (VK7PF), New Zealand (ZL1AOX), England (G3YJO, G8NOB) and Japan (JA1ANG).

In every sense the events were an unqualified success. This was due to excellent organization and preparation by W6SP, AD6P and N6DD. Here's a synopsis of the day's events.

Registration for the symposium began promptly at 0800 with Office Manager Martha Saragovitz and Laura Yowell (XYL of AD6P) staffing the registration desk, under the overall guidance of N6DD. Registration went smoothly despite the occasionally long queues. Promptly at 0900, AMSAT Chairman and Symposium Facilities Chairman John Browning, W6SP, opened the session. He was followed by Cleyon Yowell, AD6P, Symposium Technical Chairman. With the preliminaries passed, the technical session itself began.

First off was Al Dayton, KA4JFO, who described "Advanced Gateway Concepts" to the enthusiastic audience. Al described a plan whereby a group of Amateur Radio clubs and organizations would purchase a geosynchronous satellite, complete with several "C" band transponders, and give access to the average ham through numerous gateway stations. The gateways, or teleports would serve large communities of Amateurs, according to Dr. Dayton.

Next, AMSAT Director Harry Yoneda, JA1ANG, presented a fascinating preview of the exciting JAS-1 satellite being built entirely in Japan by JARL and JAMSAT and scheduled for launch by NASDA, Japan's national space agency. The paper, written by JK1VXJ with technical help from JR1SWB, was translated and reported by JA1ANG. The audience learned of plans for a February 1986 launch of JAS-1. According to JA1ANG, "JAS-1 will have two missions to perform: One will be to provide amateurs with a JA mode — that is Mode J Analog mode — transponder similar to JAMSAT's Mode J that AO-8 carried, with 2 meters up and 70 cm down. Second is to provide a JD mode — that is a Mode J digital store and forward transponder utilizing packet radio technology." Launched by the Japanese H1 launcher, JAS-1 is expected to have a 1500-km orbit inclined 50 degrees to the equator, according to JA1ANG.

ARRL Technical Department Manager Paul Rinaldo, W4RI, described progress in amplitude compandored sideband (ACSB) techniques. Paul described initial experiments performed recently at ARRL Headquarters. He then explained Project Companion, a joint ARRL-AMSAT Project OSCAR effort designed to encourage the use of the spectrum-efficient ACSB technique on the ham bands. Paul explained that by using special compression techniques, along with some other "tricks," very substantial improvements in signal-to-noise ratio and intelligibility have been noted by land-mobile users of advanced ACSB radios. Field and laboratory tests performed by the FCC showed excellent results, Rinaldo said. Paul's talk was supplemented by those of Jim Eagleson, WB6JNN, and Paul Shuch, N6TX, both of Project OSCAR. The two have been among the leaders in getting ACSB on the ham bands. Jim showed several graphs indicating quantitative improvements realizable with ACSB. He then played several taped QSOs, showing the improvements of ACSB over conventional SSB. Jim pointed out that ACSB, like FM, had a pleasing, quieting effect. He also showed some circuits he has developed for effective audio compression.

At 1100, Bob Diersing, N5AHD, gave an excellent presentation on "Computers and the Satellites." Bob focused on systems he has developed to track and decode the telemetry of the UoSAT satellites. Bob revealed many of the techniques he has developed and which have distinguished him as the outstanding UoSAT telemetry expert in this hemisphere.

At 1300, a distinguished group from the World Space Foundation spoke on the Solar Sail Project. Foundation president Robert Staehle, Mark Bergham and Chauncey Uphoff each explained a different aspect of the Solar Sail Project, including its history, purpose, initial tests, program outline and some of the options that would rely on Amateur Radio for telemetry and communications. One would have the Solar Sail in a nearly geosynchronous orbit. Another would have the sail in a lunar orbit. K8OCL explained the agreement between AMSAT and the World Space Foundation to explore means of cooperation in future projects.

Next, another distinguished group presented a review of the latest happenings and progress on the PACSAT project. Speakers included PACSAT Project Manager Harold Price, NK6K, Wally Lindstruth, WA6JPR, Rick Fleeter, WA8VGK, and Phil Karn, KA9Q. NK6K narrated a slide presentation on the PACSAT program. WA6JPR described some of the experiments that he and others are performing in California. WA8VGK discussed some of the propulsion motors being considered for PACSAT. This is an especially important aspect of PACSAT engineering since the anticipated Shuttle launch will be too low for PACSAT; it will need to be boosted up by several hundred kilometers. KA9Q described progress on advanced modems and solicited help in designing PSK modems that will resist the anticipated radar interference the satellite is expected to encounter when in orbit.

Martin Sweeting, G3YJO, UoSAT Programme Manager, next summarized the status of both UoSAT-OSCARs 9 and 11. He said that both spacecraft were behaving well and that UO-11 had been stabilized, resulting in improved link performance. A brief slide presentation showed the preparations that led to the launch of UO-11 last March.

Tom Clark, W3IWI, explained some of the economic factors that determine what projects can be built and what expenses AMSAT absorbs in order to keep the organization running. Tom pointed out especially the cost of publications in proportion to the overall annual budget of $250,000.

Bill Tynan, W3XO, gave a progress report on future "Ham-In-Space" activities. Bill noted that approval of the joint ARRL-AMSAT proposal for W0ORE to take along a variety of Amateur Radio equipment was thought to be imminent. Among equipment expected to be approved, according to W3XO, was a 2-meter scanning receiver, 2- to 10-meter scanning repeater and slow-scan television (SSTV) with a 10-meter downlink. Bill said it appeared everything was in order for a 1985 flight, but that the exact date of the Shuttle flight was not yet fixed.

Closing the technical program, WA2LQQ spoke of future advanced-satellite projects. Rip claimed that an appraisal of Amateur Radio indicates that the time may be right to begin serious consideration of a system of geosynchronous Amateur Radio satellites for continuous global coverage. He cited some of the basic

(continued on page 67)

*Satellite Program Manager, ARRL

Silent Keys

Administered By Marvis Bogatz

It is with deep regret that we record the passing of these amateurs:

W1BWH, Rodney A. Merrill, Attleboro, MA
W1CMW, Roger W. Dodd, Danvers, MA
WB1DVC, Nellie J. Miklos, Torrington, CT
W1IOH, Thomas C. Spiers, New London, CT
W1MED, Harold "Dutch" Sprague, Waldoboro, ME
W1ODS, Louis J. Maher, East Templeton, MA
W1TDI, Erwyne P. Seabury, Zephyrhills, FL
WA1TNG, John F. Crowther, Old Lyme, CT
W1TQH, Ivan L. Sheaf, West Southport, ME
K1UKR, George D. Noiles, Tavares, FL
WA1YAY, Edmund P. Henke, Bristol, CT
W1ZER, Alfred Hodgson, Springfield, MA
W1ZJ, Francis H. Bailey, Leicester, MA
N2BYR, Edward Galloway, Glens Falls, NY
WA2CGD, Charles H. Muir, Jr., Schenectady, NY
W2DJL, Earl M. Coomber, Cazenovia, NY
W2FMX, M. L. "Pete" Peterson, Waterville, NY
W2FN, Vincent J. Lapp, LeRoy, NY
WB2GMN, Henry Wymbs, Hartsdale, NY
WB2IGD, Hugo P. Scheuerman, Linwood, NJ
KC2II, James E. Jones, Holmdel, NJ
W2KTI, Frederic Ambrose, Titusville, FL
W2MCN, Michael Moscinski, Latham, NY
WA2MVW, Ralph C. Bradburn, Tallman, NY
*WB2NDI, O. Lewis Levitt, Brooklyn, NY
W2QBJ, Hazel R. Mulligan, Elmira, NY
K2ULN, Arthur A. Luhrs, Levittown, NY
W2UNQ, Robert J. Campbell, Mexico, NY
N3CM, Davis N. Bishop, Baltimore, MD
WB3KPP, Michael W. Kropp, Mt. Wolf, PA
*K3RS, Richard G. Price, Potomac, MD
W4AAV, Lawrence Eisler, Miami, FL
AA4BI, Arthur M. Shaw, Clearwater, FL
WD4CLG, Thomas R. Miles, Sr., Sharon, TN
K4DK, Raymond L. Moore, Chattanooga, TN
K4DQ, Karl K. White, Colorado Springs, CO
W4ERZ, Lesly W. Williams, Ft. Lauderdale, FL
W4FHT, James R. Crabtree, Maryville, TN
WD4FJZ, William H. Collier, Mobile, AL
N4GBO, Edith P. Roach, Vero Beach, FL
N4GZX, Richard K. Thompson, Lakeland, FL
WA4HGN, Bill Byrd, Savannah, TN
KA4JBC, Delmar L. Johnson, Oakland Park, FL
W4JBR, Thomas B. Ross, Jr., Colonial Heights, VA
WA4LCM, Robert O. Buckley, Charleston, SC
W4LTL, Carl Logan, Kings Mountain, NC
KA4N, Travis B. Wood, Ft. Lauderdale, FL
WD4NIX, Gordon L. Fella, Sr., Longwood, FL
WD4NYY, Kenneth L. Eckerle, Chipley, FL
KA4OTX, Warren F. Fortier, Clearwater, FL
*K4PUI, Glen R. Starkey, Jr., McLean, VA
WB4QXI, Jack L. Zimmerle, Fayetteville, TN
W4TRB, Thomas M. Whitsett, Fayetteville, TN
WB4URZ, Robert E. Cilley, Jacksonville, FL
WA4VBB, Robert L. Justice, Kissimmee, FL
W4VJR, Frank R. Crim, Sr., Akron, OH
*K4VPK, Wendell W. Collins, Bartlett, TN
W4YYS, Robert H. Wright, Maitland, FL
W5AXR, Howard M. Davis, Amarillo, TX
WB5FHN, Olin L. Chancellor, Mineral Wells, TX
WB5JFA, Edwin C. Pinner, Dallas, TX
W5YWU, Charles B. Whitfield, Roswell, NM
W5ZT, Jack W. Garriott, Conroe, TX
N6DHL, Frank F. DeMasi, Fontana, CA
W6EXM, Marvin M. Williams, Wills Point, TX
W6HA, Warren M. Andrew, Hemet, CA
W6HUJ, James E. Muncey, Carlsbad, CA
W6HVT, Robert K. Janeway, San Luis Obispo, CA
W6INR, Edward M. Hallwas, San Gabriel, CA
WA6JYQ, Robert F. Nash, Hemet, CA
W6LLE, Robert Hopkins, San Diego, CA
KA6LWG, Robert F. Brians, Grizzly Flat, CA
W6VBI, John M. Clarke, Sacramento, CA
*K7AGJ, Irving O. Litke, Ephrata, WA
WB7AKB, Robert E. Sailors, Gig Harbor, WA
WA7IKZ, George R. Hamill, Spokane, WA
W7IRD, Byron J. "Mac" McKinney, Manhattan, MT
W7KLU, Allen L. Dyer, Venice, FL
W7KWJ, John L. Ashe, Prescott, AZ
K7STG, Harold E. Smith, Eugene, OR
*WB7ULF, Robert E. Hilton, Steilacoom, WA
K8BMA, John K. Lucas, Columbus, OH
W8DUP, Robert R. Lowe, Parma, OH
W8GXI, Paul K. Rosenberg, Reynoldsburg, OH
KA8IGP, Muriel E. McNutt, Union Lake, MI
WA8IOZ, Robert E. Wootton, Parma, OH
W8IRG, Richard C. Littler, Springfield, OH
W8KMI, John W. Cooper, Birmingham, MI
W8OA, George W. Hale, Chardon, OH
WB8SKW, Byron E. Wilcox, Grosse Pointe Wood, MI
W8UB, Emery V. Qualman, Port Clinton, OH
W9FL, Maurice H. Nelson, Rockford, IL
K9KJE, Lloyd A. Jackson, Indianapolis, IN
W9LOM, James W. Woolsey, Wausau, WI
KA9NSF, Laurence E. Pennell, Van Wert, OH
W9PUI, Howard E. Baumgardner, Indianapolis, IN
KB9RR, Roland V. Lupient, Mosinee, WI
WB9TJK, Donald W. Lasiter, Greenwood, IN
W9YLD, Temple Nieter, Evanston, IL
KAØGCS, William H. Bishop, Montrose, CO
KØHPJ, Leslie C. Hindman, Jr., Grand Island, NE
WBØIZK, Herbert R. Baumgartner, Bridgeton, MO
KAØJFU, Arthur E. Sahly, Minneapolis, MN
WAØOMB, Wilkie "Tex" Pedigo, Omaha, NE
KFØV, Forrest S. Smith, Carterville, MO
VE3BSY, Stanley R. Swinerd, Peterborough, ON
VE3DPN, Harry W. Gasson, North Bay, ON
VE3FAM, Harry E. McNiff, Chatham, ON
VE7ATI, Margaret D. Tettelaar, Salmon Arm, BC
G3SM, Don W. Morgan, North Harrow, Middlesex, England

*Life Member, ARRL

In order to avoid unfortunate errors in the Silent Keys column, reports of Silent Keys are confirmed through acknowledgment only to the family of the deceased. Thus, those who report a Silent Key will not necessarily receive an acknowledgment from Hq.

Note: All Silent Key reports sent to Hq. must include the name, address and call sign of the *reporter* as well as the name, address and call of the Silent Key in order to be listed in the column. Please allow several months for the listing to appear in *QST*.

50 Years Ago

February 1935

☐ Brrrrr! The cover photograph is of a snow-clad antenna on the Mount Washington (N.H.) observatory, where 175-mph winds are not uncommon.

☐ The switch from separate station and operator licenses to a combination card is causing a renewal problem because of different expiration dates. The Editor undertakes to lead us through the new forms and procedures.

☐ The accent this issue is on antennas. John Reinartz, who 10 years ago proposed the now-accepted theory of short-wave propagation, expands on the subject with a novel antenna and feeder design aimed at fitting radiation characteristics to varying communications conditions.

☐ W1BDH surveys patterns of various antenna setups, pointing out the effects of low-angle radiation and — naturally — explaining impedance matching and coupling systems.

☐ The Zepp antenna is W3AQC's major interest, and after experiments with coupling systems he offers a unique end-fed arrangement that gives a high-efficiency match.

☐ Last autumn's elections were the first in which members had to indicate whether they held amateur licenses; more than 80% did. Some fella named Wayland Groves with the call W5NW won the West Gulf directorship over veteran incumbent Frank Corlett.

☐ Ross Hull uses a quarter-wave length of copper tubing as a grid inductance on a 2½-meter rig. The "circuit" is high *Q* and has an electrical "flywheel" action to help achieve stability.

☐ W2EKC built an eight-element stacked beam for 56-Mc. QSOs with Hartford and also 3rd district stations on that band.

☐ Quite a bit of interest in the new pentodes (802, RK-23, RK-25). George Grammer adds some operating characteristics for amateur use, and points out that as amplifiers the tubes should be shielded from excess grid-plate capacity to avoid self-oscillation.

☐ Station licenses are now issued only to holders of an amateur *operator* license. No more authorizations for telegraph schools and business colleges, as in the past.

☐ Partly to assuage a lingering animosity between die-hard 'phone ops and ditto c.w. telegraphers, the League is sponsoring a 'Phone-C.W. QSO Contest during two February weekends. And don't forget the big DX fray in mid-March — this year you cannot operate more than 90 hours during the nine-day contest period.

☐ Nearly 1000 Army amateurs copied the Armistice Day special message from Maj. Gen. Carr, who included commendation for amateur performance in emergency-communications work.

25 Years Ago

February 1960

☐ National publicity on amateur accomplishments makes us all proud, but the Editor points out that *local* coverage is what forms the community's view of us as individuals. The League has a number of helps and background for interviews, speeches and broadcast programs.

☐ The three main desirables in a receiver — selectivity, sensitivity, stability — were principal aims in a double-conversion amateur-band superhet built in the lab by W1ZIF. He says you can save quite a few dollars by building one yourself.

☐ W3KKO picked 28 Mc. for his transistorized super-regen "handie-talkie," built in a form convenient for one-hand operation. He had to try a number of SB-100 transistors before the oscillator worked to his satisfaction.

☐ Transistors can be rather noisy, especially in a mixer in a mobile job. W6ZNM's noise generator got a real workout in taming his receiver, but led to some useful conclusions on practical reduction techniques.

☐ Propagation is at once the most interesting and the most mysterious of phenomena we hams encounter. W7UIY tries to smooth the path for us with a recitation of fundamentals, followed by expansion on some current procedures of interest, such as scatter and knife-edge refraction.

☐ When General Manager Budlong returned from the four-month sessions of the world radio conference, he was surprised with a special plaque from the Hq. crew, who, perhaps more than any others, appreciated the outstanding accomplishment of preserving our bands in the face of foreign attacks.

☐ The cooling fan is almost as big as the rest of W1DXE's nifty 2-meter kilowatt amplifier, which can be operated in c.w., a.m.-voice or linear modes.

☐ Nothing was ever manufactured that some ham couldn't improve. The popular Hallicrafters HT-32 is no exception, and W6EVX revamped his to make use of the vox control system for telegraphy break-in.

☐ Among a collection of non-technical essays, W8CBM decries the "uuhhhs" and "aahhs" the sideband crew uses to excess to hold in the vox; W7RGL offers a number of homebrew axioms (e.g., "if a hay-wired unit functions perfectly, the rebuilt permanent model will malfunction"); and WØRRN makes a "plea for dignity" in hoping newcomers will cease the silly procedure of addressing QSL cards to "Chief Op" or "Chief Fuse Blower," or what have you.

☐ You don't need a kilowatt to compete in the DX contest. A survey shows that a fourth of last year's winners used less than 150 watts, and half were below 500 watts. — *W1RW*

FM/RPT

Conducted By Stan Horzepa,* WA1LOU

Fear and Loathing in the *Repeater Directory*

Future editions of the *Repeater Directory* will include a designation to differentiate between a repeater that has been coordinated by the area frequency coordinator and one that has not (so voted the ARRL Board of Directors at their October 1984 meeting). If there was any confusion as to what was what in past editions of the *Directory*, things will be clarified shortly. Soon you will be able to tell the good guys from the bad guys — the good guys being the coordinated, the bad guys the uncoordinated. (Maybe a skull and crossbones can be used to designate the uncoordinated.) Peer pressure is the name of the game. The FCC lets us run our own show (more or less), and peer pressure is one of the tools we use to cleanse the unwashed in Amateur Radio. How would you feel if you picked up the next edition of the *Repeater Directory* with page after page of repeater listings and came across your repeater's listing clearly designated as uncoordinated? Wouldn't you try to do something about it? If peer pressure does not bother you, maybe the FCC does. When push comes to shove in a repeater war and the FCC is called in to settle the matter, the FCC has let it be known that a coordinated repeater will win out over an uncoordinated repeater. And where's the first place the FCC will look to see who's coordinated and who is not? You guessed it — the *Repeater Directory*.

MONTHLY FM/RPT

At their last meeting, the ARRL Board of Directors also voted that this column appear in *QST* on a monthly basis. Why monthly? The vote of the Board reflects the state of the art of the Amateur Radio Service. FM repeaters is where the action is today. There are more amateurs active in the FM repeater mode than any other mode of Amateur Radio operation, and its popularity warrants monthly coverage.

What It Means to You

There are five active FM repeater bands (29, 52, 145, 222 and 450 MHz) and some others that are not as active. Obviously, I cannot be at all places at once, so I need your help in the form of cards, letters, diagrams and photographs concerning the FM repeater mode. If you are doing something unique, tell me about it. If you have an opinion on something, tell me about that, too. This space is yours to fill. You tell me, and I will repeat it to everyone else. (There's the telegraph, the telephone, and now there's teleStan.) My mailbox awaits!

TEXAS 20-kHz SPACING?

A meeting of the Texas VHF FM Society will be held February 16 in Arlington to decide whether 20-kHz channel spacing on 2 meters will be adopted in the Lone Star state. For more information, contact Society President Chuck Adams, WB5WRR, 4613 Collinwood, Fort Worth, TX 76107.

*75 Kreger Dr., Wolcott, CT 06716
CompuServe ID no. 70645,247

OHIO AREA REPEATER COUNCIL

The Ohio Area Repeater Council has adopted new bylaws and a constitution, and have elected a board of directors. Anyone having any questions, problems or information concerning Ohio repeaters should send all correspondence to Ohio Area Repeater Council, c/o Cliff Dice, KC8DF, 1375 Canaan Twp. Rd. 67, Edison, OH 43320.

NY AND S. ONTARIO ADDRESS CHANGE

Please note that the address of the frequency-coordinating body for Western New York and Southern Ontario has changed. The new address is Western New York-Southern Ontario Repeater Council, c/o Dr. David B. Toth, VE3GYQ, 499 Bobbybrook Dr., London, ON N5X 1GB, Canada.

REPEATER LOG

According to reports received at ARRL Hq., repeaters were involved in the following public-service events: 59 weather emergencies, 11 crimes, 36 medical emergencies, 499 vehicular emergencies, 23 fires, 8 search and rescues, 16 public safety events, 131 drills/alerts and 11 power failures.

The following repeaters were involved (followed by the number of events): W1AW 2, WA1DGW 55, K1FFK 3, WA1GTT 2, KB1JF 5, W1PW 1, K2BFO 1, N2GG 1, N2MD 1, WB2NHD 1, W2ODV 1, WB2OXB 1, WB2RUH 6, W2VDX 3, W2VL 76, WB2ZCM 2, WB2ZIY 1, WA2ZWP 12, N3BFL 41, W3CWC 1, WA3JDX 2, K3PSP 1, VE3TTT 2, W3UER 5, W3VRZ 6, N4CKE 5, WB4EHT 1, WK4F 1, WA4GIC 2, K4HEX 1, W4HHB 3, KD4JL 1, WB4QES 99, WA4SWF 14, WB4UPS 18, K4VUW 1, WA4WTX 1, W4WWQ 1, KD4XX 1, WB5KRH 1, KA5L 1, N6APB 1, W6APZ 1, W6ASH 6, WD6AWP 37, WB6BJO 1, WB6CAN 1, W6CX 1, KH6H 3, KH6HHG 10, W6HUK 2, N6IN 1, K6JE 13, KG6LF 1, WB6LSC 1, K6LY 1, WB6MFV 1, KA6MNA 1, WB6OQS 11, W6OYF 1, WA6UGY 1, W6WGZ 1, W7EX 218, W7HSG 3, W7MLJ 1, K7OMR 7, WB7PFO 1, WA7PQU 2, K7SKW 1, W7WGW 9, K8DDG 95, WA8EFK 2, WD8IEL 34, W8JI 2, KA8OFE 1, K8PE/Ø 3, K8QYL 5, WA8ULB 22, K9AAJ 1, N9BE 1, WDØBQM 15, WØCET 1, WØES 1, KØKKV 2, WØKUJ 3, WØMXW 4, WAØPEZ 1, WBØSBH 2, KØSCM 15, WAØVRS 1.

(continued from page 65)

Phase IV conceptual work recently completed by W3GEY and the so-called gateway concept, examined earlier by KA4JFO and others. In closing the technical program, WA2LQQ encouraged AMSAT members at large to recapture its former self-confidence and accept the challenge of developing and fielding a satellite system more generally available and convenient.

At the banquet awards ceremony, the AMSAT-Stoner 25th Anniversary Challenge Cup was presented to grand prize winner Nick Laub, WØCA. The cup, a silver champagne bucket on a walnut base standing nearly two feet tall, was presented by none other than Don Stoner, W6TNS. It had been Don who, 25 years earlier had openly mused about amateurs launching their own satellite. W6SP expressed AMSAT's thanks to the Northern California DX Foundation which sponsored the Challenge Cup as well as the other awards given to participants in the contest held earlier this year. WA2LQQ expressed thanks as well to Steve Place, WB1EYI, of ARRL Hq. for conceptual help with the contest, as well as KO5I, K8OCL and N2CF for establishing the contest mechanism.

An award was presented in absentia to Rich Zwirko, K1HTV, honoring him for his many years of service as both an AMSAT Director and Vice President for Operations. AMSAT president W3IWI accepted the award for K1HTV.

At 1900, the Annual Membership Meeting began with President Tom Clark, W3IWI, presenting a picture of major achievements over the last four years. Tom indicated where we are going and focused on our present quandary: too big to be a club, too small to be like ARRL. Following Tom's historical review, General Manager Bill Lazzaro, N2CF, gave a status report. Bill said AMSAT's present size is 5500 and shows a strong growth (36%) in annual members. He said expenses need to be trimmed and more monies allocated to spacecraft projects if growth is to be sustained for long periods. Bill concluded that the organization is generally in good condition despite the slight overexpenditure in the last calendar year. Moreover, he said, prospects for health and progress were excellent.

Following the presentations by the President and General Manager, there was an open discussion among the members and officers. Major topics included organizational objectives, information flow between groups and individuals, publications, perspectives of "U.S." AMSAT by those not living in the U.S. and the need to be more sensitive to external matters, namely diplomacy.

At 2300, with many questions left unfielded, the meeting was adjourned. It seemed that no one left disappointed. Although there was occasional controversy and some fine technical points that were not unanimously accepted, it was a statement of AMSAT's maturity. To stage such an event, to organize such a happening, to attract the caliber of talent abundantly in evidence, was testimony to a new level of AMSAT accomplishment. AMSAT is more alive now than ever and may have taken, in this one-day meeting, a great stride toward being a mature, well-rounded, self-confident organization of which greater things may yet be born!

Special Events

Conducted By Edith Holsopple,* N1CZC

Kwajalein: The Kwajalein ARC is sponsoring KX6BU from 0600Z *Feb. 1* until 0600Z *Feb. 9* to commemorate the 41st anniversary of the Battles of Kwajalein and Roi-Namur. Suggested frequencies: phone — 14.250 21.350 28.600; CW — 7.050 14.050 21.050 28.050. Requests for QSLs should be sent to KX6BU, Box 444, APO SF 96555-0008.

*Communications Assistant, ARRL

Vernon, British Columbia: The North Okanagan RAC will operate VE7NOR to commemorate the 25th anniversary of the Vernon Winter Carnival. Operation will be from 2100Z-2400Z daily *Feb. 1-10.* Frequencies will be 14.225 21.375 28.525. Send QSL info to Box 1706, Vernon, BC V1T 7T9, Canada.

Punxsutawney, Pennsylvania: The Punxsutawney ARC will commemorate Groundhog Day by operating from 1400-2200Z on *Feb. 2.* Suggested frequencies: 7.230 and 14.230. For certificate send an s.a.s.e. to Kevin D. Fultz, KA3GGZ, Rd 3, Box 161, Brookville, PA 15825.

Karlskrona, Sweden: The *HMS "Carlskrona,"* SL8CKR, has eight hams on board who will operate on its worldwide tour. Times will be at 1100Z, 1600Z and 2000Z on the following frequencies: CW — 3.533 7.033 14.063 21.063 28.063; phone — 3.770 7.070 14.163 21.163 28.563. The ship will be in the Singapore Harbor, *Feb. 3-7;* the Bombay Harbor, *Feb. 14-18;* the Tunis Harbor, *March 1-5;* the Bordeaux Harbor, *March 10-14.* The tour will end *March 19.*

Valentine, Indiana: The Ft. Wayne RC will operate "The Valentine Station," W9TE, from 1500-2300Z on *Feb. 9.* (Postponement date is *Feb. 16.*) Suggested frequencies are 3.910 7.280 14.285 21.385 MHz for phone, and 7.105 MHz on the Novice band. Certificate via P.O. Box 15127, Ft. Wayne, IN 46885.

Beaverton, Oregon: Oregon Tualatin Valley ARC will operate station KA7NPN from 0000-2400Z on *Feb. 10* in celebration of Valentine's Day and Oregon's 126th anniversary of statehood. Approximate frequencies: phone — 3.880 7.280 14.280 21.380 28.580. Large s.a.s.e. for certificate to *Callbook* address of KA7NPN.

Hilversum, The Netherlands: Radio Netherlands will operate two Amateur Radio transmitters using some of the largest directional shortwave antennas in the world. Operation will be for 36 hours only, from 0600Z *Feb. 16* until 1800Z *Feb. 17,* using the call sign PA6FLD (Flevoland) on both phone and CW modes.

St. Catharines, Ontario: VE3SAS will be active (possibly with a special prefix) from *Feb. 17-24* to celebrate the 75th anniversary of Guiding in the World. Look for this Girl Guide Jamboree on the Air on 10-75 meters, SSB, RTTY monitor 3.745 3.785 3.905 7.065 7.235 14.168 14.277 MHz. A special QSL card is available via Salvation Army Guides, 12 Frederick St., St. Catharines, ON L2S 2S2, Canada

Westland, Michigan: Girl Scouts of Troop 578 will operate N8CKH from 1500Z-2100Z *Feb. 23.* Suggested frequencies are 7.240 21.350 144.200. QSL with an s.a.s.e. to W. Wheeler, Box 204, Westland, MI 48185.

Note: The deadline for *receipt* of items for this column is the 15th of the second month preceding the publication date. For example, your information would have to reach Hq. by February 15 to make the April issue. For the convenience of those wishing to operate, please be sure that the name of the sponsoring organization, the location, dates, times(Z), frequencies and call sign of the special-event station are included. Requests for donations will not be published. QST

W1AW Schedule

October 28, 1984 — April 28, 1985 **MTWThFSSn = Days of Week** **Dy = Daily**

W1AW code practice and bulletin transmissions are sent on the following schedule:

UTC	Slow Code Practice	MWF: 0300, 1400; TThSSn: 0000, 2100; Sn: 0300
	Fast Code Practice	MWF: 0000, 2100; TTh: 0300, 1400; S: 0300; Sn: 0000
	CW Bulletins	Dy: 0100, 0400, 2200; MTWThF: 1500
	Teleprinter Bulletins	Dy: 0200, 0500, 2300; MTWThF: 1600
	Voice Bulletins	Dy: 0230, 0530
EST	Slow Code Practice	MWF: 9 A.M., 7 P.M.; TThSSn: 4 P.M., 10 P.M.
	Fast Code Practice	MWF: 4 P.M., 10 P.M.; TTh: 9 A.M.; TThSSn: 7 P.M.
	CW Bulletins	Dy: 5 P.M., 8 P.M., 11 P.M.; MTWThF: 10 A.M.
	Teleprinter Bulletins	Dy: 6 P.M., 9 P.M., 12 P.M.; MTWThF: 11 A.M.
	Voice Bulletins	Dy: 9:30 P.M., 12:30 A.M.
CST	Slow Code Practice	MWF: 8 A.M., 6 P.M.; TThSSn: 3 P.M., 9 P.M.
	Fast Code Practice	MWF: 3 P.M., 9 P.M.; TTh: 8 A.M.; TThSSn: 6 P.M.
	CW Bulletins	Dy: 4 P.M., 7 P.M., 10 P.M.; MTWThF: 9 A.M.
	Teleprinter Bulletins	Dy: 5 P.M., 8 P.M., 11 P.M.; MTWThF: 10 A.M.
	Voice Bulletins	Dy: 8:30 P.M., 11:30 P.M.
MST	Slow Code Practice	MWF: 7 A.M., 5 P.M.; TThSSn: 2 P.M., 8 P.M.
	Fast Code Practice	MWF: 2 P.M., 8 P.M.; TTh: 7 A.M.; TThSSn: 5 P.M.
	CW Bulletins	Dy: 3 P.M., 6 P.M., 9 P.M.; MTWThF: 8 A.M.
	Teleprinter Bulletins	Dy: 4 P.M., 7 P.M., 10 P.M.; MTWThF: 9 A.M.
	Voice Bulletins	Dy: 7:30 P.M., 10:30 P.M.
PST	Slow Code Practice	MWF: 6 A.M., 4 P.M.; TThSSn: 1 P.M., 7 P.M.
	Fast Code Practice	MWF: 1 P.M., 7 P.M.; TTh: 6 A.M.; TThSSn: 4 P.M.
	CW Bulletins	Dy: 2 P.M., 5 P.M., 8 P.M.; MTWThF: 7 A.M.
	Teleprinter Bulletins	Dy: 3 P.M., 6 P.M., 9 P.M.; MTWThF: 8 A.M.
	Voice Bulletins	Dy: 6:30 P.M., 9:30 P.M.

Code practice, Qualifying Run and CW bulletin frequencies: 1.818, 3.58, 7.08, 14.07, 21.08, 28.08, 50.08, 147.555 MHz.
Teleprinter bulletin frequencies: 3.625, 7.095, 14.095, 21.095, 28.095, 147.555 MHz.
Voice bulletin frequencies: 1.89, 3.99, 7.29, 14.29, 21.39, 28.59, 50.19, 147.555 MHz.

On Monday, Wednesday and Friday, 1400 through 2200 UTC, transmissions are beamed to Europe on 14, 21 and 28 MHz.

Slow code practice is at 5, 7½, 10, 13 and 15 WPM.
Fast code practice is at 35, 30, 25, 20, 15, 13 and 10 WPM.

Code practice texts are from *QST*, and the source of each practice is given at the beginning of each practice and at the beginning of alternate speeds. For example, "Text is from July 1984 *QST*, pages 9 and 81," indicates that the main text is from the article on page 9 and the mixed number/letter groups at the end of each speed are from the contest scores on page 81.

On Fridays, UTC, a DX bulletin replaces the regular bulletin transmissions.

On Wednesdays at 2330 UTC, an IARU Region 2 bulletin in English and Spanish on 45.45-baud Baudot is sent on the regular teleprinter frequencies, beamed to Central and South America. The 2300 UTC Teleprinter Bulletin transmission is also beamed south on Wednesdays.

W1AW bulletins are sent on OSCAR 10, Mode B, when the satellite is within range. Look for CW on 145.840 MHz and SSB on 145.972 MHz.

Teleprinter bulletins are 45.45-baud Baudot, 110-baud ASCII and 100-baud AMTOR, FEC mode. Baudot, ASCII and AMTOR (in that order) are sent during all 1600 UTC transmissions, and 2300 UTC on TThFSSn. During other transmission times, AMTOR is sent only as time permits.

CW bulletins are sent at 18 WPM.

W1AW is open for visitors Monday through Friday from 8:00 A.M. to 1 A.M. EST and on Saturday and Sunday from 3:30 P.M. to 1 A.M. EST. If you desire to operate W1AW, be sure to bring a copy of your license with you. W1AW is available for operation by visitors between 1 and 4 P.M. Monday through Friday.

In a communications emergency, monitor W1AW for special bulletins as follows: voice on the hour, teleprinter at 15 minutes past the hour, and CW on the half hour.

W1AW will be closed on February 18 and April 5.

Mini Directory

As a convenience to our readers, here is a list of items of particular interest and when they most recently appeared in *QST*.

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International DX Contest Rules	Jan. 1985, p. 73
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Major ARRL Operating Events and Conventions — 1985	Jan. 1985, p. 46
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IARU News

Conducted By Richard L. Baldwin,* W1RU

A Course in Amateur Radio Administration

The U.S. Telecommunications and Training Institute (USTTI) was established in September 1982, as a joint venture between major American telecommunications firms and the U.S. government, to share in telecommunications technology with developing countries. During its first two years, USTTI has trained more than 400 telecommunications managers, engineers and technicians from 70 countries. It is a nonprofit, independent corporation administered by a board of directors representing both industry and government, and is assisted in its operations by the International Division of the Academy for Educational Development in Washington, DC.

In June of this year, USTTI is offering a course, sponsored by ARRL and IARU, in Amateur Radio Administration. The course is being offered to senior government executives, middle managers, engineers and technical professionals with a working fluency in English.

This course will provide insights into the Amateur Radio Service and Amateur Satellite Service. The applicable frequency bands, international regulatory structures, technical standards and licensing procedures will be reviewed in depth. The course will be tailored, to a large extent, to the needs of the students. The principal instructor will be Richard L. Baldwin, W1RU, president of the International Amateur Radio Union. The objective will be to help create, administer and foster the Amateur Radio Service among the citizens of a country.

Orientation will take place on May 30 and June 1, and the course will be conducted from June 3 to June 7. Further information can be obtained by writing to USTTI, 1255 23rd St., NW, Suite 400, Washington, DC 20037, USA.

IARU POTPOURRI

☐ Under the provisions of the new IARU Constitution, adopted by the membership in 1984, the International Secretariat (ARRL), in consultation with the IARU Administrative Council, nominated Richard L. Baldwin, W1RU, as president, and Carl L. Smith, WØBWJ, as vice president. These nominees were ratified by the membership of IARU, and their new terms of office began on January 15, 1985. They will continue in office until the nomination/consultation/ratification procedure is repeated in 1988.

W1RU and WØBWJ have been active in the work of IARU for a number of years, in several roles, including being members of the IARU WARC team in 1979.

☐ Congratulations are in order for the Radio Society of Thailand, which recently celebrated its 20th anniversary.

☐ ITHE — what's that, you say? It's the International-Travel Host Exchange, a program to further promote international goodwill and friendship. A number of amateurs in the USA and elsewhere have expressed their eagerness to act as hosts and/or guides for visiting overseas amateurs. If you'd like to know more about this program, contact Naoki Akiyama, JH1VRQ/N1CIX, ARRL's International Programs Manager.

☐ The Calcutta Key, awarded by the Radio Society of Great Britain for "outstanding service of international friendship," was recently presented to Eric Godsmark, G5CO, in recognition of his considerable work for IARU Region 1, which he served as secretary.

☐ Please note a very important change in the telex instructions for either ARRL or the International Secretariat of IARU. Their telex number is now 650 215 5052 and the answer-back is MCI. The telexes will be placed automatically in an electronic mailbox, which ARRL will check three times daily. Thus, telexes will no longer be "real time," but will indeed be received in Newington on the day they are sent.

*President, IARU

Coming Conventions

OHIO STATE CONVENTION
February 23-24, Sharonville (Cincinnati)

It's time again for Ohio's sure cure for cabin fever: the 5th annual Ohio State Convention at the Great Oaks Career Development Campus, just off I-275, near I-75 in northern metropolitan Cincinnati. A Friday evening hospitality suite will kick off this ever-growing, all-indoor event. Saturday and Sunday will feature a full lineup of forums, many vendors, a large flea market, meetings, food, women's activities, banquet and Wouff Hong. Featured speakers include Bob Winn, W5KNE, editor, *QRZ DX;* Jeff Ward, K8KA, ARRL Hq. packet-radio expert; George Wilson, III, W4OYI, Great Lakes Division Director; and Don Tyrell, W8AD, Alpha Delta Communications. Special convention rates on request (through Feb. 6) at Radisson Inn, 11400 Chester Rd., Cincinnati (Sharonville), OH 45241, tel. 513-771-3400. The $5 convention registration fee includes all convention awards. Flea-market spaces are $5 unreserved, $10 reserved. Call Joe Halpin, W8JDU, at 513-851-1056 for reservation information. Bring your own tables. Banquet is $14.95 (includes banquet awards). Make banquet reservations by February 18. Women's program: crafts, color flow beauty consultant on Sunday only. Forums: 10-10 international, weather, parasitic-loop-array antennas, lightning protection, packet radio, computers, ARRL, county hunting, antennas, DX, public service, VEC. Nondenominational church service Sunday. Talk-in on 07/67, 16/76, 28/88 and 224.06. For information and schedule: Cincinnati ARRL, P.O. Box 11300, Cincinnati, OH 45211, tel. 513-921-3844 or 513-471-4775. Vendor inquiries: John Haungs, WA8STX, tel. 513-563-7373. Organized by Hamilton County Amateur Radio Public Service Corps (ARES and RACES); sponsored by Committee For Amateur Radio.

LOUISIANA STATE CONVENTION
March 9-10, Lafayette

Come to Cajun Country for a fun family weekend at the ARRL LA State Convention/Acadiana ARA Hamfest '85, to be held March 9-10 at the Holiday Inn Central Holidome, 2032 NE Evangeline Thruway, Lafayette. Hospitality Suite opens at 5 P.M. Friday. Doors open 9 A.M. daily. Activities include a flea market with commercial dealers, forums, meetings and QCWA. Women's activities to include a tour of Nottoway Plantation in White Castle on Saturday. Registration fee of $2 (no advance registration) covers both days. Special-event rates at the Holidome. Talk-in on 22/82. For more information, write to HAMFEST INFO, Acadiana ARA, Inc., P.O. Box 51174, Lafayette, LA 70505. For reservations, call the Holidome at 318-233-6815.

†February 2-3	May 18-19
Southeastern Division, Miami, FL	Alabama State, Birmingham
February 22-24	May 18-19
Ohio State, Sharonville	Atlantic Division/New York State, Rochester
†March 9-10	
Louisiana State, Lafayette	**ARRL NATIONAL CONVENTIONS**
March 16-17	October 4-6, 1985
Roanoke Division, Charlotte, NC	Louisville, Kentucky
March 30-31	September 5-7, 1986
Nebraska State, Kearney	San Diego, California
April 13-14	July 10-12, 1987
Missouri State, Kansas City	Atlanta, Georgia

†At press time, Amateur Radio exams are scheduled to be given at this convention. For other exam opportunities see Hamfest Calendar.

Hamfest Calendar

Administered By Marjorie G. Tenney,* WB1FSN

[Attention those who send in items for Hamfest Calendar and Coming Conventions: Postal regulations prohibit mention in *QST* of prizes of any kind and games of chance such as bingo. Hamfest information is accurate as of our deadline; contact sponsor for possible late changes.]

Florida (Fort Myers) — February 23: Southwest Florida's oldest and largest Amateur Radio club, the Fort Myers City of Palms ARC, will host hams and exhibitors inside the 5000-square-foot air-conditioned Moose Hall at 1900 Park Meadow Dr. ARRL volunteer license exams (by previous registration only; no walk-ins). Considerable emphasis on computer exhibits. Indoor flea-market tables are $10 and may be shared by two exhibitors. Admission is $3 at the door (no mail orders). Ample free parking. Talk-in on 28/88.

Indiana (LaPorte) — February 24: LaPorte ARC's winter hamfest is at the LaPorte Civic Auditorium. Tables are $2 in advance, $2.50 at the door, with all reservations held until 8:30 CST. LaPorte is 50 miles southeast of Chicago. Talk-in on 52. Donation is $2.50 at the gate. For more information and reservations: LARC, P.O. Box 30, LaPorte, IN 46350.

Kentucky (Glasgow) — February 23: The annual Glasgow Swapfest, from 8 A.M. central time until everyone goes home, is at the Glasgow Flea Market Bldg., 2 miles south of Glasgow, just off Hwy. 31E. Large, heated building, free parking. No meetings or forums; just free coffee, large flea market. Admission is $2; no extra charge for exhibitors. One free table per exhibitor, with extra tables $3 each. Talk-in on 34/94 (primary) or 63/03 (alternate). Additional information from N4HCO, Rte. 4, Box 354, Glasgow, KY 41241.

Louisiana (Ruston) — February 24: The Ruston ARC will hold its annual hamfest-swapfest at the Ruston Civic Center, from 9 A.M. to 3 P.M. Lunch and refreshments will be served by the Louisiana Tech University Ham Club. No admission charged; tables free. Tables reserved in advance by calling K5ODL at 318-255-6991, or K5LVZ at 318-255-7835. Talk-in on 72/12. Several dealers will be present. Bring your used gear and let it go home with someone else.

Massachusetts (Marlboro) — February 17: The Algonquin ARC will hold its annual electronics flea market at Marlboro Junior High School Cafeteria. Doors open for sellers' setup at 8:30 A.M.; doors open to buyers at 10 A.M. Talk-in on 01/61 and 52. General admission $1; sellers' tables $7.50 before Feb. 9, or $10 at the door. Food available. For table reservations and more information, write to AARC, P.O. Box 258, Marlboro, MA 01752.

Michigan (Traverse City) — February 9: The Cherryland ARC announces its Twelfth Annual Swap 'N' Shop to be held at the Immaculate Conception Middle School Gymnasium, 218 Vine St., Traverse City. Doors open from 9 A.M. to 2:30 P.M. General admission is $2.50; single tables $3. Talk-in on 25/85 and 52. For further information, contact Paul Nepote, KA8HIB, Chairman, 802 Fern St., Traverse City, MI 49684. An s.a.s.e. appreciated.

Michigan (Livonia) — February 24: The Livonia ARC presents its 15th Annual Swap 'n' Shop, from 8 A.M. to 4 P.M., at Churchill High School in Livonia. Plenty of tables, refreshments and free parking. Talk-in on 144.75/5.35 and 52. Reserved table space (12-ft minimum) available. For further information, send an s.a.s.e. (4 × 9) to Neil Coffin, WA8GWL, c/o Livonia Amateur Radio Club, P.O. Box 2111, Livonia, MI 48151.

Minnesota (Robbinsdale) — February 23: The 4th Annual Mid-Winter Madness Hobby Electronics Show, sponsored by the Robbinsdale ARC, will be held at Totino-Grace High School, 1350 Gardena Ave., NE, Fridley, MN, from 9 A.M. to 2 P.M.; flea market opens at 8 A.M. Admission is $4 at door. Features: manufacturers, dealers, flea market of radio, computer, satellite TV, etc. Talk-in on 60/00 and 52. Contact: Robbinsdale ARC, P.O. Box 22613, Robbinsdale, MN 55422, or call Bob at 612-533-7354. All Amateur Radio tests will be given. Write to Elmo Nygard, 4151 Adair Ave. N, Robbinsdale, MN 55422 for information.

†Missouri (Kansas City) — February 24: The Mid-America FM Assn., Inc. hamfest will be held at the National Guard Armory. No admission charge. For further information, contact Bob Atkeisson, WØAT, P.O. Box 188, Raymore, MO 64083, tel. 816-331-6033.

Missouri (St. Louis) — March 8: The Jefferson Barracks ARC will hold their 25th annual Amateur Radio Auction at the St. Louis Firefighters Hall, 5856 Gravois at Christy, in south St. Louis City. The auction starts at 7:30 P.M. For further information, contact Carl H. Hohenberger, WBØBZP, 5266 Parker Ave., St. Louis, MO 63139.

†New York (Melville) — February 17: LIMARC HAMFAIR, sponsored by the Long Island Mobile ARC, Inc., will be held at Electricians Hall, 41 Pinelawn Rd., Melville, Exit 49N on 495, first right onto Pinelawn, Melville, from 9 A.M. to 4 P.M. Admission: $3. Tables $10; your own, $6 in advance only from Bob Reed, WB2DIN, 2970 Valentine Pl., Wantagh, NY 11793, tel. 516-221-8116. VHF Testing Clinic, ARRL information, meet your local League officials. License testing information. Special surprises, food, free parking at the hall and alongside the Expressway. Talk-in on 25/85. Further information from Al, WA2FBQ, tel. 516-796-2965, or Hank, WB2ALW, tel. 516-484-4322.

†New York (White Plains) — March 3: The WECA Hamfest, sponsored by the Westchester Emergency Communications Assn., Inc., will be held at the Westchester County Center, Rte. 119 and Bronx River Pkwy., White Plains, from 9 A.M. to 4 P.M. Admission is $2. Flea market, seminars, distributors' displays, license exams, food and drink. Talk-in on 66/06, 442.475/447.475 and 223.18/224.78. For further information, contact Sal Lagonia, N2EQM, via WECA, P.O. Box 131, North Tarrytown, NY 10591-0855, tel. 914-245-7550.

†North Carolina (Elkin) — February 17: The eighth annual Elkin Winter Hamfest will be held at the Elkin National Guard Armory, two miles off I-77 at Exit 85. Doors open to the public at 8 A.M. Breakfast and lunch will be served by the sponsoring clubs, the Foothills ARC of Wilkesboro (NC) and the Briarpatch ARC of Galax (VA). Talk-in on 69/09, 144.77/5.37 and 52 simplex. For table reservations and information, contact George Reeves, WD4BMG, Rte. 6, Box 412, North Wilkesboro, NC 28659, tel. 919-670-2803.

†Ohio (Lorain) — February 3: Winterfest, sponsored by the Northern Ohio ARS, will be held at Gargus Hall on Rte. 254, between Lorain and Elyria. Activities to include indoor flea market and dealers; mobile clinic; check-the-power-output, VSWR, frequency. Amateur exams will be given; contact Dave, AI8M, for details. Tables on a first-come, first-served basis. Tickets $2 in advance, $2.50 at the door. Food and beverage will be served. For information, write to Winterfest, P.O. Box 354, Lorain, OH 44052, tel. 216-282-4256 (after 5 P.M.).

†Ohio (Mansfield) — February 10: The 24th Annual Mansfield Mid-Winter Hamfest, sponsored by the Inter-City ARC and M.A.S.E.R., Inc., will be held at the Richland Co. Fairgrounds, from 8 A.M. to 5 P.M. Admission $3 in advance, $4 at the door. ARRL/VEC exams nearby (2 miles away). Mobile check-in, MARS forum, free auction, free parking, food available on grounds. Tables $5 in advance, $6 at the door; half tables available. Shopping mall nearby. Talk-in on 34/94. For information and reservations, contact Dean Wrasse, KB8MG, 1094 Beal Rd., Mansfield, OH 44905 (please send s.a.s.e.), tel. 419-589-2415 (after 3 P.M.).

†Ohio (Akron) — February 24: The Cuyahoga Falls ARC 31st annual Electronic Equipment Auction and Hamfest will be held at the North High School, from 8 A.M. to 3 P.M. Tickets $3 at the door. Sellers may bring their own tables; some available for rent. Advanced table reservations advised. S.a.s.e. for orders and reservations, please. Plenty of room for buyers and sellers — over 32,000 square feet. Easy access from Tallmadge Ave. off ramp of North Expressway (Rte. 8). Talk-in on 87/27. Details from Bill Sovinsky, K8JSL, 2305 24th St., Cuyahoga Falls, OH 44223, tel. 216-923-3830. Table reservations may be made by phone, but will be held only until 9 A.M. unless paid in advance.

†Ohio (Circleville) — March 3: The Teays ARC 7th Annual Hamfest will be held at K.C. Lodge, two miles north of Circleville, on Co. Rd. 511. Sellers set up 6 A.M.; open to public 8 A.M. Advance tickets $2; at door $3. Tables (8-ft): advance $4, at door $5; first-come basis. Table reservations: Send an s.a.s.e. to Joe Subich, AD8I, 7825 State Rte. 188, Circleville, OH 43113. Talk-in on Circleville Repeater 78/18. Refreshments available. For additional information, contact Chairman Len Campbell, WB8PPH, 8951 State Rte. 188, Circleville, OH 43113.

Ohio (Toledo) — March 16: The First Annual Lucas County ARES Benefit Banquet, to coincide with the Toledo Mobile Radio Assn. Hamfest, will be held at the Scott Park Banquet Hall. Reservations must be placed by March 1. Tickets are $12.50 per person or $25 per couple. We will be featuring the Lucas County Ham of the Year Award. All proceeds will go to supporting the Lucas County ARES. For further information, contact Pat Smith, KA8GVZ, 1917 Farnham, Toledo, OH 43607.

†Ohio (Maumee) — March 17: The Toledo Mobile Radio Assn., Inc. 30th Annual Ham/Computer Fest and Auction will be held in the Lucas County Rec Center in Maumee. Dealers admitted at 5:30 A.M.; general admission is 8 A.M. to 5 P.M. Admission is $2.50 in advance, $3 at the door. Antenna forum by Dave Smith, W8YZ, women's activities, commercial exhibitors, refreshments. Auction starts at 10 A.M. Free parking all day and overnight. S.a.s.e. for information and tables. Displays are limited to electronic, ham and computer gear. Flea market tables available. FCC exams will be given — Tech through Extra Class. Deadline for filing is February 18. For exam information only, contact Elmer Zieroff, KU8V, 2614 106th St., Toledo, OH 43611. Talk-in on 01/61, 19/79, 34/94, 87/27, 975/375 and 52. For general information, advance tickets, etc., contact Roy Start, N9DGZ, 4322 Boydsen, Apt. A, Toledo, OH 43623, or Joe Nyitray, W8LNV, 3950 Drummond, Toledo, OH 43613, tel. 419-472-7935.

Oregon (Salem) — February 23: The 1985 Salem Mini-Hamfair will be held at the Polk County Fairgrounds. The one-day event will feature seminars, commercial displays, amateur license exams and a large flea market. Admission is $4. Flea-market setup at 8 A.M.; doors open at 9 A.M. Talk-in on 26/86 and 52. For further information, contact Salem Repeater Assn., P.O. Box 784, Salem, OR 97308.

Texas (Arlington) — February 16: The Texas VHF-FM Society Winter Convention will be held at the Charlie Club Hotel. All-day activities. Admission is $5 in advance, $6 at the door. Meetings include discussion of pending 2-meter band plan for Texas. Winter sidewalk sale — a good time to buy or sell. Talk-in on 75/15 or 442.20 MHz. For further information, contact Merle Taylor, ARRC, P.O. Box 3608, Arlington, TX 76010-0408, tel. 817-274-6952.

Vermont (Milton) — February 23: The Northern Vermont Winter Hamfest will be held from 9 A.M. to 4 P.M. at Milton High School, Rte. 7, Milton. Admission is $1.50. Flea market, amateur TV display, computers and videos. Amateur Radio exams at noon (walk-ins accepted); $3 exam fee. Contact M. Stern, WB2JSJ, at 802-879-6589 for further information. Talk-in on 25/85.

†Virginia (Vienna) — February 24: The Vienna Wireless Society will hold its annual WINTERFEST at the Vienna Community Center, 120 Cherry St., Vienna. Admission is $4. Doors open at 8 A.M. For vendor and tailgate applications, send an s.a.s.e. to Earl Hohbein, N4FSW, 4602 Lawn Ct., Fairfax, VA 22032. Coffee and food available all day. Talk-in on 31/91 and 085/685 and 147.51 MHz. For further information, write to Vienna Wireless Society, P.O. Box 418, Vienna, VA 22180.

Washington (Puyallup) — March 9: The Mike and Key ARC presents its 4th Annual Electronic Flea Market at the Western Washington Fairgrounds, Puyallup, from 9 A.M. to 7 P.M. Admission is $2; women and children free. Flea-market tables $15. Consignments 10%. Large area for dealers and exhibitors, demonstrations. For reservations, write to Electronic Flea Market, 20903 NE 77th, Redmond, WA 98052, tel. 206-883-3012.

†West Virginia (Fayetteville) — February 24: The 7th Annual Plateau ARA Hamfest will be held in Fayetteville beginning at 9 A.M. Admission is $3; children under 12 free. Flea market, exhibitors, hot food, drinks. Talk-in on 19/79 and 52. For further information, contact John Witt, W8OQC, 135 Daniels St., Fayetteville, WV 25480, tel. 304-574-1176 or 574-0532.

Note: Sponsors of large gatherings should check with League Hq. for an advisory on possible date conflicts before contracting for meeting space. Dates may be recorded at ARRL Hq. for up to two years in advance.

†ARRL Hamfest

*Convention/Travel Coordinator, ARRL

Public Service

Conducted By Robert J. Halprin,* K1XA

Some Thoughts on Disaster Communications

Disaster communications can be organized, chaotic or somewhere in between. Preparation is the key. An organized, well-trained Amateur Radio Emergency Service (ARES) unit can meet communications needs in a professional manner. However, it is difficult for the ARRL Emergency Coordinator (EC) to know exactly what to expect when disaster strikes. The following are critical communications requirements to be expected in a disaster:

1) Large increases in the volume of message traffic per channel are experienced on public safety radios, accompanied by prolonged waiting to gain access.

2) Equipment outages occur at key locations.

3) A need arises for agencies to communicate with other agencies operating incompatible radio systems, using unfamiliar or unattainable frequencies, names, terms and procedures. In general, the management of most agencies is reluctant to use another agency's system, or to allow theirs to be used by others.

4) A need arises to contact locations at distances beyond the range of a given radio or system (50 to 350 miles or more).

5) Message-reply delays are experienced, leading to deferred decisions on crucial matters, message duplication and confusion.

6) A need arises to generate and decipher handwritten messages sent through relaying stations.

7) Alternative modes of communicating are required in addition to voice:

a) Volume data in printed form (teletype, high-speed Packet Radio, facsimile).

b) Morse code under difficult reception conditions.

c) Encoded data for extreme privacy.

d) Television — mobile, portable, aeronautical, marine.

e) Telephone interconnections to or from radio systems.

8) A need arises to cope, simultaneously, with high-volume message traffic containing widely differing priorities. (Priority and precedence designations differ among agencies.)

9) Operational problems arise such as high-volume traffic circuits with no supply of message forms; use of printed forms designed for a different, unrelated agency or function; deciphering (scribbling) from untrained message writers; use of scribes who are unfamiliar with radio parlance; traffic volume so heavy that confusion results over which messages are to be sent, were sent, received for delivery, or are to be filed for ready reference.

The First 72 Hours

In the early hours of an emergency, it takes precious time to fully activate mutual aid resources. *Communications* is one of those vital resources.

The greatest relief effort is generally in the incorporated cities served by agencies with paid professionals — assuming their equipment, facilities and personnel remain operable. On-scene commanders need to receive important information and aid to issue orders for action in the field. Mutual aid requests to and from other agencies require wide-area communications not possessed by local agencies. With telephones overloaded or out of service, and local government and public safety radio channels swamped, communications problems develop rapidly.

While urban areas experience more concentrated damage, suburbs and isolated areas of a county suffer because they are remote from fire, public works, law enforcement forces and the services of all other agencies as well. All organizations scramble to respond to demand for service within their authorized jurisdiction. The public is often isolated, unable to call for help, and unable to determine the nature and extent of the disaster. Should they: wait it out, prepare to evacute, actually evacuate with some possessions to some safe place then unknown, obtain physical aid for an impending catastrophe, or offer aid to a relative, friend or neighbor?

Lack of information results in further overuse of the local telephone system. Calls often can be received from out of town but not from across town. Citizens living or traveling outside urban areas in the unincorporated portions of a county are less able to receive essential services quickly, if at all, because of personnel being stretched over a wider destroyed area and encountering less accessibility and poorer to non- existent communications. The opportunity to call for help is often unavailable to most citizens during the first 72 hours. Occasionally, a passing public safety vehicle or one equipped with an operational commercial, utility, amateur or CB radio can be accessed, assuming there is contact with someone who can help.

Too little information is gathered about the public's immediate needs and ways to meet them. Distorted public perceptions occur through misinformation. Yet at the same time, essential damage assessment report data are needed by higher agencies to initiate relief aid from outside the disaster area.

Broadcast stations initially air rumors in the absence of factual information. As darkness falls, rumors (some true) of looting are generated.

Word circulates about shelter locations. Some displaced persons stay at homes of friends or relatives, while others, still searching for family members, are housed at public shelters into the fourth day. The opportunity to notify concerned distant relatives is available only via Amateur Radio. Later, often too late, information trickles in about problem areas or cases that have been overlooked because of lack of communications.

Once the immediate threat to life has passed, survival instincts prevail. Printed instructions on what to do are located, and people operate essentially on their own for an indefinite period while public agencies respond to the most urgent problems.

Interorganizational and multiorganizational communications are poor to nonexistent. At the end of 72 hours, the disaster area remains in virtual isolation except for helicopter service for known critical cases and official use.

Little centralized information is available. Amateur Radio operators from neighboring counties and states offer to help but are often unable to cross the roadblocks established to limit access by sightseers and potential looters. Local volunteers, not previously organized and trained often lack essential skills and orientation. Costly mistakes are made and systems bog down.

Eventually, essential functional communications networks evolve as priorities are asserted and clusters of traffic emerge. Relief efforts are mounted when someone takes charge, makes a decision, and directs the efforts of others. The command and control process of directing requires communicating, the ingredient in short supply during disasters.

At critiques following the disaster, as always, the cry is heard: "Next time we must be better prepared!"

The Challenge: Providing An Effective Communications Response

The need for a combined response to communications emergencies has always been apparent. Concerned amateurs regularly band together under a local ARES and local club or service group in support of local agencies. Over the years, there have been, and still are, some very effective Amateur Radio response groups working with various disaster-relief agencies. In some disasters, a solitary volunteer or a small, unaffiliated group of amateurs, responds with some assistance.

Increasingly, however (especially in large emergencies), it is the League's nationally recognized ARES that is pressed into action in disasters involving multiple public and private organizations at more than one jurisdictional level across wide geographical areas. This is no

*Deputy Communications Manager, ARRL

longer a simple single-agency or single-community response, but many Amateur Radio operators working together in a joint effort.

It is the League's National Traffic System (NTS) that is tasked with handling high-volume outgoing Welfare and incoming Welfare traffic which inevitably attends disasters. And it is the local and section ARRL leadership that must provide the necessary coupling with NTS operators and the NTS leadership to make such communications possible and efficient.

The challenge to ARRL Field Organization leadership is to integrate the efforts of ARES, NTS, and other like organizations (MARS, RACES, independent nets and repeater associations), *and* nonamateur volunteer response units (REACT, CAP, etc.) in coordinated support of the many separate agencies serving in a disaster. This must be done in such an effective manner that the public is truly well-served. That challenge needs to be addressed by amateurs and agency professionals alike.

Since no public or private institution is perpetually effective or enduring, it is up to ARRL, through its widespread Field Organization, to continue to introduce Amateur Radio to the ever changing stream of new agency officials who have never-heard of it or used it. Ongoing, enduring relationships between ARRL and those agencies must be continued at all levels.

Amateur Radio has served the public with distinction throughout this nation and across the world for two-thirds of a century. Yet, often little is known or understood about this life-saving capability by officials responsible for the public welfare. The League has gone a long way towards correcting this situation by executing written memoranda of understanding with the Red Cross, Salvation Army, Federal Emergency Management Agency, National Communications System and the Associated Public Safety Officers, Inc.

