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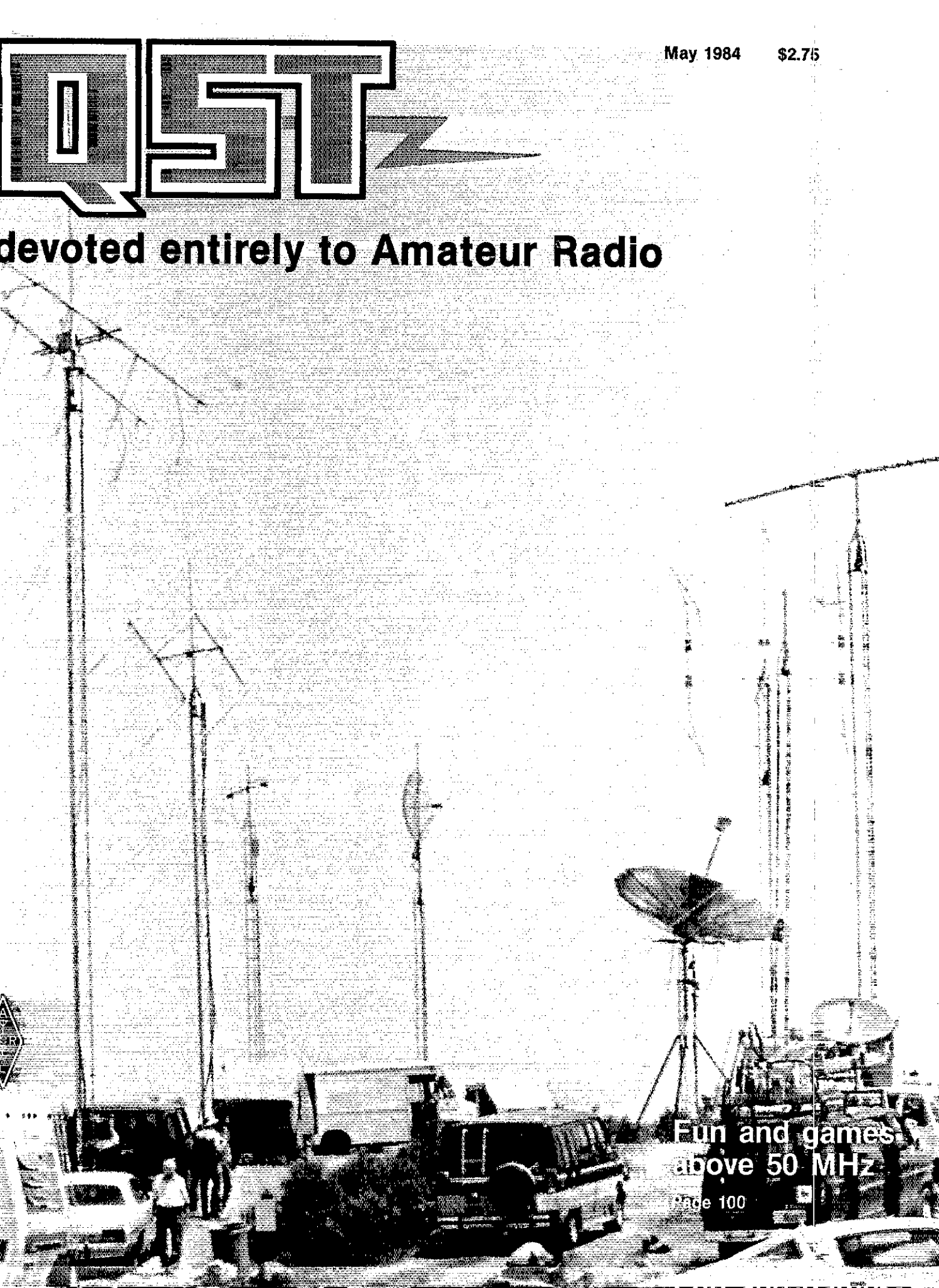

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Page 100

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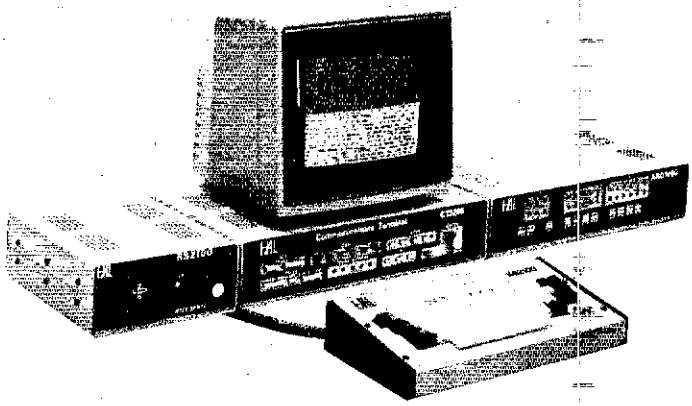
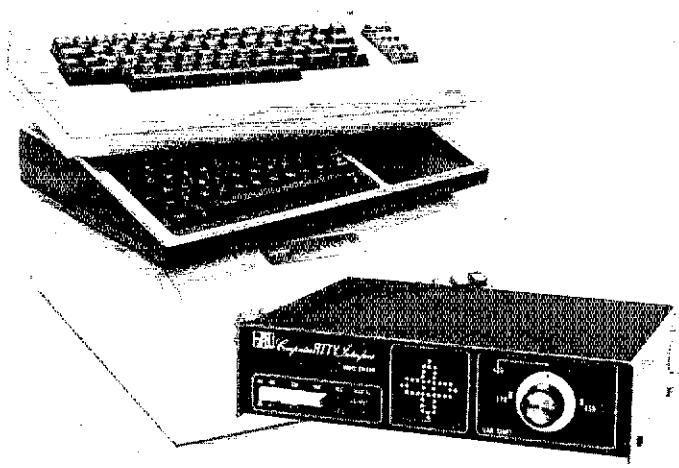
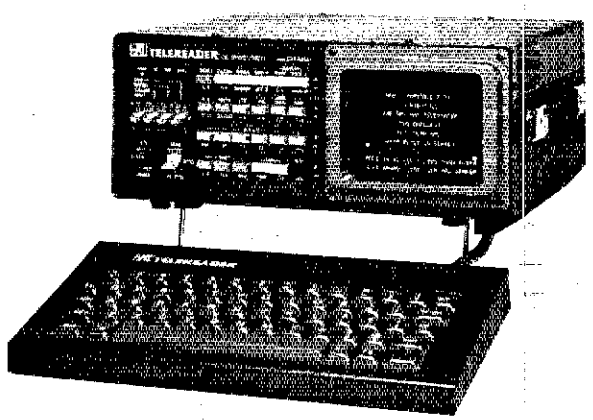
The CT2200 and KB2100 give you an integrated system that includes video, RTTY demodulators (high, low, modem low, and modem high tones), and many advanced features. Operate Baudot or ASCII at 45–1200 baud and CW at 5–99 w.p.m. Add the ARQ1000 for ALL AMTOR features (not just *some* of them). The RS2100 RTTY Scope gives you the acknowledged best tuning indicator for a complete RTTY system. Also included in the CT2200 is selective-call ASCII printer output, split screen, 36 or 72 characters per line, smooth scroll, and 2 or 4 pages of display memory. In addition, the CT2200 has 2 HERE IS and 8 large "brag-tape" memories that are programmable and non-volatile. This is our most popular system, used by thousands of amateurs around the world.







CRI-200:
At last, a computer interface that *really* works and has an accurate tuning indicator. Take advantage of HAL's years of experience in RTTY and see how good computer RTTY can be. Best of all, it's universal and you can select the computer and software of your choice. Why be frustrated with computer RTTY? Hook-up the CRI-200 and work ALL the stations!

CWR6850:
Have a space problem or want portable RTTY? The CWR6850 is a one-package complete RTTY system. All you need is your transceiver and 12 VDC—the rest is in the CWR6850, including the screen. The high-performance RTTY demodulator for all shifts and either high or low tones is built-in. AND, the system is expandable! Add the ARQ1000 for AMTOR, the RS2100 RTTY Scope, and an ASCII printer, and you have a no-compromise base station for all modes.

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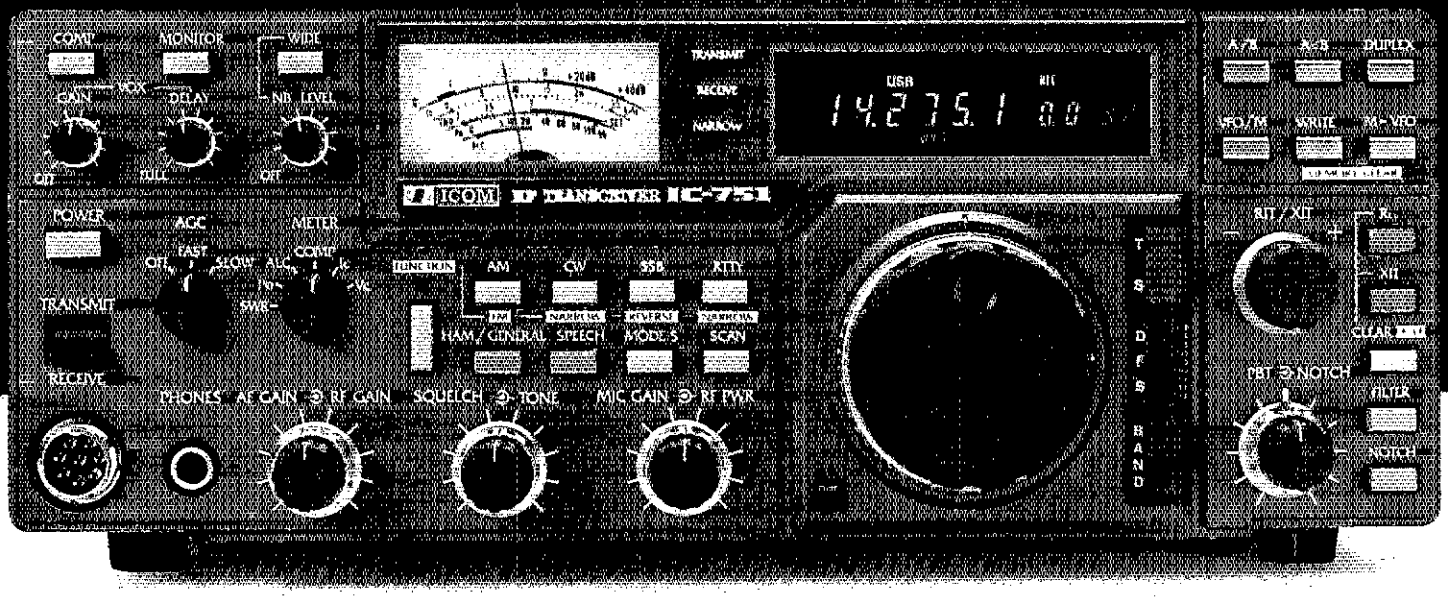
ICOM IC-751

The New Standard of Comparison



ICOM is proud to announce the most advanced amateur transceiver in communications history. Based on ICOM's proven high technology and wide dynamic range HF receiver designs, the IC-751 is a competition grade ham receiver, a 100KHz to 30MHz continuous tuning general coverage receiver, and a full featured all mode solid-state ham band transmitter, that covers all the new WARC bands. And with the optional internal AC power supply, it becomes one compact, portable/field day package.

Receiver. Utilizing an ICOM developed J-FET DBM, the IC-751 has a 105dB dynamic range. The 70.4515MHz first IF virtually eliminates spurious responses, and a high gain 9.0115MHz second IF, with ICOM's PBT system, gives the ultimate in selectivity. A deep IF notch filter, adjustable AGC and noise blanker (can be adjusted to eliminate the woodpecker), audio tone control, plus RIT with separate readout provides easy-to-adjust, clear reception even in the presence of strong QRM or high noise levels. A low noise receiver preamp provides exceptional reception sensitivity as required.

Transmitter. The transmitter features high reliability 2SC2904 transistors in a low IMD (-38dB @ 100W), full 100% duty cycle (internal cooling fan standard), 12 volt DC design. Quiet relay selection of transmitter LPF's, transmit audio tone control, monitor circuit (to monitor your own CW or SSB signal), XIT, and a high performance speech processor enhance the IC-751 transmitter's operation. For the CW operator, semi break-in or full QSK is provided for smooth, fast break-in keying.

Dual Dual VFOs controlled by a large tuning knob provide easy access to split frequencies used in DX operation. Normal tuning rate is in 10Hz increments and increasing the speed of rotation of the main tuning knob shifts the tuning to 50Hz increments automatically. Pushing the tuning speed button gives 1KHz tuning. Digital outputs are available for computer control of the transceiver frequency and functions, and for a synthesized voice frequency readout.

32 Memories. Thirty-two tunable memories are provided to store mode, VFO, and frequency, and the CPU is backed by an internal lithium memory backup battery to maintain the memories for up to seven years. Scanning of frequencies, memories and bands are possible from the unit, or from the IC-HM12 scanning microphone. In the Mode S mode, only those memories with a particular mode are scanned; others are bypassed. Data may be transferred between VFO's, from VFO to memories, or from memories to VFO.

Standard Features. All of the above features plus FM unit, high shape factor FL44A, 455KHz SSB filter, full function metering, SSB and FM squelch, convenient large controls, a large selection of plug-in filters, and a new high visibility multi-color fluorescent display that shows frequency in white, and other functions in white or red, make the IC-751 your best choice for a superior grade HF base transceiver.

Options. External frequency controller, external IC-PS15 power supply, voice synthesizer, computer interface, internal IC-PS35 power supply, high stability reference crystal (less than ±10Hz after 1 hour), IC-HM12 hand mic, desk mic, filter options:

SSB: FL-70
CWN: FL-62A, FL-63A, FL-32, FL-63
AM: FL-33

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The World System

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May 1984 Volume LXVIII Number 5

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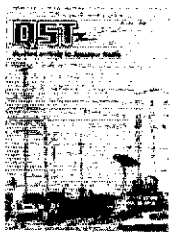
CONTENTS



OUR COVER

If you're into VHF/UHF, you'll want to hone your system for the VHF QSO Party June 9-11 (Rules are on page 100). The W3BBS setup, with antennas for 220, 432 and 1296/2304, was good for second place in the multiop category last year. *(photo courtesy WA3IAO)*

TECHNICAL

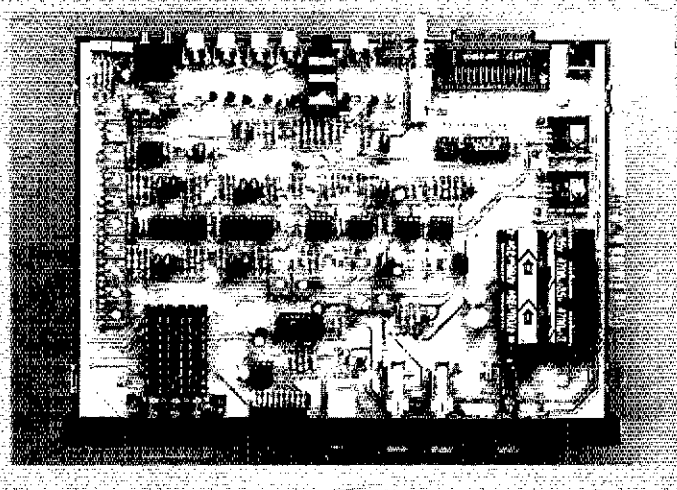
BEGINNER'S BENCH

NEWS AND FEATURES

OPERATING

DEPARTMENTS

CHAMPAGNE RTTY/CW on a Beer Budget



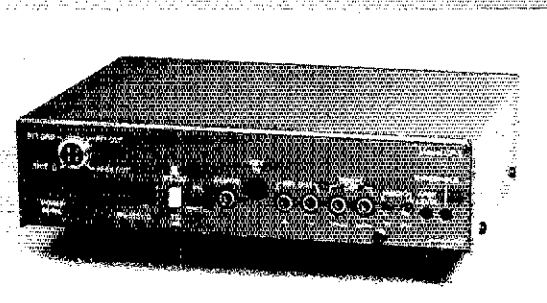
CP-1 Computer Patch™ Interface

The AEA Model CP-1 Computer Patch™ interface will let you discover the fastest growing segment of Amateur Radio; computerized RTTY and CW operation.

When used with the appropriate software package (see your dealer), the CP-1 will patch most of the popular personal computers to your transceiver for a complete full-feature RTTY/CW station. No computer programming skills are necessary. The CP-1 was designed with the RTTY neophyte in mind, but its sophisticated circuitry and features will appeal to the most experienced RTTY operator.

The CP-1 offers variable shift capability in addition to fixed 170 Hz dual channel filtering. Auto threshold plus pre and post limiter filters allow for good copy under fading and weak signal conditions.

Transmitter AFSK tones are generated by a clean, stable function generator. Plus (+) and minus (-) output jacks are also provided for CW keying of your transmitter. An optional low cost RS-232 port is also available. The CP-1 is powered with 16 VAC which is supplied by a 117 VAC wall adaptor included with the CP-1.



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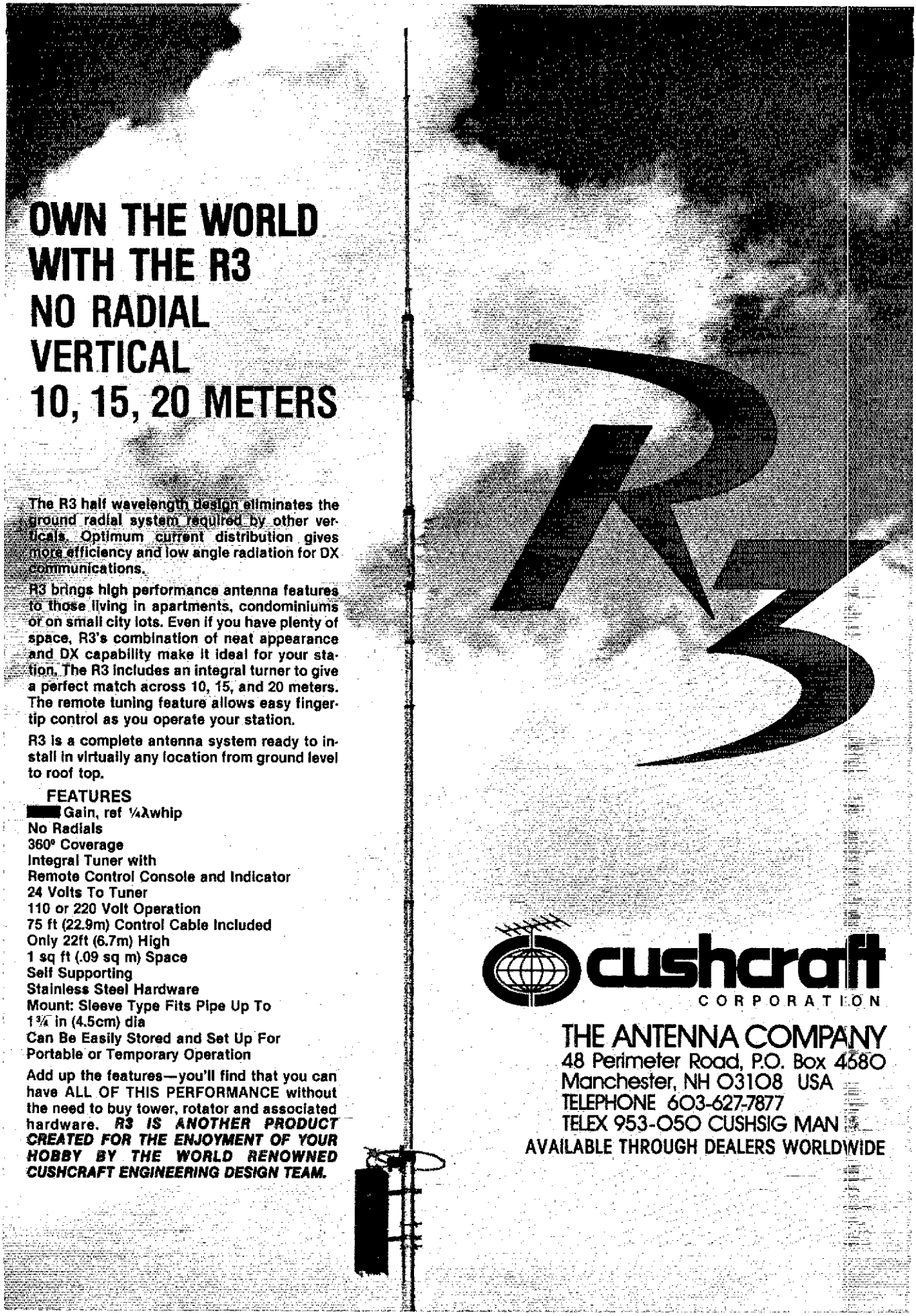

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The R3 half wavelength design eliminates the ground radial system required by other verticals. Optimum current distribution gives more efficiency and low angle radiation for DX communications.

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 turner 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

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- 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
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- 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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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!

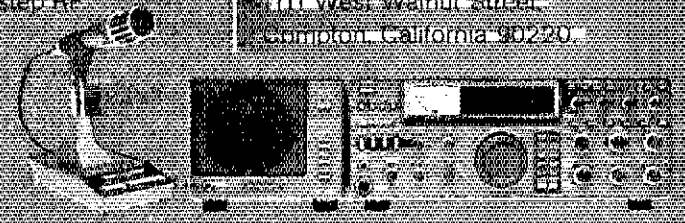
The TS-930S is loaded with all the special features that you always wanted in an HF transceiver. Full coverage of the 160 through 10 meter bands, including the new WARC frequencies, easily modified for HF MARS), plus a general coverage receiver that can tune any frequency from 150 kHz to 30 MHz. Operation 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. Step IF slope tuning for maximum rejection of interference. CW variable bandwidth, with pitch and side-tone 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. SF-930 external speaker, with selectable audio filters. YK-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. SW-100A 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 or Trio-Kenwood Communications, 1111 West Walnut Street, Compton, California 90220.



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TS-430S "Digital DX-terity!"

TS-430S

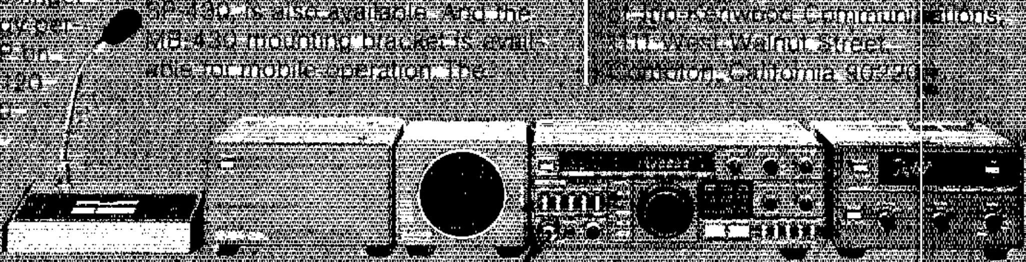
Digital DX-terity... that outstanding attribute built into every KENWOOD TS-430S that lets you easily flow from band to band, frequency to frequency, and from mode to mode with the speed and ease that will give you a dominant position in DX operations.

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 operator's 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 tunable 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 [illegible] CW filters, the YK-88SN SSB filter, and the YK-88A AM filter can be easily installed for serious DX'ing. A 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 160~2 m, 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.



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Central Division

Illinois — David E. Lattan, WD9EBQ, RR 1, Box 234, Makanda 62958 (618-529-1578)
Indiana — Bruce Woodward, W9UMH, 6208 Bramshaw Rd., Indianapolis 46220 (317-251-5606)
Wisconsin — Roy Pedersen, K9FHI, 510 Park St., Juneau 53039 (414-386-4666)

Dakota Division

Minnesota — Helen Haynes, WBØHOX, 3101 N.W. 18th Ave., Rochester 55901 (507-288-2437)
North Dakota — Ron Roche, KØALL, 1437 North University Dr., Fargo 58102 (701-237-9026)
South Dakota — Fredric Stephan, KCØOO, Box 772 - Wind Cave Ranch, Hot Springs 57747 (605-745-6006)

Delta Division

Arkansas — Joel M. Harrison, Sr., WB5IGF, 1403 Forrest Dr., Searcy 72143 (501-268-9540)
Louisiana — John M. Wondergem, K5KR, 600 Smith Dr., Metairie 70005
Mississippi — Thomas Hammack, W4WLF, 9 Cardinal Cove, Long Beach, 39560 (601-864-4452)
Tennessee — John C. Brown, NO4Q, P. O. Box 37, Eva 38333 (901-584-7531)

Great Lakes Division

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Michigan — James R. Seeley, WB8MTD, 14630 Clinton Rd., Springport 49284 (517-569-2411)
Ohio — Allan L. Severson, AB8P, 1275 Ethel Ave., Lakewood 44107 (216-521-1565)

Hudson Division

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N.Y.C.-Long Island — John H. Smale, K2IZ, 315 Kensington Ct., Coplague 11726 (516-226-4835)
Northern New Jersey — Robert E. Neukomm, KB2WI, 404 O'Brien Ct., Wyckoff 07481 (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 — Reynolds B. Davis, KØGND, 1922 Pawnee, Lincoln 68502 (402-421-2415)

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Eastern Massachusetts — Richard P. Beebe, K1PAD, 6 Tracy Cir., Billerica 01821 (617-667-5609)
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 — Reed A. Garfield, WB1ABQ, P.O. Box 571, Lyndonville 05851 (802-626-9430)
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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)

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Nevada — Leonard M. Norman, W7PBV, 1310 Hazelwood St., Boulder City 89005 (801-586-9859)
Pacific — James F. Wakefield, AH6CO, 647 Kunawai La., #201, Honolulu, HI 96817
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)

Roanoke Division

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South Carolina — James G. Walker, WD4HLZ, Rte. 2, Box 432, Marion 29571 (803-423-3645)
Virginia — Claude E. Feigley, W3ATQ, 135 The Main-RR #1, Williamsburg 23185
West Virginia — Karl S. Thompson, K8KT, 5303 Pioneer Dr., Charleston 25312 (304-776-4352)

Rocky Mountain Division

Colorado — William "Bill" Sheffield, KQØJ, 1444 Roslyn St., Denver 80220 (303-355-2488)
New Mexico — Joe Knight, W5PDY, 10408 Snow Heights Blvd., N.E., Albuquerque 87112
Utah — Ronald C. Todd, K3FR, 2112 W. 12060 S., Riverton 84065 (801-254-6051)
Wyoming — Richard G. Wunder, WA7WFC, Box 2807, Cheyenne 82001 (307-634-7385)

Southeastern Division

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Georgia — Edmund J. Kosobucki, K4JNL, 5525 Perry Ave., Columbus 31904 (404-322-2856)
Northern Florida — Billy F. Williams, Jr., N4UF, P.O. Box 9673, Jacksonville 32208 (904-744-9501)
Southern Florida — Richard D. Hill, WA4PFK, 3800 S.W. 11th St., Ft. Lauderdale 33312 (305-583-6932)
West Indies — Gregorio Nieves, KP4EW, 1390 San Bernardo St., Altamesa-San Juan, PR 00921 (809-782-4375)

Southwestern Division

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Los Angeles — Stanley S. Broki, N2YQ, 2645 North Marengo Ave., Altadena, CA 91001 (818-798-8827)
Orange — Sandra Mae Heyn, WA6WZN, 962 Cheyenne, Costa Mesa, CA 92626 (714-549-8516)
San Diego — Arthur R. Smith, W6INI, 4515 Melisa Way, San Diego, CA 92117 (619-273-1120)
Santa Barbara — Ernest L. Kapphahn, WB6HJW, 1404 Grand Ave., Arroyo Grande, CA 93420 (805-481-0311)

West Gulf Division

Northern Texas — Phil Clements, K5PC, 1313 Applegate La., Lewisville 75067 (214-221-2222)
Oklahoma — Arthur E. Roberts, W1GOM, 2208 Elk Dr., N.E., Piedmont 73078 (405-373-3219)
Southern Texas — Arthur R. Ross, W5KR, 132 Sally La., Brownsville 78521 (512-831-4458)

"It Seems to Us..."

Federal Preemption

While the federal regulation of our avocation has been accepted by radio amateurs for more than 70 years, for almost as long we have resisted the efforts of state and local governments to add their own layer of restrictions on our activities. Our best defense has been a Constitutional doctrine known as "federal preemption." Recently, we have used this defense to blunt state and local efforts to "prohibit" interference, to limit amateur antenna installations on questionable grounds, and to "protect" the public against a perceived, but ill-defined, threat of biological effects from RF radiation. Let's take a closer look at this doctrine of federal preemption, to better understand how we can defend ourselves against unreasonable government actions at the state and local levels.

Federal preemption wasn't invented for the convenience of radio amateurs; its roots go back to the founding of the Republic. Article VI of the Constitution of the United States provides that the Constitution, the laws made pursuant to it, and the treaties made by the U.S. shall be the supreme law of the land. Where there is a conflict with state law, the state law must yield. The Supreme Court of the United States has applied this general principle to innumerable specific decisions over the years. What has emerged is that there are at least two degrees of preemption. By acting to regulate a particular area, Congress either can be assumed to have completely occupied the regulation of that area, or to have left some room for state action within the framework of, and consistent with, federal law. The intent of Congress at the time legislation is adopted is important to this determination.

Perhaps the most important legal case involving Amateur Radio was decided in 1927: *Whitehurst v. Grimes.* At the time, tensions were high between amateurs and broadcast listeners, and a number of communities had set out to protect broadcast listeners from interference by restricting, licensing, taxing or prohibiting Amateur Radio operation. The ARRL Board, recognizing that this harassment had to be nipped in the bud, asked attorney (and Rocky Mountain Division Director) Paul M. Segal, 9EEA, to pick a suitable test case where the issue could be confronted squarely and with the best chance of success. A suit brought against Portland, Oregon, collapsed when Portland amended its ordinance so it would not apply to federally licensed stations. Segal then moved against the city of Wilmore, Kentucky, on behalf of R. B. Whitehurst, 9ALM, to overturn an ordinance requiring a $100 license to operate an amateur station within the city. The U.S. District Court decision that Amateur Radio is interstate commerce, and thus is subject only to federal regulation, became the cornerstone of our defense against local "nuisance" ordinances. (Segal's success led to his appointment in 1928 as General Counsel of ARRL, an association that was to endure until 1961.)

Of course, *Whitehurst v. Grimes* did not mark the end of local efforts to regulate Amateur Radio; one need not look very far to find current examples that are not quite as outrageous as that of Wilmore, Kentucky, but are dangerous nonetheless. An important weapon was added to our arsenal with the enactment of Public Law 97-259 in 1982. Not only did Congress give the FCC specific authority to regulate the interference susceptibility of electronic devices; it also made clear that the field of RF interference has been fully preempted, and is not subject to local or state regulation. However, more remains to be done, and is being done, by ARRL.

For several years, *QST* has chronicled the efforts of a blue-ribbon panel of volunteer League members, experts in the biological effects of RF energy, to have the federal government establish reasonable standards for exposure of the general public to nonionizing radiation. The need for such standards is not altogether clear; but what *is* clear is that, in the absence of such federally mandated standards, we (and others licensed to generate RF energy) will be subject to a crazy quilt of ill-conceived and poorly drafted state and local regulations on the same subject. Fighting such regulatory efforts at the local level is a terribly costly and inefficient process; what is required to prevent regulatory chaos is for the federal government to preempt the field by adopting standards that have a sound scientific basis and provide every reasonable measure of protection, but are not unduly restrictive. Such standards already have been developed by the American National Standards Institute (ANSI) and are known as ANSI-C95.1-1982. In March, the League again urged FCC to take the long-overdue step of endorsing the work ANSI has done in this field.

Antenna regulations are a more complex area, because local interest in the safety of an antenna installation cannot be denied. In most cases, a municipality will not quarrel with the right of a federally licensed operator to have *some* sort of antenna on his property although this right can be signed away through a deed restriction, restrictive covenant or similar legal device. However, the size (and most especially, the height) of the antenna system is something else again. Somewhere between a roof-mounted whip and a 200-foot tower on a city lot, local interest asserts itself — and existing federal law is little help in determining where the line is to be drawn.

Because every situation is different, the line can never be drawn precisely. Even so, it would be an enormous help to radio amateurs throughout the country for Congress to establish that the federal interest precludes local regulation which would render our antennas ineffective or unreliable. It was with this objective in mind that the ARRL Board established a Task Force on Federal Preemption at its meeting last October. The Task Force has been researching the issue and developing strategy, and a brief synopsis of its first report is contained in the Board Meeting minutes in this issue (see "Moved and Seconded").

Much as we may sometimes complain about our federal regulations, and the snail's pace at which even simple changes sometimes are made, it would be infinitely worse to be subject to the whims of tens of thousands of local governments, most of them totally devoid of any understanding of radiocommunication. The next time you're thinking about the benefits of our Constitutional form of government, you can add one more to the list. — *David Sumner, K1ZZ*

League Lines...

Congratulations to ARRL's leaders, elected at the March Board Meeting: Larry Price, W4RA, President; Leonard Nathanson, W8RC, First Vice President; Gar Anderson, KØGA, Second Vice President; Jay Holladay, W6EJJ, Third Vice President; Richard Baldwin, W1RU, International Affairs Vice President; David Sumner, K1ZZ, Secretary; James McCobb, K1LLU, Treasurer. President Price has appointed Al Hart, W8VR, as Vice Director of the Great Lakes Division, and Wayne Overbeck, N6NB, as Vice Director of the Southwestern Division. These positions became vacant when W8RC and W6EJJ were elected by the Board as Vice Presidents. See the Board Meeting article on p. 54.

ARRL's request for the elimination of power restrictions on 160 meters has been approved by the FCC. The Commission's Order was adopted on March 22 and released March 27. Effective immediately, A1 and A3 emissions with a maximum PEP output of 1500 watts are permitted in all areas under FCC jurisdiction over the entire 1800-2000 kHz band. The League's petition asking for F1 emissions on 160 meters has not been acted upon yet. See Happenings, p. 64.

In response to Board Minute 72, the ARRL filed a Motion for Expedited Action for the expansion of phone segments in the 75-, 15- and 10-meter bands, PR Docket No. 82-83. The League filed timely comments on an FCC Further Notice of Proposed Rulemaking in July last year. (See QST, September 1983, p. 63.) This proceeding is now two years old, and a year has lapsed since comments were filed in response to that further Notice.

The petition filed by Wayne Green, W2NSD, asking that radio amateurs be retested for Morse code proficiency every two years, until 35 WPM is achieved, was dismissed by the FCC on March 9, without a Rulemaking number.

The ARRL filed a Petition for Rulemaking requesting that the new ham bands at 24.890-24.990 MHz and 902-928 MHz be opened up for amateur use. With regard to the 24-MHz band, the League requests that the lower 40 kHz be reserved for A1 and F1 emissions, with the upper 60 kHz available for other modes. Amateur operation on the 900-MHz band will be subject to limitations. Since the amateur status on 900 MHz will be secondary, hams must tolerate interference from the primary services -- industrial, scientific and medical (ISM) devices, government users and others, including perhaps microwave ovens on 915 MHz. Details on p. 64.

Rates for multiple-year ARRL Membership have decreased. Now you can save $10 if you renew or join the League for three years. You'll save $3 for a two-year membership.

Acting on information provided by Fort Worth Amateur Radio operators, the Dallas FCC Office recently investigated illegal use of the 2-meter amateur band. As a result of this action, Hanson Properties, of Arlington, TX was fined $2000 for operating an unlicensed radio station on 144.08 MHz. The operation was, in fact, coordinating commercial business activity on an amateur frequency. Investigation revealed that this operation had been going on for six months.

Over 12,000 W5LFL SWL QSL cards have been mailed. Volunteers from the Poughkeepsie (NY) Amateur Radio Club, Murphy's Marauder's Contest Club (CT), the Newington Amateur Radio League, and others, stuffed the cards and related promotional materials into the envelopes. The two Newington clubs had a chance to become famous when George Barker, WB8PBC, who works for a local NBC-affiliated TV station, showed up with the TV camera! An interesting wrap-up of the W5LFL/STS-9 mission was aired on the evening news.

To all Charter Contributors of $100 or more to the Goldwater Scholarship Fund: Your signed photographs of the Senator will be delayed a while. Barry has expressed a willingness to have a unique, one-of-a-kind photograph taken of himself operating his station at his home QTH in Arizona during an upcoming Senate recess. This promises to be a collector's item. Information on how you can contribute to the Goldwater Scholarship Fund and receive this photo is on p. 66.

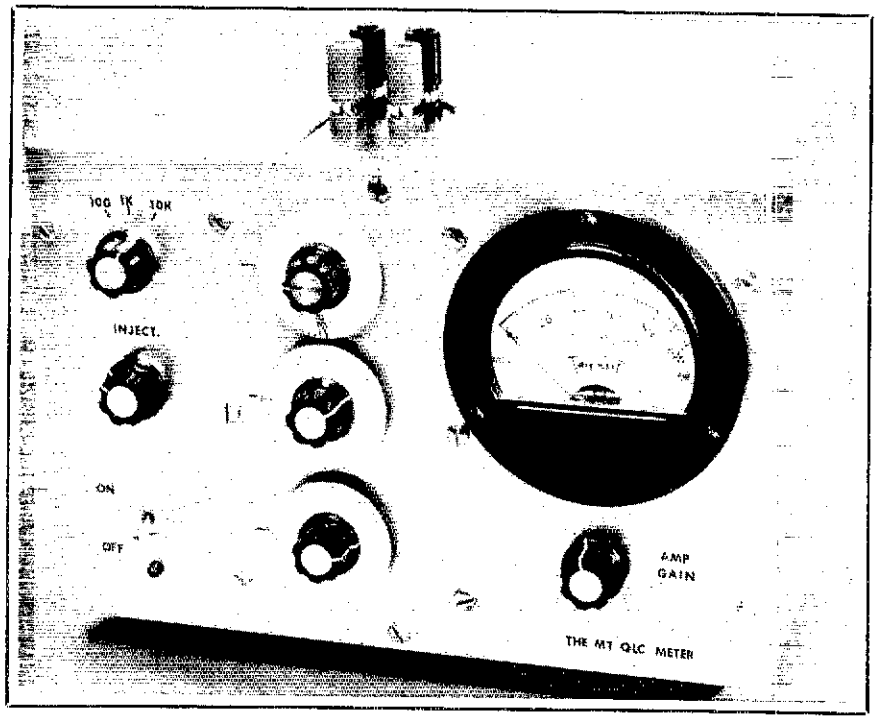
The deadline for Net Directory listings is June 1. Please include net name, frequency, meeting days, times in UTC and the manager's call sign. A Net Directory registration form, CD-85, is available from ARRL Hq. for an s.a.s.e.

The State Department has informed ARRL Hq. that a new third-party-traffic agreement is now in effect between the United States and Dominica (J7).

A Crystal-Controlled Q Meter

Now you can measure coil Q as well as inductance and capacitance without straining your budget. This piece of test equipment will be a welcome addition to your bench.

By Frank Noble,* W3MT



Inductors and capacitors in tuned circuits cyclically store and return energy without losing much of it. The quality factor, Q, is proportional to the ratio of energy stored to energy lost per cycle. Since capacitors are quite efficient, it is customary to assign all losses to the coil.

Coil Q is affected by coil geometry, the type and size of wire used to wind the coil, the type of insulation used, the coil-form material, and the core (if any) and the coil proximity to other conductors. The number of factors involved requires some means to measure Q rather than attempting to calculate it. Commercial Q meters do this. Unfortunately, the cost of one of these instruments is beyond the means of most of us. This article is intended to provide you with a Q meter of reasonable cost, complexity, size and accuracy.

Q Measurement

In the circuit used here, Q is measured by the reactance-variation method.[1] First, the circuit is resonated and the meter set to full scale. The circuit is then detuned to the high-capacitance side of resonance to obtain a reading of 70.7% of full scale, and the capacitance, C2, is noted. Then, the circuit is tuned to the 70.7% point on the low-capacitance side of resonance, and the capacitance, C1, is recorded. The Q is determined from the ratio of the sum to the difference of these capacitances as shown in Fig. 1. Q values from 10 to 500 are readily determined.

Table 1
Q-Meter Constants and Variables

ω_o (radians/s)	ω_o^2 (radians/s)	f_o (MHz)	L (μH) C (pF)	Range Switch Position	C Range (pF)	L Range (μH)
10^8	10^{16}	15.915	100	100	40-440	0.227-2.5
3.16×10^7	10^{15}	5.0328	1K	1K	40-440	2.27-25
10^7	10^{14}	1.5915	10K	10K	40-440	22.7-250

Inductance Measurement

Since

$$L = \frac{1}{\omega_o^2 C} \qquad \text{(Eq. 1)}$$

where

$\omega_o = 2\pi f_o$
f_o = frequency
C = capacitance
L = inductance

the calculation of inductance is made easier by selecting frequencies for which $\omega_o^2 = 10^n$, where n is an integer. This is shown in Table 1.

As an example, when the RANGE switch is in the 1K position and the meter peaks when C = 200 pF, the inductance is 1000/200 = 5 μH. The capacitance used to tune the unknown coil is comprised of three variable capacitors having ranges differing by factors of 10. This is required so that coils of widely different inductances and Q values may be tuned with ease.

Capacitance Measurement

Capacitances in the 0-400 pF range may be measured by substitution. A coil with an inductance slightly greater than 2.27 μH is tuned to resonance in the 1K range. The capacitance value is noted. The unknown capacitance is then connected to the C terminals, and the tuning capacitance is decreased to re-establish resonance. The difference between the two dial readings is equal to the unknown capacitance.

Hardware

Refer to Fig. 2. Note that a crystal oscillator is used instead of an LC VFO. This is because it

[1]Notes appear on page 14

*10004 Belhaven Rd., Bethesda, MD 20817

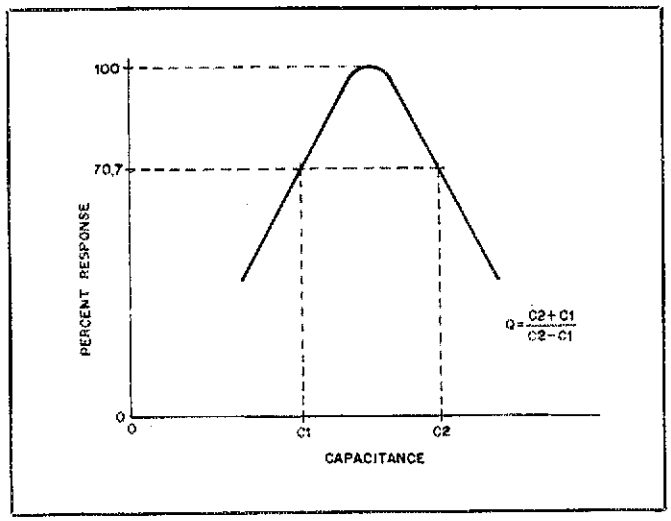
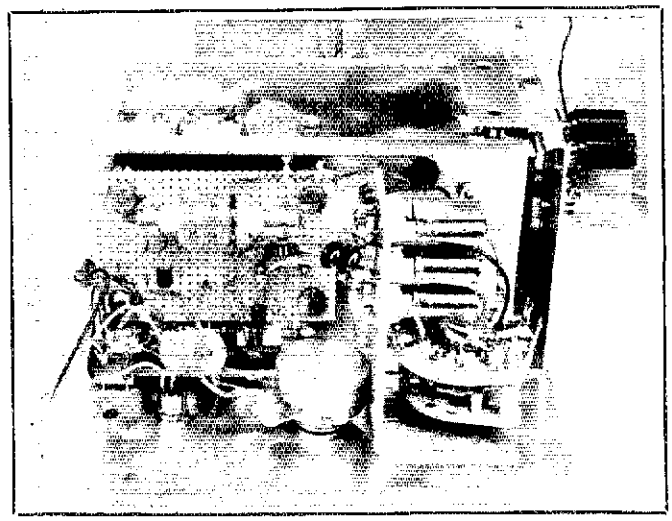


Fig. 1 — Resonance curve showing the relationship of Q to relative response and capacitance.



The oscillator compartment is shown at the left. Crystals and range switch are to the right.

• produces a frequency that is known to a high degree of accuracy.

• will not exhibit large frequency changes with time.

• is less sensitive to pulling when the test circuit is tuned.

• is less expensive to build than LC oscillators.

• is easy to get working properly.

A JFET Pierce circuit with diode clamping is used because it is forgiving and does not need a tuned circuit. Separate feedback capacitors are used with each crystal because crystals have "personalities" and require some trimming to obtain a good output waveform at a given output voltage. In my unit, the high-frequency crystal has a good waveform and

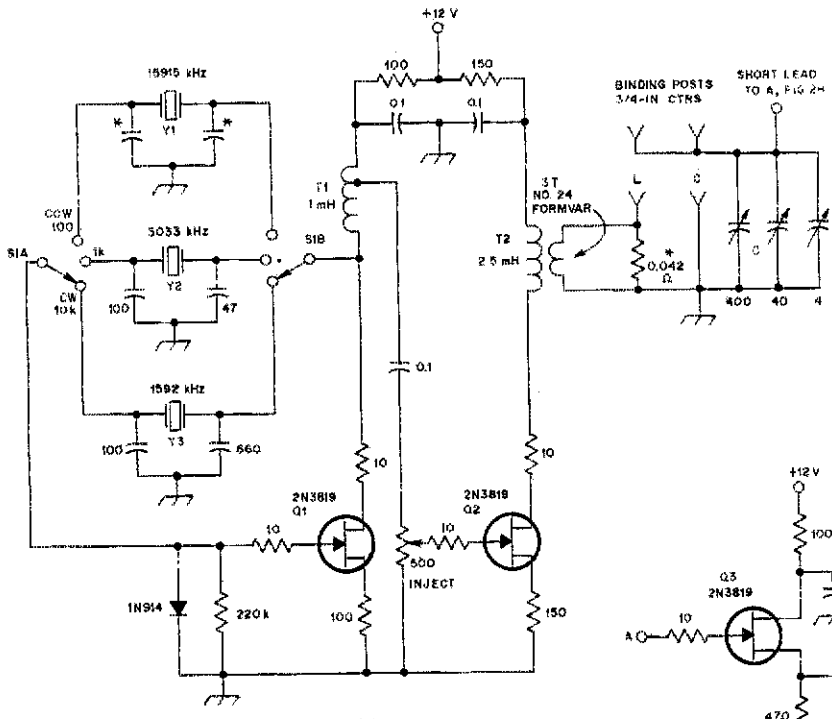


Fig. 2A — Y1-Y3, incl. are HC-6/U-type fundamental-mode crystals having 0.005% tolerance and 32-pF load capacitance ratings. They are available from JAN Crystals, 2400 Crystal Dr., P.O. Box 06017, Fort Meyers, FL 33906-6017. T1 is a three-pie RFC on a ceramic form and is tapped one pie up from the cold end.[4] The tap and lead are reinforced by filling the space between the adjacent pies with quick-setting epoxy. T1 and T2 should be kept separated from each other and preferably be at right angles to one another. T2 is a four-pie RFC on a ceramic form. The secondary winding is placed in the space above the first pie from the cold end of the choke. Anchor the secondary winding with epoxy cement. Q1-Q3, incl., are Radio Shack 276-2035 N-channel FETs.

Fig. 2B — The source follower and RF amplifier stages are shown in this schematic diagram. The detector output approximates the peak-to-peak output of U1, about 1 V maximum.

reasonable output without the aid of additional capacitors. So, I trimmed the other two crystals to provide the same output voltage and waveform. Different oscillators and crystals will require somewhat different values of capacitance. A high-frequency scope is required to properly perform this trimming. The unbypassed source resistor improves the waveform. Output is taken from a tap on the drain RF choke. Assuming unity coupling in the choke, the 500-ohm INJECT potentiometer reflects as 4.5 kΩ at the drain, which is a reasonable load for the oscillator. The low-resistance potentiometer is required to minimize capacitance effects at the high frequencies employed here.

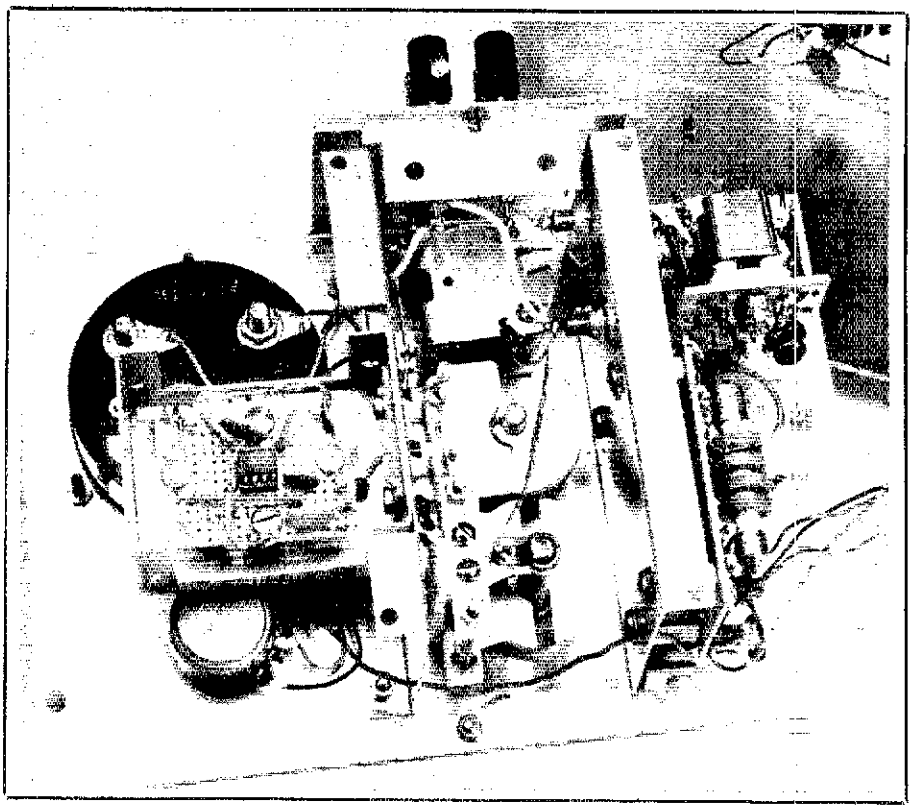
Buffer Q2 is another JFET with an RF choke serving as an untuned output transformer. The three-turn secondary provides a low output impedance suitable for driving the injection resistance. This choke should differ in value from that of the oscillator choke to discourage spurious oscillations. An unbypassed source resistor reduces waveform distortion.

The test circuit components are shielded from the oscillator so that coupling is restricted to the 0.042-ohm injection resistor. This resistor must be small in value compared to the smallest series resistance expected in the unknown coils; otherwise, it will degrade the coil Q. I use a straight piece of no. 36 wire about 1-3/16 inches long.[2] Its exact resistance does not matter, and long-term drift in its value will not affect the measurement accuracy. The variable capacitors are placed as close together as possible, and wired with the shortest and heaviest-gauge wire that is mechanically usable. This minimizes the residual inductance. More about that later.

The amplifier is thoroughly shielded and decoupled from the oscillator and the test circuit because any signal arriving from a source other than the hot side of the coil will produce errors. It is placed in its own shield box on the far side of the shield partition. The gate lead to the JFET source follower is short and has low capacitance to ground to minimize the capacitive load presented by the amplifier. A JFET is used in lieu of a MOSFET because it has lower input capacitance and nearly as high an input resistance. More importantly, it is not subject to gate failure created by the inevitable transients produced during testing. To maximize the input impedance, no gate resistor is used. The gate return is through the test coil. For this reason, power should be applied only when a coil is connected in the circuit.

The RF amplifier, U1, is an IC designed for AGC-controlled IF amplifiers. Its gain is adjustable over a wide range by means of a panel-mounted potentiometer. The meter is driven by a simple rectifier/filter using germanium diodes (silicon diodes are not as linear at low signal levels).

An IC-regulated, 12-V power supply is built on the inside of the back cover plate. It is controlled by a toggle switch on the front panel. An LED connected to the 12-V bus serves as an on/off indicator. The cabinet is of unfinished aluminum measuring 5 × 6 × 9 inches (HWD).



All shield covers have been removed for this photo. The meter amplifier is at the left, the calibrated tuning capacitors are in the center, and the oscillator section is on the right. Note that the meter amplifier is enclosed in a small aluminum box. A shield plate covers the rear of the variable capacitor compartment when the unit is assembled.

Calibration

The variable capacitors must be provided with dials having skirts that allow hand calibration. I made skirts by shearing 1½-inch holes in thin aluminum with a punch. The cutouts were flattened in a vise, and the edges were smoothed with a file. Manila folder paper is glued to the skirts, which are then epoxied to the knobs. Calibration is performed using a CMO operating on 160 meters.[3] A 10-pF capacitor is used to simulate the input capacitance of the source follower. The smaller capacitors are set at minimum capacitance and labeled zero at the proper location. Their minimum capacitance is charged against the main capacitor; their calibration is in added capacitance. Calibration marks are made directly on the manila-covered skirts, then transferred to typewriter paper. These second scales may then be labeled and glued in position on the skirts. The index marks are placed on the left side because the dials are stacked closely in the vertical direction. Such placement provides more room for labeling.

Operation

For all measurements, a coil is connected to the binding posts *before* the instrument is energized, and removed *after* it is turned off. This is because the source-follower gate return is through the coil. Meter transients will occur if power is applied before the coil is connected.

For inductance measurements, the RANGE switch is set for the estimated inductance. The INJECT control and the amplifier GAIN are set at midrange, and the coil is resonated using the largest capacitor. The INJECT and GAIN controls are adjusted to keep the meter on scale. Exact peaking is done more easily with one of the smaller capacitors, depending on the inductance and Q of the coil. The inductance in μH is equal to the RANGE switch reading divided by the sum of the capacitance readings in pF.

For Q measurement, the meter reading is maximized by using the variable capacitors, then set to full scale by the INJECT and GAIN controls. (The amplifier must be linear; for this reason, it is wise to keep the injection level low.) The circuit is then detuned to 70.7% of the response on the high-C side of resonance, and the total capacitance, C2, is noted. Then, the

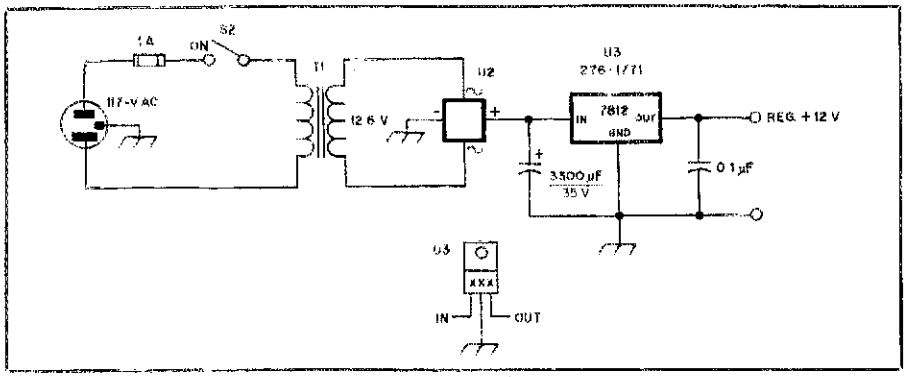


Fig. 3 — Schematic diagram of the built-in, IC-regulated 12-V supply. Power transformer T1 has a 117-V primary and a 12.6-V/300-mA secondary (273-1385). U2 is a 1.4-A/100 PIV bridge rectifier (276-1152), and U3 is a 7812 regulator IC (276-1771). Part numbers in parentheses are Radio Shack. The input and output capacitors for the regulator should be placed as close as possible to the IC using minimum lead lengths.

circuit is detuned to the 70.7% point on the low-C side, and the total capacitance, C1, is recorded. The Q is the ratio of the sum to the difference of the values as shown in Fig. 1. Capacitance is measured by the substitution method explained earlier.

Accuracy

Measurement accuracy depends on the tolerance of the capacitance standards employed. I used 100-pF, 5-% silver-mica capacitors for reference. As explained in note 1, apparent L (which, for reasonably good coils, is close to true L) is measured. Corrections may be made if better accuracy is desired. The same is true for Q. In the case of very good coils, the Q measurement will not be highly accurate because C2 – C1 may be less than 1 pF, which is difficult to interpolate. A fourth variable capacitor with a range of 0.4 pF might be used to cover such situations.

In the 100 RANGE position, a correction for residual inductance should be made. In my unit, the residual inductance measures 0.114 µH. This is simply subtracted from the value obtained with the Q meter. The residual inductance will vary with the components and wiring used, so it must be measured. To do this, shunt the L terminals with the shortest possible piece of no. 14 wire and add external capacitance to the C terminals. These capacitors should have the shortest leads possible, and the leads should be of heavy gauge wire to minimize inductance. When resonance is achieved, the residual inductance (in µH) is found by dividing 100 by the sum of the capacitance (in pF).

Discussion

Coil Q determines the maximum selectivity of any passive tuned circuit in which the coil is used. Thus:

$$B = \frac{f_o}{Q} \qquad \text{(Eq. 2)}$$

where

B = the half-power bandwidth

f_o = the resonant frequency.

Q also enters into the expression for the equivalent parallel resistance of a parallel resonant circuit since

$$R_p = Q\,\omega_o L = \frac{Q}{\omega_o C} = QX \qquad \text{(Eq. 3)}$$

In many cases, the desired operating Q may be lower than the unloaded Q of the coil. The operating Q may be lowered by adding resistors in series, or in parallel, with the coil. Knowledge of the coil Q is necessary to calculate the values of these resistors, however. Since the operating Q may never exceed the coil Q, high-Q coils are desired for flexibility.

As a practical matter, the Q in many cases need not be known to great accuracy, but its general order of magnitude is required. The problem arises frequently where a "junk box" coil with a slug or toroidal core is considered for use at a particular frequency. The Q meter will determine the inductance easily and accurately. If the Q is 30 or more, the coil will be suitable for most purposes. The Q meter is also an accurate and easily used capacitance meter for values below 400 pF.

There you have it. This simple instrument will measure Q, L and C over the range of values commonly used at frequencies from 160 to 10 meters. It is easy to build and use, and should prove to be a reliable instrument. No bench should be without one. I'd like to thank Dick Schellenbach, W1JF, for many helpful discussions throughout the course of this project.

Notes

[1] Terman and Pettit, *Electronic Measurements*, 2nd ed. (New York: McGraw-Hill, 1952), p. 96.

[2] num = in × 25.4.

[3] F. Noble, "CMO — A Capacitance Measuring Oscillator," *QST*, Aug. 1979, p. 38; Sept. 1979, p. 23.

[4] A pie (or pi) is one of several pie-shaped coils spaced along a single core or form and connected in series to form a larger inductor.

Strays

QEX: THE ARRL EXPERIMENTERS' EXCHANGE

☐ Wonder what you've been missing by not subscribing to *QEX*, the ARRL newsletter for experimenters? Among the features in the April issue were:

- "A Wide-Band Instrument Amplifier," by Clint Bowman, W9GLW
- "A Practical Digital Control Unit for the ICOM 720A," by Bob Young, VK4BRY (a *RADCOM* reprint)
- "AMTOR in Australia," by S. E. Molen, VK2SG

QEX is edited by Paul Rinaldo, W4RI, and is published monthly. The special subscription rate for ARRL members is $6 for 12 issues; for nonmembers, $12. There are additional postage surcharges for mailing outside the U.S.; write to Headquarters for details.

CALL FOR *QST* TECHNICAL ARTICLES

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Submit a short summary or outline to Paul Rinaldo, W4RI, Manager, Technical Department, ARRL, 225 Main St., Newington, CT 06111. — *Paul K. Pagel, N1FB, Assistant Technical Editor*

I would like to get in touch with...

☐ anyone who has service manuals for the Yaesu FL-101 transmitter and the FR-101S receiver. John J. Slaveter, KA2TFA, 1681 Blue Jay La., Cherry Hill, NJ 08003.

Next Month in QST

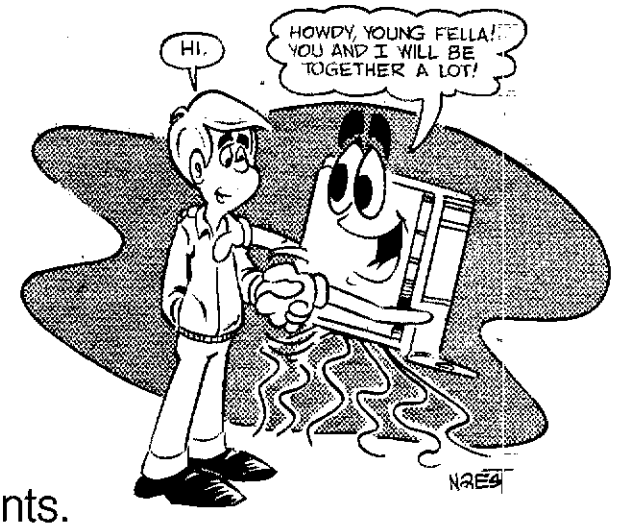
There's always lots to do in June: make final adjustments to the antenna system replacing the one that blew down during that March storm, get ready for Field Day and the VHF QSO Party, and enjoying those long, warm days.

One way to enjoy yourself, in a hammock or elsewhere, is to absorb the contents of *QST*, which will include:

- tips on operating from overseas
- an easy-to-build 20-meter antenna project that's just the ticket for Field Day
- a simple computer-interface project for the IC-720
- results of the latest Simulated Emergency Test

• *First Steps In Radio*

An Introduction to Coils and Transformers



Part 5: This time, we'll take a look at two useful and common components. Coils are simply turns of wire wrapped around a form, while transformers change (transform) a voltage. What could be simpler?

By Doug DeMaw,* W1FB

Can we get by without coils and transformers in our Amateur Radio pastime? If we worked only with logic circuits and audio amplifiers, the answer might be "yes." But receivers, transmitters, antenna systems and most power supplies require some type of transformer and/or coil. Let's look at how coils and transformers fit into the overall scheme of things.

Meet the Coil

A fancier name for a coil is *inductor*. Each coil, depending on its diameter and the number of conductor turns it uses, has a property known as inductance. Inductance is defined as the "property of an electric circuit by virtue of which a varying current induces an electromotive force in that circuit or in a neighboring circuit."

The basic unit of inductance is the henry, abbreviated H. Our radio math can be carried out much more conveniently if we work with small fractions of the henry, such as the millihenry (mH) or microhenry (μH). A mH is 1/1000 of a henry, or 10^{-3} henry. A μH is 10^{-6} henry and a nanohenry (nH) is 10^{-9} henry. Inductance values of 1 H or greater are common only in audio and power-supply circuits. It is important to familiarize yourself with these various expressions of the henry, since you will encounter them often.

Types of Coils

Most of the large coils are wound on insulating cylindrical forms. Some are self-supporting, or "air wound." Generally, the conductor is large-diameter copper wire, but some very large coils are fashioned from copper tubing. Large conductors are needed to create a self-supporting coil. Other large coils are semi air wound; that is, they have high-grade insulating material in the form of ribs that are spaced 90 degrees apart, parallel to the axis of the coil. The coil turns are essentially air wound between the four ribs (see Fig. 1). Two

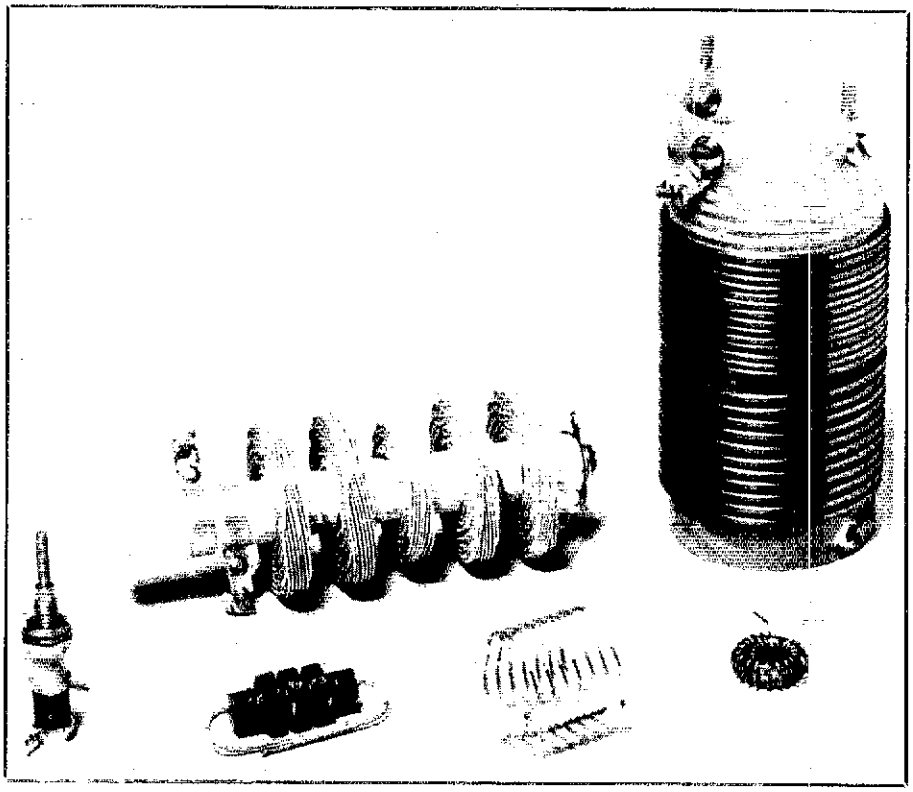


Fig. 1 — A variety of coils. Clockwise, from the left, are: a slug-tuned coil with the adjustment screw visible at its top, a high-power RF choke for transmitters, a homemade coil wound on a cylindrical insulating form, a small toroidal coil, an air-wound Miniductor coil and a small RF choke.

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firms make coils of this type (Barker & Williamson Miniductors® and Poly Coils Co.).

Most of the smaller coils we will use are wound on some type of insulating form, and the wire gauge is small — usually no. 20 to, say, no. 40 gauge. Small coils are suitable in low-power circuits, but large air-wound inductors are the rule when working with high power. Today's miniature coils are wound on high-quality plastic, ceramic or phenolic forms. The coils may have only a single layer (solenoidal) of wire, or many layers may be stacked atop one another to obtain high values of inductance. The wire used in these little coils must be insulated to prevent the turns from shorting to the adjacent ones. Most large air-wound coils use bare wire for the conductors.

Another common style of inductor is the toroid. The coil is wound on a toroidal core, which is doughnut-shaped. Fig. 1 shows such a coil. The toroidal core may be made from ferrite or powdered-iron material. The exact nature of the particular core (there are many types) will determine the final inductance value for a given number of turns. This magnetic core material will always yield a higher-inductance coil than we would obtain when using an equal number of turns on a standard insulating form, or if our coil happened to be an air-wound type.

Similarly, many small coils contain a movable iron or ferrite core (slug). The slug provides a range of inductance for a specified number of turns of wire. These slug-tuned inductors are very convenient when we need to adjust the inductance for a critical value in our circuits. You will often hear an amateur say that he or she "tweaked" a circuit for correct performance. Generally, this means that the ham adjusted the slug in a coil, or perhaps adjusted a trimmer capacitor.

Some adjustable coils contain brass slugs. These are used chiefly at very high frequencies (VHF). The brass core has the opposite effect of powdered iron or ferrite: it *decreases* the inductance of a coil.

We should be aware that there is also a style of coil contained within an enclosure made from ferrite material. The coil is wound on an insulating form or bobbin, and the halves of the core material are bolted together (or cemented) over the bobbin. These units are called *cup cores* or *pot cores* (see Fig. 2). The core halves increase the coil inductance, just as an iron or ferrite slug does in a slug-tuned coil. The advantage of the pot-core inductor (or transformer) is that the outer shell provides a shield, just as would be true if a plain coil was mounted within a metal enclosure. The shielding is helpful when we want to isolate our coil from adjacent circuit elements.

No matter what form a single inductor has, it is a coil. You will hear about radio-frequency (RF) chokes. They are simply coils used for a specific purpose. You may also hear of coils being called *reactors*. In essence, these terms indicate that we're using the "same players in different games."

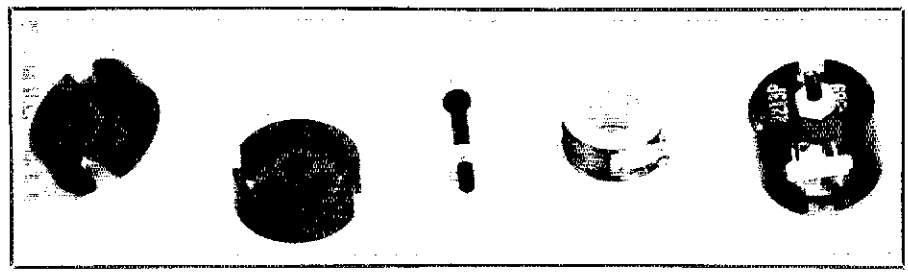


Fig. 2 — A pot-core or cup-core assembly. To the left is a break-down view of the core halves and the insulating bobbin that contains the coil winding. The unit at the right is a completed pot-core coil with the core halves bolted together.

Some Common Coil Applications

First, let's look at the coil symbols we are going to find in schematic diagrams. Memorize these, for you will be using them many times. The common designations are given in Fig. 3.

Thus far we've talked a lot about coils, but haven't shown examples of their use. Let's contrive an imaginary circuit for the purpose of illustration. Fig. 4 shows a suitable example in schematic form. Here we have a two-stage transistorized code transmitter. Q1 is the oscillator, and it creates our signal when the telegraph key is closed at J1. Y1 is the quartz crystal that determines our transmitter frequency. In the collector circuit of Q1, we find an RF choke (a coil) labeled RFC1. All coils are for use in alternating-current (ac) circuits: Remember that radio-frequency (RF) energy is also a form of ac. There is no such thing as a direct-current (dc) transformer. So, RFC1 is used in Fig. 4 to permit the flow of dc to the collector of Q1 while preventing, or choking, the flow of RF energy back into the +12-V voltage line. The RF choke has a value of 1 mH.

If we look to the right in Fig. 4, we will note another coil, L1. It is used to tune the output of the crystal-oscillator stage to the frequency of the crystal — 3.7 MHz. C1 is used with L1 to achieve this requirement. When the combination of C1 and L1 is tuned to 3.7 MHz, we have what is known as a *resonant* circuit, or we might say the circuit is tuned to *resonance*. We can see

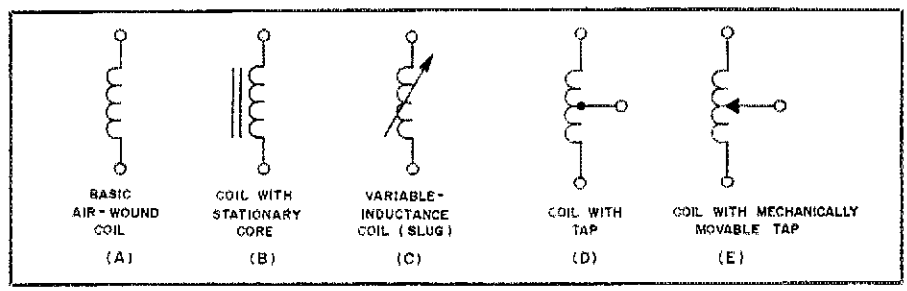


Fig. 3 — Various common symbols for coils. The example at E is for a coil with manual taps such as terminals and clip leads, or a coil with a movable contact, such as a roller inductor has.

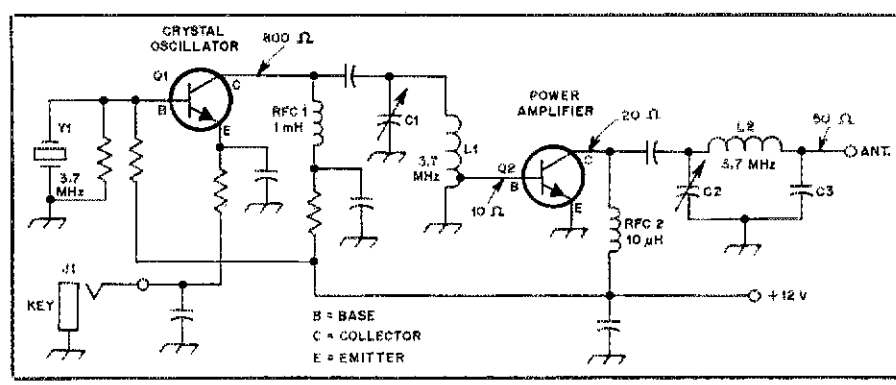


Fig. 4 — Circuit example of a transmitter that uses four styles of coil. See text for details.

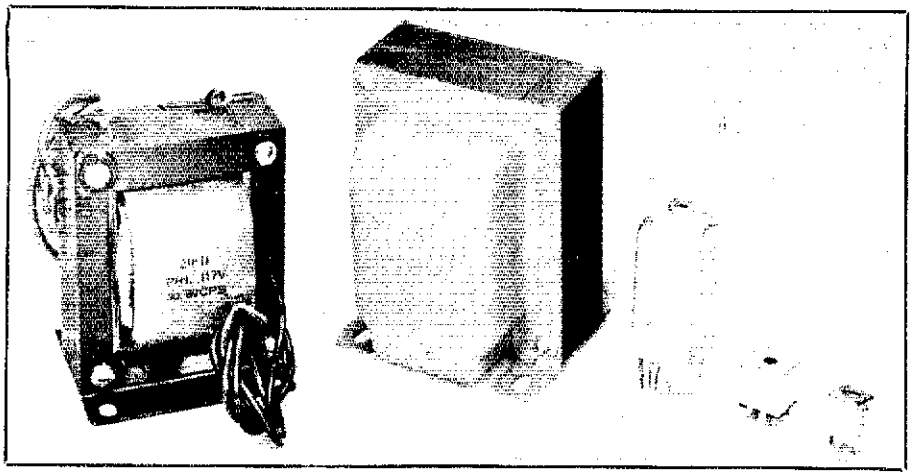


Fig. 5 — Various transformers. The one at the left is called an "open frame" or unshielded type. Next is a shielded power transformer, which is enclosed in a metal shell or case. To the right of this transformer are three styles of shielded RF transformers for use in transmitters or receivers.

that L1 serves a different purpose than does RFC1, but both are coils. L1 must have a specific value of inductance, and C1 must be set for a particular capacitance value in order to tune the circuit to 3.7 MHz. Not just any coil and capacitor combination can provide the desired resonance.

Moving to the right of our diagram once more, observe the placement of RFC2. It functions in a like manner to RFC1 — keeping the RF energy where we want it to be while permitting dc to reach the collector of Q2. In this example, we have an RF choke in the microhenry (μH) range. The reason for RFC2 having much less inductance than RFC1 is not important now. Later in our beginner's course we will learn more about such matters. You will recall that 10 μH is 1/100th of a millihenry (mH).

At the far right in Fig. 4 we have L2. It is a coil also, but in this application it serves two purposes: It is tuned to resonance by means of C2 while acting as an impedance-matching network. Our circuit example shows that the collector of Q2 looks like 20 ohms to the circuit that follows it. But, the antenna presents a 50-ohm impedance. If we are to have maximum power transfer from Q2 to the antenna, we must match the impedances of the two devices. By selecting the proper values for C2, C3 and L2 we can reach this goal.

So, we have seen three important uses for coils in Fig. 4. I should mention also that the tap on L1 (near ground) is selected to provide another impedance match. This time, we are matching the 800-ohm collector of Q1 to the 10-ohm base of Q2. The coil, L1, actually functions as a transformer under such a condition. The impedances presented by the various elements of a transistor are determined for the most part by the operating voltage and current common to the transistor. The values listed in Fig. 4 are by no means specific.

Enter the World of Transformers

From a physical point of view, a transformer is simply two or more coils wound on a magnetic core. The word "transformer" means the component can be used to transform one ac voltage to another (higher or lower than the source voltage). It also is used to transform one impedance to another, or to match unlike impedances.

A specific definition of a transformer is "a device consisting of a winding with tap or taps, or two or more coupled windings, with or without a magnetic core, for introducing mutual coupling between electric circuits." Transformers that have no magnetic core material are used at radio frequencies, but many RF transformers do contain core material. Conversely, coreless transformers are not suitable for use at audio frequencies and lower. Fig. 5 shows a variety of transformers as assembled units. The larger the size, the greater the power-handling ability of the device.

Transformer Applications

I'm sure you are aware of the large transformers found on utility-company poles throughout your area. These "pole pigs," as some amateurs call them, are used to reduce the potential on the power line before it is routed to the consumer. The power lines that crisscross the country carry thousands of volts. It would be unsafe and impractical to route so high a potential into our homes. Therefore, the existing power-line voltage is dropped to 234 V for entry into our homes.

You will also find power transformers in your TV set, hi-fi gear and ham radio equipment. These are used in the equipment power supplies to change the 117-V ac-line level to some higher or lower voltage. The voltage chosen depends on the requirements of your equipment. After the voltage is lowered or raised by the transformer, it is converted to dc voltage by means of *rectifiers* (usually semiconductor diodes). Then, the not-so-pure dc voltage is filtered to remove any ac energy that may still be present after rectification.

Various types of transformers are shown schematically in Fig. 6. Illustration A shows the basic arrangement for a transformer that has two windings — a primary and a secondary, as we call them. The two parallel lines between the windings signify that a magnetic core exists. It might be made of iron, powdered iron or ferrite material, depending on the application. Voltage is specified in Fig. 6 as E, and it can be of any frequency in the ac range. The proper core material must be used for the frequency of operation if the transformer is to function correctly, however.

Next, let's consider the transformer of Fig. 6B. It is similar to the one shown at A, except that it steps down the voltage we might apply to the primary winding. The ratio of the turns of the windings determines what the transformer output voltage will be. The smaller the number of secondary turns, the lower the output voltage.

Fig. 6C shows a transformer with a number of taps on the secondary winding. Under this arrangement, we may have a variety of secondary voltages available. The location of the tap, respective to the number of turns for both windings, will determine the output voltage. Fig. 6E shows a unit that can achieve the same results, except that separate windings are used to obtain the different output voltages.

At Fig. 6D we have a tuned transformer. This is a common type that we will encounter in working with RF circuits. Because the transformer primary winding and capacitor C form a resonant circuit at a desired frequency, we are actually dealing with what is called a *narrow-band* transformer. Untuned transformers respond to a broad range of frequencies, so they are known as *broadband transformers.* The core material in the transformer of Fig. 6D is adjustable within the coil winding. This slug enables us to tune the transformer precisely to the operating frequency. For RF work, the core will be made of powdered iron or ferrite.

Finally, we see an audio transformer at Fig. 6F. It is similar to the transformers shown at A and B, except that we have a center tap in the primary winding. This allows us to provide what is known as "push-pull" operation for the two output tubes or transistors in the audio amplifier. In other words, we will achieve a desired balanced condition for the amplifier devices.

Audio transformers are used also to ensure an impedance match between the amplifier output and the load, which in our example is an 8-ohm speaker. The impedance transformation is related to the turns ratio of the windings. It is the square of the turns ratio. Hence, a turns ratio of 3:1 will yield an impedance ratio of 9:1. Conversely, a 12:1 impedance ratio will be

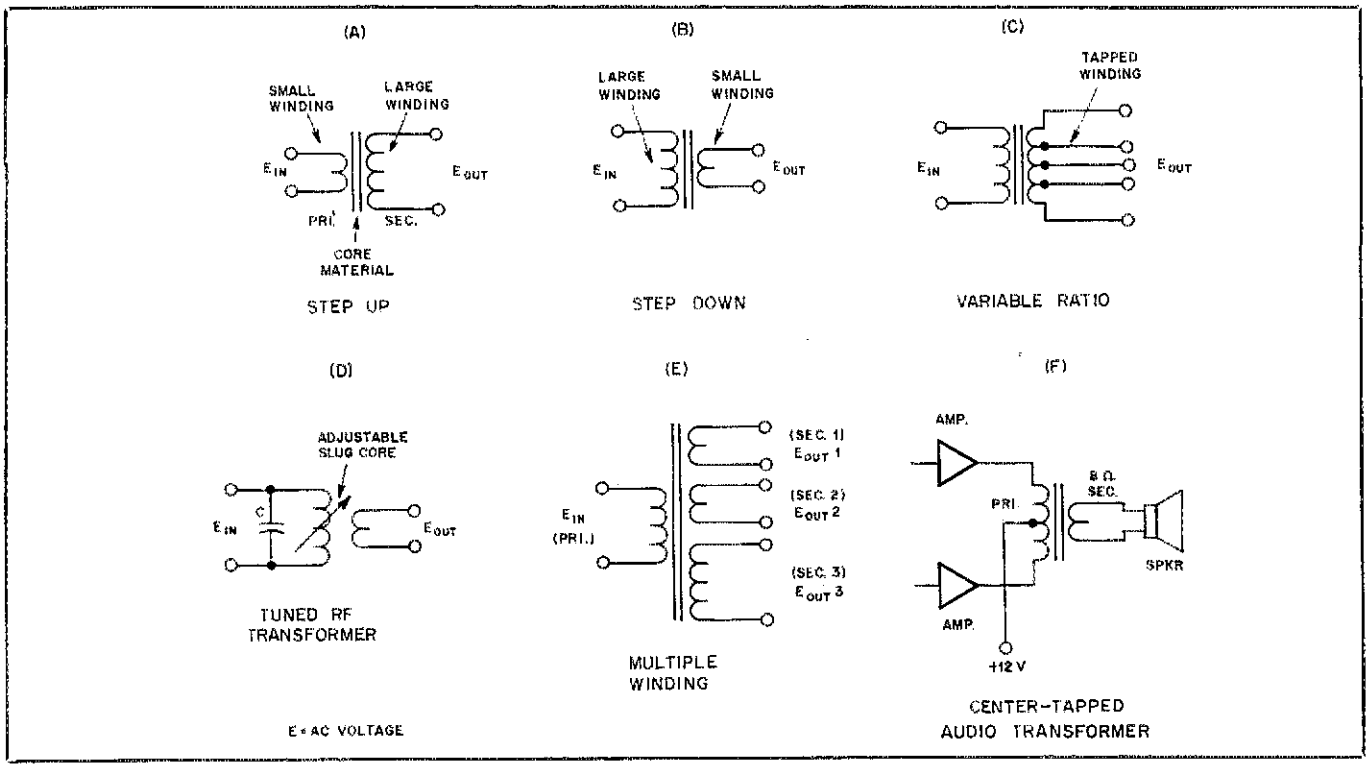


Fig. 6 — Schematic representations of a number of common transformers. These are discussed in the text.