It is vitally important that the public service lifeline provided by Amateur Radio be universally understood and fully utilized at every level *before* the next disaster occurs. — *Bob Dyruff, W6POU, (adapted from the ARRL* Emergency Coordinator's Handbook.)

NCS NEWSBRIEF

The latest in the series of Exercise NIGHT TANGO national communications tests were conducted in August and again in September. These tests, sponsored by the National Communications System (NCS), are designed to develop and evaluate the capabilities of five selected volunteer communications systems (Amateur Radio, AF MARS, Army MARS, Navy/Marine Corps MARS and CAP) to support national security and emergency preparedness requirements. See June 1984 *QST*, p. 94, and October 1984 *QST*, p. 72, for further information.

These exercises are not designed to test specific networks, but rather to test overall volunteer communications capabilities. Specific exercise objectives are created to demonstrate and evaluate the capability of these volunteer communications systems to provide alternate communications for surviving senior government officials or operations centers. During the conduct of an exercise, the NCS representative (who may be simulating a senior government official) is given the names of several radio operators representing each of the five systems. These operators, if they choose to participate in the exercise, will pass simulated critical messages through their respective systems. In the case of Amateur Radio, ARRL Section Managers of the selected test areas are normally contacted a few weeks in advance of the exercise so they can solicit volunteers. The Exercise NIGHT TANGO program is designed to test a wide range of Amateur Radio capabilities, rather than specifically using only seasoned traffic handlers. Accordingly, the amateur operators may or may not be regular participants in the National Traffic System (the specific choice of an amateur volunteer is, of course, made by the Section Manager, and the particular background of the volunteer is taken into consideration.) This is a logical approach since following a "real world" crisis, the senior government official may be able only to locate an amateur operator who has little, if any, experience in passing formal message traffic.

Exercise NIGHT TANGO V was conducted on August 16 and 18, 1984. NCS representatives from Washington, DC were located in the following areas: Youngstown, Ohio; Pittsburgh, Pennsylvania; Little Rock, Arkansas; Fort Smith, Arkansas; Lincoln, Nebraska; Omaha, Nebraska; and Minneapolis, Minnesota. As in previous exercises, 12 "basic" messages (a message between two NCS representatives) were sent among NCS representatives each day of the exercise. All basic messages were received through at least one volunteer system, for an overall success rate of 100%. A total of 99 "individual" messages (the "basic" message sent through the five volunteer systems, when available) were transmitted during the two-day exercise. Seventy-eight were received, for an overall individual success rate of 79%. Average time for message transmissions for the 99 messages was one hour and 19 minutes. For purposes of this analysis, message transmission time is defined as the total elapsed time from when the message is initially passed to a volunteer operator by an NCS representative to the receipt of that message by another NCS representative.

Exercise NIGHT TANGO VI, with objectives similar to the previous exercise, was conducted on September 27 and 29. Exercise locations were Washington, DC; Savannah, Georgia; Jacksonville, Florida; Amarillo, Texas; Lubbock, Texas; Madison, Wisconsin; and Rockford, Illinois. This test proved to be the most successful of the current Exercise NIGHT TANGO series, with a 100% basic message reception rate and 91% individual message reception rate. Average transmission time for this exercise was one hour and 21 minutes.

The NCS again expresses its thanks to the many enthusiastic volunteer radio operators who participated in these tests, which demonstrates that they are, indeed, a tremendous national resource. — *Chuck Cavanaugh, K4VKU, NIGHT TANGO Coordinator*

DDXA SPELLS RELIEF

The premise that emergency preparedness breeds resoluteness in times of disaster proved true for 10 members of the Dauberville DX Association (Pennsylvania) when three tornadoes touched down in Berks and Lehigh Counties on Thursday, July 5, 1984. Fortunately, the DDXA had just ratified a cooperative understanding with the Berks chapter of the American Red Cross, which greatly facilitated communications and disaster relief in the stricken area.

On Thursday evening, an approaching severe-weather front caused the local office of the National Weather Service to issue a "tone alert," which was instantly detected by a second receiver at the Dauberville repeater site. The WB3FYL/R microprocessor controller then transmitted a weather notice, using the repeater's speech synthesizer to disseminate the information to amateurs.

The tornadoes struck at 9 P.M., weaving an erratic pattern of destruction that spanned an area 18 miles long and 400 miles wide. Utility lines were sliced by the ferocious storm, and roads were closed by downed trees. About 2400 homes were left without electricity.

The Berks County chapter of the Red Cross opened a shelter and temporary communications center at the nearby Ruscombmanor Fire Company. At 10 A.M. the following morning, the chapter requested assistance from the Dauberville DX Association in assessing the damage; amateurs quickly responded, using the WB3FYL repeater for coordination. A 2-meter base station was activated at the fire company, with teams of hams covering the heavily hit areas first to relay emergency traffic quickly to the temporary Red Cross headquarters. The DDXA used a grid-locator system called "HELP," in conjunction with maps of the area, to check every residence (trailers, cottages, houses, etc.), and to report patterns of damage when noted.

The DDXA's assistance proved invaluable, since the only reliable means of communication was WB3FYL/R, which remained clear of nonemergency-related traffic for the duration. A programmed message originated at the site actuated the microprocessor voice synthesizer, which stated that emergency communications were in progress; this was repeated on every "tail drop."

By Saturday morning, much of the debris was cleared, and some regular communications channels were again available. It had taken DDXA members a record two days to survey the community, which included canvassing adjacent areas that received minor damage.

What led to such quick and efficient performance? No doubt much of the success can be attributed to a DDXA-initiated agreement ratified with the Red Cross chapter, in which each party pledged to assist the other in the event of a disaster situation.

Initially, KA3BMO (a member of both the Red Cross chapter and the DDXA) suggested that the chapter's headquarters building be used as a communications center for hams, and also as a control station in emergencies. The director of the Red Cross chapter invited DDXA members to the chapter Board of Directors meeting, at which the DDXA was given an opportunity to submit their proposal. Portions of the agreement are excerpted below:

"The Dauberville DX Association, an affiliate of the American Radio Relay League, Inc., proposes to the Berks County Chapter the implementation of supportive emergency communications in keeping with the 'Cooperative Agreement between the American Radio Relay League and the American National Red Cross.' "

The document then lists the numerous advantages Amateur Radio can provide as a public service to the Red Cross disaster-relief efforts. The League's national agreement served as a prototype. For other clubs desiring similar affiliations, it pays to have club officers familiarize themselves with this agreement (available from ARRL Hq. for an s.a.s.e.), since local Red Cross chapters may be unaware of its existence.

Emergency communications requires planning and preparation long before disaster strikes. As the Dauberville DX Association found out, a cooperative understanding between the club and the Red Cross chapter was a good beginning. — *Gary R. Hafer, WA3VUE, Reading, Pennsylvania*

ALERT HAMS HELP HEART ATTACK VICTIM

The hot summer sun bore down on the softball players of a Veterans of Foreign Wars annual tournament in Santa Cruz, California. The batter drove a ball over the fence for a home run. Very shortly after, when the home run batter took his position on the pitcher's mound, he clutched his chest and collapsed with a combination massive heart attack and epileptic seizure.

Teammates rushed to the fallen pitcher and rendered first aid. Fortunately, one softball team was made up of the medical staff from the local hospital, and two medical doctors.

While these physicians tried to keep the patient alive, team officials ran to the park maintenance office to use the telephone to summon an ambulance. The office was locked. A hurried search was made for the park attendant, who had the only key and was attending to his duties in a distant part of the park.

N6GOW, an official of the softball tournament committee, realizing the victim was in grave danger, ran to his truck and turned on his 2-meter rig. Earlier that morning, before leaving home, he had debated whether to take the rig. Practically as an afterthought, he decided to bring it along to the game, never imagining it would be used in a life-saving situation. He brought up the Santa Cruz K6BJ repeater (19/79), and transmitted in the blind — "QST, QST ... I have a medical emergency at De Laveaga Park, can anyone please help?"

WB6RWU was enroute to the ARRL Pacific Division Convention in Santa Clara and was the only one monitoring the frequency at the time. He was traveling north on Highway 17, high in the Santa Cruz Mountains, nearly out of repeater range. Upon hearing the plea for help, he stopped his car and brought up the autopatch and the county emergency 911 telephone number.

"I heard N6GOW calling for anyone to connect him to 911," he said. "I punched in the autopatch and he talked to the operator. After the ambulance and fire department rescue teams were dispatched to the scene, I got back on the road. As I was barely making the repeater, I kept calling for a standby operator."

N6GJL, who was at work at the time, heard WB6RWU's call. Both he and KG6EE came up and stayed on the repeater frequency to provide further emergency communications if it became necessary.

As a result of the quick action by radio amateurs in this life-threatening situation, rescue personnel arrived at the scene in time to avert a tragedy. — *Arthur R. Lee, N6FAD, Santa Cruz, California*

ARRL SECTION EMERGENCY COORDINATOR REPORTS

For November, 31 SEC reports were received, denoting a total ARES membership of 20,497. Sections reporting were: AZ, AR, CO, CT, IA, IN, KS, MI, MN, NFL, NH, NTX, OH, OK, ON, ORG, PAC, SDG, SJV, SCV, SFL, SD, SNJ, TN, UT, VA, WA, WMA, WNY, WV and WI.

NATIONAL TRAFFIC SYSTEM

November Reports

1	2	3	4	5	6	7
Cycle Two						
Area Nets						
EAN	30	1016	33.9	.747	93.9	
CAN	30	978	32.6	.647	100.0	
PAN*	59	864	14.6	.548	96.1	
Region Nets						
1RN	60	663	11.0	.400	93.3	100.0
2RN	55	356	6.5	.333	83.3	100.0
3RN	30	301	10.0	.557	91.7	100.0
4RN	60	792	13.2	.512	82.1	100.0
RN5	60	796	13.2	.483	96.8	
RN6	58	524	9.0	.365	—	96.7
RN7						96.7
8RN	60	409	6.8	6.5	.408	100.0
9RN						
TEN	60	718	12.0	502	84.4	
ECN						63.3
TWN	59	562	9.5	.456	71.3	95.0
TCC						
TCC Eastern	97[1]	565				
TCC Central						
TCC Pacific	88[1]	429				
Cycle Four						
Area Nets						
EAN	30	1622	54.1	1.240	91.7	
CAN	30	945	31.5	.990	100.0	
PAN	30	1020	34.0	.956	98.9	
Region Nets						
1RN						90.0
2RN						86.7
3RN						100.0
4RN	57	749	13.1	.462	93.6	93.3
RN5	60	796	13.3	.760	91.9	100.0
RN6						100.0
RN7	60	444	7.4	.625	93.1	98.3
8RN	58	369	6.4	.312	91.0	86.7
9RN	60	519	8.6	.475	94.2	100.0
TEN	60	374	6.2	.346	78.1	100.0
ECN						93.3
TWN	60	417	6.9	.386	100.0	98.3
TCC						
TCC Eastern	104[1]	587				
TCC Central						
TCC Pacific						
Sections[2]	6218	24,913	4.0			
Summary	7344	41,828	5.7			
Record	8258	66,257	18.4			

*PAN operates both cycles one and two.
[1]TCC functions are not counted as net sessions.
[2]Section and local nets reporting (226): APSN ATN (AB), AENB AEND AENK AENR AENX AENY AENZ ATNM WAEN (AL), ATEN (AZ), SWN (AZ/NM), BCEN (BC), NCN NCTN RTTY/V SCN/V (CA), DEPN DTN SEN (DE), CFRN DEN ENMC FAST FMSN FMTN FPON FPTN GCVTN GN LSTTN NFPN PBTN PEN PRVAN QFN QFNS SEFTN SPARC SVTN SWFTN TPTN VEN (FL), GCN GSBN GSN NWN (GA), IMN IMNS (ID/MT), ILN ISN ITN (IL), ICN ITN QIN (IN), CSTN KMWN KRN KSBN KWN QKS QKS-SS (KS), 3ARES 7ARES 11ARES CARN KNTN KTN KYN KYPON MKPN NKARC TSTMN WTEN (KY), LTN (LA), CITN EM2MN EMRI EMRIPN EMRISS HHTN NEEPN RIEM2MTN WMEN WMN (MA/RI), MEPN MMN MTN WRIN (MB), MEPN (MD), AEN CMEN MPSN OXRACES PTN SGN (ME), MNAMWXNT MSN MSPN MSRN MSSN PAW (MN), CN CNCTN CSN NCEN NCMN PCTN RARS (NC/SC), BRARES BVARES CC2MN EN2MARES MARES MNARES NCHN NCN NE40 NE75 NMPN NNN NSN PV2MN SBARES WNN (NE), GSFM (NH), JSARS MCN NJM NJN NJPN NJSN OBTTN SJVN SJVN220 TCETN (NJ), NSN WNARES (NV), BAVTN CDN EPN HVN NYPON NYS NYS/M SDN (NY), ALERT BN BNR BRTN BSSN COARES COTN DAEN LCNWO MCTN NEON ONN OSN OSSBN OSSN RARA TATN TSRAC VWEN WCTN (OH), CARA MCRAN OCWN OLZ ONON OPEN OTWN QCWA-63 STN (OK), KTN OLN OPN OSN OSND TIN (ON), BSN OARES OHNN OSN PdxARES PTTN SOFM THN (OR), D5ESN (PA), PTN (PAC), QSN (PQ), GPD2MN LC2MN SCNTN SCSSBN BHN PDN SDEN WCEN (SD), TNCN TNPN TNVN TSRN (TX), DFW NET TEX TTN (TX), BUN DCASN (UT), SSN STARES SVEN VLN VN VSBN VSN VTN (VA), VTN (VT), EWTN NTN NWSSBN PSTS WARTS WSN (WA).

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — AVERAGE
5 — RATE
6 — % REP.
7 — % REP. TO AREA NET

Transcontinental Corps

Certificates from TCC-Pacific/cycle 2 were issued to N7CSP, WD5ESV, KB7FE, WA0OYI. ND5T, NV6T and K6YBV.

1	2	3	4	5
Cycle Two				
TCC Eastern	115	84.9	1160	565
TCC Central	90	88.9	932	466
TCC Pacific	120	73.3	1020	429
Summary	235	79.1	2180	994
Cycle Four				
TCC Eastern	150	69.3	1220	587
TCC Central				
TCC Pacific				
Summary	150	69.3	1220	587

1 — AREA
2 — FUNCTIONS
3 — % SUCCESSFUL
4 — TRAFFIC
5 — OUT-OF-NET TRAFFIC

TCC Roster

The TCC Roster (November) *Cycle Two* — Eastern Area (KW1U, Director) — AA4AT W3ATQ N1AWX N1BHH K1CB KA8CPS KK3F WA2FJJ WD4FTK WB3GZU WA2HEB KB2HM WD8LRT W8PMJ KT1Q W8QHB W1QYY KW1U KB3UD AF8V W2VY N2XJ W1XX WB8YDZ. Central Area (N5AMK, Director) — N5AMK N5BT W5CTZ N5EFG KA0EPY KA9FEZ NG5G KW9J W4JL WA4JTE W9JUJ W5KLV KD5KQ WB9NVN WB5OXE KD5RC K5UPN WF4X WB5YDD. Pacific Area (W0HXB, Director) — KT6A VE6CHK N0CXI KU6D WD5ESV KB7FE KR7L KB0MB WA0OYI KF7R ND5T K6UYK WB7WOW K6YBV. *Cycle Four* — Eastern Area (W2CS, Director) — AA4AT W3ATQ VE3AWE K1BA WA4CCK N3COY W2CS KA3DTE W1EFW W1EOF W2FR WD4FTK N4GHI W2GKZ WB3GZU KB2HM WB9IHH W1ISO KN1K N4KB W2MTA W1NJM W8PMJ WB4PNY W3PQ W8QHB W1QYY W2RQ K3RZR KA1T KQ3T KW1U KB3UD WB4UHC W4UQ AB4V AF8V K4WJR W2XD N2XJ N8XX N2YL K4ZK K2ZM. Central Area (K5GM, Director) — N5BB WB5CIC W9CXY W5GHP K5GM W0HI AE5L K5OAF N5TC K5TL K0SU WB9UYU KB9X KV5X. Pacific Area (KN7B, Director) — AD0A K0BN KA7CPT KC0D W7DZX W6EOT W7EP W7GHT N2IC W6INH W5JOV W7LG W7LYA WB7NHR W0OGH ND5T W7VSE W6VZT KM7Z VE7ZK.

Public Service Honor Roll
November 1984

This listing is available to amateurs whose public service performance during the month indicated qualifies for 60 or more total points in the following nine categories (as reported to their SM). Please note maximum points for each category: (1) Checking into CW nets, 1 point each, max. 30; (2) Checking into phone/RTTY nets, 1 point each, max. 30; (3) NCS CW nets, 3 points each, max. 12; (4) NCS phone/RTTY nets, 3 points each, max. 12; (5) Performing assigned NTS liaison, 3 points each, max. 12; (6) Delivering a formal message to a third party, 1 point each, no max.; (7) Handling an emergency message, 5 points each, no max.; (8) Serving as emergency coordinator or net manager for the entire month, 5 points, max. 5; (9) Participating in a public service event, 5 points, no max. This listing is available to Novices and Technicians who achieve a total of 40 or more points. Stations that are listed in the Public Service Honor Roll for 12 consecutive months, or 18 months out of a 24-month period, will be awarded a special PSHR certificate from Hq.

275
K7VW
154
N4HMD
149
WB7WOW
142
W9FZW
K4SCL
WB4WYG
140
KD7ME
139
KK3F
137
KA0EPY
136
KA2SPH
134
WF4Y
KB0Z
133
KC9CJ
128
W9YCV
KB7FE
127
KD8KY
126
KA2F
125
W1EOF
124
KW1U
122
N4EDH
121
N4GHI
KV5X
WB2OWO
119
WA4QXT
WF4X
117
KW9J
K4JST
AL7W
116
WB2EAG
K5CXP
N2XJ
114
K4ZK
KB2HM
113
W4PIM
112
KA1EXJ
KC4VK
KB0MB
W0OYH
111
W9HLX
AA4AT
KS5V
W0IKT
110
NG4J
109
W7VSE
WB6TIF
108
W2PKY
107
WA4CCK
WD8MIO
106
WA2FJJ
W2MTA
WA4PFK
WB2MCO
KJ3E
K4KDJ
105
WB1GXZ
W1KK
WA2ERT
WX4H
KA4BCM
104
AF8V
WA4JDH
WD4ALY
N4PL
W9JUJ
103
WD8LDY
VE3BDM
102
WB2VUK
W6VOM
N0EVC
KC2TF
K2GCE
101
WB1HIH
KZ8Q
KB4OZ
100
N8FYJ
W7JMH
AF3S
99
KB4WT
WB4WII
W3YVQ
WB8JGW
98
KA0ARP
N5AMK
KT5Y
KA8GJV
KC3Y
97
W1RWG
KA6BNW
KT1Q
96
KA4AMC
KC2ZO
W0FIR
W4CKS
K7GXZ
W4ANK
95
KA2MYJ
N9BDL
WB4HRR
94
WD4KBW
KA1KML
K3JL
KB5EK
K2MFF
93
WB0TED
VE3DPO
92
N8FCQ
NS5J
WA6ZUD
K4VWK
N1CPX
91
VE3WM
90
WD0FWB
WD8KQC
WA4LXP
KJ3T
89
WA6QCA
W9DM
N7FXM
N8AEH
K7QVK
NT4S
N5DKM
88
WB2IDS
VE3GT
K0GP
WA7VTD
W2BIW
N5BT
K0SI
87
WB2RBA
N4KFU
KR7L
K2VX
86
WD0AIT
WD8OUO
KB5UL
K8ND
W5CTZ
WB6QBZ
85
KA2BHR
N6CVF
N6AWH
WB4YQP
N1BJW
84
KA4EYF
KA0BWM
WA1FCD
83
WA8GMT
KA4GUS
WA2JBO
82
W6NTN
WA0TFC
N4IYU
KB4GPN
WB4ADL
W1KRV
KD1R
81
N1AJJ
KA0ODQ
K2ZVI
WB1GLH
WB5OXE
80
WD9IID
KD9K
WB9RKJ
WD5GKH
79
KA5AZK
K6UXO
78
W8QHB
K8JDI
KA8PQH
N1AKS
77
N0DZA
AG9G
WA1YNZ
NI6A
KC3AV
76
KA1EPO
ND0N
WB4VMX
K5OAF
75
WD0BOX
WA1TBY
WA4EYU
WD4HBP
KB4BZA
74
ND2S
W0KK
WB4TZR
K2YAI
KR4V
KB9QX
73
KA4MTX
WD9FRI
KG2D
N7BGW
KA4IUM
KI1M
72
KA1GWE
KA1T
KB4LB
K2ZM
N2BFG
W4LXB
W4FMZ
71
N8ØD
WA8MAZ
KB9LT
70
K4IWW
VE3KK
K5UPN
WA8DHB
K2YQK
KA9FFO
69
KC0OO
WA2KOJ
VE2NST
WA8HGH
W5KLV
W7LG
KT6A
WA3UNX
68
VE2EDO
N0CLS
WD6BZQ
KL7IJG
WD0GUF
WB8SYA
KA1KTH
67
VE2FMQ
AI0O
KA0KWM
K1CB
W1TN
66
KB1PA
WD9DNQ
65
WB9ESM
WB5YDD
N1BGW
KA7AID
K6AGD
64
KA4SKV
W3DKX
N2EQM
W9NXG
WA7RWK
WB8MTD
W4HON
KD2DE
W2VY
63
W7LNE
WA4JTE
62
W2GJ
KX2T
KA4YHS
WB0HOX
WB0HOP
WD4PBF
N8EFB
KP4DJ
61
KA2DQA
W0LAE
W9IEM
WA4RNP
KB4OG
W8EK
WB7WVD
60
N8CW
KA3DTE
WD9JAA
NC0R
WD8EIB
N1BYS
55
KA2OPG/T
52
KA6HJK/T
50
WB1CBP/N
49
KA1HPO/T
45
KA7RFD/T
43
N8FNP/T

Brass Pounders League
November 1984

The BPL is open to all amateurs in the United States, Canada and U.S. possessions who report to their SM a message total of 500 or a sum or originations and delivery points of 100 or more for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in standard ARRL form.

1	2	3	4	5	6
W3CUL	776	997	1489	185	3447
N0BQP	31	1444	163	793	2431
KA9CPA	74	1039	126	833	2072
WA0HJZ	0	1117	25	686	1828
W1EOF	1	457	655	29	1142
KW1U	5	511	436	23	975
W3VR	327	191	349	18	885
KC0MB	286	144	420	15	865
WA4JDH	0	444	387	3	834
W9JUJ	3	402	387	3	795
WD8MIO	42	389	291	23	745
W7VSE	0	352	332	8	692
K0JAN	0	333	30	200	567
KA9FEZ	1	309	216	1	527
ND5T	10	253	246	7	516
WB7WOW	5	229	261	18	513
N4GHI	44	208	219	32	503
NG4J (Oct.)	21	256	213	20	510

BPL for 100 or more originations plus deliveries:

W0BMA	207
KD8KY	143
W9FZW	126

1 — CALL
2 — ORIG.
3 — RCVD.
4 — SENT
5 — DLVD.
6 — TOTAL

Independent Nets (November 1984)

1	2	3	4
Early Bird	31	1051	—
Golden Bear	30	219	2151
IMRA	26	836	1626
Midwest RTTY	51	39	276
Mission Trail	30	111	1100
20-Meter ISSB	26	640	234
75-Meter ISSB	30	356	983
7290 Traffic	46	944	3120

1 — NET NAME
2 — SESSIONS
3 — TRAFFIC
4 — CHECK-INS

Results, Eighth IARU Radiosport Championship

By Edith Holsopple,* N1CZC and Michael B. Kaczynski,** W1OD

The eighth IARU Radiosport Championship, July 13-14, 1984, wasn't exactly Sesame Street in entertainment and excitement, but we surmise from the 1334 who sent in their logs that it was more interesting than unadorned white rice. Propagation reeked. WA5TYX reported that the solar flux levels for the contest were the lowest since 1977, the year of the contest's inception. Because of dismal conditions, the faithful die-hards were suffering assault and battery to get their QSO totals up. Some ever-ready operators even managed to wrangle a few countries out of the static soup! Lousy conditions were mirrored in a slight slump in the number of logs received. Let's hope that Murphy was only passing through, and not taking up permanent residence.

One bright star in the desolate sky was the number of zones active during the operating period. European zones 28 and 29 sent in the bulk of the entries: 295 and 233, respectively. At the other end of the spectrum were zones 1, 17, 21, 41, 50, 64, 65, 69 and 75 with one entry each. If you managed to work one or more of these rare zones, consider yourself lucky.

LU8DQ took advantage of north-south skip conditions to top his last year's effort and established himself in the first-place world CW spot for the eighth year in a row. What a tradition! Will his record have nine lives? Only next year will tell.

The face of the leader boxes changed considerably between this year and last, with only 14 repeats out of 80 leaders. UR2QD went from second place world phone to eighth place world mixed, while scoring only half as many points as last year. LU1BR pulled a similar stunt by ascending one rung on the phone ladder to fifth place world, while his score decreased. JG1ZUY continued the trend by scoring fewer points than last year, but maintaining his 10th place spot worldwide on phone. On CW, UW3HV moved from last year's 11th place finish to fifth place this year, while scoring only half as many points. On the world multiop scoreboard, only one familiar call sign remains in the high-score box, HG5A, who went from fourth place last year to fifth place this year with a 50-percent drop in score points.

Three hired guns led the stateside phone-only shootout. A184V (operated by N6KT) barely squeezed by N6RO (manned by WA6VEF).

K5KG/OH0 operated both phone and CW from the Aland Islands, zone 18.

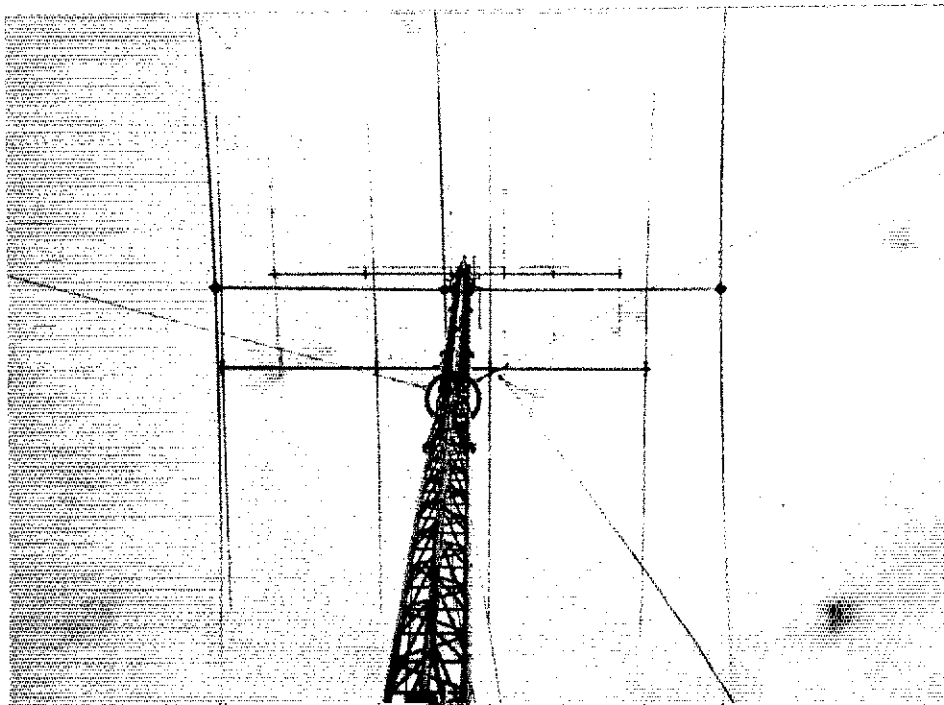
From the east coast, N4ZC (operated by N5TR) moved into the number 3 slot, up from last year's fifth place W/VE finish. N4UH and W8KKF each dropped one rung to eighth and ninth places respectively, with a 30-percent drop in score.

On CW, W3GM continued the trend by scoring less and moving from fifth place to fourth. KB0G moved up from eighth to fifth spot, with a smaller point total than last year. N5DU topped the CW listing with 344 k, followed closely by K4XS with 320 k.

Mixed-mode scores were down this year, as evidenced by the score required to make the top 10: The score of last year's number 10 W/VE entrant would have taken this year's mixed-mode honors. Nevertheless, W9RE managed to squeak over the 500-k barrier for first, with NW4B right on his tail.

First-place multiop stateside goes to W5XZ, who put in a third-place showing last year. They were one of the two stateside stations that managed to break the 1-million point barrier (the other was N5AU). Good show! WA5PQK just missed the megapoint mark, for a third-place finish. Our friends at N4WW sank from second to fourth, while K5QY and crew followed suit

These are the antennas used by K5KG/OH0 to place in the Top Ten World.



*Communications Assistant, ARRL
**Assistant Communications Manager, ARRL

Top World Scores

Mixed

RB5IM	1,049,802
UF6CR	873,715
RB5AA	751,285
JA1YWX	739,680
UA0SAU	711,588
Y31M	681,560
OK6RA	664,302
UR2QD	634,516
VK6DU	617,580
K5KG/OHØ	606,001

Phone

VK6MD	1,302,260
RB5FF	1,117,269
Y24UK	1,082,421
WB6FCR/KH6	1,049,321
LU1BR	1,017,900
YCØVM	892,619
5B4MF	885,354
AI84V (N6KT)	867,332
N6RO (WA6VEF)	824,780
JG1ZUY	639,856

CW

LU8DQ	1,737,648
UA6LLT	928,203
RB7GG	800,943
UA9SA	770,434
UW3HV	390,558
N5DU	344,454
K4XS	320,374
UJ8JA	308,080
UA4FAZ	291,494
UA9XR	262,795
CT2CQ	262,314

Multioperator

LZ2KTS	2,259,180
RW4F	1,774,880
RP3P	1,439,288
RL8PYL	1,429,344
HG5A	1,295,559
JA3YBF	1,243,957
OK1KRG	1,241,856
W5XZ	1,238,142
UH8EWW	1,209,416
NP4CC	1,183,400

Top W/VE Scores

Mixed

W9RE	502,579
NW4B	490,641
KM9L (WB9JKI)	342,419
KL7Y	316,407
KB5FU	224,550
K84EID	203,426
WC4E	176,814
K1840	165,990
WD8IXE	131,279
KE23PQ	87,920
WA6FGV	85,428

Phone

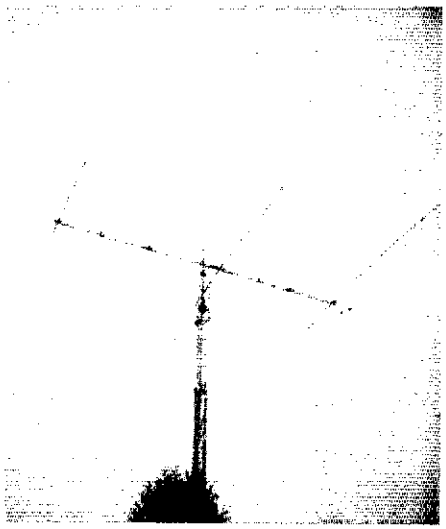
AI84V (N6KT)	867,332
N6RO (WA6VEF)	824,780
N4ZC (N5TR)	376,635
K23SVL	304,152
KQ1Y	302,320
W4DFU (KA3IKE)	256,487
KD7LF	150,765
KC3EK	141,489
N4UH	137,972
W8KKF	134,602
KR1R	134,264

CW

N5DU	344,454
K4XS	320,374
KB1W	242,450
W3GM	241,830
KBØG	240,540
NØEBM	236,532
W8FN	229,149
K3HPG	172,040
AI1S	124,372
N5RM	121,752

Multioperator

W5XZ	1,238,142
N5AU	1,013,610
WA5PQK	986,830
N4WW	894,927
K5MR	894,159
W23KUT	858,600
K1KI	782,460
K1NG	704,062
W23TMD	683,366
K5QY	585,576



DL6FBL is the number one station from the Federal Republic of Germany, zone 28. At the right: his antennas.

5B4MF, from Cyprus in zone 39, placed number 7 worldwide in the phone category.

by dropping from seventh to 10th. It's a good thing there are always the same number of winners, no matter how poor the propagation.

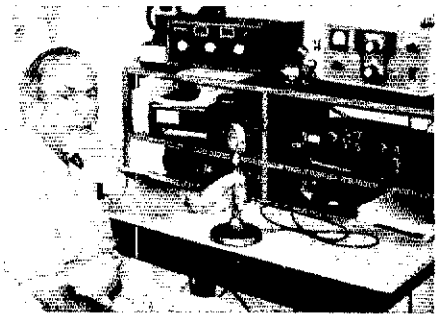
Only seven single-operator stations managed to top the 1-meg mark. On top of the list is LU8DQ, who is worth mentioning twice. LU8DQ is worth mentioning twice. He managed to compile the number one score, and was the only CW-only entrant to break the 1-megapoint plateau. Similarly, RB5IM was the only mixed-mode entrant in the million-point club. VK6MD, who takes phone honors, was hotly pursued by RB5FF, Y24UK, WB6FCR/KH6 and LU1BR, who all topped the 1-M mark. This year's winners are a study on the more with less philosophy: better position with fewer points than their predecessors. Them's the breaks, guys.

At worst, Radiosport is merely an exercise in patience and operating skill; at best, it's a friendly competition to promote goodwill to people of all lands who share the planet earth. See ya next year!

Thanks to Ted Beilman, who assisted in the preparation of this report.

SOAPBOX

Fifteen meters yielded 1500 QSOs and 30 multipliers less than last year. See what a small auroral storm will do for us high-latitude folks? At least I got lots of sleep (KL7Y). I worked every multiplier I heard! The band was just not open on 20 for DX and on 10 or 15 period (VY4MG). No line noise and no TVI complaints, so what happened? The office called me in to work all day Sunday (AA4M). Contest propagation? 10 meters dead; 15 meters open, but few noticed or bothered; 20 meters open to everywhere except Europe; 40 meters open, but again not to Europe. A true sign of the times, or did too few bother to try? (W7FGT). A lack of good openings to JA and Europe on this end, and generally poor conditions this year kept QSOs domestic. When DX openings are slim, it makes the choice easy to keep the beam stateside and DX QSOs become a nice surprise, hi, hi (KS7T). Those 5-pointers were few and far between (NC5O). Whew, with this out of the way, I can go trout fishing (KT5X). Bad line noise killed us during the second day of the contest. I've got to get that fixed before the next one (K5MR). I sure hope my new antennas don't receive that badly all the time. I hope it was just bad conditions (N5DU). All was done on indoor antennas (N5BQO). Because of my new job, I could not operate full-time, so I set about to operate as long as conditions made things fun. My final score tells all. I entertained myself on Sunday by listening to Ws work each other with my boom box on the beach (KC1F). There was a nice DX window on 20 meters late Sunday. Someday I'll get a real rig and I'll be able to work some of them, hi, hi (KB1GN). I had lots of fun. My age is 15. I liked the excitement of the QRQ contacts. I got my last two states (KA2SGD). Keep the RS Contest (WC4E). Summertime in FL means afternoon and evening QRN — thanks for repeats. Noise at times cripples AGC (K1ZX). Conditions were terrible for most of the weekend. Thank goodness the 6's had the Olympic calls to spice things up a little bit (N8BJQ). My equipment must be getting older. It can't stay on anymore for 36 hours. The keyer is slower, the antenna doesn't turn as fast and my chair is getting harder, however aging contesters never cry, they just fall asleep (NA9J). Despite poor propagation, I was glad to work some new countries for my 5BDXCC and gain more skill in operation. The most interesting thing was to see the excellent behavior of the contesters (PY1QQ). I was happy to help 226 hams to work zone 16. 73 to all (LU2WM). Unfortunately propagation was poor, but I still had a lot of fun (OZ7JZ). What a difference between my QTH here and my QTH on Tenerife, Canary Islands. I have never worked this few QSOs with my call EA8ZI (SM5IWC). Conditions were poor, but I was lucky to work some non-Eu stations. I enjoyed the contest very much (PA3BQX). This contest is very interesting and beautiful for me because many stations usually are QRV (SP8RJ). There were a few stations that impressed me: LU8DQ, PY4OD, WA8YVR are first-class contesters (YO9CIB). Thanks for the good contest (UA9MX). We had fun operating this nice contest during the DXpedition! Conditions were portable — living in the tent at the height of 3500 meters above sea level (RJ6R). The biggest thrills were being called by Franz Josef and to finally work USAs on 15 meters only 2 hours before the contest ended (JA1YWX). Conditions were poor here (JH1MTR). With band conditions poor and noise levels high, I still loved it. It was not only a good test of equipment but also one of strategy and persistence. I think I am now addicted (KA9OKH). 10 & 15 meters were completely dead at my QTH (W7QN). I know my scores do not compare with some of the better hams, but I had a great



W2KN handed out the Isle of Man multiplier from station GD5AVF, zone 27.

time and would like to thank everybody involved with the radiosport contest for the joy I had in joining, not to mention the fact that I was able to work two new countries (KC7LK). I am only a General, so thanks to everyone who came looking for me (W4DFU/KA3IKE). Murphy dropped by to calibrate the high antenna's direction indicator. He also helped with some strong RF. It wouldn't be a contest without him (K1NG). The only spot of Murphy that occurred was the blown fuse Friday night, and not having the faintest clue as to where the fuse box was located. Thanks to KM9L for rousing out of his sound sleep at that early hour and running to the store for fuses. Does replacing a fuse constitute multi-op? (WB9JKI). I started the contest to see if I could get a few fast-signal reports from out of state for my new 18' indoor antenna and QRP rig and ended up getting sucked in with all those 599 reports (WA8HGR/Ø). Using 100 W and a vertical, I beat our last year's multiop score when I went single-op mixed-mode ... I'm happy (KAØFXH). I think you can only win this contest when sitting in Africa! (DL6FBL). Thanks alot for the beautiful contest. Sorry about the bad propagation (UA3AGW). Propagation was good on 40 meters, but 15 and 10 were poor. I spent 36 hours in 36° C weather in my shack, Hi (RB7GG). Conditions were nonexistent (UY5XE).

FEEDBACK

Please refer to February 1984 *QST*, page 80, for the following corrections to the results of the 1983 Radiosport contest: OZ1CTK operated CW, not phone; WBØYJT was accidentally listed as WBØJYT; KA3HIE operated from WPA, not EPA; WB6HEU was mislisted as WB6HEW; W4VQ was listed wrongly as W4QV; IKØAZG should have been listed as IKØAKG; N2RM was operated by KM3T in SNJ, not EPA.

Scores

Scores are listed by ITU zone, then by country within that zone. The line score (example — KL7Y 316,407-891-91-A) indicates the call sign used, the total score, the number of valid contacts, the number of ITU zone multipliers and the entry class. The entry class letters indicate: A — single operator, mixed mode; B — single operator, CW only; C — single operator, phone only; D — multioperator, single transmitter.

ZONE 1

Alaska

KL7Y 316,407-891-91-A

ZONE 2

Alaska

KL7PK 5600-110-16-B

Alberta

VY6AGV (VE6AGV,opr.) 7128-163-14-C

British Columbia

VY7RG 13,472-101-32-C

ZONE 3

Manitoba

VY4MG 14,200-228-20-A
VE4CCC 35,088-338-34-C

Saskatchewan

VE5AAD 2511-33-9-B

ZONE 4

Quebec

VE2FJR 14,168-138-28-C

Ontario

XO3OMU (VE3OMU,opr.) 3405-82-13-B
KB2XP/VE2 5200-76-20-C

ZONE 6

W6

East Bay

K6CSL 5842-106-23-B
N6RO (WA6VEF,opr.) 824,780-2272-110-C
KS6Q 385-25-5-C

Los Angeles

K84EID 203,428-847-74-A
WA6R 29,601-277-33-B
N6IBP 9282-144-17-B
K23SVL 304,152-1252-76-C
W23CN 85,118-529-53-C
W6YRA (AG6B, KU6T, N6GTU, oprs.) 117,823-609-59-D

Orange

NX6M 12,558-173-26-A
NM6L 6040-90-20-C
W23TMD (+ K6XT, N6ND) 683,366-2088-101-D

Sacramento Valley

KI84O 165,990-928-55-A
KF23A 35,247-366-31-A
WA6AGD 19,749-224-29-A
KV23H 50,037-397-39-B
AI84V (N6KT, opr.) 867,332-2211-116-C
K23SG 13,186-232-19-C

San Diego

K23ZH 5632-126-16-A
AA4M 79,458-436-57-B
AA6EE 16,344-216-24-B
N6JMV 8140-114-22-C
W23KUT (+ KM9P, NI6W) 858,600-2504-106-D

San Francisco

WB6SRM 6402-115-22-A

San Joaquin Valley

WD84DET 23,430-250-33-B
W6SXM 296-24-4-B

Santa Barbara

WA6FGV 85,428-694-42-A

Santa Clara Valley

KE23PQ 87,920-446-56-A
W6KXG 8873-149-19-A
K23ITL 68,040-499-45-C

W7

Arizona

KY7M 67,575-457-51-A
KC7V 762-45-6-A
N7CIX 31,682-382-31-B
W7FGT 30,784-224-37-B
WA7NXL 6820-102-22-B
N7CEE 736-31-9-B
KD7RF 16,020-277-20-C

Montana

KS7T 71,136-686-36-A
KD7LF 150,765-861-57-C

Nevada

WB7VVH 5850-98-18-C
NF7P (+ KY7N, NF7K, WA7HVU) 161,756-962-53-D

Oregon

WA7OEM 30,450-245-42-A
WA7IIM 2420-68-11-A
W7TC 48,520-401-40-B
AD7T 37,785-171-55-B
K7KJM 5321-117-17-B
WA7CZA 4384-98-16-B
KA7FEF 3822-106-13-B
W6VPK 448-12-8-B
KC7LK 23,940-291-28-C
WB7NNA (+ WB7RPJ) 122,550-744-57-D

Washington

KG7D 107,300-535-58-B
W7QN 12,512-100-34-B
W7DRA 924-32-11-B
KC7LL 28,188-289-29-C
WA7STA 4600-50-23-C

ZONE 7

W5

Arkansas

W5EIJ 6321-101-21-B

Louisiana

W5WG 37,777-341-37-B
W5OB 14,760-118-40-B
N5BMD 11,044-222-22-C
W5XZ (+ KZ5D, N5AN, W5WMU, W5ZR, W8MJ) 1,238,142-2958-129-D

New Mexico

N5DVY 28,365-337-31-A
NC5O 69,444-434-54-B
N5EZA 2112-56-11-C
KT5X (+ WA6OTU, WA6PZL) 139,167-690-63-D

Northern Texas

N5RM 121,752-891-57-B
N5M 14,212-100-34-C
K2SCU/5 8402-108-33-C
N5AU (+ K5MM, KM5X, WB5VZL) 1,013,810-2502-130-D
K5MR (+ N5RZ) 894,159-2074-133-D
K5QY (+ AK4L, KM5K, KY5N) 585,576-1758-108-D

Oklahoma

W5AS 21,660-250-30-B
AC0E/5 (+ N0CPC) 9500-203-19-D

Southern Texas

KB5FU 224,550-982-75-A
N5DU 344,454-998-102-B
AG5C 58,005-428-45-B
W5NR 2448-34-18-B
WA5IYX 28,704-252-39-C
WA5PQK (+ K5LZO, KD5SP, KE5IV, NM5L, NM5M) 986,830-2338-130-D
K5LZO (+ KA5SBS) 291,364-1000-92-D
N5BQO (+ N5CUR) 26,208-345-28-D

W8

Colorado

KA0FXH 7480-124-20-A
N0EBM 236,532-1093-69-B
AC0S 59,455-397-47-B
WA8HGR/8 4037-135-11-B
KC0WP 41,792-481-32-C
W0IZV 6479-115-19-C
W0KEA (+ K9MWM, ND0E, W0RSG) 481,824-1284-112-D
N0EKK (+ KA0TEE, KC0HH) 149,358-832-62-D

Iowa

KE0Y 4750-50-25-B
KC0GM 16,092-184-27-C
W0PPF 12,052-164-23-C
NE0P (+ KA0s GOA, HKO, N0EYO, WA0GUY, WB0UIT) 56,810-470-48-D

Kansas

KD0JM 23,328-314-27-A
W0RT 5356-90-19-A
N0CBG 2842-77-14-A
KB0G 240,540-999-76-B
WA0CFZ 9000-162-18-B
N0CLV 7638-148-19-B
N0FMR 3728-86-16-B
KB0U 22,351-193-31-C
WB0YJT 5120-82-20-C

Minnesota

KF0T 16,492-221-28-B
W0RXL 11,050-142-25-C

Missouri

W0HBH (+ KB0KK, KM0R, WB0UN) 247,310-1124-70-D
KU0G (+ KM0L, N0CDH) 138,512-715-54-D

Nebraska

AK0G 17,888-297-24-A
K0SW 17,832-186-29-A

South Dakota

K0JV 21,948-220-31-B
KD0IS 5814-113-18-C

ZONE 8

W1

Connecticut

KB1CM 80,208-444-48-A
K1NCD 7872-102-24-A
AA2Z 488-61-8-A
W1VH 17,130-185-30-B
W1CNU 2700-114-12-B
KA1YR 62,424-487-34-C
KR2K 17,496-263-24-C
WA1NCN 1440-58-10-C
K1KI (+ KA2MXO, K3EST, KB4?) 782,460-1880-115-D

Eastern Massachusetts

W1FM 11,570-181-26-A
KC1F 2296-48-14-A
K1XM 86,528-404-52-B
N1CWU 52,275-377-51-B
W1AX 44,896-212-46-B
KQ1F 13,800-134-30-B
AD1C 6058-123-18-B
N1CRD 450-29-6-B
KW1G 7744-98-22-C
KB1GN 5612-84-23-C

Maine

W1HHV 20,192-216-32-B
K1SA (+ KQ1V, N1AFC, W1OO) 77,007-425-57-D
K1BZ (+ N1ATN) 31,228-283-37-D

New Hampshire

K1TR 26,040-248-28-C
WA1NPZ 420-36-5-C

Rhode Island

KN1I 33,396-352-33-A
KA1GQW 18,488-254-27-A
KS1J 4704-107-16-A
K1NG (+ KI1G) 704,082-1641-122-D

Western Massachusetts

WA1ZAM 1705-65-11-A
KB1W 242,450-1032-65-B
AI1S 124,372-614-59-B
KR1R 134,264-820-52-C

W2

Eastern New York

N2EIK 658-33-7-A
K2SHZ 97,020-551-49-B
K1ZM 75,725-307-65-B
KW2D (KC2KK, opr.) 48,536-360-42-B
N2ETF 6356-131-17-B
WA2ZWS (WB2QEU,opr.) 3456-78-16-C
K2GBH (+ KA4VZN, WB2KMY) 4944-121-16-D

Northern New Jersey

WA2PID 33,111-256-39-A
KB2ZQ 4384-74-16-C

New York City — Long Island

W2GKZ 37,711-283-43-A
N2EEH 7260-114-22-B
K2KTT 3281-65-17-C

Southern New Jersey

KA2SGD 17,081-215-31-A
NC2V 21,719-183-37-B

Western New York

KW2J 36,894-306-39-B
W2FTY 25,612-202-38-B
W2FUI 21,386-208-34-B
W2AWF 3703-51-23-B
K2GXT (KA2JBA, WB1ADR, WB2EEE, oprs.) 39,296-392-32-D

W3

Delaware

N3AHA 2240- 100- 14-A

Eastern Pennsylvania

W3ARK 30,955- 237- 41-A
W3GM 241,830-1164- 90-B
N3CZB 4125- 81- 15-B
WA3DMH 15,475- 137- 25-C
WA3SPJ (+ K3DTD, KS3F, N3CFR) 173,196-1051- 51-D
KI3N (+ KA3DSW, N3s CHL, CIX, WB3s EPW, FPA, FYL) 48,803- 402- 37-D

Maryland — District of Columbia

K3ZO 79,518- 384- 58-A
WB3JRU 46,904- 384- 41-A
WA3VPL 11,280- 126- 30-A
K3HPG 172,040- 739- 68-B
K3GY 50,225- 441- 35-B
KB3J 17,430- 154- 35-B
NN3SI (W4KM,opr.) 428- 23- 6-B
KC3EK 141,489- 587- 79-C
KR3M 25,688- 226- 38-C

Western Pennsylvania

KA3HIE 32,256- 290- 36-B
W3KYN 3896- 89- 18-B
K3MJW (KR3P, KT3S, WB3KNS, oprs.) 12,300- 125- 30-D

W4

Alabama

W4NTI 110,154- 578- 66-B
WD4PZN 33,120- 346- 40-B
WA4RAJ 28,416- 508- 24-B
N4DLE 576- 16- 9-C

Georgia

W4GLS 34,480- 302- 40-A
W4MGX 26,520- 182- 39-A
K4BAI 41,860- 452- 35-B
WU4E 34,272- 279- 42-B
AK4T 3240- 43- 24-C

Kentucky

N4XM 108,568- 560- 56-B
KA4JMZ 17,280- 195- 32-B
W4PDZ 1576- 96- 8-B
WR4F 40,710- 279- 46-C
KI4DC 38,000- 352- 40-C

North Carolina

NW4B 490,841-2228- 67-A
N4AYJ 24,804- 229- 6-A
WA4TOD 89,900- 634- 50-B
K4PB 39,228- 334- 42-B
K4HF 3570- 50- 17-B
N4ZC (N5TR, opr.) 378,635-1155-105-C
N4UH 137,972- 581- 68-C

Northern Florida

WC4E 178,814-1060- 66-A
K4XS 320,374-1661- 82-B
AA4DI 17,955- 141- 35-B
AC5R 6008- 115- 21-B
KQ1Y 302,320-1513- 80-C
W4DFU (KA3IKE, opr.) 256,487-1398- 77-C
N4WW (+ N4SA, NX4N, WA4SVO) 894,927-2119-141-D

South Carolina

K4LQ 16,851- 112- 41-A

Southern Florida

K1ZX/4 68,688- 597- 36-B
WB4TDH 65,910- 250- 65-B
K4MF 64,209- 433- 51-B
WD4AHZ 47,658- 418- 46-B
N4TL 1968- 63- 16-B
WK4F 41,887- 267- 51-C

Tennessee

W8HTM 1932- 42- 14-A
WB4SEZ 28,680- 255- 40-B
K4JHT 33,160- 251- 40-C

Virginia

KJ7K 48,116- 350- 42-A
K4FPF 14,084- 150- 29-A
N4MM 4216- 77- 17-A
KG4W 80,912- 499- 52-B
W4PBC 16,524- 83- 51-B
N4JOD 1440- 62- 10-B
WC4B 78,873- 429- 61-C
KA4RVS 39,482- 323- 38-C

W8

Michigan

KS8Q 29,610- 290- 35-A
KN8I (WA8ZYW, opr.) 45,954- 410- 46-B
KZ8F (+ KO8T) 319,644-1392- 78-D

Ohio

WD8IXE 131,279- 601- 71-A
W8UPH 46,412- 378- 41-A
K8EF 33,440- 270- 40-A
K8MR 5152- 90- 23-A
WB8HDO 4485- 88- 15-A
W8FN 229,149- 798- 81-B
N8BC 70,110- 357- 57-B
N8BJQ 54,350- 425- 50-B
W8KKF 134,602- 677- 62-C
KA8FAN 4554- 81- 18-C
KI8O 576- 28- 8-C
W8LT (K3JT, KZ4M, WB8PHI, oprs.) 291,900-1012-100-D
WD8LLD (+ N8FLS) 194,250- 867- 70-D
WB8KKI (+ WD8AUB) 125,376- 653- 64-D

West Virginia

WB8SQX (+ WD8EOG) 2180- 72- 10-D

W9

Illinois

KM9L (WB9JKI, opr.) 342,419-1516- 77-A
W9QWM 2509- 57- 13-A
K9UQN 1140- 36- 10-A
NA9J 85,171- 642- 53-B
WB8NSF/9 4720- 121- 16-B
WD9HMQ 32,034- 289- 38-C
W9LYN 6666- 103- 22-C
KC9JT 3936- 92- 16-C
K9SD (+ K9s BGL, FD, KC9AL, KD9M, KF9F, N9JL, K8SU) 320,578-1408- 89-D
KS9O (+ KA9DVY, KC9XM) 203,130-1029- 74-D
WB9TDR (+ K9UQN) 18,202- 400- 19-D

Indiana

W9RE 502,579-1597-107-A
N9ACD 26,180- 262- 35-A
W9XO 14,392- 206- 28-A
N9NB 1161- 54- 9-A
KA9OKH 65,296- 488- 53-B
W9NZW 15,030- 139- 30-C
KB9C/9 5865- 153- 15-C
NI8L (+ KR8V) 77,520- 623- 48-D

Wisconsin

KO9Q 24,480- 223- 34-A
KA9OTD 7780- 129- 20-A
KB9S 25,042- 257- 38-B
N9BUS 15,428- 102- 38-C
KQ9L (+ N9EFV, WB9DCM) 99,738- 636- 52-D
KC9XF (+ N9EJL) 54,284- 475- 41-D

ZONE 9

Maritimes-Newfoundland

CZ1CM 5486- 112- 13-A
CZ1CBF 8602- 121- 22-C

ZONE 10

Mexico

XE2MX 11,419- 186- 19-B
XE1OX 186,263- 775- 77-C

ZONE 11

Haiti

HH2WL 85,538- 859- 38-C

Dominican Republic

HI8LC 42,517- 311- 41-A
HI8GB 288,825-1073- 75-C
HI3AMF 14,950- 176- 26-C

Panama

HP1AC 10,101- 119- 21-B

Puerto Rico

NP4CC (KP4BZ, KP4HC, NP4Z, WP4C, oprs.) 1,183,400-3178-100-D

Montserrat

VP2ML 53,655- 342- 49-C

ZONE 12

Ecuador

HC1OT 173,824- 813- 56-C

Venezuela

YV3ANG 23,092- 204- 23-B
YV8ABM 13,616- 171- 16-B
YV3AZC 288,981- 768- 77-C
YV5JEA 54,285- 523- 21-C
YV1DWQ 7112- 108- 14-C

ZONE 13

Brazil

PP7JCO 34,188- 189- 37-B
PY2MKL 19,382- 239- 22-B
PT2ACZ 7400- 60- 25-B
PT2TF 30,386- 21- 42-C
PY3CM 5- 1- 1-C

ZONE 14

Argentina

LU8DQ 1,737,648-2435-144-B
LU1EWL 94,714- 417- 46-B
LU1BR 1,017,900-2069-100-C
LU8DYV 88,740- 418- 38-C
LU8ESU 73,138- 507- 29-C

Paraguay

ZP5JCY 457,963-1173- 79-C
ZP7CO 1760- 40- 12-C

ZONE 15

Brazil

PP2ZI 21,173- 228- 31-B
PP1AEA 5508- 66- 17-B
PY3CJI 4065- 58- 15-B
PP2ZDD 408,969-1023- 81-C
PY1QQ 55,246- 265- 46-C
PY1BKA 1520- 32- 10-C

ZONE 16

Argentina

LU2WM 37,910- 226- 34-B
LU1VK 89,849- 365- 39-C

ZONE 17

Iceland

W3TB/TF 5670- 87- 18-B

ZONE 18

Norway

LA1XDA 21,376- 189- 32-A
LA8CJ 18,414- 188- 27-B
LA9ZV 91,524- 464- 58-C
LA9PT 41,403- 339- 37-C
LA6DY 17,276- 185- 28-C
LA5QK 14,136- 146- 31-C
LA2AD 5796- 163- 12-C
LA2TO 5695- 105- 17-C
LA2CBA 1824- 48- 12-C
LA4O (LAs 4DCA, 5KO, 6EV, 9HW, oprs.) 362,240-1804- 84-D

Finland

OH4RH 138,409- 713- 61-A
OH8MM 33,198- 310- 33-A
OH7NW 8289- 81- 27-A
OH2OT 3432- 60- 13-A
OH6UP 2820- 71- 12-A
OH2PM 155,040- 538- 80-B
OH5UG 34,706- 284- 37-B
OH3NM 33,726- 310- 33-B
OH5NY 11,664- 200- 18-B
OH4PW 13,392- 232- 18-C
OH3BU 7678- 131- 19-C
OH6AM (OH6s EI, LK, oprs.) 833,900-2508-100-D

Aland Islands

K5KG/OH0 606,001-2167- 89-A

Denmark

OZ7JZ 66,825- 847- 45-A
OZ8EI 1904- 39- 14-A
OZ1III 68,712- 533- 42-B
OZ5KU 55,692- 382- 42-B
OZ3Q 10,452- 75- 39-B
OZ1EUO 3820- 49- 20-B
OZ5EV 106,524- 458- 66-C
OZ1APA 27,984- 145- 44-C
OZ4RP 24,228- 207- 36-C
OZ1ACB 9292- 130- 23-C
OZ1CFV 8344- 91- 28-C
OZ1AXG 3684- 99- 12-C
OZ3KE 2805- 54- 17-C
OZ8T 987- 37- 7-C
OZ5DDS (OZ1s DYL, EMY, IJP, INN, oprs.) 31,612- 367- 28-D

Sweden

SM5ARL 50,963- 389- 41-A
SM5BMB 31,413- 245- 37-A
SM7DER 5120- 85- 20-A
SM6FX 738- 41- 6-A
SM4OGQ 89,600- 572- 40-B
SM7LAZ/6 44,400- 350- 40-B
SM1BVQ 30,135- 225- 41-B
SM6DED 14,805- 233- 21-B
SM6BDS 7176- 86- 23-B
SM5RE 6176- 118- 16-B
SM7TV 2954- 211- 14-B
SM5IWC 34,560- 397- 27-C
SM6IJF 2862- 100- 9-C
SM2OTU 285- 21- 5-C

ZONE 19

European R.S.F.S.R.

RA1OM 23,544- 260- 27-A
UA1ZDW 45,395- 373- 35-B
UA1ZFK 25,968- 345- 24-B
UA1ZEF 2665- 53- 13-B
RA1AA 193,700- 918- 65-C
UW1BM 23,156- 272- 28-C
UZ1NWD (RA1NA, UA1NCF, UB5IMD, oprs.) 322,482-1433- 77-D
UZ1AWW (UA3DPX, UA4NBJ, EZ6ADZ,oprs.) 262,707-1182- 67-D
UZ1AWT (RA1CA, UA1s AFN, ALZ, oprs.) 65,020- 339- 42-D
UZ1AWO (UA1s ARL, 169-2026, -169-2028, oprs.) 35,759- 385- 27-D

ZONE 20

European R.S.F.S.R.

UA1POL 50,184- 310- 41-A
UW1PA 17,172- 292- 18-C

Asiatic R.S.F.S.R.

UA9XR 262,795- 885- 65-B
UA9XBV 64,343- 390- 37-B
UA9KAT 21,550- 196- 25-B
UZ9XWW (UA9s XBD, XDG, XM, -090-611, oprs.) 202,130- 781- 58-D
UZ9CWG (RV9s CBS, CBT, UA9CPL, oprs.) 188,136- 757- 54-D

ZONE 21

Asiatic R.S.F.S.R.

UA9LU 105,938- 507- 47-A

ZONE 22

Asiatic R.S.F.S.R.

UA0SZ 96- 8- 4-B
UZ0BWC (2 oprs.) 83,562- 461- 38-D

ZONE 23

Asiatic R.S.F.S.R.

UA0QEP 168,482- 828- 61-C
UZ0QWA (UA0s QBB, QCA, QDC, QDL, oprs.) 359,980-1094- 82-D

ZONE 27

Republic of Ireland

EI7DJ (+ EIs 646, 740, 880, 8AU, oprs.) 47,128- 347- 43-D

France

F8TM 4368- 58- 21-B

England

G4VXE 35,260- 258- 43-A
G4XRX 15,946- 125- 34-A
G4BKI 190,120-1013- 58-B
G3ESF 37,128- 298- 39-B
G3TXF 33,554- 259- 38-B
G4OKN 21,715- 297- 43-B
G2AJB 6872- 131- 16-B
G3NT 40,248- 418- 24-C
G3ICG 32,856- 263- 37-C
G4XKR 29,374- 253- 38-C
G4XTM 8985- 195- 15-C

Isle of Man

GD5AVF (W2KN,opr.) 16,120- 156- 28-A

Northern Ireland

GI4MWA 2354- 70- 11-C

Scotland

GM4ELV 16,011- 265- 27-C

Wales

GW3MPB 28,116- 223- 36-B
GW3JI 11,956- 125- 28-B

Luxembourg

LX1YZ 74,100- 373- 60-B
LX2EL 8112- 161- 16-B
LX1DA 152,134- 822- 58-C
LX1BI 139,440- 791- 55-C
LX1CC 54,958- 484- 44-C
LX1FJ 20,580- 170- 40-C
LX1JX 17,424- 116- 44-C
LX1WH 14,280- 244- 17-C
LX2EA 11,900- 239- 20-C
LX1RQ 6468- 182- 14-C

Belgium

ON4ALC 312,450-1240- 75-A
ON4XG 32,523- 273- 37-B
ON5CZ 15,548- 227- 23-C
ON5FV 2772- 117- 9-C

The Netherlands

PA3CEF 13,248- 292- 16-A
PA0LOU 60,830- 393- 59-B
PA3BQX 35,568- 310- 35-B
PA0UV 28,566- 167- 46-B
PA3BTH 24,552- 256- 31-B
PA3BNT 16,048- 145- 34-B
PA0DIN 12,284- 332- 37-B
PA0ERA 9400- 144- 20-B
PA0LKR 2442- 70- 11-B
PA3CNI 1092- 20- 14-B
PA0QX 40,560- 416- 26-C
PA2NJN 10,274- 151- 22-C
PA3CNY 5044- 116- 13-C
PA3COA 1519- 75- 7-C
PA0KHS (+ PA3s ADJ, AIR, DQW, PA0DUO, PE1KCP, PD0MEO) 261,234-1207- 69-D
PI1GOE 79,534- 567- 46-D

ZONE 28

Federal Republic of Germany

DL6FBL 523,566-1982-102-A
DL8MBS 118,035- 634- 61-A
DF6VE 69,500- 518- 50-A
DK8FD 13,760- 230- 20-A
DL0IU 140,296- 775- 52-B
DL1RB 87,535- 492- 61-B
DL1TH 47,184- 376- 48-B
DF3QN 11,452- 163- 28-B
DK7QB 11,270- 168- 23-B
DL8EBN 8112- 116- 24-B
DL4BBO 4116- 96- 21-B
DL5JQ 2565- 53- 19-B
DJ6TK 1958- 77- 11-B
DF4QP/P 872- 31- 8-B
DL1QT 180- 6- 6-B
DL8PC 202,045- 799- 85-C
DF2RG 6741- 109- 21-C
DL9MAA 3576- 92- 13-C
DL7PD 3298- 64- 17-C
DL8AAM 292- 31- 4-C
DK5DS 28,677- 269- 33-C
DJ6QD 76- 9- 4-C

Hungary

HA8DU 361,232-1119-107-A
HA8KAX 3660- 90- 15-A
HA5LZ 167,600- 632- 80-B
HA8LKC 12,456- 238- 18-B
HA7UJ 4494- 54- 21-B
HA1SB 3570- 119- 10-B
HA8LKB 2936- 141- 8-B
HG9TK 700- 38- 7-C
HG9TL 222- 74- 3-C
HG5A (HA5s FN, GF, OM, ML, UA, WE, HA7s RY, SU) 1,295,559-3150-123-D
HG8V (6 oprs.) 587,044-2276- 89-D
HA5UUG (6 oprs.) 510,952-1558-104-D
HA1KRR (HA1s XO, XU, ZN, ZZ, oprs.) 481,536-1842- 76-D
HA8KNX 307,445-1015- 85-D
HA2KMR/P (6 oprs.) 204,408-1156- 72-D

Switzerland

HB9AON/P 19,210- 240- 34-A
HB9DX 26,934- 229- 46-B

Italy

I2JIN 61,552- 535- 48-B
I1XPQ 79,408- 504- 56-B
I3FDZ 28,980- 193- 35-B
I1MUU 10,962- 190- 21-B
I5JHW 203,412- 758- 69-C
I4CSP 47,840- 276- 52-C
IK1BTT 18,032- 258- 21-C
I8ZUT (+ I0s FSP, UZF, IK0EFR) 102,540- 611- 60-D

Bulgaria

LZ1RN 47,328- 306- 51-B

LZ2SI 20,020- 282- 26-B
LZ1FJ 102- 51- 27-B
LZ1IR 14,274- 253- 18-C
LZ1GD 2996- 60- 14-C
LZ2QW 34- 11- 2-C
LZ2KTS (LZ1-A-310-Z, LZ2s CC, DF, HE, PO) 2,259,180-3846-165-D
LZ1KOZ (2 oprs.) 188,400- 992- 75-D
LZ1KVF 90,829- 602- 61-D

Austria

OE9SLH 33,957- 236- 49-B

Czechoslovakia

OK6RA 664,302-1891-106-A
OK2BHV 414,752-1320-104-A
OK3CFP 132,675- 703- 61-A
OK1KZ 84,188- 569- 52-A
OK1HCH 56,334- 425- 41-A
OK1AJN 48,739- 329- 47-A
OK1AJY 30,415- 281- 35-A
OK3CWA 20,230- 226- 30-A
OK2BDP 19,635- 847- 17-A
OK1TW 10,689- 167- 21-A
OK1DBM 195,048- 780- 81-B
OK1AVD 123,340- 513- 70-B
OK1DCU 57,420- 341- 60-B
OK2QX 48,100- 303- 50-B
OK1MZO 33,705- 282- 45-B
OK1AXB 29,304- 265- 37-B
OK2BGR 22,360- 237- 26-B
OK3TAY 21,760- 308- 32-B
OK2PCF 18,428- 192- 34-B
OK2BBQ 5082- 114- 14-B
OK3GES 3864- 114- 24-B
OK3IF 3360- 60- 16-B
OK3CEL 2989- 176- 7-B
OK3BA 2171- 43- 13-B
OK2ABU 1807- 35- 13-B
OK1DWJ 737- 47- 7-B
OK2SPS 750- 30- 25-B
OK2KZC 726- 66- 11-B
OK2PGT 498- 50- 4-B
OL8COZ 404- 46- 4-B
OK3CFA 263,858- 625- 94-C
OK2BQL 64,953- 315- 47-C
OK2JK 44,981- 481- 31-C
OK2BTI 9744- 176- 21-C
OK1VMA 8343- 109- 27-C
OK1BB 8240- 150- 20-C
OK2PJK 3060- 38- 17-C
OK1KRG (OK1s ADS, AWZ, DWA, oprs.) 1,241,856-2912-128-D
OK3KAG (OK3s CDX, CIR, ZFM, ZWA,-26638,oprs.) 568,266-1920-106-D
OK3KEX (OK3s CAL, CAP, ZAZ, oprs.) 122,416- 768- 56-D
OK3RJB 70,510- 441- 55-D
OK3KJF (OK3CAE + oprs.) 38,532- 298- 39-D
OK5MVT/P 10,908- 126- 27-D
OK3KNS (+ OK3KV) 7304- 104- 22-D

Poland

SP9CTW 134,376- 589- 68-A
SP6BFK 74,847- 413- 61-A
SP5PB 70,900- 459- 50-A
SP3HC 52,381- 387- 49-A
SP3IQE 7462- 105- 26-A
SP3LWU 4032- 79- 18-A
SP6PST (SP6HEK, opr.) 201,618-1010- 69-B
SP5CJQ 90,816- 738- 44-B
SP9BBH 64,484- 460- 49-B
SP5JTR 59,007- 363- 51-B
SP4JWR 20,160- 121- 35-B
SP8KJX 11,232- 128- 26-B
SP9KZ 9861- 150- 19-B
SP8UFO 3010- 136- 10-B
SP1ADM 2850- 115- 10-B
SP2EBG 1145- 101- 5-B
SP3AOT 608- 38- 16-B
SP3IBS 58,272- 442- 48-C
SP6DVP 45,657- 257- 57-C
SP9MRQ 34,960- 562- 23-C
SP3JHY 18,386- 203- 29-C
SP3HFX 17,523- 175- 33-C
SP6BXZ 15,029- 280- 19-C
SP2UUU/1 13,804- 179- 28-C
SP8RJ 8382- 127- 22-C
SP9HZF 6650- 167- 14-C
SP7FOI 4563- 59- 27-C
SP9AWH 3784- 47- 22-C
SP9AVZ 3729- 115- 11-C
SP2KLR (SP2JXN, opr.) 2388- 80- 12-C
SP2QG 1696- 87- 8-C
SP9PRO (SP9-3021, opr.) 1134- 56- 9-C
SP8PDT (SP6IKS, SP6TOI9, oprs.) 148,800- 887- 62-D
SP8PBT/1 (SP1EOI) 39,442- 336- 41-D
SP2KFV 18,275- 267- 25-D
SP9KOU (SP9COO) 9984- 416- 24-D

Greece

W4MAT/SV1 11,919- 123- 29-C

Romania

YO8DDP 32,522- 583- 23-A
YO2ARV 24,879- 247- 37-A
YO5CYH 4704- 153- 14-A
YO2CMI 2112- 40- 16-A
YO4BBH 52- 12- 2-A
YO9CIB 35,145- 356- 33-B
YO5ALH 13,760- 264- 20-B
YO6AVB 4906- 76- 22-B
YO4CSE 354- 58- 3-B
YO8ADW 44- 8- 2-B
YO6BTY 1- 1- 1-B
YO3CDH 59,938- 487- 46-C
YO2BEH 40,670- 455- 35-C
YO7AUU 19,032- 306- 18-C
YO9AHX 14,345- 201- 19-C
YO4ZL 7740- 196- 15-C
YO9CUF 6062- 177- 14-C
YO6DBL 2587- 104- 13-C
YO8DHY 1288- 59- 8-C
YO3DDX 918- 50- 6-C
YO3KWJ 702- 47- 6-C

Yugoslavia

YU4IEF 130,908- 704- 58-A
YU7ODY 51,625- 291- 59-A
YU3SB 37,035- 291- 45-A
YU4VEF 27,740- 264- 38-A
YU7SF 113,920- 563- 64-B
YU7PXT 108,868- 497- 68-B
YU7ORQ 36,980- 271- 43-B
YU1OVU 32,144- 152- 56-B
YU1NZW 4896- 82- 18-B
YU2TY 1472- 60- 8-B
YU5RK 8840- 99- 24-C
YU1PUU 2055- 39- 15-C
YU5ZZ 1840- 58- 10-C
YU5DZ (+ YU5s ZZ, XKD) 141,220- 173- 20-D
YZ2AYZ (YT2LOM + 1 opr.) 92,919- 737- 47-D

German Democratic Republic

Y31M 681,560-1886-110-A
Y33ZL 418,383-1737- 87-A
Y24RL/A 179,855-1060- 85-A
Y32KE 144,082- 818- 61-A
Y37UF 109,858- 824- 49-A
Y52ZH 50,692- 429- 46-A
Y44ZN 32,636- 295- 41-A
Y51XG 26,208- 238- 48-A
Y41WM 24,414- 359- 26-A
Y22XF/A 21,632- 258- 32-A
Y48UJ 21,030- 236- 30-A
Y51YC 19,950- 243- 30-A
Y22HF 19,342- 189- 38-A
Y25YA/A 17,720- 313- 20-A
Y25IDI/A 17,081- 217- 29-A
Y51WO 14,768- 206- 26-A
Y37RL 9230- 120- 26-A
Y22WF 5282- 278- 19-A
Y36ZG 5271- 75- 21-A
Y25GH/A 4114- 69- 22-A
Y43VD 3978- 109- 13-A
Y24ZH 3120- 54- 16-A
Y27BN 2964- 102- 12-A
Y22RU 2178- 70- 11-A
Y37OM 1540- 42- 14-A
Y54PL 143,640- 732- 72-B
Y51ZE 122,878- 727- 67-B
Y38VM 78,010- 497- 58-B
Y54WO 55,314- 474- 42-B
Y21NE 48,178- 410- 41-B
Y46WA 36,933- 377- 38-B
Y25XA/A 28,766- 280- 38-B
Y59FA 26,631- 316- 33-B
Y21EA 18,825- 274- 25-B
Y23UB 18,164- 149- 38-B
Y23HN 10,550- 155- 25-B
Y23CM 8762- 99- 26-B
Y23HJ 6902- 80- 29-B
Y59ZA 5265- 121- 15-B
Y23RJ 4480- 40- 32-B
Y22DK 3399- 139- 11-B
Y37RB 306- 25- 6-B
Y23MA 196- 21- 4-B
Y24UK 1,082,421-2317-127-C
Y38YK 75,378- 530- 51-C
Y47VN 44,592- 303- 48-C
Y54VA 42,586- 279- 46-C
Y23LD 31,720- 374- 40-C
Y53VL 17,453- 563- 31-C
Y32WH 10,752- 175- 21-C
Y22WD/P 6321- 89- 21-C
Y78VL 4465- 80- 19-C
Y54ZI 3220- 64- 14-C
Y54YO 1588- 43- 13-C
Y26HG 1316- 40- 14-C
Y37ZE 1190- 41- 10-C
Y21WM 690- 39- 6-C
Y23XE 234- 13- 6-C

ITU Geneva

4U1ITU (I2s KMG, MQP, VXJ, oprs.) 435,957-1690- 87-D

ZONE 29

European R.S.F.S.R.

UA3RAR 374,904-1360- 82-A
UA4PO 360,972-1098-111-A
UA6XDX 226,240-1104- 70-A
RA3AF 210,749-1053- 77-A
RW3AU 131,052- 638- 67-A
UA3QF 129,269- 776- 59-A
RZ3DF 123,481- 663- 67-A
RW3AL 103,781-1759- 59-A
UA3RKK 103,488- 540- 66-A
UA4CAR 77,221- 587- 63-A
UA3DUA 57,279- 281- 61-A
UA3TT 48,785- 320- 55-A
UW3GL 48,134- 425- 41-A
UA3DQS 48,359- 353- 51-A
UA4NZ 39,136- 465- 32-A
UA6ARE 32,970- 673- 21-A
UA3DRT 32,000- 277- 40-A
UA6AX 28,900- 350- 25-A
UA1NA 28,390- 341- 34-A
RW3DF 27,270- 333- 27-A
UZ3EWW 26,940- 310- 30-A
UA4LM 25,088- 301- 28-A
UA3QR 21,825- 457- 25-A
UA1AHQ 19,136- 438- 26-A
RV6AF 18,870- 205- 34-A
UA6EG 17,688- 172- 33-A
RA3RR 17,060- 280- 20-A
UA6HO 15,080- 274- 20-A
UA6HAB 13,860- 259- 28-A
UA3DQZ 6216- 100- 21-A
RV6AB 1746- 75- 18-A
UA4FDE 1425- 23- 19-A
UV3QNO 392- 58- 4-A
UA6LLT 928,203-1821-141-B
UW3HV 390,558-1297-102-B
UA4FAZ 291,494-1081- 94-B
UA6LCN 225,910- 914- 82-B
UA6HRZ 104,092- 758- 53-B
UA3AFQ 86,788- 562- 58-B
UA6ABM 78,804- 562- 44-B
UW3UO 75,500- 541- 50-B
UA6PDF 68,671- 574- 43-B
UA3AGW 66,248- 329- 61-B
UA3VIM 64,932- 566- 42-B
UA1QBE 62,651- 465- 47-B
UA3QOQ 59,241- 514- 39-B
UA3DVS 58,566- 466- 43-B
UA4CGS 52,174- 500- 38-B
UA6ECS 50,330- 532- 35-B
UA6YCI 49,172- 557- 38-B
UW6OE 48,633- 363- 43-B
UA6LTC 45,980- 398- 44-B
UA6BPU 42,160- 516- 34-B
UA4CHH 41,328- 430- 36-B
UA3XBB 40,908- 350- 42-B
RA3HN 40,768- 270- 52-B
UA4AO 40,749- 299- 47-B
UA3SBV 39,379- 265- 53-B
UA4HNP 36,680- 299- 40-B
UV3HD 34,655- 337- 43-B
UA3TBM 34,058- 344- 36-B
UA3DIJ 32,612- 403- 31-B
UA3TFZ 30,578- 263- 42-B
UA3TFO 28,368- 274- 36-B
UA3EDQ 27,900- 335- 31-B
UA6BAB 25,172- 377- 28-B
UA3AJU 24,099- 363- 28-B
RA3VA 23,970- 270- 34-B
UA4YZ 23,430- 281- 30-B
RV6AA 21,824- 272- 31-B
UA3UAD 20,904- 278- 26-B
UA3TAM 20,216- 257- 28-B
UA4ANZ 20,061- 293- 27-B
UA3QAI 19,908- 274- 28-B
UA3PGZ 18,711- 307- 27-B
UA6LAM 17,480- 284- 23-B
UA6LJE 16,770- 262- 26-B
UA1ANA 16,588- 754- 22-B
UA6HQV 16,416- 279- 27-B
UA4LCL 16,308- 281- 27-B
UA6BFI 15,456- 255- 21-B
UA3PGI 14,385- 279- 21-B
UA4FDU 13,855- 261- 17-B
UA3TU 12,485- 57- 55-B
UA3XAG 7885- 139- 19-B
UA3AGX 7568- 183- 16-B
UA4FFG 5440- 146- 16-B
UA3DTT 3852- 161- 12-B
UA4CFQ 3136- 86- 14-B
UA1DF 2603- 39- 19-B
UA6LFR 835- 80- 5-B
UA3LAR 744- 41- 8-B
UV3DDD 232- 38- 4-B
UV6AS 128,464- 720- 64-C
UW3RR 71,500- 467- 52-C
UA3DRB 68,103- 308- 63-C
UA6LHC 66,616- 439- 52-C
UA4CO 64,024- 389- 53-C
UA4NC 62,301- 397- 57-C
UW1AE 56,500- 371- 50-C
UA3QA 50,120- 411- 40-C
UA6XT 44,880- 329- 44-C
UA6HKN 42,872- 311- 46-C
UA3TN 35,217- 283- 39-C
UW6LC 34,645- 289- 41-C
UV1AR 27,710- 318- 34-C
UA4UBC 27,048- 378- 28-C
UT4UO 26,460- 274- 35-C
UV1AT 25,980- 281- 30-C
UA6PE 14,040- 201- 26-C
RW3DW 13,293- 180- 21-C
UA3VCC 11,380- 253- 16-C
RW6PC 8109- 167- 17-C
RW4F (UA4s FBL, FDS, FEF, FER, FZ, oprs.) 1,774,880-3387-160-D
RV6L (UA6s LCT, LE, LN, MN, oprs.) 1,025,973-3097-111-D
UZ4CWB 107,749- 738- 53-D
UZ4HWV 68,904-1276- 54-D

Kaliningradsk

UA2EC 94,120- 550- 65-B
UA2FFC 35,666- 393- 34-C
UZ2FWA (UA2s FEM, FEW, FF, FJ,FM, oprs.) 857,264-2206-131-D

Ukraine

UB5MLP 132,628-1868- 71-A
UY5TE 102,663- 762- 57-A
UB5BZ 66,464- 532- 56-A
RT5UO 78,240- 458- 60-A
UB5GBU 44,660- 509- 35-A
UB5ZA 29,400- 280- 40-A
UB5IUH 24,420- 485- 22-A
UB5UAG 18,356- 289- 26-A
UT5UCM 7479- 273- 27-A
UB5IFW 2008- 125- 8-A
RB7GG 800,943-1928-143-B
UB5CE 246,528- 839- 96-B
UB5ILW 131,918- 559- 71-B
UB5LF 108,518- 667- 58-B
UB5INO 106,500- 821- 50-B
UB5FBV 104,622- 841- 53-B
UB5TN 87,969-1239- 71-B
UB5CBA 86,372- 862- 52-B
UB5QJA 84,510- 578- 54-B
UB5HEQ 77,028- 697- 42-B
UB5MPD 55,600- 410- 50-B
UB5QGD 51,560- 459- 40-B
UB5TR 46,002- 446- 41-B
UT5UBW 34,960- 385- 40-B
UB5VK 34,475- 432- 35-B
UB5EF 31,688- 404- 34-B
UY5WA 31,648- 325- 32-B
UT5GP 28,300-1132- 25-B
UB5INT 27,848- 398- 27-B
UB5KBK 25,432- 269- 34-B
UB5UHT 24,955- 304- 31-B
UB5KBV 24,882- 200- 41-B
UB5CN 21,423- 232- 37-B
UB5JNW 20,900- 282- 25-B
UB5WAR 19,062- 313- 27-B
UT5UGO 16,775- 297- 25-B
UB5TCS 14,700- 326- 21-B
UB5GBF 13,478- 292- 23-B
UB5KCW 11,968- 260- 22-B
UB5KDD 11,837- 275- 19-B
UT5LQ 11,440- 292- 20-B
UB5FAN 7890- 305- 15-B
UT5EM 4704- 294- 16-B
UB5EKQ 3895- 100- 19-B
UB5VKE 3590- 278- 13-B
UT5YF 2117- 73- 29-B
UB5KAG 2002- 65- 14-B
RB4IHR 1926- 113- 8-B
UB5MX 1260- 44- 10-B
UB5DCW 180- 26- 4-B
UY5XE 57,454- 805- 46-C
UB5IBW 28,476- 267- 16-C
UT5RY 27,904- 322- 32-C
UB5EKG 23,415- 257- 35-C
UB5MFR 21,318- 233- 34-C
UB4ZWW (UB5Zs AL, X, CW, oprs.) 582,639-1795-111-D
UB4MXA (+ UB5s MRO, MTV, MRN,MTS) 582,467-1800-101-D
UB4MWA (UB5Ms DA, MR, OJ, oprs.) 512,960-1415-112-D
UB4QWW (+ RB5QW, UY5YB, UB5QFR, UB50641444, UB50641361) 375,057-1494- 87-D
UB4IXZ (RB5IIY, UB5ITU, oprs.) 322,235-1269- 85-D
UB4LWA (+ UB5s LPZ, LNU, LNS, 0771354) 283,520-1240- 80-D
UB4IWI (UB4IUK, RB5ICY, UB5IOV, oprs.) 120,445- 679- 65-D
UB4VWA (3 oprs.) 94,700- 654- 50-D
UB4DWN (3 oprs.) 47,196- 532- 36-D
UB4JXM (UB5s JKG, 087-1540, 087-2013, oprs.) 45,864- 384- 42-D
UB4FWD (UB5s FAD, FGO, FEE, 070-713, oprs.) 44,940- 404- 42-D
UB5TAU (+ UB5s TAT, TCM) 21,895- 325- 29-D
UB4DWA (UB5s DCT, DCW, oprs.) 21,142- 290- 31-D
UB4QXL (RB5s QZ, QM, UB5QIZ) 18,798- 274- 26-D
UB4AXA (UB5s 075-1041, 075-1091, 075-1101) 14,256- 262- 18-D
UB4EXZ (UB5s ELE, EQG, EUI, oprs.) 7619- 135- 19-D

White R.S.S.R

UC2DQ 84,535- 570- 55-A
UC2ACT 83,232- 595- 51-A
RC2AF 46,043- 389- 41-A
UC2WO 22,562- 259- 29-A
UC2OBB 118,128- 939- 48-B
UC2ACO 29,018- 414- 28-B
UC2WBI 20,894- 272- 31-B
UC2AFZ 16,824- 295- 24-B
UC2AT 3264- 85- 17-B
UC2IDZ 498- 41- 6-B
UC2AIG 59,000- 254- 25-C
UC2IDC 9268- 283- 14-C
UC1AWB (UC2AAX + 5 oprs.) 288,134-1462- 77-D
UC1AWC (UC2s AIU, -006-105, -009-743, oprs.) 240,150-1187- 75-D
UC1WWF (2 oprs.) 48,450- 391- 38-D
UC1AWG (UC2s -18-873, -009-105, -009-490, oprs.) 40,020- 201- 60-D
UC1CWD (UC2s CAI, CAJ, -009-904, oprs.) 19,450- 304- 25-D
UC1AWP (+ 2 oprs.) 2868- 110- 12-D

Azerbaijan

UD6DEY 68,112- 509- 48-A
UD6AS 42,353- 315- 41-A
UD6DHL 21,025- 289- 25-B
UD6DR 27,032- 122- 62-C
UD6DV 48,982- 308- 38-C

Georgia

UF6CR 873,715-2389- 95-A
UZ8AXB/UF6 (RA6s AF, AR, AW, UR6s ADH, APL, ARA, ARX, YCK, oprs.) 939,060-2101- 94-D

Armenia

UG6GAI 34,399- 307- 41-B

Donetsk

RB5IM 1,049,802-2461-129-A
RB5AA 751,285-1815-131-A
RB5IZ 429,856-1203-112-A
RB5IA 272,397-1015- 93-A
RB5IF 41,757- 440- 31-A
RB5IQ 37,464- 315- 42-A
RB5QR 35,088- 280- 43-A
RB5QP 134,355- 753- 65-B
RB5FF 1,117,269-2539-129-C
RB5DX 22,506- 299- 31-C
RB4IYJ (RB4IRQ, UB5-073s-3830, -3826, oprs.) 10,404- 228- 18-D

Moldavia

UO5ON 14,070- 195- 30-A
UO5OA 102,186- 594- 63-B
UO5OV 25,180- 266- 34-C
UO5OFU 1490- 74- 10-C
UO4OWR (3 oprs.) 25,476- 427- 22-D

Lithuania

UP2BKZ 35,734- 450- 34-A
UP2PAQ 24,150- 274- 35-A
UP2BAE 18,840- 225- 30-A
UP2PBM 12,792- 207- 24-A
UP2BJM 120,128- 652- 64-B
UP2BIM 74,665- 658- 37-B
UP2BB 67,232- 567- 44-B
UP2BZ 35,172- 395- 36-B
UP2BEF 31,450- 360- 37-B
UP2BEG 17,490- 218- 30-B
UP2FF 13,840- 268- 22-B
UP2BOQ 8946- 329- 14-B
UP2BCS 8845- 198- 19-B
UP2BOG 3816- 147- 12-B
UP2PBW 88,392- 529- 58-C
UP2NO 5688- 195- 17-C
RP3P (UP2s BBT, BCO, BCR, BCT, BCW, BDF, BFI, BFL, BFN, BJK, BNC,BNO, BNY, BOC, NK, OO, OU, PAV, PBT, QA, oprs.) 1,439,288-3066-152-D
U2PWI (UP2s BAO, BAS, BAW, BEX, BIJ, BKW, PAX, PX, oprs.) 953,172-2438-132-D
U2PMM (UP2s BBF, BBM, BKF, BKK, BNI, -038-728, oprs.) 141,735- 910- 55-D

Latvia

UQ2GLW 36,360- 353- 40-A
UQ2PQ 145,472- 899- 64-B
UQ2PM 78,548- 499- 57-B
UQ2GKM 43,937- 829- 53-B
UQ2GBJ 15,318- 292- 23-B
UQ2GMB 10,488- 204- 23-B
UQ2PG 804- 43- 6-B
UQ2PP 294- 40- 3-B
UQ1GWY (UQ2s GNL, GIU, GMK, oprs.) 96,750- 738- 50-D
UQ1GXJ (UQ2-037-221 + 2 oprs.) 26,012- 433- 28-D

Estonia

UR2QD 834,516-2081-106-A
UR1RWW 140,470- 904- 55-A
UR2OI 46,483- 361- 47-A
UR2RJJ 3148- 67- 22-A
UR2RKS 47,640- 447- 40-B
UR2RND 38,088- 280- 46-B

UR1RWL (UR2s RKZ, RMI, -083-1540, oprs.) 729- 57- 9-D

European R.S.F.S.R.

UZ3DD 73,935- 519- 53-B
UZ3TG 12,025- 127- 25-B
UZ3DX 67,257- 510- 47-C
UZ5LWZ (UA6s LIG, LV, UA6-150s -1060, -1103, -1135, -1240, oprs.) 929,008-2223-124-D
UZ6LWT (RA6s LG, LOT, UA6s 150-685, 150-697, oprs.) 498,720-1875- 88-D
UZ6AWJ (RA6ATL, UA6s AS, 101-622, -101-657, oprs.) 381,176-1259-106-D
UZ4LWA (UA4s LBE, LBQ, LCQ, oprs.) 225,256-1227- 74-D
UZ6HWA (3 oprs.) 201,115-1032- 73-D
UZ3AXX (RA3s DUU, DVR, UA3s AQW, DBP, -142-911, -170-79, oprs.) 164,032-1012- 64-D
UZ3ZWF (UA3s ZDN, ZFE, ZGR, ZJ, oprs.) 159,250- 731- 70-D
UZ6AYQ (3 oprs.) 87,596- 494- 43-D
UZ6LZL (3 oprs.) 63,804- 381- 52-D
UZ3YWG (RA3YAI, UA3s YDK, -118-343, oprs.) 52,140- 336- 66-D
UZ6LWY (UA6s LAG, LJE, UB5ILW, oprs.) 49,036- 302- 46-D
UZ6LXX (RA6LVA, UA6s LMW, LOF, oprs.) 46,132- 475- 38-D
UZ6XWC (3 oprs.) 45,900- 365- 45-D
UZ3PWJ (UA3s PHA, PLS, PNN, oprs.) 41,724- 347- 36-D
UZ3SWW (UA3s SEY, -151-377, -151-440, oprs.) 36,663- 405- 33-D
UZ4SWH (2 oprs.) 35,328- 485- 32-D
UZ6HXK (UA6-108s -1664, -1620, -1740, oprs.) 32,310- 374- 30-D
UZ3DZF (UA3s DNZ, -142-259, -142-809, oprs.) 20,574- 261- 27-D
UZ6AYN (UA6s AH, -101-1027, -101-1025, oprs.) 18,853- 327- 36-D
UZ3TWW (UA3s TDK, TFW, TFX, oprs.) 12,999- 251- 21-D
UZ3SWA (UA3s SCM, -151-642, -151-635, oprs.) 11,360- 186- 20-D
UZ3SWU (UA3-151s 506,-508, oprs.) 9340- 154- 20-D
UZ3XWB (UA3s XAG, -127-200, -127-824, oprs.) 4179- 169- 21-D

ZONE 30

European R.S.F.S.R.

RA4PM 168,210- 825- 63-A
UA4HAU 88,690- 329- 70-A
UA4RF 103,427- 518- 59-B
UA4PML 49,760- 363- 40-B
UA4HBP 25,425- 299- 25-B
UA4CED 20,125- 270- 23-B
UZ4WWB (4 oprs.) 599,648-1572-112-D
UZ4WWA (5 oprs.) 484,302-1600- 91-D
UZ4HWS UA4s HSV, -133-1714, -133-1715, oprs.) 229,908-1035- 68-D

Kazakh

UL7TT 10,880- 178- 16-A
UL7ECH 49,856- 308- 38-B
UL7CAZ 20,700- 237- 20-B
RL8PYL (UL7s PAE, PAO, PAZ, PBY, PCZ, -023-158, -023-434, oprs.) 1,429,344-2504-144-D
UL8CWI (UL7s CAV, CEB, -028-120, oprs.) 101,916- 602- 38-D

Asiatic R.S.F.S.R.

UA9AO 225,120- 826- 60-A
UW9AO 70,788- 324- 51-A
UA9QA 55,384- 230- 56-A
UA9CE 55,315- 523- 23-A
UA9AW 46,657- 311- 37-A
UA9FKW 548- 33- 4-A
UA9SA 770,434-1524-113-B
UA9CBR 132,251- 637- 49-B
UA9WYL 126,947- 609- 47-B
UA9FKM 98,158- 627- 34-B
UA9MX 86,292- 414- 51-B
UA9CM 73,983- 423- 39-B
UA9ALD 64,575- 425- 35-B
UA9FD 58,548- 253- 46-B
UA9AEH 57,929- 254- 53-B
UA9FII 26,600- 323- 20-B
UA9CUP 23,604- 242- 22-B
UA9AOV 23,598- 360- 18-B
UA9LCU 23,194- 285- 18-B
UA9CIY 18,768- 220- 24-B
UA9AKS 17,940- 347- 12-B
UV9DO 10,560- 115- 22-B
UV9FM 612,854-1482- 89-C
UW9CL 65,029- 317- 39-C
UA9CS 29,119- 183- 37-C
UZ9AWZ (UA9s AOA, 165-938, oprs.) 940,680-2023-104-D
UZ9AWH (UA9s ABO, ACA, -165-1436, oprs.) 116,375- 553- 49-D
UZ9SWA (2 oprs.) 82,080- 465- 40-D
UZ9CXU (UA9CB, RA9CVC, oprs.) 35,820- 277- 30-D
UZ9AXT (UA9AML + 1 opr.) 1116- 35- 9-D

Turkoman

UH8ED 61,152- 314- 49-B
UH8EWW (UH8s EAA, -044-18 + 7 opr.) 1,209,416-2418-116-D

Tadzik

UJ8JA 308,080- 882- 80-B
RJ8R (UB5s UAT, XCM. UJ8s JB, JC,JX, oprs.) 577,486-1491- 82-D

Uzbek

UI8AFA 3825- 65- 15-B

ZONE 31

Asiatic R.S.F.S.R.

RA9UN 319,130-1242- 70-A
RV9UV 44,910- 251- 45-A
UA9UR 36,673- 262- 31-A
UA9YHD 130,450- 607- 50-B
UA9YGA 85,008- 436- 46-B
UA9URF 75,118- 407- 46-B
UA9UFW 29,592- 286- 36-B
UA9YBY 28,404- 248- 27-B
UA9OA 8148- 136- 14-B
UA9YGO 1233- 43- 9-B
UA9YCO 278,208-1102- 64-C
UZ9UWN (RA9UCP, UA9s JHN, -130-278, oprs.) 86,802- 456- 51-D
UZ9OWM (UA9-145s -1981, -2201,-2241, oprs.) 85,462- 352- 38-D

Kirghiz

UM8MU 43,996- 369- 34-A
UM8MGO 33,780- 276- 30-A
UM8MM 18,096- 185- 29-A
UM8MBA 71,595- 370- 45-B
UM8MAN 18,963- 204- 21-B
UM8MO 511,020-1199-102-C
UM9MWO (UM8s MFY, MKO, -036-094, oprs.) 332,422-1124- 71-D

Kazakh

UL2GAV 114,699- 518- 51-B
UL7FCG 100,755- 538- 45-B
UL7PFH 53,464- 341- 41-B
UL8GWB (3 oprs.) 763,232-1905- 92-D

ZONE 32

Mongolia

JT1KAA (JT1BQ, opr.) 39,072- 500- 24-C

Asiatic R.S.F.S.R.

UA9SAU 711,588-1516-114-A
UA9SGJ 60,525- 336- 45-A
UA9SG 7504- 77- 28-A
UA9BL 108,987- 543- 51-B
UA9WAE 58,950- 324- 45-B
UA9SR 48,312-1098- 44-B

ZONE 33

Asiatic R.S.F.S.R.

RA9JD 63,000- 319- 60-B
UA9UCW 43,785- 321- 45-B

ZONE 34

Asiatic R.S.F.S.R.

UW9CM 45,012- 288- 44-A
UA9FDX 5734- 169- 13-A
UA9FEO 63,616- 292- 56-B
UA9LH 55,800- 309- 45-B
UA9LT 36,252- 200- 53-B
UA9LJ 30,108- 214- 39-B
UA9CDS 28,923- 277- 31-B
UA9CFF 28,175- 223- 35-B
UA9FFH 27,445- 355- 47-B
UA9LCF 4340- 69- 20-B
UA9CS 1764- 44- 14-B
UA9FFI 840- 33- 8-B
UW9CW 204,792- 947- 69-C
UA9FF 71,004- 324- 61-C
UZ9LWW (UA9s LCZ, LFK, oprs.) 449,730-1355- 95-D
UZ9CWO (UA9s CGL, CHG oprs.) 66,144- 375- 53-D
UZ9FWD (UA9 153s -2,-3, -285 oprs.) 1456- 54- 8-D

ZONE 35

Asiatic R.S.F.S.R.

UA9ZBP 187,572- 581- 84-A
UA9ZBF 224,845- 641- 85-B
UA9ZDE 22,967- 350- 48-B
UA9ZCQ 4095- 67- 15-C

ZONE 36

Azores

CT2CQ 262,314-1173- 59-B

Madeira Islands

CT3BD 372,890- 773- 98-C

Canary Islands

EA8AGH 12,220- 611- 20-B
EA8RCT 8866- 162- 11-B
EA8ATA 7751- 69- 23-B

ZONE 37

Portugal

CT1CBW 124,500- 668- 50-B
CT1CVK 44,485- 402- 35-C
CT1ANO 37,488- 496- 22-C

Spain

EA1CDF 75,840- 490- 40-A
EA2CR 25,871- 197- 41-A
EA5CPK 111,916- 671- 49-B
EA3LL 57,120- 496- 34-B
EA3BOW 49,077- 335- 41-B
EA4CKV 29,882- 256- 34-B
EA3DXD 24,120- 264- 30-B
EC5BMD 12,606- 177- 22-B
EA5CGU 4900- 66- 20-B
EA7AZA 1781- 43- 13-B
EA1ASI 864- 28- 9-B
EA5EQL 112,945- 667- 49-C
EA1BGT 60,882- 673- 37-C
EA7ECT 60,320- 448- 40-C
EA3EZG 52,800- 325- 50-C
EA3DMP 24,893- 242- 31-C
EA1BCK 24,165- 292- 27-C
EA5CHT 22,320- 222- 31-C
EA3ELM 15,309- 161- 27-C
EA3EZD 15,111- 201- 23-C
EA5DIT 12,750- 101- 34-C
EA5BZS 11,628- 176- 19-C
EC2AFP 1734- 97- 6-C
EA1AHA 945- 36- 9-C

Balearic Islands

EA6TC (+ EA6s JD, NP) 158,620- 925- 55-D

ZONE 39

Cyprus

5B4DN 14,355- 96- 33-A
5B4MF 885,354-2384- 82-C

Israel

4Z4TA 12,708- 236- 18-C

ZONE 41

India

VU2JXO 79,728- 432- 44-B

ZONE 44

Korea

HL4XM 30,632- 272- 28-B
HL1ABR 87,872- 896- 32-C

ZONE 45

Japan

JA1YWX 739,680-1322-134-A
JH4UYB 242,845- 785- 85-A
JA6BIF 98,240- 395- 64-A
JR6GIM/2 54,945- 282- 55-A
JA2UOT 50,328- 254- 54-A
JJ3JJL 49,140- 200- 60-A
JR3WXA 22,644- 116- 51-A
JH1EVD 14,976- 94- 39-A
JH1MTR 14,720- 92- 48-A
JA6CM 10,808- 100- 28-A
JA1AAT 7128- 65- 27-A
JG3NKP 4360- 48- 20-A
JK1RJQ 4224- 98- 18-A
JE1ARO 4075- 40- 25-A
JN1ENK/3 1044- 36- 12-A
JA3HTK 616- 21- 8-A
JL1EJO 36- 4- 3-A
JO1ITV 106,828- 433- 68-B
JA5EGX 102,816- 444- 54-B
JH7WKQ 96,200- 374- 74-B
JA2FXV 62,010- 280- 85-B
JH7IMX/2 57,710- 257- 59-B
JA1BNW 55,401- 217- 59-B
JR3XEX 28,908- 165- 44-B
JA1OP 17,160- 86- 52-B
JA1PS 12,024- 334- 36-B
JR4ISK 4472- 74- 26-B
JA7KM 4224- 42- 24-B
JA8EJO 4176- 62- 18-B
JH8NVX 3759- 51- 21-B
JA2KPV 2941- 45- 17-B
JO1LZX 2618- 51- 14-B
JA1OYB 2325- 37- 15-B
JA1JGP 1708- 36- 14-B
JF6NBB 1488- 48- 12-B
JA0UMV 1274- 28- 13-B
JE3CYH 95- 5- 5-B
JR3KQJ 21- 3- 3-B
JG1ZUY 639,856-1292-116-C
JA1YCL 259,994- 724- 98-C
JE6JVJ 189,090- 847- 90-C
JA9RPU 100,264- 305- 83-C
JR1WHW 69,240-1154- 60-C
JH3DPB 56,862- 318- 39-C
JF1JLW 8760- 293- 20-C
JP1TRJ 6885- 111- 27-C
JH1UUT 6302- 110- 23-C
JA0VHI 5771- 59- 29-C
JH3DEJ 5512- 83- 26-C
JH0XUP 4862- 75- 22-C
JA6QDU 4580- 61- 20-C
JQ1IBJ 3582- 80- 18-C
JL1MWI 3216- 201- 16-C
JL1KCO 2772- 46- 18-C
JE7VEI 2709- 39- 21-C
JA4CUU 2704- 76- 8-C
JA0GZ 2338- 41- 14-C
JP1TVZ 864- 18- 9-C
JI3IAG 540- 22- 9-C
JG2VMN 488- 21- 8-C
JR3KAH 396- 10- 9-C
JA1AAV 759- 15- 11-C
JA3RBC 372- 20- 6-C
JO1MCC 360- 10- 10-C
JE1TTQ 115- 9- 5-C
JA3YBF (JE6BXJ, JG3LZG, JH9GRM, JR4IZK oprs.) 1,243,957-2470-143-D
JA9YBA (JA9s LNJ, QCE, QWJ, VBW, JH0HHU, oprs.) 966,042-1830-123-D
JA6YAI (JE6s MQW, UWI, JG6EAP, JR6s EZE, IGY, JH0FKC oprs.) 757,188-1668-123-D
JA3YQP (JA3PIA, JE3KAM, JF3PGA, JI3QPN, JR3BOT, JJ3EFM oprs.) 411,570-1355- 90-D
JA1ZLO (JI1CUP, JJ1BDX, JL1IOI, JM1LPN, JF2IWL, JI2GUT, JI3DMA oprs.) 338,451- 873-101-D
JA6YDH (JE6VFJ, JF6GQC, JR6s GHN, PKJ, QPB oprs.) 297,661-1015- 91-D
JA8YAU (JF2EKC, JR7COO, JA8AAY, JH8s COQ, DXI, LEF, MQZ, NFQ, JR8IQB oprs.) 196,536- 699- 76-D
JA7YCO (JE7WVX, JN1LIG, JR7MZC oprs.) 157,760- 563- 80-D
JR1ZTT (JF2NXS, JH6NBW, JR4WKV oprs.) 155,376- 592- 72-D
JA7YAL (JH7MEV, JH7VXM, JR7s ACN, TNW, TWL oprs.) 129,996- 512- 69-D
JA7YTB (JR7TJP, JE7FZX, JE7OWL oprs.) 26,542- 263- 46-D
JA7YBL (JE7LOA, + 7 oprs.) 15,402- 122- 51-D
JA7ZWD (+ JA7HQK) 3864- 44- 23-D

ZONE 50

Republic of the Philippines

K1BAZ/DU1 43,500- 304- 29-B

ZONE 54

Indonesia

YC0VM 892,619-2915- 91-C
YC0DPO 73,656-1084- 22-C

Singapore

9V1TL 84,524- 478- 44-B

ZONE 58

Australia

VK6DU 817,580- 849- 90-A
VK6MD 1,302,260-2321-115-C
VK6IR 55,080- 236- 51-C

ZONE 59

Portugal

CT4MS 93,100- 530- 50-C

Australia

VK2BQQ 205,884- 354- 86-B
VK1XX 120,170- 408- 61-B
VK5AGX 50,912- 250- 45-B

ZONE 60

New Zealand

ZL2BR 59,040- 256- 48-B
ZL1AIZ 1143- 27- 9-B
ZL1ANJ 398,288- 936- 88-C
ZL1AFU 54,740- 326- 34-C
ZL2AH 30,060- 362- 30-C

ZONE 61

Hawaii

KH6CP 50,105- 213- 55-A
KH6SC 20,064- 218- 24-A
AH6EK 4544- 58- 17-B
WB6FGR/KH6 1,049,321-2354- 91-C

ZONE 64

E. Carolines

KC6DX (KD7P, opr.) 318,528- 908- 72-A

ZONE 65

Wake Island

AH9AB 1070- 23- 10-C

ZONE 69

Antarctica

4K1A 19,992- 146- 28-A

ZONE 75

Franz Josef Land

UA1OT 31,812- 166- 44-A

Checklogs

EA1CVY,EA7BYM,HA0DD,HA1UB, HA7RB,HA8GZJA9YBA,K0VUW, K9NA,K9QVB,LZ1EO,LZ11A, LZ1KKZ,N6UW,O24ZT,O27BW, OH1PYOH2BRL,OH6NH,OK1AD, OK1JST,OK1US,ON5CW,OZ1FFG, OZ4VK,OZ5MJ,OZ5PA,OZ7GN, PA3BFH,PA3BNH,PY5IW,RA0AC, RA1ASK,RA1NB,RA3AR,RB5FA, RT5UE,RT5UY,SM0BFJ,SM0LZT, SM0NMR,SM2NTU,SM5BDV, SM5NWX,SM6CDN,SM8KMD, SM7KWE,SM0CMH,SP3BYZ, SP4EEZ,SP5ENA,SP5GQX, SP5LGP,SP6LK,SP8JMA,UA0ID, UA0KBC,UA0SGT,UA0ZCK, UA1-120-306,UA1OGA,UA1QED, UA3DB,UA3DFV,UA3DJG, UA3GGF,UA3LCC,UA3UAR, UA3VAO,UA3VBU,UA4ACP, UA4ADL,UA4AGG,UA4AHT, UA4HLX,UA4LBQ,UA4NBD, UA4NCB,UA4QK,UA4RC,UA5BBH, UA6BJF,UA6HON,UA6LDF, UA6LMT,UA6LUE,UA6XDL, UA9COJ,UA9COT,UA9FFE, UA9OP,UA9SBM,UA9SIZ, UB4WZA,UB5FDG,UB5GFT, UB5HFU,UB5KW,UB5LEE, UB5LQM,UB5NBO,UB5QKN, UB5UHE,UC2LB,UC2SAD, UG6GAW,UJ8JJ,UL7CAD, UN1CC,UO5AP,UO5OJM,UO5OK, UR2RKB,UT4UWC,UT4UWE, UV3DN,UV3MM,UV9EI,UW3BX, UZ0LWX,UZ3AXJ,UZ9SWY, UZ9SWY,UZ9UZT,Y2-10583/834, Y2-8708/N6ZY21DC,Y23JA,Y24EA, Y24LO,Y24PM,Y24TG,Y25MG, Y26HO,Y27HH,Y27HL,Y31TM, Y32LL,Y33ON,Y33TB,Y33UB, Y33VL,Y41XI,Y53VN,Y53YN, YO6ADW,YU4EJC.

Contest Corral

A Roundup of Upcoming Operating Events

Conducted By
Edith Holsopple,* N1CZC

FEBRUARY

Jan. 26-Feb. 3

ARRL Novice Roundup, Jan. *QST,* page 71.

2-3

New Hampshire QSO Party, Jan. *QST,* page 83.

Vermont QSO Party, Jan. *QST,* page 84.

Zero District QSO Party, Jan. *QST,* page 84.

YU WW DX Contest, Jan. *QST,* page 84.

3

North American Sprint, Jan. *QST,* page 84.

5

West Coast Qualifying Run, 10-35 WPM, at 0500Z Feb. 6 (9 P.M. PST Feb. 5). W6OWP prime, W6ZRJ alternate. Frequencies are approximately 3.590/7.090 MHz. Underline one minute of the highest speed you copied, certify that your copy was made without aid and send to ARRL for grading. Please include your full name, call sign (if any) and complete mailing address. A large s.a.s.e. will help expedite your award or endorsement.

9-10

QCWA QSO Party, CW

West Coast 160 Bulletin SSB Contest, Jan. *QST,* page 84.

YL-OM Contest, phone, Jan. *QST,* page 84.

PACC Contest, sponsored by VERON, from 1400Z Feb. 9 to 1700Z Feb. 10. No rules received this year. CW and phone, 160-10 meters. Work PA PE PI stations. Single and multiop categories. Exchange signal report and serial number. Dutch stations will send report and province (GR FR DR OV GD UT YP NH ZH ZL NB LB). Work stations once per band, regardless of mode. Count one point per QSO. Multiply by number of provinces worked per band for final score. Mail logs by March 31 to PACC Contest, F. Th. Oosthoek, PAØINA, P.O. Box 499, 4600 AL Bergen op Zoom, The Netherlands.

10

W1AW Qualifying Run, 10-40 WPM, at 0300Z Feb. 11 (10 P.M. EST Feb. 10). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 147.55 MHz. See Feb. 5 listing for more details.

16-17

ARRL International DX Contest, CW, Jan. *QST,* page 73.

America Radio Club DX Contest, from 1200Z Feb. 16 until 2400Z Feb. 17. All bands, phone and CW. Single ops only. No crossband, crossmode or repeater contacts. Stations may be worked again on different bands. Phone and CW count as separate bands. Exchange signal report, QTH, call sign and QSO number. Count 1 point per contact, (10 points per contact with an America RC official operator.) Mail entries by March 30 or send an s.a.s.e. for more information to America RC DX Contest, P.O. Box 3576, Hialeah, FL 33013.

20

W1AW Qualifying Run, 10-35 WPM at 2100Z (4 P.M. EST) Feb. 20. See Feb. 5 and 10 listings for more details.

23

RTTY World Championship Contest, sponsored by *The RTTY Journal* and *73 Magazine,* Feb. 23 from 0000Z until 2400Z. Single ops work 16 hours max.; off-times must be at least 30 minutes long and noted in the log. Multiops may use all 24 hours. Work stations once per band; no crossmode QSOs. Single and multioperator, single transmitter only. Single band and all band (10-80 m). W/VE stations send signal report and state, province or territory. Others (including KH6/KL7) send signal report and serial number. Count 5 points per W/VE QSO, 10 points per DX QSO. Multiply by total states/provinces/countries worked per band. (MD and DC count as one multiplier). Use official entry forms. Separate logs by band. Awards. Mail entries by April 16 to *The RTTY Journal,* P.O. Box RY, Cardiff, CA 92007.

22-24

CQ WW 160-Meter Contest, phone, Jan. *QST,* page 83.

OMISS QSO Party, sponsored by the OM International Sideband Soc., from 2100Z Feb. 22 until 0200Z Feb. 25. Phone only, single op, unless family station. No net QSOs allowed. Contact each station once per band, 80-10 meters. Exchange RS, state, province, territory or country (including KH6, KL7). Count 2 points for each member QSO, 1 point for each nonmember. Multiply by the number of states (48 max.), provinces/territories (13 max.) and DX countries worked. Compute the score for each band and add together for the final score. Submit separate logs for each band worked. Awards. Mail by March 16 to Doris Francis, NI4U, 2406 Sycamore St., Catlettsburg, KY 41129.

YL-OM Contest, CW, Jan *QST,* page 84.

UBA Trophy, phone, Jan. *QST,* page 83.

YL-ISSB-Commo-System 1984 QSO Parties, sponsored by Rick, KØRDJ, and Minnie, NAØV, Connolly. Phone from 0001Z Feb. 23 until 2359Z Feb. 24. (CW is from 0001Z March 16 to 2359Z March 17.) Frequencies are the General portion of all bands. Send all logs, summary sheets and comments by April 30 to Rick and Minnie Connolly, KØRDJ/NAØV, Star Rte. 1, Crocker, MO 65452.

25-26

REF French Contest, phone, Jan. *QST,* page 83.

MARCH

2-3

ARRL International DX Contest, phone, Jan. *QST,* page 73.

6

West Coast Qualifying Run, 10-35 WPM at 0500Z March 7 (9 P.M. PST, March 6). See Feb. 5 listing for more details.

9-10

QCWA QSO Party, phone.

DIG QSO Party, phone, sponsored by *DIG Journal,* from 1200-1700Z March 9 and 0700-1100Z March 10. (Separate CW contest 1200-1700Z April 13 and 0700-1100Z April 14.) Work stations once per band. Exchange RS(T) and membership number if a member. Suggested frequencies on March 9 are 14.250-14.300, 21.300-21.350, 28.550-28.600 MHz. On March 10, use 3.700-3.800 MHz from 0700-0900Z and 7.050-7.100 MHz from 0900-1100Z. (Suggested frequencies for the CW portion of the contest are 14.035-14.100, 21.035-21.050, 28.035-28.050 MHz from 1200-1700Z April 13, and 3.535-3.600 from 0700-0900Z and 7.000-7.040 MHz from 0900-1100Z April 14.) Phone and CW are separate contests. Count 1 point per QSO with nonmembers, and 10 points per QSO with members. Count zero points for contacts with own country on 20, 15 and 10 meters. Multipliers are the DIG-members (count each one only once, regardless of band), and the number of DXCC countries worked on each band. Multiply the sum of QSO points by the sum of multipliers. Send an s.a.s.e. to DJ3HJ for official log sheets or use a duplicate log format. Send logs by May 31 to R. Knobloch, DJ3HJ, Freiburger Str. 13, D-7814 Breisach, Fed. Rep. of Germany.

West Coast 160 Bulletin CW Contest, from 0000Z March 9 until 2359Z March 10. Single operators only. Exchange signal report and QTH. Count 10 points per QSO and multiply by total states, VE provinces and countries worked. Categories for various PEP ratings: 3 kW, 2 kW, 1 kW, 250 W and QRP. To calculate PEP rating, multiply output power by two. Send logs to R. Koziomkowski, KA1SR, 5 Watson Dr., Portsmouth, RI 02871.

10-11

Wisconsin QSO Party, sponsored by the West Allis RAC, from 1800Z March 10 until 0100Z March 11. CW and phone. Work stations once per band and mode. Work mobiles again as they change county. No repeater QSOs. Exchange signal report and QTH (county for WI stations; state, province or country for others). Suggested frequencies: CW — 3.550 3.725 7.050 7.125 14.050 21.150; phone — 3.890 7.290 14.290. Count 1 point per phone QSO, 2 points per CW QSO. WI stations multiply by total WI counties, states and provinces worked. Others multiply by total WI counties worked (max. 72). WI mobiles may add 500 points to their score for each county outside their home county they make 15 QSOs from. Mail logs by April 15 (include large s.a.s.e. for results) to WARAC, P.O. Box 1072, Milwaukee, WI 53201.

11

W1AW Qualifying Run, 10-35 WPM, at 0300Z March 12 (10 P.M. EST March 11). See Feb. 5 listing for more details.

16-17

YL ISSB QSO Party, CW

Spring QRP CW Activity Weekend

Bermuda Contest

DARC International SSTV Contest

Iowa QSO Party

21

W1AW Qualifying Run, 10-35 WPM.

23-25

BARTG Spring RTTY Contest

30-31

Rio DX Party

HF Costa Lugo Contest

Strays

QST congratulates...

☐ Kenneth M. Miller, K6IR, of Rockville, Maryland, on receiving an Award of Achievement from the Society for Advancement of Management.

☐ Ruth Garrison, WA8FSX, of Sun City, Arizona, on being chosen a Volunteer of the Month by the northwest Valley retirement communities' Volunteer Bureau.

☐ George Mackley, WB7BZJ, of Ivins, Utah, on receiving the Woodbadge Beads award, the adult equivalent of the Eagle Scout Award.

☐ Larry Mooney, WB5PWY, on being appointed Deputy-Meteorologist-in-Charge for the National Weather Service in Oklahoma City.

☐ Julie Oliver, KA4DYV, of Adel, on becoming Miss Teen of Georgia, 1985.

*Communications Assistant, ARRL

Section News

The ARRL Field Organization Forum

Coordinated By Steven Ewald, WA4CMS

CANADA

ALBERTA: SM, E. Roy Ellis, VE6XC — A/SM: VE6AMM. SEC: VE6XC. STM/NM/DEC (APSN & ATN): VE6ABC. The PCARC has taken on the job publishing the VE6 magazine with Dave VE6XY as the editor. Thanks and good luck gang. Bill VE6ABC has another hat and its Prairie Region Director for CRRL. He also has a DTMF telephone service installed at his home. Bill is a busy boy.

BRITISH COLUMBIA: SM, H. Emie Savage, VE7FB. British Columbia Emergency Net, end of year report shows that some fifty have earned the SNC like VE7BNI 365 — VE7CJT 337 — VE7CDF 307 and VE7ESA 272 are the top for QNI's to the net. Dick, VE7COA is very sick at home. Fred VE7SS is home after heart surgery. Steve VE7OF is also home and also my Edna VE7BH after her second trip into hospital last time for surgery. Ron VE7BY and XYL snow birding in the south. Jack VE7CAM is in Dalhousie, N.C. University as lecture. Last heard of Alan VE7LL and Peggy that they were last heard way down south. VE7AZ Shorty Mac destroyed by basement fire, sorry to report. 73 and ARL 61 to You All. Traffic: VE7BNI 207, VE7CDF 115, VE7CCJ 41, VE7FB 34, VE7FSP 11, VE7XA 10, VE7FFO 10, VE7EIR 8, VE7EGM 7, VE7BZI 2.

MANITOBA: SM, Peter Guenther, VE4PG — A/SM: VE4AJE. SEC: VE4FK. An ARES meeting, held at Winnipeg November 26, should be of use to all emergency groups. Representation were VE4FK SEC, VE4AGR DEC, VE4ALO EC, VE4HK outgoing SEC, VE4ADS CRRL director and VE4PG SM. MEPN QNI 1150, QTC 14, sess. 30. WRIN QNI 225, QTC 1, sess. 30. MTN QNI 236, QTC 44, sess. 30. Traffic: VE4LB 44, VE4RO 40, VE4AJE 35, VE4AFO 31, VE4TE 30, VE4PG 18, VE4JA 15, VE4AAD 14, VE4IX 14, VE4FK 11, VE4BI 8, VE4DT 8, VE4XN 4, VE4NE 3, VE4ADS 2, VE4HK 1, VE4TL 1.

ONTARIO: SM, Larry Thivierge, VE3GT. BM: VE3LST. PGL: VE3AR. SEC: VE3GV. STM: VE3BDM. TC: VE3EGO. I am pleased to announce the appointment of George, VE3BDM as the Section's Traffic Manager. I hope you will all give him your support and cooperation. Final totals are not available at this time but there has been an abundance of Christmas traffic, unfortunately band conditions have been at their worst in a number of years. New OBS appointees are VE3BBS VE3EFX and VE3LSU. It is with regret that I report VE3BVG VE3FG and VE3RL have become Silent Keys. VE3GFN has issued Local Net Certificates to members of the Open Line Net. TC VE3EGO has been actively setting up a "community of interest" for amateurs interested in exchanging TELEDON/VIDEOTEXT colour graphics and text using NAPLPS on RTTY. Syd will be pleased to assist amateurs in getting started. VE3EER is now VE3KE. VE3BDO and not VE3BUO, as reported earlier, is now VE3UD. Brighton now has a repeater operating on 147.765 in/147.165 out, however I do not have the call sign. Scarborough ARC has won the Keith Russell and Rusty Brennan Memorial Trophies. This is the first time that SARC has won the Rusty Brennan trophy and the first time that one Club has won both in the same year. Ottawa ARC, under the chairmanship of VE3BBM, has a very successful EMI Committee. VE3NTI is the new editor of the North Shore ARC Newsletter. Congratulations to VE3MEM on obtaining his advanced. Traffic: VE3KK 294, VE3GT 191, VE3DPO 125, VE3BCZ 115, VE3BDM 87, VE3GNW 82, VE3CYR 64, VE3AWE 56, VE3GFN 52, VE3KCZ 49, VE3WM 46, VE3FGU 43, VE3AJN 37, VE3WV 37, VE3JSM 22, VE3GOL 21, VE3BAJ 14, VE3EWD 11, VE3KLX 11, VE3KXB 11, VE3MCO 6, VE3HSF 5.

QUEBEC: SM, Harold Moreau, VE2BP — STM: VE2EDO. BM: VE2ALE. PIO: VE2YW. TC: VE2ED. NMs VE2EDO VE2FSA. Change of call: VE2FHB is now VE2KT, VE2FEX now VE2WA. Congrats to Sorel-Tracy ARC, VE2CBS, for their Field Day high score. VE2GT a été élu president du club VE2CAM de St-Hyacinthe. Avec regret j'ai a vous annoncer le decès de VE2ASG. Traffic: VE2EDO 112, VE2EC 88, VE2BP 41, VE2EKC 28, VE2FKZ 26, VE2NST 22.

SASKATCHEWAN: SM, W. C. Munday, VE6WM. SEC: VE5CU. STM: VE5HG. TC: VE5GF. NMs: VE5EX, VE5HG, VE5NJ, VE5AEM, VE5AEJ, VE5BAF. Net reports: MJARC-2 meter 28 sessions, 200 QNI. RARA-2 meter: 28 sessions, 476 QNI, 5 QTC. PWXN: 30 sessions, 589 QNI. Congratulations to VE5CU in accepting the SK SEC appointment. He is no stranger in this field having served in that capacity for many years in the past and will be a welcome addition to the ARES team. Well Christmas is now over and I hope you found the ham gear you wanted under the tree. Now if the hams bands would only improve. On behalf of the ARRL Field Organization Team in SK I extend sincere wishes for a new year of health and happiness to you all.

ATLANTIC DIVISION

DELAWARE: SM, John Hartman, WA3ZBI — STM: W3DKX. SEC: W3PQ. PIO: N3DIP. PSHR: K3JL, W3DKX. SARA has installed a new antenna on their Millsboro repeater 147.075/675 improving coverage. Sick call: Tom W2AGR, Vic N3DCK. At SARA's third annual club dinner John, K3JL was awarded the W3WD Dick DeWitt Memorial Award for his years of dedicated work as club president. Vic, N3DCK, received an award for his work as secretary-treasurer. DTN QNI 374, QTC 41 in 23 sessions. DEPN QNI 69, QTC 16 in 4 sessions. SEN QNI 38, QTC 6 in 4 sessions. Traffic: W3PQ 120, W3QQ 88, W3DKX 70, WB3DUG 31, WA3WIY 27, K3JL 24, WA3ZBI 24, W3FEG 17, N3AXH 10, KA3IXV 9, KC3FW 8, KC3JM 4, K3ZXP 3.

EASTERN PENNSYLVANIA: SM, James B. Post, KA3A. ACC: KB3NE. PIO: W3AMQ. SEC: WA3PZO. STM: KB3UID. TC: W3FAF. ASM: KB3LM KA3GJT DECs: K3QXC AA3C W3EEK KB3UD N3BFL K3MWA KB3LR N3AIA WA3JRL.