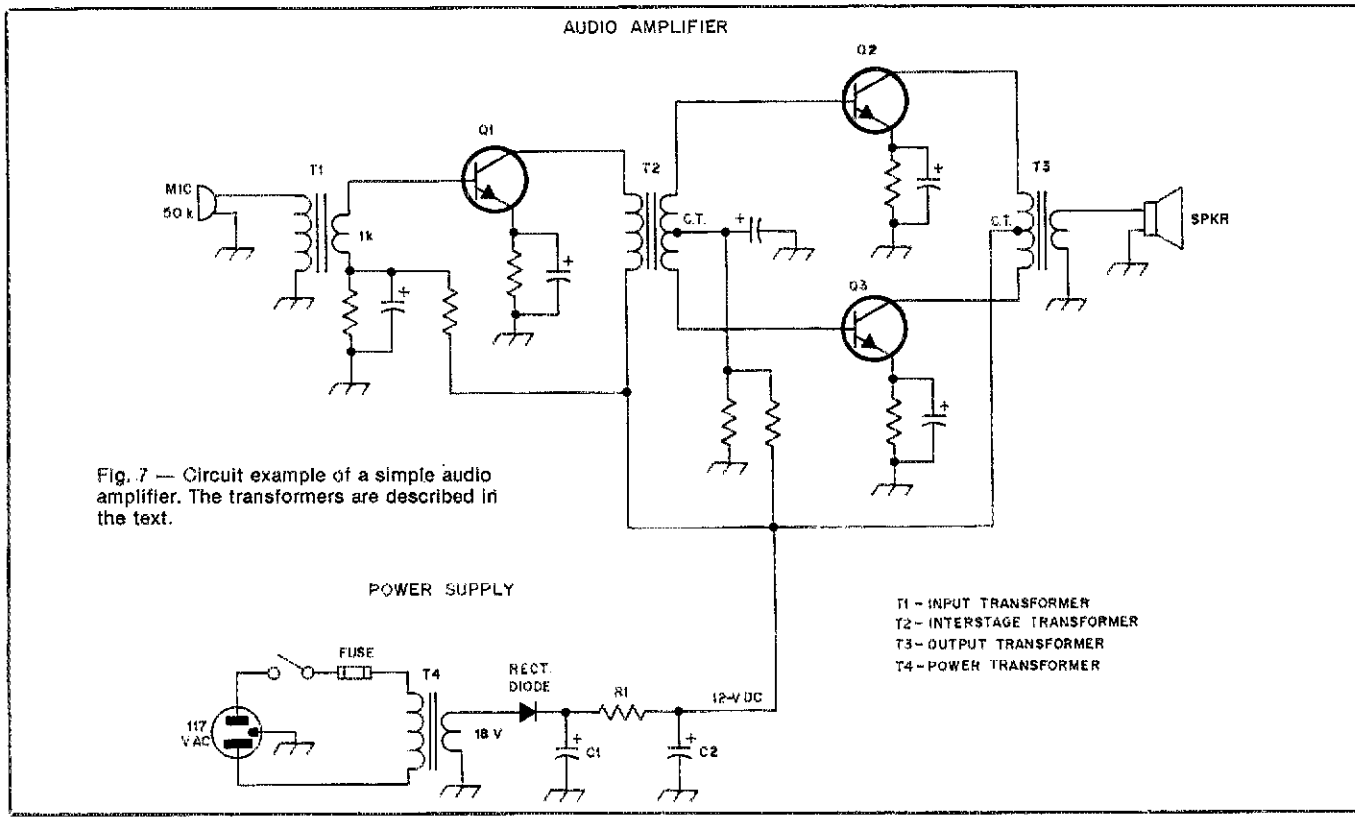


Fig. 7 — Circuit example of a simple audio amplifier. The transformers are described in the text.

had when the turns ratio is 3.46:1. The transformer voltage ratio, however, is the same as the turns ratio. Memorize these facts for later use.

Fig. 7 shows a hypothetical audio-amplifier circuit in which some transformers are used. You will note that we have a power supply in our circuit. It also uses a transformer, T4. It steps the voltage down from 117 to a more manageable 18. The diode rectifier converts the ac voltage to dc voltage. The remaining unwanted ac energy is filtered out of the +12-V line by means of C1, C2 and R1. T4 also isolates us from the 117-V wall

outlet, helping to prevent shock hazards.

Transformer T1 is used to match the high impedance of our microphone to the low impedance of the Q1 transistor input. So, we can think of T1 as a matching transformer, or an input matching transformer. T2, on the other hand, is an interstage transformer with a center-tapped secondary winding. The split winding enables us to supply audio energy in push-pull (balanced) to the push-pull output transistors. It can be used also to match the output impedance of Q1 to the input impedance of Q2 and Q3 if the proper turns ratio is chosen.

The output transformer, T3, functions as does the example of Fig. 6F, which we have already discussed. We have not assigned parts values to any of the circuit components, since this is purely an imaginary circuit. In reality, most modern audio amplifiers that use transistors do not employ audio transformers, but they were standard fare in the vacuum-tube days and during the early days of transistors.

Glossary

henry — basic unit of inductance. Abbreviations are H: henry; mH: millihenry; μH: microhenry; nH: nanohenry.
inductance — a property of an electric circuit by which voltage is induced in it by varying current in the circuit itself or a neighboring circuit.
inductor — a coil or transformer winding, with or without a magnetic core, for introducing inductance into an electric circuit.
magnetic core — one of various materials, such as iron, brass, powdered iron or ferrite, contained within a coil or transformer winding to increase the inductance over that which would exist with no core material. It concentrates an induced magnetic field in a transformer or coil.
potential — the relative voltage or voltage level in an electric circuit.
reactor — a device used for introducing reactance in a circuit. An inductive reactor, or inductance. Coils and transformer windings exhibit reactance, hence can be referred to as reactors.
rectifier — a device used to convert ac to dc. Semiconductor or tube types of diodes are used for this purpose.
resonance — a point at which a coil and capacitor combination are set for the same or zero reactance at a chosen frequency. A condition under which the coil and capacitor are adjusted so as to be tuned to a specific, chosen frequency. The circuit is then said to be "resonant."
shielding — the use of metal or other conductive material to prevent magnetic or capacitive coupling between circuit elements. A shield is an electrical barrier for ac energy.
signal — ac or dc current varied according to the information it carries.
quartz crystal — a mineral that resonates at a precise frequency according to how it is cut.
toroid — doughnut-shaped device, such as a toroidal core for coils and transformers.

Coil and Transformer Power Capability

The greater the power a transformer must accommodate (watts = E multiplied by I, where E is voltage and I is current), the larger the wire size and the greater the core area. The core material plays an important role in the power rating too, as some materials are more efficient than others. The large wire is needed to reduce the resistance (and heating) of the windings. Also, the greater the winding resistance, the higher the transformer losses. An ideal transformer would be cool to the touch after many hours of operation, but this is seldom the case. Most transformers in power supplies are warm or quite warm to the touch after they have been on for a period of time. This heat causes wasted power and reduced efficiency.

Coils that must handle RF power also can become warm. To reduce resistive losses, it is wise to use large-diameter wire for such coils. High-quality insulation should always be used in coils and transformers to prevent arcing between the windings, and to minimize losses.

Let's Summarize

What have we learned? First, that coils can take many shapes. They can be built for fixed values of inductance, or they can be made variable by using a movable slug inside them. They are used in all manner of radio circuits and at many power levels. Coils are also known as inductors, and they may be wound on magnetic cores or can be built as "air-wound" units with no core.

Transformers are used from the power-line frequencies (50 or 60 Hz), through audio frequencies, and into the high RF range. They can be narrow band or broadband, and they may also have cores or no cores. They are used not only to step up or step down a specific voltage level, but may serve as impedance-matching devices between components of unlike characteristics. The impedance ratio of transformers is the square of the voltage or turns ratio and vice versa.

Coils and transformers are among the common radio parts we will be working with during our amateur careers. Detailed information about them can be found in the *Radio Amateur's Handbook* and other ARRL books.

Next, we'll take a look at still another electronics component. See you then.

New Books

ELECTRONIC PROTOTYPE CONSTRUCTION
by Stephen D. Kasten

Published by Howard W. Sams and Co., Inc., Indianapolis, IN. First edition, 1983. Soft-bound, 5-3/8 × 8-1/2 inches, 398 pp. including appendixes and index, $17.95.

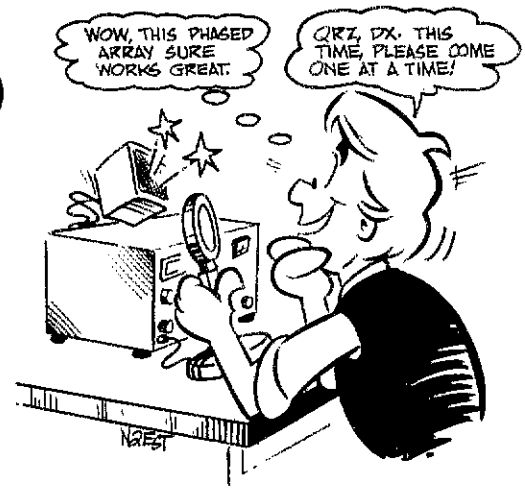
A bit of the author's background may help explain what to expect from this book. Steve Kasten is a professional chemist who is experienced in the use of computers in laboratory automation. He's presently working on the development and application of computer models for various chemical processes. His interests include certain computer systems and their interface circuits.

This text clearly shows Steve is no stranger to a workbench. The 11 chapters of this book are packed with illustrated information covering wire-wrapping; printed-circuit technology; PC-board design, layout and artwork; photography; photo-resist techniques and PC-board etching. Other subjects include electroplating and coating, screen printing, PC-board machining, soldering and assembly, the construction of high-density PC boards, and electronic systems packaging. The author covers each subject in good detail. No matter how much you know about any of the various subjects, you're bound to learn something.

Construction projects include a D/A converter (it will plug into an Apple® II computer), an air-bubble PC-board etching tank (it's made from a plastic ice chest and uses a small laboratory pump, fish-tank aerator or vacuum-cleaner exhaust), a PC-board tab-plating tank and a simple screen-printing frame. There's even a description of the construction of a double-sided PC board from two thin, single-layered PC boards. (That's a method I'd not heard of before.)

If you do any electronic circuit construction at all, you should take a look at this book. Reading it may provide the impetus to get you started on that project you've "been meaning to build, some day." — *Paul K. Pagel, N1FB*

40 Meters with a Phased Delta Loop



Large 40-meter Yagis can set you back a week's salary and take a month to install. A bidirectional, 2-element Delta Loop array provides a better way to snare some DX at modest cost.

By Edward Peter Swynar,* VE3CUI

A station in the U.K. was heard to say, "Forty DX separates the men from the boys." In line with this, it is fortunate for the home-construction crowd that 7 MHz is an area where the mind must often rule over matter! In pursuit of 40-meter DX, some amateurs have embraced the costly "consumer approach." Others have resigned themselves to the likes of the simple and relatively ineffective inverted-V antenna — coupled to the omnipresent kilowatt amplifier. There *is* a better way!

With moderate property dimensions, some trees (perhaps), wire, coaxial cable and a bit of patience, it is possible to build an excellent gain type of array. It can be switched to either of two directions. It is inexpensive and effective for working long-haul DX. I will refer to it as the "2-element, 90-degree-phased Delta Loop."

The Case for Phased Loops

Literature abounds regarding the cardiodal pattern of 2-element 90-degree-phased vertical antennas with 0.25-wavelength spacing. A gain of 3 dB is available over a single 0.25-wavelength vertical element.[1] But, since such an element has a *minus* gain of 1.8 dB over a dipole, one can realize a 1.2-dB gain over a dipole when using two verticals that are phased. The major advantage of the vertical 2-element array is, therefore, the low radiation angle and the directivity (at the expense of many buried copper radials).

With 90°-phased dipoles there is, relatively speaking, more gain and less wire. Again, each dipole element by itself has no gain (using dBd as a reference). Also, this type of array must be fairly high above ground to be an effective DX antenna on 40 meters.

Now, consider the phased Delta Loop arrangement of Fig. 1. By virtue of the feed points on each element, the array is vertically polarized and produces a low angle of radiation, as with the phased vertical system. Furthermore, each loop (by itself) offers a 2-dB gain over a dipole (3.8 dB over a single 0.25-wavelength vertical). Imagine the benefits of two such gain-style loops, positioned properly and driven in combination to enhance the already-existing gain of a single loop element.

Construction

Your specific situation will dictate the precise shape of your loop. Nevertheless, the length of the wire for each element should be taken from the standard loop equation — L(ft) = 1005/f(MHz).[2] I like to add approximately 2 feet of additional wire to facilitate final adjustment for lowest

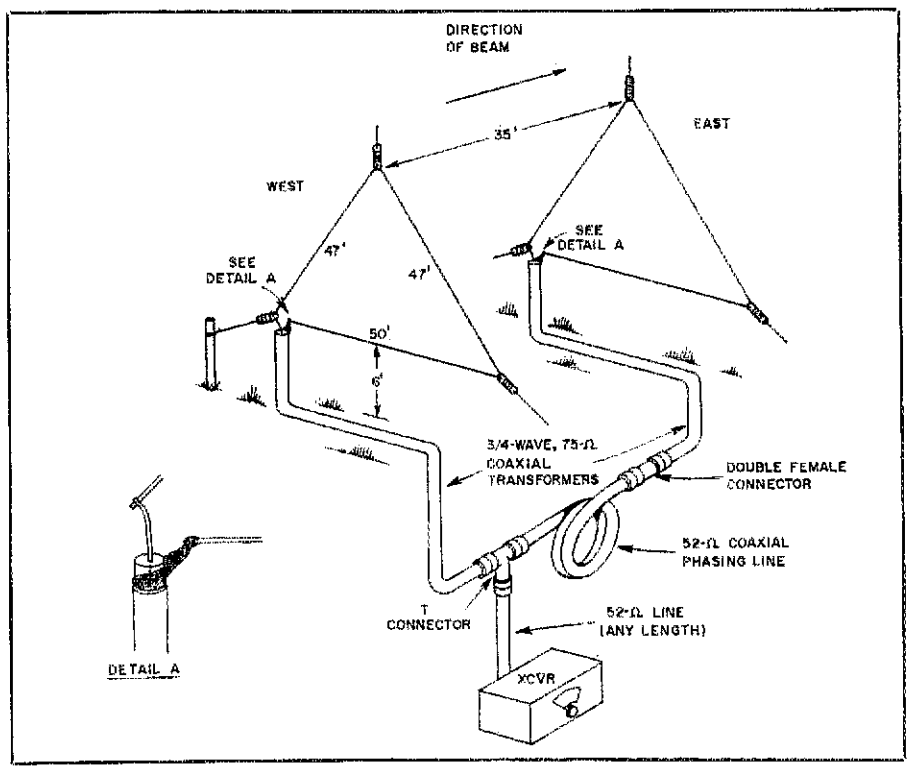


Fig. 1 — Illustration of the final arrangement chosen at VE3CUI for the phased 2-element Delta Loop array. Corner feed, apex up (as shown) yields vertical polarization and a low radiation angle.

[1]Notes appear on page 21.

*48 Evergreen Dr., Whitby, ON L1N 6N6, Canada

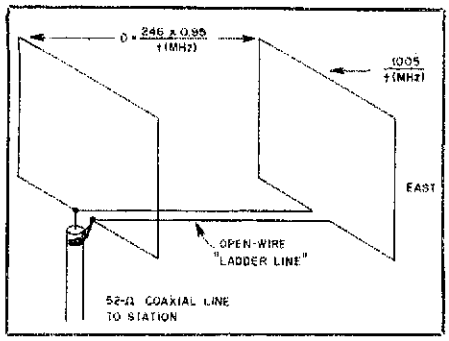


Fig. 2 — Arrangement for the unidirectional loop array that was used first at VE3CUI.

SWR. The element spacing (based on free-space conditions) is obtained from L(ft) = 246/f(MHz).

I first used the feed method seen in Fig. 2. This system has the advantage that use of costly coaxial line is restricted to a single run of 52-ohm cable from the antenna to the ham shack. Also, the balanced phasing line helps to preserve the symmetry of the array. I'm sure this could be improved further by inserting a 1:1 balun transformer at the feed point. The disadvantage of this method is seen when trying to reverse the directivity of the antenna: I must go outside the shack, remove the coaxial feeder from one loop and connect it to the other loop. This is no fun whatsoever when the band is open to two directions at once during a cold January morning!

My present feed system is that of Fig. 1. It is an odd-multiple expansion of the conventional ¼-wave matching transformer, the type used for matching to single loops that are fed with 50-ohm line. I tripled the length of the 75-ohm line section to ¾ wavelength. This was a convenience because of the distance between the shack and the most distant loop. Two equal lengths of 75-ohm coaxial cable are used as transformers (one per loop). The line length is determined by

$$L\ (\text{feet}) = 0.66 \left[\frac{246}{f(\text{MHz})}\right] \times 3 \quad \text{(Eq. 1)}$$

when the coaxial cable has solid dielectric rather than foam material. In this case, the velocity factor of the line is 0.66. This factor will be different if you do not use solid-dielectric polyethylene line.

Adjustment

The loops should be adjusted separately for resonance. Attach a 3/4-wavelength transformer to one loop, then connect the free end of the transformer to a random length of 52-ohm line (through an SWR indicator). Attach the remaining end of the 52-ohm cable to your transmitter. While using the least power possible to obtain an SWR-meter indication, adjust the loop length for a 1:1 SWR. *[Safety first! Do not touch a "hot" antenna. Take the rig to the antenna site, or have a friend switch it on and off for you during the tests. — Ed.]*

On completion of this procedure, repeat it with the remaining loop. I do not recommend that you "stagger-tune" the loops in the hope of obtaining increased bandwidth; one loop should be the electrical twin of the other one. I have found, also, that both loops should be the same shape and height above ground, and as perfectly spaced apart as possible. This suggestion may seem extreme, but best results will be had later on if some pains are taken during installation and adjustment.

With the loops installed in their final positions, it is time to add the 52-ohm coaxial phasing section. The length is determined by Eq. 1, but do not multiply by 3, as in the equation, since the line will be an electrical quarter wavelength rather than 0.75 wavelength. This phasing line can be rolled up and taped so that it won't occupy a lot of space in the ham station. This phasing line should be placed in series with the feeder that connects to the loop element that will serve as the *forward* radiator, since it will be the element that will require the 90° lag. The remaining end of the phasing section is connected (by means of a coaxial T connector) to the end of the feeder that goes to the other loop element. The third port of the T connector is used to mate the feed system to the transmitter and receiver via a short run of 52-ohm coaxial cable. Switching of the directivity is done manually in the shack by transposing the ends of the T connector that go to the feed system. Faster switching can be had by using a coaxial relay or manual switching method. For my needs, it was easy to grow used to reversing the two PL-259 plugs by hand.

The layout of my 50- × 80-foot lot is such that the directivity of the array is NNE or SSW. This has been good for DX from Europe and the South Pacific. One loop is held aloft by means of a tall tree. The other loop is supported by my 48-foot tower, and it is spaced 10 feet away from the tower.

The SWR curves differ between "beaming east" and "beaming west." See Fig. 3. I feel that the problem is caused by the aluminum siding on the house, which is close to one of the loops. Despite this annoyance, the system is flat across the part of the band that interests me — the DX segment.

Results

The bulk of my DXing is done at a power level of 500-W dc input. The exception was my first QSO with the antenna, during which I was using 50 W: I received an RST 559 report from 3B8CF on Mauritius Island, despite the pileup bedlam.

The front-to-back ratio of the array appears to be roughly three S units (18 dB) over long DX paths. Over short paths (interstate or interprovince), do not expect much by way of F/B ratio. Close-in contacts will be more satisfactory with a high-angle radiator, such as a single loop from this array, or a dipole, can provide.

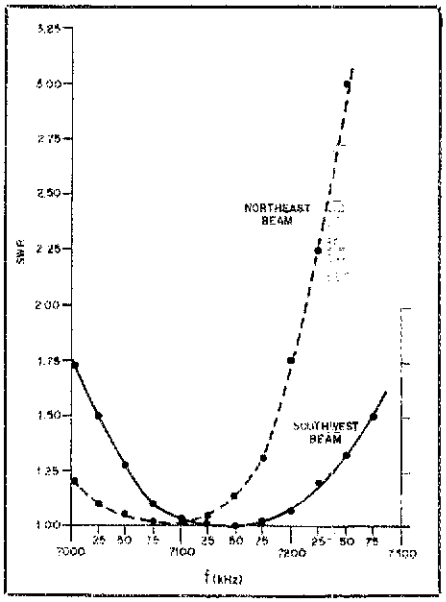


Fig. 3 — SWR curves developed at VE3CUI for the 2-element loop array. Note that the curves show a disparity. This may be the result of one loop being in proximity to the aluminum-sided house.

The phased loops certainly "hear" the signals better than other antennas I have used. Also, I seem to receive longer band openings than with other types of antennas I have used. I have been gratified a number of times by comments such as, "Best signal from North America, OM." I have not made performance comparisons against a reference dipole, but I received the substantially stronger signal report during a four-way DX QSO that included two local hams. One was using an inverted V, and the other had a single Delta Loop. One fellow had a report of "inaudible" (inverted V at 40 feet), and the ham with the Delta Loop was barely discernible in the noise. My report was 5 × 8.

Conclusion

Despite the low antenna height and cramped space, the 2-element phased loop array is a superlative budget-saving performer. I hope some of you will investigate the DX potential of this simple antenna. Certainly, you will experience the same kinds of pleasures I have while chasing DX on 40 meters!

Notes

[1]Gain figures are unproven and are theoretical.
[2]m = ft × 0.3048.

E. P. Swynar, 31, was licensed in 1971. His first ham station was homemade from circuits in the ARRL literature. He has had two antenna articles published in CQ. His major interests in radio are homemade gear and homemade antennas. He has a B.A in history and economics, and works as a supervisor in the quality control section of General Motors of Canada, Limited. QST

Eliminate TVI With Common-Mode Current Controls

Are your TVI-related problems caused by errant common-mode currents? Here's how to keep them in line.

By Richard J. Buchan,* WØTJF

High-frequency currents caused by the switching of electromechanical devices have a devastating effect on other electronic equipment operation unless the currents are properly filtered and controlled. Line-to-line transients are handled easily. Common-mode currents, however, prove to be the real culprits and the most difficult to tame. In this article, I'll show you common-mode control techniques I have learned and successfully applied to eliminate TVI.

I live in a TV-fringe area, 75 miles from the nearest station.[1] The apex of my inverted V antenna is 4 feet from the TV antenna, which is mounted atop the common supporting mast. My TV set is 4 feet from my Amateur Radio station transmitter. Even under these conditions, I have interference-free TV reception while operating my amateur station.

Common-Mode Currents

Common-mode currents can be defined as currents resulting from the difference in magnitude between the outgoing and return currents in a transmission line. In a perfectly balanced line the currents are equal, resulting in total field cancellation and no radiation from the line as indicated by currents A of Fig. 1. Extensive tests with a high-frequency signal generator and a current-probe recorder show that, in virtually every case, an unwanted signal generated on a signal, control, ground or power line results in the major part of the signal becoming common mode in nature. The return path consists of many paths throughout the surrounding area: building wiring, plumbing, heating ducts, telephone lines, etc., shown as currents B of Fig. 1.

Common-mode currents can be described as having these characteristics: (1) They flow in the same direction through all conductors in a cable or transmission line; (2) they can assume many return paths through the universal reference return path; (3) if a wide gap exists between the conductors and the return path, little field cancellation takes place and the line can act as an almost perfect radiator.

The Universal Reference

A universal reference can consist of: (1) a metallic building structure; (2) plumbing and/or drainage systems; (3) earth ground; (4) concrete floors and reinforcements; (5) station ground; (6) signal-control cables; (7) telephone lines; (8) a combination of all of these.

Tests show that evidence of these return paths could be found on almost any metallic piece in a building that the aperture of the probe could be made to surround. It was enlightening (and discouraging) to see and record high-frequency current bursts peaking in the 10-A range with the probe encircling what was considered to be an almost perfect ground conductor! These bursts were usually found to be generated by the turning on and off of electromechanical devices within the building.

Station Ground

A station ground conductor, if of any appreciable length (inches, at the VHF TV channels), *cannot* act as an infinite sink to dissipate unwanted harmonic and parasitic currents. Unless designed as a low-impedance lossy type of conductor, the ground conductor can act almost like a perfect radiator for these currents. A system ground can be analyzed by considering it as a conductor whose termination is a ground, or as a universal return with a very low impedance path approaching zero. Under these conditions, it can be analyzed as a shorted transmission line. The input impedance (Z_s) can be shown as

$$Z_s = Z_o \cot(\theta K) \qquad \text{(Eq. 1)}$$

where

Z_o is the characteristic impedance $\sqrt{L/C}$
K is equal to the loss factor
θ is the electrical length of the line

With a line length of ¼ λ or a multiple thereof, and a lossless line (air), the cotangent becomes infinite and the loss factor zero. Under these conditions, a ground conductor can have an input impedance approaching infinity. Not likely? At the upper TV channel (7-13) frequencies, a ¼-λ line is 2½ feet or less. Furthermore, a 0.1-λ cable (approximately 1 foot at the upper channels) can be an efficient radiator. The

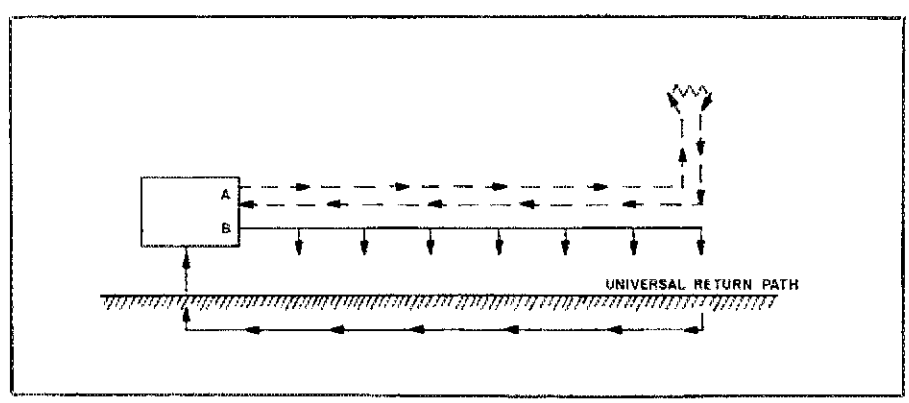


Fig. 1 — Currents A are balanced and exhibit total field cancellation. Currents B are unbalanced (common mode), with respect to a universal return path, and exhibit little field cancellation.

[1]km = mi × 1.609; m = ft × 0.3048; mm = in × 25.4.

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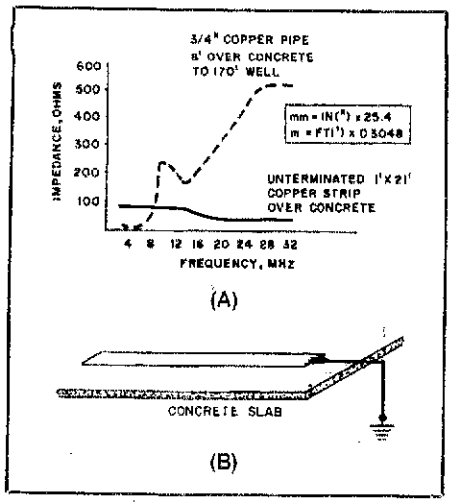


Fig. 2 — At A, a chart showing the high-frequency impedance of ground systems. Terminating the copper strip in an earth ground would improve the low-frequency performance. An example of a strip-line ground is shown at B. A 3-foot-wide conductive strip terminated in a good earth ground will provide an approximate 10-ohm infinite-sink ground from dc through the VHF range. The effectiveness of this copper strip concept is pointed out in "Facility Planning," by David A. Reismah, published in *Datamation*, Nov. 1974.

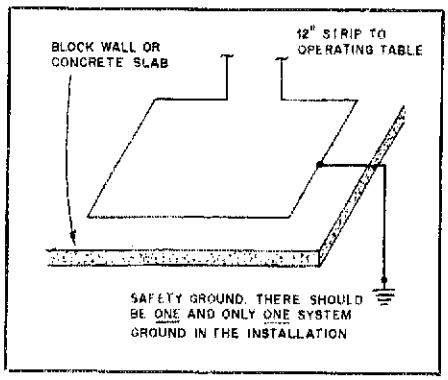


Fig. 3 — A 15-square-foot metallic sheet placed over a lossy dielectric will produce an approximately 10-ohm capacitive shunt to unwanted high-frequency signals.

experimental plot of two ground systems is shown in Fig. 2A. As Eq. 1 shows, if L can be made very low, C very high and K very lossy (high), an almost perfect ground termination can be had. Tests have shown that a 3-foot-wide metallic strip over a concrete base (see Fig. 2B) produces a virtually perfect ground and acts as an infinite sink line with *no* reflections, all unwanted signals being dissipated in the lossy dielectric.

Where a continuous length of copper strip cannot be used, a similar dissipative ground sink can be made with the use of flat copper sheet over a lossy dielectric. The dissipative element is, in fact, a large capacitor using the floor, wall or some other lossy dielectric separating the copper plate from the universal reference (see Fig. 3).

The Low-Pass Filter

Perusing low-pass filter specifications will show that a high degree of attenuation can be obtained over a wide frequency range. You must realize, however, that these figures are a result of laboratory testing under ideal conditions: a matched termination (rarely obtained at the high-frequency ham-band harmonics), and with the filter case mounted on a table with a near-perfect ground sheet. The fundamental design of most (if not all) such filters depends on the ability of high-Q passive elements to shunt the unwanted signals to a dissipative mass in such a manner that practically nothing leaks through. From a line-to-line standpoint, this can be accomplished with a reasonably good installation. With an inadequate or high-Q ground system, however, the common-mode component can flow easily through the return frame and back to the outer coaxial conductor, resulting in the entire transmission line acting as a long-wire radiator (see Fig. 4A). The solution to this problem is to use a large dissipative mass and a routing system that results in a transmission line with a low Z_0 along its entire length as shown in Fig. 4B.

Transmission-Line Radiator

Radiation from an unbalanced line is a function of the height above ground and the line length. If we consider the coaxial line as one conductor and the ground return as the other, and assume under these conditions that it is a two-wire nonresonant line, the radiation from it can be expressed as

$$\frac{\text{Radiated power}}{I^2} = 160\left(\frac{\pi D}{\lambda}\right)^2 \quad \text{(Eq. 2)}$$

where
radiated power = watts
D = spacing in wavelengths
I = RMS line current in amperes

As Eq. 2 shows, large amounts of radiation can take place with a spacing of a fraction of a wavelength, and an almost perfect radiator exists for the common-mode component at ¼ and ½ wavelengths, as shown in Fig. 5. This applies to all conductors, such as power lines, telephone cables, ground conductors and control lines. It also demonstrates why all conductors subject to common-mode pickup *must* be coupled tightly to a lossy mass of some sort so as to minimize the radiation from this loop. This fact also explains why the electronic-packaging engineer will route cables or wires tightly in cabinet corners or close to a ground plane so as to minimize radiation and coupling from the cable.

The Common-Mode Choke

Ferrite cores have made possible the construction of common-mode chokes to control the flow of unbalanced currents. A

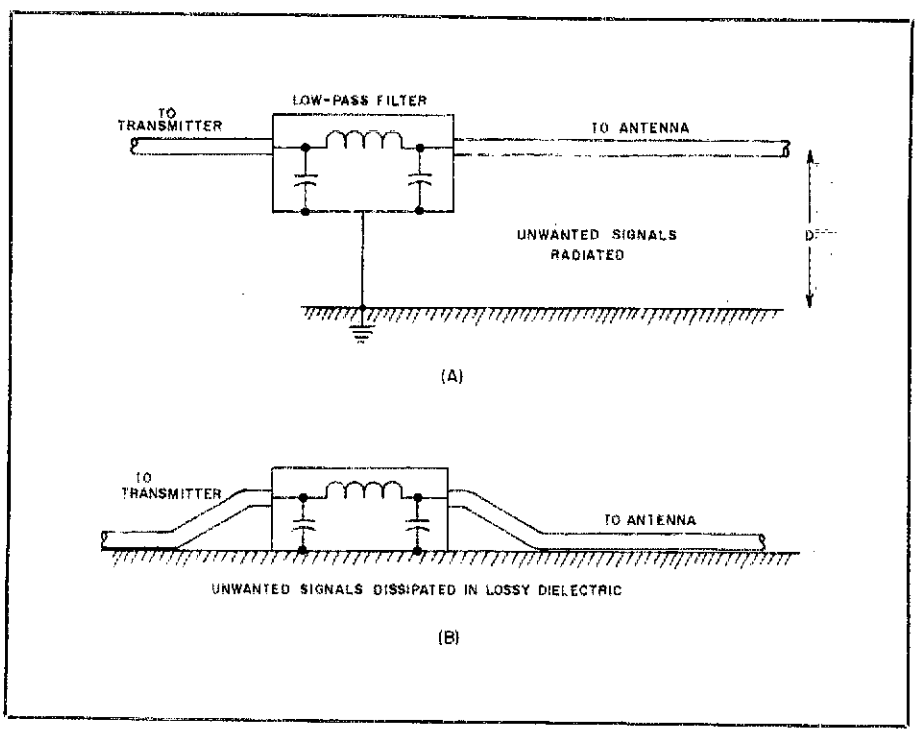


Fig. 4 — At A, lacking a direct dissipative mass, the shunted high-frequency currents will flow along the outer cable and back through the universal reference. With D greater than 0.1 λ, almost perfect radiation will take place. With the case of the filter directly coupled to a large dissipative mass as at B, the unwanted signals are absorbed. Virtually no unwanted radiation takes place.

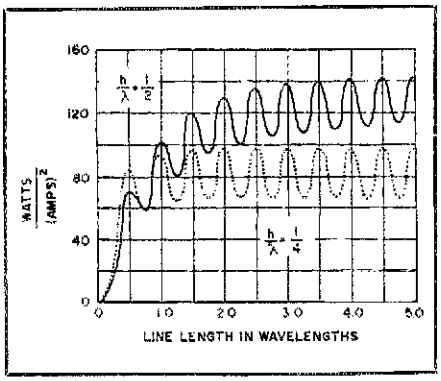


Fig. 5 — Unbalanced currents are much more effective in producing radiation than the normal balanced currents because of the considerable distance between the two sides of the circuit through which the unbalanced currents flow. The amount of radiation depends both on the height of the line above ground and on the line length. The order of magnitude of the factors involved can be estimated using this chart. (Reproduced from *Radio Engineer's Handbook*, by F. E. Terman, first edition, courtesy of McGraw-Hill Book Co.)

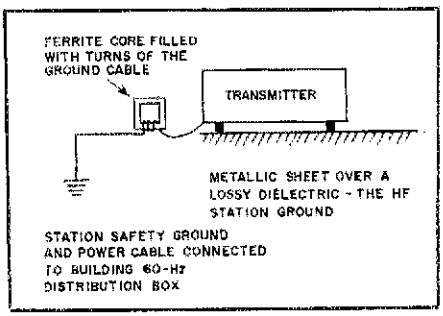


Fig. 6 — The common-mode choke presents a high impedance to high-frequency currents, thus forcing them to be dissipated in the metallic mass and lossy dielectric.

number of cable turns threaded on the core exhibits no attenuation to balanced currents because complete field cancellation takes place. To the unbalanced (common-mode) current, however, a high impedance exists because no field cancellation takes place. This is true because the return current is through the universal reference, which can be far removed from the core.

A typical application is shown in Fig. 6, where the core has been wound with the safety ground conductor to force the dissipation of unwanted currents into the lossy ground mass. These common-mode chokes can be used effectively with speaker leads on audio equipment (see Fig. 7), and power cables used with solid-state devices such as electronic organs, antenna transmission lines and telephone cables. Flyback transformer cores from junked TV sets may be used to wind these chokes.

Current Loops

Current loops can have a devastating effect on TVI control. The most common offender is the use of two ground returns in a system — a safety ground consisting of a third wire in the power cable back to the ac-line entrance box, and a station ground to a water pipe or a metal stake in the ground. The difference in potential between the two grounds, plus the large radiation loop between the two paths, can spell disaster to the best of installations. The solution to this problem is to have the system ground consist of a large dissipative sink for the station ground with *no* current path back to the safety ground.

In cases where interconnecting cables between cabinets are shielded, loops will exist unless the shield is grounded at one end only, which is highly unlikely. The impact of this can be minimized by maintaining a low Z_0 between the shield and the ground mass as shown in Fig. 8. Fig. 9 illustrates a loop that contains a high-Z_0 loop that can radiate, and is the way *not* to do it.

In cases where a ground conductor is contained in a cable to the equipment, this ground must be removed and the case grounded directly to the copper sheet. The metallic sheet, in turn, is connected to the safety ground at the ac-line outlet. Any cabinet in which the safety ground has been disconnected should carry a warning to alert the user that other steps must be taken to assure that the enclosure has a low-impedance metallic circuit to the building ground.

Putting It All Together

To reach the goal of a TVI-free Amateur Radio station, one fact must be recognized: *All* unwanted signals must be dissipated in a manner such that *no* radiation of these signals takes place. This can be accomplished by

1) establishing a lossy ground reference;
2) coupling all equipment directly to this mass;
3) adding a low-pass filter directly coupled to this mass;
4) using a dedicated, filtered ac line;
5) routing all wires to achieve a low Z_0 to a lossy universal reference;
6) having *no* current loops in the system;
7) offering *no* compromises. A few inches of wire can act as a nearly perfect radiator and negate all the techniques applied.

The Lossy Ground Reference

This can be made by covering the operating table top, sides and back with 1-oz copper sheet as shown in Fig. 10. The sheet extends about 12 inches up the back of the table so that it can be folded over the interconnecting wires and cables.

Coupling to the Mass

Copper strips are looped over the four legs of the transmitter. This results in four virtually zero-impedance couplings to the copper sheet. The power supply and other cabinets have no legs, so their metallic bottoms sit directly on the copper sheet. If there is *any* doubt as to safety, solder a safety wire to the sheet.

Adding a Low-Pass Filter

In the example shown, the filter is coupled directly to the copper sheet so as to shunt high-frequency currents into the lossy ground reference. Ideally, this connection should be as close as possible to the transmitter and with the coaxial line input tightly coupled to the ground plane. Common practice is to mount the filter on the back of the transmitter. This approach is acceptable, but there is some risk in shunting the currents back into the device and thus causing a feedback loop. The risk is a function of the equipment design and the filter mounting method employed. This was demonstrated to me when a filter was added to a computer peripheral to prevent its conducted EMI from faulting the system. The equipment faulted under certain operations because of reflected EMI currents.

The Dedicated, Filtered AC Line

This approach has many advantages:

1) It eliminates the common coupling to other circuits in the building.
2) It can be routed so as to achieve a low impedance to the universal reference.
3) It can (and should) include the safety

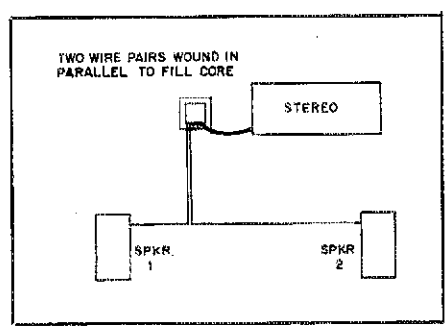


Fig. 7 — The high-impedance common-mode choke prevents high-frequency currents from entering the stereo chassis, thus forcing them to be reradiated or dissipated in the speakers.