Net	Time	Sess.	QNI	QTC
EPA	7/10 PM Dy	56	463	163
D8ARES	Tu/Th 8 PM	5	42	15
EPA EPJN	6 PM Dy	30	175	12
ATN		45	18	8
PFN	30	204	90	
D2ARES	MON 9 PM	4	42	8
PWA ARES		4	61	12

More new ECs, welcome to KN3V in Lackawanna and W3KNE in Lebanon. Although in the past few months there have been five new ECs added, there are still a few counties that need this position filled. District nine, which consists of Perry, Union Snyder and Juniata counties, still need a DEC and all ECs. Can a volunteer please come forward? Congrats to Penn Wireless on capturing First Place Honors in the 7A Class in Field Day. A note of thanks to both Mid-Atlantic ARC and the Del-Lehigh ARC for their hospitality, when visiting them. The Del-Lehigh Club ran the W3OK Christmas City, Bethlehem, Pennsylvania special event station with N3BHF K3YD KR3I KA3MNY WA3DAY KU3K KC3GL WA3BOM N3DRZ and KA3IWX providing the Hampower to set up and run the station. Preliminary and unofficial reports say the Erie Club came out on top in the PA. QSO party with Erie and Mungas passing the megapoint mark. Thanks to those ARES members in District 2 and Lancaster county that joined in on the search for the lost child; AA3C sends his thanks for the efforts made by the membes. The section newsletter will be going in January — all clubs please send a copy of your newsletter to Kay Cragie, KC3LM, 128 Berkley Road, Devon, PA 19333 so there will be a mention of your news. Traffic: KA3DLY 258/149, N3COY 202/86, KA3IME 1/10, W3KAG 102, WA3GLX 100, WB8KPE 84, N3AIW 81, WA3EHD 56, N3CD 54, KC3LY 53/98, W3ADE 34, W3AQN 33, W3FAF 26, NZBSK 3/15, W3CL 15, K3NTD 14, WA3CKA 10, K3EBZ 9, W3TWV 5, N3BFL 5, WB3FPL 4, W3HK 3, WA3QM 2.

MARYLAND, DC: SM, Karl R. Medrow, W3FA — OO reports from KA3R and K3CHP. Remember OOs are trying to help you not police you! KC3EK W3IK and KA3R are new Amateur Aux. members. Congrats. The Antietam members miss silent key WA3RMI. Simulated emergency "peachbasket" became a real train accident, K3DAV WB3ISS KA3DRQ KA3DRO WA3TFI KA3YAQ KC3IQ and KA3IQJ were nearby and provided the circuits till cleared. Congrats to all CBARA members participating. WA3UMI is keeping SMARC in the forefront. KC3D and W3ZNW are out of report cards. KC3Y is big man of the month. N4DLA is not to be confused with W3DLA or is it vice versa! N3EBQ is making a splash on the MEPN. W3YVQ reports BARC had 17 stations covering the Maryland Marathon won this year by natives of Maryland! KJ3E is emergency powered on HF and VHF with battery rigs and a generator. WB3FUE is happy with the new 6 cavity duplexer on the 22/82 machine. KK3F uses 2 meters for local traffic. W3DQI has put away his grill until next summer. K3NNI is back to work after a line bypass operation. W3FZV is a QSO Party participant. KA3EWV was holding a bundle when the bottom dropped out of the band. KC3DW recommends W4FBA EC for Washington County. K3MR is Balto outlet. KC3AV is looking for MSN recruits. Find WB3BFK on the PON. W3LDD is a prenetter. WA2ERT knows real winter. Note KA3DUE and KA3HUT have ARES connections. W3UT is a Frederick VE. W3FZT KA3LQN W3NHR WA3CGU KA3KUK K8RYA KA3LWL K3OJG KC3DW W3ARZ WA3VDX KA3IWP W3IUT and WA4IBY furnished communications for the 50 mile JFK Hike-Run. Thanks men. Net/Manager Sessions/Traffic/QNI Average. MEPN/KJ3E 43/289/25. Top ten: W3FA KJ3E W3YVQ W3DKX WA2ERT KA3CDQ N4DLA N3EBQ and KB3WL. MDC PON/W3OYY 5/2/11.8. WC 2 Mtr/KC3DW 4/60/15. MSN/KC3AV 30/60/8. WR PON/WB3BFK 21/18/12.7. SMARC/KA3DUE 4/4/20. WICOM/CO/KA3HUT 3/10/8. October MDD/W3PQ 62/208/9.5 Brass W3FA, W3QQ and WA2ERT. Traffic: KC3Y 187, KC3DW 179, KJ3E 154, W3FA 139, KK3F 110, KC3AV 88, KA3EWV 73, W3YVQ 52, WA2ERT 50, N4DLA 43, W3UT 42, N3EBQ 25, K3NNI 21, WB3BFK 20, W3ZNW 19, W3FZV 16, W3DQI 16, WB3FUE 14, K3MR 10, W3LDD 8, KC3D 6.

SOUTHERN NEW JERSEY: SM, Richard Baier, WA2HEB — SEC: K2QIJ. STM: WB2UVB. ACC: K2IXE. TC: W2IJX. SGL: W2XQ. PIO: WB2RVE. BM: WB2UVB. OO/RFI: WA2HEB. I am very involved with a computer bulletin board system (BBS) in Forked River called the Jersey Shore TBBS. It has quite a number of different features and boards on it. One of the boards I co-sysop, is an Amateur Radio board. In addition to putting up the latest League bulletins and section news, we recently started a radiogram service via ham radio. It was started in late November and has really taken hold. Here's how it works. A person who logs onto the system picks a menu selection which prompts the user for the addressee's name, address and telephone number, the text of the message and the signature. Whenever I logon, I very simply download the messages to my printer or disk and send them out via NTS at the first opportunity I have. The telephone number for this unique bulletin board is (609) 693-8849 and it's open to all. 73. Traffic: WA2HEB 101, KC2PB 84, W2IU 5.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA. SEC: W2BCH. ACC: N2EH. BM: W2GLH. PIO: WA2PUU. TC: K2QR. SGL: KO2X. OO/RFI: W2AET.STM: OPEN. Appts: EC: KA2KUI, Essex; WA2PUU, Onondaga; KD2JJ, Erie; OES: WB2GHH N2HR W2OW KO2Q. Officers: Drumlins KD2CO KA2JQV KX2T N2DIT KC2GZ; U of R KF2T. Congrats new Affiliate and SSC Liverpool Amateur Repeater Club. PSHR: KA2BHR KG2D KA2DQA WA2FJJ VE2FMO W2GJ WB2IDS WA2KOJ W2MTA WB2OWO ND2S KX2T K2YAI. Novice Classes: many, including Drumlins — N2CSY/N2DIT; RARA — WA2UGE K2MP NE2B; Tompkins — WB2WDN KD2IM KC2YF KO2X. OBS: WB2DSR WA2ZPE. Owego/STARC Hamfest May 4; Rochester May 18/19, including VE exams.

NYS/1*	3677	1000/Dy	WB2EAG	484-193-30
WDN/1*	04/84	1100/Dy	WB2OWO	365-088-30
MFN	3925	1300/M-S	VE2FMQ	197-072-26
NYPON*	3913	1700/Dy	WA2KOJ	840-410-30
NYSPTEN	3925	1800/Dy	WB2HKU	627-067-30
ESS	3590	1800/Dy	W2WSS	430-057-30
OCTEN/E*	34/94	1830/Dy	WB2HLY	701-102-30
Q Net	31/91	1830/Dy	KA2CMQ	373-004-29
WDN/E*	04/84	1830/Dy	WB2OWO	678-181-30
BlueLine	93/33	1900/Dy	WA2SEF	295-023-29
NYS/4*	3677	1900/Dy	WB2MCO	485-228-30
JCARCN	10/70	2000/Dy	WA2WAX	
OARCN	25/85	2000/Wed	K2VTT	049-001-04
BRVSN	055/655	2100/Dy	WB2OFU	343-002-30
CNYTN*	90/30 +	2115/Dy	WA2PUU	322-059-30
OCTEN/L*	28/88	2130/Dy	WB2HLY	299-019-30
STAR*	99/39	2130/Sat	TBA	
WDN/L*	04/84	2130/Dy	590-111-30	
NYS/5*	3677	2200/Dy	WB2MCO	358-200-30

NTS Net. Field Day: 1A Bty K2RN 49/62; 1A W2SEX 37/156, WA2WAX 115th; 2A Bty W2LZ* 7/43, NC2C* 14th, W2RUI 40th; 2A K2NY 7/384, K2IO*71, N2AE 121, NC2T 169, K2JPM 190, KE2Q 320, KZ2R 327, KS2J 341, N2DM 357, WB2ELW 369; 3A K2MP*41/283, W2CFO*49, K2HE*66, K2SA*75, W2SAM 111, W2UXC*114, W2AE*145, WD2ASX 168, KA2X 265, WA2AAZ*273; 4A W2QYV 64/109; 4AC W2PE 1/3; 5A K2QR 18/69, 1B-1 op Bty AI25 12/30; 1B-1 op K2OID 3/11. *SM got ur FD MSG for points! Congrats: NA2Q got 5 Band WAS; K2RL via Learjet. Comms: Skyline with 8 Band Pageant in Cortland. All of you Volunteer Examiners, THANKS for your dedicated efforts, eat lots of spinach for your fortitude; the fruits of your labors will strengthen you in the ham years ahead. We lost our mentor on the 16th, K2CS became a Silent Key; Bill Boerner started hamming in April 1912. GB CR and WB. Traffic: WB2OWO 422, WB2IDS 397, WA2FJJ 304, VE2FMQ 263, W2MTA 247, WA2HSB 231, WB2QIX 133, ND2S 114, K2YAI 108, KG2D 91, KA2DBD 88, KA2BHR 83, KX2T 69, KA2DQA 63, W2GJ 63, WB2RBA 62, WA2KOJ 44, W2UYE 36, AF2K 32, W2FR 30, KA2TFC 29, KA2UBX 29, N3DPE 28, WA2SMZ 27, W2ZOJ 24, KU2N 23, N2FBK 20, K2IUT 10, KC2SJ 4, N2DZD 3, WB2NAO 2, K2VR 2. (Oct.) KA2BHR 50, N3DPE 43. (Aug.) KA2BHR 37. (July) KA2BHR 65.

WESTERN PENNSYLVANIA: SM, Otto L. Schuler, K3SMB — SEC: AB3O. STM: AC3N. ACC: N3EE. OO/RFI: KN3B. PIO: WB3IZJ. TC: W3FE. BM: WN3VAW. SGL: K3HWL.

Net	QNI	QTC	Sess.	kHz	T/D
WPACW	330	143	30	3585	7:00 P/D
WPAPTN	546	119	30	3983	6:15 P/D
WPA2MTN	430	47	30	146.28/88	8:00 P/D
NWPA2MTN	388	2	27	145.13/53	6:00 P/D
PFN	204	90	30	3958	5:00 P/D

I would like to thank all who voted for me for SM again. N3ECQ (was KA3IYR), KA3LBT & KA3LPB to General and KA3LNG to Tech, Congrats to all. New officiers for 1985: South Hills B.P. and MOD. Pres W3IQD, V.P. K3MPJ, treas. N3AEW, Sec. WA3KOD. Directors W3MML, W3LDB & W3QNI, Trustees WA3WNT, WA3PBD & N3DXE, North Hills ARC Pres. K7TFY, V.P. K3SJD, Sec. N3DOS, Treas. KA3JLQ, Trustee K3RN, Directors W3OVM, KA3JUM & WA3ZPL. Triple "A" ARA, Inc. Pres. K3NPX, V.P. WA3ZJE, 2nd V.P. KA3GQO, treas K3NPW, Chief Eng. KA3GQO, Treas. K3NPW, Chief Eng. KA3GQO. Trus. W3VRZ. Quad County ARC Pres. WA3IHK, V.P. N3DEO, Sec. WA3UFN, Treas. K3PS, Exc. Bd. WA3BUX, WA3GNS, WB3HUE, WA3MYO & KA3DWR. I will be glad to list all club officers but I must have their call letters to do so. I have received favorable comments on the new third district QSL bureau all who have commented approve their operations. I would like to make a list of all clubs with VEC programs and would appreciate your input. If your club would like to apply for SSC please get in touch with me and I will have the necessary applications sent. There are many advantages in belonging to the League as a affiliated club and having SSC appointment, I will be glad to visit your club if convenient. Traffic: W3EGK 400, W3OKN 144, AC3N 139, KQ3T 124, W3NGO 111, KC3JQ 79, WB3QNT 69, N3FM 66, WA3DBW 65, WA3UNX 62, W9KPT/3 62, K3SMB 58, WN3VAW 58, K3NPW 56, KQ3M 38, N3WS 38, W3RUL 26, W3KMZ 26, W3MML 18, W3KUN 15, KC3HR 14, K3LTV 12, K3NPX 8, KB3NV 8, W3SN 5. (Oct.) WN3VAW 34.

CENTRAL DIVISION

ILLINOIS: SM, David E. Lattan, WD9EBQ — SEC: W9QBH. STM: KB9X. OO/RFI: W9TT. BM: K9ZDN. PIO: WD9EED. SGL: W9KPT. ACC: WB9SFT. ASM: K9ORP.

Net	Freq	Times (Z WIN)	QNI	QTC	Sess
ILN	3690	0030/0400 DY	577	241	57
ITN	3705	0100 DY	270	72	28
ILPN	3915	2230 DY (X SN)	723	75	28
NCPN	3915	1300 DY (X SN)	486	77	26
NCPN	7270	1815 DY (X SN)	349	57	25
IEN	3940	1500 SN	106	2	4
IARES	3915	2230 1+3 SN	47		2
ISN	3905	0000 DY	562	158	30

Illinois was represented 100% to 9RN by stations K9AZS K9BVE KD9K N9DR KA9FEZ K9GMZ KZ9I KW9J WB9NVN W9NXG K9PNG K9QEW N9TN KB9X and KC9YN. Illinois was represented 100% to D9RN by stations WA8AHO KA9FEZ W9HLX WB9WGD W9HOT WB9NVN K9AZS K9EHP W9NXG KW9J and WB9ODN. D9RN was represented 100% to CAND. Illinois stations were K9AZS W9NXG KA9FEZ WB9NVN KW9J and W9HOT. EC AA9D reports that Kane Co ARES now has 29 members. EC KA9MNX of Champaign Co ARES gave a talk on ARES and showed the film "At Any Moment." In addition to interested local amateurs, ESDA and RACES members were also present. W9LNQ reports that 160 has been in excellent shape recently and encourages us to join him on the "top band." The Rockford Amateur Radio Assn hosted Fr. Marshall Moran, 9N1MM at their November meeting. EC/PIO WD9EED was unable to make a scheduled presentation to the local LIONS club due to sickness, but with a little arm twisting got WA9SID to go in his stead. Stan showed the ARRL film "Moving up to Amateur Radio" and followed up with a talk on local Amateur Radio activities. W9RQO, president of the St. Clair Amateur Radio Club forwarded a copy of a letter he received from Barry Goldwater which was in response to their concerns over the possible jeopardy of the 220 MHz band. Mr. Goldwater gave assurances that he would be watching those developments very closely. W9IL of the Centralia Wireless Assn has scheduled VEC exams for March 9th and May 5th 1985. The May 5th session will be at the Centralia Wireless Assn Hamfest. If you are interested in taking exams in the Centralia area on these dates contact W9IL Lou Hodges, at Route 1, Box 62A, Centralia, IL 62801. SM WD9EBQ represented IL ARRL at a November meeting of the Illinois VOLAG or volunteer agencies active in disaster. These meetings are held semi annually to keep officials of member agencies abreast of changes in other member agencies. Illinois Emergency Services and

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C22A	220	Yes	2W	20W	5A	$89
C106	220	Yes	10W	60W	10A	$179
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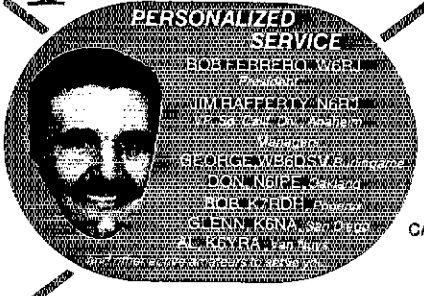

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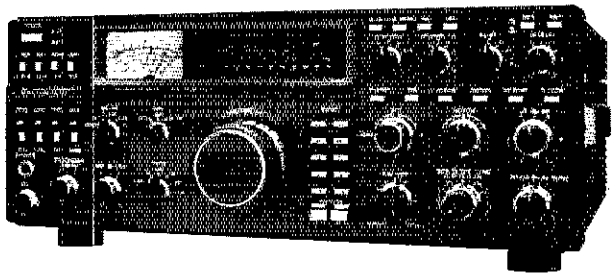

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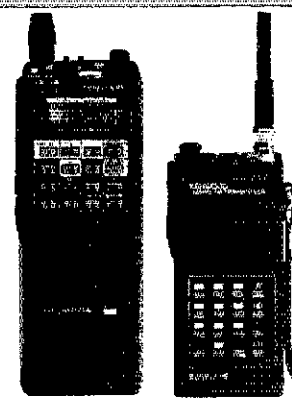

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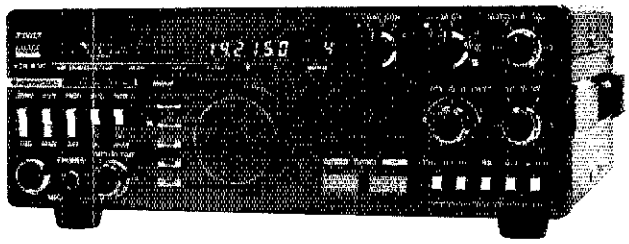

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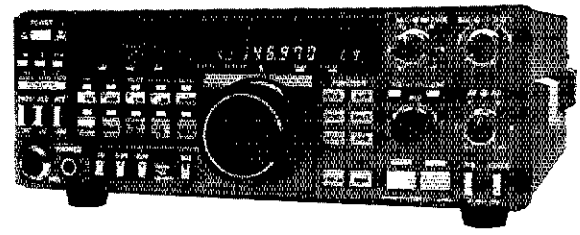

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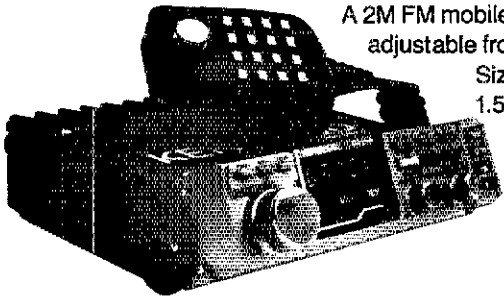

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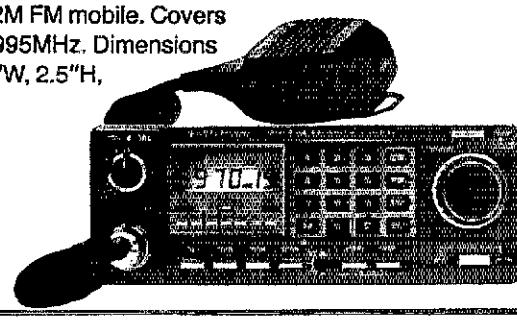

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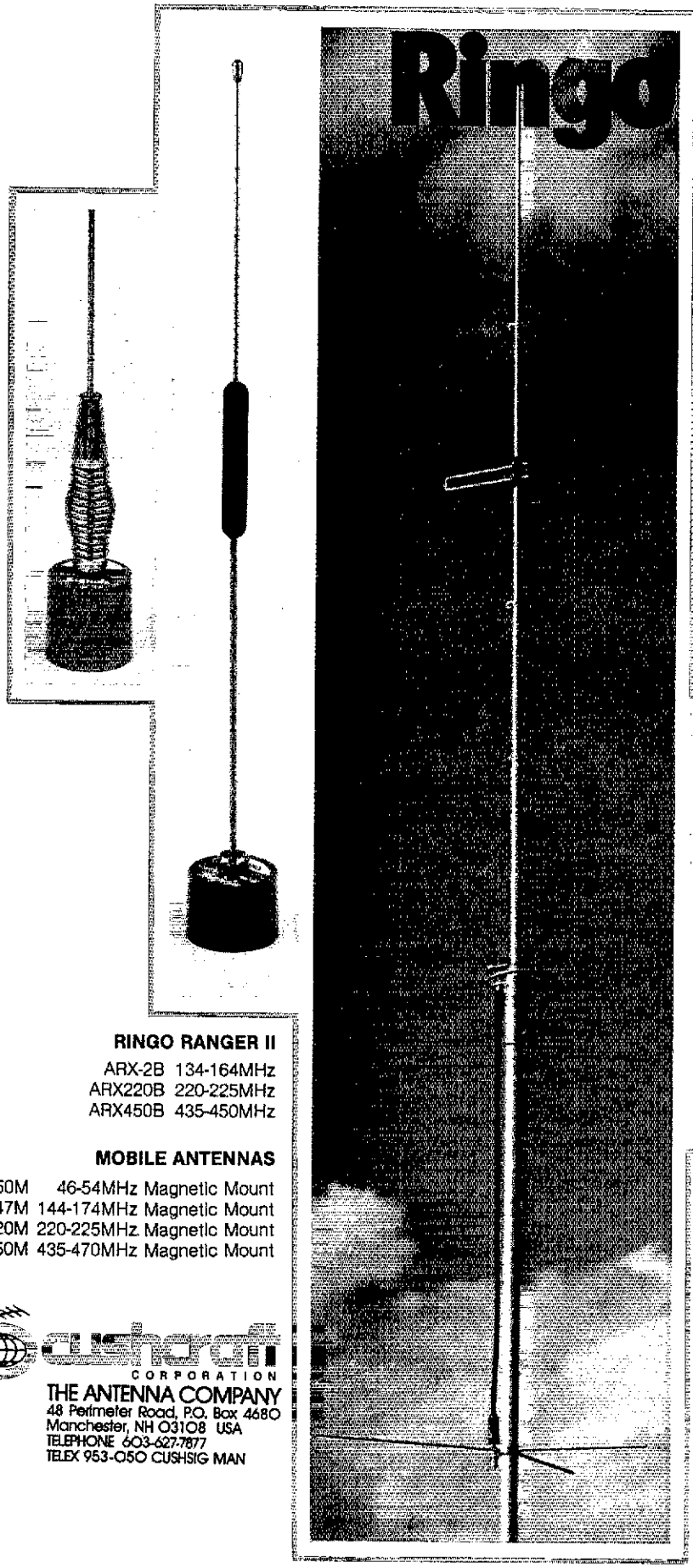
Prices, specifications, descriptions subject to change without notice. Calif. and Arizona residents please add sales tax



Ranger II

Simply the best

The best combination of gain, bandwidth and low angle radiation for simplex or repeater operation.

Quick easy assembly and installation

Mount anywhere with compact dimensions and neat appearance

Proven performance and durability in all environments

Complete FM band coverage

One year warranty

Cushcraft antennas created the FM antenna revolution by making the best performance and value available to every ham. We continue to set the pace with a broad line of antennas for every FM application. Tune across the band and you will find the overwhelming majority of hams using one, two, or more Cushcraft antennas. The reason is very simply that they are the best. Now is the time for you to enjoy the value of a Cushcraft antenna. See your nearby dealer today.

RINGO RANGER II

ARX-2B 134-164MHz
ARX220B 220-225MHz
ARX450B 435-450MHz

MOBILE ANTENNAS

CS50M 46-54MHz Magnetic Mount
CS147M 144-174MHz Magnetic Mount
CS220M 220-225MHz Magnetic Mount
CS450M 435-470MHz Magnetic Mount

New Mobile Antennas

Exciting news for HAMS! the same high performance and quality, CUSHCRAFT/SIGNALS antennas, used by professionals and business, are now available to improve your mobile communications.

FEATURING

- **SILVER PLATED LOADING COILS**
- **TAPERED 17-7PH STAINLESS STEEL WHIPS**
- **STRONG, MOISTURE PROOF ABS COIL CASES**
- **CADMIUM PLATED NON-SEIZING HARDWARE**
- **FULL BRAID COVERAGE RG 58A/U CABLE**
- **COAXIAL CONNECTORS**
- **EACH COMPLETE WITH CABLE, CONNECTORS AND THREADED BASE TO TAKE EITHER THE**
- **STAINLESS STEEL SPRING OR STRAIGHT WHIP**
- **CHOICE OF 3 MOUNTING OPTIONS**
  1. **90 POUND MAGNET MOUNT**
  2. **TRUNK LIP MOUNT**
  3. **¾ INCH HOLE MOUNT**

ONLY **CUSHCRAFT/SIGNALS MOBILE ANTENNAS** GIVE YOU ALL OF THESE IMPORTANT PERFORMANCE FEATURES.

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THE ANTENNA COMPANY
48 Perimeter Road, P.O. Box 4680
Manchester, NH 03108 USA
TELEPHONE 603-627-7877
TELEX 953-050 CUSHSIG MAN

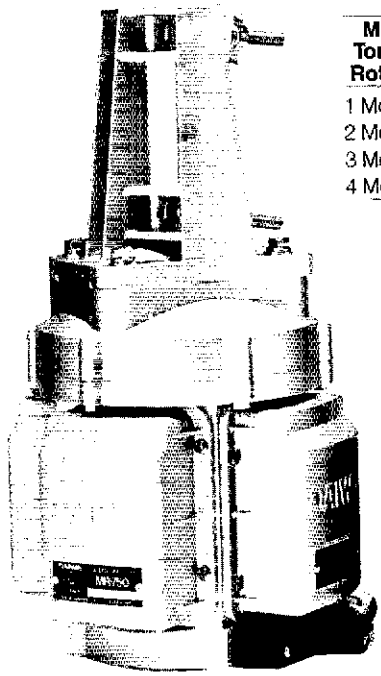
New Multi Torque

Check These Features:

1. The rotator frame can house up to 4 motors to increase the torque and load capacity of your antenna system.
2. Each motor is equipped with a Super Wedge and Clutch brake system which works independently from the main frame gear train.
3. Maximum brake power is 18,300 lbs/in when 4 motors are installed. The main frame and reduction gear train have been designed to withstand maximum wind loading.
4. The motor unit can be dismantled easily for maintenance if required.
5. A 1½" to 2½" diameter can be installed and aligned easily with the rotator center.
6. Low voltage (24VAC) motors are used to ensure safety during installation work on the antenna tower.
7. Low cost 6-wire control cable can be used for the low voltage motors.
8. The control panel can be removed easily for calibrating the direction indicator.
9. Balanced type control knobs have quick lock mechanisms on both sides.
10. The advanced Super Wedge and Clutch brake system (Slip clutch type) provides exceptional holding power and protects the rotator mechanism from excessive torque.
11. Lower mast bracket MS-1 is available (optional).

MR-750E/MR-750PE

Multi Torque Rotator	Output Torque lbs/in	Brake Powe lbs/in
1 Motor	610	5,20
2 Motors	1,200	9,60
3 Motors	1,800	13,90
4 Motors	2,400	18,30



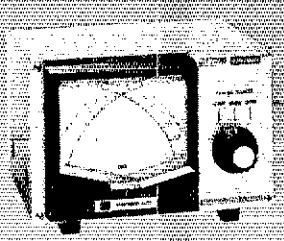
MR 750E Rotator
Standard Model
(58 sec/rotation)

MR 750PE Rotator
For use with
Pre-Set Controller
(58 sec/rotation)

MR-300E
High Speed Model

For rotating VHF/UHF antennas at high speed

SWR & POWER CROSS NEEDLE METERS



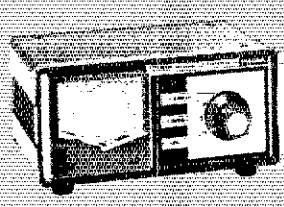
Top Quality

CN-720B

Frequency Range: 1.8-150MHz
SWR Detection Sensitivity: 4 W min.
Power: 3 Ranges (Forward, 20/200/2000 W)
(Reflected, 4/40/400 W)
Dimensions: 180×120×130 mm;
7.12×4.75×5 in.

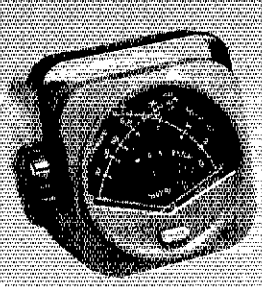
CN-820B

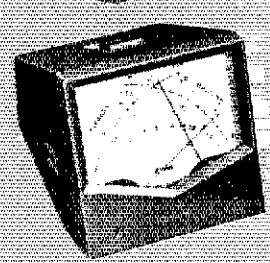
Frequency Range: 1.8-150 MHz
SWR Detection Sensitivity: 4 W min.
Power: 3 Ranges (Forward, 20/200/2000 W)
(Reflected, 4/40/400 W)
Dimensions: 165×75×97mm
6.5×2.9×3.8 in.



CN-630

Frequency Range: 140-450 MHz
SWR Detection Sensitivity: 4 W min.
Power: 2 Ranges (Forward, 20/200 W)
(Reflected, 4/40 W)
Dimensions: 180×85×120 mm;
7.12×3.37×4.75 in.



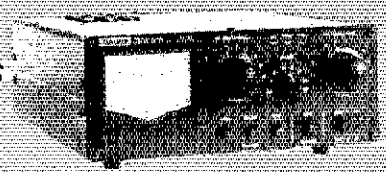


	CN-410M	CN-460M	CN-46
Frequency Range:	3.5-150MHz	140-450 MHz	140-450
SWR Detection Sensitivity:	3 W min.	3 W min.	3 W min.
Power Range: Forward	15 W/150 W	15 W/150 W	15 W/75
Reflected	5 W/50 W	5 W/50 W	5 W/25
Dimensions:	71×78×100 mm; 2.8×3.1×3.9 in.		

All Models Back Lit, with mobile bracke

	CN-520	CN-540	CN-5
Frequency Range:	1.8-60 MHz	50-150 MHz	144-250
Power Range:	200/2000 W	20/200 W	20/200 W
Dimensions:	72×72×95 mm; 2.83×2.83×3.74 in.		

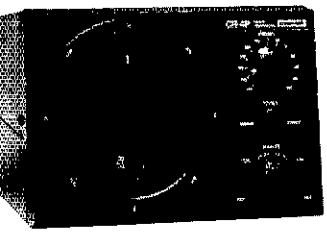
ANTENNA TUNERS



	CNW-518	CNW-419	CL-680
Frequency Range:	3.5-30 MHz (8 bands)	1.8-30 MHz (17 bands)	1.8-30MHz(17 ban
Power Rating:	1 kW CW (50% duty)	200 W CW (3.5-30 MHz)	200W CW(3.5-30
		100 W CW (1.8-3.4 MHz)	100W CW(1.8-3.4
Output Impedance:	10-250/25-100 ohm (On 3.5 MHz)	10-250 ohm	10-250 ohm
Dimensions:	225×90×275 mm; 8.9×3.5×10.8 in.	225×90×245 mm; 8.9×3.5×9.6 in.	165×75×97mm 6.5×2.9×3.8 in

Antenna Rotator [Pat. Pend.]

p To Four Motors For Extra Torque and Braking

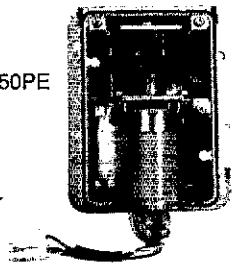


CR-4 Manual Controller for use with MR-750E and MR-300E Rotators

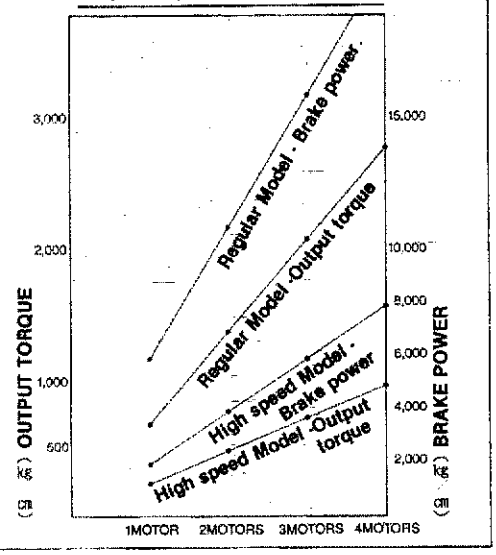
CR-4P Controller with Pre-Set function for use with MR-750PE Rotators

MR-750U Motor For use with MR-750E and MR-750PE Standard Rotators

MR-300U Motor For use with MR-300E High Speed Rotator



MULTI TORQUE ROTATOR — Output torque/brake power



SPECIFICATIONS

■CONTROLLER UNIT

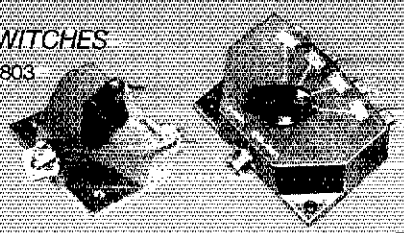
	CR-4 (for MR-750E/MR-300E)	CR-4P (for MR-750PE)
Power source	117 V AC (50/60 Hz)	
Power consumption	200 W (with 4 drive motors)	
Motor running voltage	24 V AC	
Dimensions	180 mm (W) × 125 mm (H) × 175 mm (D)	
Weight	9 lbs (4 kg)	
Operation	Manual	Manual/Pre-set

■ROTATOR UNIT

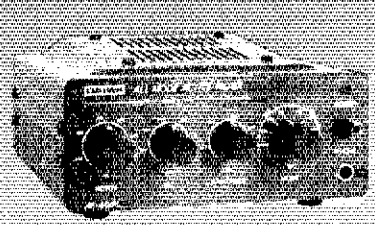
		MR-750E/PE	MR-300E
Rotation time	60 Hz	58 seconds (60 Hz input)	33 seconds (60 Hz input)
	50 Hz	70 seconds (50 Hz input)	39 seconds (50 Hz input)
Output torque Brake power	1 motor	610 lbs/inch (700 kg/cm) 5,200 lbs/inch (6,000 kg/cm)	220 lbs/inch (250 kg/cm) 1,700 lbs/inch (2,000 kg/cm)
	2 motor	1,200 lbs/inch (1,400 kg/cm) 9,600 lbs/inch (11,000 kg/cm)	440 lbs/inch (500 kg/cm) 3,500 lbs/inch (4,000 kg/cm)
	3 motor	1,800 lbs/inch (2,100 kg/cm) 13,900 lbs/inch (16,000 kg/cm)	650 lbs/inch (750 kg/cm) 5,200 lbs/inch (6,000 kg/cm)
	4 motor	2,400 lbs/inch (2,800 kg/cm) 18,300 lbs/inch (21,000 kg/cm)	870 lbs/inch (1,000 kg/cm) 7,000 lbs/inch (8,000 kg/cm)
Rotation angle		375 degrees	
Permissible mast size		1-1/2 ~ 2-1/2 inch (38 ~ 63 mm) <diameter>	
Control cable		6-wire cable 0.5sq ~ 1.25sq (AWG16/18/20 etc.)	
Continuous running		5 minutes Max. permissible	
Unit weight		16.5 lbs (7.5 kg) <with 1 motor unit fitted>	

COAXIAL SWITCHES

PAT. No.59-000803



	CS-201 2position	CS-201G 2position	CS-401 4position	CS-401G 4position
equency:	600 MHz	1.3 GHz	800 MHz	1.3GHz
nnectors:	SO-239	N type	SO-239	N type
SWR:	Below 1:1.2			
sertion Loss:	Less than 0.2 dB			
olation:	better than 50 dB at 300 MHz better than 45 dB at 450 MHz adjacent terminal.			



AUDIO FILTERS

AF-606K & AF-406K

Four stages of filtering...variable bandwidth over broad range... remarkably improved reception for all modes...razor sharp CW reception...built-in speaker.

The AF-606K adds PLL Tone Decoder circuitry for the ultimate in CW reception...PLL locks onto the desired CW signal and reproduces it with utmost clarity.

Dimensions: 150×62×150 mm; 5.9×2.4×5.9 in.

POWER AMPLIFIERS

	LA-2035	LA-2035R	LA-2065R
nd:	144-148 MHz	144-148MHz	144-148MHz
put Power:	0.5-3 W	0.5-3 W	0.5-5 W
ax. Output Power	30 W plus	30 W plus	80 W plus
ower Consumption:	13.8 VDC, 4.5 A max.	13.8V DC, 8A max.	13.8V DC, 5A max.
mensions:	100×35×125 mm; 3.9×1.4×4.9 in.	100×35×125mm 3.9×1.4×4.9in. Pre-Amp. Built-in.	122×45×175mm; 4.8×1.7×6.9 in. Pre-Amp. Built-in.

ELECTRONIC KEYER **DK-210**

CW is both communication and art. Sharpen your "fist" with Daiwa precision!

Dealer Inquiries Invited

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TELEX 887631 DAIWA UD

Disaster Agency Communications chief W9NXJ has been busy revamping the IESDA communications system both in the State Emergency Operations Center and throughout the state. Many thanks to him and to SGL W9KPT for their continuing efforts in the improvement of the utilization of amateur radio as an adjunct to normal emergency communications resources in Illinois. Traffic: KA9FEZ 527, KW9J 395, K9BVE 201, W9HLX 198, W9HOT 104, W9JJJ 95, W9NXG 88, K9QEW 84, KD9K 77, KB9X 46, WA9SHE 41, WB8RFB 37, W9DBO 36, K9EHP 36, KA9BBV 34, N9DIX 30, N9DR 26, N9TN 25, W9LNQ 22, KZ9I 18, WD9BBI 17, WD9IBH 16, W9HEZ 12, WA9SID 11, KB9QX 11, WD9CJB 10, W9VEY/M 9, KA9PKG 8, K9BED 8, W9KPI 7, WA9RUM 5, WD9HQW 5, WB9TVD 3.

INDIANA: SM, Bruce Woodward, W9UMH. SEC: WB9ZQE. STM: W9JUJ. ACC: K9TUS. TC: WD9ADB. GLC: WA9VQO. OBC: KC9TA. PIO: K9DIY. SRC: N9WB. SHC: WA9FUD. SOOC KJ9G. NMs: ITN KD9DU, QIN KJ9J, ICN KW9D, IRN KB9SU, VHF W9PMT, IWN KA9ERC.

Net	Freq.	Time Daily UCT	QNI	QTC	QTR	Sess.
ITN	3910	1330/2130/2300	3196	396	2514	90
QIN	3656	1430/0000/0300	684	319	1855	90
ICN	3708	2315	110	38	675	27
IRN	3629	0000	242	142	1054	30
IWN	3910	1310	1966	0	432	30
IWN VHF	Bloomington		1142	0	300	30
IWN VHF	Kokomo		1090	0	208	30

Hoosier VHF Nets for November. QNI 6660, QTC 303, Bulletins 92, QTR 6399 in 158 sessions for 27 nets. 9RN cycle four QNI 377, QTC 519, QTR 1093. IN 100% Stns: N9AEI W9CSJ W9EI N9HZ KJ9J W9JUJ WA9QCF W9OLW WB9UYU K9WWJ. D9RN 384 messages in 1059 minutes. IN. 100%. Stns: K9CGS W9JUJ N9DWU. CAND 978 messages in 30 sessions. D9RN 100%. Stns: W9JUJ N9DWU. CAND 978 messages in 30 sessions. D9RN 100%. Stns: W9JUJ N9DWU. Appointments: ORS KD9DU, W9QYY, KA9EIV. EC WB9EBI Huntington County, WD9EVK Monroe County, WA9NOH DeMotte County, WB9UNL Whitley County. PIO K9DIY. OO/RFI KJ9G. ACC K9TUS. Silent Keys: W9OUN Marion and WB9AHB Muncie. Remember, encourage all Novices to participate in the Indiana Code Net on 3708 at 2315 UCT. Our thanks to KQ8O, N9AIN, WB9VPG and WD9HEE of the Old Post A.R.S. for conducting Novice classes. I have been generating Indiana ARRL Bulletins for the past year and a half. I read them prior to the start of the 3910 ITN on Sunday morning at app. 1325 UTC. If you need to know of an amateur testing or hamfest date you may check with me. These bulletins are retransmitted on RTTY on 3629 at 0000 UCT. If you have information you wish published please keep me informed. I was very pleased with the activities and cooperation of the Fort Wayne hamfest committee. W9JUJ, WB9ZQE, and myself wish to thank everyone who helped. November, December, and/or January are months when new officers are elected. Those clubs with News Letters usually list the new officers and we can sort them out. It would help if all clubs would inform me or Mike, WB9ZQE, of your new officers for our records. Don't forget your annual reports. YES traffic information is being submitted by the STM. Traffic: W9JUJ 795, KJ9J 229, W9EI 189, KD9DU 163, WB9UYU 161, N9AEI 117, KA9FFO 82, WD9JAA 80, N9HZ 68, WA9QCF 63, W9UEM 61, W9UMH 45, KB9HH 44, KA9EIV 43, K9KTB 41, W9JZV 38, K9DFK 38, W9PMT 32, KW9D 32, WD9HII 32, W9PRD 29, N9DYC 28, KD9ER 22, WD9DWD 22, AB9A 19, KW9C 17, WB9AWI 17, KB9NR 17, K9ET 15, K9TKE 12, WD9ART 12, K9BRF 11, K9FVN 9, N9DHX 9, K9CGS 8, W9CM 8, W9ZGC 7, W9RTH 7, KK9N 7, K9OUP 7, K9PS 6, N9AST 5, WB9AJY 5, WB9VPG 5, W9OZJ 5, KA9LAU 4, WD9CIV 4, K9SBW 4, K9DIY 4, K9FW 4, WB9OZZ 4, W9UPI 3, N9DOK 3, W9YEW 2, W9XD 1, W9BDP 1.

WISCONSIN: SM, Richard R. Regent, K9GDF — SEC: W9OAK. STM: K9UTQ. ACC: AE9K. BM: KA9CPA. OO/RFI: KA9IKR. PIO: K9ZZ. SGL: AG9V. TC: K9GDF. Plan to participate in the Wisconsin QSO Party, March 12th, conducted by West Allis RAC. The KMRA and WK Clubs compete against each other in several major contests. Don't forget to send in Novice Roundup logs. This year, Wisconsin Chapter QCWA members volunteer to computer-check contests logs of the worldwide contests. The CW QCWA contest, February 9th to 11th, will have logs checked by K9UTQ, while the phone QCWA contest, March 9th and 10th, will be handled by W9FPA. Wis. QCWA net meets Sundays, 8:30 A.M., on 3985. There are 38 ARRL Affiliated Wisconsin Clubs, nearly 1,700 ARRL members, and increasing. Find out how your club can become affiliated or learn about the benefits by getting in touch with Affiliated Club Coordinator AE9K. The Milwaukee Repeater Club, Inc., had Packet Radio and W5LFL video-tapes. Tri-County ARC had delicious Christmas dinner in Whitewater, presented KJ9I the club annual scholarship, K9GDF said hello, and KW9W presented hot-air balloon video. Central Division Director W9PRN, K9FHI, and K9GDF compliment MRAC on 65th anniversary as oldest ARRL Affiliated Club at its Christmas dinner and Old Timer's Night. The all-new 1985 ARRL *Handbook* is overwhelming and excellent — do you have your copy? K9ZZ has full page report and pictures of Barneveld emergency communications published in ARRL *Amateuradio* newsletter. N9BYK has Exercise Night Tango article printed in ARRL *QCD* and in *BSSS*. Did you see story about Milwaukee's Operation Santa Claus in *QST*, December, page 80? KA9RHN back on the air with new rig. Did you know that W9KU and his brother, W9SD, learned CW when they were kids? While quarantined at home with measles, recovering in separate bedrooms across the hall from each other, they beamed flashlights on the hall ceiling and keyed the on-off switches! Please turn in your traffic totals to help Wisconsin improve its rank of 3rd place out of 73 Sections in traffic handling, BPL to KA9CPA.

BWN	3984	6 A.M.	WD9IID	1137-1322-26
BEN	3985	Noon	WB9ESM	677-186-30
WSBN	3985	5:30 P.M.	WA9ZTY	842-366-30
WNN	3723	6 P.M.	KA9OBP	112-24-27
WSSN	3645	6:30 P.M.	N9BDL	144-32-30
WIN-E	3662	7 P.M.	WB9ICH	287-188-28
XPO	3925	12:31 P.M.	K9AKG	260-21
WCWTN	31/91	6:00 P.M.	N9DHT	568-46-30

Traffic: KA9CPA 2072, K9GDF 424, W9YCV 232, W9CBE 222, WA9WYS 191, WB9YPY 164, KA9BHL 153, W9UCL 147, W9IEM 134, WD9IID 121, N9BDL 106. WB9ICH 100, W9DND 88, K9AKG 85, WB9ESM 77, N9DHT 76, K9UTQ 74, N9BGE 73, KA9AFB 69, WD9FRI 69, K9FHI 63, KA9OBP 61, W9JSF 55, W9IHW 45, K9JPS 38, KG9B 37, AG9G 36, N9BCX 34, WB9JSW 34, KA9RII 29, N9DCF 28, WB8RGE 28, KZ9V 22, KA9JJY 17, WB9NRK 13, W9ODV 9, W9NA 7, W9UW 6, KA9KEQ 5, KA9NOT 4, KB9WC 2. (Oct.) KA9RII 12, KA9NOT 4.

DAKOTA DIVISION

MINNESOTA: SM, George Frederickson, Jr., KCØT. SEC:

KAØARP. STM: KDØCI. Now that we are in the middle of winter, a bit of good news. The Mid Winter Madness is coming up; Totino Grace HS in Fridley is the place and February 23rd is the date. See folks, winter isn't all bad! No doubt that it is THE amateur radio happening around these parts during the winter, so we'll see you there! As promised, here is the current list of section appointments including those listed above. Technical Coordinator: KØLSE, Bulletins Manager: KBØMB, Official Bulletin Stations: WAØAXG, WBØFMI and WAØLMK, Official Relay Stations: KAØEPY and WØOJH. KCØT is still searching for someone to fill the vacant PIO, ACC and OO/RFI posts. If you are interested in these positions, or helping us in other positions within the section, contact KCØT or any of our appointees. NET NEWS: The Minnesota Section RTTY Net is now operational on a limited schedule. This new net has had some difficult band conditions to work through to say the least. To those who are working with NM KØOTF to make the net go, surely propagation will improve soon! THE MNAMWXNT has had the same problems to contend with; some nights have been a complete shutdown. Our CW nets continue to work thru it so hats off to our CW people! I'm happy to report that WBØWNJ assumed the post of NM for MSPN/N. She has not named an assistant yet. Please give her your full support. KAØAJF has been named to succeed yours truly as NM of the Mille Lacs Lake Area Repeater Net. Upgrades for the month include the following Novices to Tech: KAØTAO KAØTAT KAØTOP and KAØTOQ, General to Advanced: KAØMZJ, Advanced to Extra: KØSIR. Congrats to KAØEPY who recently received a PSHR certificate. If you think you qualify for PSHR, send me a report on your activities for the month within the first five days of the following month. Details on PSHR and other awards can be found in *QST*. I regret to inform you that WØJMI and WØTLE are now silent keys. Both were well known in Minnesota and will be missed by us all. Finally, KAØEVR is looking for help again this year in covering the annual Mora Vasaloppet X-Country Ski Race. The race is scheduled to be run on February 17th. If you'd like to help out, plus get the chance to see one of the worlds great X-Country ski races, contact KAØEVR. The Mora rptr is 146.19/.79 MHz.

Net	Freq.	Time	QNI	QTC	Sess.
MSN/1	3685	6:30P	281	88	30
MSN/2	3685	10:00P	197	33	30
MSSN	3710	6:00P	194	20	29
MSPN/N	3929	12:05P	611	103	30
MSPN/E	3929	5:30P	1085	195	30
MSRN	3685	8:00P	29	1	6
MNAMWXNT	3929	6:15P	304	172	17
PICONET	3925	9:00A	3455	214	26

Traffic: KBØMB 865, WAØTFC 365, WØHZU 242, KAØEPY 190, KAØARP 187, WØEHI 157, WBØWNJ 117, WAØCNJ 113, NØCLS 98, KT9I 97, KDØCI 82, WBØHOX 81, KAØODQ 46, WDØGUF 42, KTØR 34, WDØBGS 29, NØEXP 28, W9DM 26, KAØAJF 20, KCØT 17, KØCSE 16, KAØKWM 16, KAØBFP 13, KCØNL 12, WAØMJF 10, NØBEI 8, WØKYG 6, KØOGI 6, KN9U 6, KBØWV 5, NØEWA 3, NØFKU 3, NGØ3.

NORTH DAKOTA: SM, Joseph Gregg, KNØA — The Bismarck Amateur Radio Klub is now M/BARS-Mandan/Bismarck Amateur Radio Society, which put on a successful Amateur Radio display at the Gateway Mall. The Bismarck group has an extensive repeater link up and running, connecting the whole western part of the state, with plans to link the state for comprehensive statewide SKYWARN and other emergencies coverage. TRARC will have a Tech/Gen class starting in January. Fargo RRRA club is planning a computer/hamfest in March, watch *QST* for more information. WØRRW is going to link the Fargo 97 repeater to the Grand Forks 70 machine. Please send copies of your club newsletters describing local activities.

SOUTH DAKOTA: SM, Fredric Stephan, KCØOO — As you recall we recently printed most of the usual concerns and objections that we heard from many hams in the area regarding traffic and traffic handling; looking for responses both pro and con. So far, almost all hams have agreed with those statements. We have received only one written contrary opinion from Sioux Falls. Please send in your opinion as soon as possible. Your opinion does count with the League, especially here in good old S.D. I have not given my own personal opinion as yet; neither has NBØD. Emergency coordinators are required in many counties, especially this winter. Contact our SEC WØYMB in Mobridge to volunteer. We need your help. Don't forget to send us your ARRL Club activities report. Include anything of interest.

DELTA DIVISION

ARKANSAS: SM: Joel M. Harrison, WB5IGF — SEC: N5BPU. STM: AE5L, TC: W5FD. ACC: AD5M. PIO: K5DW. SGL: W5LCI. Repeater Coordinator: WB5FDP. Don't forget that the ARRL State Convention and Arkansas Hamfest is just around the corner on April 13 & 14. The Mississippi County ARA provided communication for the annual winter festival and Christmas Parade in Osceola. Those participating were K5SMV N5DOC WDØFDT N5BIT & K5DW. The Hot Springs County ARC had their annual Christmas meeting at Bill Cotherns, W5BXJ, in December. All county officials and the Malvern city officials were in attendance with high praises for the volunteer work the hams perform in that area. Traffic: W5QFU 82, W5TUM 80, W9OK 63, AE5L 32, KA5DFT 24, W5UAU 22, WD5FCE 18, WB5IGF 18, K5DW 7, W5MYZ 4.

LOUISIANA: SM, John "Wondy" Wondergem, K5KR — SEC: KA5PFB. ACC: K5DPG. SGL: KD5SL. TC: N5JM. OO/RFI: WB5TPG. Central Louisiana ARC election: Pres: Ed Crump KB5CX. VP: Bill Hayes NØBUH. Sec: Louise Wilson KA5HCL. Treas: Sonny Haas KE5KT. The club has a new 2 meter on a 250 ft. tower thanks to KA5AJH, KA5AJV, AB5G and KD5YU. Early 85 volunteer exams will be conducted in Monroe, Shreveport, Alexandria, Baton Rouge, Hammond & New Orleans. An S.A.S.E. will get you the dates and locations. Generally, the cut-off date is 30 days in advance. Clubs are requested to send their advance VE schedules for inclusion in this column. The new permanent location of the Livingston ARS is in the Denham Springs High School 2nd Tuesday. Call-in 146.73. Delta DX had an all-out evening with food by Chet Buster and an enjoyable session with Father Moran 9M1MM who presented a slide show of his school, hamshack and the Nepal countryside. Kevin Beatty KA5PFB is now permanently at Lake Charles and raring to get back in the saddle as SEC. Check in on 3910 kHz at 8 PM Monday nights with net control N5ADF.

LTN	3910 kHz	Daily 6:30 PM	N5ANH
LAN	3615 kHz	Daily 7 & 10 PM	N5BFV
LSN	3703 kHz	Daily 7:30 PM	WA5ANV
LEN	3910 kHz	Monday 8 PM	N5ADF

Traffic: WA5TQA 65.

MISSISSIPPI: SM, Paul Kemp, KW5T — SEC: N5DDV. STM: KB5W. VHF Coord: NF5Q. FB job by W5TXK and crew in getting emerg. operating station operating at Hinds EOC in Jackson. KK5K active working with group of prospective hams in Pontotoc. New appt. KO5S now EC for Lowndes Cty. Meridian planning test session the 1st weekend in March. Due to propagation MSBN time had to be moved back to 2345Z. Wish NF5Q a speedy recovery from his stay in the hospital. VARC members WB5HKT, YKR, SXK, OWY, K5VXV, KA5HNP provided communication during a search for a lost deer hunter. The hunter was found in good condition. Congrats to *upgrades:* K4KCB now Extra, WB5PCT now General. CAND (W5KLV) sess. 30, QTC 978. DRN 5 (WB5YDD) sess. 60, QTC 796. MTN (K5OAF) sess. 30, QNI 139, QTC 35. MSBN (KW5T) sess. 30, QNI 2221, QTC 58. MMN (WB5RMW) sess. 29, QNI 516, QTC 8. GCSBN (W5JHS) sess. 30, QNI 750, QTC 10. CAEN (NF5Q) sess. 4, QNI 87, QTC 2. Traffic: N5AMK 372, K5OAF 252, KT5Z 145, W5WZ 62, WD5JXT 44, KW5T 18, W5LSG 12.

TENNESSEE: SM, John C. Brown, NO4Q — ASM/ACC: WA4GLS. OO/RFI: W9FZW. PIO: WK4V. SEC: WA4GZQ. SGL: WA4GZZ. STM: NG4J. TC: W4HHK. Although it is seldom that I make reference to any of our departed "Silent Key" Tennessee members, I feel that it should be noted that WA4HGN be mentioned. He and our Technical Coordinator were involved and did hold for several years the distance record across the earth's surface the EME record. The two of them were very involved with that work on the 13 cm spectrum as can be seen on page 71 of the December *QST*. As with all SK members they will and are missed on the frequencies. It was good to note the number of Section stations and clubs that participated in the 1984 Field Day exercise. Time is getting very short before the next annual Field Day. Planning should already be under way for the 1985 event. Should remind all clubs to send to the Secretary, Tennessee Council of Amateur Radio Clubs and your SM, as well as ARRL Club Program a listing of new 1985 Club officers. Correct mailing to the proper official is difficult at its best. TNX. Traffic total is 1,927, and needs a lot of other stations to really reflect the true activity of the section. A comparison of the Section activity report below will so indicate. How about *YOU*? The Section Emergency Coordinator has indicated that he wishes to be replaced. He has done a very commendable job under a year with the AUTO CALL PLATE change as well as other items. Many, many thanks Lee. Section activity for the month is as follows: LF = sessions 81, QNI 3604, QTC 139; VHF sessions 83, QNI 2811, QTC 602; CW sessions 18, QNI 121, QTC 48; RTTY sessions 28, QNI 27, QTC 3. Honor Roll for the month is K9IMI. Congrats. CUL. Traffic: W4WXH 251, W9FZW 250, NG4J 239, KA4RSC 220, K4WWQ 147, K4WOP 49, W4DDK 38, KE4LS 25, NN4S 25, W4PFP 21, NV4Z 20, WB4YPO 14, W4TYV 13, K4DEC 12, W4MRD 12, K4UMW 11, W4PSN 8, WA4GZQ 8, W4EWR 8, N4KOX 8, WA4AKU 5, WV4E 2. (Oct.) NG4J 510, WA4GZQ 31.

GREAT LAKES DIVISION

KENTUCKY: SM, Ann Jackson, KA4GFU — SEC: WA4JAV. STM: KA4BCM. KY Frequency Coordinator WA4YOF, Lexington, asks un-coordinated repeater trustees to contact him. In cases of interference, coordinated repeaters will be favored. When granted a new coordinated frequency the repeater must be on the air within 90 days or lose the frequency. KFC Scott Wills, 340 Eagle Creek Dr., 40502. Thanks to our D9RN Liaisons WA4JTE KA4SAA N4JLT KA4MZY and WD4BSC. Help is still needed on Late D9RN and Early 9RN CW. WA4GHQ KD4TQ WD4IRJ and W4TRB provided Commo for the Keeneland Pony Club, Owensboro Hams helped organize the Henderson and Owensboro Christmas Parades. NETS: MKPN 1223 97, KTN 1200 84; KYN 121 43, KNTN 74 73, KYPON 48 5, TSTME 641 51, CARN 126 10, NKARC 73 1, WTEN 37 7, 3ARES 63 7, 7ARES 44 2, 11ARES 62 9. Traffic: WA4JTE 187, KB4OZ 80, WD4IYI 71, N4JLT 68, KA4BCM 57, KA4SWF 31, W4WQV 29, KA4SKV 28, K4MHL 27, KA4MTX 27, WB4ZDU 26, K4HOE 18, WD4BSC 16, WA4SAC 16, WD4PBF 14, KA4GBZ 13, WA4AVV 12, WD4IXS 12, WK4D 8, WA4NOG 7, WA4YPQ 7, WD4CQF 6, KA4YIV 6, WD4IYH 4.

MICHIGAN: SM, James R. Seeley, WB8MTD. ASM: WA8DHB. SEC: WB8BGY. STM: WD8RHU. ACC: K8SB. PIO: KC8K. SGL: N8CNY. TC: W8YZ. BM: KZ8V.

Net	Freq.	Time	QNI	Tfc	Sess.	Mgr
MITN*	3953	1900	678	286	30	WD8EIB
QMN*	3663	1800**	397	267	88	W8UE
MACS*	3953	1100**	536	184	30	K8LNE
UPN*	3922	1700	899	107	34	WA8DHB
GLETN	3932	2100	352	643	30	WB8AXI
WSSBN	3935	1900	560	37	30	WB8EYM
160	1950	2000	384	27	30	WB8EMV
MNN*	3722	1930**	---	---	---	KA8TPX
VHF nets	---	---	679	15	16	W8CUP

*NTS nets. Times local. **QMN late net, 2200; MNN late net, 2000; MACS Su, 1300. ARES Net, Su, 3932, 1730. ARRL Info Net/Traffic Workshop, Su, 1600, 3953, 3932 is MI HF emer. freq. Please take note of two major changes in your leadership list. WB8BGY has moved from TC to SEC, and W8YZ has been appointed as the new TC. Dale Williams, WA8EFK, has retired for personal reasons after eight years of exemplary service as SEC. He has at various times been described as "dedicated," "talented," "innovative," "intrepid," and many more equally laudatory things, all true in good measure in one context or another. Thanks, Dale. George Race, WB8BGY, our new SEC, brings many excellent qualifications with him to his new assignment, not the least of them being intense dedication to the cause of public service through Amateur Radio communications throughout the many years I have known him. MI ARES/RACES suffers no loss with this change. Nor does it lose with the appointment of David A. Smith, W8YZ, to the post of TC. Dave is an active member of the League's VUAC. His antenna/feedline/lecher-wire programs have been well received by many radio clubs. The technical excellence of his home station in amateur and MARS operations further attests to the rightness of this appointment. Note also the appearance of a new net in the listing at the head of the column. Labeled "160" because of space constraints, I say a very special WELCOME to the 160 Meter MI Thumb Net. (Thumb...? Non-MI hams, take a look at a map of our state!) A quote here from their preamble says a lot: "... for the purpose of offering reliable communications during the low sunspot cycle when 80 meters is not good for statewide traffic handling at night..." (Not good...? MI and non-MI hams alike, give heed: It's real; it works. The "top band" *is* a good choice for an alternate net spot at night during the current frustrating propagation wash-outs on 75/80. Traffic: AF8V 394, WBQHB 343, WA8YMH 159, WA3DHB 154, WD8KQC 148, KA8QVH 95, K8OCP 86, K8GXV 84, K8EQO 58, WB8SIW 55, WD8OUO

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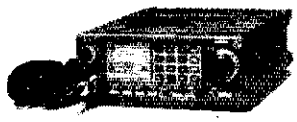

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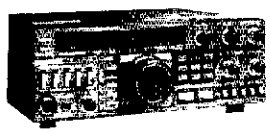

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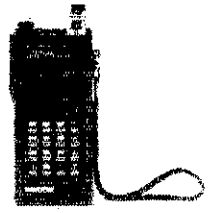

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RS-20A	16	20	115.95	89.95
RS-20M	RS-20A w/switchable volt and Amp meter		137.95	109.95
RS-35A	25	35	174.95	139.95
RS-35M	RS-35A w/switchable volt and Amp meter		194.95	159.95
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OHIO: SM, Jeffrey A. Maass, K8ND — ASM: KF8J. SEC: K8AN. STM: WB8MZZ. ACC: K8US. BM: W8ZM. TC: KB8MU. OO/RFI: AD8I. PIO & SGL: N8CVK.

Net	QNI	QTC	Sess.	Time(Local)	Freq.
BN	385	219	60	1845,2200	3.577
BNR	454	119	30	1800	3.605
BSSN	423	260	58	1915	3.885
ONN				1830	3.708
OSN	330	142	30	1810	3.577
OSSBN	2243	998	90	1030,1615, & 1845	3.9725
OSSN	154	72	30	0646	3.577
O6MN				2100	50.16

As Spring approaches, can the Dayton Hamvention be far behind? Tickets and flea market reservations are now available. The banquet speaker this year will be humorist Jean Shepherd K2ORS. Hamvention mail should be directed to: PO Box 2205, Dayton 45401. License exams will be given at the Hamvention on Saturday at 9 AM and 1 PM, and on Sunday at 9 AM. Send application materials before March 27 to Judy Frye KG8P, 203 Bellewood St., Dayton 45406. Make checks payable to "ARRL/VEC". The Portage ARC will hold license exams quarterly, the first to be held on March 30. Contact Joanne Solak KJ3O/8, 9971 Diagonal Rd., Mantua 44255 for information. Congrats to new officers of the Columbus ARA: Pres AD8I; VP K8NIO; Treasurer KD8KY; Secretary WA3ZBU; Directors N8EMR, N8FFK. W8BMR is assisting the Upper Arlington School System with an Amateur Radio program. Students will receive class credit while being exposed to Amateur Radio. What about your schools? N8FYJ has just taken over the Ohio Novice Net (ONN) as Net Manager. Thanks to Bernie, N8EVC for a job well done as ONN NM. WB8BWY and the Trumbull County ARES handled communications for the Kiwanis Turkey Trot, and are becoming increasingly active in traffic handling: good job! Don't forget the hamfest at Mansfield on February 10 — contact K8RT for details. The 1985 Ohio State ARRL Convention will be held in Sharonville (Cincinnati), February 22-24. This is a *don't miss* event: a hamfest and more! Check the "Coming Conventions" column or contact K8JE for details. New appointments: N8EFB/ORS; N8ESS/EC Allen County.

Local Nets	QNI	QTC	Sess
ALERT	81	12	4
BRTN	256	131	29
COARES	87	0	3
COTN	238	164	18
LCNWO/ARES	231	164	18
Medina County	332	51	30
NCTW	8	12	4
NEON	154	38	25
RARA	50	148	4
Tristate	247	58	31
TSRAC	980	99	38
VWCEN	26	2	3
WCTN	203	32	30

Traffic: WD8MIO 745, K8JDI 408, WD8KFN 381, KD8KY 325, WB8MZZ 245, W8QZK 225, WD8RIB 210, NE8X 206, WB8MEK 205, KV8O 171, K8ND 158, W8EK 138, KA8CGF 137, N8FCQ 130, KA8GJV 120, WB8JGW 119, N8AKS 118, KA8KHS 98, WB8KWD 98, WA8SSI 97, N8EFB 92, WA8GMT 92, N8AEH 90, N8CW 78, K8TVG 72, WA8HGH 70, K8CMR 68, N8FNP 68, W8SKP 68, KA8SAK 63, WB8HHZ 52, WD8RGP 50, W8CXM 47, N8FYJ 47, K8AN 46, WD8IKC 46, K3RC 42, KA8ICB 36, WA8HED 35, K8DXZ 31, WB8RSM 31, WB8HMI 30, N8FPH 29, K8VOY 28, W8IQ 27, KD8SS 26, W8MVE 25, K8LQM 24, W8RG 22, NC8Q 19, W8BHL 16, WB8MRL 15, W8ZM 14, KC8JI 13, K8CKY 9, WD8RGS 9, N8CJS 8, W8FUP 8, NJ8P 7, N8AJU 6, WB8TRK 6, N8CGM 5, WD8EKI 5, WB8NTR 5, K8WLF 2. (Oct.) N8FNP 21, WB8BWY 18, WD8CSP 9, WB8NTR 4. (Sept.) WB8BWY 23. (Aug.) WB8BWY 18.

HUDSON DIVISION

EASTERN NEW YORK: SM, Paul S. Vydareny, WB2VUK — STM: WB2MCO. SEC: AK2E. ACC & SC: N2BFG. BM: WB2EAG. SGL: KB2HQ. TC: KC2ZO. ASM: K2ZM. News Ed.: WA8MAZ. Net reports: AESN-QNI-40; CDN-QNI-775 QTC-74; EPN-QNI-105 QTC-74; ESS-QNI-430 QTC-57; HVN-no report; NYPON-QNI-840 QTC-410; NYS/M-QNI-484 QTC-193; NYS/E-QNI 465 QTC-228; NYS/L-QNI-358 QTC-200; SDN-QNI-310 QTC-85. Club News: Albany ARA had a holiday night family social evening at December meeting. Schenectady ARA reports new members K2OXW KA2VBI KA2EXB and upgrade KA2BUG. They also had social evening for December. Rip Van Winkle ARS had holiday dinner. CCNR getting ready for annual elections in January. WECA had W2XM speak about using VIC20 for CW at December meeting. Also had holiday dinner on 15th Dec. where County Executive O'Rourke presented WECA with a proclamation making Dec. 15, 1984 WECA Day in Westchester County for public service work. Congrats to KD2IB as EC Dutchess Cty. Thanks to WB2SON who has done good job as EC for Orange and will be retiring as of Dec. 31st. REMINDER: Your report will not appear in column if you don't send your report to me or WB2MCO. Clubs: send me a copy of your newsletter or any info I can include in column. I am not a mind-reader! Congrats to N2YL new Hudson Div. Director. Thanks to all for help during past year. Nov. PSHR: WB2EAG W2PKY WB2MCO KC2TF WB2VUK KC2ZO KA2MYJ W2BIW WA2JBO K2ZVI N2BFG K2ZM WA8MAZ N2EQM KA2OPG. Traffic: KC2TF 397, KC2ZO 326, WB2EAG 283, K2ZM 250, WB2MCO 155, W2PKY 123, KA2MYJ 110, WB2VUK 99, K2HNW 79, WB2ZCM 58, K2ZVI 52, W2BIW 49, WB2KCR 44, WA8MAZ 44, KA2AQV 37, N2BFG 36, N2EQM 34, WA2JBO 30, N2AWI 22, AA2Y 17, KA2OPG 9.

NEW YORK CITY — LONG ISLAND: SM, John H. Smale, K2IZ — SEC: KA2RGI. ACC/ASM: WB2IAP. OO/RFI: NB2T. TC: W2JUP. PIO: W2IYX. STM: WA2ARC. The following are traffic nets in and around the section:

NLI CW*	3630 kHz	1900/2200	N2AKZ mgr
NCVHF	6.145/745	1930 m-f	K2MT mgr
BAVHF	6.07/67	2000 m-f	WB2BNA mgr
SCVHF	4.77/5.37	2030 m-f	W2GZD mgr
ESS	3590 kHz	1800	W2WSS mgr
NYS/M	3677 kHz	1000	WB2EAG mgr
NYS	3677 kHz	1900/2200	WB2EAG mgr

*Denotes section net, all times are local, please try and help out by checking in whenever possible. WB2IAP announces that LIMARC will be conducting license exams the 2nd Sat. of Mar., April, May and June at New York Inst. of Tech., Northern Blvd, Greenvale, from 9 A.M. to 2 P.M. Contact Bob, WB2DIN at 221-8118 for further info and details. If your club or group is planning to hold a license exam please let Woody, WB2IAP know so we can pass the information around. Remember OOs you must complete the exam from the ARRL to get your appointment renewed or else it will be cancelled, for further info contact NB2T. New members of SIARA are WB2MGP and KA2TKS, the club also purchased a new Stationmaster for the club repeater. W2FGK has relocated to Fla, also moving South is N2AOX. Gene Pfeiffer has asked me to relay that anyone with space RTTY parts or machines and would be willing to donate them for use with the CAP, should contact him at 212-839-9000. New officers for Larkfield ARC; W2GLE Pres., K2YEW VP, KD2AS Sec., WB2YJF Treas., WA2TSN, WB2GUB, KK2E, WB2AZT Trustees. The W.T. Clarke H.S. Radio Club had a candy drive and with the profits they purchased "Tune in the World" books and code cassettes for each member. They also plan a trip in the spring to W1AW. Metroplex is now making announcements about times and locations of amateur testing. They are made on Thurs. 2030 local on 145.45 and 443.95. It is with deep regret that we list Joseph Maloney, W2BE as a Silent Key. Radio Central had a fine turnout for their Hamfest. Grumman ARC reports that the visitor clearance desk for the Bethpage Fac. is now at Corp. Hdqtrs Bldg. Plant 111, 111 Stewart Ave. If your traffic reports are missing, please resend them to me, my mail has been getting messed up. Traffic: K2GCE 185, K2YQK 95.

NORTHERN NEW JERSEY: SM, Robert Neukomm, KB2WI — SEC: WB2VUF. STM: W2XD. BM: Vacant. RCC: W2CC. SGL: W2KB. PIO: WB2NQV. TC: AD7I. ACCs: KK2U KY2S. NMs: W2CC KB2HM WB2RMI WB2ANK WB2PKB WB2QMP N2XJ W2PSU.

Net	Freq	Time	Sess	QNI	QSP
NJM	3695	1000 Dy	30	183	96
NJPN	3950	1800 Dy 0900 Su	34	221	151
NJSN	3735	1830 Dy	30	346	62
NJN/E	3695	1900 Dy	30	278	150
NJN/L	3695	2200 Dy	30	175	47
OBTTN	147.12	2000 Dy	30	303	103
TCETN	147.255	1930 Dy	29	168	38

As I write this all nets are in the throes of very heavy holiday traffic. Here's wishing you all had a very happy Hannakuh and a very merry Christmas and healthy, happy New Year. The Sussex County ARC reports their VE program is underway and the first examination will be a Saturday early in February. Watch this column for future dates for Amateur examinations held under the VE program. Sussex County ARC also reports being involved in the NJ Special Olympic Winter Games being held January 30 to February 1 at Great Gorge. BARA reports an excellent turnout to their annual dinner held at the Old Hook Inn in Westwood. January's program will highlight Talzo N2ATT's video tapes of the club's activities for 1984. BARA's VE program is under the able guidance of K2MHP. The Computer Users Group of BARA meets the first Tuesday of the month at the Montvale Library at 8 PM with N2FBF teaching a course in Basic. Hamapo Mountain ARC held its annual election with the following being elected: President K2BJG, VP K2VAC, Secty KC2YG and Treas. W2WCE. Anyone interested in becoming a Bulletin Manager for NNJ please send me your credentials and I'll review them. We in NNJ still need more OOs and if you have the time and equipment please drop me a line and I'll send you an application. Traffic: KB2HM 341, N2XJ 296, K2MFF 253, KA2F 174, K2VX 121, KA2SPH 117, W2VY 66, W2XD 52, W2RRX 47, W2UH 47, W2CC 19, KA2IOW 14, KD2DE 12, KY2P 3. (Oct.) W2VY 13.

MIDWEST DIVISION

IOWA: SM, Bob McCaffrey, KØCY — SEC: WA4VWV. STM: KAØX. TC: KØDAS. ACC: WBØQAM. PIO: KBØZP. BM: KØIR. SGL: AKØQ. The ARRL Exec Comm has approved the Iowa State Convention in Des Moines in July, watch for more. I am taking nominations for the "1985 Iowa ARRL Ham of the Year." Send me your letters by Apr. 1. Davenport Hamfest Feb. 24. Iowa QSO party sched for March 16-17. Congrats to KAØPCJ who upgrade to Extra and WDØGUS to General. Thanks to all who filed Annual Reports, some interesting SET activities. New Officers in Mt. Pleasant are KAØBTE NØFIB WDØENR. Need ICN Support NOW.

Net	Freq	UTC	Days	QNI	QTC	Sess.
75 M Phone	3970	2330-1830	M-S	2011	159	54
TLCN (CW)	3560	0030-0400	Dy	320	247	60
ICN (CW)	3713	700 PM	M-F	127	72	20

Welcome to new OO/FCC Auxiliary members NØEBA and KAØENQ. New Officers in Waterloo are KKØR, KIØN NØAKF WBØUFU KZØC and NIØM. Mason City and Des Moines beginning new Novice classes. KØGHD honored with "Win Mager Award" in Des Moines at Xmas Party. Mt. Pleasant Club is joining in the "Sesquintenial" celebration. What does Potowanac Mean? KSØL new DEC in SW IA. Send your Valentine a Radiogram!! Traffic: WDØFWB 170, WØSS 158, KØGP 141, WAØAUX 139, KAØX 89, WØYLS 79, NCØR 77, NØCWW 72, KØOXL 69, W4JL 69, KØBRE 65, KAØADF 48, KQØI 38, KCØSC 26, KØCY 24, WBØJFF 24, WØBW 20, WBØQAC 12, NØEFG 8, KDØBG 6, WDØFOY 4, WØHTP 65.

KANSAS: SM, Robert M. Summers, KØBXF. Received information in the mail recently with reference to an ARRL Convention to be held July 19, 20 and 21, 1985 by the Des Moines Radio Amateur Radio Association, IA. The words "Electronic Fair" will be referred to in many publications to come. WØKL reports no emergencies in the state the past month but alerts us all to the fact "to be prepared" is not a bad idea. ACØE reporting the interest in the KS RTTY net Sundays at 1 P.M. Local on 3610 is picking up. Why not join the group — put that computer to work. Net reports for November QNI/QTC/MGR follow: KSBN 1175/109/WØFRC, KPN 414/15/WØFRC, KWN 96/1700 WAØLBB, KMWN 810/664/WAØLBB, CSTN 1988/93/WØDE, QKS 334/113/WBØZEN. CKS-SS missing — will pick it up next month. WØPB at Hiawatha has been accredited as an ARRL VE and he is wanting to have a list of other VE's in the KS Section. I do not have such a list, so how about all of you who are VEs drop me a line or a radiogram telling me of such. The 1984 holiday season will have been a thing of the past by the time you read this. Hope you all survived the Thanksgiving and Xmas dinners without too much discomfort. May the wishes of the coming year be at your command. Traffic: WØFRC 423, WØFIR 206, WØQBK 176, KSØU 171, WØKL 142, WØHI 137, WAØLBB 124, WBØYH 114, KØBXF 53, NBØZ 14, WØMYM 12, KAØE 10, NØBDG 9, WØPB 8, WØRBO 8, WAØOWH 7, WØCHJ 6.

MISSOURI: SM, Ben Smith, KØPCK — The Heart of America ARC has been busy providing communications for many public events in the greater Kansas City area. On Oct. 14 they furnished communications for the CROP Walk in Kansas City and Oct. 27 assisted the Grandview School District in a Walk-A-Thon with proceeds used to buy eyeglasses for those unable to afford them. Club members taking part in this project were: WBØYBA

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WBØVAW KAØREN KØUAA NØCLV. On November 4th they participated in the Macy's Marathon, an event with over 7200 runners entered. Club members worked with medical volunteers, staffed aid stations, buses and ambulances. Hams that participated were: KAØOEX KØUAA NØCLV WBØEJJ WØQIZ WBØYCD KAØREN WAØPFS WBØRHR KØORB WBØRAF NØFK WAØMBG KNØE WØAIB WDØEIG KCØHV WBØBBC KBØUH NBØE KRØM KBØWD NØFMO NØCIM NØCDH W3EAU Joyce Masters. That is a lot of public service in a short time. WBØCJB received an ORS Field Appointment. Club election time has rolled around again. Clubs and their officers reported to me are: Callaway Amateur League, Pres. WBØPLY, VP. WØNUB, Sec-Tres. KSØM; Missouri-Valley ARC, INC, Pres. KAØKCB, VP WBØVRA, Sec., KAØIKS and Tres., WBØHNO. Board members elected WBØWXE KAØKBY KBØDE.

Net	Sess.	QNI	QTC	Mgr.
MOSSB	30	686	120	KT5Y
MON	60	375	260	KØSI
MEOW	30	537	32	KØDSQ
HBN	22	366	23	KØDSQ
MTTN	15	128	56	KAØPGN
ZAEN	4	50	5	K9OCU
PTN	13	50	20	WBØROQ
Leb. ARES	4	49	0	WBØRHC
CMEN	4	56	4	KØPCK
MOFO	5	23	11	AIØO
RRARSBN	27	313	2	KAØBKR
LOFMN	5	104	0	WØRTL
LOCWN	5	23	1	WØRTL
ARESN	5	57	0	NØEHU
IFN	3	28	6	WBØSZI
SARN	4	59	0	WØENW
JCCO ARES	4	41	0	WØORI

Traffic: WØBMA 628, KT5Y 204, KØSI 203, NDØN 184, AIØO 153, NØEVC 104, KØPCK 82, K2ONP 57, WØOUD 43, NØBKE 43, KØDSQ 35, WBØHOP 26, WAØYJX 26, KØORB 25, WBØCJB 23, WØNUB 12, K9OCU 7.

NEBRASKA: SM, Vern J. Wirka/WBØGQM. STM: WDØEGK. SEC: NØAIH. BM: WDØEMR. ACC: KCØDA. OO/RFI: WAØWRI. TC: KØNG. PIO: KDØEV. SGL: WBØRJJ. Some operators have been reluctant to accept traffic that must go outside the section. The reason is many have the mistaken idea there is no way to get the traffic into NTS. This is not the case. There are several dedicated traffic handlers that provide liaison to NTS. Next time you deliver a message and the third party asks to send a return message go ahead and accept the traffic. Get the traffic on one of the section nets and it will be picked up and sent on its way. Lincoln Packet Radio Operators have changed their operating frequency from 145.700 MHz to 147.555 MHz to avoid interference to stations working Oscar 10 on 145.810 MHz and to get on the same frequency as Iowa and Minnesota. Lincoln has another VHF repeater. The 147.93 MHz in 147.33 MHz out machine is sponsored/supported by the Shrine Temple Amateur Radio Club. The Grand Island Amateur Radio Society has a repeater on a commercial FM broadcasting tower north of Boelus, NE on 147.84 MHz in 147.24 MHz out. The Pine Ridge club has a new repeater at the 146.04 MHz in 146.64 MHz out site. The AK-SAR-BEN Amateur Radio Club of Omaha has been designated a Special Service Club by the ARRL. If your club would like information on how to become an SSC contact the ACC KCØDA. Traffic: WBØTED 133, KØDKM 122, WØKK 76, KØIXY 26, WBØGQM 17, WDØBOX 17, KAØBWM 14, KAØBCB 14, KAØBOC 11, WBØGMQ 10, WAØBOK 4, KØFRU 2, KDØHJ 2.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Robert J. Koczur, K1WGO — STM: K1EIC. SEC: KA1ECL. BM: K3ZJJ. ACC: KG1M. OO/RFI: KA1ML. TC: W1HAD. PIO: KX1B. SGL: K1AH.

Net	Freq.	Local Time	QTC	QNI	NM
CN	3640	1900/2200	141	214	K1EIR
CPN	3965	1600M-S/1000 Sn	91	365	KA1BHT
NVTN	22/88	2130	38	272	WA1EMI
WCN	78/18	2030	164	484	WB1GXZ
RTN	13/73	2100	65	233	KA1JAN

Happy Valentines Day to all. WB1GXZ reports that our section had 100% representation on FRN for November. The results of the ARRL Director's race are in. Tom Frenaye K1KI defeated John Sullivan W1HHR. On January 1, 1985, Tom took office. I would like to thank John for his many years of fine service to the New England Division and the Connecticut Section. It has been my pleasure to work with him and I wish John and his family happiness and success in the years to come. Best of luck to Tom and congrats on winning the directorship. I look forward to working with him for the Connecticut Section. Richard Beebe was reelected as Vice-Director, and I wish him well also. FARA sponsored its first VE on December 15th, 1984. According to FARA president K3ZJJ future exams will be held at regular intervals. The Stamford and Candlewood RC's will be working with FARA to achieve this goal. Information on future exams may be received by sending a SASE to FARA PO Box 99 Southport CT 06490. Congrats to new FARA officers Pres K3ZJJ, VP KF1J, Sec KN1X, Treas KA1GGT, Sta Mgr W1GDZ, Activ Chair WB1ESV. Our Conn ARES has shown excellence in their contribution to public service. During Halloween many ARES groups supported local police departments to insure the safety of our children. Congrats to two outstanding DECs KA1BRD & W1SA and their members for their dedication to public service. If you or someone known to you has contributed to a public service activity in a way that you feel should be recognized please contact me and enclose all information on form CD157 which may be obtained either by contacting League Headquarters or myself. Have a good month, 73. OBS Reports: KA1XG 7, W1LUH 5, K1VKO 4, W1GDZ 4. Traffic: WB1GXZ 477, W1EFW 258, KA1GWE 182, K1EIR 138, KA1JAN 91, W1YOL 59, KA1KTH 54, N1BOW 50, KA1XG 44, KA1BHT 38, W1BDN 29, K1AQE 18, W1DPR 17, KA1EGE 9. (Oct.) WB1GXZ 459, W1EFW 304, KA1GWE 178, K1EIR 114, KA1BHT 71, KA1JAN 71, KA1XG 59, N1BOW 54, K1PUG 51, W1DPR 32, W1YOL 29, K1AQE 29, K3ZJJ 28, W1BDN 24, KA1EGE 13, W1QV 8, W1CUH 5, K1FYS 4.

EASTERN MASSACHUSETTS: SM, Rick Beebe, K1PAD — STM: KA1GBS. SEC: W1IA. ASM: K9HI. ACC: K1AZE. OO/BM: WA4STO. Tech: KA1IU. PIO: WA1IDA. SGL: K1BDN.

Net	Mgr	Freq	Time(loc)/Dy	QNI	QTC
EMRI	WA1LPM	3.658	1900/2200/Dy	409	366
EMRIPN	N1BGW	3.860	1730/Dy	337	375
EM2MN	KA1AMR	23/63	2000/Dy	523	232
NEEPN	K1BZD	3.945	0830/Sn	64	18
HHTN	WB1CMQ	04/64	2230/Dy	409	204
EMRISS	N1AJJ	3.715	2030/Dy	124	35
CI2MN	N1BYS	045/645	1930/Dy	278	168

On Nov 3 all New England OOs were invited to attend a meeting with Mr. Vincent Kajunski, the Engineer in Charge

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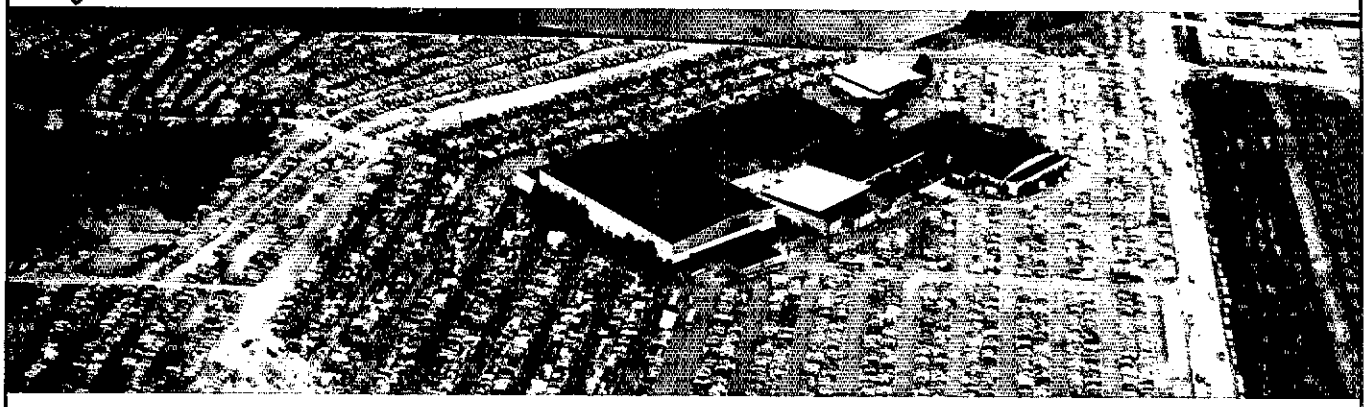

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at the Boston FCC office. The purpose of the meeting was to start putting in place the new Amateur Auxiliary Program in New England. A full morning was spent on the subject and another meeting is planned for March. The meeting was held in conjunction with one of W1HHR's open town meetings. Our new Director, K1KI, will continue to support the Amateur Aux as W1HHR did. Congrats go out to K1KI for his election as our division director. I'm sure you will all join me in supporting K1KI. He is looking for opportunities to visit with our clubs so don't hesitate to invite him to your meetings. Norwood club member K1CB has been noticed operating W1AW on occasion. Middlesex club had a successful flea market and the combined efforts of the 1200 radio club and the Waltham club resulted in another successful auction at the Honeywell plant. Cape Ann and Whitman clubs both held XMAS parties. Quannapowitt club had the privilege of having 9N1MM speak at a recent meeting and are in the process of donating a small computer to his teaching efforts in Nepal. Massasoit club members enjoyed their annual MARA night potluck supper. North American Radio Teleconference Net was on packet radio this month. Billerica club member K1OJH who is recently back from an extended trip to China gave talks on the subject at his club and the Norwood club. Sturdy Memorial club members K1ZZJ, KB1KA, WB1ETV and KC3MB gave a helping hand to N1CUZ in putting up a tower/ant system in the rain. Greater Lawrence club is undertaking a club technical project: A noise bridge. Framingham club member WA1UEH was honored with a plaque and life membership for his many years of leadership in numerous club activities.

MAINE: SM, Cliff Laverty, W1RWG — SEC: KL7IJG. STM: AK1W. PIC: KA1TJ. TC: KQ1L. OO/RFI: W1KX. BM: W1JTH. ACC: KB1JF. SGL: K1NIT. Congrats to upgrades at Ellsworth: (Gen) N1BTE N1DGM KA1LPD KA1LVL: (Adv) KA1JHH: (Extra) KB1JF KA1TJ. Code credit (20) KA1BC KB1PM. Pass Rate 50%. Sandy River ARA elect pres N1BCE, vp KA1CNG, sec WA1LZR, treas WA1JCN.

Net	Sess.	Checkins	Tfc	Mgr
SeaGul	26	1004	194	K1GUP
Pine Tree	30	338	102	AC1G
CenMeEmer	9	193	32	W1WCI
Late PTN	21	107	23	WA1YNZ
RACES	4	47	9	W1RWG
MePubSvc	4	74	0	KL7IJG
Aroostook	4	68	0	WA1YNZ

PSHR W1RWG, N1BJW, WB1GLH, WA1YNZ, KL7IJG, WB1CBP. Traffic: WB1CBP 160, KA1JOJ 135, W1BMX 112, WB1GLH 96, W1RWG 95, AK1W 75, WB1BYR 67, N1BJW 64, KA1JPR 51, N1BLZ 47, W1ISQ 39, W1JTH 33, WA1YNZ 29, W1KX 28, KL7IJG 21, KA1KFC 17, KA1AVU 16, W1WCI 15, KA1ENL 13, N1BME 12, W1OTQ 11, W1CTR 9, KA1FTL 6, KB1PB 5.

NEW HAMPSHIRE: SM, Robert C. Mitchell, W1NH — STM: W1TN. SEC: open. Congrats to new upgrades: General — KA1LBH KA1LJH KA1LJI; Tech — KA1JUL KA1KGB. EC reports from W1FYR and K1OIQ. Don't forget to use the new FCC Form 610 for all transactions. W1KGZ back in NH. Example of good publicity — see Nashua Area Radio Club Field Day log in past *QST*. W1TN now FCC Amateur Auxiliary. K1HDO received his 5BDXCC plus rare 5A1TK QSL from 1969. KA1M spoke at Nashua club on satellite communications. Welcome to NF6D who just moved to NH. Not much news this month. Guess everyone getting ready for the Holidays. Seasons Greetings to all. Traffic: N1CPX 305, AK1E 149, N1NH 147, K1M 118, K6UXO 113, W1TN 110, W1GUX 97, N1AKS 89, KK1E 85, K1PQV 80, W1FYR 80, W1ALE 75, K1UWB 73, WA1YZN 60, KV1S 55, W1MHX 42, WB1GXM 28, W1CUE 25, KA1HPO 24, K1TQY 24, K1OIQ 22, N1ALM 11, KA1QF 5, W1NH 4.

RHODE ISLAND: SM, Gordon F. Fox, W1YNE — SEC: Vacant. STM: W1EOF. TD: AB1D. NM: WA1OSL. ACC: N1BEE. SGL: K1DA. Newport County Radio Club Officers for 1985: Pres, K1PTV, V Pres, KA1AVG, Treas, WA1OSL, Rec. Secy, W1IIC, Corres. Secy, W1JFF. NM WA1OSL reports RIEM2MTN QNI 157 QTC 45. East Bay Amateur Wireless Assoc. operating a RTTY MSO (Message Storage Operation) on 146.40. Contact N1RI for further info. Traffic: W1EOF 1142, KA1KML 276, WA1CRY 58, WA1CSO 37.

VERMONT: SM, Ralph T. Stetson, KD1R — STM/BM: Pete, AE1T. SEC: Frank, W1CTM. SGL: Joe, W1KRV. ACC: Gerry, KA1AKI. Help wanted: need PRA, ORS, OBS, OO/Amateur Auxiliary. Anyone interested in OO/AA contact KD1R directly. We need more help in ARES: please contact W1CTM for ways you can help. Mitch, WB2JSJ, tells us that on Feb. 23, a big ham/computer flea market will be held at Milton High School, Milton, VT. Write WB2JSJ for details. Traffic: KT1Q 167, W1KRV 143, AE1T 111, KD1R 95, W1COB 47, KD1M 18, W1OAK 17.

WESTERN MASSACHUSETTS: SM, Don Haney, KA1T — PIO: WB1CJH. SEC: WB1HIH. STM: W1UD. TC: KA1JJM. OO/RFI: N1CM. Pleased to welcome N1DAY as member of OO/Amateur Auxiliary. Also to appoint W1UD as OBS and WB1FSV as ORS. Looks like antenna issues are finally leaning our way with Newport News, VA supporting federal preemption and with having a favorable outcome in Burbank, IL. Regret to note WA1YYW as Silent Key. HCRA honors WA1RWU for contributions in VHF-UHF communications. K1BE is trying to figure out how to use satellites as repeaters. Packet BBS for handling NTS traffic on the air at KA1T. ARES started winter with Dec. 6 net to gather reports for National Weather. PSHR: W1KK, WB1HIH, KA1T. Traffic: W1UD 162, KA1T 162, KA1EKO 108, W1KK 89, WB1HIH 70, K1JHC 45, WA1OPN 36, K1IJV 36, WB1FSV 32, W1ZPB 4.

NORTHWESTERN DIVISION

ALASKA: SM, David W. Stevens, KL7EB — STM: KL7T. SEC: KL7QS. PIO: NL7CP. OO/RFI: AL7FL. Congratulations to Lil, NL7DL, for becoming PARKA's President. Al Bianco, KL7FKO, is better after his heart attack Dec. 1, 1984. The Iditarod dog race and other major races are upon us, so help out with phone patches and traffic whenever you can. Dave Cloyd, KL7M, is the ham trail manager for Iditarod. AL7FL is looking for more Official Observers. Sniper's Net had over 1000 checkins, 21 written, 11 phone patches, and four more 25-checkins-a-month certificates were issued. Thanks Del, KL7JKW, for the good work. Traffic: AL7FJ 16, KL7VL 4.

IDAHO: SM, Lem Allen Jr., W7JMH — SEC: KD7HZ. STM: W7GHT. PIO: WB7PFQ. OO/RFI: KU7Y. CLUB NEWS: Xmas parties everywhere. Some on the same date, DARN IT! Twin Falls Club thinking of a spring swapfest — hope it works out as we need one in central Idaho. Club secretaries please drop us a line telling us what your club activities are. ARRL MATTERS: KU7Y, KA7T, WB7CYO have now joined the FCC Field Operations Organization as Amateur Auxiliary members — Congratulations! We still need volunteers to be Emergency Coordinators in

Introducing The New LK-500Z"B"

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Thinking of buying a linear amplifier? You owe it to yourself to check out the new LK-500ZB.

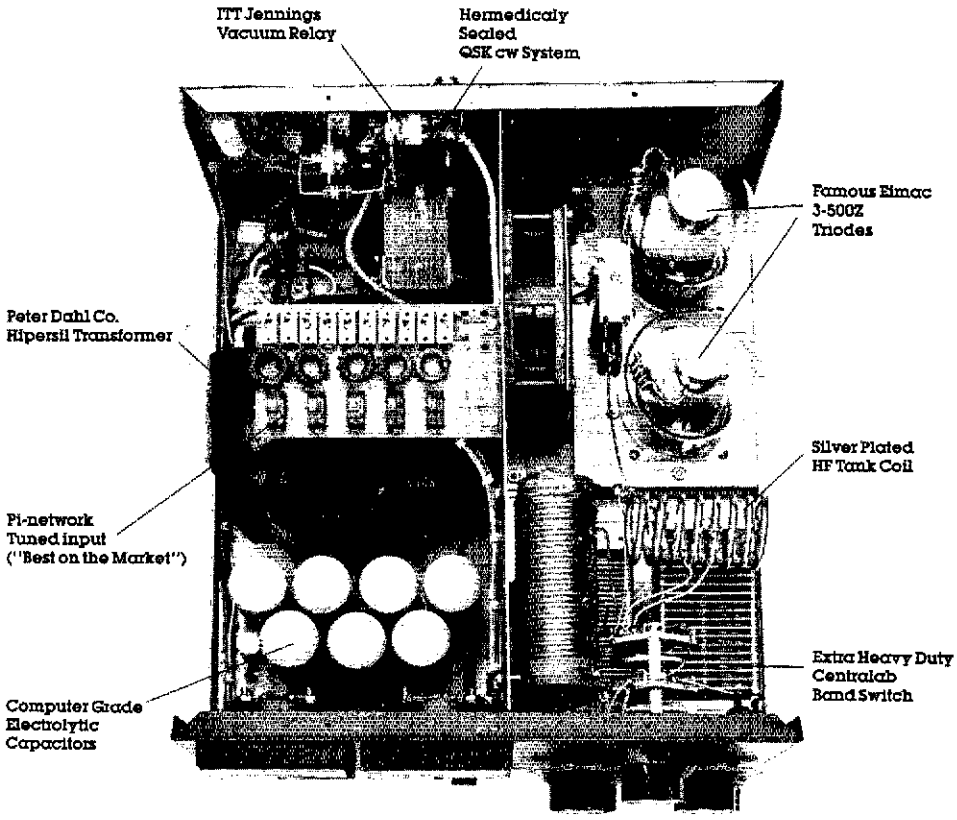
The LK-500Z series of amplifiers were created to offer the best value you can buy in HF linears covering 160-15 meters. Last year, it was demonstratively the best value. It was the lowest priced, full feature pair of 3-500Z's on the market. It had the longest warranty and the only amplifier with a money-back guarantee. It's not surprising that the LK-500ZA, both the standard and "hipersil" version, became one of the most popular amplifiers on the ham bands.

Now, for 1985, Amp Supply engineers have taken this durable, dependable "rock crusher," fantastically improved it, and call it the LK-500Z "B" version.

Improvements include an ITT Jennings vacuum antenna changeover relay with a companion sealed relay QSK system which eliminates any signal attenuation between CW characters. The silver-plated HF tank coil and the extra heavy duty silver-plated Centralab bandswitch are the finest available.

The LK-500Z "B" version has all the outstanding standard features of the LK-500ZA; such as the Peter Dahl Hipersil power transformer, and a full-wave bridge rectifier system (we will not produce amplifiers using weak voltage doublers). Computer grade electrolytic capacitors are standard and the low-pass pi-network tuned input is the absolute best on the market. Oh yes, we only use Eimac 3-500Z triode tubes in the LK-500Z amplifiers.

Amp Supply Co. has been a pioneer in manufacturing quality amateur radio products, providing service to back them up and selling at low prices. The people of Amp Supply Co. have been designing and manufacturing amplifiers since 1974, and we challenge any competition to match our total amateur HF amplifier production — 17,678 amplifiers in eleven years. You don't manufacture and



supply that many amplifiers unless you have first-rate products and service. Join the thousands of satisfied radio amateurs who have come to the people at Amp Supply Co. for their amplifier needs. We believe good service starts with answering your questions and needs before and after you buy.

All Amp Supply amplifiers carry a two year warranty. Ask our competitors what theirs is!

Our price is the whole price. LK500Z "B" version: $1295.00 includes UPS surface charges and insurance in the continental USA. In a hurry? Two day UPS air service is just $20.00.

The LK-500Z "B" version is clearly a progressive, new amplifier, a leader in its field; but what else would you expect from a company called Amp Supply?

Thank you for purchasing an Amp Supply Co. product.

Denny K8KXK

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If you are not completely satisfied with the performance of your new LK-500ZB you may return it within ten days for a refund less shipping and repackaging. If you can get any of our competitors to give you the same guarantee, buy both and return the one you don't like. We know which one you'll keep.

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LK-500NT-B No-Tune-Up	$1595.00
LK-500-ZA	$1099.50

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some counties — please help! PEOPLE AND THINGS: Darlene, WB7DZX has remarried, moved from Montana to the Twin Falls area, has a new set of twins. Welcome to Idaho from all your traffic handling friends! WA7RUT has gone to Yuma for the winter, traded his TS-520-S for a TS-820-S, loved the freq. readout. W7IRY had a few days in hospital again, now home.

NET REPORTS:

Net	FQ	MD	Time	SES	QNI	QTC
FARM	3935	LSB	7P Da	30	1760	62
ICD	3990	LSB	810A M-F	21	815	32
IMN	3635	CW	8P M-F	21	207	76

GENERAL: Now that Sunspot activity is causing abnormal propagation, more Hams are trying 160 meters and having great success. During this winter season 160, 80, 40 and 30 meter activity is about all we can expect for reliable communications. Test Emergency exercises should include alternate frequencies to insure uninterrupted communications. Traffic: W7GHT 79, W7JMH 53, KA7KAI 70, K7TM 4, WA7ANM 3.

MONTANA: SM, Les Belyea, N7AIK — 1985 officers for the Yellowstone ARC are Pres - K7TQM, VP - K7AEZ, board member's - KD7LF N7EOR W9KNF. Capitol City ARC Pres. - KA7MAH, VP - K7CCZ, Sec'y - N7FFM, editor - N7AMN. WA7ZMC was selected as "Ham of the Year" in Billings. WA7DEO from Missoula reports the following up-grades: to Tech - WB7PWN, to Gen - KA7MMY KA7QPF N7DGV KA7HRE N7DGU, to Adv, WA7OPY. VE sessions will be held in Great Falls - Feb. 9th, Bozeman-Mar. 16th and Havre-Apr. 12th. A plan is being set up where an up-grade exam will be held at least once a month at various locations in Montana. KB7KB and WB7NFK are active with packet radio. New EC in Polson is KA7HRE. A22ME was country #298 (cw) for W7LR. KØDNV W7BKB WA7PHB KA7OAO and K7HOP provided direction and coordination for the Turkey Trot races in Kalispell. PSHR — WB7WVD.

Net	Sess.	QNI	QTC	Mgr.
MTN	29	1567	141	KB7SE
MSN	4	41	0	KØPP
IMN	21	207	76	KY7I
IMNS	7	37	1	KY7I

Traffic: W7TGU 163, WB7WVD 86, N7AIK 47, WA7TUW 33.

OREGON: SM, William R. Shrader, W7QMU — STM: W7VSE. SEC: N7CPA. PIO: KC7YN. SGL: KA7K6K. ACC: WB7WTD. RFI: AK7T. OO: N7SC. STC: N7ENI. Upgrades: KA7ORS (Tech); KA7QPP, KA7SFU, N7EPE, N7FCA (General); WB7VHC, N7FLD, KA7RZG, KA7RZH KE7BB (ex N7CNW) (Advanced). Nice to see larger number of upgrades this month. N7TE and WB7WDE are the proud parents of a bouncing baby boy. N7EYS received a certificate for CW copy at 20 wpm. OTVARC won the 4A-Battery category of ARRL Field Day last summer. W7LRB is the new Emergency Coordinator for Yamhill County and W7TWL has the same position for East Multnomah County. Hearty congratulations to all! The Salem Mini-Hamfair is scheduled for 23 February 1985. Put it on your calendar, further info will be passed as plans are firmed. Plans are well underway for the Oregon State Ham Convention next summer. If you have questions or input contact WB7SIC. WØQOT is assisting W7AZD with the Oregon Weather Net. The Simulated Emergency Tests held throughout the state during the Fall provided good recognition for Amateur Radio plus some good training and insight into emergency communications problems. N7CPA and his team of EC's are beginning to 'get ball rolling smoothly' so give them assistance if you can. Traffic: W7VSE 692, K7OVK 193, AL7W 120, WA7VTD 57, N7BGW 35, KA7AID 28, W7OLT 14, W7LNE 10.

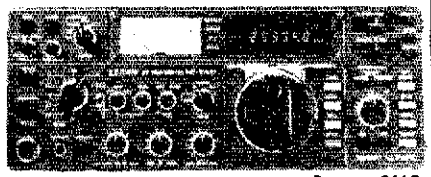
WASHINGTON: SM, Joe Winter, WA7RWK — STM: K7GXZ. SEC: W6IIH. PIO/SGL: W7CKZ. TC: K7UU. OO/RFI: KC7FA, BM: KD7G, ACC: WB7QNS.

Net	Freq.	Time(Z)	QNI	QCT	Mgr.
WARTS	3970	0200	2735	245	W7SFT
WSN	3590	0245/0545	558	154	N7CSP
PSTS	145.33	0130/0630	161	91	W7IEU
NTN	3970	2000	1129	77	W7UU
EWTN	146.04	0130/0630	77	51	WA7CBN
NWSSB	3945	0230	409	33	W7HFN

N Seattle ARC was presented a program on Oscar IV & Amsat by WA7TIB. Starting in January exams are planned to be given on the 2nd Sat. of each month at the No. Seattle Comm. College. Amateur classes are scheduled at the Corinthian Yacht Club in Jan. Feb & Mar. Congrats to Judge Goodloe, WA7GWJ on his election to the Wash. State Supreme Court. KA7EOV Lewis Co. EC/RO reports the D.E.S. station is now operational but needs more work. D.E.S. provided the room and some financing. Thanks go to KA7NZG, KA7KTT & KA7EOV for the installation work. WWARA officers for 1985: Chairman W7FHZ, V Chair. W7JEZ, Sec/Treas. K7CR, Bd. #1 KC7TD, Bd. #3 K7RNZ. Congrats! WWARA now has 62 members. Unlicensed fisherman using 146.01 & 146.17 simplex are still being heard. Please monitor these freqs. and try to get evidence of boat name, location and other pertinent info. Contact W7JIE of the Intruder Watch, or me, WA7RWK, for action. The Northwest Amateur Packet Radio Assoc. was born Nov. 13th. Its officers are Pres. KB7DZ; Exc. Vp N7BTI; Tech. Vp KD7UW; Sec/Treas. WB7FHC; Board Mbr. WB7DCH. They list appox. 30 mbrs and support digipeaters on 147.6 & 224.56 including two packet bulletin boards covering from Olympia to Bellingham. Linking the Sea/Tac area to B.C., eastern Wash., and Portland are planned. A voice net is held on 145.33, Thurs. 2100 to 2200 PST. More on packet. Possibly a first in the NW! The Pierce Co. SAR Council contributed approx. $8,000 to purchase the necessary radio equipment and three computers for use by ARES & RACES for emerg. comms. around Pierce Co. One unit is in the E.O.C. of P.C., one in the mobile command vech. Tac - 1, and one is a portable and can be used a digipeater on a remote site for linking and other uses. The system is now operational. Heading the project was W7KKN with assists from P.C. ARES EC N7DRT, WB7FHC, and WA7FUS. Plan to attend the Mike & Key ARC Flea Market on 3/9/85. Contact the club at 5430 Lake Alice Rd. SE, Fall City, WA 98042 for details. Mt. Baker ARC has scheduled the following license exams, to be given in Bellingham. Feb. 15, Mar. 22, Apr. 27, May 31. Code test at 6:30 PM, written 7:30 PM Register two weeks prior to the exam. The fee is $4.00. Contact K7IWX or call 206-734-0577. Traffic: WB7WOW 513, KD7ME 354, K7GXZ 246, KR7L 233, W7GB 114, W7LG 86, W7HNA 70, KR7F 61, N7FXM 11, N7DDP 43, KD7TJ 42, W7IEU 38, WA7BDD 36, W7LUP 25, KD7MW 20, K7AJT 14, K7OXL 9, KA7CSP 7, WA4RWK 4, W7AIB 1.

PACIFIC DIVISION

EAST BAY: SM: Bob Vallio, W6RGG — ASMs: W6ZF N6DHN. SEC: W6LKE. STM: NI6A. HRC is moving to new quarters in Hayward Fire Stn. #1. Sounds very nice. Their Novice class got 11 students successfully past the CW test. MDARC is currently running a Novice class with 15 students, and a General/Advanced class with 30 students. NBARA is holding their elections. Results next month.



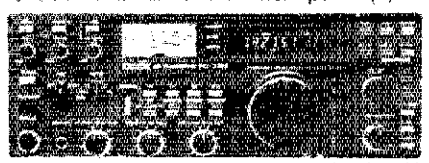
HF Equipment

	Regular	SALE
IC-740* 9-band 200w PEP xcvr w/mic	$1099.00	869.95

***FREE PS-740 Internal Power Supply & $50 Factory Rebate** - until gone!

PS-740 Internal power supply	159.00	149.95
*EX-241 Marker unit	20.00	
*EX-242 FM unit	39.00	
*EX-243 Electronic keyer unit	50.00	
*FL-45 500 Hz CW filter (1st IF)	59.50	
*FL-54 270 Hz CW filter (1st IF)	47.50	
*FL-52A 500 Hz CW filter (2nd IF)	96.50	89.95
*FL-53A 250 Hz CW filter (2nd IF)	96.50	89.95
*FL-44A SSB filter (2nd IF)	159.00	144.95
SM-5 8-pin electret desk microphone	39.00	
HM-10 Scanning mobile microphone	39.50	
MB-12 Mobile mount	19.50	
Options also for IC-745 listed below		
IC-730 8-band 200w PEP xcvr w/mic	$829.00	569.95
FL-30 SSB filter (passband tuning)	59.50	
FL-44A SSB filter (2nd IF)	159.00	144.95
FL-45 500 Hz CW filter	59.50	
EX-195 Marker unit	39.00	
EX-202 LDA interface; 730/2KL/AH-1	27.50	
EX-203 150 Hz CW audio filter	39.00	
EX-205 Transverter switching unit	29.00	
SM-5 8-pin electret desk microphone	39.00	
HM-10 Scanning mobile microphone	39.50	
MB-5 Mobile mount	19.50	
IC-720A 9-band xcvr/.1-30 MHz rcvr	$1349.00	869.95
FL-32 500 Hz CW filter	59.50	
FL-34 5.2 kHz AM filter	49.50	
SM-5 8-pin electret desk microphone	39.00	
MB-5 Mobile mount	19.50	
IC-745 9-band xcvr w/.1-30 Mhz rcvr	$999.00	789.95
PS-35 Internal power supply	160.00	144.95
CFJ-455K5 2.8 kHz wide SSB filter	4.00	
HM-12 Hand microphone	39.50	
SM-6 Desk microphone	39.00	

**See IC-740 list above for other options (*)*



IC-751 9-band xcvr/.1-30 MHz rcvr	$1399.00	1199
PS-35 Internal power supply	160.00	144.95
FL-32 500 Hz CW filter (1st IF)	59.50	
FL-63 250 Hz CW filter (1st IF)	48.50	
FL-52A 500 Hz CW filter (2nd IF)	96.50	89.95
FL-53A 250 Hz CW filter (2nd IF)	96.50	89.95
FL-33 AM filter	31.50	
FL-70 2.8 Khz wide SSB filter	46.50	
HM-12 Hand microphone	39.50	
SM-6 Desk microphone	39.00	
CR-64 High stability reference xtal	56.00	
RC-10 External frequency controller	35.00	
MB-18 Mobile mount	19.50	
Options: 720/730/740/745/751	Regular	SALE
PS-15 20A external power supply	$149.00	134.95
EX-144 Adaptor for CF-1/PS-15	6.50	

ICOM

Options - continued	Regular	SALE
CF-1 Cooling fan for PS-15	45.00	
EX-310 Voice synth for 751, R-71A	39.95	
SP-3 External base station speaker	49.50	
Speaker/Phone patch - specify radio	139.00	129.95
BC-10A Memory back-up	8.50	
EX-2 Relay box with marker	34.00	
AT-100 100w 8-band automatic ant tuner	349.00	314.95
AT-500 500w 9-band automatic ant tuner	449.00	399.95
AH-1 5-band mobile antenna w/tuner	289.00	259.95
PS-30 Systems p/s w/cord, 6-pin plug	259.95	233.95
OPC Optional cord, specify 2 or 4-pin	5.50	
GC-4 World clock	99.95	94.95
HF linear amplifier	Regular	SALE
IC-2KL w/ps 160-15m solid state amp	1795.00	1299
VHF/UHF base multi-modes	Regular	SALE
IC-251A* 2m FM/SSB/CW transceiver	$749.00	499.95

***$50 Factory Rebate** - until gone!

IC-551D 80 Watt 6m transceiver	$699.00	599.95
EX-106 FM option	125.00	112.95
BC-10A Memory back-up	8.50	
SM-2 Electret desk microphone	39.00	
IC-271H 100w 2m FM/SSB/CW xcvr	899.00	759.95
PS-35 Internal power supply	160.00	144.95
PS-15 external power supply	149.00	134.95
CF-1 Cooling fan for PS-15	45.00	
EX-144 PS-15/CF-1 fan adaptor	6.50	
AG-25 Mast mtd. GaSFET preamp	84.95	
IC-471H 75w 430-450 SSB/CW/FM xcvr	1099.00	989.95
PS-35 Internal power supply	160.00	144.95
PS-15 20A power supply	149.00	134.95
CF-1 Cooling fan for PS-15	45.00	
EX-144 PS-15/CF-1 fan adaptor	6.50	
AG-35 Mast mounted preamp	84.95	
IC-271A 25w 2m FM/SSB/CW xcvr	699.00	619.95
PS-25 Internal power supply	99.00	89.95
AG-20/EX-338 2m preamplifier	56.95	
IC-471A 25w 430-450 SSB/CW/FM xcvr	799.00	699.95
AG-1 Mast mounted 15dB preamp	89.00	
PS-25 Internal power supply	99.00	89.95
Common accessories for 271A/H and 471A/H		
SM-6 Desk microphone	39.00	
EX-310 Voice sythesizer	39.95	
TS-32 CommSpec encode/decoder	59.95	
UT-15 Encoder/decoder interface	12.50	
UT-15S UT-15S w/TS-32 installed	79.95	
VHF/UHF mobile multi-modes		
IC-290H 25w 2m SSB/FM xcvr, TTP mic	549.00	489.95
IC-490A 10w 430-440 SSB/FM/CW xcvr	649.00	579.95
VHF/UHF/1.2 GHz FM	Regular	SALE
IC-22U 10w 2m FM non-digital xcvr	299.00	249.95
EX-199 Remote frequency selector	35.00	
IC-27A Compact 25w 2m FM w/TTP mic	369.00	329.95
IC-27H Compact 45w 2m FM w/TTP mic	409.00	369.95
IC-37A Compact 25w 220 FM, TTP mic	449.00	359.95
IC-47A Compact 25w 440 FM, TTP mic	469.00	419.95
UT-16/EX-388 Voice synthesizer	29.95	
IC-120 1w 1.2 GHz FM transceiver	499.00	449.95
ML-12 10w amplifier	339.00	299.95
6m portable	Regular	SALE
IC-505 3/10w 6m port. SSB/CW xcvr	$449.00	399.95
BP-10 Internal Nicad battery pack	79.50	
BP-15 AC charger	12.50	
EX-248 FM unit	49.50	
LC-10 Leather case	34.95	
SP-4 Remote speaker	24.95	

Hand-held Transceivers

Deluxe models	Regular	SALE
IC-02AT for 2m	349.00	299.95
IC-04AT for 440 MHz	379.00	339.95
Standard models	**Regular**	**SALE**
IC-2A for 2m	239.50	189.95
IC-2AT with TTP	269.50	199.95
IC-3AT 220 MHz, TTP	299.95	239.95
IC-4AT 440 MHz, TTP	299.95	239.95

Accessories for Deluxe models	Regular
BP-7 425mah/13.2V Nicad Pak - use BC-35	67.50
BP-8 800mah/8.4V Nicad Pak - use BC-35	62.50
BC-35 Drop in desk charger - all batteries	69.00
BC-60 6-position gang charger, all batts	SALE 359.95
BC-16U Wall charger - BP7/BP8	10.00
Accessories for both models	Regular
BP-2 425mah/7.2V Nicad Pak - use BC35	39.50
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	29.50
BP-4 Alkaline battery case	12.50
BP-5 425mah/10.8V Nicad Pak - use BC35	49.50
CA-2 Telescoping 2m antenna	10.00
CA-5 ⅝-wave telescoping 2m antenna	18.95
FA-2 Extra 2m flexible antenna	10.00
CP-1 Cig. lighter plug/cord - BP3 or Dlx	9.50
DC-1 DC operation pak for standard models	17.50
LC-02AT Leather case for Dlx models w/BP-7/8	39.95
LC-2AT Leather case for standard models	34.95
LC-11 Vinyl case for standard models	17.95
LC-14 Vinyl case for Deluxe models w/BP-7/8	17.95
RB-1 Vinyl waterproof radio bag	30.00
HH-SS Handheld shoulder strap	14.95
HM-9 Speaker microphone	34.50
HS10 Boom microphone/headset	19.50
HS-10SA Vox unit for HS-10 (deluxe only)	19.50
HS-10SB PTT unit for HS-10	19.50
ML-1 2m 2.3w in/10w out amplifier	SALE 79.95
ML-25 2m 2.3w in 20w out amplifier	SALE 179.95
SS-32M Commspec 32-tone encoder	29.95

Shortwave receivers	Regular	SALE
R-71A 100 Khz-30 Mhz digital receiver	$799.00	689.95
FL-32 500 Hz CW filter	59.50	
EX-310 Voice synthesizer	39.95	
RC-11 Wireless remote controller	59.95	
CR-64 High stability oscillator xtal	56.00	
R-70 100 Khz-30 Mhz digital receiver	749.00	569.95
EX-257 FM unit	38.00	
IC-7072 Transceive interface, 720A	112.50	
FL-44A SSB filter (2nd IF)	159.00	144.95
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LARK is experimenting with an open autopatch on their repeater. WA6ODP/R, after deciding to remove their prefix decoder lock-out feature. Their new Novice class has 26 students. EBARC member K6AGD has upgraded to Extra. They welcome new member N6FT, and elected new officers: K6AGD, pres.; KF6PD, 1st v.p.; KB6APL, 2nd v.p.; KG6HF, 3rd v.p.; KG6HU, secy.; NU6W, treas. Traffic: NI6A 212, W6VOM 120, K6AGD 95, NV6T 39. (Oct.) NI6A 207.

NEVADA: SM, Leonard M. Norman, W7PBV — SEC: K7HRW. 1985 is fiftieth anniversary of building Hoover Dam, Hoover Dam project and Boulder City Radio Amateurs taking part in the celebration. Winnemucca Mtn repeater fqcy is 146.16/76. NARA and SNARC are 100% ARRL Clubs. Single-candidate election held by LVRAC, new officers are, KC7ZA, President; N7CLK, V.P.; K7WS, Secy; N7KJP, Treas; KD7KC, WB7EHN and WB7VUK, Directors. Nominating Chairperson was WD9CKM. Las Vegas Tuesday evening net on 34/94 WA7NQH CHOP. Call N7BIG at 565-0242 if you want to take the ham exam or help give them. KD7KC and KA7RKH published a nice HF band allocations chart. Traffic: W7CX 4, W7PBV 5.

SACRAMENTO VALLEY: SM, Ron Menet, N6AUB. ASM: W6RFF. SGL: WB6WFG. SEC: WA6ZUD. STM: WA6WJZ. OO/RFI: NY6Z. I ask for your prayers and thoughts for Wayne Heck, N6EPG, currently locked in a life or death struggle with cancer. Wayne has been very active in Yolo County. SEC Taylor has written a Section Emergency Operations Guide which all EC's should receive shortly. This has been needed for a long time. Good Job, Lyle! Jettie Hill, W6RFF, recently relocated from Cupertino to Roseville, has accepted an appointment as Asst. Section Manager. Jettie was formerly SM/SCV and Vice Director, Pac. Div. A.R.R.L. Jettie will be a valuable asset to the Section Staff. Keith Crandall, K6QIF, EC, Sacramento County has tendered his resignation effective January 1, 1985. Keith has worked very hard and achieved considerable success. Good luck in whatever you do in the future, Keith. AR. Traffic: N6CVF 265, K6SRF 167, WA6WJZ 160, WB6CLD 128, KA6PDG 52, WD6BZQ 51, WB6SRQ 19, WA6ZUD 16.

SAN FRANCISCO: SM, Bob Smith, NA6T — I had a chance to visit MARC, HARC, and our newest club in the section, the Ukiah Amateur Radio Club this month. All three meetings were very informative. KK1A, Carl, is using W6PW, the SFRC Club station, and handling lots of traffic on CW and VHF phone. The VE Program within the section is working well with SCRA in their second test session, and MARC, HARC, and DNARC planning their first sessions. Watch the QST's in the newsletters and the VHF Reptrs for times and dates. New club officers and a new year, get out and support your local club's activities. CDF-VIP program in Sonoma County had 41 amateurs at the "Thankyou Dinner" given by CDF in November. Vern, WB6RTE, is in the Mad River Community Hospital, drop Vern a QSL and say "Hello." Glad to see that Bob, W6PDD, is back at the editorial desk of the FDT Newsletter, out of the hospital and back in the reins. Traffic: W6IPL 231, N6FWG 110.

SAN JOAQUIN VALLEY: SM, Charles McConnell, W6DPD — SEC: WA6YAB. STM: N6AWH. TC: WA6EXV. ACC: N6ECH. ASMs: W6TRP and K6YK. New officers of the Central Valley Radio Club are Pres. WB6VGZ, 1st VP N6AWD, 2nd VP W6TRP, S/T W6VMB. The Club meets the 2nd Thursday in Delano or Bakersfield. New officers of the Tulare County ARC are Pres. WC6U, VP KA6VMJ, Sec KA6AWV, Treas. KB6AEV, Act Dir. W6MUV, Repeater Dir KA6VAF. The Club meets the 4th Thursday in Visalia. New officers of the Kern County ARC are Pres. WB6KLL, V.P. KB6CEM, Sec KB6CMB, Treas N6GFO, Dir. N6DTB. The Club meets the 4th Friday in Bakersfield. The Stockton Radio Club and the Delta ARC have merged to form the Stockton-Delta ARC. KA6YXF is a Silent Key. N7EGW is KG6LY. KB6CXX is a Tech. N6BWW has a TS711A. W9MQT has a FT209RH. WD6GFF is on 220 MHz. The volunteer exam program is working in the section with groups in Ridgecrest, Bakersfield, Visalia, Hanford, and Modesto giving exams. The International DX Convention is April 19-20, 1985 in Fresno. The 1985 Fresno Hamfest is May 3-5 at the Tropicana Inn. All affiliated clubs are reminded to file their annual reports with ARRL Headquarters. Traffic: W6DPD 19, W6SX 12, WA6YAB 4.

SANTA CLARA VALLEY: SM, Rod Stafford, KB6ZV — ACC: W6MKM. SEC: K6ITL. TC: K6HLE. STM: W6PHT. PIO: N6BIS. W6TC gave a very informative and interesting talk to the Foothill Amateur Radio Society on coax baluns and antennas. W6CF is another Official Observer for the SCV Section. If you think you are interested in the OO position, please give me a call and I can explain the procedure for becoming one of the Section OOs. San Mateo Radio Club recently elected new officers for the upcoming year. Pres WA6Y, VP W6KXG, Treas WA6SWK and Sec KF6AB. There was good participation by many local amateurs during the recent Medex drill in early December. Thanks to groups like SPECS, SVECS and many amateurs in San Mateo County, the Medex turned out to be a good exercise of amateur capabilities in handling emergency communications. N6IIU and WB5VUL gave a demonstration and talk about Packet Radio at a recent Palo Alto Amateur Radio Assoc. meeting. Packet radio was used extensively by amateurs associated with the Palo Alto Red Cross during the recent annual Simulated Emergency Test (SET) and the Medex. Those of you who know about Packet probably realize the importance it can play in handling traffic in the National Traffic System and emergency communications. It is rapid and very reliable. The Santa Cruz County ARES members run a traffic and training net on K6BJ/R each Wednesday evening at 7:30 pm (local). The net provides an excellent chance to learn about emergency communication procedures and formal traffic handling procedures. Other wide-coverage emergency communications oriented nets are as follows:

Monday	8:00 PM	145.27 (−)	SPECS
Tuesday	8:00 PM	146.715 (−)	SVECS
Wednesday	7:00 PM	145.45 (−)	SCV Section ARES

WA6KRA was once again congratulated by his fellow traffic handlers for his high volume traffic efforts. He is very active on the HF traffic nets and the NCN-VHF traffic net. WA6NIL reportst that the Palo Alto-Stanford-Mt. View area recently had a failure of its 911 emergency dialing system. ARES amateurs were immediately called out and the city disaster preparedness officials were very impressed with the speed with which the amateurs took to their assigned locations in case they were needed for communicators. Favorable publicity was the result in the local newspapers and WA6NIL, EC for Palo Alto, received a very complimentary letter from the Fire Chief of Palo Alto indicating the ARES efforts were much appreciated. WA6NIL has spent a great deal of time educating the local civil authorities about amateur radio and what we as amateurs can do to help them in an emergency. A number of local DXers are involved in planning and running the upcoming 1985 International DX Convention scheduled for April in Fresno.