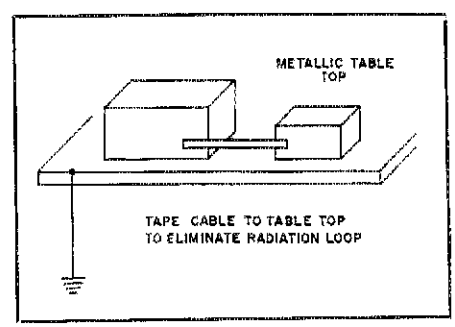


Fig. 8 — Use of a metallic sheet, a single safety ground connection and a loop length confined to inches ensures that little unwanted radiation can take place.

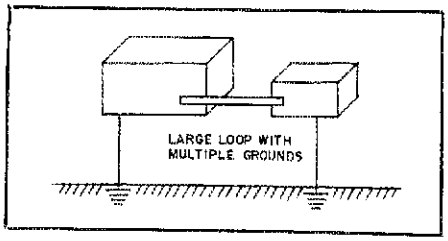


Fig. 9 — Long ground leads combined with high-impedance loops can spell disaster to TVI control.

ground conductor (an electrical code requirement).

A Low Z_o

All wires should be coupled as closely as possible to the lossy reference. Fig. 11 depicts the methods I use. A similar approach is applied to the ac line power and ground conductor, which lies on the ground under my mobile home.

No Current Loops

I use the dual isolated-ground system. The safety ground is the ground conductor in the ac cable; system ground is the lossy copper sheet. There are *no* interconnections between the two systems. Any compromise to this — such as a grounded neutral connection to a box — can create havoc with the TVI control system. On the operating table, current loops will exist as a result of the direct coupling to the copper sheet and the grounded, shielded interconnecting cables. By confining the loop to a low Z_o (taping the cables to the cabinet wall or the sheet), the radiation loop can be virtually eliminated.

No Compromises

Mobile operation has demonstrated to me that even a small antenna can serve as an efficient radiator. If there ever was a place for Murphy to demonstrate the validity of his famous law, EMI suppression is the place! In my station, several feet of coaxial cable hang in free space. This does not prove to be a problem for a couple of assumed reasons: (1) The filter and low Z_o up to this point provide sufficient suppression; (2) the several feet exposed are in an area surrounded by lossy material — earth, building wall and floor. There are probably thousands of antenna transmission lines hanging in free space between houses and masts. Hopefully, these stations are in a primary signal area, and the common-mode component is dissipated before it reaches a point where it may become a problem.

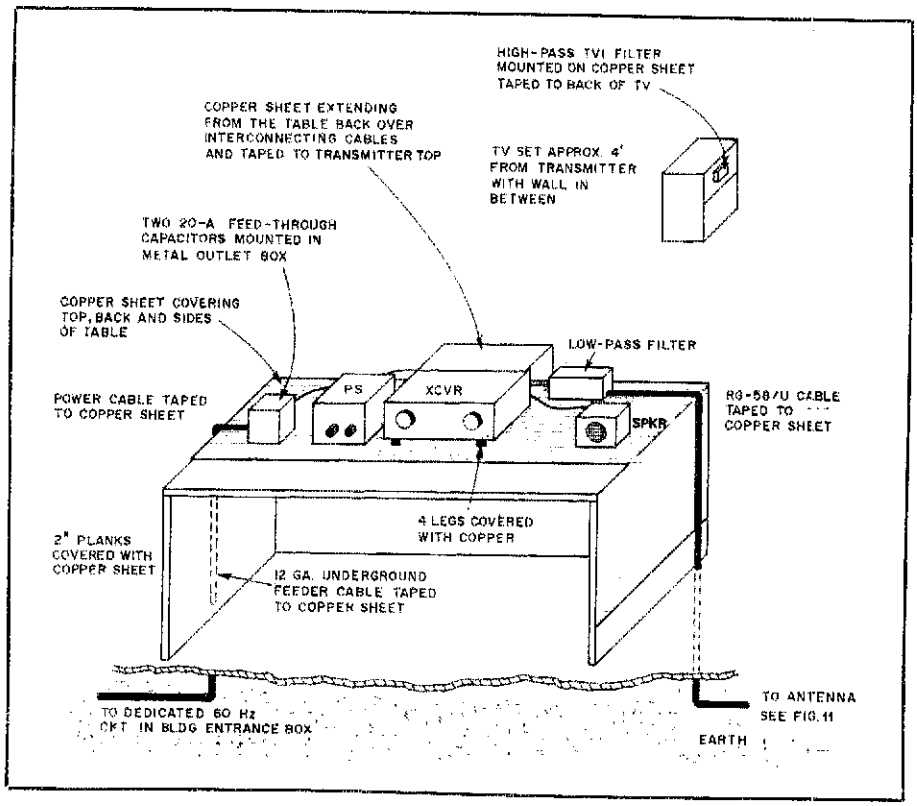


Fig. 10 — A station layout showing the measures taken to dissipate and eliminate radiation from common-mode currents.

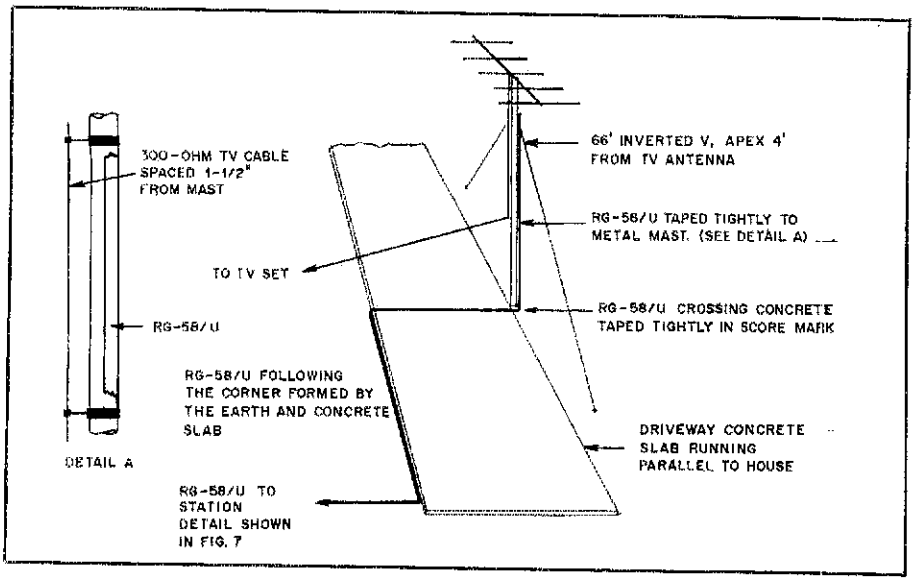


Fig. 11 — With the inverted V serving as guy wires and the coaxial cable taped tightly to the metal mast, the entire setup appears as nothing more than a normal TV antenna installation.

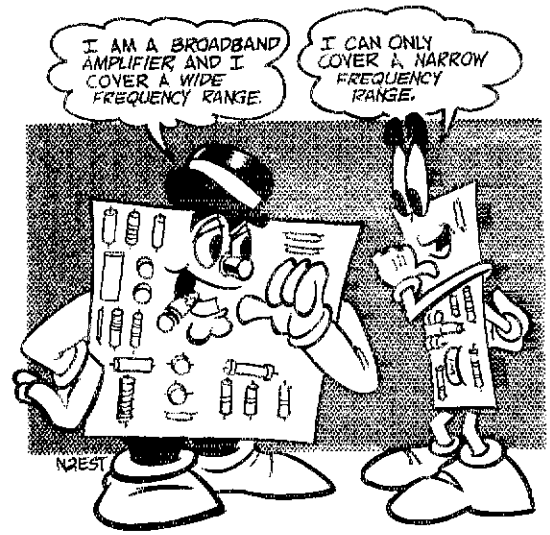
Summary

The TVI-free station depicted here is a result of a challenge — one that resulted from buying a winter residence in a densely populated mobile-home community located in a TV fringe area. This private community is particularly sensitive to any type of radio transmission, and has a population firmly convinced that any type of radio transmission could only result in TVI.

My antenna is camouflaged by using two of the TV-mast guy wires as an inverted V. The station is hidden in a bedroom closet next to the den, where the TV set is located. For several years, an SB-200 amplifier was used. Not a single TVI complaint from neighbors was received; a small amount of interference was noted on the home set, however. During the past several years, the station has been operated without the amplifier. It is indeed rewarding to demonstrate how interference-free television reception can be had while operating on the 40- and 15-meter amateur bands.

BEGINNER'S BENCH

Broadband and Narrow-Band Amplifiers



Narrow-band amplifiers have been around for many years, and most hams know how to design them. But, the broadband RF amplifier did not become popular until the semiconductor world bloomed. This article covers some practical aspects of both types.

By Doug DeMaw,* W1FB

Have you wondered what the difference may be between a narrow-band amplifier and a broadband one? Are all broadband amplifiers linear? Must they be linear? These are natural questions in the minds of most beginners to electronics, so we will try to provide simple answers.

If you work with transistors and RF circuits, it is likely that you will need to know something about how a broadband amplifier is designed, what to expect from it and how to build one for the job you have in mind. For the most part, these amplifiers are less prone to self-oscillation than are tuned, narrow-band styles of amplifier. The fundamental thought to keep in mind however, is that we must always trade some overall gain for increased bandwidth. If we can accept that trade-off, the major barrier will have been abolished.

Narrow-Band versus Broadband

The narrow-band amplifiers we use from day to day in our VFOs, receivers, converters and transmitters are *tuned* to some particular operating frequency. The tuned circuits are usually designed to yield a fairly high loaded Q (Q_L). The greater the circuit Q, the narrower the frequency response of the amplifier. Many applications require high Q and the attendant narrow bandwidth. Examples are VFOs, receiver front ends, transmitter tank circuits and filter circuits that contain an amplifier.

The narrow bandwidth is needed to reject unwanted signals above and below the desired operating frequency, and to prevent spurious energy from leaving the transmitter and reaching the antenna system. When broadband amplifiers are used in some of these more critical circuits, a filter of some kind must be used to obtain the desired spectral purity. By way of simple explanation, a broadband amplifier that has no filtering elements is merely an *untuned* amplifier. It will respond to a broad range of frequencies and, if designed well, should have relatively constant gain across that frequency range. An audio amplifier is but one example of a broadband amplifier.

Another advantage of the narrow-band circuit over the broadband type is that some circuits require minimum noise — as in the case of a receiver oscillator strip — and the high-Q tuned circuits greatly reduce the inherent noise output of the oscillator. High-performance receivers require "quiet" local oscillators in order to minimize "reciprocal mixing" in the mixer stage. Transmitter local oscillators should be similarly clean if we are to avoid broadcasting prohibitive amounts of broadband noise along with the desired signal output. Some commercial early-day solid-state transmitters were very offensive in terms of transmitted wideband noise.

Fig. 1 shows examples of narrow-band and broadband amplifiers in some simplified circuits. Illustration A shows a conventional small-signal RF amplifier with tuned circuits at the input and output. This is typical of what we may find at the input of a receiver. The high-Q tuned circuits or resonators restrict the frequency response for a given setting of C1 and C2. For this reason we will call our circuit a narrow-band amplifier.

Although the circuit at B of Fig. 1 is an oscillator, it is in reality a form of amplifier. For an oscillator to work as such it must be designed as an amplifier. Some of the output energy is fed back to the input terminal to cause oscillation. Again we have a high-Q tuned circuit (C3, C4 and L1), which restricts the bandwidth of the circuit in accordance with the particular setting of C3. Owing to our use of some of the output power as feedback, this type of amplifier is not as efficient as is the circuit in Fig. 1A.

Fig. 1C contains an example of a broadband amplifier for RF use. It operates linearly because it is biased for class A. T1 is a broadband transformer that can be used to match the amplifier impedance to that of the load by virtue of the transformer turns ratio. Note that T1 is untuned; hence the bandwidth.

A class-A linear broadband amplifier

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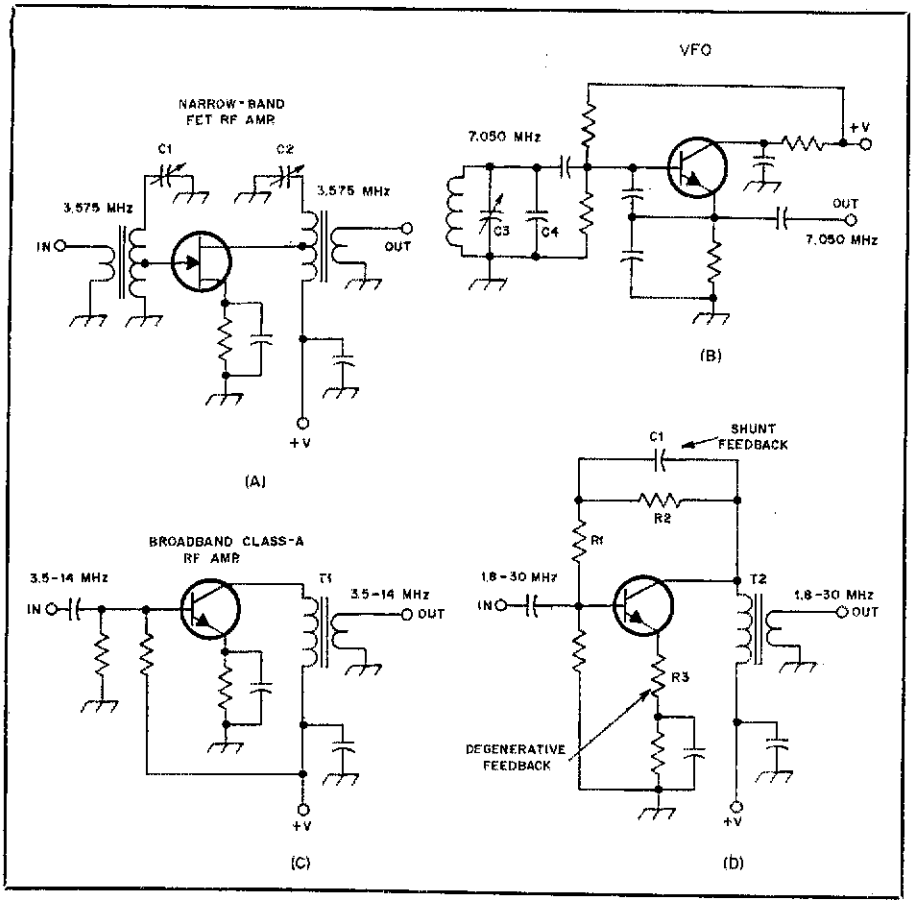


Fig. 1 — The diagrams at A and B illustrate narrow-band amplifiers. The VFO circuit is still a form of amplifier, since its output power (in part) is fed back to the input for the purpose of causing oscillation. A simple Class-A broadband amplifier without feedback is seen at C. A feedback Class-A broadband amplifier is shown at D. It uses a combination of shunt and degenerative feedback (see text).

with feedback is shown at D of Fig. 1. Here, we have intentionally introduced feedback by means of resistive divider R1/R2 and C1. Degenerative feedback is provided by means of the unbypassed emitter resistor, R3. This type of amplifier has considerable bandwidth. The shunt feedback stabilizes the current gain of the stage while decreasing the input and output resistance of the amplifier. The emitter degeneration helps stabilize the transistor voltage gain, and it increases the input impedance of the transistor. The increase is approximately proportional to the transistor beta. A specific treatment of feedback applied to broadband amplifiers is contained in *Solid State Design for the Radio Amateur*, available from ARRL.

Amplifiers with feedback are used not only for low-power circuits, but are practically the order of the day for high-power solid-state RF amplifiers. A circuit for a broadband, fed-back linear amplifier is provided in Fig. 2. Since this diagram is purely for illustrative purposes, no component values are assigned.

Assume that the circuit is capable of delivering 100 W of output from 1.8 to 29.9 MHz. Shunt feedback is made possible by the networks that contain R1, R2, R3, R4, C1 and C2. Here, we are applying negative feedback between the collectors and bases. Were we to use positive feedback, as in the case of oscillators, the amplifier would "take off" in a spasm of self-oscillation. *Positive* feedback is of the same phase as the input energy, whereas *negative* feedback is approximately 180 degrees out of phase with the input signal. This relationship is important to remember. An absolute 180-degree phase shift is difficult to realize when working with transistors, owing to some inherent phase shift as the signal current passes through the semiconductor material.

T1 and T2 of Fig. 2 are broadband transformers whose frequency response, if they are designed well, is reasonably flat across the 1.8-30 MHz range. Generally, ferrite core material of 800 to 950 effective permeability (μ_e) is used for high-frequency broadband amplifiers. This is a no. 43 material when ordering from Amidon Associates or Fair-Rite Corp.[1] Palomar Engineers and RadioKit also supply cores of the no. 43 variety. Core permeabilities of 125 and 40 are commonly used for VHF broadband transformers.

Broadband transformers work like this: As the operating frequency is increased, the core material becomes less and less effec-

[1]Notes appear on page 30.

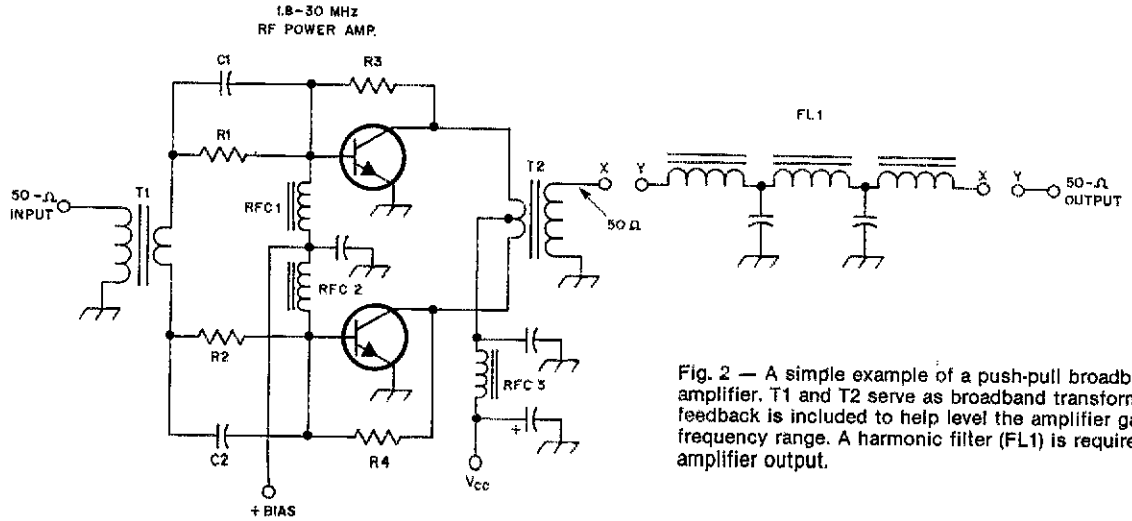


Fig. 2 — A simple example of a push-pull broadband RF power amplifier. T1 and T2 serve as broadband transformers. Shunt feedback is included to help level the amplifier gain over a wide frequency range. A harmonic filter (FL1) is required at the amplifier output.

tive in the circuit. At the low-frequency end of our transformer range, the core does its job and increases the inductance of the windings (necessary). At the high end of the transformer performance range, the core becomes essentially "not there" as far as the windings are concerned. This enables us to obtain a substantial bandwidth that would be impossible with coreless transformers. A suitable rule of thumb for transformer design is to make the inductive reactance of the smallest winding approximately four times the load impedance. Hence, if the base of a transistor amplifier exhibited a 10-ohm impedance, the broadband-transformer winding that we connect to the base should have sufficient inductance to have a reactance of 40 ohms or slightly greater. If not, the low impedance of the winding would shunt part of the driving power to ground and could cause an SWR condition.

Let's assume that our amplifier is operating at 7.1 MHz. The base impedance of the transistor with drive applied is 12 ohms. How much winding inductance would we need for the transformer secondary? The standard equation for inductance would be used:

$$L(\mu H) = \frac{X_L}{2\pi f(MHz)} \qquad \text{(Eq. 1)}$$

So, with an X_L of 4 times 12, we would obtain the following answer:

$$L(\mu H) = \frac{48}{6.28 \times 7.1} = 1.07 \qquad \text{(Eq. 2)}$$

The required number of turns can be calculated from

$$\text{Turns} = 100\sqrt{L(\mu H)/A_L} \qquad \text{(Eq. 3)}$$

where A_L is the number provided for each type of core by the vendor or manufacturer. Each core, relative to its cross-sectional area and the core material, has a specific A_L factor. The Amidon Associates catalog contains such data, as does a book concerning magnetic cores.[2]

I don't want to mislead you into thinking that broadband amplifier design is a snap. There are many subtleties involved, and considerable study of the pertinent literature is important before launching one's own project from scratch. Motorola Semiconductor Company has a wealth of useful data in its book on power semiconductors, inclusive of application notes on transformer and broadband amplifier design.[3]

But, let's return to Fig. 2 and learn a bit more about what's going on. T2, the output transformer, serves also as an impedance-matching device. The inductances in the transformer windings are based also on a $\times 4$ rule, respective to the collector impedance. This impedance can be calculated closely from $Z = V_{cc}^2/2\,P_o$ ohms. Eq. 1 is then applied. FL1 is a harmonic filter, and is a low-pass type. A switch can be inserted at points X and Y to permit band switching of the low-pass filters. This is standard procedure in commercial equipment. For single-band use, a jumper can be placed across X and Y.

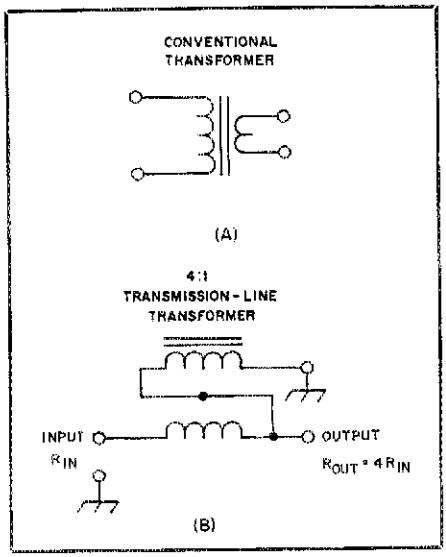


Fig. 3 — Examples of conventional and transmission-line transformers. See text for additional information.

It is important in all broadband amplifiers to minimize the stray capacitive and inductive reactances. These parasitic quantities of L and C have a marked effect on the amplifier performance as the operating frequency is increased. In other words, unwanted capacitive and inductive reactance will limit the upper frequency response of the circuit. An improperly designed broadband transformer will degrade the performance in a like manner.

If we are to minimize the presence of stray reactance, we must use large or very short circuit-board strips. This will reduce the effective inductance of the PC-board foils. These copper strips should also be as direct as possible. Similarly, the connecting leads of resistors and capacitors must be held to a minimum length. Many amplifiers contain chip resistors and capacitors to keep stray inductance and capacitance to a minimum. These components are supplied without leads or "pigtails." They are soldered directly to the PC-board foils. They are practically a requisite at the upper end of the HF range and higher, but they are more costly than are silver-mica or disc-ceramic capacitors.

Conventional or Transmission-Line Transformers?

I'm sure you've heard designers speak of "conventional" and "transmission-line" transformers. The so-called conventional transformer is built along the lines of an audio or power transformer. That is, it has a core and separate windings, as in Fig. 3A. The transmission-line transformer, on the other hand, has bifilar, trifilar or quadrifilar windings that are placed on the core in parallel, or they may be twisted together beforehand. In this case, each winding conductor is the same length. The windings function as short lengths of transmission line, and the impedance is generally 25 ohms. Either style of transformer can be used in a broadband amplifier, or as a matching transformer in other types of circuits, such as antennas.

The conventional transformer is considered less efficient than the other type, but it enables us to obtain nearly any turns ratio we desire. The transmission-line transformer (Fig. 3B) yields only specific integers of transformation, such as 4:1, 9:1, etc. Furthermore, we can find ourselves rather frustrated when trying to hook up a multiwire transmission-line transformer, especially if the same size and color of wire is used for the windings. Many engineers use enameled wire of various colors to avoid this problem. Green, red and brown wire is often used. You can solve the problem by dipping the wires in different colors of paint before using them. I have had good results by spraying the wires with fast-drying paint.

A Handy Broadband Amplifier

Many times we find ourselves in need of a little extra "push" when working with a scope or frequency counter. Perhaps the sampling point in the circuit has insufficient signal voltage to trigger our frequency counter or cause ample deflection on the face of the scope tube. A broadband amplifier is useful at such times to give that weak signal the needed boost.

Our workshop project this month is shown schematically in Fig. 4. It is patterned along the lines of a broadband amplifier designed by Hayward, W7ZOI. His design did not use transformers and there was no high-level stage at the tail end of the amplifier strip, but the feedback networks are similar to his. The particulars of the general design are given in the text of *Solid State Design for the Radio Amateur*, referenced earlier in this article.

CATV transistors are used to ensure good bandwidth (1.2 GHz f_T) and linearity. Each stage is biased for linear Class-A operation. A combination of shunt and degenerative feedback is used throughout the circuit. The input of each amplifier is roughly 50 ohms, and each output is approximately 200 ohms with the values given. Amplifier stability is excellent, even when there is no termination at the input and output ports. Circuit boards and parts kits for this circuit are available.[4]

The bandwidth is flat from 400 kHz to 34 MHz (within 1 dB). I measured the overall gain as 41 dB. The maximum acceptable output, in terms of distortion, is 0.25 W. The circuit draws 90 mA of current with a supply voltage of +13.

Owing to the linearity and bandwidth of the circuit in Fig. 4, it is ideal as a drop-in

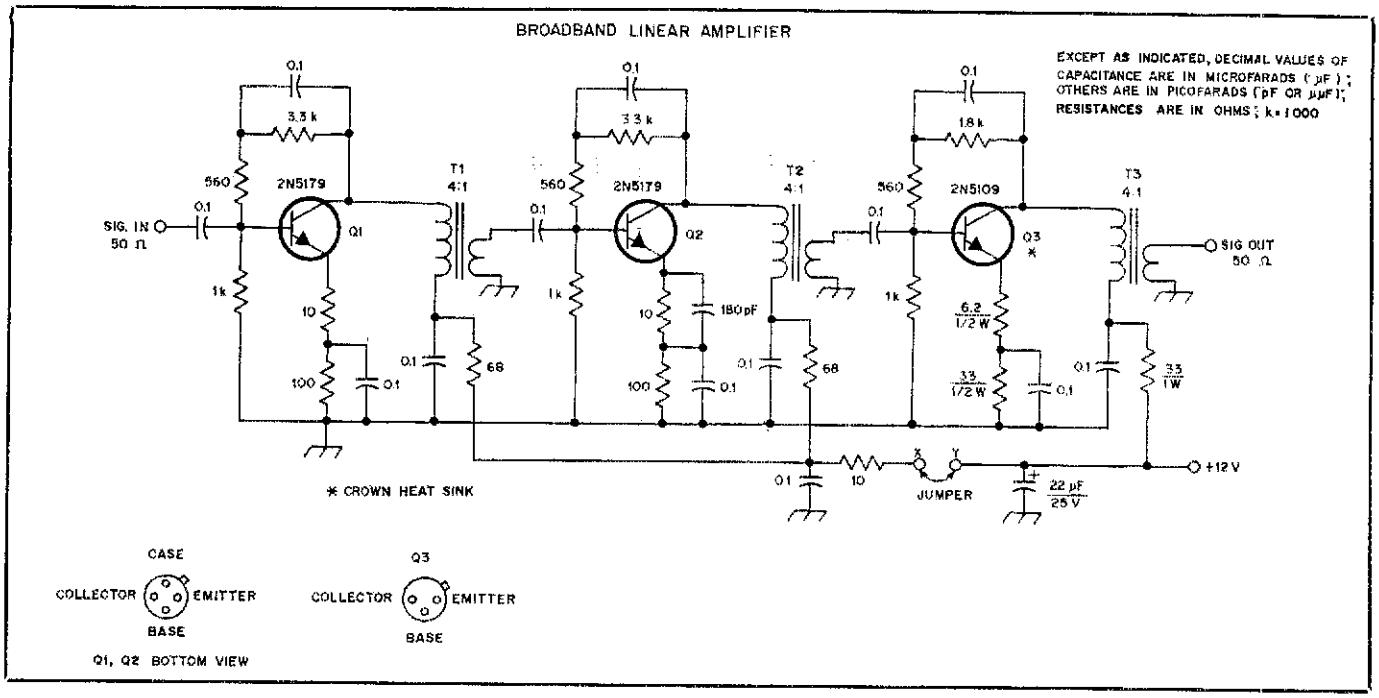


Fig. 4 — A practical circuit for a broadband linear-amplifier strip. This can be used as an instrument amplifier, a low-level RF strip in a transmitter or as part of a receiving-loop preamplifier. Resistors are ¼-W carbon-composition unless otherwise noted. The polarized capacitor is tantalum or electrolytic. All others are chip-style or disc-ceramic with short leads. T1 and T2 contain 15 primary turns of no. 28 enameled wire on an Amidon FT37-43 toroid core. The secondary windings consist of seven turns of no. 28 enameled wire. T3 uses an Amidon FT50-43 toroid core with 12 primary turns of no. 26 enameled wire. The secondary of T3 contains six turns of no. 26 wire.

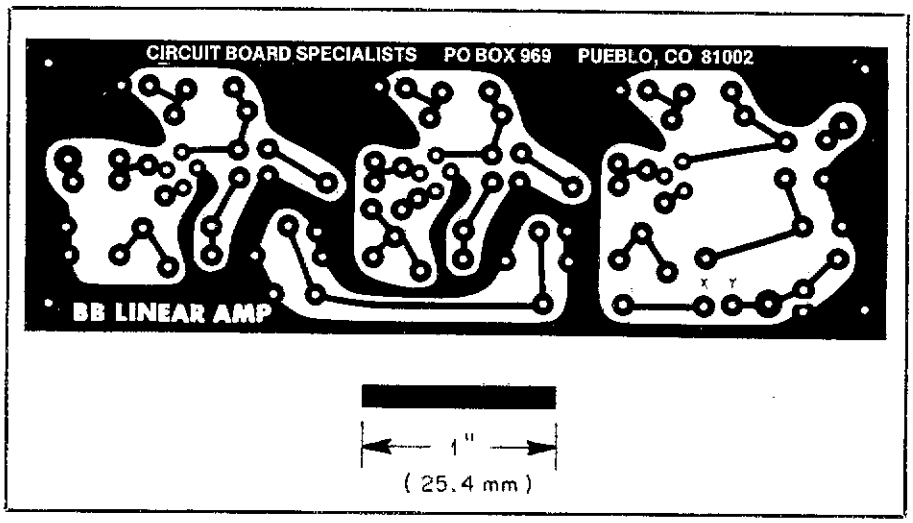


Fig. 5 — Circuit-board etching pattern for the broadband amplifier of Fig. 4. The pattern is shown full size from the foil side of the board. Black areas represent unetched copper foil.

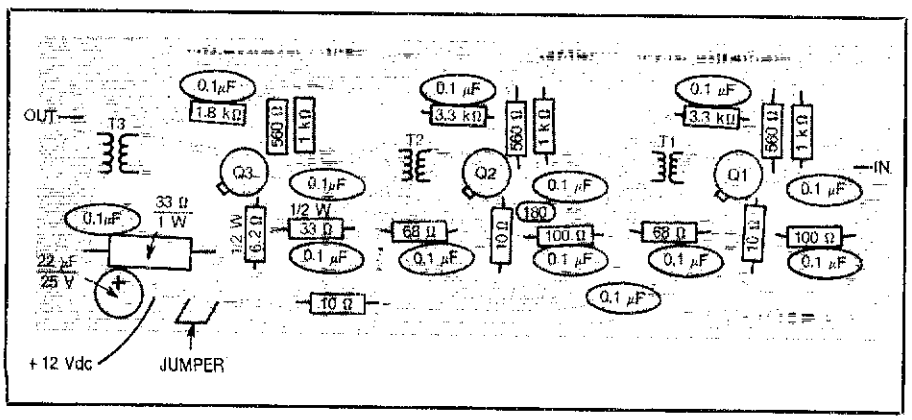


Fig. 6 — Parts-placement guide for the broadband amplifier of Fig. 4.

unit for an HF-band CW or SSB transmitter. It can be used as the low-level section of such a transmitter. I wish to caution you, however, that it should not be used for QRP operation unless a suitable harmonic filter is placed between the amplifier output and the antenna. A half-wave style of filter should be suitable if you want to try your hand at low-power operation.

Terminals X and Y on the circuit board are available for use as a standby point, or for CW keying. If a keying line is attached at X and Y, be sure to include a shaping network so that your signal won't sound clicky.

This amplifier can be used also as a preamplifier for loop antennas. A step attenuator can be inserted at the output of the amplifier to control the gain. If you choose to use this circuit in such a manner, a low-noise preamplifier should precede Q1 of Fig. 4. I find that a JFET stage is suitable for this purpose. Owing to the small signal that a receiving loop provides, the preamplifier (even at 1.8 MHz) must be a low-noise type. If not, you will enjoy listening to "pop-corn" noise along with the DX signals! Q1 does not have a low enough noise figure for satisfactory weak-signal reception.

Construction

If you choose to make your own PC board for this project, try to keep all stages in a straight line. Keep the PC-board foils short and direct. Minimize the lead length of each capacitor and resistor. Make sure the transistors are seated close to the PC board in order to keep their leads as short

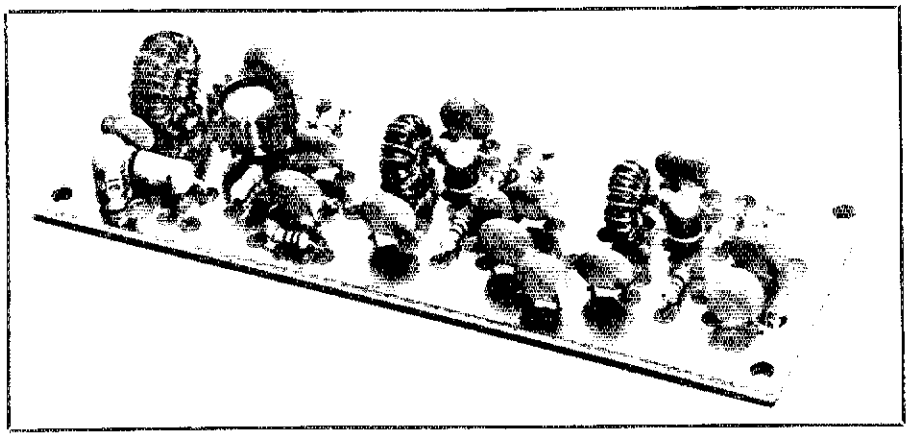


Fig. 7 — The assembled broadband amplifier. Note that in-line layout is used.

as possible. A crown heat sink is needed on Q3, the 2N5109. A coating of silicone grease should be applied to the transistor cap before installing the heat sink. Double-sided PC board is recommended in the interest of stability. Fig. 6 shows the parts placement for the circuit board, as seen from the component side. A scale template of the PC-board pattern is provided in Fig. 5. Fig. 7 is a photograph of the assembled amplifier.

Some Final Remarks

I hope you have learned the basics about narrow-band and broadband amplifiers. Certainly, we've only scratched the outer layer of the subject. A thorough treatment would require several *QST* installments. Our purpose this time is to explain the difference between amplifier types, and to provide a project that would enable you to try your hand at broadband amplifier construction and use.

A broadband amplifier can be built for Class A, B or C service, just as narrow-band amplifiers can. The advantage of broadband designs is, in retrospect, to obtain a wide frequency response with relatively flat gain. This helps us to design circuits that do not require band-switching provisions. In other words, it simplifies the design of a multiband transmitter. But, as an instrumentation amplifier, the circuit of Fig. 4 has a great many advantages around the workshop. Good luck with your project.

Notes

[1]Amidon Associates, 12033 Otsego St., N. Hollywood, CA 91607 (catalog available). Fair-Rite Products Corp., 1 Commercial Row, Walkill, NY 12589. See *QST* ads for Palomar and RadioKit.

[2]D. DeMaw, *Ferromagnetic Core Design & Applications Handbook*, no. 0-13-314088-1 (Englewood Cliffs, NJ: Prentice-Hall, Inc.).

[3]*Motorola RF Data Manual*, Motorola Semiconductor Products, Inc., P.O. Box 20912, Phoenix, AZ 85036.

[4]Circuit Board Specialists, P.O. Box 969, Pueblo, CO 81002, tel. 303-542-5083. ■

Strays

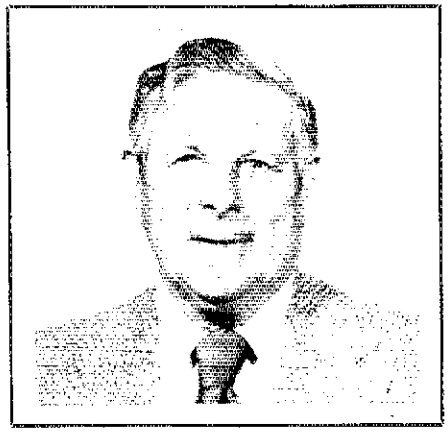
TA PROFILES

☐ It is our pleasure to introduce ARRL Technical Advisor Michael E. Hiehle, W6RZ. Since joining our official TA family on January 3, 1980, his professional advice as one of our antenna experts has been invaluable to radio amateurs. He is a Life Member of the ARRL, and has written articles for *QST*.

Mike received his first Amateur Radio license in 1929, while residing in Canada. He was issued the call W6RZ in 1930, and currently holds an Extra Class license. He is also the holder of a First Class Radiotelegraph Operators Certificate with endorsements and a radio Telephone Operator License, First Class.

After graduating from the California Institute of Technology with a BSEE degree, Mike was employed at General Electric Company. During his 10 years there, he was responsible for antenna radar design during World War II and subsequently on commercial antenna design. Mike now lives in Culver City, California, and is enjoying retirement after 31 years of service at Hughes Aircraft. He is presently working on a 5-band quad antenna.

For 20 years, Mike has been an active member of the National Ski Patrol (specializing in avalanche phenomena), and has worked with the Boy Scouts since 1943.



TA Mike Hiehle, W6RZ

His leisure time is spent backpacking/mountaineering (Mt. McKinley, 1964). — *Marian Anderson, WB1FSB*

ANTENNAS SUBJECT OF TRN TALK

☐ "Multiband, Broadband and Frequency Independent Antennas — An Overview" will be the subject of a talk by noted antenna expert John Belrose, VE2CV, on the North American Teleconference Radio Net on June 21 at 7:30 P.M. CDT. Belrose, director of radio communications at the DOC Research Center in Ottawa, Ontario, has written many articles on antenna design for *QST* and other publications.

Access to TRN is provided by more than 180 gateway stations, mostly VHF repeaters, linked together to cover virtually every metropolitan area in the U.S. and much of Canada. For information on linking your repeater into the net, send an s.a.s.e. to Net Manager Rick Whiting, WØTN, 4749 Diane Dr., Minnetonka, MN 55343.

ROANOKE DIVISION PLANNING SESSION THIS MONTH

☐ This year's Roanoke Division League Planning Meeting will be held May 12-13 at the Ramada Inn, South Charleston, West Virginia. ARRL Communications Assistant Jim Clary, WB9IHH, will be among those attending. For more information, contact Albert Hix, W8AH, 860 Alta Rd., Charleston, WV 25314, tel. 304-344-1215.

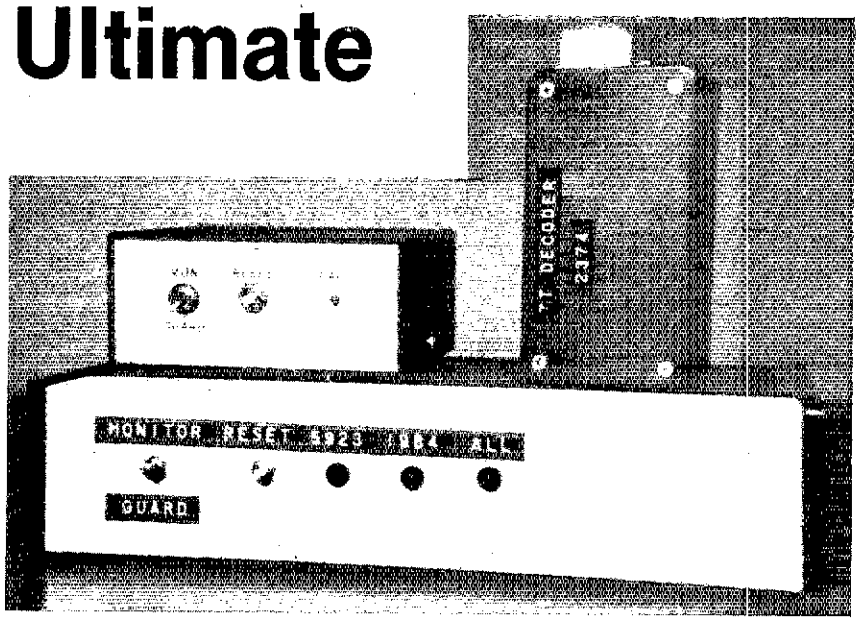
QST congratulates...

☐ the following radio amateurs on 60 years as ARRL members:

- Robert Aldrich, WØJVM, of Minneapolis, Minnesota
- Frank A. Gunther, W2ALS, of Staten Island, New York
- John F. Longley, W2ANB, of Slingerlands, New York

The Nearly Ultimate Decoder

Need a simple project for your next club activity? Try this versatile paging system, a sequential DTMF decoder, for use with your favorite repeater.



By Paul Newland,* AD7I

Does your club need a system that will allow you to call other people on a repeater channel, just as you might ring their telephones? If you do, you might be interested in building the Nearly Ultimate Decoder, or NUD. NUD is capable of detecting either of two sequences of up to eight Touch-Tone® signals from a VHF-FM radio and then ringing a bell, buzzer or other alarm indicator when the proper sequence is received. It is also possible to link the two decoders to form a single 15-digit decoder. An all-call function is also supported for emergency use. If NUD hears any valid dual-tone, multifrequency (DTMF) signal on the channel for more than 5 seconds, it will trigger the alarm. If these features appeal to you, spend a weekend building this simple circuit.

Since 1976, I have been trying to devise a simple and reliable method of signaling individuals or groups using VHF hand-held radios. My first attempt used a four-tone selective-call sequence. Tone pads, either integrated into commercial VHF radios or added as accessories, were used to generate single tones by simultaneously pressing two buttons in the same row.

The decoder used an NE567 phase-locked loop (PLL) tone decoder. The desired frequency for the PLL was programmed by selection of an RC time constant. I used a CMOS counter driving a set of CMOS analog switches to select different resistance values, depending on which of the four tones was desired. When a tone was selected, the counter input was taken to the inactive edge. After the tone was removed and the PLL unlocked, the counter was advanced and the next resistance value was selected. If the next tone was correct, the counter advanced. When the counter reached four, a latch was set and an alarm sounded to tell the operator that a proper code had been received.

This system was unreliable for two reasons. First, ambient-temperature changes altered the RC-network time constant, which in turn changed the PLL detection frequency. Second, the NE567 PLL is sensitive to signal level. If the signal is too weak, the decoder never detects the signal. If the signal is too strong, the decoder responds to signals other than the desired one. Both problems proved to be too tough to overcome with the space and power that was available for hand-held portable operation.

My next attempt at a pager-like decoder was a system I called Not Just Another Decoder or NAD.[1] NAD was based on an IC encoder/decoder chip made by National Semiconductor. That chip was intended for use as part of a radio-controlled garage-door system. NAD's problem was that for reliable operation, the operator had to electrically couple it to the modulating circuitry of the radio for transmission. This was not a big problem, but it did require connecting and disconnecting NAD's transmitter to a radio microphone circuit; it was not convenient. After this experimentation, I decided that the only system of any real value to radio amateurs for pager-type operation must be based on the tone pad that has been incorporated into almost every VHF-FM Amateur Radio set manufactured since 1980.

The Next Generation

In late 1982, Silicon Systems, Inc., announced an 18-pin tone-decoder chip: the SSI 202-P.[2] This is a low-power CMOS device, ideal for battery powered operation. It uses an inexpensive 3.V color-burst crystal for timing, does not require any band-splitting filters, uses a +5-V supply, detects all 16 tone pairs, and has good speech immunity.

Because of the introduction of this IC (and other ICs with similar characteristics from other manufacturers), I believe the technology is available for a DTMF-based system for hand-held Amateur Radio use. Before these new ICs were available, such systems consumed too much power for battery operation, were unreliable (most systems used by amateurs employed 567 PLL decoders), or were too expensive. The 202-P chip, which forms the basis for NUD, overcomes all of these problems.

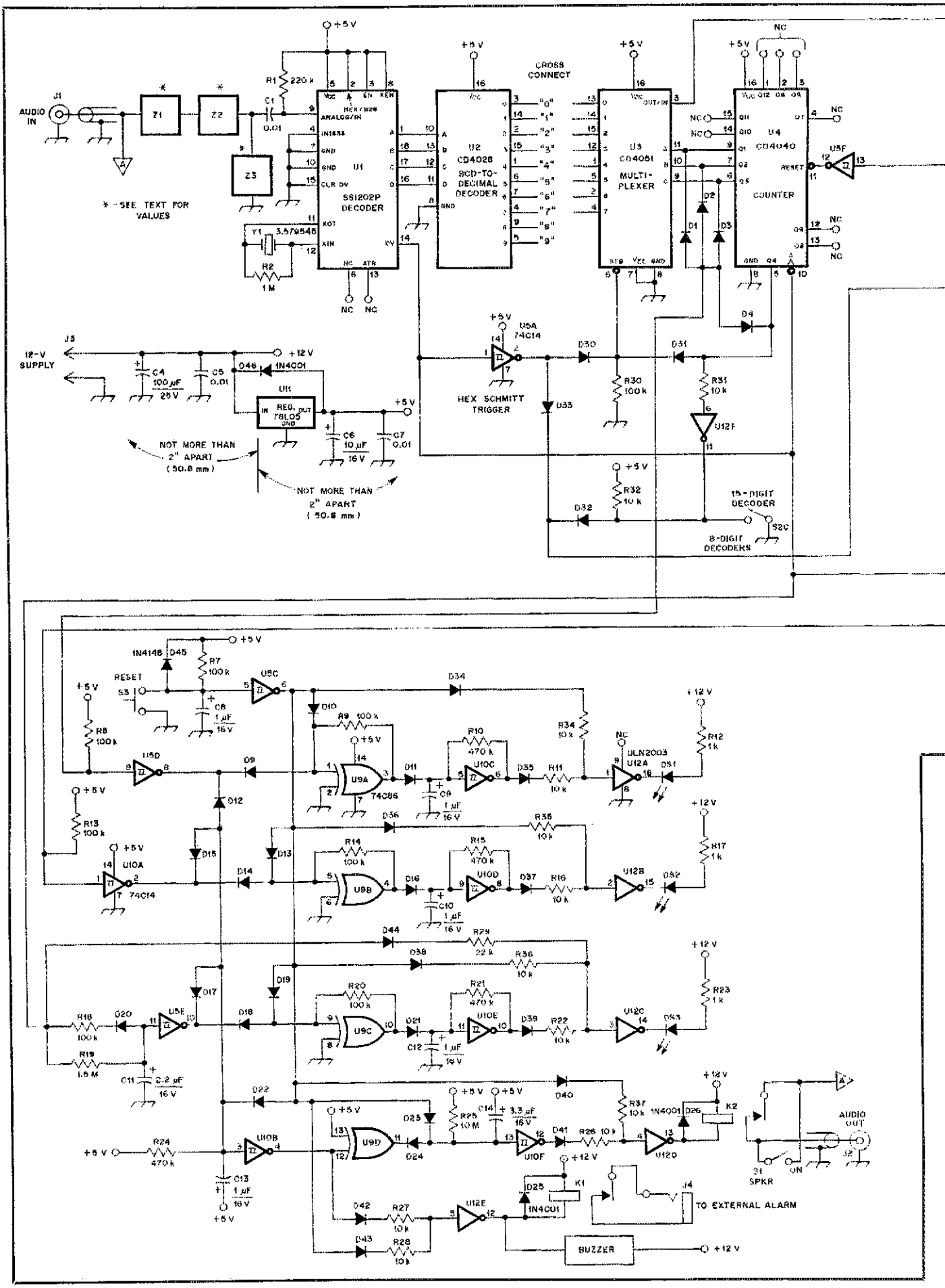
Circuit Description

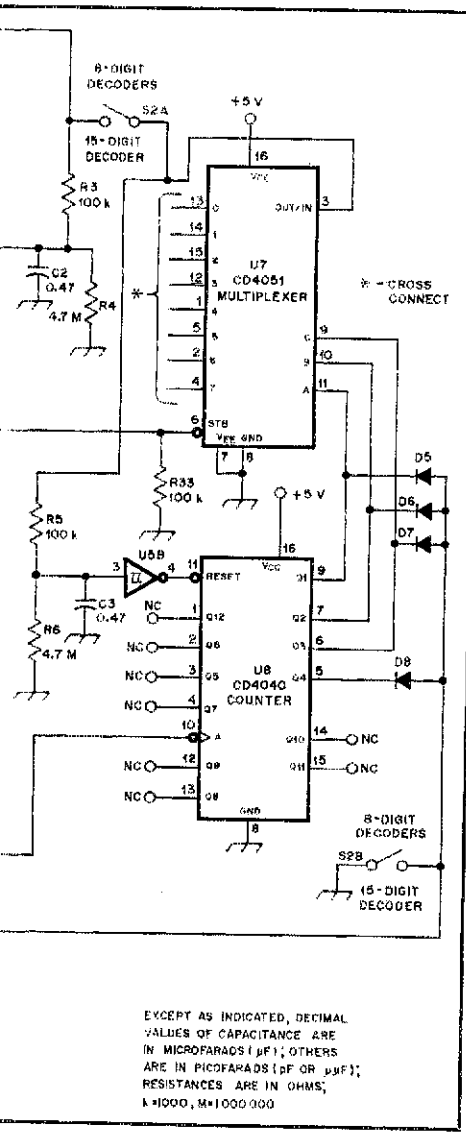
The lead photo shows three versions of NUD, and a complete schematic diagram is given in Fig. 1. The audio input is filtered by Z1, Z2 and Z3 to provide proper audio-frequency response for U1. The IC requires both tone-pair signals to be of equal amplitude. If there is a difference in levels, the lower-frequency signal should have the greater amplitude. The filter values depend on the audio characteristics of the radio receiver you are using. Table 1 lists the values of each component to be used with a given AF response. "High" refers to a radio that emphasizes the higher audio frequencies. "Low" refers to a radio that emphasizes the lower audio frequencies, and "flat" refers to a radio that reproduces all audio frequencies at the same level. Later, I'll discuss how you can determine what type of audio characteristics your radio has.

The DTMF decoder chip is biased by C1 and R1. A time base to enable the chip to detect DTMF signals is provided by Y1 and R2. Output signals from U1 include a binary coded-decimal (BCD) representation of the decoded signal and a data valid

*P.O. Box 205, Holmdel, NJ 07733-0205

[1]Notes appear on page 34.


AUDIO IN
J1
Z1
Z2
Z3
* - SEE TEXT FOR VALUES
R1 220 k
C1 0.01
U1 SSI202P DECODER
Y1 3.579545
R2 1 M
U2 CD4028 BCD-TO-DECIMAL DECODER
CROSS CONNECT
U3 CD4051 MULTI-PLEXER
U4 CD4040 COUNTER
U5F
D1
D2
D3
D4
J3
12-V SUPPLY
C4 100 µF 25 V
C5 0.01
D46 1N4001
U11 REG. 78L05
C6 10 µF 16 V
C7 0.01
NOT MORE THAN 2" APART (50.8 mm)
U5A 74C14
HEX SCHMITT TRIGGER
D30
D31
D33
R30 100 k
R31 10 k
U12F
R32 10 k
D32
15-DIGIT DECODER
8-DIGIT DECODERS
S2C
1N4148 D45
R7 100 k
RESET
S3
C8 1 µF 16 V
U5C
D34
D10
R9 100 k
R8 100 k
U5D
D9
U9A 74C86
D11
C9 1 µF 16 V
U10C
D35
R11 10 k
R10 470 k
R34 10 k
U12A
D51
ULN2003
R12 1 k
R13 100 k
U10A 74C14
D12
D15
D13
D14
D36
R35 10 k
R14 100 k
U9B
D16
C10 1 µF 16 V
U10D
D37
R16 10 k
U12B
D52
R17 1 k
D44
R29 22 k
D38
R36 10 k
D17
D19
R18 100 k
D20
U5E
D18
R20 100 k
U9C
D21
C12 1 µF 16 V
U10E
D39
R22 10 k
U12C
D53
R23 1 k
R19 1.5 M
C11 2.2 µF 16 V
D22
D40
U10B
R24 470 k
C13 1 µF 16 V
D23
R25 10 M
C14 3.3 µF 16 V
U9D
D24
U10F
R37 10 k
1N4001 D26
K2
R26 10 k
U12D
D41
AUDIO OUT
J2
S1 SPKR ON
D42
R27 10 k
U12E
D43
R28 10 k
D25 1N4001
K1
J4
TO EXTERNAL ALARM
BUZZER
+5 V
+12 V
NC



EXCEPT AS INDICATED, DECIMAL VALUES OF CAPACITANCE ARE IN MICROFARADS (μF); OTHERS ARE IN PICOFARADS (pF OR μμF); RESISTANCES ARE IN OHMS; k=1000, M=1000 000

Fig. 1 — Schematic diagram of NUD, a sequential DTMF decoder.
D1-D24, D30-D44 — 1N4148.
D25, D26 — 1N4001.
S1 — SPST switch.
S2 — 8-position DIP switch.
S3 — Momentary push button, normally open contacts.
K1, K2 — SPST 12-V relay.

Table 1
Filter Components

Receiver Audio Response	Z1	Z2	Z3
Low	6800 pF	0 ohms	10 kΩ
Flat	0 ohms	0 ohms	Open
High	0.1 μF	10 kΩ	0.022 μF

(DV) signal to show when the BCD output is valid. A significant deviation from what most would expect for a BCD output is that zero is encoded as 1010 (decimal 10) and the letter D is encoded as 0000 (decimal 0).

U2 is a 1-of-10 decoder, and converts the BCD input to a high logic level at one of its outputs. For example, if the BCD output from U1 is 0101 (5), then pin six (logic output five) of U2 is at +5 V and all other outputs are at 0 V. U3 is an analog multiplexer. You can think of it as a single-pole, eight-throw switch. Its position is selected by the BCD input on pins 11, 10 and 9. If the select inputs are in state 011 (3), input 3 (pin 12) can be considered connected to the output (pin 3). By cross connecting the outputs of U2 to the analog inputs of U3, NUD can be programmed to whatever sequence of tone digits is desired. The STROBE input to U3 (pin 6) can be thought of as an additional switch in series with the output. If the STROBE signal is at logic high, the switch is open; if it is at logic low, the switch is closed. U4, a binary counter, keeps track of how many digits in the sequence have been received correctly. The RESET pin on this chip is driven by the BCD-to-decimal decoder, U1, via the multiplexer, U3.

Now, let's see what happens when the unit detects a tone pair. This example will explain how the major portions of the circuit function. When a tone pair is detected by U1, its BCD outputs reflect the value of the tone pair received. Additionally, the DV signal will go high, telling the remainder of the circuit that the data on the BCD output lines of U1 are valid. U2 converts this value to a high signal level on only one of its outputs. Counter U4 would be in the 0 state because its reset pin is held high. (The input to U5F is low.)

With U4 at count 0, pins 3 and 13 of U3 can be considered connected together when the STROBE signal is low. With DV high, the STROBE signal is low, and if pin 13 of U3 is connected to the output of U2 that is high, C2 will charge to a high state. This will remove the reset signal from the counter. When U1 takes DV low (the tone pair has been removed from the input), U4 will advance its count by one and U3 will connect pin 14 to pin 3. If another tone pair is detected, and pin 14 of U3 is connected to the output of U2 that is high this time, the counter will advance again when the tone pair is removed. If the selected input of U3 is low (as would be the case if the wrong tone pair was received), C2 will discharge to a low state, resetting U4. If the gap between valid tone pairs is too long (more than 1.5 seconds), C2 will discharge to a low state through R4.

D1, D2, D3 and D4 form an AND gate to determine when the proper number of tone pairs have been received correctly. Table 2 shows which diodes must be installed for a given number of tones in the sequence.

When the proper count is reached, the input to U5D will go high, the latch formed by U9A will be set, and DS1 will flash on and off until the RESET button is pressed. Additionally, the output from U10B will go high for the time determined by R24 and C13 (about 3 seconds). This will cause the buzzer to sound by saturating U12E. The speaker will also be connected to the radio audio for about 30 seconds via U10F and U12D.

Table 2
End of Sequence Detection

No. of Tones	D4	D3	D2	D1
1	out	out	out	in
2	out	out	in	out
3	out	out	in	in
4	out	in	out	out
5	out	in	out	in
6	out	in	in	out
7	out	in	in	in
8	in	out	out	out
9	in	out	out	in
10	in	out	in	out
11	in	out	in	in
12	in	in	out	out
13	in	in	out	in
14	in	in	in	out
15	in	in	in	in

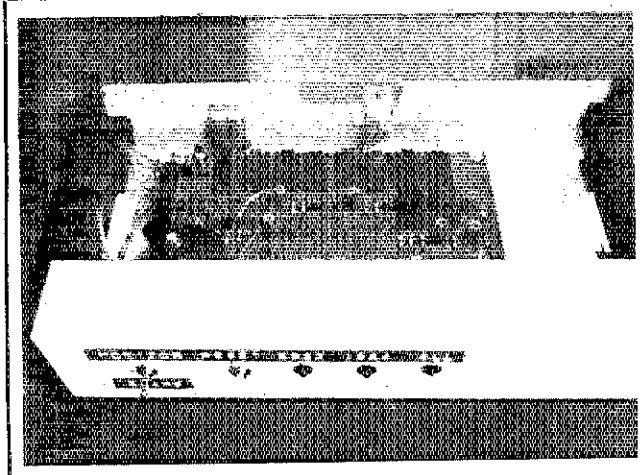
The second decoder, formed by U7 and U8, operates exactly the same as the first decoder. D30 to D33 and R30 to R33 allow the two decoders to be linked to form a 15-digit decoder. If two 8-digit decoders are desired, open switches S2A and S2B, and close switch S2C. If you want one 15-digit decoder, reverse the positions of these switches. With the 15-digit decoder, the first eight digits are programmed into U3 and the remaining seven digits are programmed into U7. Good design practice requires that any unused inputs of U3 and U7 should be grounded.

If the DV signal is high for more than 5 seconds, C11 will charge through R19 to more than 4 V and the output of U5E will go low. If the DV signal goes low before the capacitor is fully charged, it will quickly discharge through D20 and R18. When the output from U5E goes low, the alarm will sound and the speaker will be connected to the radio. This feature provides a simple all-call function for emergency operations. To disable this feature, simply short out C11. The time required for C11 to charge is proportional to its capacitance. To change the amount of time required to trigger the all-call feature, change the value of C11.

U5C and associated components form a power-on and manual reset/test circuit. When the reset button is pressed, all latches are cleared, the lamps light, the speaker becomes active, and the buzzer will sound. This provides a self-test feature, in addition to resetting the system.

Construction

Few construction details are given. You can choose any construction method you like. I prefer the wire-wrap technique because it makes circuit changes easier during the development stage. Fig. 2 shows the layout used for two decoders that I built. Power and audio-signal connectors can be any style available, but if everyone in your group uses the same convention, it will be



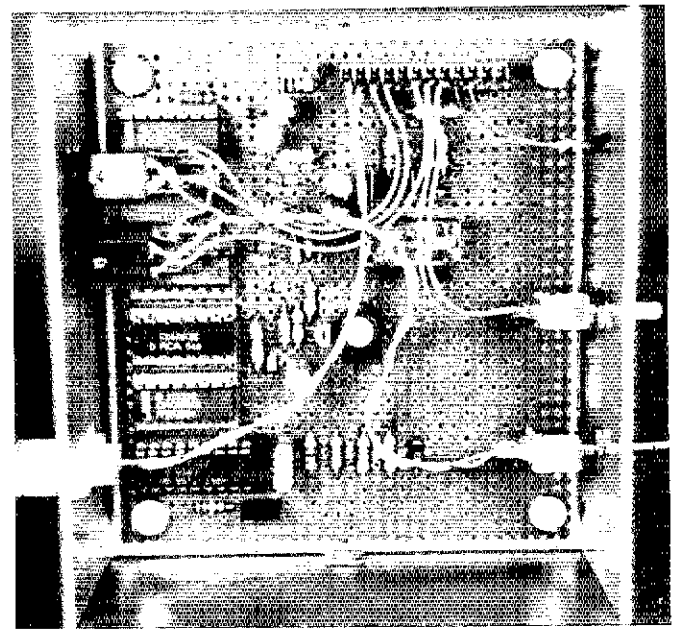


Fig. 2 — Parts placement for two versions of the decoder are shown. The unit shown above is a full-featured decoder. The power connector is located on the back panel and the audio input and output lines are on the left side. A buzzer is located at the front left corner of the perf board. At the right is a version of NUD that provides only a single-sequence decoder.

easier to use your decoder with someone else's radio.

Selective-Call Numbers

I have only a few comments about code selection. Each individual in a group should select or be assigned a number sequence to use as a selective call. Because U2, the BCD-to-decimal decoder, cannot detect a 1010 input, I recommend that the Touch-tone digit 0 not be used as part of a selective call. Instead, this digit should be reserved for resetting NUD to a known state. As an example, all selective calls could begin with 0 to reset the decoder. I don't recommend the use of a selective call that uses the same tone pair twice in a row. If a call for someone else fades out and then comes back during a tone that your decoder wants twice in a row, it might sound a "false alarm." A selective call of 023345 would not be desirable, but 023534 would be fine.

Programming

Programming NUD is a simple matter. The decoded outputs for the digits 1 through 9 are labeled on U2. Note that the 0 output will be active when the D button on a 16-button tone pad is pressed. This is because U1 encodes the D tone pair as 0000 (or just 0), and cannot be changed. Use of this output should be avoided because some stations may not have a 16-button tone pad. Connect pin 13 of U3 to the pin of U2 that represents the first tone pair you want to detect. Connect pin 14 of U3 to the pin of U2 that represents the second tone pair. Continue this process until you have programmed all the tone pairs in your sequence. If you are using fewer than eight digits connect the remaining U3 inputs to ground. Next, install D1, D2, D3 and/or D4 as required for the number of tone pairs in your sequence. Follow a similar procedure to program the second decoder. Remember that all unused inputs to U3 and U7 must be connected to ground.

Testing

With all ICs removed, apply power and check the voltage at the supply pin of each chip for +5 V. Turn off the power and install all of the chips. Re-apply power and key in the first tone-pair signal for your selective call. When the tone is detected, the DV output of U1 will go high and the proper output of U2 will also go high. DS3 will light when a tone-pair is detected. As each tone pair is detected in sequence, a high logic level can be measured at U3 pin 3. Failure to get these signals indicates a problem in the detection, decoding or selection circuitry. When the proper number of tone pairs have been detected, the diode AND gate will go high. This causes the lamp and buzzer to be activated.

Determining the Audio Characteristics of Your Radio

The audio-frequency response of all my radios favors the higher frequencies. In this instance, NUD requires a low-pass filter formed by Z1, Z2 and Z3 in Fig. 1. A simple way to determine the response of your radio is to have a friend transmit some tones. Connect a resistive load (100 ohms) across the audio output of your receiver. Wire a 1-V full-scale meter across the resistor. Have your friend send a single low-frequency tone by simultaneously pressing buttons 1 and 2. Record the voltmeter reading. Next, have him or her send a single high-frequency tone by pressing buttons 3 and 6 at the same time. Again note the voltage. Now, have your friend transmit the single tone that produced the largest reading. While this tone is being received, adjust the volume control on your radio to provide a full-scale reading. Then, have the other single tone sent and note the voltage.

If the weaker of the two tones measures more than 700 mV, your radio has a flat audio response. If the weaker tone is less than 700 mV and the high-frequency tone is the stronger of the two, your radio can be considered to have a high frequency response. If the low-frequency tone is the stronger one, your radio has a low frequency response. One note of caution for these tests: They are not exact, and you should probably try the measurements with several transmitting stations and average the results. Use your test results, along with Table 1, to determine the components to employ at Z1, Z2 and Z3 in your decoder.

The requirements of the DTMF decoder chip, U1, are such that it will detect signals properly only if the high-to-low-tone ratio is between −8 dB and +4 dB. So, if you must choose, it is better to have the high-frequency tone be weaker than the low-frequency one.

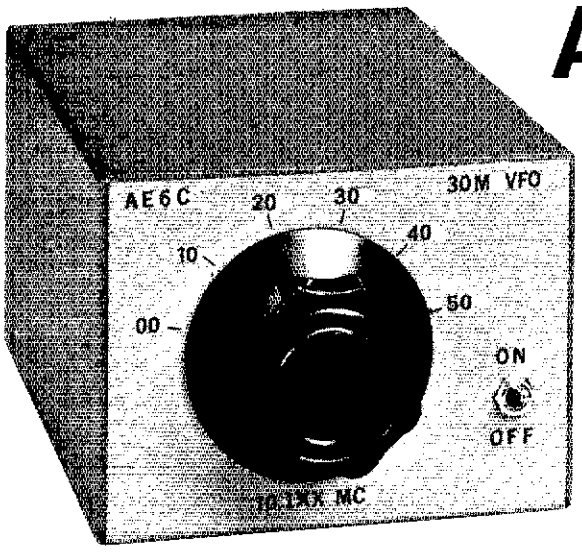
Conclusion

NUD provides many features that will prove useful for repeater clubs, ARES organizations and other groups of Amateur Radio operators. It may not be the *ultimate* DTMF decoder, especially in light of the rapidly advancing technology in this area, but the low cost and simplicity make it an attractive project.

Notes

[1]P. Newland, "Not Just Another Decoder (NAD)," *QST*, June 1982, pp. 25-27.

[2]Silicon Systems, Inc., 14351 Myford Rd., Tustin, CA 92680, tel. 714-731-7110.



A Battery-Powered 30-Meter VFO

Is your old tube CW rig collecting dust? Give it new life on 30 meters with this simple, stable VFO.

By Dennis Monticelli,* AE6C

The 30-meter band has generated a lot of interest, particularly among CW buffs. It is uncrowded, contest- and kilowatt-free, and open nearly around the clock to some point of the world. As the MUF declines, 30 meters will increase in value as an alternative to 20 meters. If your rig is new, you're only an antenna away from getting on the band; but if your rig is a few years or more old, you may be out of luck.[1]

While planning a "mod" attack on my Kenwood transceiver one weekend, I noticed my trusty old Johnson Viking II sulking in the recesses of my junk closet. It was proud once, but its time had passed . . . or had it? My mind was quickly made up! Work began immediately on designing a stable, self-contained VFO for use with the Viking. Receiving chores are handled by my Collins R-390A; others may want to try using a receiving converter.[2] I wanted the design to be simple and well isolated to encourage others to retrofit their old rigs, tube or transistor type. The VFO is suitable for use in a "homebrew" 30-meter rig, too.

Some Ground Rules

In working with VFOs, I've found that the choice of oscillator circuit is secondary to proper use of that circuit. This means paying attention to a long list of common sense rules. Failure to observe even one of these rules can result in less-than-satisfactory performance:

- Use the least amount of power necessary to drive the load.
- Use the least amount of feedback necessary to ensure quick starting and insensitivity to load changes.
- Shield the frequency-determining components.
- Use a regulated and well-filtered power supply (at least for the oscillator transistor).
- Keep supply lines isolated and/or decoupled from the transmitter RF field.
- Lightly couple the oscillator transistor output to the next stage, and/or employ a buffer stage with constant input impedance and a high degree of isolation.
- Choose a transistor (bipolar, JFET or MOSFET) whose frequency rating (f_T) is well in excess (>20 times) of the oscillating frequency.
- Stabilize the oscillation amplitude if possible.
- Choose low-temperature-coefficient, low-loss capacitors, such as NP0 ceramic, silver-mica or polystyrene types.[3]
- Place capacitors in parallel to reduce self-heating. This is especially important when oscillator power is high and/or capacitors are physically small.
- Use mechanically stable, air-variable capacitors with a smooth turning action. Brass plates (often plated) and double end bearings are preferred, but not absolutely necessary.
- Use a mechanically stable, air-wound coil on a ceramic, glass or plastic form. Use "Q dope" on homemade coils. If a core is used, choose a low-temperature-coefficient iron-powder material and minimize core penetration into the coil.
- Keep air currents away from the frequency-determining components.
- Keep L and C strays to a minimum by using short lead lengths and a wide ground return path. Avoid the use of double-sided PC boards and their accompanying unstable stray capacitance.
- Reduce mechanical vibration by mounting all critical components securely and interconnecting them with heavy-gauge wire.

Circuit Description

The series-tuned Clapp oscillator was chosen for this VFO partly because it is able to use a larger inductor for a given frequency, thus reducing the effect of stray inductance. Fig. 1 shows that the VFO is battery powered. This is done for a number of reasons. First, it results in a high degree of isolation between the VFO and other components. The only wire leaving the VFO box carries the output signal. Second, the overall circuit is simplified, as there is no need to build and decouple a power supply. Third, to achieve long battery life, I was forced to come up with a low-power design.

The VFO runs at 5 MHz and depends on doubling in the transmitter to produce the desired output frequency. Sufficient output voltage (22-V P-P, unloaded) is produced by the VFO to drive most tube stages into frequency doubling.

I prefer to use JFETs or depletion-mode MOSFETs for oscillator service because their ability to self-bias eliminates the need for a stabilized and decoupled bias supply. Note that the output signal is taken from the drain of Q1, which is not the convention in this type of oscillator. The drain-current signal is usually far from pure, but offers a way to couple maximum energy efficiently from Q1 to the next stage. In its direct-grounded, common-gate configuration, Q2 exhibits a high degree of isolation and consumes no additional current. Furthermore, it stabilizes the potential and im-

[1]Notes appear on page 37.

*48617 Tonopah Ct., Fremont, CA 94539

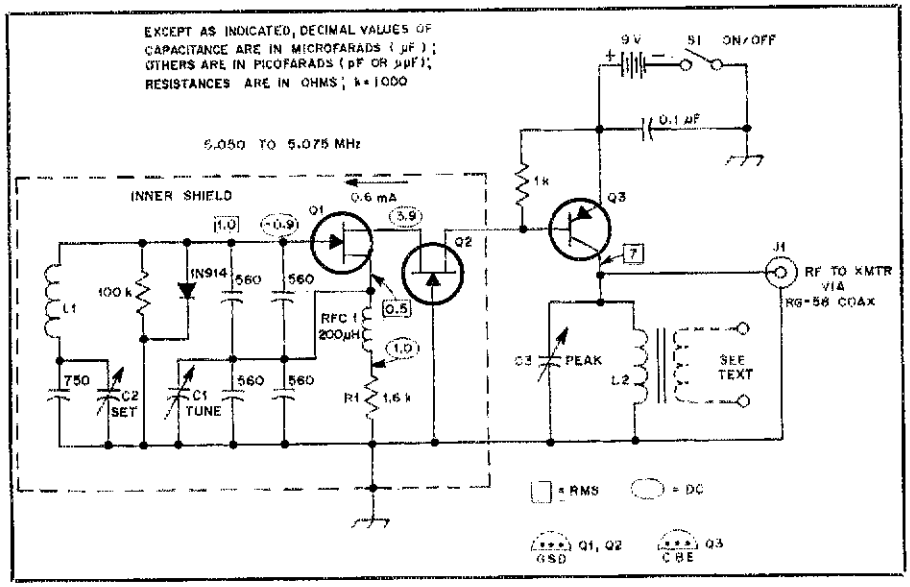


Fig. 1 — Schematic diagram of the battery-powered 30-meter VFO. The secondary winding on L2 is optional (see text). Fixed capacitors are silver-mica types. Resistors are ¼-W carbon types. Refer to the text for additional information on certain parts.

C1 — 4-50 pF air variable (Hammarlund HFA-50B, Millen 22050 or Cardwell 167-3).[5]
C2 — 2-17 pF air trimmer (Johnson 189-0506-005 or equiv.).[5]
C3 — 180-pF mica compression trimmer (ARCO 463 or equiv.).[5]
J1 — Female BNC connector.
L1 — 2.9-μH air-wound coil, ½-in-dia, 2-in long with 16 tpi (Airdux 416T or Miniductor 3003).[5]
L2 — 5.0 μH, 32 turns of enameled wire on a T50-2 core.[5] (See text for explanation of secondary.)
Q1 — 2N5484 N-channel JFET with low V_p (see text).[6]
Q2 — 2N5486 N-channel JFET with high V_p (see text).[6]
Q3 — MPS3640 PNP switching transistor or equiv.[6]
RFC1 — 200-μH molded choke (J. W. Miller 9210-90 or equiv.).[6]
S1 — Subminiature SPST toggle.

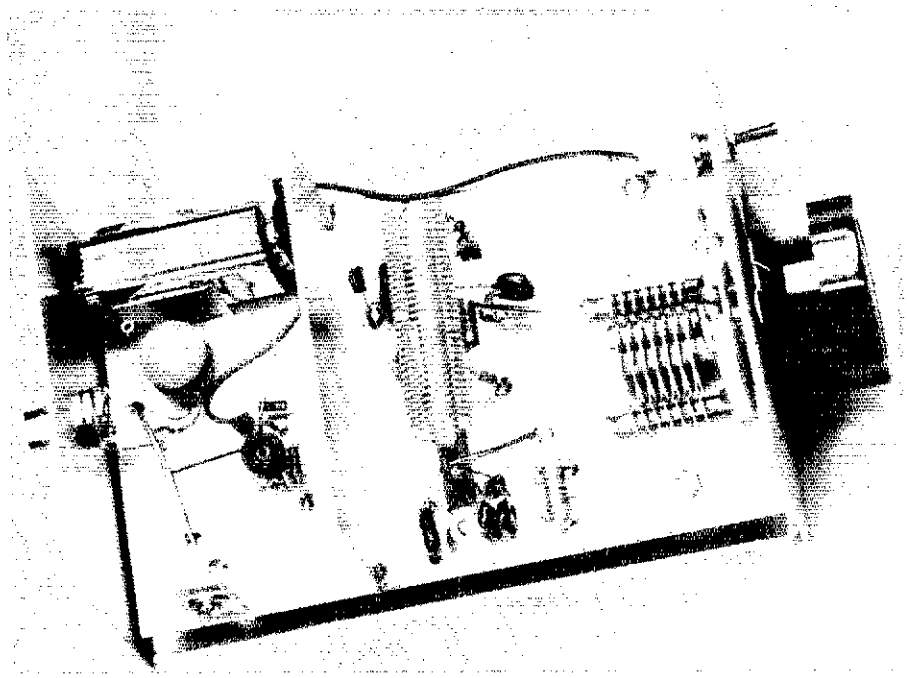


Fig. 2 — Inside view of the VFO showing the placement of parts.

pedance at the drain of Q1, doing away with the need for a power-hungry regulator or Zener diode at that point. The power consumption of Q1 is held to only 2.5 mW, which aids stability significantly.

The drain lead of Q2 passes through the shield wall and is dc coupled to Q3. Note that this lead is the *only* lead to exit the inner shield. It serves double duty as it carries battery power to Q1 and Q2, and carries out the signal to Q3. To reduce power consumption and clean up the oscillator signal, Q3 operates as a class-C amplifier with a high-Q tuned load. Power is furnished to the transmitter as needed by this stage. If the transmitter load is the grid of a tube, as it is in my case, the load is light and the total current consumption is only about 2 mA!

Construction

Although a PC board can be used for the VFO, I was lazy and used the "ugly" direct-wiring method of construction (see Fig. 2). Parts are wired over a ground plane of single-sided PC board. An eight-point insulated terminal strip holds Q1 and associated parts (including L1) rigidly. C1 and S1 are mounted on the front of the 3 × 4 × 6-in (HWD) LMB aluminum box.[4] J1 is mounted on the rear of the box. A PC-board partition shields Q1 and Q2 from the output stage energy. A small hole is drilled in the partition to allow the drain lead of Q2 to pass. Purists may want to place Q1, Q2 and the associated circuitry within a completely shielded enclosure, although that seems to be overkill for this design. On the other side of the partition, Q3 is mounted in a socket. L2 is sandwiched between two fiber washers and mounted above the ground plane by means of nylon hardware. C2 and C3 are soldered directly to the ground plane along one edge of the board and oriented such that a screwdriver can turn them while the box cover remains partially on.

Q2 should have a higher (at least 0.5 V higher) pinch-off voltage (V_p) than Q1 to obtain best performance. The transistor types listed virtually assure this condition, but using other transistor types, such as the 2N4416, 2N5485 or the popular MPF102, will require some testing. The simple V_p test described in Fig. 3 should be used regardless of transistor type(s) selected to

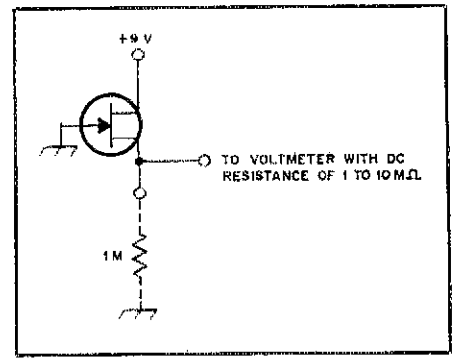


Fig. 3 — Simple test circuit for measuring the pinch-off voltage (V_p) of a JFET. The 1-MΩ resistor is needed only if your voltmeter has a dc input resistance greater than 10 MΩ. A low-impedance VOM (i.e., 20 kΩ /V) can also be used, but with reduced accuracy. The supply voltage should be greater than the highest anticipated V_p.

guarantee that the device with the higher V_p is used for Q2.

Power-Up and Adjustment

Connect 1 to 3 feet of RG-58 coaxial cable to J1. If a substantially greater length, or a higher-capacitance coax is used, you may have to reduce the inductance of L2 to establish resonance. Connect the coax to an oscilloscope if you have one, or just let it hang. Turn on the VFO power and check the voltages at the top of R1 and the drain of Q1 for values close to those indicated on the schematic diagram. Since the performance of JFETs varies quite a bit, the values you get may vary also. Tune your receiver to the VFO signal, or use an oscilloscope or dip meter to sense oscillation. If the VFO is not oscillating, the trouble could be caused by low gain at Q1; reduce R1 to induce oscillation. For best performance, the value of R1 should be as large as possible, consistent with quick starting. You may want to use a small trimmer potentiometer for R1 and change to a fixed resistor later on, or leave the trimmer in place.

Once the circuit is known to be oscillating, put the box cover part way down, leaving room to adjust C2 and C3. Connect a milliammeter across S1 (with the switch open) so as to monitor supply current. Using an accurately calibrated receiver or a frequency counter, adjust C2 for a frequency of 5.049 MHz with C1 fully meshed. With C2 unmeshed, the frequency should be slightly greater than 5.075 MHz. Now, adjust C3 for a sharp current dip (to about 2 mA), indicating resonance for L2. This current will vary from transistor to transistor. It will also depend on the unloaded Q of L2, and eventually on the load resistance presented by your rig. You can close the box now and check for frequency drift from a cold start.

The performance of my VFO is shown in Fig. 4, as measured in a fairly temperature-stable room. From a cold start, drift measured 19 Hz (38 Hz at 10 MHz) over the first 15 minutes of operation. Beyond the first several minutes, the drift was near the jitter and resolution capabilities of my frequency counter. This may explain a few of the erratic points on the graph.

An alkaline 9-V battery has a capacity of 550 mAh, giving the VFO a potential operating life of over 250 hours on one battery. A carbon-zinc battery can yield about 60 hours with its 125-mAh rating. NiCd batteries of the 7.2-V variety (80 mAh) have been used, also with good results. Unless you happen to get some JFETs with very high V_p (6 V), the unit will operate well down to the last gasp of the battery.

Applications

The VFO can be coupled to the oscillator or buffer stage of your rig by direct connection, through a dc-blocking capacitor,

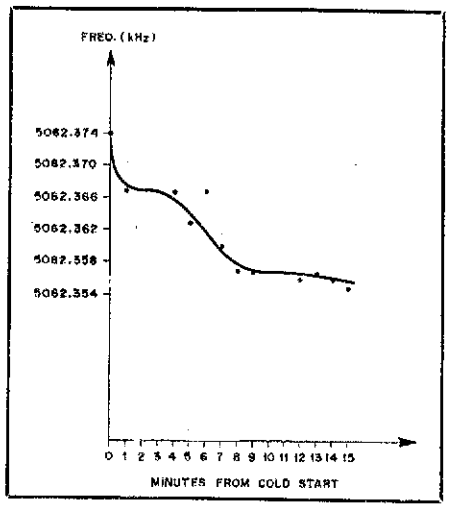


Fig. 4 — Measured frequency drift of the VFO over a 15-minute period beginning with a cold start. After 8 minutes, the drift approaches the resolution of the counter (1 Hz).