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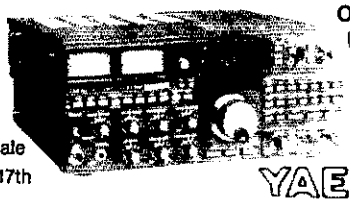

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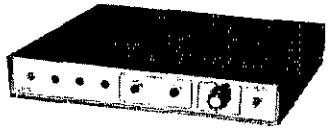

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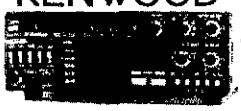

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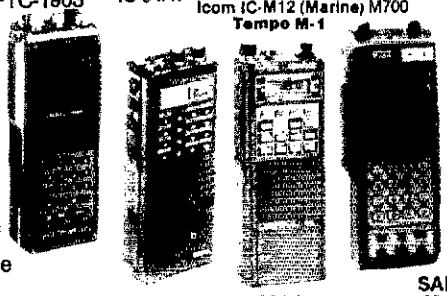

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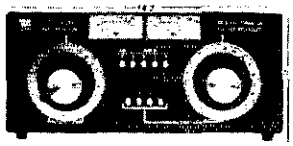

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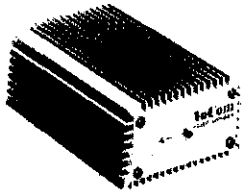

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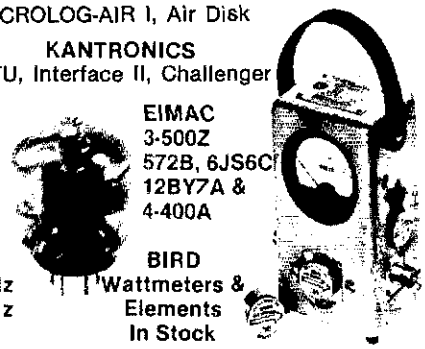

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KA6W is pre-registration chairman, WC6I is On-Site Registration Chairman and K6SSJ is publicity chairman. WD6GHY recently made an appearance before the Cambrian (San Jose) School District Board and made a plea for the school board to install two-meter antennas on all of the schools within the district. They have agreed to do so and the antenna will shortly be installed. Two long-time hams in the section have recently passed away. W6AHG had been in amateur radio for more than 60 years. He was a member of the Coastside ARC. Ex-W6KG recently died at the age of 92. He was one of Santa Clara Co. Amateur Radio Association's earliest members. As a teenager, he put up a 100-foot antenna tower in the Evergreen Area of San Jose in 1909. I think that was before the city fathers were big on antenna ordinances. K6TEH is an *Official* Bulletin Station and regularly gives ARRL bulletins on the 147.47 repeater in the South Santa Clara County area. Traffic: W6YBV 274, W6PRI 24.

ROANOKE DIVISION

NORTH CAROLINA: SM, Rae Everhart, K4SWN — SEC: AB4W. STM: K4NLK. BM: K4IWW. ACC: WC4T. PIO: WA4OBR. SGL: AB4W. Enjoyed meeting many of you at the Concord and Greensboro Hamfests. ARRL was invited to speak about the League, explain what amateur radio is, and how ham radio can help public safety people and radio services. The APCO state convention was held this month and a large crowd about the ARRL/APCO agreement. It was explained to those attending how to make contact with government, police, fire, EMS people and how amateur radio can help them and their community. Contact on the local level is the best place to start. If you have not made contact, do son NOW, it may surprise you in the amout of public relations you can generate. For all of you in the section this is to advise that county governments, AREA Emergency Coordinators of state government, and city governments will start working on the 1985-86 budgets so make contact and a strong pitch for amateur radio with them. You might be able to get some amateur equipment for your area/county included in the budget. New officers of W4MOE are KA4CAC Pres., KA4WPM VP., K8SKX Sect., KI4EA Tres., N4NH Trustee. Many thanks to all who helped with large amount of traffic during Holiday season. Don't forget to mark your calendar for the LEAGUE PLANNING MEETING on May 11-12 in Raleigh. I would strongly encourage all radio clubs in section to send a delegation and/or representative to the meeting. Contact K4HF for more details. Also the Roanoke Division Convention in Charlotte on March 16-17. Rumor has it that a lot of you have an interest in the new mode of communications — PACKET RADIO. The Charlotte club is trying to have a Packet Radio seminar at the convention. Write WC4T for more information. If any of you have information on packet radio in your area, let me know. Don't forget the NASA Space Shuttle Flights in 85 will carry more amateurs. Be prepared or better prepared this time. League HQ has been re-organized. 8 departments have been reduced to 5. More emphasis being placed on getting more people into amateur radio. Many club members at W4NYR are going on 2M. SSB. Does your club have a special project? Share it with others. Traffic: K4NLK 235, NJ4L 219, WA4OBR 204, KA4EYF 192, KB4FWL 185, N4JRE 148, WB4HRR 122, WB4N 100, WA4MNR 93, WA4SRD 61, WD4LRG 60, WB4DAR 51, K4SWN 35, WD4EQK 34, WD4CEB 33, NE4J 32, KA4YMY 31, K4GI 27, N4CJJ 23, K4QXA 19, K4YJB 18, W4PRG 17, WB4CYN 16, WA4PID 12, WD4NTE 10, KB4IVV 10, NT4K 5, N4UE 3. (Oct.) N4UE 7.

SOUTH CAROLINA: SM, Jimmy Walker, WD4HLZ — I mentioned several programs last month that are planned for the coming year and HAM WATCH (operates under CRIME WATCH) was the first on the list. NC amateurs have been active in this program for several years and we can use them as a guide for SC. I am looking for an individual and/or club to start this project for the SC Section. Second on the list was SKYWARN. The NWS wants amateurs (individuals and/or clubs) to sponsor SKYWARN training in SC. In other words, you set up the training with NWS; then you invite amateurs, city and county police, fireman and rescue personnel to attend the seminar. The NWS intentions are for amateurs to be the driving force in presenting the SKYWARN message to the public in SC. Come on SSCs, clubs and those wanting to get involved, either one of these programs are great for improving your public service image and attracting the attention of the news media. Anyone wishing to take the ball on these programs please let me know. Traffic: K4ZN 265, W0IKT 156, W4NTO 152, K4WJR 131, W4FMZ 121, KB4BZA 86, WB4UDK 49, W4ANK 43, K4ZB 41, WJ4P 39, WD4FJP 20, KA4LRM 17, WV4B 9, KB8GT 7, W4DRF 4, KA4AUR 3.

VIRGINIA: SM, Claude Feigley, W3ATQ — STM: WD4ALY. SEC: WB4UHC. ACC: WD4KQJ. OO/RFI: W4HU. BM: AB4U. PIO: WN4VAU.

VTN	1 PM	3907	AA4AT
VSBN	6 PM	3947	WB2OMZ
VSN	6:30 PM	3680	KB4WT
VN (EARLY)	7 PM	3680	K4JST
VN (LATE)	10 PM	3680	KR4V
VLN	10:15 PM	39457	KA4IUM

By the time you read this all Section traffic handlers should have recovered from an outstanding job during the holiday crunch and gearing up for the Va. Tech Valentine Massacre. K4JST is firmly that RTTY and AMTOR is the way to handle bulk traffic. With the upcoming Boy Scout Jamboree at A.P. Hill we should be thinking about using these modes for the traffic. Anyone ready to setup a Section net on RTTY or AMTOR for practice and education? The Richmond-area gang completed their first exam session on Nov. 17 with 33 participants and 47% passing. Congrats to KA3DTE who is now AA4GL. Other known upgrades are: KA4OCF to Tech, KB4EOQ to General, KA4FCC, N4JSP, WN4VAU to Advanced, N4JHN to Extra. Good to hear K4AXF, N1PG and WB4EDB on Region and Area nets. Packet radio is active with WD4OLV active in Roanoke area, KA4MVO and WA4SNY in Lynchburg meeting on 145.01 MHz. K4JST using AMTOR on HF. KI4LO and WB4EDB are new ORS. WB4UOI reports another exam session in Richmond Mar. 23 contact him for details. DEC reporting are KA4ERP N4EXQ K4BAV AA4GL. NM4R WD4RIE WA4RTS WB4SHK K4VWK and WB4ZNB. OOs KE4EQ W4HU W8IRT K4JDJ and KB4WT continue their monitoring of the bands. Stations with over 100 PSHR points are N4GHI K4JST AA4AT WA4CCK K4KDJ and WD4ALYL. N4GHI makes BPL again. Traffic handled for the month 4331 with 48 stations reporting. See you at the Winterfest Feb. 24. Traffic: N4GHI 503, AA4AT 486, N4EXQ 352, W3ATQ 345, WA4CCK 259, WD4FTK 232, WB4PNY 205, KR4V 172, K4KDJ 163, KA3DTE 152, K4JST 141, WD4ALY 131, KA4IUM 113, WD4OCW 110, K4AXF 96, KB4WT 88, KI4LO 77, K3RZR 76, K4JM 68, K4ECD 56, KB4OG 54, NW4O 47, NT4S 44, WB4VMX 44, WB4KIT 43,

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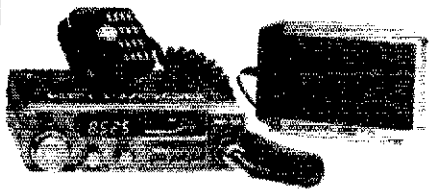

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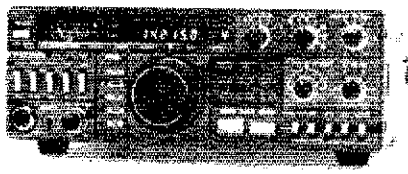

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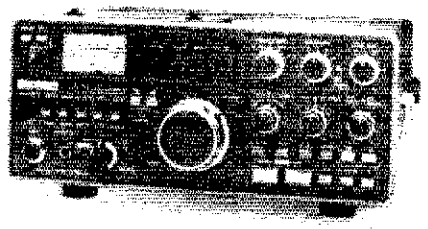

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NN4I 36, KB4PW 30, WB4UHC 25, K4GR 25, K4MLC 21, N6ANQ 20, W4LXB 17, K4VWK 14, WB4EDB 11, WB4DQZ 10, N4IBY 10, WA4TVS 9, WB4ZNB 7, N3RC 7, KA4ZTB 7, K4JUM 5, WA1VRL 4, KC4HN 2, W4YE 1, N4LE 1.

WEST VIRGINIA: SM, Karl S. Thompson, K8KT — SEC: K8QEW. STM: KD8G. ACC: WA8CTO. SGL: K8BS. TC: K8CG. Rpt. Coord. WD4KHL. Newly appointed ECs are: N8FXC for Calhoun Co. and N8FYF for Roane Co. Kanawha Valley, or visiting hams are invited to attend breakfast each Sat. at 8:00, Rose City Cafeteria, So. Chas. Totals below reflect activity for Oct. and Nov.

Net	Freq	Time	QNI	QTC	Sess	NM
Hillbilly	14290	Noon Su	252	44	8	KC8YU
WVFN	3865	6:00	2145	237	61	N8AJC
WVMD	7235	11:45	2015	117	61	W8FZP
WVN	3567	7:00	440	240	60	W8LYV
WVNN	3730	6:30	176	45	31	KD8RD
KCF 2M	87/47	8:30 M	78	0	7	N8FYF

Traffic: WD8LDY 246, KZ8Q 213, W8FZP 116, K8TPF 100, KA8OGF 99, N8AJC 92, K8KT 85, WA3NUI 80, KA8OMM 77, K8QEW 70, K8UQY 50, WA8KCJ 31, KD8G 28, W8HZA 23, WD9DNQ 22, W8JWX 10, WD8DHC 9, NC8G 8.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Bill Sheffield, KØØJ — SEC: WBØFQB. STM: WDØAIT. OO/RFI: NCØF. ACC: WBØDUV. PIO: KAØPYH. SGL: WDØGQL. TC: KØØP. BM: WØMDT. Dec. & Jan. have been months of elections for the majority of Amateur Radio Clubs in Colo. Congrats to all new officers & Good Luck on your future endeavors. The traffic nets in Colo do a great job, but can use help at net control or just participating, so check in & let one of the NM's know if you are willing to help. CWN & SCTN - WDØAIT, CWXN - WAØHJZ, HNN - WØLAE, COL - WAØRYL, NCTN - NØDZA. We have a good start on scheduled VE tests and many clubs and groups are becoming involved, & there will be tests each month in Colo. (See Jan. Section News). Packet Radio is now being operated by three Section leaders, KOØP, KQBJ & WBØFQB with two more on the way to getting on the air. Swapfests coming up are: ARA, Aurora March 17th, April will have swapfests in Grand Junction and Colorado Springs. This month's name droppers: KAØJMB, EC for Dist. 22. WBØEIV & K7RH for their contributions to RMPRA. NETS: Col; QNI 992, QTC 59 inf-152, Time 907, 26 sess. CWN; QNI 134, QTC 73, Time 514, 30 sess. CWXN; QNI 2894, QTC 3308, Time 2700, 30 sess. HNN; QNI 1933, QTC 117, inf-490 Time 1633, 30 sess. NCTN; QNI 311, QTC 148, Time 487, 27 sess. SCTN; QNI 22, QTC 5, Time 52, 6 sess. Traffic: NØBQP 2431, WAØHJZ 1828, KØJAN 567, WØACH 437, KØRXK 430, WDØAIT 179, KBØZ 138, NØDZA 137, WDØBSZ 115, WAØOYI 102, WØLAE 90, KJØG 88, AIØW 69, WØNFW 49.

NEW MEXICO: SM, Joe T. Knight, W5PDY — ASM: W5HD. DEC: KB5XD. STM: KV5U. NMs: WA5UNO, K6LL, W5VFQ. TC: W8GY. ACC: W5HD. Southwest Net (SWN) meets daily on 3583 at 1930 local and handled 165 msgs with 175 stations in. New Mexico Roadrunner Net meets daily on 3939 at 0100 UTC and handled 88 msgs with 1099 stations in. New Mexico Breakfast Club meets daily on 3939 at 0830 local and handled 88 msgs with 876 stations in. Yucca 2-Mtr Net 78/18 & 93/33 handled 17 msgs with 449 checkins. Caravan Club 2-Mtr Net 66/06 handled 88 msgs with 130 checkins. SCAT 2-Mtr Net 66/06 handled 23 msgs with 516 checkins. First NM VEC exams successful at Las Cruces — FB job fellas — WØRRU making progress with new pacemaker. WB5NNG doing well after hospital stay. W5NUI/7 Oregon. Traffic: ND5T 516, W5DAD 162, N5EXC 11.

UTAH: SM, Ron Todd, K3FR — STM: W7OCX. SEC: NA7G. BM: WA7MEL. OO/RFI: KD7FL. ACC: KB7XO. PIO: N7BHC. TC: K7RJ. EXAMS: N7IE. Entering the new year, I am going to put more emphasis on bulletin and OO/RFI programs we could use some more volunteers. WA7MEL has new QTH. Any one wanting a print out of section staff drop me a note or send msg with your address. Congrats K7HLR net mgr TWN-c4. W7OHR off air for roof repairs. N7CEU has tty MSO in operation on W7EU 6.70/6.10 SLC. K7PB notes he's still single, come on you YL's. X-W7HLS is SK. Several XEROX 820 boards now in section, these will be used in setting up packet network and links toward Denver and Boise, contact me or N7BHC for details. N7IE joins section staff as ASM for Exams. K7HK and WB7DZX parents of twins and have moved to Idaho. Tnx all who participated in SET. New officers of UARC are pres-K7RJ, evp-KD7NX, vp-KD7ML, sec-KY6J, treas-WB7DPA. Traffic: K7HLR 295, WA7KHE 80, KO7H 14, W7OCX 11, WA7MEL 4, N7BQE 1.

WYOMING: SM, Dick Wunder, WA7WFC — ASM: KA7AWS. EC: W7TVK. I would like to thank W7TVK for his efforts in keeping the ARES and RACES organizations going through this past year. There is quite a group of Wyoming hams on 160M these days, check 1.950 about 8 P.M. every evening. Old Saint Nick was busy in the Cheyenne area as there are some TS-430S's on the air around here. This month's report is a little short as there is not much activity at present. All reports & information about the happenings in our section is appreciated as I can always use the information. Wyo. Cowboy Net held 22 sessions with 740 QNI & 13 QTC. Wyo. Jackalope Net held 25 sessions with 599 QNI & 1 QTC. Traffic: WB7NHR 323.

SOUTHEASTERN DIVISION

ALABAMA: SM, Joseph E. Smith, Jr., WA4RNP — SEC: N4DMA. STM: NAJAW. SGL: KA4WVU. BM: KF4VV. OO/RFI: K4ELY. The Amateur Auxiliary is getting off to a good start but the turnout has been somewhat skimpy over the Alabama section so if you are interested in becoming an Official Observer please contact K4ELV, Mike or me; since this is a monitoring position it is not necessary to live in a heavily populated area. We have a Silent Key: W4GUW, Hershel G. Dupree of Gadsden. There is a new ARRL affiliated club in the section called the Montgomery-Tuskegee Technicians Amateur Radio Society, with N4QT Art as pres. Please send me news of upgrades, new club officers, special activities, Silent Keys, and anything else of special interest for this article. My address is on page 8. Traffic: CAND reports 978 messages in 30 sessions with DRN5 rep 100% by NW4X, W4CKS, and WX4I. DRN5 reports 796 messages in 60 sessions with Alabama rep by WB4IXA, WA4JDH, W4CKS, NW4X, KC4GS, WX4I, and W4WJF. BPL: WA4JDH. PSHR: WA4JDH, W4CKS, KB4GPN, WA4LXP, and WA4RNP. 73 Joe SM, Alabama. Traffic: WA4JDH 834, W4CKS 180, NW4X 128, WA4LXP 85, WA4RNP 51, WB4IXA 49, KB4GPN 42, WD4NYL 34, K4AOZ 32, KC4GS 16, K4HJX 16, W4DGH 13, WB4TVY 6, W4WJF 5, KC4AF 5.

GEORGIA: SM, Eddy Kosobucki, K4JNL — SEC: WB4ABY. STM: K4VHC. ACC: WA4ABY. BM: W4BIA. OO/RFI: W4RZL. PIO: WA4PNY. SGL: W4BTZ. TC: K4UDR. Remember TFC counts go to STM, K4VHC & P6HR to me by the 6th of the month. Heard nothing but FB comments on VE exams held at Stone Mt. Hamfest. Hope this can continue thruout the section. The annual Peachtree Road was agn a success tnx to the help of BGMRC. MALARC needing gold newspapers & mags, call Dot N4ATC if u have any. VE team in Savannah now functional, call Bill, KK5M for info. N4JWS rpts Vidalia Emerg Coordinating Repeater Grp organized, check on 146.625/025 for meeting times. QCWA meets each Sat at 0900 EST on 3832 - we need ur support. Tnx from all to Fay N4HLE & Jim, KE4BI fer FB work on "Top of the Rock" publication. As Fay says "Gud luk to the new editor." Gwinnett 84-85 officers are: Pres: KA4NPY, VP: KØJRG, Sec: KA4BNC, Treas: NG4I, Act: KA4HEN, Edit: WA4BXA, Trust: WB4GKI. Albany ARC has accredited VE team. Contact K4PGY or K4XA fer details. Tnx to West GA ARS for adding me to their mailing list. Kennehoochee ARC elected; Chrm: W4OCW, Vice Chrm: KD4BB, Sec: WI4K, Treas.: KA4KRN Asst Sec/Treas: K4JGK, Ga Radio Amateur Packet Enthusiast Society (GRAPES) recently organized - Pres: KF4JJ, VP: WB4GQX, sec/treas: N4CI, Corr Sec: N4XY , RF Items: N4CLA, Digital: KD4NC, User Int: KI4MQ. If u are interested in Packet Radio contact any of the mentioned. The Atlanta 1985 Hamfestival is going to need much more help than in the past. Contact Bill, KF4CQ if u desire to help. Malatchie Farms ARG report 144.71/145.31 machine on the air since Aug 19, 1984. Call sign is KA4KIN. Tnx fer that info. Central Ga ARC rpts new officers are; Pres: WB4UHL, VP: KL7IEK, Sec-Treas: KC4WU, Prog Dir: WZ4M. Which one of u clubs will be the 1st Special Service Club in 1985. Traffic: W4PIM 162, N9ECB 154, W9NXC 110, W4JWO 72, K4NM 69, WB4WQL 38, K4VHC 25, K4EV 19, K4BAI 16, W4BIA 15, KF4FG 15, K4JFY 15, N4DOM 12, N4BIM 8, KF4TV 8, W4HON 6, K4PIK 5, N4UZ 5.

NORTHERN FLORIDA: SM, Phil O'Dwyer, WF4X. A reminder that all ARRL appointments are contingent on continuing your ARRL membership, so keep an eye on the expiration date on your QST. However, you don't have to be a member to send me a station activity report (SAR), so keep them coming as this is the year that we are trying to beat the Southern Florida Section on the number of SAR's as well as the quantity of traffic handled. All net managers are reminded that they should have copies of "The Florida Combined Section Net Agreement", as well as the "Emergency Operations Schedule for Florida Section Nets" dated Oct 1, 1984. Hats off to all of our PIA's and Editors and the good work that's so obvious in the fine newsletters and bulletins that you have been sending to me-many thanks! Our congratulations to John, W4MMW for his achieving a personal goal of working all states on 2 meters-had to drive to all except Hawaii, hi! One of our favorite DXers, Bill, W4WIJ, keeps picking up the rare ones by listening more than he talks, a much to be admired characteristic. Hope to make the Orlando fest as well as the one here in Fort Walton in March and look forward to seeing you at one or the other or both. The holiday season, as well as improved propagation, are generating a nice increase in traffic activity as reflected in the following: Traffic: WD4IIO 886, WF4Y 821, N4PL 715, WF4X 701, WX4H 697, WA4QXT 577, WB4ADL 412, N4HMD 252, KC4VK 236, KB4LB 203, N4EDH 196, WA4EYU 160, WB4GHU 152, K4VND 148, NY4E 125, WD4HBP 121, KF4U 113, KD4KK 109, KF4TM 93, KB9LT 90, NF4O 88, WB9RKJ 80, WD4MLQ 80, WB4TZR 76, WD4IUI 74, W4KIX 74, W4MGO 73, KC4FL 72, WD4JDU 70, N4JAQ 65, W4GUJ 58, WB4YQP 52, N4GMU 52, N4IYU 43, WD4EQB 35, KA4OFG 32, W4DTV 30, KI4CQ 26, N2AMG 22, NS4C 19, N4ADI 18, NQ4P 18, WB4AWG 16, W4FI 14, N4IIP 13, NA4F 12, W8IM 12, N4JHI 10, KF4GY 9, WX4J 9, WA4PUP 9, WA4PUO 8, WA4STZ 7, N4UF 6, WB4FJY 6, N4DY 5.

SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFK — SEC: W4SS, STM: K4ZK, TC: KI4T, BM: WA4EIC, PIO: W4WYR, SGL: KC4N, OO/RFI: W4SS. WA4EIC reports total bulletin activity of 196 bulletins received and transmitted this month. Bulletin stations reporting were WA4EIC 53, WD4KBW 16, W4DL 43, AA4BN 30, WT4F 10, K4IEK 24, and AA4MI 20. Both the Suncoast Convention in Clearwater and the Broward Hamfest were held this month. There was some very severe weather just before the Clearwater hamfest — K4ZK reported a number of ham antennas were blown down in Martin County, but his stayed up. W4SS, SEC, reported that the Division of Emergency Management was very complimentary in their comments regarding the assistance provided by ham radio during the same storm. West Palm Beach had over nine inches of rain as a result of this storm. At the Broward Hamfest W4RH, Division Director presented a plaque to WA4KXY, President of the Motorola Amateur Radio Club, in appreciation for the outstanding work done in providing the two meter equipment used by W5LFL on STS-9. There were about 38 in attendance at the traffic handlers breakfast in Clearwater. The first traffic handlers breakfast was held during the Broward hamfest with 17 in attendance — that was a great start! Many thanks to AA4WJ for his work as ACC — Bill has retired as ACC, but is the newly elected president of the Brandon ARS! Congrats to the South Brevard ARC which has been approved as an affiliated club. W4JM reports that he and W2HGV are getting organized to teach a ham radio class in Lakeland starting in January. This will be followed by an ARRL volunteer exam. N4KB says that the TCC sked will be handled from here until W1NJM goes back to Connecticut. N4KB also reports that high speed code practice will be sent from N4KB on 3636 and 7085 kHz starting at 830 P.M. local time on Sundays and Wednesdays. It's sure good to have N4KB's brother George, W1NJM down for the winter and active on QFN. W4LLA reports 101 phone patches this month. The manual on Public Service Communications provides much information plus the NTS Routing Guide. If you don't have a copy be sure to pick one up at the next hamfest or write ARRL for a copy. 73 de WA4PFK. Traffic: W3CUL 3447, W3VR 885, K4SCL 357, N4KFU 353, WB4WYG 329, WA4PFK 325, W4NFK 311, K4ZK 258, K4EUK 253, KJ3T 230, K4IA 221, WA4UQQ 201, WA4EIC 159, KA4GUS 144, W4DL 124, K4FQS 121, KA4AMC 120, WD4KBW 117, AF3S 112, WB4AID 93, KE4O 83, W4YCL 76, WA4HXU 71, W4PKP 70, NJ4O 68, KF4RL 62, K4JLL 58, KA4NXF 53, N4ET 52, W3TLV 50, KA4FZI 48, AA4BN 45, KA4YHS 44, WD4CHO 44, W4LLA 40, K4JI 39, WD4NXK 37, K5IHH 35, WB4GCK 31, AA4MI 30, N4KB 29, W4SME 28, KD4GR 26, WT4F 22, KF4JA 22, W3IJR 21, VE1SH 21, K8BXT 20, W4SS 19, WD9AEP 18, K4FQU 18, KA9AKY 14, KB4ELQ 13, KA4SIH 13, N4JOA 12, K4IRT 11, N4IXQ 11, KA4RWV 9, W4WYR 9, WA4LKY 8, W4MFD 8, WD4MGC 7, KA4EBO 6, NX4X 6, WK4F 5, KA4GDU 5, W4MPV 5, WV4F 4, WA4YNO 3, WW4W 3, KB4AXD 2, N4KWH 2, K4OCV 2, WB8SNT 2. (Oct.) W4NFK 234, W4SS 101, WA4HXU 50, N4JOA 4.

WEST INDIES: SM, Gregorio Nieves, KP4EW — West Indies Net Slow (WINS) daily 7:00 PM (2300 UTC) on 3.710 MHz. West Indies Net Central (WINC) Daily 6:30 P.M. (2250 UTC). The new sessions of WINC are growing up in

members and conducted now under the direction of its new Net Manager, WP4CFX. Hugo is doing a good job and some of the previous net controls and new ones that have joined him. Congratulations to all of you for a job well done. The PRARC will be celebrating a post-Christmas party or mini-hamfest at "Ranchos de Guayama" south of the Island on January 13 and that according to planning it will be a good one. The club at the same time is recruiting ARRL volunteer examiners and encouraging others to be accredited in order to conduct examinations within two or three months and may be in the future to become a VEC. Under this new plan the Club will soon have a schedule of examinations that will be announced through the Sunday net and the "Onda Terrestre" publication. Those interested tune the Sunday nets and ask some of your friends for possible examination dates. Congratulations to KP4HZ who upgraded to Extra and WP4BDS that upgraded to General on November 5th. Though you will be reading this a little after; greetings to every one of you on this season. Congratulations to Ivan KP4FI for his performance in last Field Day for a second position in the 1A category. KP4DJ reports the following totals for WINS: QND 437. Traffic: KP4DJ 716, WP4CFX 16.

SOUTHWESTERN DIVISION

ARIZONA: SM, Erich J. Holzer, N7EH — STM: W7EP. NMs: K6LL. KA7HEV WB7CAG. The holiday season is indeed upon us now. Many of the clubs in the section are reporting plans for Christmas parties. The Scottsdale ARC reports the following operated a display at the Confederate Air Force, Arizona Chapter, air show: N7FVN KA7OHD WA8OKE WA7JZL W2KKM NC8P K7TR W7KB N7EAL WB7PKR WB0IBZ N7FVQ KE9R KA7AKJ W7QVI KC7MC N7GIU K7CXA N7DOT K7MJD WB7CAM KD7FW WB7ETR. The London Bridge RA reports that the following members provided communications for the World Outboard Motorboat Races: W7MCF KA7BTC W7LVB WA6ZVN KA7KMN N6KOT K6IZR WB6UFQ WB7ALO WB7EXX W5ZYF K1IMW. The Coconino ARC reports that W7YS has earned 200 countries DXCC endorsement, and that KR7Y has completed 5-Band DXCC. W7JU reports that after 64 years as a licensed amateur he received his A-1 certificate. OPRC and Coconino ARC seem to have volunteer test schedules pretty well set up. ATEN: QNI 1066, QTC 340. SWN: QNI 175, QTC 165. PSHR: KB7FE. Traffic: KB7FE 681, W7AMM 420, W7EP 176, KF6TF 163, K6LL 143, K7NMQ 58, KA7HEV 44, W7LVB 40, WA7KQE 36, K7POF 22, K7JKM 21, K7RDH 12, WB3LQQ 9, WA7NXL 3, W7DQS 2. (Oct.) WB3LQQ 12.

ORANGE: SM, Sandra Heyn, WA6WZN. ASM/SEC: W6UBQ. STM: WA6QCA. ACC: KA6NLY. BM: W6DXL. OO/RFI Coord: W6RE. PIO: NS6W. SGL: N6HIO. TC: AA6DD. DEC's (by counties) WB6JBI (Orange); W6LKN (Riverside); WA6IKH (San Bernardino); KA6HII (Inyo). As the only candidate for SM, W6UBQ was declared the new SM with his term starting in April. Congrats Joel Congrats to new ECs: KA6IYS Riverside Dist #5, K6WX Riverside Dist #9, WD8CHR San Bernardino Dist #6, and KB6CYD So Orange County. Tnx to the hard working retiring ECs: KZ6D, WD6AQK, & K6GUK. Congrats to new qualified OO/FCC Aux members N6PE and WA6JEY. New club officers — Anaheim ARA: N6TM pres, KC5IY vp, WB6QDO treas, KB6DAB rec secy, KA6LKA corr secy.; So Ca Contest Club: NE6I pres, N6ADI editor, NI6W Org Co Coord.; Beach Cities Wireless Society: KB6KQE pres, So Ca Contest Club: NE6I pres, N6ADI editor, NI6W Org Co Coord.; Beach Cities Wireless Society: KB6KQE pres, K6WO vp, WB6GGF treas, N6IRZ secy.; Rio Hondo ARC: KA6DJK pres, NJ6K vp, WB6ISR treas, KA6NOO secy.; West Coast ARC: N6ISW pres, KA6NLY vp, KB6EVY treas, N6KRF secy.; Org Co ARC: AF6C pres, N6KJL vp, KA6IMP treas, WA6VKZ secy.; Western ARA: N6ME pres, K6RUB 1st vp, NJ6C 2nd vp, KB6AQY treas, KB6TA secy.; So Ca AR Computer Club: AC6O pres, N6KJL vp, KA6IGG treas, KF6NO secy.; Victor Valley Xmas parade communications was provided by WD6CHR KA6MXD KA6BLD W6OUU WB6FOL W7QMB KA6LLO. The San Bernardino Microwave Society will be changing meeting location; for info contact K6HIJ secy. Coachella Valley ARC has changed their RTTY net to 7PM Sun 146.700 with code practice nightly at 7:30PM while the RATS net continues at 7PM Mon 146.94. Due to work AI6E is looking for a SCN manager replacement. Also there are many liaison/NCS spots open. With great sorrow we must report silent key, an outstanding traffic operator, W6HUJ. EC KB6CYD has started a new So Org Co ARES net on W6CNL/rpt 145.14 (– .60) Tues 7 PM. The ARES Red Cross net (NM K6LJA) that meets each Wed at noon has changed repeaters to N6ME/rpt 145.40 (—.60). PSHR: WB6TIF, KA6BNW, WA6QCA, WB6QBZ, W6NTN, KA6HJK/t. Local/regional NTS nets.

9:45 AM	RN6D	7275 kHz	SSB and CW
3:30 PM	RN6D	7275 kHz	SSB and CW
7:00 PM	SCN/1	3598 kHz	CW (20+ WPM)
7:45 PM	RN6	3655 kHz	CW
8:15 PM	SCN/2	3598 kHz	CW (15 WPM max)
9:00 PM	SCN/V	147.045/147.645	WD6AWP/R FM
9:30 PM	RN6	3655 kHz	

Traffic: WB6TIF 240, KA6HJK 214, WA6QCA 206, N6GOT 196, K6GGS 160, WB6QBZ 156, AD6A 155, KA6BNW 87, W6GPB 49, W6NTN 44, N6FRW 20, K6DD 16, W6RE 16, W6TKV 7, K6ZCE 5, WA6WZO 2.

SAN DIEGO: SM, Arthur R. Smith, W6INI — BM: WA6HJJ. STM: N6GW. SEC: W6INI. PIO: KG6LF. ACC: WA6COE. TC: N6NR. San Diego Amateur Radio Council VEC now has phone — 619-465-3926 (EXAM). Mail address P.O. Box 5023, La Mesa, CA 92041. City of San Diego needs Amateur Radio operators for Emergency Management volunteer program. Write Bill Wolf, Office of Emergency Management, 1222 First Ave. — 504, San Diego, CA 92101 or contact Art Smith, W6INI, 283-1120. Amateur Radio/computer Swap Meet is now being held at San Diego Jack Murphy Stadium on 1st Sat of the month. Novices and Technicians are invited to participate in ARES CW Net on Sunday at 0930 on 3725 kHz. NCS is WA6IIK. Twenty-five Amateurs participated in annual El Cajon Mother Goose Parade supporting Red Cross first aid teams. Palomar ARC has new repeater tower in place on Palomar Mtn. W6NWG operates on 146.730 MHz (-). Operators handling written message traffic regularly should report monthly traffic totals to N6GW by 5th of the month. NCTN met 29 times, handled 176 msgs. ARESN: 4 sessions, 19 ck-ins. Traffic: KU6D 198, KB6AI 106, KT6A 62, N6GW 37, KM6I 4. (Oct.) KT6A 171.

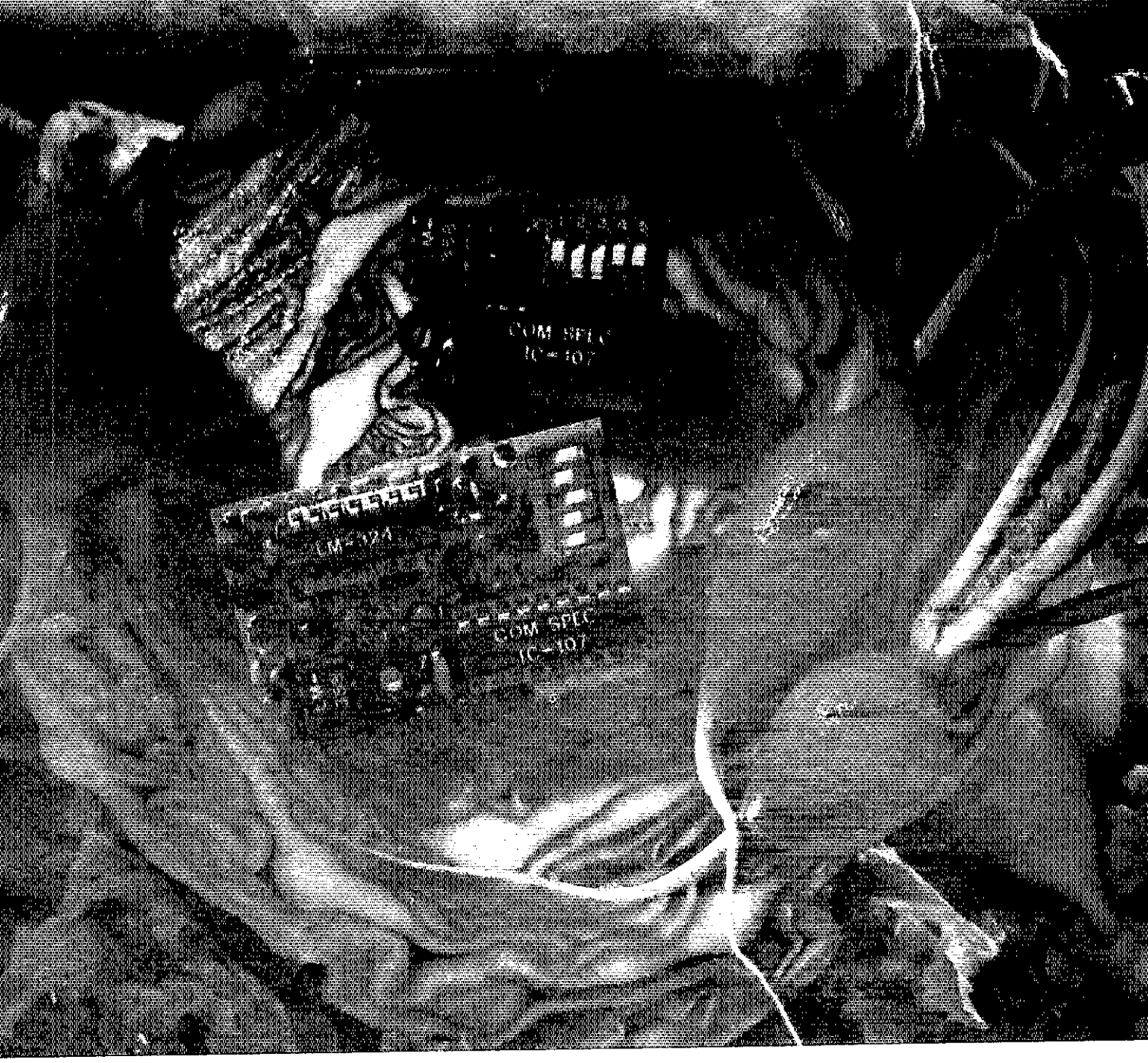
WEST GULF DIVISION

NORTHERN TEXAS: SM, Phil Clements, K5PC — ASM/ACC: NI5V. SEC: W5GPO. STM: AE5I. SGL: W5UXP. BM: W5QXK. OO/RFI: WB5JBP. PIO: N5FDL. We have an opening for Technical Coordinator on the Section Staff. If you are interested in this let me know, and I will forward details. My address is on the bottom of page 8, this issue of *QST* (K5PC). The annual Section SKYWARN meeting;

"STORMCOM '85" will be held Feb. 9th at 8 A.M. at Mountain View College in Dallas. I hope all Section DECs, ECs, or at least a rep. from each of our Section ARES/RACES groups can attend. A much expanded program is promised this year, and is an excellent forum to meet and get to know our public safety officials and news media personnel. Try to bring your city/county officials with you. Talk-in on 147.66/.06 and 146.28/.88. An advanced SKYWARN training school will be held in Garland on Feb. 23rd at the Performing Arts Ctr. at 9 A.M. Talk-in on 147.84/.24. Try to attend a SKYWARN class this spring, as the technology of severe wx is constantly changing, and we all need an annual refresher! It is time to again check out all that portable equipment and emergency gear as tornado season is approaching. PSHR: KA5AZK N5BT WB5OXE K5UPN KB5UL and N5EZM. Traffic: WB5OXE 331, K5UPN 317, N5BT 314, KD5RC 298, WB5CIC 177, KA5AZK 150, KB5UL 149, W9OYL 137, AE5I 79, WB4HML 46, NI5V 41, W5ERT 36, WA5EZT 29, N5GQG 23, K5PC 18, N5EZM 1.

OKLAHOMA: SM, Dave Cox, NB5N — SEC: W5ZTN. STM: KV5X. ACC: K5CAY. BM: W5AS. PIO: NJ5Y. OO/RFI: K5WG. SGL: W5NZS. TC: W5QMJ. A new year is dawning. Let's make it the best ever for the OK Section. OCAPA voted to affiliate with ARRL. Ada ARC will be the first club to apply for SSC status. Many new hams are on the air due to the efforts of many clubs who sponsored fall novice classes. Congrats to WA5NRT for being named "Ham of the Year" at NWAARC. New RFI chairmen: BARC-WB5ZHD; L/FSARC-KD5RQ. All clubs need to appoint RFI chairman to help in resolving local complaints. Forward all names to K5WG. W5RB received plaque from ARRL for many years of dedicated service to amateur radio and ARRL. W5EDZ, Div. Dir., now has personalized VHS presentations for clubs. Contact any AD or NB5N for details. ARRL/VEC exams: Vici-Jan 26; Bartlesville-Jan 26; Ada-Feb 16; Tulsa-Feb 26; Moreland-Apr 14. OLZ CW net needs more operators. Check in any day at 0100Z on 3862.5. Traffic: KV5X 271, W5AS 204, K5CXP 168, KB5EK 161, W5VXU 129, WB5SRX 93, W5RB 75, WA5OUV 75, WB5LSW 55, KC5OU 53, W5UYH 49, W5REC 43, K5GBN 40, N5HIH 39, WD5IFB 38, KA5FUU 38, WA5IMO 35, NB5N 34, WD5JCE 34, WA5CGC 33, NR5L 33, NQ5W 29, WA5WHV 28, WA5ZCO 25, K5CAY 22, W5VOR 21, W5VLW 20, KX5W 18, K5ENA 16, ND5C 5, W5JJ 3.

SOUTHERN TEXAS: SM, Arthur Ross, W5KR — SEC: KA5KRI. STM: K5QEW. ASM: N5TC. Brazos Valley ARC President ND5F reports other club officers for 1985 are KE5SC Vice Pres; KA5DKS. Secretary: WD5HEH. Treasurer; also reports VE teams have requested ARRL to approve exam dates for the 4th Saturday of each month in 1985, with WB5IGG as liaison. Beaumont ARC VEs held first exam session November 10; KA5UJC, KA5UJA, KA5FFC upgraded to Technician; 3 received 13 wpm credit, one received 20 wpm credit. Newly upgraded to Advanced, KA5PEX also reports on the Guadalupe Valley Rptr Assn: W5EWC, W5FFG and WA5YDN working for Motorola temporarily on 900 MHz project in Seguin; WB5BEP drafting local emergency net flood control plan; W5EWC is also Elmer to a high school honor roll sophomore who is also a computer buff; W5UPS, age 78, has completed site work for new antenna tower. CAND Manager W5KLV reports 978 messages handled in 30 sessions: DRN5 represented 100% by southern Texas stations KD5CB K5WOB WB5FQU WB5EPA WB5YDD N5EFG KD5KQ W5KLV and N5DFO. Busiest OBS in Texas W5KLV gave 12 bulletins, 4 DX bulletins, 5 CRRL bulletins, 23 satellite bulletins, and 4 propagation forecasts 117 readings on 7 nets. Texas Southmost ARC, Harlingen, providing communications for another walkathon in early December. Traffic: W5KLV 386, W5CTZ 351, WB5YDD 218, WB5EPA 154, N5GKM 135, KS5V 89, NS5J 75, WB5FQU 74, N5DKM 61, K5OWK 51, KK8L 24, WD5GKH 23, K5QEW 20, W5BGE 18.



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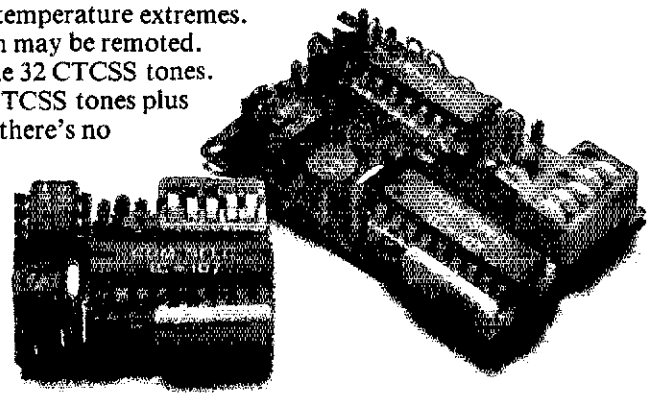

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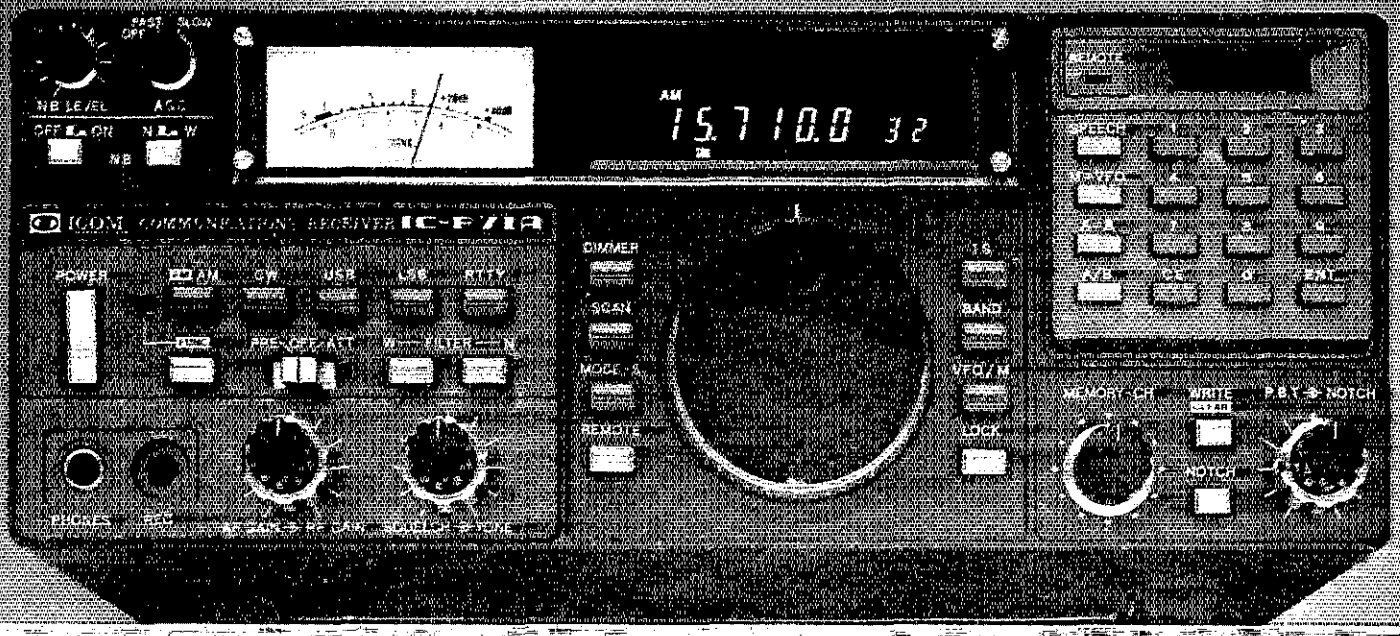
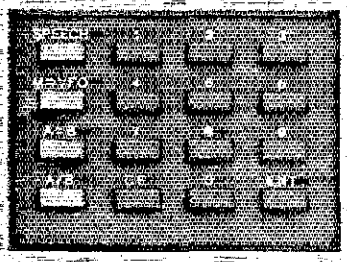


The World-Class World Receiver

ICOM introduces the IC-R71A 100KHz to 30MHz superior-grade general coverage HF receiver with innovative features including keyboard frequency entry and wireless remote control (optional).

This easy-to-use and versatile receiver is ideal for anyone wanting to listen in to worldwide communications. With 32 programmable memory channels, SSB/AM/RTTY/CW/FM (opt.), dual VFO's, scanning, selectable AGC and noise blanker, the IC-R71A's versatility is unmatched by any other commercial grade unit in its price range.



Keyboard Entry. ICOM introduces a unique feature to shortwave receivers...direct keyboard entry for simplified operation. Precise frequencies can be easily selected by pushing the digit keys in sequence of frequency. The frequency will be automatically entered without changing the main tuning control.

Superior Receiver Performance. Passband tuning, wide dynamic range (100dB), a deep IF notch filter, adjustable AGC (Automatic Gain Control) and a noise blanker provide easy-to-adjust clear reception even in the presence of strong interference or high noise levels. A preamplifier allows improved reception of weak signals.

32 Tunable Memories. Thirty-two tunable memories, more than any other general coverage receiver on the market, offer instant recall of your favorite frequencies. Each memory stores frequency, VFO and operating mode, and is backed by an internal lithium memory battery.

Options. FM, RC-11 wireless remote controller, synthesized voice frequency readout, IC-CK70 DC adapter for 12 volt operation, MB-12 mobile mounting bracket, two CW filters, FL32-500Hz and FL63-250Hz, and high-grade 455KHz crystal filter, FL44A.

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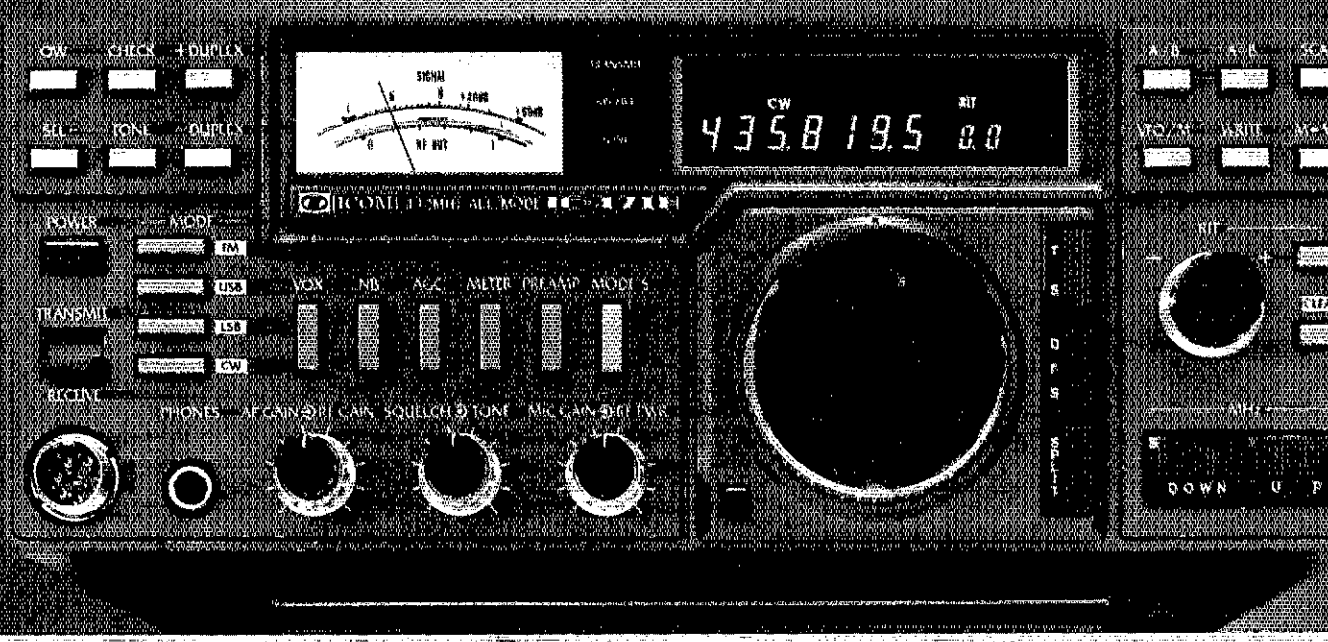
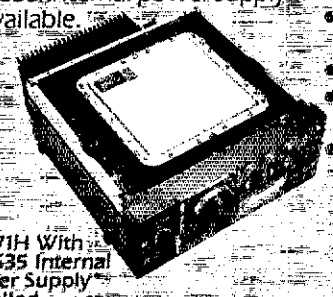
ICOM UHF Transceiver IC-471H



For Maximum UHF Base Station Performance

Whether your interest is simplex, repeater operation, or satellite work, the IC-471H 430–450MHz base station transceiver will give you maximum UHF operation.

75 Watts. The IC-471H provides 10 to 75 watts of adjustable power in all modes. This enables adjusting the drive level to a linear amplifier for higher power uses such as moonbounce. For a portable UHF station, the optional IC-PS35 internal power supply is available.



IC-471H With IC-PS35 Internal Power Supply Installed.

Compare these exceptional Standard Features:

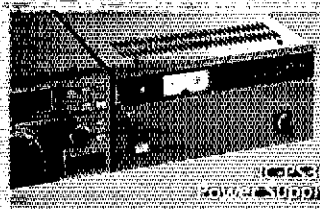
- 430 – 450MHz
- Variable tuning steps, FM 5KHz and 1 KHz, SSB 10Hz, 50Hz and 1KHz
- 32 full-function Memories with lithium battery backup
- 75 Watts, fully adjustable on all modes
- 32 built-in Subaudible Tones
- High visibility display
- Scanning systems... Memories, Modes or Programmable Band
- RIT/XIT with separate readout
- S-Meter and Center Meter
- IC-HM12 Microphone with Up/Down Scan
- 11¼"W x 4⅜"H x 12⅝"D

Optional Features. AG-35 switchable mast-mounted GaAsFET preamp, UT-15S CTCSS encoder/decoder (encoder is standard), IC-EX310 voice synthesizer, IC-SM8 two-cable desk mic and IC-SM6 desk mic. PLUS a variety of power supplies: the IC-PS35 internal power supply, the IC-PS30 system power supply or the IC-PS15 external power supply.

AG-35 Mast Mounted GaAsFET Preamplifier

The IC-471A. The 25 watt IC-471A is also available and has the same outstanding features as the IC-471H, plus an optional IC-PS25 internal power supply for portable operation.

To complete your VHF/UHF base station, the IC-471's 2-meter companions, the 100 watt IC-271H and the 25 watt IC-271A are also available.



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ICOM 220MHz Mobile

IC-37A

Join the Excitement on 220MHz!

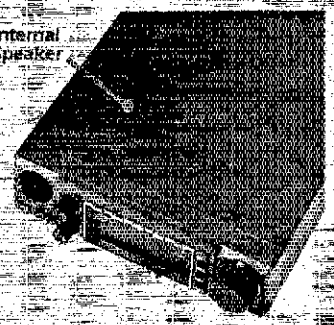
Join the excitement on 220MHz with ICOM's IC-37A full-featured 25 watt ultra compact mobile.

Size. The IC-37A measures only 5½"W x 1½"H x 9"D allowing it to be mounted in a variety of tight spaces. Yet the IC-37A has large operating knobs which enable easy operation of the unit in the mobile environment.

9 Memories. The IC-37A has 9 memories which will store the receive frequency, transmit offset, offset direction and PL tone. All memories are backed up with a lithium battery.

Speech Synthesizer. To verbally announce the receive frequency, an optional UT-16 voice synthesizer is available.

32 PL Frequencies. The IC-37A comes complete with all 32 standard PL frequencies installed. Each PL frequency is selected by turning the main tuning knob, and may be stored into any memory position. Also included is an internal PL level adjustment.



Internal Speaker. The 25 watt IC-37A super compact mobile contains an internal speaker which makes it easy to mount.

Scanning. The IC-37A has four scanning systems...memory scan, band scan, program scan and priority scan. Priority may be a memory or a VFO channel, and the scanning speed is switchable.

More Features. Other IC-37A standard features include a slide-in mobile mount, IC-HM23 DTMF mic with up/down frequency and memory scan, and internally adjustable transmit power. An optional IC-PS45 slim-line external power supply and IC-SP10 speaker are also available.

See the IC-37A 220MHz mobile at your local ICOM dealer and join the excitement on 220MHz.

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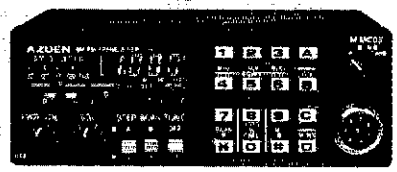
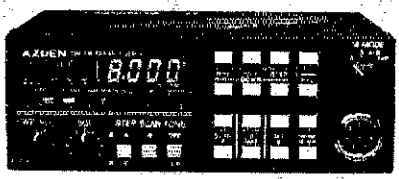


PCS-4500 6-m FM Transceiver



PCS-4800 10-m FM Transceiver

- **WIDE FREQUENCY COVERAGE:** PCS-4000 covers 142.000-149.995 MHz in selectable steps of 5 or 10 kHz. PCS-4200 covers 220.000-224.995 MHz in selectable steps of 5 or 20 kHz. PCS-4300 covers 440.000-449.995 MHz in selectable steps of 5 or 25 kHz. PCS-4500 covers 50.000-53.995 MHz in selectable steps of 5 or 10 kHz. PCS-4800 covers 28.000-29.990 MHz in selectable steps of 10 or 20 kHz.
- **CAP/MARS BUILT IN:** PCS-4000 includes coverage of CAP and MARS frequencies.
- **TINY SIZE:** Only 2"H × 5.5"W × 6.8"D. COMPARE!
- **MICROCOMPUTER CONTROL:** At the forefront of technology!
- **UP TO 8 NONSTANDARD SPLITS:** Ultimate versatility. COMPARE!
- **16-CHANNEL MEMORY IN TWO 8-CHANNEL BANKS:** Retains frequency and standard simplex or plus/minus offsets. Standard offsets are 600 kHz for PCS-4000, 1.6 MHz for PCS-4200, 5 MHz for PCS-4300, 1 MHz for PCS-4500, and 100 KHz for PCS-4800.
- **DUAL MEMORY SCAN:** Scan memory banks either separately or together. COMPARE!
- **TWO RANGES OF PROGRAMMABLE BAND SCANNING:** Limits are quickly reset. Scan the two segments either separately or together. COMPARE!
- **FREE AND VACANT SCAN MODES:** Free scanning stops 5 seconds on a busy channel; autoresume can be overridden if desired. Vacant scanning stops on unoccupied frequencies.
- **DISCRIMINATOR SCAN CENTERING (AZDEN EXCLUSIVE PATENT):** Always stops on frequency, no matter what the offset.
- **ILLUMINATED KEYBOARD WITH ACQUISITION TONE:** Unparalleled ease of operation.
- **BRIGHT GREEN LED FREQUENCY DISPLAY:** Easily visible, even in direct sunlight.
- **DIGITAL S/RF METER:** Shows incoming signal strength and relative power output.
- **BUSY-CHANNEL AND TRANSMIT INDICATORS:** Bright LEDs show when a channel is busy and when you are transmitting.
- **FULL 16-KEY TOUCHTONE® PAD:** Keyboard functions as autopatch when transmitting (except in PCS-4800).
- **PL TONE:** Optional PL tone unit allows access to private-line repeaters. Deviation and tone frequency are fully adjustable.
- **TRUE FM:** Not phase modulation. Unsurpassed intelligibility and audio fidelity.
- **HIGH/LOW POWER OUTPUT:** 25 or 5 watts selectable in PCS-4000; 10 or 1 watt selectable in PCS-4200, PCS-4300, PCS-4500, and PCS-4800. Transmitter power is fully adjustable.
- **SUPERIOR RECEIVER:** Sensitivity is 0.2 uV or better for 20-dB quieting. Circuits are designed and manufactured to rigorous specifications for exceptional performance, second to none. COMPARE!
- **REMOTE-CONTROL MICROPHONE:** Memory A-1 call, up/down manual scan, and memory address functions may be performed without touching the front panel! COMPARE!
- **OTHER FEATURES:** Dynamic microphone, rugged built-in speaker, mobile mounting bracket, remote speaker jack, and all cords, plugs, fuses, and hardware are included.
- **ACCESSORIES:** CS-7R 7-amp ac power supply, CS-4.5R 4.5-amp ac power supply, CS-AS remote speaker, and Communications Specialists SS-32 PL tone module.
- **ONE YEAR LIMITED WARRANTY!**

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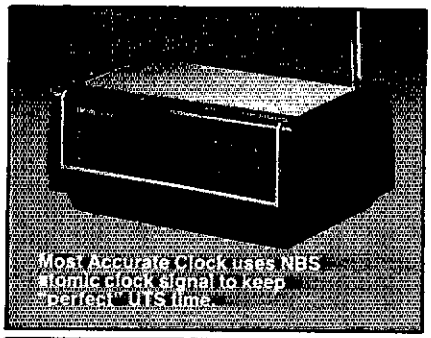

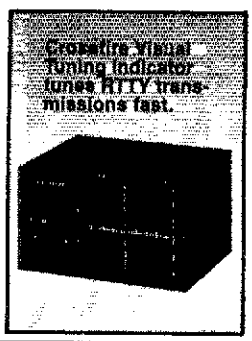

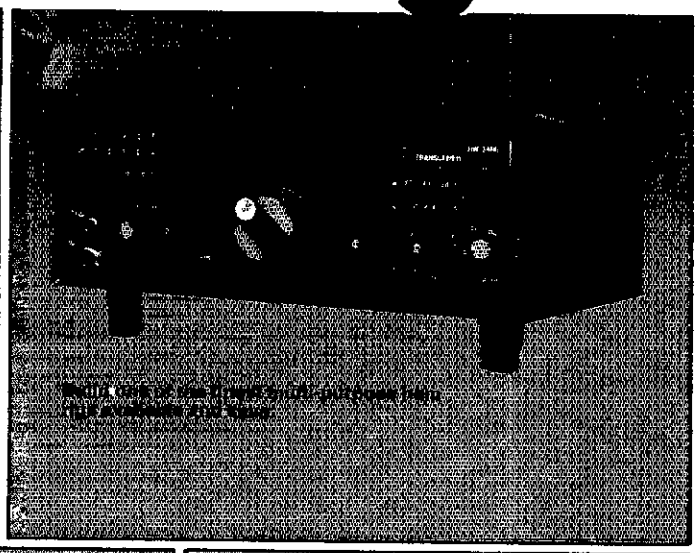

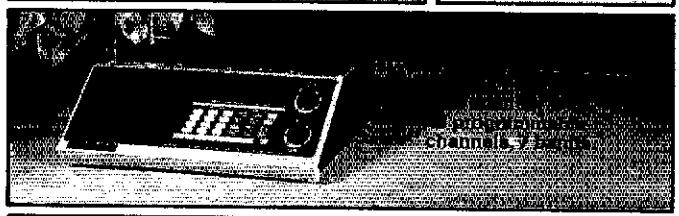

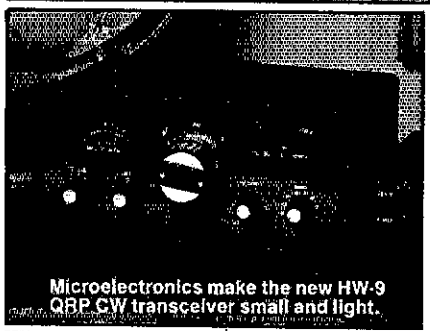

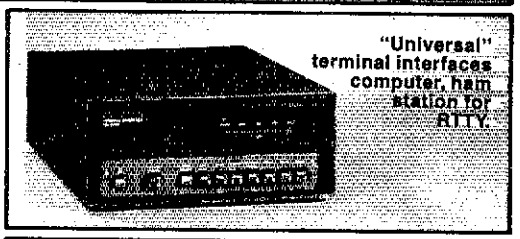

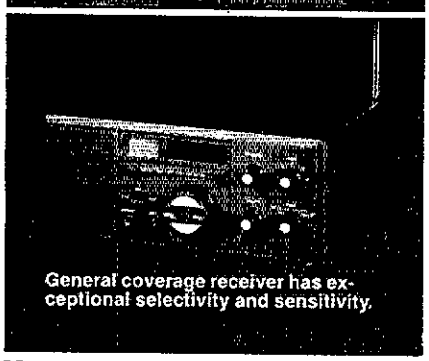

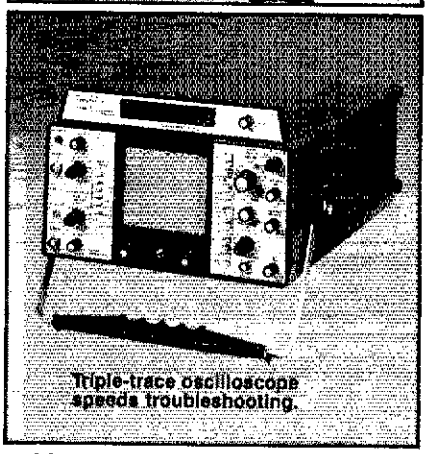

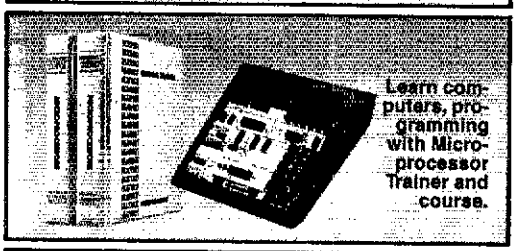

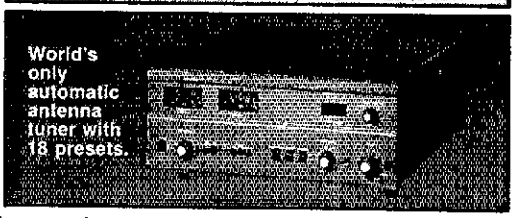

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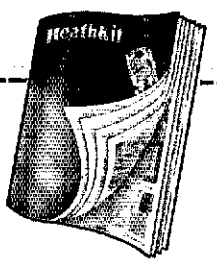

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FIND OUT what else you can hear on your general coverage transceiver or receiver. Complete information on major North American radio listening clubs. Send 25¢ and S.A.S.E. Association of North American Radio Clubs, 1500 Bunbury Drive, Whittier, CA 90601.