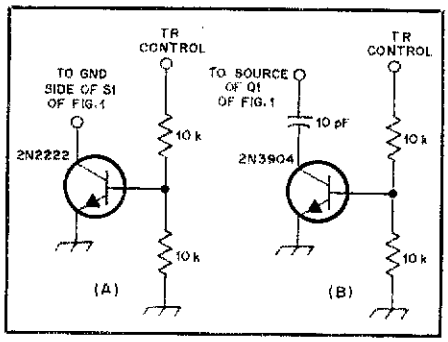


Fig. 5 — Suggested circuit additions to eliminate the possibility of hearing the continuously operating VFO during receiving periods. At A, the transistor shuts off the VFO during receive mode. With the circuit at B, the VFO frequency is "pulled" lower when receiving.

or via a secondary winding of your choice wound on L2 (shown as a dotted winding in Fig. 1). You will probably have to retweak C3 for a dip after connecting the VFO to your transmitter. There is sufficient output from Q3 to drive a tube into nonlinear conduction, thus creating the desired second harmonic. In some cases, the tube may have to be rebiased closer to cutoff to enhance nonlinear action. If you're fortunate enough to have a wide tuning range in your transmitter stages, as I have in the Viking II, then your rig will develop 10-MHz output and drive a 50-ohm load without the need for any modifications. I coupled the VFO through a 150-pF, 500-V capacitor to the grid of the oscillator tube with the band switch set to 20 meters. The 6AU6 oscillator stage operates straight through, and doubling takes place in the 6AU5 buffer stage. The dual 6146 final amplifiers load my inverted V easily through the wide-range pi-network output circuit.

Normally the VFO runs continuously, but some rigs may allow sufficient key-up VFO leakage to mask weak-signal reception. You can turn off the VFO during receiving periods by connecting the simple transistor switch of Fig. 5A in series with the ground side of S1. Alternately, you can "pull" the VFO frequency during receiving periods by connecting the capacitor switch of Fig. 5B to the source of Q1.

This VFO is also at home with transistor rigs, homemade or commercial. Use a second winding on L2 to step the voltage and impedance down when driving transistors. Q3 is able to supply a surprising amount of power if called on to do so. Expect battery drain to increase and the output network Q to fall, allowing a higher harmonic content in the output. Of course, there will also be more heat generated within the box if you draw more power from the VFO.

Give the Rig a Second Chance

I hope this article has stirred your interest. Remember how well that old rig served you? Well, it deserves a second chance. Give it a purpose in life on 30 meters and discover the excitement of our newest band.

Notes

[1]D. DeMaw, "Building and Using 30-Meter Antennas," *QST*, Oct. 1983, p. 27.
[2]DeMaw, "A VXO CW Rig for 30 Meters," *QST*, Nov. 1983, p. 31.
[3]DeMaw has often cautioned readers about the potential unpredictable temperature coefficient of silver-mica capacitors. I have never experienced any trouble with them, however. Typical temperature coefficients for those units average about +50 ppm. The builder can always substitute NP0 ceramic or polystyrene types with good results.
[4]mm = in × 25.4.
[5]Available from Radiokit, Box 411, Greenville, NH 03048.
[6]Available from Circuit Specialists Inc., P.O. Box 3047, Scottsdale, AZ 85257.

Reference

Hayward, W. and D. DeMaw. *Solid State Design for the Radio Amateur*. Newington: ARRL, 1977.

Strays

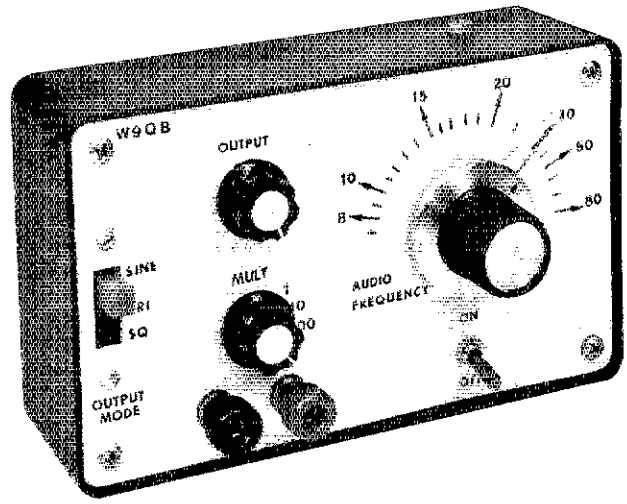
I would like to get in touch with...

☐ anyone with information on obtaining a TC9105P PLL synthesizer chip for a Motorola 550 AM/SSB 11-meter CB radio converted for amateur use. M. R. Viney, G6MRV, 8 Pine Close, Thornbury, Bristol BS12 1AS, Great Britain.

☐ anyone who can steer me to a wiring diagram for a Millen VFO, type/model 90700, vintage '40s. Joseph H. Kadlec, W9UIN, 1035 Asbury Ave., Evanston, IL 60202.

A Simple Function Generator

Are there gremlins in your audio? This inexpensive, home-built signal generator will help you track them down.



By Harry M. Neben,* W9QB

This function generator can produce a sine, square and triangular-wave output. It has relatively low distortion on the sine waveform, good linearity on the triangular waveform, a wide frequency range and relatively high output. It requires few components and is simple to build.

Signal Purity

The waveforms available from this oscillator are shown in Fig. 1. You can see that they are quite acceptable for most ham applications. I don't agree with those who demand a high degree of signal purity when it is not necessary. You purists can stop right now and go back to reading Grimm or Andersen. This is not a precision instrument, but one that will be useful in most ham shacks.

The Integrated Circuit . . .

The heart of this generator is the ICL8038 waveform generator (Radio Shack No. 276-2334). The ICL8038 is a monolithic integrated circuit, capable of producing sine, square and triangular waveforms with a minimum of external components. Signal frequency is controlled by a timing capacitor, a resistive divider and the voltage applied to the FM-sweep input. Thus, with the proper selection of timing components and a variable voltage connected to the sweep input, a wide-frequency-range function generator may be constructed.

. . . And How It Works

Operation of the 8038 is easily understood if you refer to Fig. 2. An external capacitor, C, is charged and discharged by current source no. 1, which is on continuously, and current source no. 2, which is switched on and off by a flip-flop. If you assume that current source no. 2 is off, and the capacitor is charged with a current i, the capacitor voltage rises at a constant rate with time. When this voltage approximates two-thirds of the supply voltage, comparator no. 1 triggers the flip-flop, which switches on current source no. 2. This current source supplies a current of $-2(i)$ and discharges the capacitor with a net current of i. Therefore, the capacitor discharges at the same constant rate as it is charged. When the capacitor discharges to one-third of the supply voltage, the flip-flop is triggered to the original state and the cycle repeats.

The equal charge and discharge rates produce a triangular waveform across the capacitor, while the flip-flop produces a

'Notes appear on page 39.
*1151 Fairway Dr., Dunedin, FL 33528

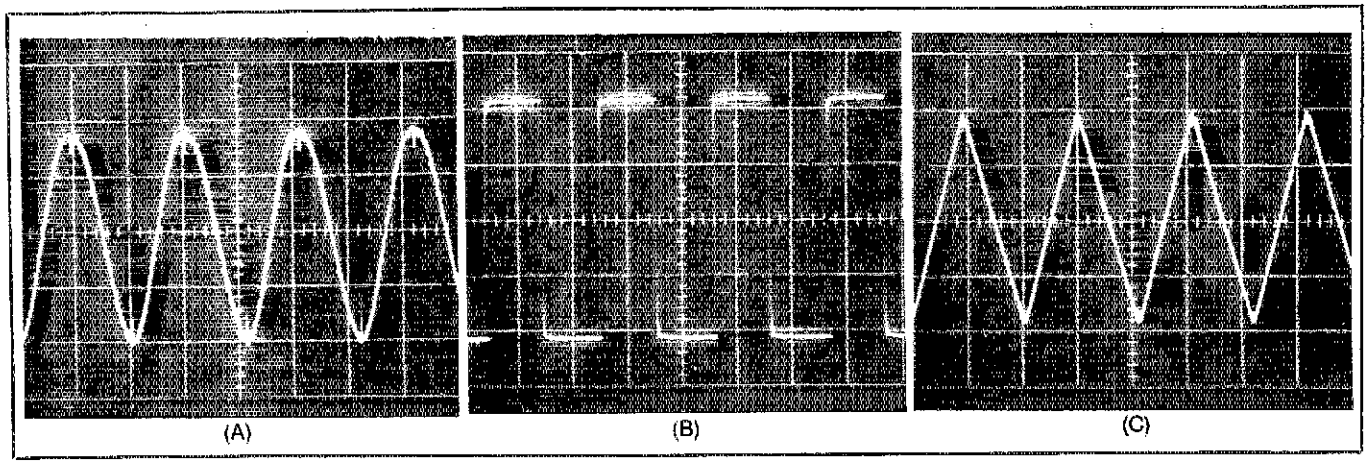


Fig. 1 — Output waveforms from the Simple Function Generator: sine (A), square (B) and triangular (C) waves.

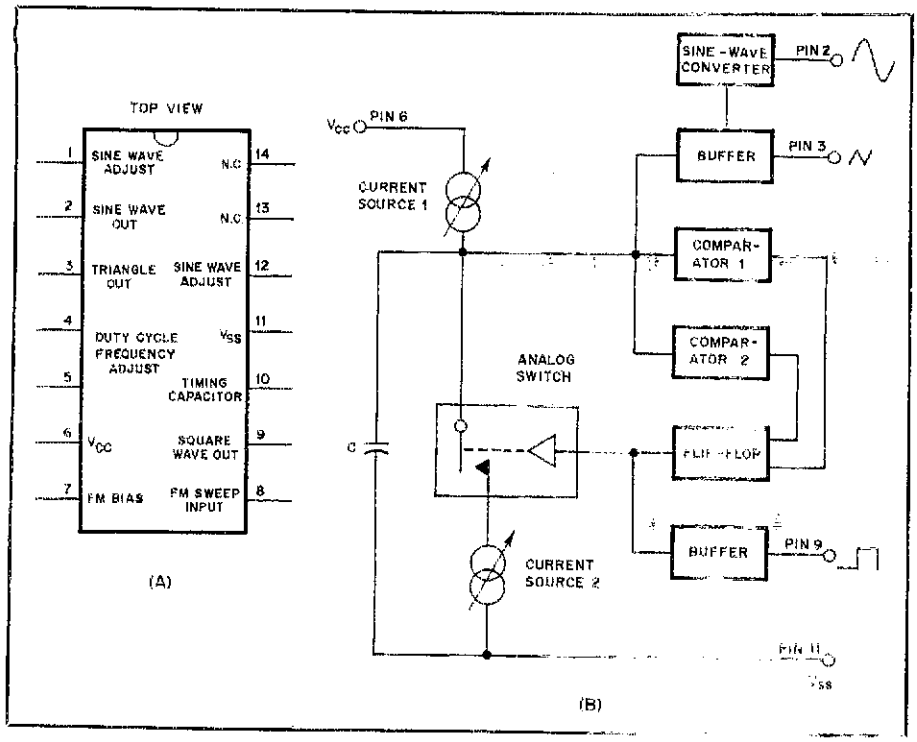


Fig. 2 — Pin-out (A) and block (B) diagrams for the ICL 8038 waveform generator.

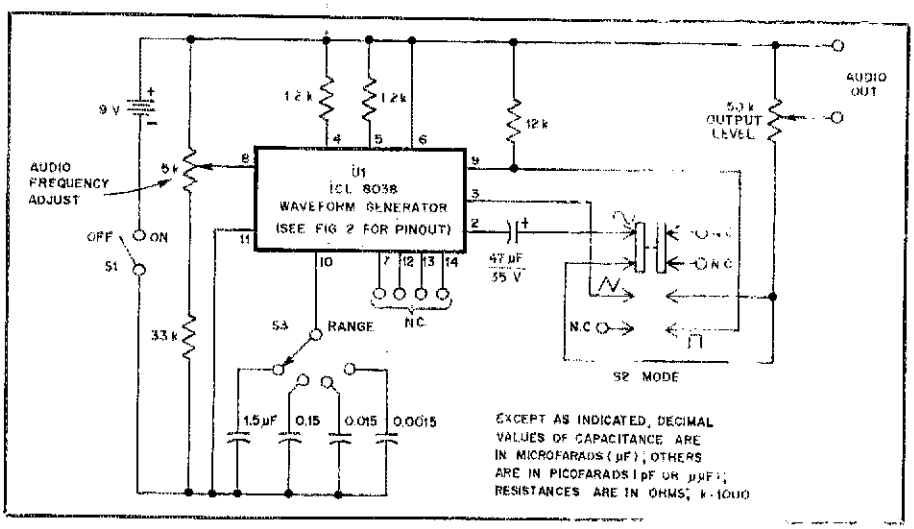


Fig. 3 — Schematic diagram of the Simple Function Generator. Capacitors are computer grade. Polarized capacitors are electrolytic.

S1 — SPST toggle switch.
S2 — 4P3T switch.
S3 — Four-position rotary switch.
U1 — ICL8038 (Intersil) waveform generator IC (RS 276-2334).

square wave. These waveforms pass through buffer stages and are available at pins 3 and 9, respectively.

Two external resistors can vary the levels of the current sources over a wide range. With the two currents set at different values, an asymmetrical sawtooth waveform appears at pin 3, and pulses with a variable (from 2% to 98%) duty cycle are available at pin 9. (This option is not implemented in the Simple Function Generator.)

A sine wave is formed by feeding the triangular wave into a sine-converter network. This network provides a decreasing shunt impedance as the potential of the triangular wave increases toward each of the two voltage extremes.

Construction

All components used in the function generator are readily available to most radio amateurs. The circuit is mounted in a 6 × 3 × 2-in box.[1] The IC, socket and most components are mounted on a pre-etched experimenter's printed-circuit board.

The frequency range is selected by a four-position rotary switch (labeled MULT). Frequency, within a range, is controlled by the AUDIO FREQUENCY potentiometer. An OUTPUT MODE switch selects the desired waveform. This is shown as a slide switch, but any two-pole, three-position switch may be used. The OUTPUT control varies the voltage available at the front panel binding posts. There is nothing sacred about the placement of these controls or the size of the case.

The "range" capacitors were selected by experimentation. Decade-related capacitors with 10% tolerance are available.[2] If you are satisfied with this accuracy, use them. I chose the 1.5-µF capacitor for the low range (8 to 80 Hz). Then I picked a 0.15-µF capacitor for the next range and "trimmed" it with a suitable fixed capacitor connected in parallel. With the audio frequency set to 20 Hz, I increased the range setting to 10 and found that only 500 pF is required to adjust the 0.15-µF capacitor for resonance at 200 Hz. This procedure was repeated for the 100 and 1K positions of the switch.

The oscillation frequency is controlled by a voltage supplied to pin 8 of the IC. This voltage is set by a resistive divider, comprised of a 5 kΩ potentiometer and 33-kΩ resistor. The maximum voltage is about 1.2 with a 9-V battery as a power source. Frequency calibration will change slightly as the battery ages. A Zener diode that would clamp the voltage across the resistive divider could be added to the circuit; however, as the scale of this unit is broad, I do not consider this refinement worth the cost and reduced battery life.

Operation

The oscillator output is fed to a three-position switch. This switch connects the selected waveform to a 50-kΩ potentiometer that controls output amplitude. This works fine for the sine-wave output, but I caution the user regarding the triangular and square waveforms. These waveforms will be satisfactory only if the circuit under test does not significantly load the function generator. One way to overcome this condition is always to set the OUTPUT control for maximum signal level. This should not be a great problem for the user, but a word of caution is in order.

The original battery in this project was a 9-V unit, as used in portable radios. Since the current drain is about 20 mA, I recommend the use of 6 AA batteries instead.

This oscillator has been in use at W9QB for about a year, and has given excellent service. It is stable and does not appear to be affected by stray RF in the shack. It certainly is simple to build, and the square waveform is very useful in audio amplifier repair and maintenance. Let the gremlins beware!

Notes

[1]mm = in × 25.4.
[2]One source for the timing capacitors is Mouser Electronics, 11433 Woodside Ave., Santee, CA 92071, tel. 619-449-2222.

Product Review

Conducted By Paul K. Pagel,* N1FB

Yaesu Electronics Corp. FT-726R VHF/UHF Transceiver

If you made a "wish list" of features you wanted in a rig for the bands at 6 meters and above, chances are good that Yaesu's newest multimode VHF/UHF offering would fulfill many of your desires. The FT-726R — a high-performance, multiband rig about the size of many modern HF transceivers — ushers in a new era for the serious VHFer.

Multiband Capability

One prime consideration on my wish list is multiband capability. Although multimode rigs for 50, 144 and 432 MHz abound, it would be great to have everything in one tidy package. The cost of separate rigs for each band really adds up at $400 to $900 a crack, and separate rigs (perhaps with outboard power supplies) take up a lot of table space. Besides, those HF guys get as many as nine bands in one box, so why not us?

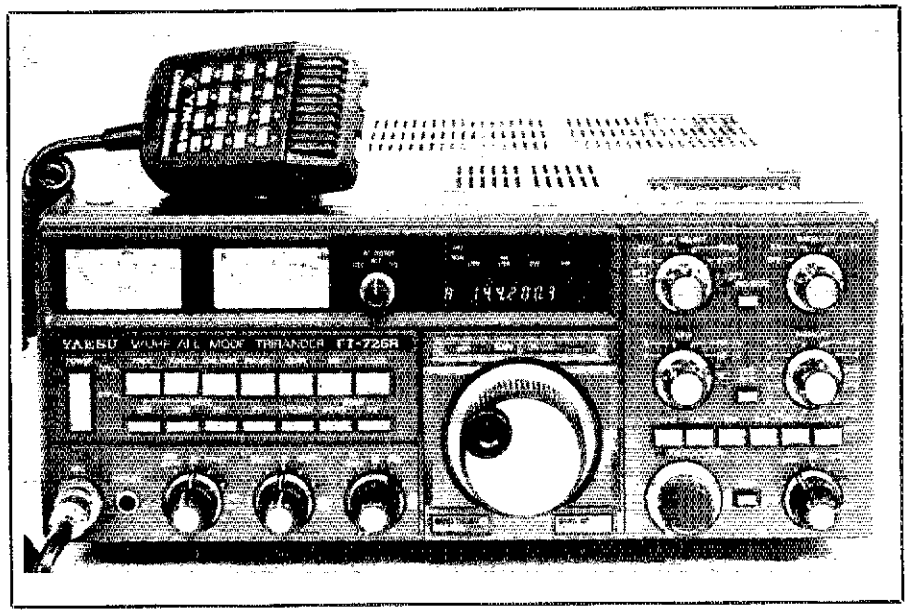
The FT-726R operates on the three most popular VHF/UHF bands worldwide — 6 meters, 2 meters and 70 cm. Two-meter coverage comes standard with the rig (the exact coverage depends on which parts of the band are permitted for use in your part of the world). Optional modules for 6 meters and 70 cm are available for far less than the cost of separate rigs for those bands.

Basically, the '726 can be thought of as a 10-MHz IF unit with separate transverter modules for each band. The main unit houses the power supply, the VFO, the 10-MHz transmit and receive section, and the audio and display sections, which are common to all bands. Each band module contains the RF circuitry for that band, a PLL, a power amplifier and appropriate switching circuitry. An 8-bit microprocessor-based controller keeps everything running smoothly. With this arrangement, the FT-726 can conceivably be expanded to include other VHF/UHF bands.

The review transceiver was supplied with the 50-54 MHz and 430-440 MHz modules. Up to three modules may be installed in the FT-726 at any time. Module installation is a snap. Just remove the top and bottom covers, place the module in one of the vacant positions, and bolt it in place with five screws. Wiring is even easier — Yaesu provides three multiconductor ribbon cables that run from the back of each module to the audio board. Each cable has a different number of conductors, and the path they follow is short and straight, so there is little chance of a wiring error.

Features

Looking at the front panel, you might well think that the FT-726R is a state-of-the-art HF rig. Yaesu's VHF/UHF flagship includes IF SHIFT and WIDTH controls, separate AF GAIN and RF GAIN controls, selectable AGC, a CLARIFIER (RIT) knob, a noise blanker, a switch to place an optional 600-Hz CW filter in the 455-kHz IF, separate MIC GAIN (for SSB) and DRIVE (for CW



Yaesu Electronics Corp. FT-726R VHF/UHF Transceiver, Serial No. 3K070227

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency Coverage: 50-53.99998 MHz (optional); 144-147.99998 MHz; 430-439.99998 MHz (optional); 440-449.99998 MHz (optional).	50-53.99998 MHz; 143.5-148.499998 MHz and 430-439.99998 MHz (optional) modules installed in review unit.
Modes of operation: USB, LSB, FM, CW.	As specified.
kHz/turn of knob: 10 or 100, switchable.	As specified.
Frequency display: 7 digit.	Blue fluorescent, ¼-in-high digits.
Frequency resolution: 100 Hz.	As specified.
Backlash: Not specified.	Nil.
S-meter sensitivity (μV for S 9 reading): Not specified.	50 MHz: 19; 144 MHz: 16; 432 MHz: 2.7.
Transmitter power input: 20 W on 50 MHz; 30 W on 144 and 432 MHz. 10-W output on all bands.	Power output: 50 MHz, 12 W; 144 MHz, 11 W; 432 MHz, 12 W.
Harmonic suppression: Not specified.	Better than 70 dB.
Spurious suppression: Better than 60 dB.	Better than 70 dB.
Third-order IMD: Not specified.	−30 dB worst case.
Receiver sensitivity: CW/SSB — less than 0.15 μV for 10 dB S+N/N; FM — less than 0.25 μV for 12 dB SINAD.	Receiver dynamics measured with optional 600-Hz CW filter installed.

	6 m	*2 m*	*70 cm*
Noise floor (MDS) dBm:	−141	−140	−138
Blocking DR (dB):	121.5	116.5	107
Two-tone, 3rd-order IMD DR (dB):	86	90.5	80
Third-order intercept (dBm):	−12	−4.25	−18
Receiver quieting (μV for 12 dB SINAD).	0.16	0.18	0.14

Squelch sensitivity: Not specified. Min. 0.053 μV; max. 0.55 μV

Receiver audio output @ 10% THD: 1.5 W min. 2.2 W.

Color: Two-tone gray.

Size (HWD): 5.1 × 13.1 × 12.4 in (129 × 334 × 315 mm).

Weight: 24 lb (11 kg) without optional modules.

*Assistant Technical Editor

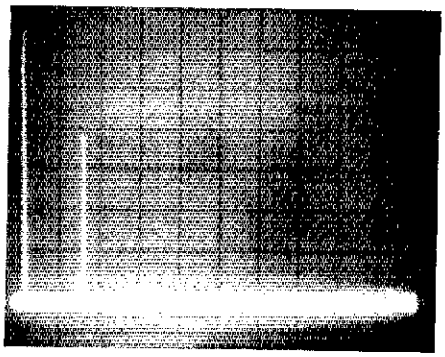


Fig. 1 — Worst-case spectral display of the Yaesu FT-726R. Vertical divisions are each 10 dB; horizontal divisions are each 100 MHz. Output power is approximately 10 W on 2 meters. The fundamental has been reduced in amplitude approximately 32 dB by means of notch cavities to prevent analyzer overload. All harmonics and spurious emissions are at least 70 dB below peak fundamental output. The FT-726R complies with current FCC spectral purity specifications.

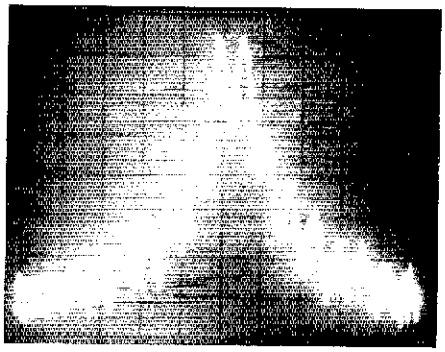


Fig. 2 — Spectral display of the FT-726R output during two-tone IMD testing. Third-order products are about 30 dB below PEP, and fifth-order products are approximately 42 dB down. Vertical divisions are each 10 dB; horizontal divisions are each 2 kHz. The transceiver was being operated at rated output power on the 6-meter band.

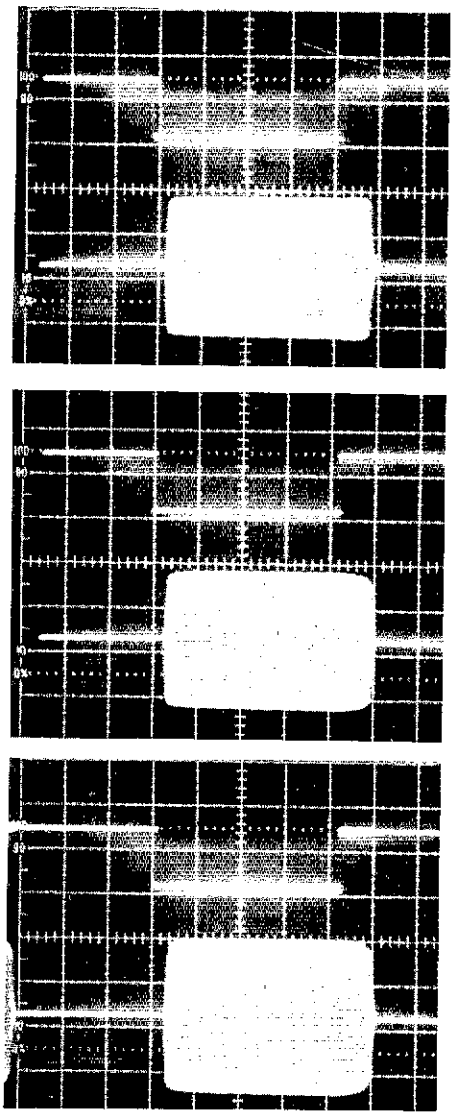


Fig. 3 — From top to bottom, CW keying waveforms of the FT-726R on 50, 144 and 432 MHz. Upper trace is actual key closure; lower trace is the RF envelope. Each horizontal division is 5 ms.

and FM) level controls, and a speech PROCessor switch.

For the low-end CW/SSB enthusiast, these features make the FT-726 a powerful tool. For example, the CW filter works very well. When the filter is used with the IF SHIFT and WIDTH controls, it is possible to dig a weak signal out of a pile of strong locals — a feature especially useful on the VHF bands where the locals are often orders of magnitude stronger than the DX. The noise blanker is effective against impulse noise from power lines and passing automobiles. The selectable AGC is useful, too. Many multimode VHF rigs have only one AGC setting with a very slow decay. For FM, this type of AGC is fine, but on CW and SSB it is very annoying when the AGC cannot track a rapidly fluttering signal, making for difficult copy.

As an FM transceiver, the '726 is a strong performer. In addition to SIMPlex operation, standard plus and minus repeater offsets may be selected from the RPT SELECT switch. In the review unit, the factory-programmed standard offsets are ±1 MHz for 6 meters ±600 kHz for 2 meters and ±5 MHz for 70 cm. The REVERSE button allows instantaneous exchange of the transmit and receive frequencies. Nonstandard offsets may be programmed and stored in the SFT SET position.

Another feature of interest to the FM operator is the FM-CH selector. When this control is activated in the FM mode, it allows the user to tune up and down the band in 10-kHz increments (switch-selectable to 5-kHz increments). This feature makes tuning around the FM portion of the bands a breeze. With the main VFO knob, it can be work zeroing in on the desired frequency, and at 10 kHz per knob revolution, it seems to take forever to get from channel to channel. With the FM-CH control, however, the channels flash past, and once the desired frequency is reached, there is no additional tuning required. It's just like having a channelized FM-only rig.

FM operators will probably appreciate the discriminator center-tuning meter and the standard tone-burst generator. A selectable continuous tone-coded squelch system (CTCSS) board is available as an option. The optional YM-48 hand-held microphone incorporates a tone pad.

The VFO and memory features on the '726 offer state-of-the-art flexibility. This rig contains two VFOs, which may be set up for in-band split-frequency operation or for crossband operation. When more than one band module is installed, the effect of having the VFOs set on different bands is like having two separate radios in one box. Eleven user-programmable memories are included. These memories store frequency and mode, and they may be used for a number of purposes. They can be used to store popular repeater frequencies, the calling frequencies for each band, or frequently used net or schedule frequencies. For example: MEMORY 1 might store 146.52-MHz FM; MEMORY 2 for 144.200-MHz SSB; MEMORY 3 for 432.100-MHz CW. Various controls allow switching among the memory channels, switching from memory to VFO and writing the frequency from the VFO into the memory.

Like many VHF rigs these days, the FT-726 has an elaborate scanning feature. It is possible to scan a band from top to bottom, a select portion of a band, or just the 11 preprogrammed memories. Through switches on the top panel, the scanning feature may be programmed to halt only on busy or clear channels, or when manually directed to halt by front-panel controls. In addition, the scanner may be set to halt momentarily (PAUSE), or to STOP.

Satellite Operation

Perhaps the most intriguing option available for the FT-726R is the satellite IF unit. With this option and two of the RF modules installed, the FT-726R may be used for full-duplex crossband operation. The satellite unit includes a complete additional IF system, so the result is really full duplex.

Despite initial misgivings about the ease of duplex operation with one radio, full-duplex satellite operation proved to be straightforward. To set the '726 up for satellite work, simply tune one of the VFOs to the desired transmit band and frequency. Set the RPT SELECT switch to SIMplex. Tune the other VFO to the receive band and frequency. The receive and transmit bands must be different. Then, set the VFO selector to the appropriate split operation setting (RA-TB to receive on VFO A and transmit on VFO B, or vice versa.) Next, switch the SATELLITE selector to the RX position. Set up like this, the FT-726 will transmit on the frequency for which it was initially set. Spotting is accomplished by tuning the main tuning knob, which now controls only the receive VFO, until the downlink signal is heard. Alternatively, the SATELLITE selector could be set to the TX position. In this position, the receive frequency stays put and the tuning knob controls the transmitter.

During actual operation, the FT-726 proved to be just as easy to use as two separate rigs. We set the radio up in the W1AW satellite operating position one lunchtime to try working through OSCAR 10. We set one VFO on the 435-MHz uplink and the other on the 145-MHz downlink, and hit the key. Our signal was perfectly copyable, even when using the FT-726R barefoot. During this time, we tried bringing the transmit frequency to stations calling CQ and bringing the receiver frequency to our CQing frequency. The FT-726 works like separate rigs.

There is no switching noise or desense; just smooth, quiet, full-duplex operation.

General Operation

The lab tests indicated that the receiver is "hot," and on-the-air operation confirmed that observation. Although not the equivalent of a system incorporating a high-performance receive converter with a GaAsFET front end and a good IF receiver using a clean crystal oscillator, the FT-726R is a step ahead of most other synthesized VHF multimode radios. Reciprocal mixing noise from the synthesizer is noticeable on stronger signals, but it is held to a tolerable level.

In addition to separate antenna connectors for each band module, Yaesu has thoughtfully provided separate amplifier key lines for each band as well. An operator active on more than one band can have separate amplifiers connected at all times without the hassle of external relays or relay switches.

The review '726 saw active duty during the ARRL 6- and 2-meter Fall Sprint contests, as well as during the ARRL January VHF Sweepstakes. Several operators used the rig; all commented that it is easy to use, the controls are in the right places and the receiver sounds good. Signal reports from other stations indicate that the audio quality is good and the CW signal is click free. Many of the operators who were asked for speech processor in/out comparison reports said that it added little, if anything, to the signal.

One glaring omission on the features list is VOX operation on SSB. The FT-726R incorporates semi-break-in operation on CW, however. There is also a rear-panel jack for an external PTT switch (e.g., a foot switch). My operating style does not require VOX operation on SSB, but it seems strange to find a rig with so many features that does not include this standard convenience.

Yaesu's newest VHF/UHF transceiver is certainly worth considering if you're in the market for a new rig. Even if you're only interested in 2 meters right now, the ability to add other bands at any time makes it an attractive box. If you like satellite operation, or would like to give it a try, take the time to see a '726 in action before spending those hard-earned dollars on separate radios.

Price class for the basic FT-726R with the 144-MHz module is $900. Price class for the options: XF-455MC CW filter, $60; 50-MHz-band module, $200; 430-MHz-band module, $300; satellite IF unit (SU), $100; 440-MHz unit, $250; HF module, $225; 144-MHz module (as a separate unit), $175; YM-48 hand-held microphone, $70. Manufacturer: Yaesu Electronics Corp., 6851 Walthall Way, Paramount, CA 90723. — *Mark Wilson, AA2Z*

HEATHKIT CANTENNA, MODEL HN-31A

☐ No Amateur Radio station is complete without a dummy antenna (also called a dummy load). Eventually, we all have a need to test a transmitter off the air. A dummy load makes leisurely testing possible while keeping signal radiation to a minimum. This will please the FCC and your fellow hams. A dummy load is also useful when testing receivers. It resembles an antenna electrically, but it does not pick up external noise and signals like an antenna; that's a desirable feature in some tests.

Electrically, a dummy load is a resistor. Not just any resistor, it must have certain

characteristics. The resistance must equal the characteristic impedance of the system in which it is used; for most systems that is 50 ohms. Ideally, it should have pure resistance; that is, there should be no reactance. In the real world, that is not possible; inductance and capacitance are always present. Further, for transmitter tests, the load resistor must be capable of safely dissipating the transmitter output.

The Heathkit HN-31 Cantenna has been around for a good many years. I have had one in my shack for about as long as I can remember. About a dozen years ago, an HN-31 was a fixture in the truck and at the bench I used in the two-way FM service business. For many of us, the name Cantenna is synonymous with dummy load.

A New Model

One immediately notices that the HN-31A is different. Gone is the small rectangular box with an SO-239 connector at one end and a phono jack at the other. The SO-239 is still there, now center-mounted and positioned vertically on the lid. The identification label is no longer painted on the can — a bright, three-color stick-on label is provided. Inside, the only noticeable change is the connector mounting. The result is that the connection between the SO-239 and the load resistor is more direct in the '31A.

There is one significant change in the electrical specifications. The '31A is rated for an SWR of less than 1.5 up to 450 MHz. (In the '31, the 1.5 SWR frequency is specified as 300 MHz, and for an SWR of 2, it is 400 MHz.) Fig. 4 shows SWR curves for an HN-31, an HN-31A and a Bird model 82 dummy load. Amateur bands between 50 and 450 MHz are identified so that you can make your own comparisons easily. As you can see, the models I tested in the ARRL lab readily surpassed their rated performance. There is a "bump" in the SWR curve for each of the Heath Cantennas. In the '31A, the bump is well removed from any amateur band and, for that reason, should not be a problem.

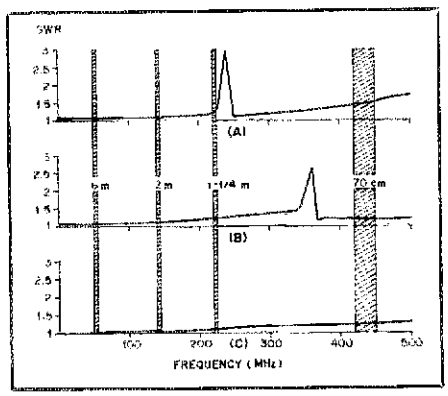


Fig. 4 — SWR curves for the Heath HN-31 shown at A, HN-31A at B and Bird model 82 at C.

SWR below 30 MHz is better than 1.07 for the '31A. That compares to 1.1 or better for the '31, and better than 1.02 for the Bird '82. (At 1.8 MHz, the Bird '82 has an SWR of better than 1.006.) Certainly, the HN-31A is more than adequate for Amateur Radio use — at 450 MHz, the SWR was better for the '31A than for the Bird '82!

The '31 had a built-in peak RF voltage detector. The loss of that feature is a small price to pay for the improved SWR performance of the '31A. Chances are, most would never use that feature anyway, especially if there is a wattmeter in the shack.

The power-handling capability of the '31A remains the same as for the '31. When power is applied to the Cantenna, the 50-ohm resistor element absorbs the power and converts it into heat. The heat is dissipated into a liquid bath that surrounds the resistor element. If that liquid is transformer oil, the load can handle a kilowatt for up to 10 minutes of intermittent operation. [Some transformer oil contains PCBs, a suspected carcinogen. Handle all transformer oil carefully. — Ed.] Mineral oil may be easier for you to locate (Heath does not supply the liquid coolant); it will limit you to one minute at 1 kW, however. Below the 400-W level, mineral oil will work as well as transformer oil. You may be able to get transformer oil through your local power utility. Mineral oil is available at most drug stores. The Cantenna holds 1 gallon (3.79 liters) of coolant.

Final Words

I calculated SWR from return-loss measurements made in the ARRL lab while using a spectrum analyzer, tracking generator and a directional coupler rated to over 1 GHz. After making those measurements, I decided to replace the SO-239 with a type-N chassis connector. It didn't make any significant change in the SWR curve, but it does make it easier to use with my 70-cm station and its N connectors.

A dummy load should be part of every station. The HN-31A is available from Heath Company, Benton Harbor, MI 49022. Price class: $25. — *Chuck Hutchinson, K8CH*

Strays

I would like to get in touch with...

☐ other radio amateurs interested in exchanging RTTY/CW software and hardware ideas for the Timex-Sinclair T/S-1000 computer. John Dowlan, W3HU, 8341 Boyce St., Spring Hill, FL 33526.

☐ anyone who has developed an interface for a Timex Sinclair 1000 computer and Amateur Radio. Charles Hudson, KA2NWP, 44 Nelson Ave., Cooperstown, NY 13326.

☐ anyone who has successfully interfaced the Radio Shack Color Computer II with a Ten-Tec Argosy transceiver for RTTY and CW. Mark Callahan, KA1IGC, 8 Pondview Rd., Norfolk, MA 02056.

Hints and Kinks

Conducted By Larry D. Wolfgang,* WA3VIL

A HOMEMADE KEYER PADDLE

☐ While it may not be possible for the average ham to build a high-performance transceiver, most can construct high-performance station accessories. There is a certain feeling of pride and a sense of accomplishment that goes with using a piece of equipment you have built yourself. In this article, I will describe a keyer paddle that I made. With care and a workshop that is equipped with a drill press and a few other small tools, most amateurs should be able to duplicate the project. Fig. 1 shows my paddle.

The base for my keyer is made from a ¼-inch-thick block of black walnut wood.[1] Any hard wood or other sturdy insulating material should work fine. Fig. 2 shows the dimensions I used. You can vary the dimensions to suit your needs and the materials you have available. A few of the measurements have been purposely left off the drawing. Some of them are not critical, while others should be made as you assemble the paddle, to ensure proper alignment.

Make the hinge block next. Mine is made of ½-inch-thick aluminum, but brass, Plexiglas®, Bakelite® or even hard wood would be fine. Cut it to size, and drill and tap the mounting holes in the bottom. Then, mount it on the base.

Cut the two bars to the dimensions shown and make the stop plate to be soldered to the short bar, as shown in Fig. 2. Cut a piece of 1/16-inch-thick brass strip ¼-inch wide and 1¼-inches long. Form the hinge bracket around the end of the short bar from this piece. Using a high-wattage soldering iron or a soldering tip on a propane torch, tin the inside edge of the hinge bracket and the rear portion of the short bar. Lay the bar inside the bracket and carefully align the pieces, then, sweat them together with a propane torch. Similarly, attach the stop plate at the opposite end of the short bar. See the assembly detail in Fig. 2.

The inside back edge of the long bar must be rounded, to allow it to pivot against the short bar after they are pinned together. Clamp the bars together and secure them to your drill-press table. Then, drill the 1/16-inch hole through the hinge bracket and long bar. Drill through the top part of the hinge block, insert the bars in the opening, push the drill through the long bar, and drill into the base of the hinge block. You need not drill all the way through the hinge block. Drilling these holes is probably the most critical part of the project. Clamp everything in position before drilling, and be certain that the hole for the hinge pin does not go through the long bar at an angle.

Use the drill bit to align the hinge bracket and the long bar, and clamp the bars together. A number 38 drill (0.101 inch) is just right to tap the 5-40 hole in the long bar. A 3/32-inch bit is just a little smaller. Drill through both bars for all three holes shown. Tap the hole in the long bar where spring 1 mounts, and enlarge the other two holes with a 3/16-inch drill. Enlarge the mounting hole for spring 1 and the contact point in the short bar.

Almost any small compression spring will work for spring 1. I found the one in a crystal holder to be just about right. It is a good idea to grind the threads off the 5-40 bolt near the head where it extends through the short bar. This will prevent the spring from binding during operation. Spring 2 is fastened to the short bar by means of a loop of no. 21 copper wire soldered to the outside edge of the bar. The spring hooks onto this loop inside the bars.