THANK YOU for attending Warren, Ohio Hamfest. See you August 18, 1985.

FLEMINGTON, N.J. Hamfest by Cherryville Repeater Association will be held Saturday, April 20 at Hunterdon Central Field House. For table reservations or other information write Bill Inkrote, K2NJ RD10 Box 294, Quakertown-Croton Rd., Flemington, N.J. 08822 or call 201-788-4080.

1985 BLOSSOM BLAST, Sunday, Oct. 6, 1985. Write "Blast" Box 175, St. Joseph, MI 49085.

ATTENTION MORSE Telegraphers - Join Morse Telegraph Club. Meet old friends, swap experiences. Morse Telegraph Club is national. There is a Chapter near you. When and where do we meet? Contact John Holman, W3INV, 1 Beth Circle, Malvern, PA 19355. 215-644-2471.

BUYERS ADMISSION is $3 per person. No Exceptions. Doors open to buyers at 0900 local. Food and refreshments will be available. For additional information contact Al Flapan, WA2FBQ, 516-796-2965 or Hank Wener, WB2ALW, @ 516-484-4322.

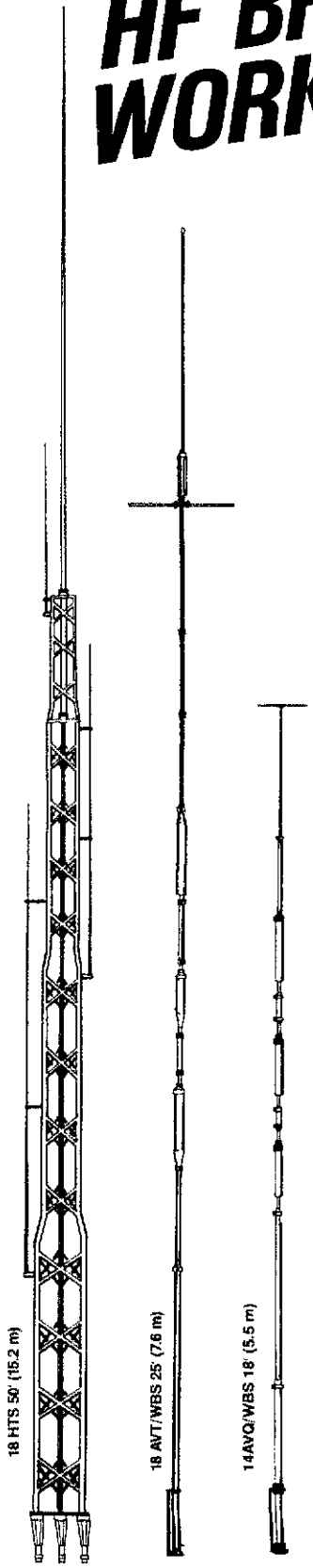
THE FLORIDA Amateur Digital Communications Association (FADCA) publishes a monthly newsletter, the FADCA Beacon, about Packet Radio. Write for a sample copy, FADCA, 812 Childers Loop, Brandon, FL 33511.

ATLAS 350XL Owners Group. Free newsletter. Send QSL with rig s/n and SASE. Know people who repair them? Information to share? Questions? Rod Sharp, N5NM, Box 2169, Santa Fe, NM 87501.

hy-gain®

HF BROADBAND VERTICALS WORK THE WORLD

Hy-Gain broadband vertical antennas load the new auto-tune solid state rigs, require minimal space and provide low angle radiation without the expense or the problems of support structures.



18AVT/WBS (80-10 meters) The most successful vertical antenna of all and for good reasons. Broadband performance covers the 40, 20, 15 and 10 meter bands in their entirety. Automatic 5 band switching is accomplished by mechanically superior, highly efficient factory tuned Hy-Q traps with large coils for consistent performance at 2:1 or lower VSWR on 40-10 meter band edges; bandwidth on 80 meters is approximately 40 kHz with VSWR below 2:1. A factory tuned matching network for 50 ohms impedance is dc grounded for lightning protection and reduced precipitation static. The mechanical integrity of this antenna is so stable that performance does not change with the weather. The 18AVT withstands winds to 80 mph (128 km/h) without guying. All stainless steel hardware is included.

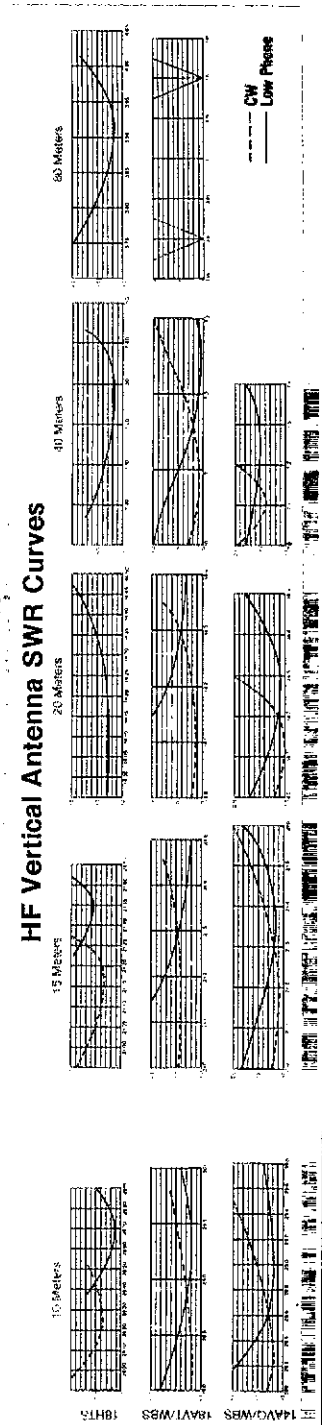
14AVQ/WBS (40-10 meters) Offers very similar construction and the same excellent broadband performance as 18AVT over the entire 40, 20, 15 and 10 meter bands; automatic band switching with mechanically superior large-coil Hy-Q traps and very low angle radiation pattern. The smaller, low visibility size also makes the 14AVQ very suitable for roof mounting. The optional 14RMQ roof mounting kit includes base plate, mast and radial/guy wires. All antenna hardware is stainless steel.

18 HTS (80-10 meters, 160 meters with optional loading coil) The superb reliability of the 18 HTS is manifest in installations now over 20 years old. And, with the improvements we made over the years, the 18HTS is now better than ever. Automatic band selection is achieved through a unique stub decoupling system which effectively isolates various sections of the antenna so that an electrical ¼ wavelength (or odd multiple ¼ wavelength) exists on all bands. For example, outstanding broadband performance on 20, 15 and 10 meters is achieved with an extended ⅝ wave collinear. On 80 meters bandwidth is approximately 250 kHz at 2:1 VSWR. With the optional base loading coil exceptional performance is also provided at 160 meters. The galvanized tower requires no guying and withstands winds to 100 mph (160 km/h). A special hinged base allows complete assembly at ground level and permits easy raising and lowering. Includes stainless steel hardware.

Other Hy-Gain vertical multiband antennas are available though not shown here. The 12AVQS (20, 15, 10 meter) is similar to 18AVT above but with VSWR of 1.5:1 or less on all bands. The 18VS (80-10 meter) comes with a base loading coil and may be installed on a short mast driven into the ground. All include stainless steel hardware.

PHASE FOR GAIN

Any two identical Hy-Gain verticals can be phased for excellent gain and directivity. A great system for beam performance on 40, 80 and 160 meters or for 10, 15 and 20 meters where space is limited. Send for our free technical report "Phased Verticals".



Hy-Gain Verticals that work the world at better Amateur Dealers.

TELEX® hy-gain®

TELEX COMMUNICATIONS, INC.

9600 Aldrich Ave. So., Minneapolis, MN 55420 U.S.A.
Europe: Le Bonaparte–Office 711, Centre Affaires Paris-Nord, 93153 Le Blanc-Mesnil, France.

CINCINNATI ARRL '85. Fifth Annual Ohio State Convention & Flea Market, February 22-24, Great Oaks Vocational Campus, Sharonville (Cincinnati), Ohio. Hospitality suite Friday & Saturday evenings. Forums, vendors, flea market, meetings, food, women's activities, banquet, Wouff Hong begin Saturday. All indoors. Speakers include: Bob Winn, W5KNE, editor "QRZ DX," Jeff Ward, K8KA, ARRL HQ packet radio expert, Division Director George Wilson, III, W4OYI, Don Tyrell, W8AD, Alpha Delta Communications. Admission: $5. Flea market: add $5/non-reserved space, $10/reserved space (reservations: 513-851-1056). General information and schedule: Cincinnati ARRL '85, P.O.B. 11300, Cincinnati, OH 45211 (telephone 513-921-3844 or 513-471-4775). Vendors call 513-563-7373.

QSL Cards/Rubber Stamps/Engraving

TRAVEL-PAK QSL Kit — Converts Post Cards, Photos to QSLs. Stamp brings circular. Samco, Box 203, Wynantskill, NY 12198.

DON'T buy QSL cards until you see my free samples — or draw your own design. I specialize in custom cards. Send black and white sketch: wil give quote. Little Print Shop, Box 9848, Austin, TX 78766.

DISTINCTIVE QSL's — Largest selection, lowest prices, top quality photo and completely customized cards. Make your QSL's truly unique at the same cost as a standard card, and get a better return rate! Free samples, catalogue. Stamps appreciated. Stu, K2RPZ, Box 412, Rocky Point, NY 11778 516-744-6260.

FREE samples — stamp appreciated. Conner, 522 Notre Dame Ave., Chattanooga, TN 37412.

QSLs & rubber stamps. Top quality. QSL samples and stamp information 50c. Ebbert Graphics D-3, Box 70, Westerville, OH 43081.

EMBROIDERED emblems, custom designed club pins, medallions, trophies, ribbons. Highest quality, fastest delivery, lowest prices anywhere. Free info: NDI, Box 6665 M, Marietta, GA 30065.

CADILLAC of QSLs — Completely different! Samples $1. (refundable) Mac's Shack, P.O. Box No. 43175, Seven Points, TX 75143.

QSLs — 1) Famous KØAAB custom collection. 2) Railroad employees and railfan's specials. 3) Front report styles. State your sample wants. 37¢ self addressed business size envelope required. Marv WØMGI, 2095 Prosperity Ave., St. Paul, MN 55109.

QSLs Samples 30c (stamps OK) Fred Leyden, W1NZJ, 454 Proctor Ave., Revere, MA 02151.

INTRODUCING: Beautiful natural full color photo QSL cards, made from your color negative or slide. From $285. for 3,000 cards minimum. Free samples, stamps appreciated. K2RPZ, Box 412, Dept. NC, Rocky Point, NY 11778 516-744-6260.

QSLS, Quality and fast service for 24 years. Include call for decal. Samples 50¢. Ray, K7HLR, Box 331, Clearfield, UT 84015.

QSL's by W4TG: Prices from $16 per 1000. Send SASE to PO Box F, Gray, GA 31032.

BE SURPRISED - get a variety of cards - 100 for $8 or 200 for $13. Samples $1 refundable. All three colors, fast service, satisfaction guaranteed. Constantine, 1219 Ellington, Myrtle Beach, SC 29577.

FINEST custom QSLs, large cut catalog and samples $1 refundable on first order. Ritz Print Shop P.O. Box 45018, Westlake, OH 44145.

QSL DISCOUNTS: $19.95 per 1000. White cards, black ink, one or two sides. 2-3 week delivery. S.A.S.E. for free samples. Jim's Printing Service, 2155 Young, Memphis, TN 38104.

PICTURE QSL cards of your shack, etc. from your photograph or black ink art work. 500 $22; 1000 $32.50. Send stamp for illustrated literature. Generous sample pack $1; half pound of samples $2. Custom printed cards, send specifications for estimate. Raum's, 4154 Fifth Street, Philadelphia, PA 19140. Phone: 1-215-228-5460.

FULL COLOR QSL from your slides, $84.75 single thousand. 250b/w $25. Subject to discount. Samples. Picturecards, Box 5471, Amarillo, TX 79117 806-383-8347.

QSLs by K6MFE — "Customized" $24.50 per 1000. 7124 "C" Mohawk Trail, Yucca Valley, CA 92284.

QSL's — since 1956, free samples, Rusprint, Box 7575, Kansas City, MO 64116.

QUALITY QSLs, Catalog 40¢ N & S Print, 2523 W. Orangewood Ave., Phoenix, AZ 85021.

QSL samples — 25¢ Samcards — 48 Monte Carlo Dr., Pittsburgh, PA 15239.

KB3XS QSL's - Twelve card colors, ten inks, Stamps bring samples, 322 Wilmot Street, Duquesne, PA 15110.

RUBBER Stamps custom made. QSL card brings Free Literature! J. Glass, WB6ZTI, 14316 Cerecita Drive, East Whittier, CA 90604.

NEW KID on block - for QSL free samples write Kings Grove Press, Box 9, Ellersile, MD 21529. Also custom printing and SWL's. Stamp appreciated.

ANTIQUE-VINTAGE-CLASSIC

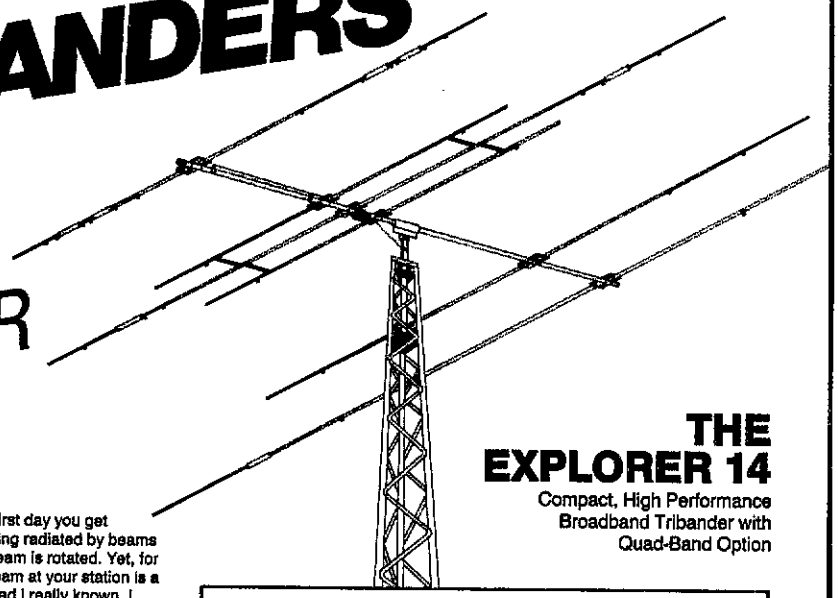
WANTED: Radios, parts, books, magazines before 1928. W6ME 4176 Chasin Street, Oceanside, CA 92054.

WANTED: Early Hallicrafter "Skyriders" and "Super Skyriders" with "Silver" panels, "Skyrider Commercial," early transmitters — HT-1, HT-2, HT-8, etc., other Hallicrafter gear, parts, accessories, manuals. Chuck Dachis, WD5EOG, The Hallicrafter Collector, 4500 Russell, Austin, TX 78745.

hy-gain®

BROADBANDERS

MAXIMIZE THE POTENTIAL OF YOUR HAM GEAR



There is nothing like a beam!

You hear about the importance of the antenna system from the first day you get involved in amateur radio. You hear the big signals on the air being radiated by beams and you hear those same signals virtually disappear when the beam is rotated. Yet, for whatever the reason, getting on the air for the first time with a beam at your station is a down-right exhilarating experience. The universal reaction is "Had I really known, I would have installed a beam years ago".

The gain of a beam multiplies the effective radiated power of your transmitter just like an amplifier. More importantly, it amplifies the signal from the station being beamed. Off the sides and back of the antenna, the effective radiated power of those kilowatts on/near your frequency are reduced to manageable QRP levels.

A well-designed beam is by far the best performance buy you can make and it doesn't use any electricity. Further, if you buy a good one, it will last longer than some of the electronics gear in your shack. In terms of cost per hour of enjoyment, a beam antenna is among the least expensive major station components.

As sunspot cycle 21 winds down over the next few years the priority for a good beam shifts from "great to have" to "essential!" To maximize your station capability on the high bands choose one of these super broadband arrays.

THE EXPLORER 14

The same compact size as the well-known TH3Mk3 it replaces. The driven element uses an open sleeve dipole which is a concept that we call PARA-SLEEVE (Patent Pending). The para-sleeve design achieves the broadband performance objective. The forward gain and front to back ratio is very impressive, especially when compared with other antenna designs in the same size class. 43 lbs. (19.5 kg) of superb performance on a 14 ft. (4.3 m) boom. Turning radius 17 ft. (5.3 m) and 7.5 sq. ft. (.69 m²) of surface area. The EX 14 is the ideal choice where space is limited. Great for roof mount or on smaller towers. Optional QK7-10 kit adds your choice of either 30 or 40 meters to the driven element.

FIVE ELEMENT THUNDERBIRD TH5Mk2

Broadbanding is achieved with our unique dual driven element system. Five elements on the 19 foot boom (5.8 m), with four active elements on each of the three bands. 72 lbs. (32 kg) of rugged antenna with 7.4 sq. ft. (.68 m²) of surface area. Turning radius is a manageable 18.4 ft. (5.6 m).

SEVEN ELEMENT THUNDERBIRD TH7DX

This is a broadband successor to the legendary TH6DXX. Five active elements on 10 meters and four elements on both 15-20 meters. The TH7DX represents the ultimate in high-performance arrays whether you're comparing other large tribander's or stacked monobander's. 76 lbs. (35 kg) with a surface area of 9.4 sq. ft. (.87 m), a 24 ft. (7.3 m) boom and a turning radius of 20 ft. (6.1 m). If you own a TH6DXX, a conversion kit is available which includes the second driven element, the completely new matching system, a full set of stainless steel hardware, and of course, step by step instructions. After conversion, your TH6DXX is a TH7DX, exactly.

FEATURES COMMON TO EX 14, TH5Mk2, and TH7DX:

- Separate Hy-Q traps for each frequency. Factory assembled and individually resonated to insure uniform performance.
- Handles maximum legal power with a respectable margin of safety.
- Unique broadband beta match assures efficient energy transfer and places the entire antenna structure at dc ground.
- BN 86 balun supplied as standard.
- Top quality stainless steel hardware supplied at no added cost.
- Super strong, taper swaged 6063-T832 thick-wall aluminum tubing used throughout.
- Unique Hy-Gain die cast aluminum boom to mast bracket. Accepts mast diameters up to 2½" (63 mm).
- Twist and slip proof die formed heavy gauge aluminum element to boom brackets.
- All tubing deburred and cleaned for ease of assembly.
- Only one set of dimensions for complete coverage of all three bands below 2:1 SWR.
- Designed to survive winds of 100 mph (160 km/hr).

THE EXPLORER 14

Compact, High Performance Broadband Tribander with Quad-Band Option

The value of a Directional Antenna was one of my early "discoveries". Over the years, I have built or bought numerous Quads and Yagis. I have never been so impressed as I am with my TH7DX. I enjoy QRP but now have a problem convincing folks that I am only running 5 watts! The TH7DX is a superb antenna, both from a performance and a structural point of view.

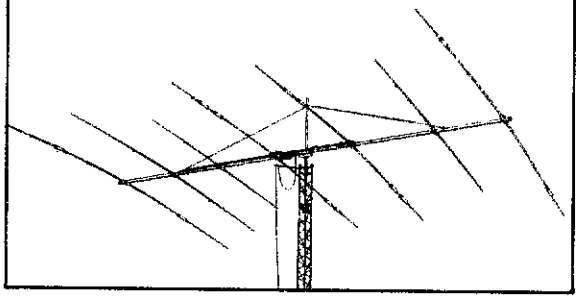
Congratulations!

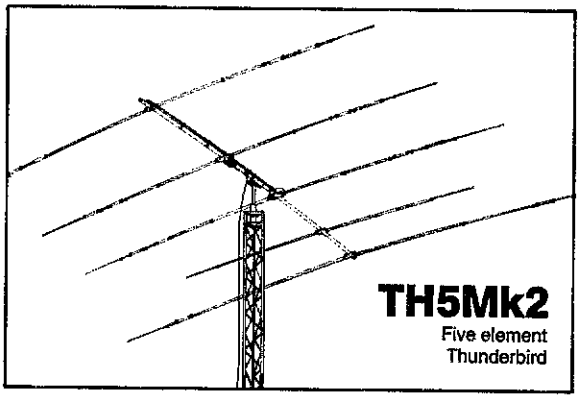
Jack Falker
W8KR

(W8KR has worked all countries but two!)

TH7DX

Seven element Thunderbird





TH5Mk2

Five element Thunderbird

TELEX hy-gain

TELEX COMMUNICATIONS, INC.

9600 Aldrich Ave. So., Minneapolis, MN 55420 U.S.A.
Europe: Le Bonaparte—Office 711, Centre Affaires Paris-Nord, 93153 Le Blanc-Mesnil, France.

KENWOOD

...pacesetter in amateur radio

Digital Code Squelch...

TR-2600A

Kenwood's TR-2600A introduces DCS (Digital Code Squelch) circuitry, a signaling concept developed by Kenwood. DCS allows each station to have its own "private call" code or to respond to a "group call" or "common call" code. There are 100,000 different 5-digit ASCII code combinations possible. You can program in call signs up to 6 digits in the ASCII code. When operating in the DCS mode, this information can then be automatically transmitted each time the transmit key is depressed. This revolutionary feature is only the beginning! The TR-2600A also sports a high impact plastic case, that is extra rugged and scuff-resistant. The molded-in color adds to the attractive appearance. The large L.C.D. display is easy to read in direct sunlight or in the dark with a convenient lamp switch. It displays transmit/receive frequencies, memory channels, and five arrow indicators for "F.LOCK" frequency lock, "REV" repeater reverse, "PROG.S" programmed scan, "MS" memory scan, "ALERT.S" alert scan. A star indicates "MEMORY LOCK-OUT" is activated, and repeater offset indicated by "+, –, S and M." The TR-2600A has 10 memories, nine for simplex or transmit with frequency offset ±600 kHz and one (memory 0) for non-standard split frequencies. Memory scan and programmable band scan have the added convenience of "Time operated Resume" that stops on busy channel and holds for approximately 5 seconds, then resumes scanning, or "Carrier Operated Resume" that stops on busy channel and resumes when signal ceases. Memory scan, scans only those memories in which data is stored, and memory lock-out allows you to skip selected memory channels without loss of data previously stored! Manual Scanning UP/DOWN in 5-kHz steps and programmable automatic band scan are also useful features. The TR-2600A has a built-in "S" meter on the top panel which also indicates battery level when in transmit mode. Extended frequency coverage, 142.000-148.995 MHz allows transmit capability in 5-kHz steps for simplex or repeater operation on most MARS and CAP frequencies. Receive frequency coverage includes 140.000-159.995 MHz.

These features only tell part of the story. The TR-2600A also has keyboard frequency selection, built-in 16-key autopatch encoder, "TX-STOP" switch, HI (2.5)/LOW (300 mw) power switch, REV switch, "SLIDE-LOC" battery pack, high efficiency speaker, BNC antenna terminal, and all of this in an extremely compact and lightweight package!

Kenwood's TR-2600A, with D.C.S., leads the way in high technology handheld transceivers!

Optional accessories:

- TU-35B built-in programmable sub-tone encoder
- ST-2 Base Stand
- MS-1 Mobile Stand
- PB-26 Ni-Cd Battery
- DC-26 DC-DC Converter
- HMC-1 Headset with VOX
- SMC-30 Speaker Microphone
- LH-3 Deluxe Leather Case
- SC-9 Soft Case
- BT-3 AA Manganese/Alkaline Battery Case
- EB-3 External C Manganese/Alkaline Battery Case
- RA-3, 5 Telescoping Antenna
- CD-10 Call Sign Display

More information on the TR-2600A is available from authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, CA 90220.

Specifications and prices are subject to change without notice or obligation.

KENWOOD

pacesetter in amateur radio

TS-430S "Digital DX-terity!"

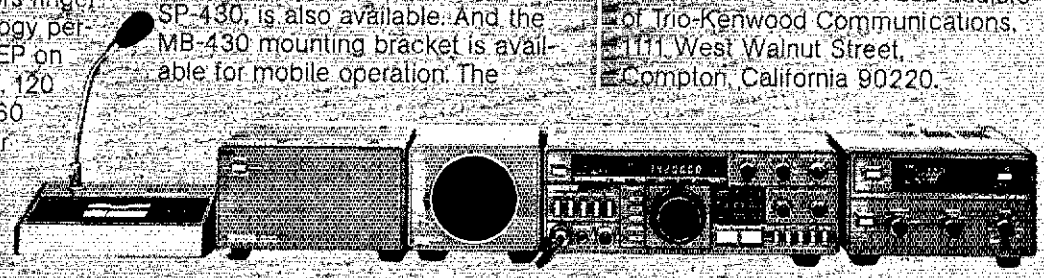
TS-430S

Digital DX-terity... that outstanding attribute built into every KENWOOD TS-430S that lets you QSY from band to band, frequency to frequency, and from mode to mode with the speed and ease that will give you a dominant position in DX operations.

KENWOOD'S TS-430S, a revolutionary, ultra-compact, HF transceiver has already won the hearts of radio Amateurs the world over. It covers 160-10 meters, including the new WARC bands (easily modified for HF MARS). Its high dynamic range receiver tunes from 150 kHz-30 MHz. It utilizes an innovative UP conversion PLL circuit for superior frequency stability and accuracy. Two digital VFO's allow fast split-frequency operations. A choice of USB, LSB, CW, or AM, with FM optional, are at the operators fingertips. All Solid-state technology permits inputs of 250 watts PEP on SSB, 200 watts DC on CW, 120 watts on FM (optional), or 60 watts on AM. Final amplifier protection circuits and a cooling fan are built-in.

Eight memories store frequency, mode, and band data, with Lithium battery memory back-up. Memory scan and programmable automatic band scan help speed up operations. An IF shift circuit, a tuneable notch filter, and a Narrow-Wide switch for IF filter selection help eliminate QRM. It has a built-in speech processor. A fluorescent tube digital display makes tuning easy and fast. An all-mode squelch circuit, a noise blanker, and an RF attenuator control help clean up the signal. And there's a VOX circuit, plus semi-break-in, with side-tone. All-in-all, it just could be that the expression "Digital DX-terity" is a bit of an understatement.

TS-430S Optional Accessories: In typical KENWOOD fashion, there are plenty of optional accessories for this great HF transceiver. There is a special power supply, the PS-430. An external speaker, the SP-430, is also available. And the MB-430 mounting bracket is available for mobile operation. The AT-250 automatic antenna tuner was designed primarily with the TS-430S in mind, and for those who prefer to "roll their own," the AT-130 antenna tuner is available. The FM-430 FM unit is available for FM operations. The YK-88C (500 Hz) or YK-88CN (270 Hz) CW filters, the YK-88SN SSB filter, and the YK-88A AM filter may be easily installed for serious DX-ing. An MC-60A deluxe desk microphone, MC-80 and MC-85 communications microphones, an MC-42S mobile hand mic., and an MC-55 8-pin mobile microphone, are available, depending on your requirements. TL-922A linear amplifier (not for CW QSK), SM-220 station monitor, PC-1A phone patch, SW-2000 SWR/power meter 160~6 meter, SW100A SWR/power/volt meter 160-2m, HS-4, HS-5, HS-6, HS-7 headphones, are also available. More information on the TS-430S is available from authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, California 90220.



*Specifications and prices are subject to change without notice or obligation

- SOFTWARE
- FEATURES
- VALUES

SANTEC®

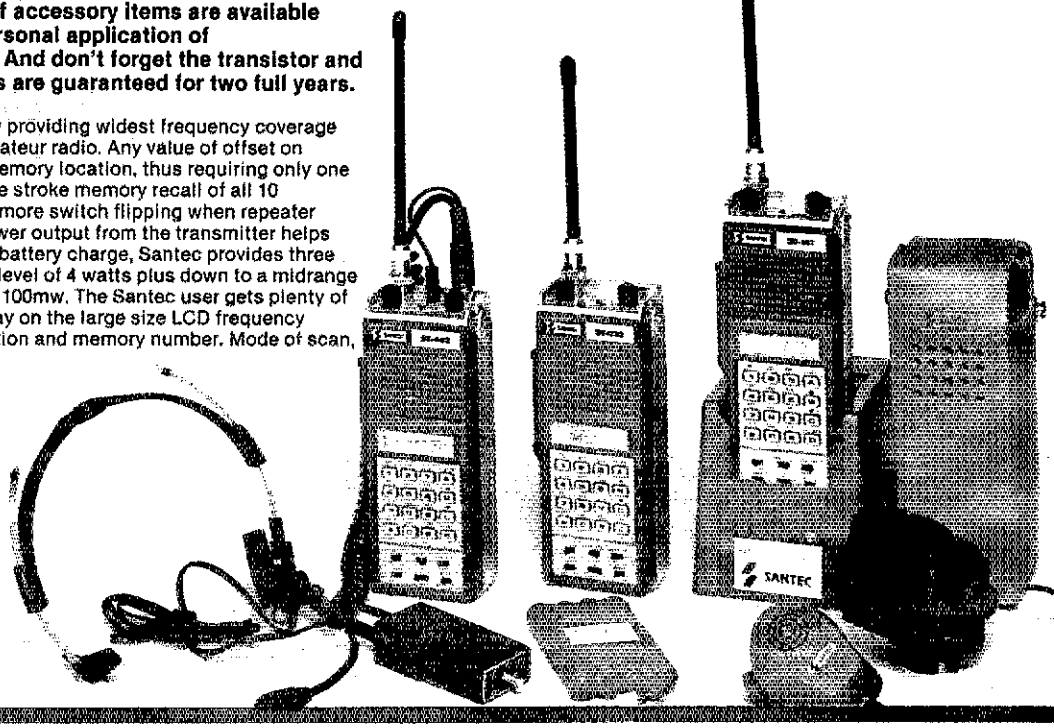
SIMPLY SMARTER HANDHELDS

144 MHz • 220 MHz • 440 MHz

Smart enough to be user friendly means the newest Santec radios are more useful in your hands. Without sacrificing features and functions you really want, you can have an easier to use, yet smarter handheld from the broad line of models for the most popular VHF and UHF bands 144, 220, and 440 MHz. Plenty of accessory items are available for the Santec radios to make your personal application of Santecnology (TM) the smoothest yet. And don't forget the transistor and semiconductors in all Santec products are guaranteed for two full years.

Santec's smarter handhelds help the user by providing widest frequency coverage for MARS and CAP operations as well as amateur radio. Any value of offset on 10 KHz steps can be set and stored in any memory location, thus requiring only one memory per transceive frequency pair. Single stroke memory recall of all 10 memories and the required offset means no more switch flipping when repeater frequencies are changed. Because lower power output from the transmitter helps the user to get longer service times on each battery charge, Santec provides three switchable power levels from the full power level of 4 watts plus down to a midrange of around one watt and a battery conserving 100mw. The Santec user gets plenty of helpful information from the complete display on the large size LCD frequency display using six digits plus the offset direction and memory number. Mode of scan, PLL lock and the receiver and transmitter indicator are all usable at the same time without any extra effort. All the neat features you expect plus a good, solid performing transceiver section with excellent sensitivity and high quality audio make Santec your best choice for a handheld transceiver.

For specifications and a full catalog of Encomm, Inc. products send us a QSL. Specifications subject to change without notice or obligation. Information in this ad does not constitute warranty.



WELZ CORP.

SUPERIOR ACCESSORIES

These attractive new compact HF/VHF/UHF meters from WELZ provide multi-mode operation in your automobile environment. The SP-430 provides POWER and VSWR measurement for the 144, 220 and 430 MHz bands and in addition the auto voltage display indicates if things are going well in that area of your installation also. The 5 Watt and 60 Watt scales provide plenty of room for today's VHF/UHF transceiver's output power (and a couple of tricks can expand the power range even further). Remote-mount sensor and backlighted meter make this the first choice for VHF/UHF mobiles.

The SP-230 meter has the same functions for HF through the two meter band as well as the voltage function. The 150/15 Watt power range is well suited for today's mobile radio setup and the compact meter head still contains an easy-to-read backlighted meter with on-the-air indicator light. The remote-mount sensor has plenty of cable to be convenient for mounting, including the dc cable for the meter light and on-air indicator power. (The dc is not necessary for power measurement, only for the lights.) When you want to know WATTS WHAT talk to WELZ for answers.

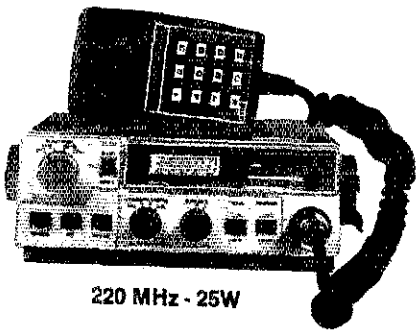
SP-430
VHF/UHF

SP-230
HF/VHF

2000 Avenue G, Suite 800, Plano, Texas 75074
Phone (214) 423-0024 TLX 79-4783 ENCOMM DAL

Quality Value Performance

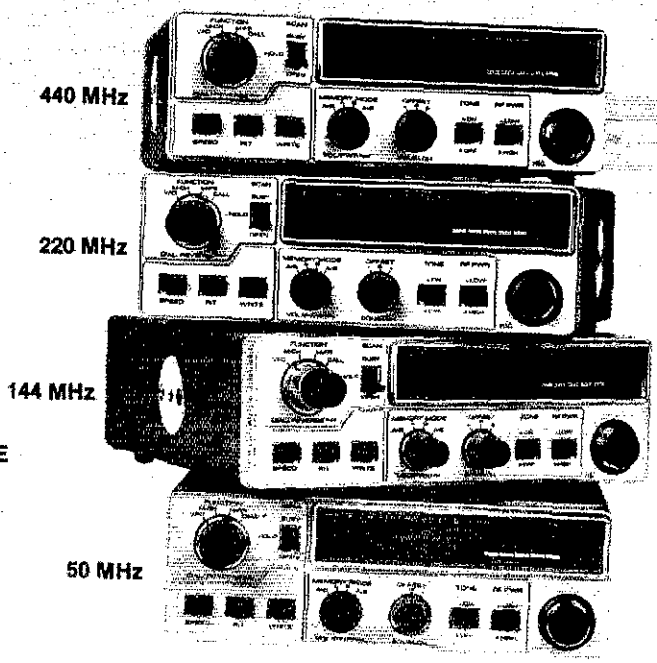
KDK presents THREE NEW MODELS to join the FM-2033. Now ONLY KDK has One model for each of the amateur bands from 50 MHz to 440 MHz. The FM-6033 for 50 MHz is an FM radio for the 6-meter FM enthusiast. The FM-4033 is the 220 MHz radio just about everybody has been waiting for, and the FM-7033 is the 440 MHz UHF band model. All of these fine radios are models of simplicity of operation. One-hand single-knob tuning and memory recall provide the most convenient method of operating FM mobile. All models have automatic recall of the repeater offset from memory, subaudible tone encoders standard, small size for easy mounting (but big enough to be comfortable to use). The KDK FM-2033 (2M) and FM-4033 (220 MHz) are both a full 25 watts output. The FM-6033 (6M) and FM-7033 (440 MHz) are 10 + watts output. KDK radios are the most value-packed line of FM mobiles around. See your local KDK dealer and compare price and performance. You will be very glad you bought a KDK.



220 MHz - 25W

NOW ALL KDK MODELS HAVE THE ENCOMM TWO-YEAR EXTENDED SERVICE PERIOD IN ADDITION TO THE 90-DAY LIMITED WARRANTY.

MAXPAC STACK



THL CORP.

AMPLIFIERS • PREAMPS • COUPLERS

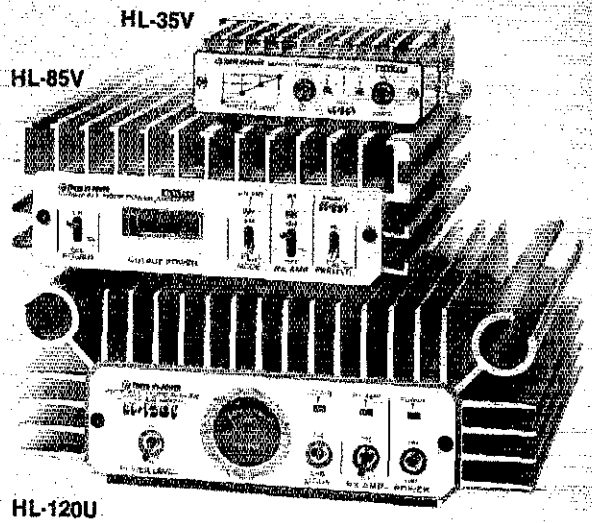
These three new faces are the new configurations for THL amplifiers in the VHF and the UHF power ranges. These three new amps utilize the best from their predecessors and the best from the current state of semiconductor technology.

The UHF HL-120U now has even more rugged output devices and can deliver upwards of 100 Watts of UHF power for your specific application.

The medium powered HL-85V two-meter amplifier incorporates the sleek look of the HL-110V and in fact includes many of the ideas from the HL-82V and the HL-110V. Produces 85-90 Watts from 10-14 Watts input.

The HL-35V is a departure from the usual two-meter 25 Watt FM amplifier in that it not only includes an output level indicator but a GaAs-FET pre-amplifier and the new-design heatsink.

These new amplifiers are available now at your nearest THL dealer. When you want to talk louder, talk to THL.



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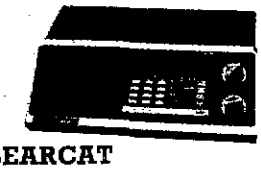

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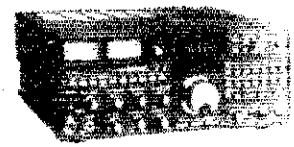

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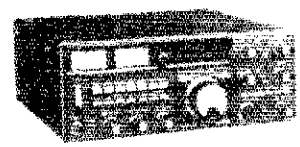

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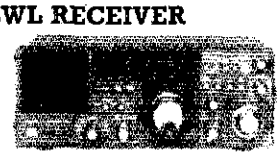

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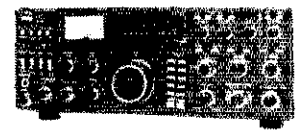

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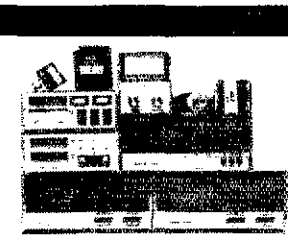

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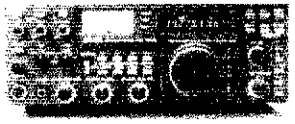

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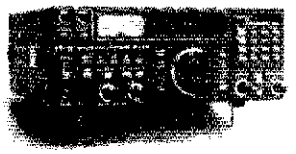

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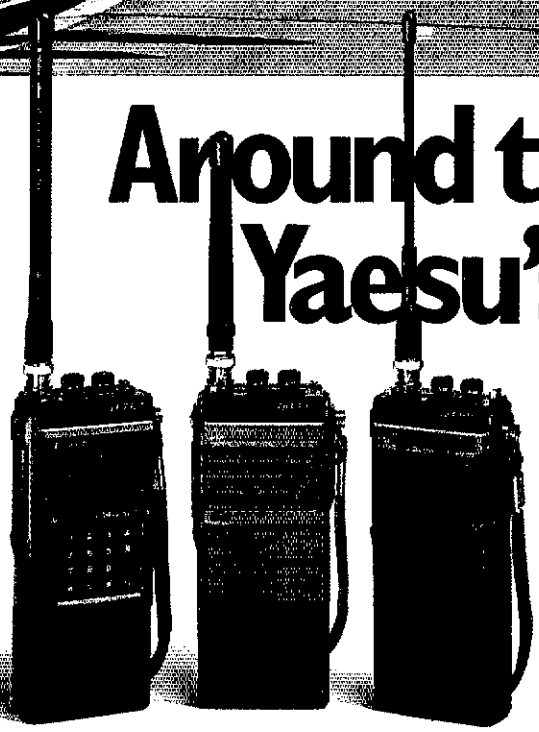

Whether it's for working your favorite repeater or working an exotic land, Yaesu's got the choice in VHF and UHF radios that you need.

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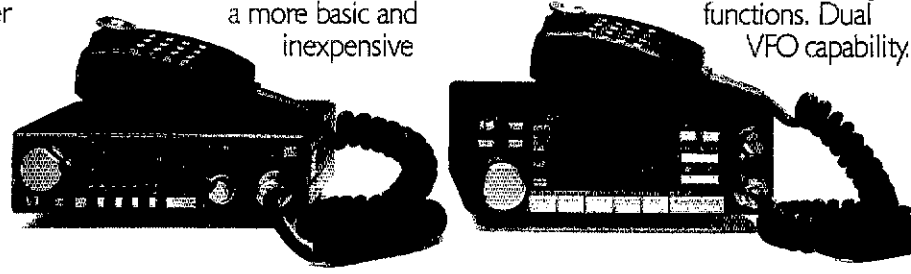
Either way, both rigs are simple to operate. You get ten memory channels. Flexible band-scanning functions. Dual VFO capability.



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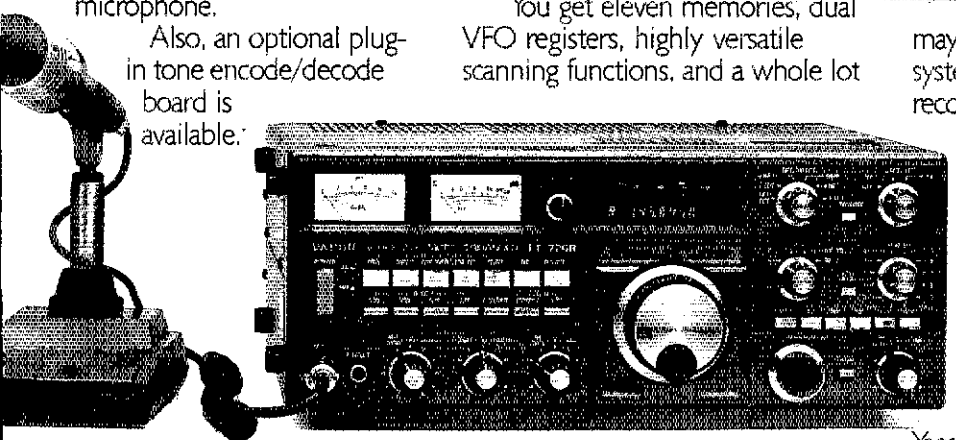

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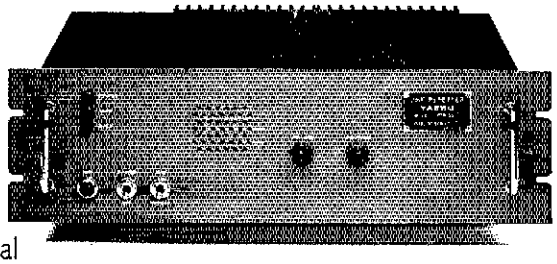

What's more, you can rest assured that our repeater system is proven and reliable. In fact, it's been used extensively in both amateur and commercial applications.

Yaesu gets you there. So when you're ready to get out on VHF/UHF, go with Yaesu. You'll discover a new world of innovation.

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Hams communicate with each other using voice, morse code, computers and teletype. The movement of floats during the Rose Parade on New Year's Day is coordinated by hams using amateur television. Hams have even built their own communications satellites to provide reliable communications around the earth.

Your passport to all of this fun and adventure is the Novice Amateur Radio License, and the best study material for passing your FCC Novice exam is contained in *Tune in the World with Ham Radio.*

Over 200,000 persons have used *Tune in the World with Ham Radio* as their steppingstone into Amateur Radio. The package contains the best study material available for passing your Novice FCC exam. The booklet tells all about the FCC rules and regulations and Amateur Radio operating procedures. An easy-to-read section of the booklet provides you with the basic electronic knowledge you need for the exam. The cassette makes learning the code as painless as possible. We have added a separate supplement which provides the FCC question pool for the Novice license and brings the package up-to-date.

The Tune in the World with Ham Radio package consists of 134 pages of easy-to-understand text and an additional 26 pages of equipment and publication advertising. The cassette prepares the prospective Novice for the 5-words-per-minute code exam by teaching the code character by character — a proven method. Code practice at 5 words per minute follows. A supplement provides questions and answers from the FCC question pool. The entire package is available for $8.50 (in U.S. funds) and is available at your favorite dealer or from **The American Radio Relay League, 225 Main Street, Newington, CT 06111.**

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Automatic Sender/Receiver: Due to the most up to date computer technology, just a console and keyboard can accomplish complete automatic send/receive of Morse Code (CW), Baudot Code (RTTY), ASCII Code (RTTY) and new ARQ/FEC (AMTOR).
Code: Morse (CW includes Kana), Baudot (RTTY), ASCII (RTTY), JIS (RTTY), ARQ/FEC (AMTOR).
Characters: Alphabet, Figures, Symbols, Special Characters, Kana.
Built-in Monitor: 5" high resolution, delayed persistence green monitor – provides sharp clear image with no jiggle or jitter even under fluorescent lighting. Also has a provision for composite video signal output.
Time Clock: Displays Month, Date, Hour and Minute on the screen.
Time/Transmission/Receiving Feature: The built-in timer enables completely automatic TX/RX without operator's attendance.
Selcal (Selective Calling) System: With this feature, the unit only receives messages following a preset code. Built-in Demodulator for High Performance: Newly designed high speed RTTY demodulator has receiving capability of as fast as 300 Baud. Three-step shifts select either 170Hz, 425Hz or 850Hz shift with manual fine tune control of space channel for odd shifts. HIGH (Mark Frequency 2125Hz)/LOW (Mark Frequency 1275Hz) tone pair select. Mark only or Space only copy capability for selective fading. ARQ/FEC features incorporated.
Crystal Controlled AFSK Modulator: A transceiver without FSK function can transmit in RTTY mode by utilizing the high stability crystal-controlled modulator controlled by the computer.
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Convenient ASCII Key Arrangement: The keyboard layout is ASCII arrangement with function keys. Automatic insertion of LTR/FIG code makes operation a breeze.
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Large Capacity Display Memory: Covers up to 1,280 characters. Screen Format contains 40 characters x 16 lines x 2 pages.
Screen Display Type-Ahead Buffer Memory: A 160-character buffer memory is displayed on the lower part of the screen. The characters move to the left erasing one by one as soon as they are transmitted. Messages can be written during the receiving state for transmission with battery back-up memory or SEND function.
Function Display System: Each function (mode, channel number, speed, etc.) is displayed on the screen.
Printer Interface: Centronics Para Compatible interface enables easy connection of a low-cost dot printer for hard copy.
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Pre-load Function: The buffer memory can store the messages written from the keyboard instead of sending them immediately. The stored messages can be sent with a keyboard command.
"RUB-OUT" Function: You can correct mistakes while writing messages in the buffer memory. Misspellings can also be erased while the information is still in the buffer memory.
Automatic CR/LF: While transmitting, CR/LF automatically sent every 64, 72 or 80 characters.
WORD MODE operation: Characters can be transmitted by word groupings, not every character, from the buffer memory with keyboard instruction.
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WORD-WRAP-AROUND operation: In receive mode, WORD-WRAP-AROUND prevents the last word of the line from splitting in two and makes the screen easily read.
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MARK-AND-BREAK (SPACE-AND-BREAK) System: Either mark or space tone can be used to copy RTTY.
Variable CW weights: For CW transmission, weights (ratio of dot to dash) can be changed within the limits of 1:3-1:7.
Audio Monitor Circuit: A built-in audio monitor circuit with an automatic transmit/receive switch enables checking of the transmitting and receiving state. In receive mode, it is possible to check the output of the mark filter, the space filter and AGC amplifier prior to the filters.
CW Practice Function: The unit reads data from the hand key and displays the characters on the screen. CW keying output circuit works according to the key operation.
CW Random Generator: Output of CW random signal can be used as CW reading practice. **Bargraph LED Meter for Tuning:** Tuning of CW and RTTY is very easy with the bargraph LED meter. In addition, provision has been made for attachment of an oscilloscope to aid tuning.
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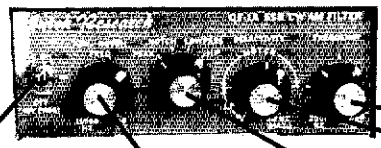

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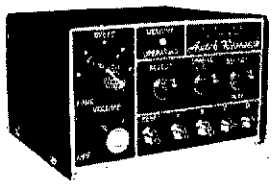

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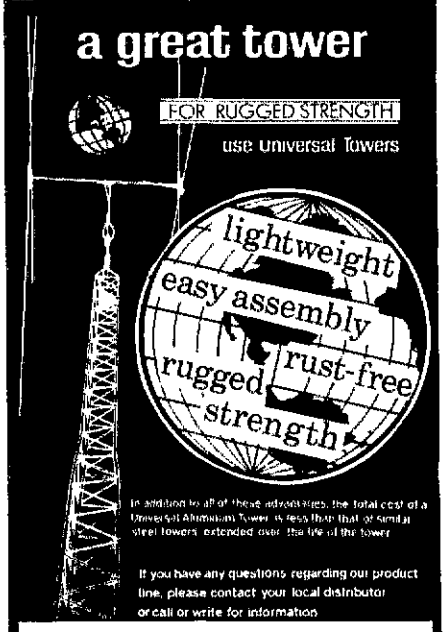

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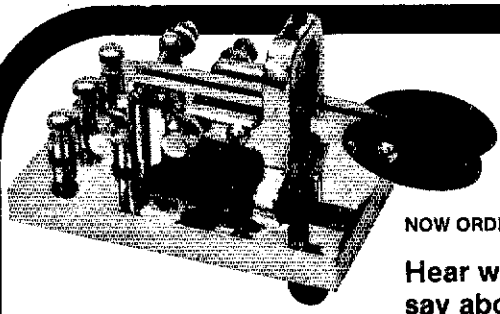

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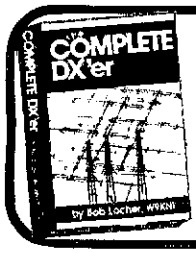

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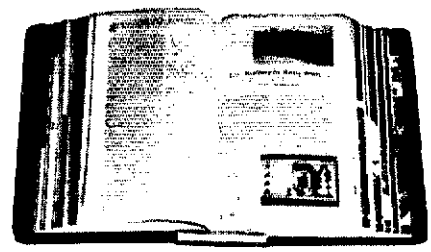

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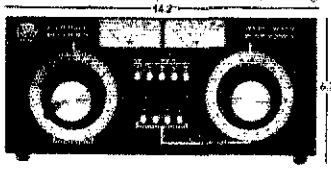

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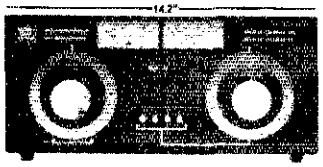
Includes all the features of the MB-V less antenna switch, balun and backlighted meters.



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Same as MB-IV-01 Model, but includes trifilar wound, double core toroid balun for balanced lines

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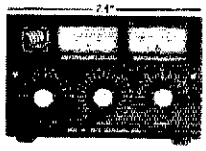

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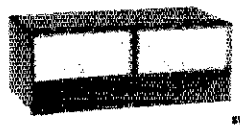

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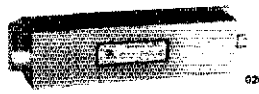

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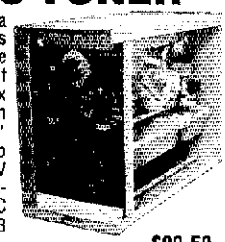

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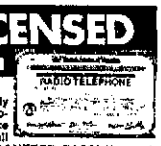

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General

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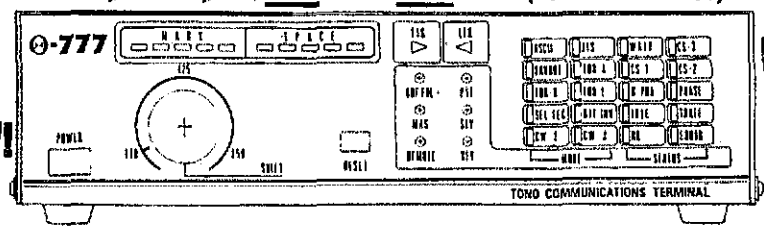

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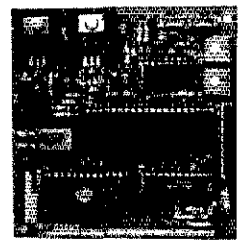

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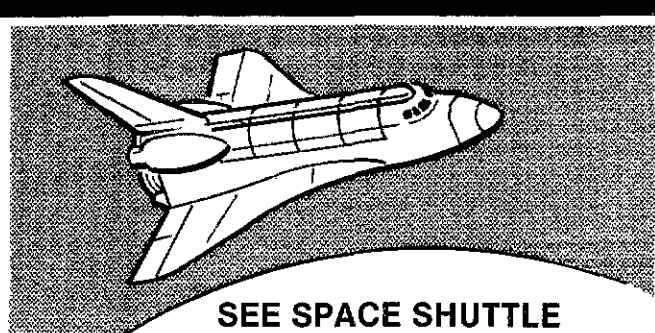

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WANTED: TS-930S with ant. tuner. MC-60A: W2UGM, 66 Columbus Ave., Closter, NJ 07624. 201-767-0123.

FOR SALE: New Drake L-7 2kW linear, 160-15 meters, less tubes and power supply, $800. K4PFK, Roger Smith, 4920 Lites Road, Raleigh, NC 27606, 919-851-4280.

PERFECT RETIREMENT Rig: 1978 31' Coachman Travel Trailer. Completely customized. Too many features to list. Includes Kenwood '820S with external speaker and VFO; '700S Kenwood with external speaker and VFO; SB220 amplifier, full set of meters, auto-patch; everything completely built-in, 4BTV antenna. Also includes low hour 4kW Onan generator. Bob Watson, WB5TKM, P.O. Box 5684, Austin, TX 78763, 512-264-1730.

FOR SALE: Complete station. Kenwood TS-520S SSB transceiver w/cw filter, Drake MN-4 antenna matchbox, Shure Model 444 microphone. Package deal: $600. Phone George: 614-587-2748 (home) or 614-587-7290 (office).

BE OUR VALENTINE - Send the crew at 22 on Manhattan's Lower East Side your old or new equipment and they will Luv Ya forever. WB2JKJ via Callbook.

SYSTRON-DONNER 7015 500 MHz counter $150. HP 330B Distortion Analyzer $90. Boonton 91CA RF Voltmeter $45. Motorola S-1329A VHF/UHF FM Signal Generator $225. Eldorado 1650 500 MHz counter $125. Heath IG-82 Sine/Square Audio Oscillator $30. 40 watt low band MOTRAC with blanker, accessories, on 52.525 MHz $90. K9MM, 312-255-5666.

YAESU FT-DX560 transceiver, CW filter, original owner $295. Collins 75A-2 with matching speaker $85. Hallicrafters HA-1 TO-Keyer and Vibroplex key $55. Autek QF-1A SSB-CW filter $40. Heath HG-10B VFO $40. Heath DX-100 transmitter $70. You ship. John, W6MQK, 1049 N. Holliston Ave., Pasadena, CA 91104, 1-818-798-9345.

ICOM 22A, 2M, 14 xtal pairs, $100. Clegg FM76, 220 MHz, $75. Ron Schwartz, N7CE, 12465 SW Foothill, Portland, OR 97225.

ICOM IC-730 with FL-30 passband tuning & mic. Mint. $350. KT9F, 812-473-0424.

TEN-TEC Argonaut 509, 208 CW filter, 206 Xtal Calibrator. Almega 3.5 amp power supply. $300 plus shipping. Sy Balsen, WA2CHE, Malden Bridge, NY 12115.

SELL: GENERAL Radio Impedance Bridge $75, WA3WHR, 4109 Queen Mary Dr., Olney, MD 20832.

MPIDSDD 8" Disk Drives (2) for sale. New in original shipping carton with complete schematics and specifications. $130 each, I ship. Call Dan, K4RN, 606-873-9959, Box 312, Versailles, KY 40383.

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TRIO-KENWOOD 520-D with CW filter, in mint condition. $375 with manuals. Can ship. KB4PE, Harold Friedman, 2265 Via Venice, Punta Gorda, FL 33950. 813-637-1293.

22 FOOT PARABOLIC dish, fiberglass construction, comes apart in 6 petals & center hub. Sell - best offer or trade for ham gear. Serious inquiries only. Will crate for shipping. Dan, K4RN, Box 312, Versailles, KY 40383.

WANTED: DG-1 for Kenwood TS-820. Chuck Hewett, W4WSD, 805-922-7163 (work). P.O. Box 1256, Santa Maria, CA 93456.

WANTED: XTALS for Motorola METRUM II (21 MHz IF). WB2FOH, Bowman, 373 Corisande #3, Fenton, MO 63026.

SWAN 500CX xmtr, 117XC pwr supply, 14C converter, mobile antenna complete, two mikes, meters and cables, all excellent condition. XMTR recently retubed and checked. $500. 213-387-2393 Los Angeles, W6HOO.

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BEAM HEADINGS! The Best! DX (including longpath) and USA headings customized for your QTH. Shows mileage to target area. $6 postpaid. T. Fleming, 1634 Baywinds Lane, Sarasota, FL 33581.

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SELL: IC-745, FL-44A, PS-35, SM6, HM-12. All new in October, $889. Diawa CNW-419 Antenna Tuner $100. Jim, AC4H, 617-233-9280.

SELL DRAKE T4XB, AC4 ps $175; Drake SPR4 all xtals, NB, calibrator, transceives with T4XB $175; Heath SB-200 with 10 mtrs $200; Heath HW-17 modified for FM $50. All for $500 with manuals. K5XE 1200 Canyon Place, Alamogordo, NM 88310.