To fabricate the contact points, place a piece of 3/16-inch brass rod into the drill-press chuck. Run this down against a file or piece of emery cloth to square the end. Cut a ¼-inch piece of the rod and place it in the contact-point hole of either bar. Keep the rod flush with the inside edge of the bar and flow solder around it. Follow the

[1]mm = in × 25.4.
*Assistant Technical Editor

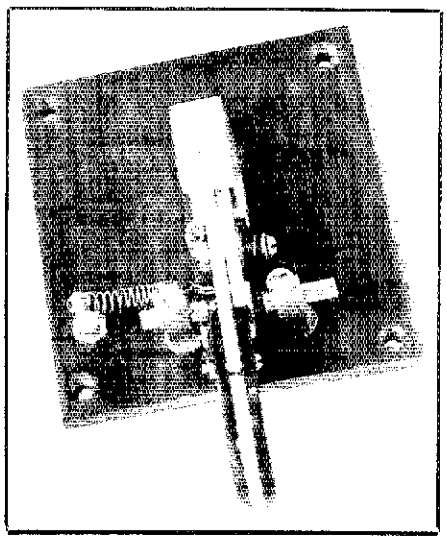


Fig. 1 — The final assembly details of a keyer paddle made by Arnold Harvey, W8OJN.

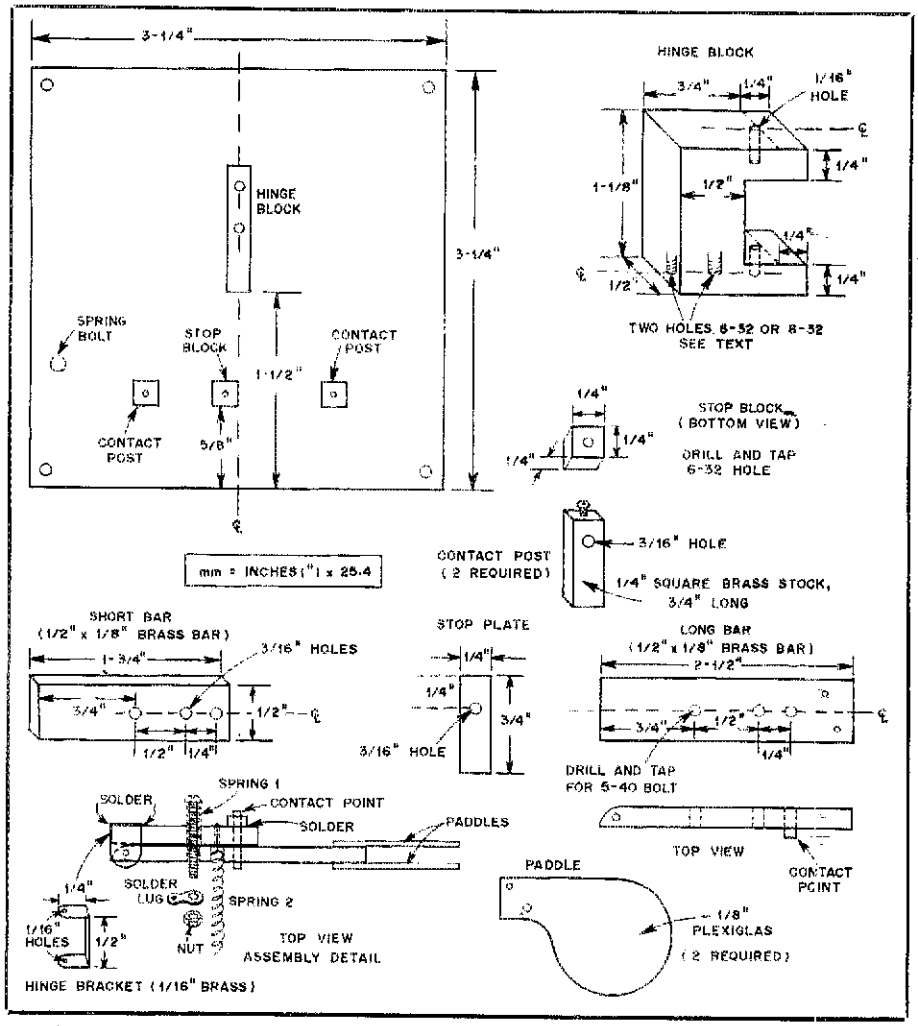


Fig. 2 — Dimensions and construction details are given for the keyer paddle built by W8OJN. See text for assembly instructions for parts where no dimensions are given.

same procedure to insert a contact point in the other bar. Then, file the inside edges so the bars will fit flush together.

Now you are ready for the final assembly steps. Slide the bar assembly into the hinge block and insert the pin. I used the shank from a broken 1/16-inch drill bit. Any portion that extends above the hinge block can be ground off after the assembly is complete.

Mount the stop block to the base so it will prevent the bar assembly from moving left of center. Stand the two contact posts next to the contacts, and mark the position of the contacts. Drill a 3/16-inch hole through each post at that height, and drill a 7/64-inch hole into the top of each post. Tap these top holes for 6-32 set screws. Drill and tap similar holes in the bottom of each post to fasten them to the base. Carefully mark the base holes, and drill 9/64-inch (or larger) holes to mount the contact posts. Use solder lugs on the bottom of the base.

Using the same technique as before, fabricate two 5/8-inch-long contact points. Slide the contacts through the posts, and adjust the spacing to suit your "fist." I insert one or more sheets of paper between the contacts to set the spacing. Then, tighten the set screws.

Cut two handles to a size and shape of your liking, and mount them on the end of the long bar. Wire the contacts as required by your keyer, for right- or left-handed operation.[2] You may want to use a router or other tool to cut grooves in the bottom side of the base for the wires. The base can be mounted on a weighted baseplate or fastened directly to your operating table.

I think you will find that this paddle operates smoothly and has a nice feel. There is very little lost motion. The paddles stay centered and don't flop around, ensuring that only the desired dots and dashes are sent. The stop block holds the assembly in position and prevents the short bar from moving to the left while you are sending a dash. Both bars move to the right to send dots. — *Arnold Harvey, W8OJN, Akron, Ohio*

KEYER-PADDLE CONSTRUCTION IDEAS

☐ Many of us are satisfied with a construction project as long as it works. So we stop with a breadboarded design or a mechanical assembly with lots of "rough edges." With a little thought about available materials and some patience and care in construction, any project can be "dressed up" for an appearance that rivals a commercial unit. It then becomes a source of pride, not just in the operation, but in the craftsmanship of the construction.

I would like to offer a few ideas about construction techniques using hand tools. A keyer paddle serves as an example. I have made several paddles using variations on the basic techniques.

My first consideration is the selection of a material for the base. Wood can be shaped and finished to add beauty to the project. But other materials can also be used. I prefer Masonite®, which is hard enough to withstand screw and nut pressure, yet can be shaped and drilled easily with hand tools, and can be smoothed with a sanding block. The base for the paddle shown in Fig. 3 is made from 3/8-inch Masonite.

One-inch brass angle brackets provide a nice way to mount the paddle blade and contact points. Holes in the brackets can be tapped for either 8- or 10-32 machine screws. If the corners are rounded slightly with a file, the appearance will be more professional.

[2]L. Wolfgang, "The 'CHIP' (Cheap, Homemade Iambic Paddle)," *QST*, Oct. 1982, pp. 33-35.

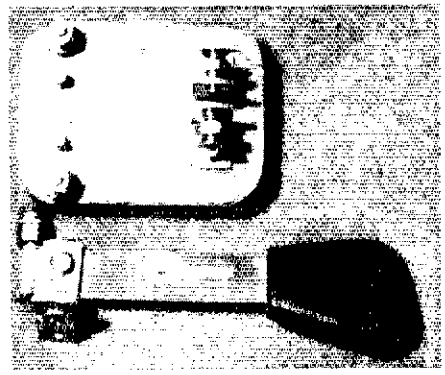


Fig. 3 — Photo showing a partially assembled keyer paddle made by W1HHF.

The paddle blade can be a saw blade or other material that has some spring to it. The teeth should be ground or filed off, and the blade sanded clean. I have found that double-sided copper-clad PC board also works well. I solder a small brass contact strip to each side of the paddle blade to serve as contacts. If these are bowed away from the blade slightly, you can achieve a softer contact feel during operation.

A paddle handle can be made from a variety of materials. The important thing is to sand it smooth on all surfaces. It can be cemented to the blade with quick-setting epoxy.

Before mounting everything on the base, I countersink all of the holes for flat-head screws and cut grooves in the material for the wires. The top surface of the base material can be covered with wood-grain contact paper. Punch all holes through from the top using a scribe or awl. Reassemble the parts and securely tighten the hardware.

After assembly, I cut a piece of QSL card to serve as an insulator between the base and a piece of lead sheet used to add weight to the paddle. Take a little extra time to glue each piece to the base and allow it to dry. Contact cement works fine for this part. Trim all of the edges and sand them to produce a smooth surface. Finish the project with a strip of contact paper around the edge. If this is done with care, the base will look almost like a solid block of wood. — *Antonio G. O. Gelineau, W1HHF, Burlington, Vermont*

30-METER CONVERSION FOR THE HW-8

☐ The Heath HW-8 QRP transceiver can be modified easily to operate on 30 meters if you are willing to sacrifice one of the existing bands. I chose to give up the 80-meter band, since I have found it to be the most demanding one, in terms of antenna size, for QRP operation. Thirty meters seems to be an excellent band for QRP operation, and it offers the side benefit of WWV reception, which I use to calibrate my VFO dial.

Complete details of the modification are summarized in Table 1. The only expensive component is the crystal, which costs around $10. The other components can be found in your junk box or purchased from a variety of *QST* advertisers. Five of the original capacitors are reused in other locations.

Remove the control knobs and front panel; then, disconnect the loading capacitor from the front of the chassis. This will make it easier to get at the components to be changed in the crowded area around SW1 (the 80-meter band switch). Remove the indicated components using a vacuum desoldering tool, solder wick or a piece of flattened braid from coaxial cable.

Table 1
HW-8 30-Meter Modifications†

Part No.	New Value	Description
Y1	18.895 MHz	Fundamental type, 15-pF load, HC-6/U holder. International Crystal Mfg. Co., P.O. Box 26330, Oklahoma City, OK 73126. Part no. 434112.
L1	1.8 μH	Secondary — 25 turns no. 24 enameled wire on T37-6 core (Amidon Associates, 12033 Otsego St., N. Hollywood, CA 91607). Primary — 2 turns no. 24 wire over C2 end of secondary (use original coil form).
L5	1.8 μH	25 turns no. 24 wire on a T37-6 core.
L13	4.0 μH	Remove 16 turns from original L13.
L22	2.7 μH	23 turns no. 22 wire on a T50-2 core.
L26, L27	3.2 μH	25 turns no. 22 wire on a T50-2 core.
C1	100 pF	Silver mica, 5% tolerance (use original C116).
C15, C96	100 pF	Silver mica, 5% tolerance.
C64	68 pF	Silver mica, 5% tolerance (use original C1).
C77	230 pF	Silver mica, 5% tolerance (use original C64).
C78	150 pF	Silver mica, 5% tolerance (use original C96).
C94	47 pF	Silver mica, 5% tolerance (use original C15).
C97	300 pF	Silver mica, 5% tolerance.
C116	30 pF	Silver mica, 5% tolerance.
C301A	—	Disconnect from L1.
R50	—	Remove.
R56	1 kΩ	½ W, 10% tolerance.

†Refer to HW-8 schematic diagram for part locations.

After the new components have been installed, the rig can be aligned according to the instructions in the HW-8 assembly manual. The only problem I encountered was that I had lost the small tuning tool used to adjust L17 in the heterodyne oscillator. I found that the larger tool or even an Allen wrench can be used. Carefully insert the tool through the top slug and tune the bottom slug for maximum output on 30 meters. Then, back the tool out and readjust the top slug (L18) for maximum output on 40 meters.

The transmitter dc power input should be about 3 W. The VFO will cover 10.0 to 10.25 MHz. Dial accuracy seems to be a problem with the HW-8, so it may be difficult to determine the band edges without a frequency counter. This is where WWV can assist you. Just be sure to stay within the legal segments (10.100-10.109 and 10.115-10.150 MHz). If in doubt, don't transmit. — *Wayne Burdick, N6KR, Santa Barbara, California*

Technical Correspondence

Conducted By
Bob Schetgen,* KU7G

C 64 KEYBOARD

☐ Dan Whipkey's program ("A Keyboard Keyer and Code-Practice System," Jan. 1984 *QST*) makes the VIC 20™ computer function as an excellent CW keyboard. Dan's program performs well because the Morse characters are generated in a compact machine-language routine. While the C 64 uses a 6510, rather than a 6502 microprocessor, the 6510 executes 6502 instructions; conversion of the program for the C 64 is not difficult. All changed lines and additional lines required for program operation on the C 64 are shown in Table 1.

The C 64 user-port location and memory map are different from those of the VIC. All references to the VIC user port (line 410) and Data Direction Register, DDR, (lines 310, 790, and 1340) must be changed for the C 64 user port and DDR (see Table 2). The user port is keyed in line 410 by writing a one to the port for "on," or a zero for "off." Memory locations zero and one, used by Whipkey's program for temporary storage (lines 190, 390, 420 and 1110), are used for memory control in the C 64; locations 251 through 254 are suitable substitutes.

A 6581 Sound Interface Device (SID) IC in the C 64 needs control statements that are not in the VIC program. All SID controls are set to zero in line 111. Line 112 sets Voice-One frequency (800 Hz), Attack/Decay, Sustain/Release and initial-volume parameters; Voice One is switched on by writing a 17 ($11) to the Voice-One control register (location S + 4) for the audio-level adjustments. Lines 113 through 119 are an input loop that sets the audio level. Line 118 switches Voice One off by writing a zero to the control register. Voice One is keyed in lines 400 and 410 during keyboard and practice operation. — *Bob Schetgen, KU7G, ARRL Hq.*

*Technical Editorial Assistant

Table 1

Changed and Added Lines for the C 64 Keyboard Program†

```
101 PRINT CHR$(147); CHR$(142): PRINT "MORSE CODE PROGRAM": PRINT
102 PRINT "C 64 VERSION BY BOB SCHETGEN, KU7G"
110 REM INITIALIZE "SID"
111 S=54272: V=0: FOR I=1 TO 24: POKE S+I, 0: NEXT
112 POKE S+1, 52: POKE S, 110: POKE S+5, 16: POKE S+6, 240: POKE S+24,
    V: POKE S+4, 17
113 PRINT "PRESS (RVON)L(RVOF) FOR LOUDER, (RVON)S(RVOF) FOR SOFTER.":
    PRINT "PRESS (RVON)RETURN(RVOF) WHEN DONE.
114 GET A$: IF A$=""" GOTO 114
115 IF A$ = "L" THEN V=V+1: IF V>15 THEN V=15
116 IF A$ = "S" THEN V=V-1: IF V<0 THEN V = 0
117 POKE S+24, V
118 IF A$ = CHR$(13) THEN POKE S+4, 0: GOTO 120
119 GOTO 114
190 POKE 252, T: TC = 0
310 POKE 1019, ASC(B$): POKE 56579, 255
390 DATA C9,20,F0,67,C9,2C,90,4E,C9,5B,B0,4A,AA,BD,96,03,A0,08,84,FB,0A,C6,FB,90
400 DATA FB,85,02,A5,02,0A,85,02,A0,01,90,02,A0,03,A9,11,8D,04,D4,EA,EA,EA,EA
410 DATA EA,EA,EA,EA,EA,EA,EA,EA,A9,01,8D,01,DD,20,A8,03,A9,00,8D,04,D4,8D,01,DD
420 DATA A0,01,20,A8,03,C6,FB,D0,CA,A0,02,20,A8,03,60,98,0A,0A,A8,A5,FC,A2,FA
790 POKE 1019, ASC(B$): POKE 56579, 255
1110 CS=225/CC: POKE 252, CS
1340 POKE 56579, 255
```

Note: The designations "(RVON)" and "(RVOF)" indicate a "CTRL 9" and "CTRL 0" key combination, respectively.

†Characters in bold type are changed from the VIC 20™ keyboard program.

Table 2

Memory locations: VIC 20™ vs C 64

	VIC 20™	*C 64*
Temporary storage	0($0000)†	2($0002)
	1($0001)	251($00FB)
	2($0002)	252($00FC)
DDR	37138($9112)	56579($DD03)
User port	37136($9110)	56577($DD01)
Sound control	36875($900E)	54276($D404)

†$ indicates hexadecimal numbers.

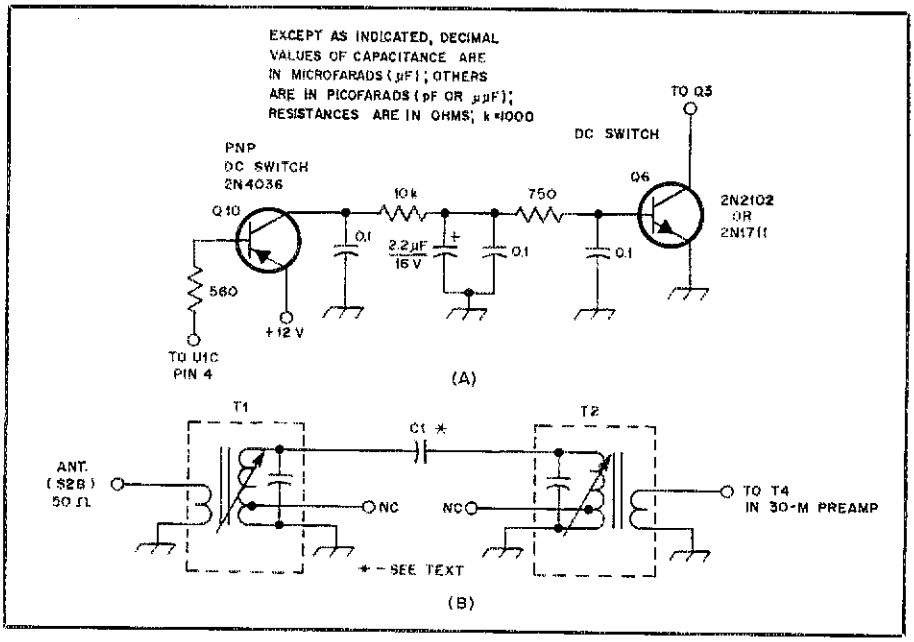


Fig. 1 — Modifications for the "8P6 Hamcation" rig. An improved keying circuit (A) and a bandpass filter to reduce intermodulation distortion (B) are shown.

MODIFICATIONS TO 8P6 SPECIAL FOR 30 M

☐ I would like to share some of my experiences with the 10-MHz Hamcation rig ("Putting the '8P6 Special Hamcation Rig' on 10 MHz," April 1983 *QST*). The keying characteristics of my rig were poor because of the time constants in the DC SWITCH circuit at Q6 (Fig. 2, p. 19, Nov. 1982 *QST*). My transmitter had key clicks and transmission continued long after the key was released. The 2.2-μF timing capacitor on the "key line" was charged through a low impedance when the key was down, but discharged through a relatively high impedance when the key was up. I improved this by placing the 2.2-μF capacitor in parallel with the 0.01-μF capacitor at the junction of the 1.2-kΩ resistors. The left 1.2-kΩ resistor was replaced with a 10-kΩ unit and the right with 750 Ω (Fig. 1A).

I noticed that there was some intermodulation distortion at night when a good antenna and the RF preamp were used. The situation can be improved by installing two back-to-back miniature 10.7-MHz IF transformers with a 1-pf capacitor for high-impedance coupling (Fig. 1B). (I used transformers from an old AM/FM radio; they had blue dots on the tops.) Install this assembly in series with the input to T4 (Q7 circuit, Fig. 3, p. 19, Nov. 1982 *QST*). The 10.7-MHz IF transformers have sufficient range to tune 10.15 MHz.

This project has given me the most fun of any project in years, and there is no commercial rig offered of the same size, weight and power. Also,

the 10-MHz band is a good choice for portable CW operation with stateside and DX propagation. — *Jim Ford, N6JF, Costa Mesa, California*

REACTANCE AND Q OF ANTENNA TRAPS VS. BANDWIDTH AND LOADING

☐ From Ramo and Whinnery, the hot end of a very thin horizontal wire dipole is an essentially constant resistance of 3-kΩ and a reactance of less than ±300 Ω over a bandwidth of 2%.[1] We make little error in assuming the antenna is a pure resistance over this frequency range. An equivalent circuit can be formed with the antenna resistance, 3 kΩ, in parallel with the trap resistance, R_T (both are subject to the same voltage).

The efficiency is:

$$\text{Eff.} = \frac{100}{1 + \frac{3}{R_T}} \qquad \text{(Eq. 1)}$$

where

Eff. = efficiency, as a percentage.
R_T = trap resistance, in kilohms.

Some values of trap resistance, and the associated trap-efficiency values are given in Table 3.

Leave this for a moment and consider trap reactance at resonance. It can be shown that, for frequencies well removed from resonance (as is the case for inactive traps), Q is unimportant in determining reactance.[2] So we can analyze the loss-free case, obtaining:

$$Z = X_o \frac{\gamma}{1 - \gamma^2} \qquad \text{(Eq. 2)}$$

where

Z = trap impedance.
X_o = reactance, in ohms.

$$\gamma = \frac{f}{f_o}$$

which is always less than one for traps as normally used.

Nothing can be done about γ, but we should minimize X_o to reduce loading effects. The trap at resonance is equivalent to a resistance:

$$R_T = Q_o X_o \qquad \text{(Eq. 3)}$$

where

Q_o = unloaded trap Q.

We see from Table 3 that for reasonable efficiency, R_T should be about 30 kΩ. So, a large Q_o is desirable because it allows for low values of X_o, hence smaller off-frequency loading effects, while achieving the necessary R_T.

To visualize the effect of trap Q, consider the system as the trap shunted by the antenna. The parallel combination of 3 kΩ and 30 kΩ (R_T) produces an effective system resistance of 2727 Ω. Since the trap resistance of a 90% efficient trap (30 kΩ) is large with respect to the system resistance (2727 Ω), unloaded trap Q has little effect on the system Q.

The system operating Q is:

$$Q = \frac{2727}{X_o} \qquad \text{(Eq. 4)}$$

[1]Ramo and Whinnery, *Fields and Waves in Modern Radio*, Wiley, 1945, pp. 490-491.
[2]Terman, *Radio Engineers' Handbook*, McGraw-Hill, 1943, pp. 144.

Table 3
Trap Resistance vs. Trap Efficiency

R_T (kilohms)	Efficiency (%)
3	50
6	66.7
12	80
24	88.9
48	94.1

Recall that the antenna is essentially a pure resistance over a 2% frequency range. Operating Q must be about 10 for the trap to be an essentially pure resistance over a 2% bandwidth.[3] Solving Eq. 4:

$$X_o = 273\ \Omega$$

This is the minimum X_o that maintains system Q requirements. Since R_T = 30 kΩ for 90% efficiency, we can solve Eq. 3 for Q_o.

For R_T = 30 kΩ, and X_o = 273 Ω, Q_o = 110.

The above values of X_o and Q_o are for traps of all frequencies. In the case of traps made from separate coils and capacitors, it is no problem to achieve these values, even though we may have to use resistive shunts to adjust the Q. But, for coaxial and bifilar traps, the reactance is not easily controlled; different types of cable or wire must be used for the various frequencies of operation. — *Frank Noble, W3MT, Bethesda, Maryland*

QUADRAQUAD UPDATED

☐ Since building the first Quadraquad antenna ("The 'Quadraquad' — Circular Polarization the Easy Way," Robertson, April 1984 *QST*), I have developed a better feed system. The simultaneous occurrence of voltage and current antinodes makes voltage feeds an easy alternative to current feeds.

To implement a voltage feed, use a pair of quarter-wave transformers. These transformers are similar to the baluns described in the article except that they have a single center conductor instead of a coaxtube, and the delay line is tapped into them some distance from the shorted end. At the open ends, the inner conductors are attached to the driven element, which is now a continuous loop, and the outer conductors are left open. This is the same, electrically, as feeding a wire antenna at one end by means of a parallel-resonant tuned circuit.

The two advantages of voltage feeding are: (1) A slot in the outer conductor allows tap adjustment for impedance matching. (2) High-power can be used; with coaxtubes, conductor spacing it so small that arcing could occur.

Match each feed point to the main feeder independently. Once this is done, a delay line with the same characteristic impedance as the feeder is matched and the power divides evenly. Of course, this yields a 2:1 SWR on the main feeder unless a matching section is used.

It is best to make the transformers a little shorter than a quarter wavelength. Use a combination of tap-point adjustment and top capacitive loading to get a good match. For capacitive loading, use a short piece of wire attached to the open end of the transformer where it joins the antenna, and adjust with sidecutters. — *David S. Robertson, Stirling, Australia*

[3]Terman, p. 145.

Feedback

☐ Joe Reisert, W1JR, has found an error in "A High-Quality UHF Source for Microwave Applications" (Feb. 1983 *QST*). The emitter of Q5 should be grounded, not connected to $+V_{cc}$ as shown in the schematic on p. 29.

☐ Author Belrose has found several printing errors in his "Beverage Antennas for Amateur Communications" (Jan. 1983 *QST*). On page 25 under Eq. 1, the definition of "n" is misplaced, since "n" is a parameter of Eq. 5. On this same page, the numerical parameters associated with Eq. 4 are incorrect. For the Beverage wire, a = 0.0404 inches (0.1026 cm) and h = 3.707 feet (1.13 meters), so:

$$Z_o = 60\ ln\ \frac{2(3.707)\ (12)}{0.0404} = 462\ \Omega$$

On page 26, e^{jn} in Eq. 5 should read e^{jn} where e is Napier's natural logarithm base. Finally on the same page δ_g = conductivity of the earth, which is a parameter used in Eqs. 6 and 9, should be written as σ_g; while this is a printing error, these equations are correctly written, and the parameter δ_g is correctly defined.

☐ Frank Noble, W3MT, has found the following errors in his Mar. 1984 Technical Correspondence item about coax traps. The formulas for I_1 and I_1', in the left-hand column of page 47, should read:

$$I_1 = \frac{E}{\omega L} \qquad I_1' = \frac{E'}{\omega L}$$

Also on p. 47, the value used for "d" in Eq. 5 is 1.695 inches (a 1¾-inch diameter form with 0.195-inch diameter cable).[4]

☐ Two minor points in "The Perfect 10" (*QST*, March 1984, p. 17) could cause confusion. In Fig. 1, pins 2 and 3 of U1 are reversed. The pin numbers are shown correctly in Fig. 2. In Fig. 2, T1 is shown having an output voltage of 25 V, but 12.6 V is specified in the parts list; either voltage is suitable. The U1 input voltage is not critical: it must be at least 2 V greater than the U2 output voltage (10 + 2 = 12), and it must be less than the breakdown voltage of U1, 40 V. (Remember, in a power supply with a capacitor-input filter the available voltage is 1.414 times the transformer rating.) Of course, the higher the input voltage, the more power U2 must dissipate.

☐ The April 1984 Product Review of the AEA CP-1 Computer Patch Interface mistakenly refers to the VIC 20™/Commodore 64™ software as "HAMTEXT™." The AEA product is MBATEXT™; the former name belongs to a Kantronics product.

☐ That stray by W4RHZ about the Navy knob (Jan. 1984 *QST*, p. 25) excited some mail on the subject. One thing that all seem to agree on: The Navy knob came into being because it was a better knob with which to send code. Even today it is used and preferred by most operators simply because it feels better than the old-style landline telegraph knob.

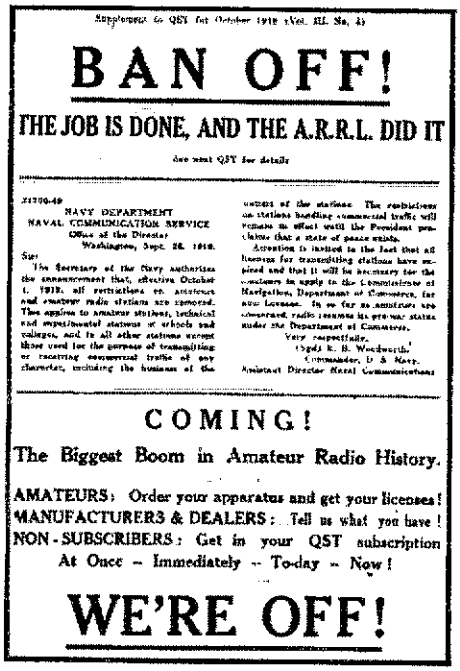
[4]mm = in × 25.4

70 Years

You've Come a Long Way, ARRL!

This was the Hartford, Connecticut, home of ARRL cofounder Clarence Tuska in 1914. It was in the attic of this house that League paperwork was handled and the first issues of *QST* were put together.

It's been 70 years this month since Hiram Percy Maxim and Clarence Tuska got together and turned the idea of relaying radio signals into a thriving organization that today is in the forefront of Amateur Radio affairs. The changes have been many over the years, and the League played a part in all of them — from spark to CW; from SSB to packet; from tube to solid-state, to chips; from national prominence to international recognition; from FCC-issued tests to volunteer examining; from across town to transatlantic, to space communications. But our purpose has remained steadfast through it all: "Of, by and for the amateur." Here's a brief look at ARRL's first 70 years.



BAN OFF!

THE JOB IS DONE, AND THE A.R.R.L. DID IT

See next QST for details

NAVY DEPARTMENT
NAVAL COMMUNICATION SERVICE
Office of the Director
Washington, Sept. 26, 1919.

Sir:

The Secretary of the Navy authorizes the announcement that, effective October 1, 1919, all restrictions on amateur and amateur radio stations are removed. This applies to amateur stations, technical and experimental stations of schools and colleges, and to all other stations except those used for the purpose of transmitting or receiving commercial traffic of any character, including the business of the owners of the stations. The restrictions on stations handling commercial traffic will remain in effect until the President proclaims that a state of peace exists.

Attention is invited to the fact that all licenses for transmitting stations have expired and that it will be necessary for the amateurs to apply to the Commissioner of Navigation, Department of Commerce, for new licenses. In so far as amateurs are concerned, radio returns to pre-war status under the Department of Commerce.

Very respectfully,
(Signed) S. S. Woodworth,
Commander, U. S. Navy.
Assistant Director Naval Communications

COMING!

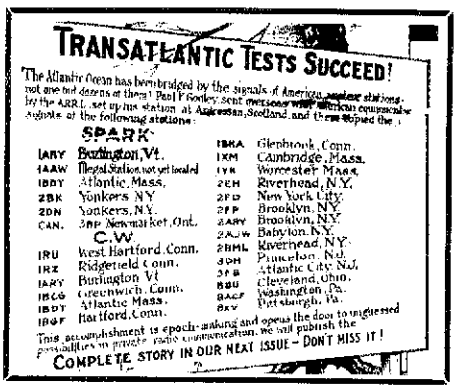
The Biggest Boom in Amateur Radio History.

AMATEURS: Order your apparatus and get your licenses!
MANUFACTURERS & DEALERS: Tell us what you have!
NON-SUBSCRIBERS: Get in your QST subscription
At Once – Immediately – To-day – Now!

WE'RE OFF!

This circular was far from modest, but the ban on amateur transmitting was not lifted until 1919. Congress, at the League's request, at long last ordered the Navy to remove restrictions on the use and operation of Amateur Radio stations, and jubilant hams were back on the air.

T Minus Ten and Still Counting on December 12, 1961 . . . Tension mounts as the moment for liftoff of OSCAR 1 nears. K6LFH talks to OSCAR Control Center, WA6GFY, while (l-r) USAF Captain Turner, W6SAI, W6MLZ and WØTSN await final word on the fate of what was to be the first in a long and successful series of amateur satellites.



TRANSATLANTIC TESTS SUCCEED!

The Atlantic Ocean has been bridged by the signals of American amateur stations, not one nor dozens of them! Paul Forsley, sent overseas with American consular Agents at the following stations:

SPARK

1ARY	Burlington, Vt.	1BKA	Glenbrook, Conn.
1AAW	Illegal Station not yet located	1XM	Cambridge, Mass.
1BBY	Atlantic, Mass.	1YK	Worcester Mass.
2BK	Yonkers, N.Y.	2EH	Riverhead, N.Y.
2DN	Yonkers, N.Y.	2FD	New York City
CAN.	Sable Newmarket, Ont.	2FP	Brooklyn, N.Y.
	C.W.	2ARY	Brooklyn, N.Y.
1RU	West Hartford, Conn.	2AUW	Babylon, N.Y.
1RZ	Ridgefield Conn.	2BML	Riverhead, N.Y.
1ARY	Burlington, Vt.	3QH	Princeton, N.J.
1BCG	Greenwich, Conn.	3FB	Atlantic City, N.J.
1BDY	Atlantic Mass.	8BU	Cleveland, Ohio.
1BQF	Hartford, Conn.	8ACF	Washington, Pa.
		8KV	Pittsburgh, Pa.

This accomplishment is epoch-making and opens the door to unguessed possibilities in private radio communication. We will publish the

COMPLETE STORY IN OUR NEXT ISSUE – DON'T MISS IT!

"Oh, Mr. Printer, how many exclamation points have you got? Trot 'em all out, as we're going to need them badly, because We Got Across!!!!!!" ran the lead in *QST* announcing the success of the ARRL Transatlantic Tests in December 1921.

When a broken dike on the Columbia River flooded Vanport, Washington, in 1948, a well-prepared ARRL Emergency Corps responded quickly and effectively. Here, a 10-meter mobile supervisor relays information from the dike to disaster headquarters.

Through the cooperative efforts of the ARRL, NASA and AMSAT, Astronaut Owen Garriott, W5LFL, became the first radio amateur to operate from space. In his off-duty hours during a Space Shuttle *Columbia* mission in December 1983, Owen was able to make historic two-way contacts with hundreds of amateurs worldwide. *(NASA photo)*

The Last Days of OSCAR 8†

OSCAR 8's telemetry paints a vivid picture of the satellite's demise from a failed battery.

By Frank Wiesenmeyer,* K9CIS

Following in the footsteps of its two predecessors, OSCAR 8 developed serious battery problems in the twilight of its life. As in the past, failure was triggered by declining exposure to sunlight. After more than five years of flawless performance, most users had almost forgotten that OSCAR 8 too was vulnerable to the malady that haunts most aging satellites — shorted battery cells.

Having been stuck in Mode A since June 2, 1983 and unable to respond to commands, OSCAR 8 finally stopped transmitting on June 24, 1983. The satellite was last heard at loss-of-signal (LOS) on orbit 27,026 at 1441 UTC. (Refer to Table 1 for definitions of A-O-8 telemetry channels discussed later.)

First Signs of Battery Decline

The first hint of a battery problem came in late October of 1982, when the battery voltage abruptly began to sag by 1.5 V after 12 hours in the energy-taxing dual AJ mode (Fig. 1). Three months later, on January 24, 1983, the spacecraft's battery could no longer support both modes simultaneously. In fact, the battery voltage fell 1.5 V within minutes after the second transponder was added to the load (Fig. 2). After this problem developed, the operating schedule was modified to eliminate AJ days to ease the burden on the aging battery. Everything else, however, continued to work well.

With the satellite operating in each mode separately for three days each week and in the recharge mode on Wednesdays, everything seemed to be back to normal. Battery voltage profiles once again showed only small voltage fluctuation during a busy pass (Fig. 3). Indeed, solar array output averaged more than 300 mA, nearly the same as on launch day more than five years before. The only exception to OSCAR 8's nominal behavior during May 1983 was an elevated internal temperature reading of 48° C. That condition undoubtedly arose from the satellite's continuous exposure to sunlight since the end of August 1982. The situation had been predicted by computer studies done by Bayman McWhan,

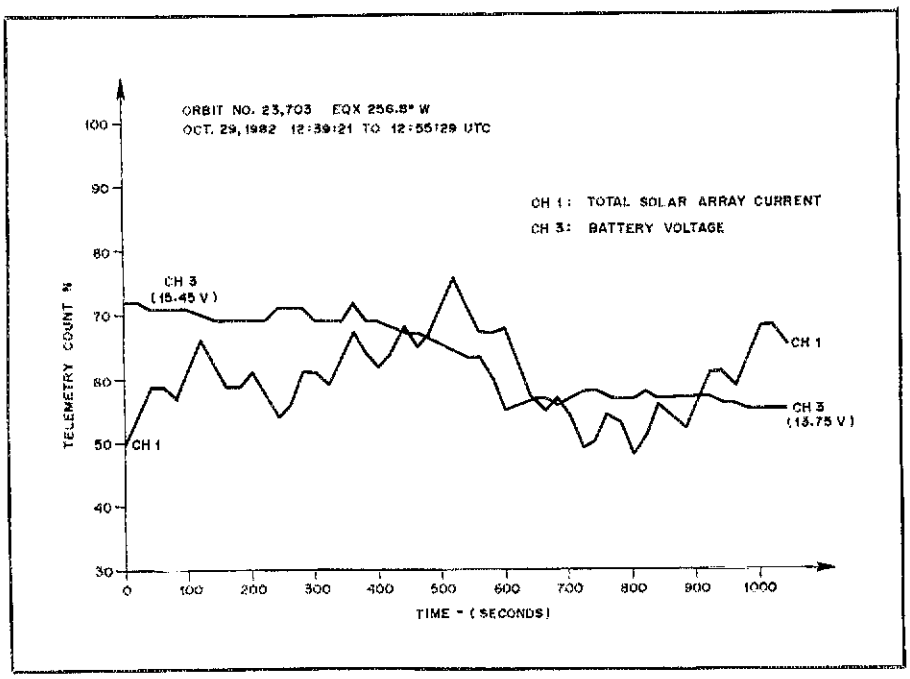


Fig. 1 — After 12 hours of simultaneous Modes A and J (October 29, 1982) battery voltage dropped suddenly: a harbinger of problems to come.

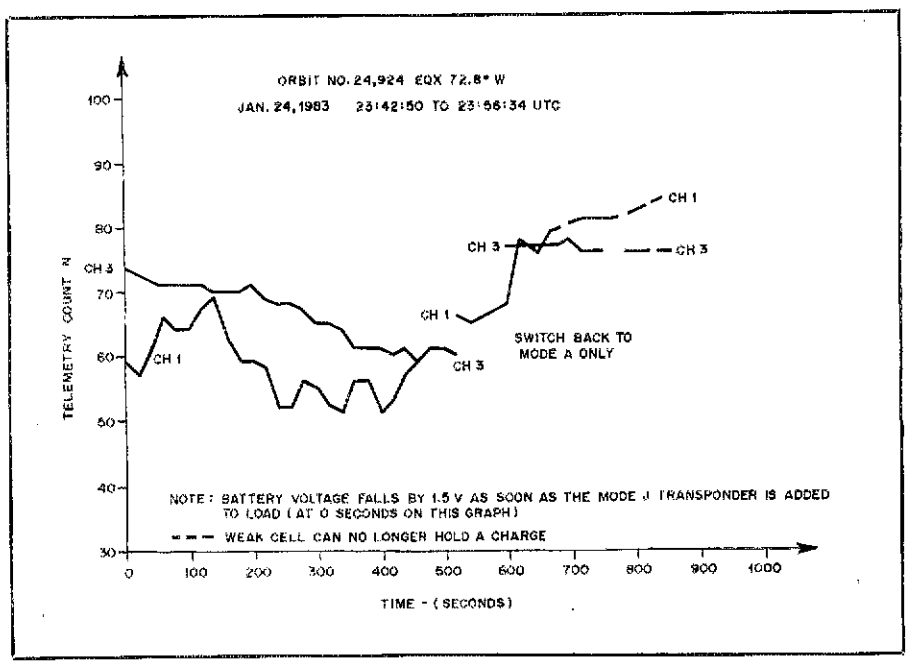


Fig. 2 — In early 1983, the weak cell in the satellite's battery discharged after just several minutes of A/J use.

*2181 Summit Ct., Decatur, IL 62526

†Reprinted with permission from AMSAT's *Orbit* (Nov.-Dec. 1983).

W2GAX. Those predictions were verified by actual battery temperature profiles that matched the computer studies nearly perfectly.

During the spring and summer months of 1982, OSCAR 8 had been in the earth's shadow for up to 20 percent of each orbit, allowing the satellite to cool down to less than 28° C, a very comfortable temperature for a satellite with nickel-cadmium batteries. During the past two years, the May through July cooling off period was the only time OSCAR 8 did not orbit in total sunlight. That was because of the gradual drift in the satellite's sun-synchronous orbit. Such drift was most noticeable to longtime OSCAR 8 users as a gradual change toward earlier passes.

The last recorded Channel 1 (Total Solar Array Current) telemetry with counts of 101 (indicating the satellite was in darkness) were recorded in Illinois in late November of 1981, as shown in Fig. 4. Since that time, OSCAR 8 had been in continuous sunlight, except for the May to July cooling off period.