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SELL ICOM 740 built-in PS - excellent $600. Ten-Tec 229 ant. tuner - $125. David Schwartz, 1183 Southeast St., Amherst, MA 01002.

WANTED: 6-METER kW. Swan Mark VI, Raytrack, or similar homebrew. W3EP/4, 404-548-9827, 517 Rutherford, Athens, GA 30606.

MFJ Noise Bridge, new, $40. Ten-Tec 216 mic, $5. Intersil Universal Counter Evaluation Kit, unused, $40. KD8IH, 6238 Pheasant Hill, Dayton, OH 45424, 513-233-0187.

STEAL: MINT ICOM-720A, $550, M.O. or Certified Check, you pay postage. Bob Dodt, Jr., MWCS-18, 1st MAW, FPO San Francisco, CA 96603.

KENWOOD TS-520S with speaker, $380. AT-520 antenna tuner, $50. MK-1 four memory keyer with paddle, $50. Shure desk mike, $20. Complete package, $450. N5HDZ, 512-664-1227.

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SB303 w/CW, SB401, like new, $300. TA-33 with TA4OKR, $125. Manuals. You ship. Emil, KA5PGA, 501-666-8451.

TEN-TEC ARGOSY with Model 220 SSB filter, CW filter, noise blanker, calibrator and Astron RS-10A power supply with Ten-Tec circuit breaker installed. Like new, $455. WB7VOO, 602-298-4820.

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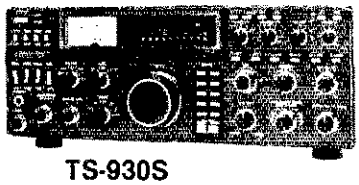

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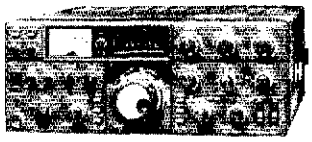

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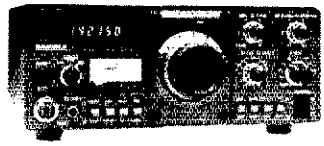

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- IF Shift
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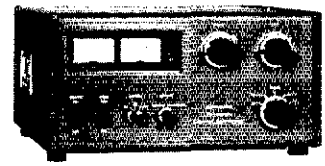

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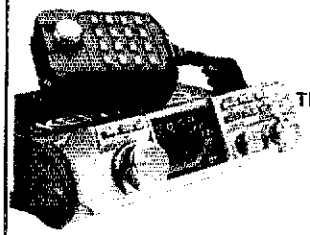

TM-211A/TM-411A 2m/70cm FM Transceiver

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- Priority Watch
- Ultra Compact
- Dual VFO—5 Memories
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- Tone Encoder/Mic
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TM-211A List $369.95 TM-411A List $449.95
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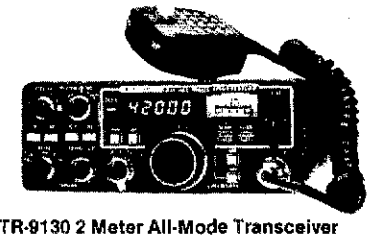

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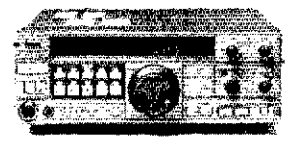

- Dual VFO
- 40 Memories
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- Built-In 120 VAC Power Supply
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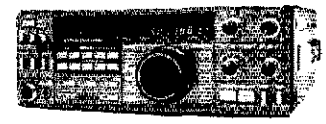

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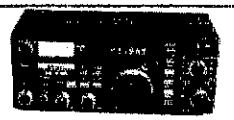

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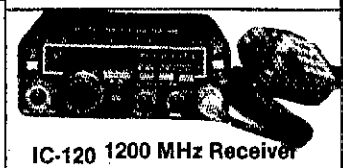

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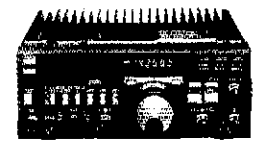

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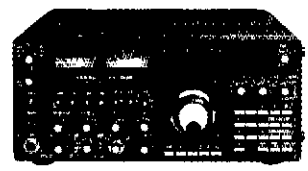

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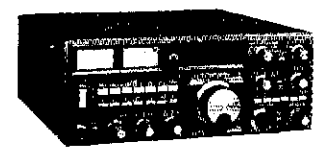

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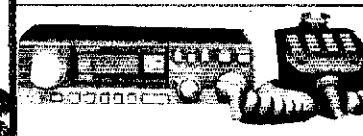

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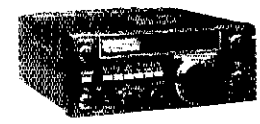

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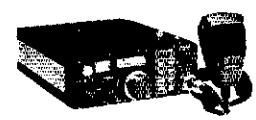

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B108	2M	Yes	10W	80W	10A	$159
B1016	2M	Yes	10W	160W	20A	$249
B3016	2M	Yes	30W	160W	17A	$199
C22	220	No	2W	20W	5A	$ 79
C106	220	Yes	10W	60W	10A	$179
C1012	220	Yes	10W	120W	20A	$259
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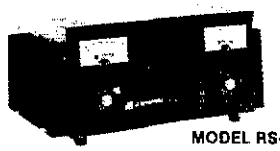
RS20A	16	20	89
RS20M	16	20	109
RS35A	25	35	135
RS35M	25	35	149
RS50A	37	50	199
RS50M	37	50	229



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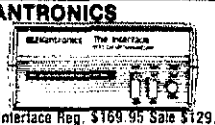
AL-80 1000W Output (single 3-500Z) . . $599
AL-82 1500W Output
(pr 3-500Z tubes) $1199
AL-1200 1500W Output
(3CX-1200 tube) $1299
RCS-8 5 Pos Remote Antenna Switch . . $119
ATR-15 1500W Antenna Tuner $259

KANTRONICS

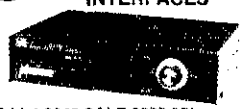


The Interface Reg. $169.95 Sale $129.95
The Interface II Reg. $269.95 Sale $239.95

CHALLENGER $89.95 UNIVERSAL TU $189.95

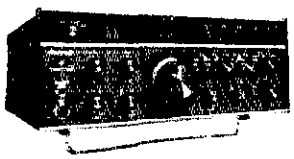
Apple Amtor Soft/Hamtext	$139	VIC-20 Hamsoft	49
Vic-20 Amtor Soft	89	Hamtext VIC-20	99
Model 64 Amtor Soft	89	Hamtext Model-64	99
Apple Hamsoft	29	Atari Hamsoft	49
		TRS-80C Hamsoft	59

HAL SALE! NEW RTTY/CW COMPUTER INTERFACES



CRI-100 List $249 SALE $229.95!
CRI-200 List $299 SALE $269.95!

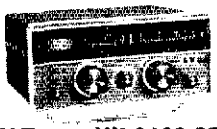
TEN-TEC SALE!



CORSAIR List $1169
Deluxe AC Supply List $199
Both Items—Yours for $1169!

425 Titan New 3KW amplifier in stock-only $2195!

TEN-TEC New 2M HT Full Featured! List $319 Sale $279.95!



4229 2KW Tuner Kit $189.95!

SANTEC

ST142 $249
ST222 $279
ST442 $289
LS202 $229

KDK FM2033 List $339 Sale $299

MFJ 1224 COMPUTER INTERFACE $89.95

202B Noise Bridge	$59.95
250 2KW Oil Load	$35.95
422 Keyer/Paddle	$89.95
901 300W Tuner	$59.95
941C 300 W Tuner	$89.95
989 Deluxe 2KW	$299.95

OSCAR/VHF DX EQUIPMENT

TRANSCEIVERS

KENWOOD

TR9130 2m All Mode 25W	$CALL
TR711A 2m Base 25W	$CALL
TR9500 70cm All Mode	$CALL
TR811A 70cm Base 25W	$CALL

ICOM

IC290H 2m All Mode 25W	$469
IC271A 2m Base 25W	$599
IC271H 2m Base 100W	$789
IC490A 70cm All Mode 10W	$579
IC471A 70cm Base 25W	$689
IC471H 70cm Base 75W	$949

YAESU

FT290R 2m All Mode 2W	$349
FT726R Triband All Mode	$779
726/70 70cm module	$269
726/SU Duplex Module	$95
FT790R 70cm All Mode 1W	$349

TEN-TEC

2510 Satellite Station	$439

ROTORS

Ken Pro KR500 Elev Rotor	$189
Ken Pro KR400 Azim Rotor	$149
Alliance HD73 Azim Rotor	$99
Hy-Gain Ham 4 Azim Rotor	$219

AMPLIFIERS

MIRAGE

B108 2m 80W out/10W in	$159
B1016 2m 160W out/10W in	$249
B3016 2m 160W out/30W in	$199
D24 70cm 40W out/2W in	$179
D1010N 70cm 100W out/10W in	$289

THL CORP.

HL110V 2m 100W out/3-10W in	$219
HL160/25 2m 160W out 25W in	$269
HL160V 2m 160W out/3-10W in	$289
HL45U 70cm 45W out/10W in	$179
HL90U 70cm 90W out/10W in	$319

ANTENNAS

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A144-20T 2m 20el cir pol	$75
416TB 70cm cir pol	$59
PS4 70cm Circularity Switch	$69
A0P1 2m/70cm Oscar Pack	$149

KLM

2m-14c 14el 2m w/cir switch	$89
2m-22C 22el 2m w/cir switch	$119
435-18C 70cm w/cir switch	$119

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½" Aluminum Hardline	$.79/ft
½" LDF-50 Heliax	$1.69/ft

OSCAR PACKAGE DEALS

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Ten-Tec 2510 Satellite Station . . . . List $489
THL HL45U 70cm 45W Amplifier . . List $199
THL HRA-2 2m Mast Mount Preamp List $159
Cushcraft A0P-1 Antenna Package . List $219
Ken-Pro KR500 Elevation Rotor . . . List $189
Alliance HD73 Azimuth Rotor . . . . . List $219
South River 10ft Roof Tripod . . . . . List $59

TOTAL LIST PRICE $1533
PACKAGE PRICE—ONLY $1249 DELIVERED!
SAVE OVER $300!!

PACKAGE #2

Yaesu FT290R 2m Transceiver . . . . List $399
Yaesu FT790R 70cm Transceiver . . List $399
Mirage D24 70cm 40W Amplifier . . List $210
THL HRA-2 2m Mast Mount Preamp List $159
Cushcraft A0P-1 Antenna Package . List $219
Ken-Pro KR500 Elevation Rotor . . . List $189
Alliance HD73 Azimuth Rotor . . . . . List $219
South River 10ft Roof Tripod . . . . . List $59

TOTAL LIST PRICE $1853
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SAVE OVER $375!!

PACKAGE #3

Kenwood TR9130 or Icom IC290H . List $549
Kenwood TR9500 or Icom IC490A . List $649
Mirage D1010N 70cm 100W
Amplifier . . . . . List $347
THL HRA-2 2m Mast Mount Preamp List $159
KLM 2M-14C 14el 2m Satellite Ant List $112
KLM 435-18C 70cm Satellite Ant . . List $145
Ken-Pro KR500 Elevation Rotor . . . List $189
Alliance HD73 Azimuth Rotor . . . . . List $219
South River 10ft Roof Tripod . . . . . List $59

TOTAL LIST PRICE $2428
PACKAGE PRICE—ONLY $1999 DELIVERED!
SAVE OVER $450!!

PACKAGE #4

Yaesu FT726R VHF/UHF
Duplex Xcvr . . . . . List $899
430/726 70cm Module . . . . . List $289
SU/726 Sat Duplex Unit . . . . . List $109
Mirage D1010N 70cm 100W
Amplifier . . . . . List $347
THL HRA-2 2m Mast Mount Preamp List $159
KLM 2M-14C 14el 2m Satellite Ant. List $112
KLM 435-18C 70cm Satellite Ant . . List $145
Ken-Pro KR500 Elevation Rotor . . . List $189
Alliance HD73 Azimuth Rotor . . . . . List $219
South River 10ft Roof Tripod . . . . . List $59

TOTAL LIST PRICE $2527
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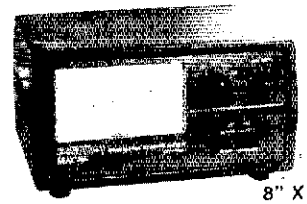
MACAW DPM-1
SWR & POWER METER

$59.95 Add $2.00 Shpg. U.S.A.

- 1.8 to 150 Mhz range
- 0-20, 200, 1000 watt scale
- Read SWR & power simultaneously

7" X 3" X 3½"



MACAW PRM-1
SWR & PEP WATTMETER

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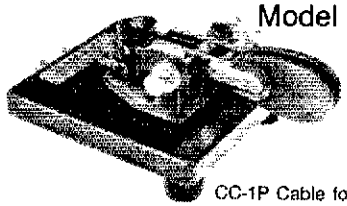
- 1.8 to 60 Mhz range
- 0-20, 200, 2000 watt scale
- Read Peak or Average power

8" X 4" X 5½"

Model HK-1

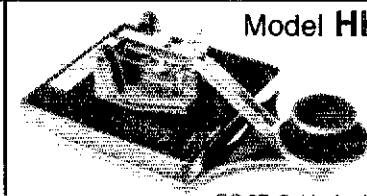


$29.95 Add $2.00 Shpg. U.S.A.

- Dual Lever Squeeze Paddle
- Use with any electronic Keyer
- Paddles adj. narrow/wide

CC-1P Cable for HK-1 **$2.00**

Model HK-3M



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- Deluxe straight key
- Navy Type knob
- Heavy non-tip base

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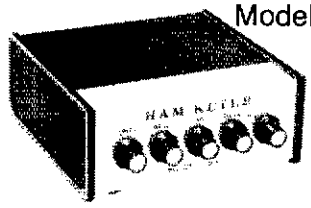

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- Battery operated

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- Hi Sens. W/Samarium Cobalt Magnets
- 4' cord W/2 CKT phone plug

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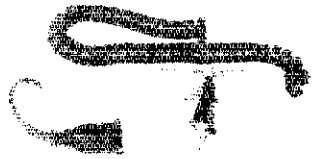
- Attenuate 2-35 mhz.
- Rated at 5 amps.
- Install in line of TV or Hi-Fi



Model RFI-02 RF/Hi-Fi Filters

$11.95 Add $2.00 Shpg. U.S.A.

- Attenuate 2-35 mhz.
- Installs in speaker leads
- Set includes 2 filters & conn.

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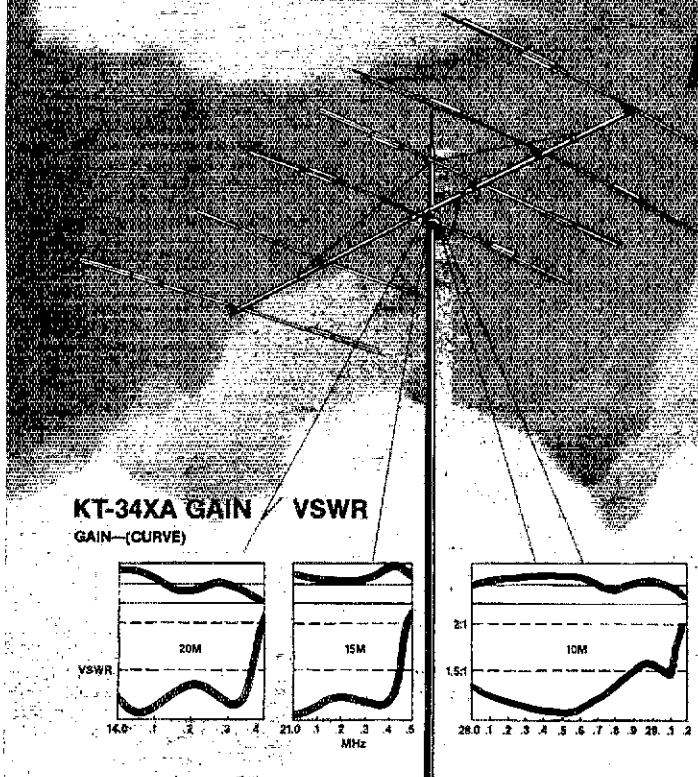
KT-34XA Triband Performance



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KT-34XA GAIN / VSWR

GAIN—(CURVE)

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ICOM IC-730, PS15S, HM-10 mint cond. $550. ICOM IC-25H, Hustler Collinear also mint, $250. W1FYI, 203-259-4999 after 7 PM, and weekends.

ICOM R-70, mint, $400. Manual, original carton. Raoul Cordeaux, N2AJV, 201-681-0448.

COLLINS R390A General Coverage military receiver. 0.5-32 MHz. $295/best offer. 609-354-0123. KD2GV.

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ROSS $$$ Used February Specials: Kenwood TS-430 $585, TS-820 w/CW filter $469, TS-130 $459, ICOM 701 $419, Yaesu FT-620B $285, FT-301D $379, FT-101 $359, Dentron MLA-2500 $495, Robot 400 $299. Send for complete used list - more than 300 items. If this month's specials are not what you are looking for, phone or send call letters and phone # for a personal price quote. Over 6,000 ham related items in stock. Closed Mondays at 2:00. Prices cash, FOB Preston. Ross Distributing Company, 78 South State, Preston, ID 83263 208-852-0830.

SELL - TEMPO S1 HT, w/lea. case, T-T pad, $150; Santec HT-1200, scanning 2m HT, 4W, includes T-T pad, $150; RCA Video Color Camera, CC001, 14-22 mm zoom lens, $300; AB5M, 918-299-1062; w/ship.

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COLLINS S-LINE equipment and accessories. Priced to sell. SASE brings list. Joe Adinolf, WB6ZWS, 1028 Fairview Rd., Ojai, CA 93023.

TI-99/4A COMPUTOR plus Hamsoft for sale. $120 plus shipping. All like new. W3KET, 302-798-4710.

HAL CWR-6700 and quality 9" monitor $275. Vomax SPB-4C and power supply $75. Heights 22" rotor shelf $20. WB4ZCD, 606-441-9684.

HEATH DX-60 for sale $50. Plus shipping. With book. Very clean. Makes FB RTTY rig. W3KET, 302-798-4710.

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PRE-TUNED five-eights wave two meter magnet mount antennas. $19.95 complete plus $3 shipping. Write for catalog page. George Shira, Rt. #7, Box 258, Anderson, SC 29624.

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HEATHKIT HW-8 no p/s, modifications, manual, A-1, $90. I ship, NN5P.

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$99.95 (+$4)

MFJ's fastest selling tuner packs in plenty of new features.
New styling! Brushed aluminum front. All metal cabinet.
New SWR/Wattmeter! More accurate. Switch selectable 300/30 watt ranges. Read forward/reflected power.
New antenna switch! Front panel mounted. Select 2 coax lines, direct or through tuner, random wire/balanced line or tuner bypass for dummy load.
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Matches everything from 1.8 to 30 MHz: dipoles, inverted vee, random wires, verticals, mobile whips, beams, balanced and coax lines.
Built-in 4:1 balun for balanced lines. 1000 V capacitor spacing. Black. 11 x 3 x 7 inches. Works with all solid state or tube rigs. Easy to use anywhere.

MFJ-940B, $79.95, 300 watts, SWR/Wattmeter, antenna switch on rear. No balun. 8 x 2 x 6 in. eggshell white with walnut grained sides.
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MDJ-944, $79.95, like MFJ-940B with balun, antenna switch on front panel, less SWR/Wattmeter.
Optional mobile bracket for 940B, 945, 944, $5.00.

MFJ-900 200 WATT VERSA TUNER

Matches coax, random wires 1.8-30 MHz. Handles up to 200 watts output; efficient airwound inductor gives more watts out. **$49.95** (+$4)
5x2x6 in. **Use any transceiver,** solid state or tube. Operate all bands with one antenna.
OTHER 200 WATT MODELS:
MFJ-901, $59.95, like 900 but includes 4:1 balun for use with balanced lines.
MFJ-16010, $39.95, for random wires only. Great for apartment, motel, camping, operation. Tunes 1.8-30 MHz.

MFJ-949B 300 WATT DELUXE VERSA TUNER II

$139.95 (+4)

MFJs best 300 watt Versa Tuner II. Matches everything from 1.8 - 30 MHz, coax, randoms, balanced lines, up to 300W output, solid state or tubes.
Tunes out SWR on dipoles, vees, long wires, verticals, whips, beams, quads.
Built-in 4:1 balun. 300W, 50-ohm dummy load. SWR meter and 2 range wattmeter (300W and 30W).
6 position antenna switch on front panel, 12 position air-wound inductor; coax connectors, binding posts, black and beige case. 10 x 3 x 7 in.

MFJ-962 1.5 KW VERSA TUNER III

Run up to 1.5 KW PEP **$229.95** (+$10)
and match any feedline continuously from 1.8 to 30 MHz; coax, balanced line or random wire. Built-in SWR/Wattmeter has 2000 and 200 watt ranges, forward and reflected power. 2% meter movement. **6 position** antenna switch handles 2 coax lines (direct or through tuner), wire and balanced lines. 4:1 balun 250 pf 6 KV variable capacitors. 12 position inductors. Ceramic rotary switch. All metal black cabinet and panel gives RFI protection, rigid construction and sleek styling. Flip stand tilts tuner for easy viewing. 5 x 14 x 14 inches.

MFJ-989 3 KW ROLLER INDUCTOR VERSA TUNER V

$329.95 (+$10)

Meet "Versa Tuner V". It has all the features you asked for, including the new smaller size to match new smaller rigs - only 10 3/4"W x 4 1/2"H x 14 7/8"D.
Matches coax, balanced lines, random wires — 1.8 to 30 MHz. 3 KW PEP- the power rating you won't outgrow (250 pf-6KV caps).
Roller inductor with a 3-digit turns counter plus a spinner knob for precise inductance control to get that SWR down to minimum every time.
Built-in 300 watt, 50 ohm dummy load, built-in 4:1 ferrite balun.
Built-in 2% meter reads SWR plus forward and reflected power in 2 ranges (200 and 2000 watts). Meter light requires 12 VDC. Optional AC adapter MFJ-1312 is available for $9.95.
6-position antenna switch (2 coax lines, through tuner or direct, random/balanced line or dummy load). SO-239 connectors, ceramic feed-throughs, binding post grounds.
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MFJ-981, $239.95. 3 KW, 18 position switched dual inductor. SWR/Wattmeter. 4:1 balun.

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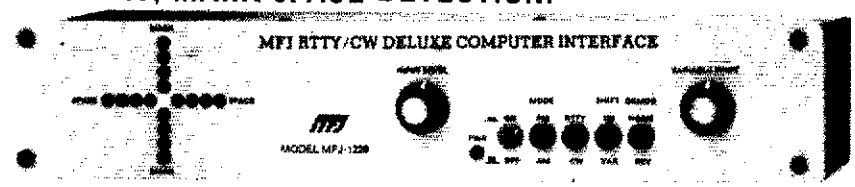


MFJ RTTY/ASCII/CW software on tape, cables for C-64/VIC-20.

MFJ-1229
$179.95

Engineering, performance, value and features sets MFJ's most advanced RTTY/ASCII/AMTOR/CW computer interface apart from others.

FM (limiting) mode gives easy, trouble-free operation. Best for general use, off-shift copy, drifting signals, and moderate signal and QRM levels.

AM (non-limiting) mode gives superior performance under weak signal conditions or when there are strong nearby stations.

Crosshair mark-space LED tuning array simulates scope ellipse for easy, accurate tuning even under poor signal-to-noise conditions. Mark and space outputs for true scope tuning.

Transmits on both 170 Hz and 850 Hz shift.

Built-in RS-232 interface, no extra cost.

Variable shift tuning lets you copy any shift between 100 and 1000 Hz and any speed (5-100 WPM RTTY/CW and up to 300 baud ASCII). Push button for 170 Hz shift.

Sharp multi-pole mark and space filters give true mark-space detection. Ganged pots give space passband tuning with constant bandwidth. Factory adjusted trim pots for optimum filter performance.

Multi-pole active filters are used for pre-limiter, mark, space and post detection filtering. Has automatic threshold correction. This advanced design gives good copy under QRM, weak signals and selective fading.

Has front panel sensitivity control.

Normal/Reverse switch eliminates retuning while checking for inverted RTTY. Speaker jack. +250 VDC loop output.

Exar 2206 sine wave generator gives phase continuous AFSK tones. Standard 2125 Hz mark and 2295/2975 Hz space. Microphone lines: AFSK out, AFSK ground, PTT out and PTT ground.

FSK keying for transceivers with FSK input.

Has sharp 800 Hz CW filter, plus and minus CW keying and external CW key jack.

Kantronics software compatible socket.

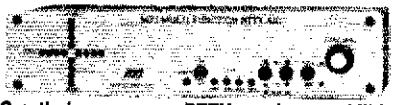
Exclusive TTL/RS-232 general purpose socket allows interfacing to nearly any personal computer with most appropriate software. Available TTL/RS-232 lines: RTTY demod out, CW demod out (TTL only), CW-ID in, RTTY in, PTT in, key in. All signal lines are buffered and can be inverted using an internal DIP switch.

Metal cabinet. Brushed aluminum front. 12½x2½x6 inches. 18 VDC or 110 VAC with optional AC adapter, MFJ-1312, $9.95.

Plugs between rig and C-64, VIC-20, Apple, TRS-80C, Atari, TI-99 and other personal computers. Use MFJ, Kantronics, AEA and other RTTY/ASCII/AMTOR/CW software.

MFJ MULTI-FUNCTION TUNING INDICATOR

MFJ-1221
$79.95



Greatly improve your RTTY copying capabilities. Add a crosshair LED Tuning Indicator that makes tuning quick, easy with pin-point accuracy. **Add** mark and space outputs for scope tuning. **Add** LEDs that indicate 170, 425, 850 Hz shifts. Great for copying RTTY outside ham bands. **Add** sharp mark and space filters to improve copy under crowded/weak conditions. 170, 425, 850 Hz shifts. **Add** Normal/Reverse switch to check for inverted RTTY without retuning. **Add** output level control to adjust signal into your terminal unit. **Add** a limiter to even out signal variation for smoother copy.

Unit plugs between your tuner and receiver. Mark is 2125 Hz, space is 2295, 2550 or 2975 Hz. Measures 10x2x6 in. and uses floating 18 VDC or 110 VAC with AC adapter, MFJ-1312, $9.95.

24/12 HOUR CLOCK/ID TIMER

MFJ-106
$19.95

Switch to 24 hour UTC or 12 hour format! Battery backup. ID timer alerts every 9 minutes after reset. Red .6 in. LEDs. Synchronizable to WWV. Alarm, Snooze function. PM, alarm on indicators. Gray/Black cabinet. 110 VAC, 60 Hz.

MFJ ELECTRONIC KEYER

MFJ-407
$69.95

MFJ-407 Deluxe Electronic Keyer sends iambic, automatic, semi-auto or manual. Use squeeze, single lever or straight key. Plus/minus keying. 8 to 50 WPM. Speed, weight, tone, volume controls. On/Off, Tune, Semi-auto switches. Speaker. RF proof. 7x2x6 inches. Uses 9 V battery, 6-9 VDC or 110 VAC with AC adapter, MFJ-1305, $9.95.

MICROPHONE EQUALIZER

MFJ-550
$49.95

Greatly improves transmitted SSB speech for maximum talk power. Evens out speech peaks and valleys due to voice, microphone and room characteristics that make speech hard to understand. Produces cleaner, more intelligible speech on receiving end. Improves mobile operation by reducing bassy peaks due to acoustic resonances. Plugs between mic and rig. 4 pin mic jack, shielded output cable. High, mid, low controls provide ±12 db boost or cut at 490, 1170, 2800 Hz. Mic gain, on/off/bypass switch. "On" LED. 7x2x6 inches. 9 V battery, 12 VDC or 110 VAC with adapter, MFJ-1312, $9.95.

MFJ ANTENNA BRIDGE

MFJ-204
$79.95

Trim your antenna for optimum performance quickly and easily. Read antenna resistance up to 500 ohms. Covers all ham bands below 30 MHz. Measure resonant frequency of antenna. Easy to use, connect antenna, set frequency, adjust bridge for meter null and read antenna resistance. Has frequency counter jack. Use as signal generator. Portable, self-contained. 4x2x2 in. 9 V battery or 110 VAC with adapter, MFJ-1312, $9.95.

MFJ PORTABLE ANTENNA

MFJ's Portable Antenna lets you operate 40, 30, 20, 15, 10 meters from apartments, motels, camp sites, vacation spots, nearly any electrically clear location where space for a full size antenna is a problem.

A telescoping whip (extends to 54 in.) is mounted on self-standing 5½x6¾x2¼ inch Phenolic case. Built-in antenna tuner, field strenght meter, 50 feet RG-58 coax. Complete multi-band portable antenna system that you can use nearly anywhere. Up to 300 watts PEP.

MFJ-1621
$79.95

MFJ 24 HOUR LCD CLOCKS

$19.95 **MFJ-108** **$9.95** **MFJ-107**

Huge 5/8 inch bold black LCD numerals make these two 24 Hour clocks a must for your shack. Choose from a dual clock that features seperate UTC and local time display or a single clock that displays 24 Hour time. **Mounted in a brushed aluminum frame,** these clocks feature huge 5/8 inch LCD numerals and a sloped face for across the room viewing. Easy set month, day, hour, minute and second function. Clocks can be operated in an alternating time-date display mode. MFJ-108, 4½x1x2 inches; MFJ-107, 2¼x1x2 inches. Battery included.

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HEATHKIT GENERAL and Novice Courses with CW Oscillator, $50, I-ship. NN5P.

CES 510SA "Smart Patch," $245. Drake 7000E terminal, MX-80 monitor, $695. IC-EX203 CWF (IC-730), $25. Azden 3000, $175. K1LEC, 802-886-8121.

JENNINGS UCSL-1000 vacuum variable capacitors, 10 thru 1000 MMFD at 5000 kV, with gear drive train and mounting bracket, ideal for that linear amplifier or tuner, $59.50. HP608C lab quality Signal Generator 10 MHz thru 480 MHz, perfect for HF/UHF/VHF alignment $345. HP614 Signal Generator 900 MHz thru 2100 MHz $345. HP618B Signal Generator 3.8 GHz thru 7.6 GHz $375. URM-25 Signal Generator 10 kHz thru 50 MHz $245. All equipment lab tested. We accept M/C, VISA or check. Phone Bill Slep, 704-524-7519, Slep Electronics Company, Highway 441, Otto, NC 28763.

NEW-TRONICS, cliff-dweller rotary dipoles, 40M/80M models, remotely tuned, pick-up only, sell/trade. Alan, WA6BUS, 714-962-6940.

AIM-65 microcomputer with BASIC, assembler, PL-1 $400. Motherboard and 32K-memory board $200. Disk controller $100. New 320K disk drive for IBM-PC $140. Voln Oklobdzija, 914-277-8152.

MOTOROLA 4-watt 460 MHz HT210 with PL. Includes NiCad and leather carrying case. Mint condition. $175 firm. K7GFL, PH 702-456-9048.

IBM-PC RTTY/CW. CompRtty II is now available! This new version of the CompRtty communications program for the IBM-PC is better than ever. Virtually any speed ASCII, BAUDOT, CW (automatic receive speed). Text entry via built-in text editor! 10,000 character transmit/receive buffers! Split screen display with movable split! Hardcopy, diskcopy, break-in buffer, received string search autostart/stop, text file transfer, customizable full screen logging, 24 programmable 1000 character messages. Ideal for traffic handling. Requires 128K, PC-DOS, serial port and RS-232C compatable TU. $65. Includes call with order. David A. Rice, KC2HO, 7373 Jessica Drive, North Syracuse, NY 13212.

WANTED: VFO for Swan-400 VFO-420 or similar. Kenwood TS-830, CB-radio: Pace-1048 $80. Voln Oklobdzija, 914-277-8152.

BARGAINS: REGENCY 4-channel UHF scanner - $40; Heathkit SW-717 shortwave receiver - $35; Allied VHF hi-lo tunable receiver - $35; Royal electric typewriter - $85; JVC portable biphonic stereo with shortwave - $75; Star STX-80 printer - $100; Olivetti Ink Jet printer with graphics disk for CBM64 - $165; Cardco + G printer interface - $50; CBM 64 accessories: Compuscope 4 slot expander - $55; Quick Brown Fox wordprocessor - $35; C64 super expander - $15; Simon's Basic - $15; Machine-language monitor cartridge - $15; music composer cartridge - $8; voice synthesizer - $45; Vicmodem - $35. You pay postage. J. B. Dennigan, 30 Woodside Ave., West Warwick, RI 02893.

FOR SALE: Kenwood TS-660 Quadbander 6, 10, 12 & 15 meters CW, AM, SSB, FM $425. Additional pkg with above unit - VOX4 speech clipper & VOX unit, HQ1 two el quad & home brew solid state linear - all for $200. Bill Foley, WB2TOU, 201-876-9320.

BEARCAT SCANNER specials: BC-III U, BC-III H, BC-6, $29.95; BC-III H/U, $39.95; BC-IV, BC-8, $44.95; SP-H/L, $49.95. Beartinder Radar Detector (nice microwave rcvr, and horn), $35. Quantities limited. Shipping and handling extra. Brand new. N5RK, Coronado Communications, 6301 N. Mesa, El Paso, TX 79912, 915-581-5708.

TS930S, Ser. Man. - $975. SP-930 - $50. K8IFF, 313-676-2872.

BROKEN SOLID-STATE rigs wanted. State price and condition. AD7I, POB 205, Holmdel, NJ 07733.

COMMODORE CODE Practice and Send Programs. S.A.S.E. for description. N1DCD, 1024 Washington, Reading, PA 19601, 215-373-7907.

KENWOOD TS-120S 5-band 100 W xcvr, PS-30 AC supply, Swan ST-3 ant. tuner, mic, balun, traps $599. K2SQZ, 716-297-6990.

COLLINS "S" LINE: 75S-1 receiver, 32S-1 transmitter, 516F-2 power supply. Appearance good, but needs trouble shooting. Asking $275, will dicker. John Longley, W2ANB, 1623 New Scotland Road, Slingerlands, (Albany County) NY 12159, 518-439-2862.

GALAXY GT-550 transceiver, RV-550 VFO, spkr AC supply, 100 to 550W CW/SSB 25 kc cal $215. 408-637-1796 KB6NL.

DIGITAL AUTOMATIC Displays for Collins KWM-2, 75S-3, Drake R-4(C), TR-3/4 and Swan 350C through 700CX. No installation. See January ad. FT-101 and TS-520 owners see December ad. Heath owners write. Prices and information. Grand Systems, P.O. Box 3377, Blaine, WA 98230. 604-530-4551.

MUST SELL by Spring: Kenwood MC-50 mike $35. Kenwood speaker SP-100 $20. Heathkit phone patch HD-15 $30. Yaesu speaker patch $40. B&W antenna - apartments, town house, hotel, etc., coils for 10-15-20 meters $25. Dick, KA1SM, 25 Rolling Lane, Dover, MA 02030, 617-785-1760.

COLLINS KWM-2 transceiver, power supply, Samsonite cc, and Collins 312B-5 speaker, VFO, phone patch in mint condition, only $650 with manual, or best offer. KA6FJH, Stan, 916-673-2381.

KENWOOD TS-530S $485. Hamtronics XV-4 432 + 435 MHz transverter + 10W. Amp + RX converter $150. Argonaut 509 $190, Collins R388 rcvr $125. K3EAV, Bill Blazina, RD 1, Box 84, Mapleton, PA 17052, 814-448-3068.

POOR MAN'S Alpha, desk top 8877 with H.D. P.S. $1200, new tube. Antenna Mart 5- and 6-position switch, boxes $90 ea. KS9K, 414-554-9170.

SELL: TS-820S, very good condition, CW filter, original carton, 2 manuals - $550. Daiwa AF-606K active audio filter w/PLL - $85. Micom Micro 400 Line Driver (400 baud) + power supply, never used - $195. Ed, KA2MXO, 718-284-4493 - even.

KENWOOD TS-830S equipped with YG-455C, YK-88C & 2.1 kHz filters. MC-50 mic, VFO-230 VFO, SP-230 speaker sand EQ-200 Heil mic equalizer. Mint condition with manuals. $1,075, package deal. KE4SN, 1-804-420-5554. Va Bca.

SALE: ICOM IC-271A transceiver, AG-20 GaAsFET preamp and mirage B-3016 power amp, package, $665. Atlas RX-110-5 ham receiver, $95. Kenpro KR-500 satellite elevation rotor, $120. Alliance HD-73 rotor, new-factory sealed, $85. Kenwood TS-660 transceiver, $450. Apple II+ computer, 2 Apple disks, CP/M, software, loaded! $900. Cromemco SCC Z80 computer w/BASIC-new, with ACT-1 RS-232 keyboard and Sanyo B/W monitor, $250. Prices firm plus UPS. Bill, WB5NXG/4, 305-676-1882 only 1800-2100 EST.

SELL: IC-701, 701PS, SM-2 mic, $420. IC-251A, HM-7, SM-5 mics, $375. Kenpro TET KR-400 rotor (new) $125. Leader LDS-824S frequency counter, $300. MMC-432/28TC-LN converter, $45. MML-144/25 amp, $50. Heath VL-1180 amp, $70. TRW coax relay (type N), $25. Bird 72-R dp rev coax switch, $25. KLM 400-470-2 coupler, $15. PSF-432 filter, $20. Albert Weiss, K6VU, 1700 Forest Lakes Blvd., Naples, FL 33942. Tel. 813-262-6866.

YAESU FT-102 mint, mike. I'll ship original carton $525. W1MU, Providence, RI, 401-521-4542.

TRADE - 75S-1, Heath H-9 terminal, 1925 Westinghouse 1-tube rcvr, TT-30 Teletype. Want - low freq coils for Millen Grid-Dip. KF6WM, 45300 Royal, King City, CA 93930.

IC-R-70 or ICF-2001. For details, write Pat Matthews, White Oak, SC 29176.

YAESU FT-One $1350. Drake R4B, T4X, MS4 $300. MN2000 tuner $125. HP606A signal generator to 65 MHz $150. Tektronix 647A 100 MHz scope $550. Ham II Rotator $90. Macrotronics Terminall for TRS80 $100. Model 28 KSR, gearshift $35. WA7ZRX, 206-759-7185.

RTTY-MORSE-ASCII: HAL ST-5000, DS-2000KSR, and Electrohome TV monitor, All mint, Package only, $650. KA1U, 617-862-9096.

COLLINS - 75S3B, mint, 32S-3C, good, 516F2, rack mtd., $850; KWM-2A, very good, round, 516F2, $650; 12V mobile supply, $100; KWS-1 transmitter, 2 RF heads, $400; KWM-380, filters, SP, NB, int board, xmit all freq., mike, rack mtd, mint, $3500; Rel-L-103, 2 kW amp, spare 4CX300A's, $500; Telequip 5" scope, mint, new, $100; Yaesu FT-707 xcvr, $400. N2AQS, 201-265-6864.

T-4XC, AC-4 $295; SB-610 $95; HG-10B $45; UXC-500 $50; Wanted: 1296 converter, 6M beams. Paul Husby, WØUC, 1697-C Fulham, Lauderdale, MN 55113. 612-642-1559.

SWAN 350 Digital excellent condition with manual and Electro-Voice 727 microphone $300. Harold Gruen, 3340 Davis Road, Barrington, NJ 08007, 609-546-5696.

FREE SHIPPING Continental USA, Mini-Quads $139.95, Butternut HF6Vs $106.50, Amp-Supply LA-1000As $379.95. Stamp for flyer, Don, WB2RTW, Hart Eastern Communications, 1444 Darlington Drive, Derby, NY 14047, 716-947-4840.

SUPER CONTESTER I (16K, $19.95). ML; Dupe; Sort; Review; Search; Edit; Printout. Super Contester II (32K, $29.95). Above features plus Clock; Autolog. Both COCO, tape only. JC Software (K8MX), 177 Chestnut Street, Battle Creek, MI 49017.

WANT: FM stereo generator; Harmonic Distortion. Analyzer: Flutterman stereo amplifier. Charles King, Miner St., Middletown, CT 06457.

DRAKE STATIONS: R4-B receiver, T4-X transmitter, MS-4 speaker, AC-4 supply, $275. R4-A receiver, T4 transmitter, MS-4 speaker, AC-4 supply, $175. All radios in excellent condition. Contact: K2AWA, (AC) 718-224-2448.

FOR SALE: Microlog AIR-1 TU for C-64, Little use, $130. Info Tech M-75 TU and M-150 keyboard, both $125. WØMZC, 303-776-1249.

WANTED: SOLID-State 2-Meter repeater in good condition. WØMZC, 303-776-1249.

Jobs for Hams

WANTED FOR Summer of 1985: Instructors in electronics, Ham Radio, and computers. Small boys' science camp in Pennsylvania. Apply: Donald Wacker, P.O. Box 356, Paupack, PA 18451.

SUMMER CAMP Counselor, General or better, teaching Novice & DXing programs to boys in private N.H. summer camp. Top equipment, triple beam tower, established ham program plus AM station. Approx. June 17 to Aug. 17th. Winter offices Camp Cody, 5 Lockwood Circle, Westport, CT 06880, Dr. Stolz, 203-226-4389.

COUNSELOR - HAM RADIO; H.S. Grad., College Student, Adult. Children's summer camp; varied activities; 6/24-8/22 or any part thereof. Northeastern Pennsylvania 2½ hrs. N.Y.C. Apply: Camp Wayne, 570 Broadway, Lynbrook, NY 11563, 516-599-4562.

COUNSELOR: OPERATOR with General license to teach Ham Radio at Pennsylvania co-ed camp. Have completely equipped Ham station. Write Trail's End Camp, 215 Adams Street, Brooklyn, NY 11201.

CAMP COUNSELLOR opportunity for General Class ham. Eight weeks at a summer camp in NE Pennsylvania. Bring your HF station. 212-874-5526.

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- Totally self-supporting—no guys needed

Model	Height	Load	Sale Price
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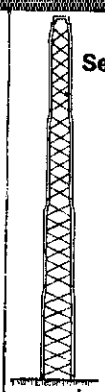
Masts—Thrust Bearings—Other Accessories Available—Call! Prices Shown Are Your Total Delivered Price In Continental U.S.A.!



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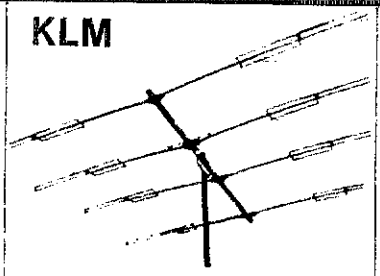
HDBX40	40 ft	18 sq ft	281	$379
HDBX48	48 ft	18 sq ft	363	$469

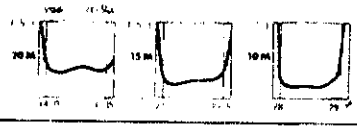
*Your Total Delivered Price Anywhere in Continental 48 States. Antenna Load Based on 70 MPH Wind.

KLM



KT34A List $433.95 SALE $349.00
KT34XA List $633.95 SALE $499.00

The new concept in triband antenna design. Gain and band width all in one compact package. VSWR curves.



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- Automatic Band Switching (80/10 meters).
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- IN STOCK for IMMEDIATE DELIVERY & LOOK at very SPECIAL PRICES . . .
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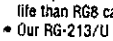
RG-213U

$.29/ft $279/1000 ft
Up to 600 ft via UPS

- RG-213/U—95% Bare Copper Shield
- Mil-Spec Non-contaminating Jacket for longer life than RG8 cables.
- Our RG-213/U uses virgin materials.
- Guaranteed Highest Quality!

RG-8X

$.19/ft $179/1000 ft



- RG8X—95% Bare Copper Shield
- Low Loss
- Non-contaminating Vinyl Jacket
- Foam Dielectric

Coaxial Cable Loss Characteristics (DB/100 ft)

Cable Type	Imped.	10MHz	30MHz	150MHz	450MHz
RG-213/U	50	.6	.9	2.3	5.2
RG8X	52	.8	1.2	3.5	6.8
RG-58/U	52	1.4	1.9	6.0	12.5
½" Alum	50	.3	.5	1.2	2.2
½" Heliax	50	.2	.4	.9	1.6
¾" Heliax	50	.1	.2	.5	.9

HARDLINE/HELIAX™

Lowest Loss for VHF/UHF!

½" Alum. w/poly Jacket	$.79/ft
½" LDF4-50 Andrew Heliax ™	$1.69/ft
⅞" LDF5-50 Andrew Heliax ™	$3.99/ft

select connectors below.

HARDLINE & HELIAX™ CONNECTORS

Cable Type	UHF FML	UHF MALE	N FML	N MALE
½" Alum	$19	$19	$19	$25
½" Heliax ™	$22	$22	$22	$22
⅞" Heliax ™	$49	$49	$49	$49

AMPHENOL CONNECTORS

Silver PL259 . . $1.25 UG230 N Female . $2.95
UG21B N Male . $2.95

ANTENNA WIRE & ACCESSORIES

14 Ga. Stranded Copperweld	$.10/ft
450 Ohm H.D. Line	$.16/ft
18 Ga. Copper coated steel wire ¼ mile long	$30
H.D. End Insulators	$2/ea
Van Gorden 1:1 Balun	$11
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HUSTLER

68TV 80-10 mtr Vert . $129
81 V 40-10 mtr Vert $89 58TV 80-10 mtr Vert . $109
66-1448 2-mtr Base $89 G7-144 2-mtr Base . $119

Mobile Resonators	10m	15m	20m	40m	75m
300W Standard	$12	$12	$15	$18	$22
2KW Super	$18	$20	$22	$26	$36

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MULTI-BAND HF ANTENNAS

A3 3-el Tribander . . . $219 A4 4-el Tribander $289
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HF MOND-BAND ANTENNAS

10-3CD	$ 95	10-4CD	$109
15-3CD	$119	15-4CD	$129
20-3CD	$199	20-4CD	$279
40-2CD	$289	D40	$149

VHF/UHF BEAMS

A50-5	$ 79	617B	$199
214B	$ 79	3219	$ 95
220B	$ 95	424B	$ 79

OSCAR/TWIST ANTENNAS

A144-10T	$ 52	A144-20T	$ 75
A147-20T	$ 63	416TB	$ 59
A14TMB	$ 29	PS4	$ 69

VHF/UHF FM ANTENNAS

A147-4	$ 29	A147-11	$ 49
214FB	$ 79	228FB	$219
A449-6	$ 29	ARX2B	$ 39

HY-GAIN

Discoverer 2-el 40-mtr Beam	**$319**
Discoverer 3-el Conversion Kit	**$199**
Explorer-14	$309
QK710 30/40 mtr. Add-On-Kit	$79
V2S 2-mtr Base Vertical	$49
TH5MK2S Broad Band 5-el Triband Beam	$389
TH7DXS 7-el Triband Beam	$439
TH3JRS 3-el Triband Beam	$189
TH2MK3S 2-el Triband Beam	$179
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155BAS 5-el 15-mtr Beam	$199
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MOSLEY

Pro37 7-el Triband Beam	$469
CL-33 6-el Triband Beam	$279
TA-33 3-el Triband Beam	$249
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TA40KR 40 mtr Kit for TA33	$119

MINI-PRODUCTS HQ-1

LIST $182.50 SALE $159

- Wing Span - 11 ft
- Wind Area - 1.5 sq ft
- Boom - 54 in. long
- 1200W P.E.P. Input

ALPHA DELTA COMMUNICATIONS

Transi-Trap™ Surge Protectors—In Stock Now!

Model LT 200W UHF Type	$19
Model HT 2KW UHF Type	$29
Model LT/N 200W N Type	$39
Model HT/N 2KW N Type	$44
Model R-T 200W Deluxe	$29
Model HV 2KW Deluxe	$32

KLM

KT34A 4-el Broad Band Triband Beam	$349
KT34XA 6-el Broad Band Triband Beam	$499
80m-1 80-mtr Rotatable Dipole	$595
40m-1 40-mtr Rotatable Dipole	$179
40m-2 2-el 40-mtr Beam	$309
40m-3 3-el 40-mtr Beam	$459
40m-4 4-el 40-mtr Beam	$649
2m-13LBA 13-el 2-mtr Beam	$79
2m-14C 14-el 2-mtr Satellite Antenna	$89
2m-16LBX NEW-16-el 2-mtr Beam	$99
2m-22C NEW-22-el 2-mtr Satellite Antenna	$119
432-30LBX NEW-30-el-432 MHz Antenna	$99
435-18C 435 MHz Satellite Antenna W/CS-2	$119
432-16LB 16-el 432 MHz Beam	$69

ROTORS & CABLES

Alliance HD73 (10.7 sq ft rating)	$99
Alliance U110 (3 sq ft rating)	$49
Telex HAM 4 (15 sq ft rating)	$219
Telex Tailtwister (20 sq ft rating)	$269
Telex HDR300 Heavy Duty (25 sq ft rating)	$519
Kenpro KR-500 Heavy duty elevation rotor	$189
KLM EL-3000 Moon Tracker Elevation Rotator	$349

Standard 8 cond cable $.19/ft (vinyl jacket 2-#18 & 6-#22 ga)
Heavy Duty 8 Cond cable $.36/ft (vinyl jacket 2-#16 & 6-#18 ga)

SOUTH RIVER ROOF TRIPODS

HDT-3 3 ft Tripod . . $19 HDT-5 5 ft Tripod . . . $29
HDT-10 10 ft Tripod . $49 HDT-15 15 ft Tripod . . $69

Heavy Duty Tripods include mtg hdw-UPS Shippable

ROHN GUYED TOWERS

10 ft Stack Sections

20G $39.50 25G $49.50
45G $112.50 55G $134.50

All 20G, 25G, 45G and 55G Accessories In Stock at Discount Prices - CALL!

Foldover Towers

Model	Height	Ant Load*	Price
FK2548	48 ft	15.4 sq ft	$ 829
FK2558	58 ft	13.3 sq ft	$ 899
FK2568	68 ft	11.7 sq ft	$ 959
FK4544	44 ft	34.8 sq ft	$1159
FK4554	54 ft	29.1 sq ft	$1259
FK4564	64 ft	28.4 sq ft	$1359
25G Foldover Double Guy Kit			$199
45G Foldover Double Guy Kit			$229

*Above antenna loads for 70 MPH winds and Guys at Hinge & Apex.

TOWER/GUY HARDWARE

3/16" EHS Guywire (3990 lb rating)	$.15/ft
1/4" EHS Guywire (6000 lb rating)	$.18/ft
5/32" 7 × 7 Aircraft Cable (2700 lb rating)	$.15/ft
3/16" CCM Cable Clamp (3/16" or 5/32" Cable)	$.45
1/4" CCM Cable Clamp (1/4" Cable)	$.55
1/4" TH Thimble (fits all sizes)	$.45
3/8EE (3/8" Eye & Eye Turnbuckle)	$6.95
3/8" EJ (3/8" Eye & Jaw Turnbuckle)	$7.95
1/2" EE (1/2" Eye & Eye Turnbuckle)	$9.95
1/2" EJ (1/2" Eye & Jaw Turnbuckle)	$10.95
3/16" Preformed Guy Grip	$2.49
1/4" Preformed Guy Grip	$2.99
6' Diam - 4 ft Long Earth Screw Anchor	$14.95
500D Guy Insulator (5/32" or 3/16" Cable)	$1.69
502 Guy Insulator (1/4" Cable)	$2.99
5/8" Diam - 8 ft Copper Clad Ground Rod	$12.95

PHILLYSTRAN GUY CABLE

HPTG2100 Guy Cable (2100 lb rating)	$ 29/ft
HPTG4000 Guy Cable (4000 lb rating)	$ 49/ft
HPTG6700 Guy Cable (6700 lb rating)	$ 89/ft
9901LD Cable End (for 2100/4000 cable)	$7.95
9902LD Cable End (for 6700 cable)	$8.95
Socketfast Potting Compound	$14.95

GALVANIZED STEEL MASTS

Heavy Duty Steel Masts 2 in OD - Galvanized Finish

Length	5 FT	10 FT	15 FT	20 FT
.12 in Wall	$25	$49	$59	$79
.18 in Wall	$39	$69	$99	$129
.25 in Wall	$89	$129	$189	$249

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TS-430S Most Advanced, Compact HF Transceiver

- General Coverage Receiver
- USB/LSB/CW/AM/Optional FM • 10Hz Dual Step Digital VFO • Eight Memories w/Lithium Back-up • Memory and Band Scan

KENWOOD

TS-930S Top of the Line HF Transceiver

- General Coverage Receiver • Superior Dynamic Range • All Solid State—28 VDC Final • QSK CW • Optional Automatic Antenna Tuner • Dual VFO w/8 Memories • Dual Mode Noise Blanker

KENWOOD

TR-7950/7930

- Large LCD Readout • 21 Multi-Function Memory • Lithium Back-up • Automatic Offset • Built-in Encoder • Memory or Band Scan

KENWOOD

TR-2600

2.5W/300 mW (Switchable) 2 Meter Handheld Transceiver

- LCD Readout • Ten Memories w/Lithium Back-up • Band and Memory Scan • Built in Sub-tone Encoder

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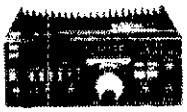

FT-757 GX

Compact General-Coverage Receiver

- General-Coverage Receiver
- USB/LSB/CW/AM/FM • Dual VFOs
- Memory/Band Scan • Speech Processor • CW Filter and CW Keyer included

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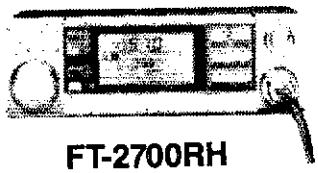

FT-2700RH

Dual Bander

- V/HF FM
- 144/430 MHZ
- 25 WATTS

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FT-209RH

- 5 Watts
- 10 Memories
- LCD
- Compact

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FT980

CAT SYSTEM—Computer Aided Transceiver

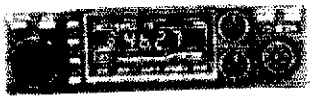
- Wide Dynamic Range • General Coverage • Low Noise Front End • 10 Hz Digital Readout • All Mode Transceive—CW/SSB/AM/FM/FSK!

ICOM

IC-745 HF Base

All ham band HF transceiver. 16 memories. 100KHz to 30 MHz general coverage receiver and adjustable noise blanker and AGC

ICOM



IC-27A Compact Mobile

A breakthrough in 2-meter mobile communications! Most compact on the market (5¼" x1½" Hx7" D), contains internal speaker for easy mounting. 25 watts. 32 PL frequencies, 9 memories, scanning and touchtone mic

ICOM

IC-02AT

The IC-02AT 2-meter LCD readout handheld features 10 memories, 32 PL tones, scanning, keyboard frequency entry, dial lock, 3W std., 5W opt. DTMF

ICOM

IC-R71A General Coverage Receiver

The IC-R71A 100KHz - 30 MHz superior-grade general coverage receiver features keyboard frequency entry, 32 memories, SSB/AM/RTTY/CW, selectable AGC and noise blanker, and wireless remote controller (optional).

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The DX is better out here. Ask anyone who owns an FT-726R.

It's true. Linking up to OSCAR 10 is the one sure way to bring the world into your ham shack. No matter where your shack is.

FT-726R owners know. You'll find them working the world from their apartments. Attics. And from their antenna-restricted neighborhoods.

They'll even boast of a signal quality and DX potential that would make any 20-meter operator envious. Regardless of where we are in the sunspot cycle.

In fact, the FT-726R is the world's most popular link to OSCAR 10.

And for good reason. This 2-meter 10-watt rig gives you full cross-band duplex capability. Simply plug in two optional modules, one for 435-MHz operation, another for cross-band duplex.

You can set up your earth station just about anywhere. All you need is the 726 and two Yagi antennas: 435-MHz for transmit and 2-meters for receive.

Even as a conventional base station, the FT-726R is a real standout.

You can choose from three operating modes: SSB, FM or CW. Expand to three-band operation with your choice of optional modules for 10 meters, 6 meters, 430-440 MHz and 440-450 MHz.

Then store your preferred frequencies and modes into the eleven memories for instant recall. With pushbutton transfer capability to either of two VFO registers. And versatile scanning functions you'd expect from a Yaesu radio.

Plus you get a lot more extras, including a built-in speech processor, all-mode squelch and a noise blanker.

So no matter where your shack is, let Yaesu's FT-726R introduce you to OSCAR 10. The world is waiting.

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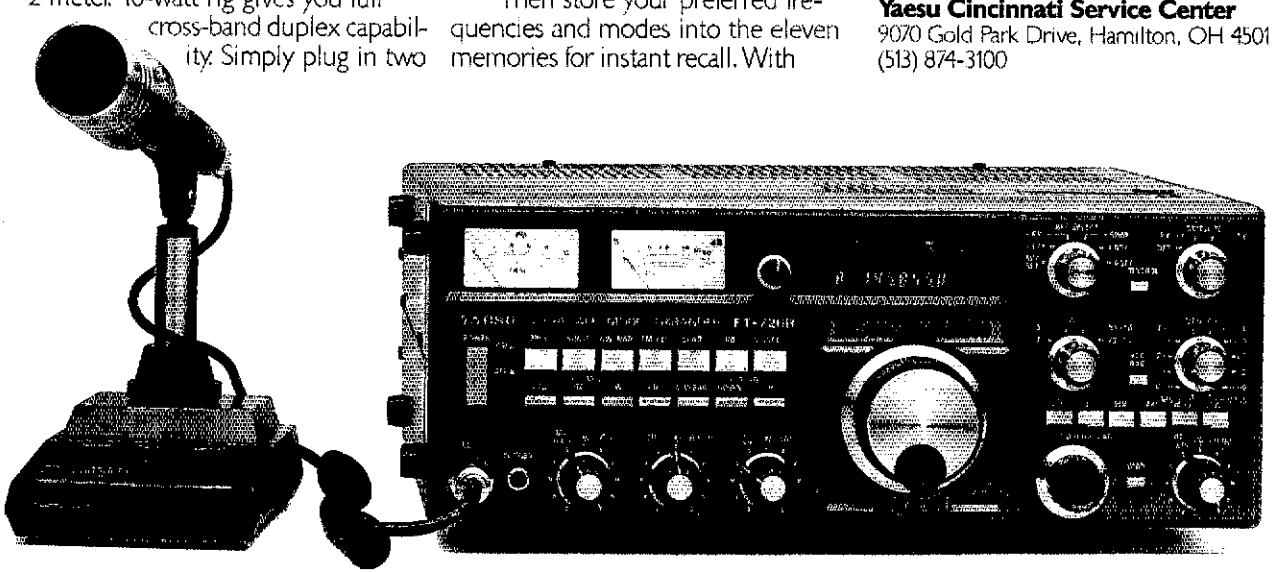


Prices and specifications subject to change without notice.

KENWOOD

pacesetter in amateur radio

TS-930S "DX-traordinary"

TS-930S

We call it "DX-traordinary" because the TS-930S has now become the favorite rig of the serious contester! Its superior capability for full break-in split-frequency operation, the speed and convenience with which its eight memory channels can be accessed, its unsurpassed receiver dynamic range and its remarkable ability to select the desired signal during periods of heavy QRM, utilizing VBT, Slope tuning, IF Notch filtering, and tuneable audio filtering, have all combined to make this the rig that gives you the EXTRA EDGE!

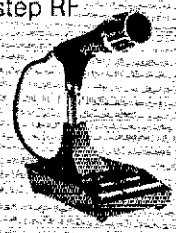
The TS-930S is loaded with all the special features that you always wanted in an HF transceiver. Full coverage of the 160 through 10 meter bands, including the new WARC frequencies, (easily modified for HF MARS), plus a general coverage receiver that can tune any frequency from 150 kHz to 30 MHz. Operation in the SSB, CW, FSK, and AM modes, with selectable full or semi CW break-in. All solid-state, with 250 watts PEP input on SSB, CW, FSK, and 80 watts input on AM. SWR/power meter. Triple final protection circuits plus two cooling fans built-in. 10-Hz step synthesized frequency control. Available with optional automatic antenna tuner built-in, another industry first! Dual digital VFO's. Eight memory channels that store both frequency and band information, with internal battery back-up, (batteries not supplied). Dual mode adjustable noise blankers, especially effective in eliminating "woodpecker" type interference. SSB IF slope tuning, for maximum rejection of interference. CW variable bandwidth, with pitch and sidetone control. IF notch filter. Tuneable audio peaking filter. Unique six digit white fluorescent tube digital display is easy-on-the-eyes during those long contests. RF speech processor, for higher average "talk-power" SSB monitor circuit. 4-step RF attenuator. VOX. 100-kHz marker. AC power supply built-in, 120, 220, or 240 VAC.

TS-930S Optional Accessories:

AT-930 automatic antenna tuner, SP-930 external speaker, with selectable audio filters, YG-455C-1 (500 Hz), YG-455CN-1 (250 Hz), YK-88C-1 (500 Hz) CW filter, YK-88A-1 (6 kHz) AM filter, all plug-in type. SO-1 commercial stability TCXO. MC-60A deluxe desk microphone, MC-80 and MC-85 communications microphones, MC-42S mobile hand microphone. TL-922A linear amplifier (not for CW QSK), SM-220 station monitor, PC-1A phone patch, SW-2000 SWR/power meter, 160 ~ 6 meter, SW100A SWR/power/volt meter 160-2m HS-4, HS-5, HS-6, and HS-7 headphones.

Isn't it about time you stepped into the winner's circle?

More information on the TS-930S is available from authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, California 90220.



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