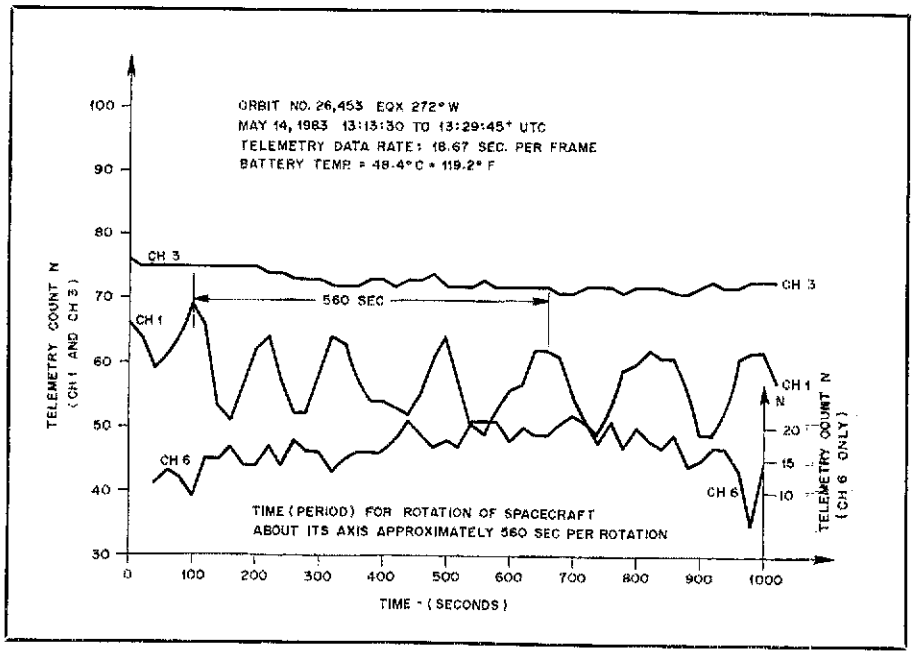


Fig. 3 — AMSAT-OSCAR 8's normal battery-voltage profile, May 14, 1983.

Battery Temperature Hits All-Time High

The many months of continuous exposure to the sun thus caused the OSCAR 8 battery and internal temperatures to climb to a very warm 48.4° C by May 12, 1983. That temperature concerned ground controllers: Operating a NiCd battery above 25° C for prolonged periods of time would significantly shorten its life expectancy. At elevated temperatures, the cells tend to lose electrolyte, reducing their charge storage capacity. When a cell is at or near total discharge, it is very susceptible to shorts.

In an attempt to lower the internal temperature of the spacecraft, or at least to prevent it from climbing any higher, a new operating schedule of continuous Mode J operation was initiated by the American Radio Relay League. The battery temperature promptly fell as shown in Fig. 5. The coincidental decline in the amount of sunlight falling on the spacecraft, however, undoubtedly was the main reason for the temperature plunge.

By the end of May, everything again seemed to be going well, with the spacecraft cooling off nicely, as it had the year before. A slight decline in the average battery voltage was noted, something that had not occurred in 1982. This minor anomaly was dismissed as a normal reaction to the heavier loading of continuous operation of the Mode-J transponder.

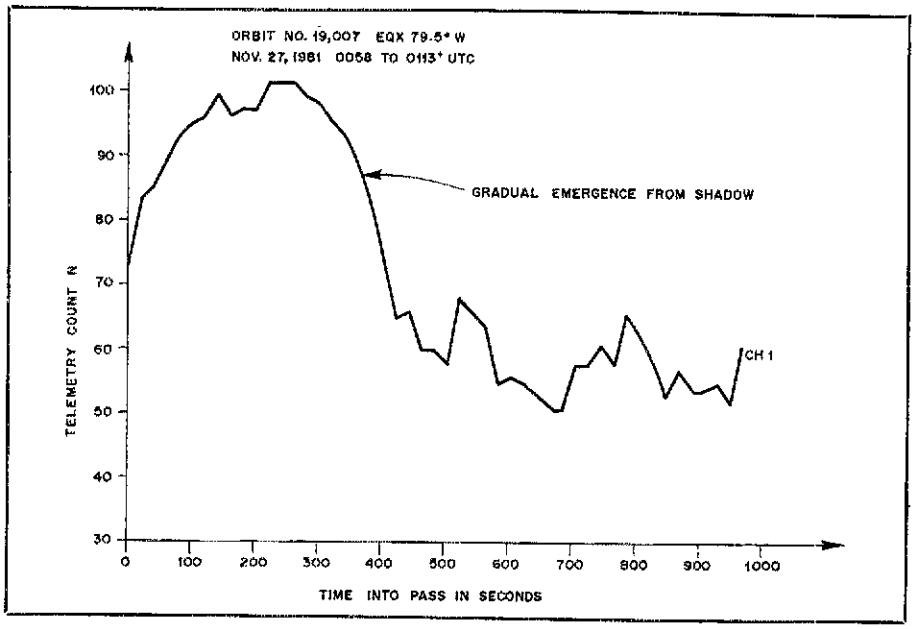


Fig. 4 — Channel 1 solar-array-current telemetry from AMSAT-OSCAR 8 shows emergence from the last long period of continuous darkness in late 1981.

Spacecraft Battery Suffers A Shorted Cell

Suddenly, on June 1, 1983, the battery voltage plunged 1.2 V at 0025 UTC on Orbit 26,697, an 86.9° W pass. The event surely signaled the shorting of one of OSCAR 8's 12 cells, which are connected in series. A hurried phone call to Bill Clepper, W3HV, resulted in the satellite's being shut off completely; it was commanded into what is called Mode D, or recharge mode. In this mode only the command receiver is on, listening for further word from the ground. That greatly minimized the load on the spacecraft's power supply system. Fortunately, Bill was at home to take the emergency call and his quick action prevented further damage to the spacecraft battery.

After a day and a half in recharge mode, Norm, K3NW, turned the satellite back on, in Mode J, on the morning of June 2. It was assumed that the weakened cell had recovered sufficiently to resume the continuous Mode J schedule. Only one orbit later, however, at 1253 UTC, the telemetry encoder stuck, generating meaningless numbers that indicated a battery voltage of less than 13.25 V. Another hurried phone call to W3HV, to alert him to the problem, came several minutes late. Bill had just left for work. With the help of Bill's wife, however, he was reached at work a few minutes later. Bill made a special trip home for the next orbit, which, at 294° W, was near the western limit of his access range. Despite that handicap, after four or five

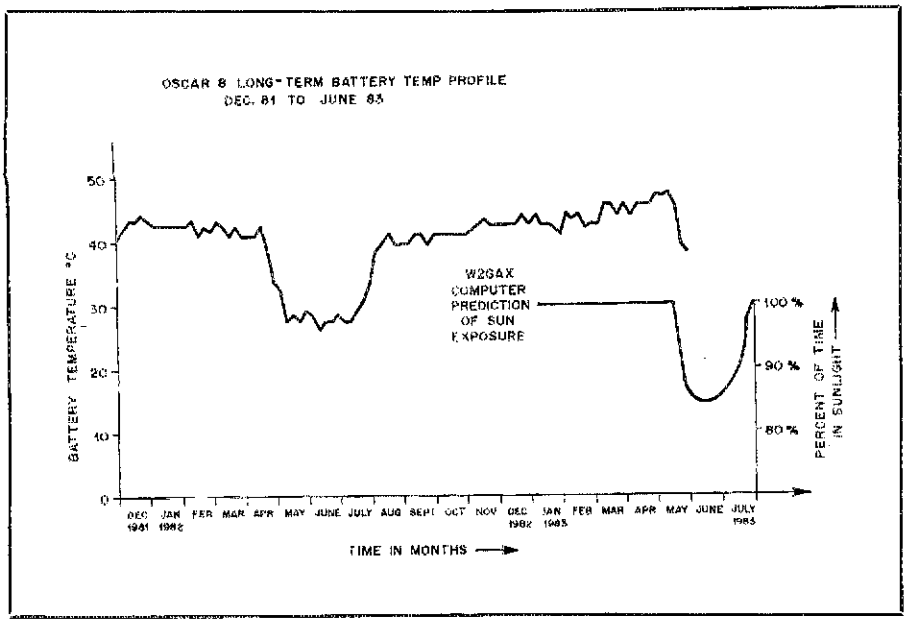


Fig. 5 — An expanded look at the satellite's battery temperature profile shows the predicted dip in May of 1983.

tries, Bill successfully switched the satellite back into recharge mode. In Mode D, the satellite would be safely hibernating while ARRL OSCAR 8 Operations Manager Bernie Glassmeyer contemplated the next move.

Latched Telemetry Encoder Not Unknown

The latched telemetry condition is not entirely new. The very same numbers had been observed once before with OSCAR 8, on June 11 and 12, 1979. At that time the satellite had mistakenly been left in the dual AJ mode for several days when it should have been in Mode A. Consequently, the satellite was in either Mode J or AJ for seven straight days. With OSCAR 8 receiving less than 70 percent sunlight exposure each orbit, several cells in the battery completely discharged and the battery voltage fell so low that the telemetry encoder no longer functioned properly. Fortunately, the command receiver still worked and Bud Schultz, W6CG, was able to rescue the satellite just in the nick of time, possibly preventing serious, permanent damage to the spacecraft battery. Since the cells were only a year old, they quickly recovered and functioned well for another four years.

Important and valuable information was obtained from OSCAR 8's first encounter with battery failure. The last good telemetry data on that occasion showed Channel 3 reading a 53 count, indicating a battery voltage of 13.55. Since the telemetry encoder malfunctioned on the next orbit, a benchmark was created against which to measure the voltage point where the telemetry encoder malfunctions. It is interesting to note that the same numbers were frequently generated by OSCAR 7 between October 11, 1978 and early April 1979 during the initial phase of OSCAR 7's battery failure. Fortunately the shorted cell later opened, allowing OSCAR 7 to function reasonably well on the power supplied by its solar panels until June 12, 1981.

Command Function Lost During Telemetry Check

Several days after the battery anomaly of June 2, Bernie, W9KDR, asked East Coast command station K3NW for daily peeks at the telemetry to see how OSCAR 8 was doing. Those checks were performed using Mode A to minimize the risk to the satellite. The conservative strategy seemed to be to let the satellite hibernate in Mode D until the end of July, when 100 percent sunlight returned. Such a recommendation was made to the ARRL by telephone and by letter. Unfortunately, before more discussion of the options could take place, command stations lost their telecommand control of the satellite during a telemetry check on June 6, 1983, on Orbit 26,780, at approximately 2310 UTC. After that, OSCAR 8 remained in Mode A, ignoring all further commands to return to recharge mode. Probably another cell in the battery had shorted, causing the command receiver to malfunction. Since AMSAT engineer Jan King, W3GEY, had indicated that the satellite command system should work with battery voltages as low as 8 V, it came as somewhat of a surprise when the satellite became stuck in Mode A so quickly.

It had been hoped that a rescue effort, similar to that used to salvage UoSAT-OSCAR 9 the preceding fall, could be put into operation in time to save OSCAR 8. If the satellite could have been commanded into recharge mode until the end of the shadow period, one more year of Mode J operation might have been squeezed out. Although command stations experimented with different command frequencies to get the satellite to respond, it is unlikely that anything short of extremely high power would have worked. Unfortunately, time ran out before the rescue effort could be initiated.

More Data from the Dying Bird

While waiting for the command stations to regain control of the satellite or for a more favorable exposure to sunlight to allow the satellite to switch modes again, observers could still extract a little information from the locked up telemetry encoder. Previous measurements had shown that the rate at which telemetry data is sent is a good relative indicator of the internal temperature of the spacecraft. As of June 9, the telemetry-frame rate was very close to 20 seconds per frame, indicating moderate internal temperatures near 36° C or even lower. Many observations over the past several years had shown that high temperatures, about 42° C, consistently caused the telemetry frame rate to speed up to 18.5 seconds per frame. If all had remained static, the telemetry rate should have increased as the satellite came out of the shadow period at the end of July 1983. But destiny intervened.

While rescue options were still being considered, OSCAR 8 abruptly ceased Mode A transmissions on June 24, 1983. Up to that point, the Mode A beacon and transponder had sounded normal, except

Table 1
AMSAT-OSCAR 8 Morse Code Telemetry-Decoding Information

Channel 1: Total Solar Array Current	I = 7.15 (101 − N) mA[1]
Channel 2: Battery Charge-Discharge Current	I = 57 (N − 50) mA[2]
Channel 3: Battery Voltage	V = (0.1N + 8.25) V
Channel 4: Baseplate Temperature	T = (95.8 − 1.48N) °C
Channel 5: Battery Temperature	T = (95.8 − 1.48N) °C
Channel 6: 435-MHz Transmitter Power Output	P = 23 N mW[3]

[1]Whenever N is less than 10, assume that an overrange condition has occurred. For example, as the satellite enters the earth's shadow, a reading of 101 is transmitted. This refers to Channel 1, N = 01. Since N is less than 10, we assume that over-ranging has occurred and the actual N is 101, which corresponds to zero current.
[2]There is a 2-second integration time associated with the current telemetered on this channel.
[3]There is a 2.5-second integration time associated with the power telemetered on this channel.

for the meaningless telemetry data. This important development was not noticed until seven orbits later, on Orbit 27,033. When no signals were heard on either beacon frequency, it was hoped that a command station had successfully regained control of the satellite and shut it down. A phone call to W3HV after the pass, however, confirmed the worst. OSCAR 8 had shut itself off, probably because of the collapse of the remaining good cells.

Subsequent checks of seven in-range orbits, beginning with Orbit 27,038 on Saturday morning June 25, produced no hint of a signal on either Mode. It appeared then that the last message from OSCAR 8 had been heard. Nonetheless, OSCAR 7 had been given up for dead many times during its final two years only to reappear unexpectedly. It was hoped that OSCAR 8 also would come to life again, or respond to commands, as it emerged from the Earth's shadow at the end of July. Unfortunately, such was not the case.

A Perspective

As of June 24, 1983, it appeared almost certain that at least two and possibly three cells of the 12-cell spacecraft battery had shorted. With a little luck, no more of the cells would have shorted before the seasonal tilt of the Earth caused the satellite orbit to be in 100 percent sunlight again. Nickel-cadmium batteries are most vulnerable to shorts when they are hot and in a state of complete discharge. After five years of use, the battery cells discharged very quickly under load and probably completely discharged during the 15 minutes of darkness that occurred once each orbit far south in the Southern Hemisphere. The risk would, of course, have been much less if the satellite had been in recharge mode.

Looking back over the final days of OSCARs 6 through 8, it is apparent that battery failure has been responsible for the demise of them all. It appears that all satellites need to be equipped with a system to disconnect the battery when it is no longer functioning. Such a disconnect device should be both automatic and ground controllable. Old, worn out battery cells are little better than large capacitors, at best, and short circuits in the worst case. Replacing the battery with a large capacitor or an open circuit would greatly reduce the risk of a shorted power-supply bus, which renders the solar cells useless. The solar panels, which typically last much longer than the battery, could then power the satellite as long as it is in sunlight. And sunlight would typically be in abundance for a large percentage of the orbital period for sun-synchronous satellites.

In the case of OSCAR 8, the most recent telemetry data indicated that there had been no apparent change in the current output of the solar panels since launch day in 1978. A popular rule of thumb states that solar cell efficiency should decrease approximately 10 percent each year from the effects of solar radiation. Apparently, the glass slips protecting the OSCAR 8 solar cells did a better job than expected.

An Epilogue

It has been a most enjoyable and interesting five years, not likely soon to be forgotten by those who have used this highly successful spacecraft. The early years were filled with technical challenges, as well as many new friendships that have endured as long as OSCAR 8 itself.

Countless school demonstrations and scientific experiments were performed studying rotation rates, shadow periods and Doppler ranging, to mention a few. Through it all, the spacecraft electronics continued to work perfectly, right up to the day the battery voltage fell too low to sustain the command and telemetry subsystems. OSCAR 8's superior reliability is no doubt closely related to the elegant simplicity of its design. Keeping the hardware to a minimum and assembling the parts with painstaking care have clearly resulted in an ultra-reliable spacecraft. No one who has experienced the thrill of communicating through OSCAR 8, using the Mode J transponder, is likely to forget how well it performed. Our good friend, OSCAR 8, served us well.

A Tribute to the Command Team

The remarkable longevity of AMSAT-OSCAR 8 can be attributed in large part to the relentless watchdogging of a group of volunteers charged with maintaining the satellite's health. This team of telecommand stations monitored the satellite's condition by recording telemetry patterns, identifying performance anomalies, diagnosing the probable causes and taking corrective action if warranted.

By prior agreement with AMSAT, the ARRL assumed operations responsibility for OSCAR 8 shortly after the successful launch. In anticipation of this, Bernie Glassmeyer, W9KDR, was brought on board as ARRL's OSCAR 8 Operations Manager. For the duration of the satellite's useful lifetime, he coordinated the work of the skilled and dedicated volunteers who kept OSCAR 8 healthy.

All who used the satellite or basked in the vicarious glory of a successful Amateur Radio Satellite Program owe a debt of gratitude to Bernie and the OSCAR 8 Command Team: Randy Smith, VE3SAT; Bud Schultz, W6CG; George Dillon, W6ELT; Martin Sweeting, G3YJO; Dave Oman, VE3HCR; Bill Clepper, W3HV; Norm Williams, K3NW; David Hull, VK3ZDH; and W1AW, ARRL's Maxim Memorial Station.

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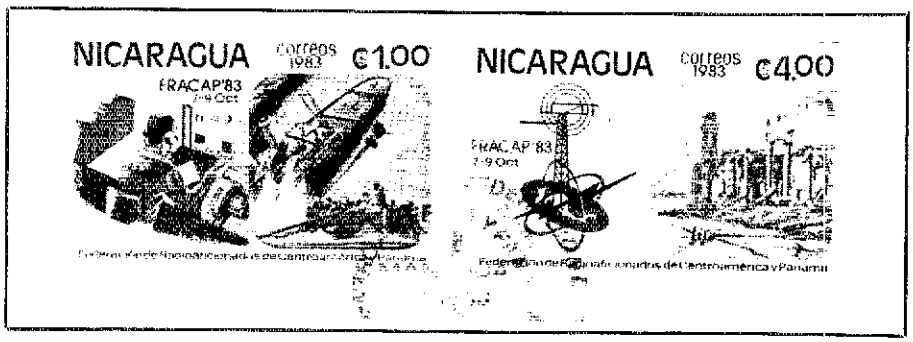
Strays

***QST* congratulates...**

☐ West Gulf Division Director Ray Wangler, W5EDZ, on being named 1984 Safety Professional of the Year by Region 3 of the American Society of Safety Engineers.

☐ Harold R. Richman, W4CIZ, of Annandale, Virginia, on receiving the IEEE Centennial Medal from the Northern Virginia Section.



The two latest Amateur Radio stamps, shown on this first-day cover from Managua, Nicaragua, honor the Federacion de Radioaficionados de Centroamerica y Panama, a consortium of the IARU member-societies in the Central America region. For a current list of Amateur Radio stamps, now totaling 29, send a business-size s.a.s.e. to Taizo Arakawa, N2ATT, 444 Westminster Pl., Lodi, NJ 07644.

The Last Steps of JG1QFW

A portrait of a famous ham and mountaineer whose adventures epitomized the spirit of Amateur Radio.

By Richard Palm,* K1CE

Many hams possess a spirit of adventure and a thirst for achieving goals. Most quench it in ham shacks, trying to make WAS on 144 MHz or DXCC on CW. Others are wedded to the workshop, where they modify, improve and design radio gear. Still others, like Naomi Uemura, JG1QFW, take their rigs and adventurous spirit where no ham or other person has gone before.

Denali, the tallest peak on the North American continent, is a veritable giant standing 20,320 feet above the sea. It can be a lonely place in most seasons. But in winter, an almost impregnable armor of fierce storms and unfathomable cold seals the peak from all but the most hardy souls, experts in severe mountaineering and survival. One such soul, Naomi Uemura, JG1QFW, recently accomplished something no one else had ever done: scale Denali in winter, *alone*. But it probably cost him his life.

Denali, the Indian name for "Great One," is also known as Mount McKinley. It lies 35° north of the latitude of the great Himalayan Range of Asia, between Anchorage and Fairbanks, Alaska, below the Arctic Circle.

Uemura was well acquainted with danger. In the '60s, he climbed Mont Blanc, the highest peak in Europe; Kilimanjaro, the highest peak on the African continent; and Aconcagua, the highest in South America. He climbed Everest in 1970, and also Mt. McKinley, for the first-ever solo climb of North America's highest peak.

On May 1, 1978, he became the first person to reach the North Pole — *solo*. During that trek, he relied heavily on Amateur Radio. A network of emergency amateur stations organized by JG1QFW, the Smithsonian Institution, ARRL and others fortunately did not need to activate (see September 1978 *QST* for more on this achievement). Most recently, he was thwarted in his attempt to climb Antarctica's highest summit. His climb of Denali was to be a warm-up for another try in Antarctica.

On January 26, 1984, Uemura was deposited by a bush pilot at the base of Denali. He departed Base Camp on February 1 with a bare minimum of provisions, including communications gear, hoping to make a quick, alpine-style ascent. It is not known if he carried Amateur Radio.

Naomi Uemura, JG1QFW, enjoys a quiet moment in front of his rig at his Tokyo ham shack as his wife looks on. *(photo courtesy JARL)*

On February 12, his 43rd birthday, JG1QFW stood atop the summit, the first person to solo Denali in winter. The achievement came 14 years after his first-ever solo ascent of the mountain in any season.

He was last seen during his descent, at the 16,200-foot level of the West Buttress ridge. He had had radio contact with planes circling overhead. Pilots reported later that Naomi sounded "tired" through the weak communications link. Then, he was gone. Despite severe weather problems, a Japanese team of four climbers, including two Everest veterans, searched for days without finding a trace of Uemura.

Two theories of Uemura's demise circulated: One is that Uemura, suffering from fatigue and possible acute mountain sickness, slipped and plunged down the ridge toward the glacier. The other is that he died of dehydration and hypothermia.

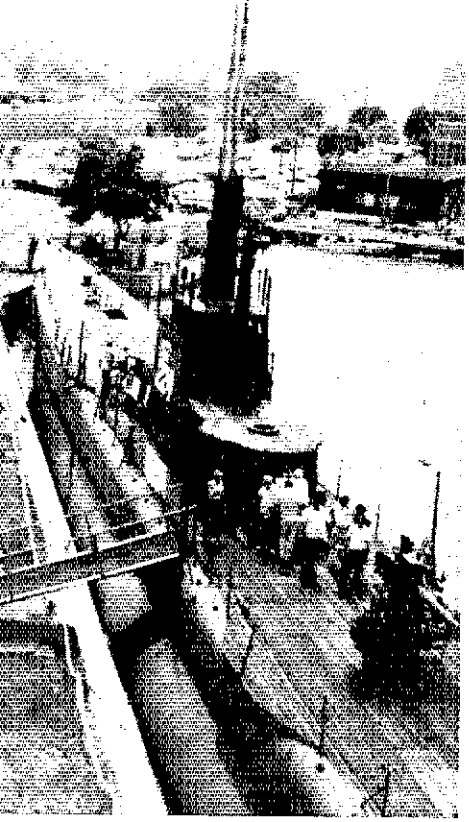
Uemura was a careful, meticulous climber who knew his limits, and operated within them. A legend in international exploring circles, Uemura was known as the "Lindbergh of Japan," where he is a subject of study in grade schools and is considered a national hero.

First licensed as JG1QFW in 1974, Uemura maintained his station in Tokyo. Often called "Animal Uemura" because of his incredible vitality, JG1QFW believed that it is nonsense to do something already done, to follow others. Naomi was a leader. It's not surprising that he was a ham, is it?

*Deputy Manager, Membership Services, ARRL

"Welcome Aboard," from K8KRG on the *USS Cod*

By George Pindroh,* K8KR and Donald Winner,** WD8RZG



N8DSG photo

Dive! Dive! Dive!" once echoed throughout the hull of the World War II submarine *USS Cod*. Today, some 40 years later, the words "CQ CQ, K8KRG calling" echo through that same hull. Through the efforts of the Northern Ohio Amateur Radio Society (NOARS), it is possible for radio amateurs around the world to make a radio contact with this gallant WW II remnant.

The *Cod* (SS-224), one of 236 fleet-type submarines used in WW II, is permanently moored in Cleveland, Ohio, on the shore of Lake Erie, as a historical monument to the men of the "Silent Service" of WW II and submariners throughout the world. One of the last of its kind, the *Cod* served in the Pacific theater during the war. Later, it saw duty during the Korean conflict and as a training vessel for both the U.S. and Canadian Navies. It was retired from service on January 1, 1972. Through the efforts of many concerned citizens, the vintage submarine was obtained by the Cleveland Coordinating Committee for the Cod as a lasting memorial.

At a Christmas banquet in 1979, WD8RZG, KA8GPW and WD8IQJ met with the directors of the Great Lakes Historical Society, which then owned the *Cod*. The success of the special-event station W6RO aboard the *Queen Mary* was discussed, and it was agreed upon by all that the *Cod* would be an ideal location for a special-event station as well.

The Parma RC, K8UZW, a small, local radio club, sponsored operations from the *Cod* during the summers of 1980 and 1981. Their operation was limited to using wire antennas on a few bands, but to everyone's surprise pileups became common as radio amateurs worldwide eagerly tried to contact K8UZW. Because of the limited support possible with the Parma RC, a larger sponsorship was picked up by NOARS, a general-interest club with about 700 members worldwide, which set up its club station, K8KRG, onboard the *Cod*.

A beautiful relationship has developed between the members of NOARS and the volunteer submarine veterans who maintain the *Cod*. They promote the submarine by providing guided tours to about 35,000 yearly visitors, and NOARS promotes the *Cod* and Amateur Radio around the world. Recently, a visitor from Florida was pleasantly surprised when she was able to say hello to relatives back home, as a club member was able to quickly raise an Orlando amateur for a phonepatch. NOARS members also help with many of the chores necessary to maintaining the ship.

During 1983, K8KRG made more than 2300 contacts from the *Cod*. We now have 49 states, with 48 of them confirmed toward a Worked All States certificate. We need to work Alaska and get both Alaska and Hawaii confirmed.

In 1984, K8KRG will operate almost daily from Memorial Day to Labor Day in the lower portion of the General bands, 10-80 meters, with special Novice operations on June 16, July 15 and August 18. The *Cod* will also be open during the Cleveland Hamfest, on September 23. K8KRG will send a QSL card to all stations who contact the *Cod*. Also, an 8- × 10-in certificate, with the *Cod*'s picture on it, is available for $1. A brochure on the *Cod*'s history is enclosed with the certificate. Our QSL manager for all contacts is WD8RZG (address listed at bottom of this page.

Here's hoping you come aboard the *USS Cod* via Amateur Radio during 1984! QST

*NOARS Secretary, P.O. Box 354, Lorain, OH 44052
**USS Cod Coordinator, 8927 Torrance Ave., Brooklyn, OH 44144

Strays

2-METER DX EXPERIMENT MAY 12-13

☐ On May 12-13, GW4UHF, in Western Wales, will attempt to contact Newfoundland and Labrador on 2 meters. Frequency: 144.444 MHz. Power: 400 W to a double rhombic with 27-dB gain, resulting in an ERP of 1.8 MW. Site: specially chosen, some 600 meters above sea level. Previous tests from this site have produced some spectacular results. Best DX to date: Tel Aviv, Israel, over a 4000-km path. If you live on the East Coast, aim those 2-meter beams northeast May 12-13 and try to catch the action. — *VE3GRO*

I would like to get in touch with...

☐ any amateur who has successfully modified the Collins KWM-2A for use on 160 meters. Hal Graepel, EI1DA, Catholic Walk, Kinsale, Co. Cork, Eire.

Board Selects New Leaders; Looks Ahead

Meeting in Hartford March 26-27, the ARRL Board pushed forward on Volunteer Examining, CRRL autonomy, frequency coordination, digital communications and phone-band expansion.

By W. Dale Clift,* WA3NLO

The 1984 Annual Meeting of the Board of Directors in March brought about changes in the leadership of Amateur Radio and the American Radio Relay League. Larry E. Price, W4RA, of Statesboro, Georgia, is the new President of ARRL. Larry succeeds Carl L. Smith, WØBWJ, who, after the untimely death last November of ARRL President Vic Clark, W4KFC, had manned the helm as President. Leonard M. Nathanson, W8RC, of Southfield, Michigan, former Director from the Great Lakes Division, is the new First Vice President. Len's ascendancy to the Vice Presidency means that the Vice Director from that Division, George S. Wilson III, W4OYI, succeeds to the directorship.

Gar A. Anderson, KØGA, of Minneapolis, Minnesota, was elected as Second Vice President, moving him up one position from his election as Third Vice President in 1982. Jay A. Holladay, W6EJJ, is the new Third Vice President, leaving his seat on the Board of Directors to new Southwestern Division Director Fried Heyn, WA6WZO. Fried had been vice director from that Division. Richard L. Baldwin, W1RU, was reelected to a second term of office as International Affairs Vice President. Dick, incidentally, presently serves as President of the International Amateur Radio Union (IARU).

David Sumner, K1ZZ, was reelected as ARRL secretary (Dave is also the General Manager at League Headquarters), and James E. McCobb, Jr., K1LLU, was reelected as Treasurer. All ARRL officers were elected by a majority of the Board of Directors, and all, except for the Secretary/General Manager, serve as unpaid volunteers. Three other individuals' contributions to Amateur Radio and the League were recognized by the Board when it elected George Hart, W1NJM, as Honorary Vice President, and Harry J. Dannals, W2HD, as President Emeritus.

*Assistant to the General Manager, ARRL

Canadian Counsel B. Robert Benson, VE2VW, and Director Thomas B. J. Atkins, VE3CDM, plan a presentation of changes to the ARRL Articles of Association and Bylaws that will accord greater CRRL independence and recognition. *(photos courtesy K1ET)*

Busy on the back-benches: Vice Directors Dick Dyas, WØJCP, and M. L. Gibson, W7JIE, discuss a proposed motion.

George formerly served as manager of the Communications Department and trustee of W1AW at ARRL Headquarters. Harry served the League as its president for 10 years, 1972-1982, and before that held the offices of Director, Vice Director and Section Communications Manager. The Board also elected Noel B. Eaton, VE3CJ, as Director Emeritus. Noel, who is a past ARRL Vice President and Director, past IARU President, and presently IARU President Emeritus, was recognized for his long and distinguished record of service to ARRL and the worldwide Amateur Radio community.

The Board also elected four of its Directors to serve on the Executive Committee (see the Table appearing elsewhere in this article). The Executive Committee exercises the authority of the Board during the intervals between Board meetings. Other positions of leadership involved the appointment of Directors to Standing Committees by the new President. President Price, shortly after his election, announced the chairmen, alternate chairmen and members of the Management and Finance, Membership Affairs, and Plans and Programs Committees.

Volunteer Examiner and Volunteer Monitoring Programs

The Board devoted a substantial amount of time to consider ARRL's participation in the FCC's Volunteer Examiner Program. After deliberating a committee report delivered by Vice President Anderson, the Board directed that the ARRL become a volunteer examiner coordinator (VEC) on a national basis and, upon the effective date of rules adopted to permit recoupment of expenses by the VECs, authorized the President and General Manager to conclude on behalf of the League an agreement with the FCC to become a volunteer examiner coordinator. Details of this action are in Minute 52.

The Board also directed the General Manager to sign an agreement with the FCC to establish an "Amateur Auxiliary" to assist the FCC in monitoring on-the-air activities. Much of the legwork on this program had been done by the Board's Subcommittee on Monitoring and the Headquarters staff, but official approval was needed for the program to move forward. This action appears at Minute 86.

Changes in the ARRL Articles of Association and Bylaws

Several changes were made to the ARRL Articles of Association and Bylaws that permit the Canadian Radio Relay League

Former President Harry J. Dannals, W2HD, hears the news that the Board has named him "ARRL President Emeritus."

to establish greater independence. The ultimate goal is for the CRRL to become autonomous from ARRL. See Minutes 48 through 51, inclusive, for these actions. The CRRL also sought and obtained independence with regard to establishing standards and affiliation procedures for Canadian Amateur Radio clubs and groups (see Minute 47).

Robert York Chapman, W1QV, Paul Grauer, WØFIR, and George A. Diehl, W2IHA, were elected as Directors of the ARRL Foundation at Minute 66. At Minute 113 the Management and Finance Committee was directed to study the feasibility of ARRL Foundation expenses being funded entirely by ARRL.

The Board also had its eyes on future WARCs. At Minute 88, the Management and Finance Committee was directed to prepare a plan to fund the activities to be supported by the ARRL prior to, and during, the next World Administrative Radio Conference. The Board also voted to invite members of the IARU Administrative Council and the Region 2 Executive Committee to participate in an informal meeting of the Board to be held this fall.

Amateur Radio Operations

The Board also took several actions that deal directly with on-the-air operations. At Minute 34 there was created a new RTTY endorsement for DXCC, and at Minute 35 the Board developed a plan for considering details of implementing additional DXCC endorsements. Also on the DXCC front, the ARRL Headquarters Awards Committee, in conjunction with the DX Advisory Committee, is to take the necessary actions to clarify and define in greater detail the existing DXCC country criteria. These revised criteria are to then be published in *QST* (Minute 70).

Other Board actions pertaining to on-the-air-operations include the adoption of interim recommendations for conducting digital communications (Minute 61), a

ARRL Organizational (Regarding Articles of Assocation and Bylaws)

Minute	Purpose	Disposition
28	Membership Affairs Committee motion to amend Bylaw 32 to provide for succession of office in event of disability of President, Vice president.	Tabled
48	Amend Article 4 so that president of CRRL serves as Director of Canadian Division	Adopted
49	Amend Article 5 so that Secretary of CRRL serves as Vice Director of the Canadian Division	Adopted
50	Amend Article 7 to provide Canadian Division independence from succession provision that Vice Director automatically becomes Director upon vacancy of directorship	Adopted
51	Amend Bylaw 23 to provide Canadian Division independence from Director/Vice Director election procedures	Adopted

Other ARRL Organizational Matters

Minute	Purpose	Disposition
5-13	Election of President, Vice Presidents, Secretary and Treasurer	Elected
14	Election of Honorary Vice President George Hart, W1NJM	Elected
15	Election of Executive Committee	Elected
44	Adoption of standard operating procedures for tabulation of director election ballots	Adopted
47	Establish CRRL independence regarding standards for Canadian Amateur Radio clubs and groups affiliation with CRRL	Adopted
65	Appointment of Board Standing Committees	Appointed
66	Election of ARRL Foundation Directors	Elected
71	Study purposes and objectives of Advisory committees	Adopted
75	Invite IARU Administrative Council and Region 2 Executive Committee to meet with Board	Adopted
78	ARRL Leadership appointees and Advisory Committee members receive lapel pins gratis	Adopted
80	Study uniform ID badge for use of ARRL officials at hamfests and other events	Adopted
88	Prepare plan to fund activities prior to and during next WARC	Adopted
92	Election of President Emeritus Harry Dannals, W2HD	Elected
93	Assistant section manager position added to Rules and Regulations of ARRL Field Organization	Adopted
98	Requires that all effort be made to display ARRL Diamond on advertising and programs for ARRL Conventions	Adopted
100	Forward Planning Committee to study Board Committees (see #104)	Tabled
101	Election of Director Emeritus Noel Eaton, VE3CJ	Elected
104	Executive Committee to study Board Committees	Adopted
108	Hq. Staff adopt standard operating procedures for Advisory Committees (see #112)	Tabled
110	Membership Affairs Committee study feasibility of Affiliated Club Coordinators to participate in affiliation process	Adopted
111	Memorandum of Understanding between ARRL and REACT	Defeated
112	Hq. Staff recommend and Membership Affairs Committee review and approve standard operating procedures for Advisory Committees	Adopted
113	Management and Finance Committee study ARRL Foundation Expenses being funded by ARRL	Adopted
117	Memorandum of Understanding between ARRL and QCWA	Adopted
119	Offer area repeater frequency coordination group coposition with local Official Observer	To Committee
120	Reimbursement of administrative expenses of Directors	Adopted
121	Reimbursement of expenses of committees, task groups and task forces	Adopted
122	Reimbursement of expenses of travel expenses of QSL bureau managers	Adopted
123	Reimbursement of travel expenses of NTS officials	Adopted
124	Establish future Board Meeting dates	Adopted

Amateur Radio Operations

Minute	Purpose	Disposition
34	Endorsements for RTTY DXCC	Adopted
35	Development of details of implementing additional DXCC endorsements	Adopted
60	Ad Hoc Committee to draft petition to FCC for rules permitting automatic control for digital communications and report back to Board	Adopted
61	Interim recommendations of good amateur practice for digital communications	Adopted
70	Clarify and define in greater detail existing DXCC country criteria	Adopted
72	Expedite phone band expansion at 75, 15 and 10 meters	Adopted
73	Study simplex autopatch: legality, propriety of use and suitability for advertising in *QST*	Adopted
79	Petition FCC for 18 MHz amateur allocation	To Committee
99	Executive Committee and Gen. Mgr. study Amateur Radio nets	Adopted
102	Petition FCC to permit general contacts from W1AW by staff operators while on duty	Adopted

Legal and Regulatory (Non-Operating)

Minute	Purpose	Disposition
52	ARRL to become Volunteer Examiner Coordinator when VEC reimbursement rules take effect	Adopted
86	Gen. Mgr. directed to sign agreement between ARRL and FCC to establish an Amateur Auxiliary for monitoring	Adopted
115	Gen. Mgr. authorized to file comments in FCC proceeding regarding VEC reimbursement of out of pocket expenses	Adopted

Publications/Media

Minute	Purpose	Disposition
30	Technical Excellence Award	Adopted
38	Consider centralizing within the Public Information Office all public relations functions at Hq.	Adopted
39	Gen. Mgr. directed to put into production press kit designed by Public Relations Advisory Committee	Adopted
40	Directive and funding for slide-and-sound presentation regarding Amateur Radio public service	Adopted
74	Forward Planning Committee's statement of publications objectives	Adopted
82	Mountain Time shown in *QST* publicity of events	Adopted
83	Public Relations Advisory Committee to develop new approaches of advertising ARRL membership benefits	Adopted
85	Refer to Membership Affairs Committee matter of designating uncoordinated repeaters with asterisk in ARRL *Repeater Directory*	Adopted
97	*QST* publish articles on current operating techniques with emphasis on certain modes	Adopted
103	Expression of Appreciation to professional newsman Douglas Edwards	Adopted
114	Expression of Appreciation to professional contributors to ARRL video *Amateur Radio's Newest Frontier*	Adopted
116	Beginners' articles on teleprinter operations to appear in *QST*	Adopted
118	ARRL Hq. staff commended for performance in media presentation of Amateur Radio during Grenada crisis and flight of Space Shuttle	Adopted

Miscellaneous

Minute	Purpose	Disposition
29	Investigate feasibility of international Amateur Radio vacation exchange program	Adopted
54	Establish International Humanitarian Award.	Adopted
69	Special Service Club logo	Adopted
76	CEE-22 6 Amp Standard for ac power connectors adopted as ARRL standard	Adopted
77	Adoption of 12-V dc power connections as ARRL standard	Tabled
81	Plaque to recognize DX Honor Roll members	Adopted
84	1987 ARRL National Convention site at Atlanta, Georgia	Adopted
87	ARRL letterhead paper suitable for tractor-feed printers	Adopted
89	Funds made available for Amateur Radio exhibit at Louisiana World's Fair	Adopted
90	Study of possible sale of additional items bearing League emblem	Adopted
94	Commendation of retired ARRL staff member Marion Bayrer	Adopted
96	Approval of implementation of 5-day work week at ARRL Hq. and directive that Gen. Mgr. examine alternatives to accommodate desires of employees while retaining this working schedule	Adopted
105	Thank code experts and ask their continued assistance in drafting code competition guidelines	Adopted
106	Further efforts to improve information on how to operate overseas	Adopted
107	Expression of Appreciation to Vice Director Mendelsohn	Adopted
109	Gen. Mgr. and Hq. staff congratulated for improvement in Board documents and workbook	Adopted

Board Committees

Executive Committee (Minute 15)

Larry E. Price, W4RA	President
Paul Grauer, W0FIR	Midwest Division
Hugh A. Turnbull, W3ABC	Atlantic Division
Lys J. Carey, K0PGM	Rocky Mountain Division
Gay E. Milius, W4UG	Roanoke Division
Leonard M. Nathanson, W8RC	Vice President (without vote)
David Sumner, K1ZZ	General Manager (without vote)

Management and Finance Committee (Minute 65)

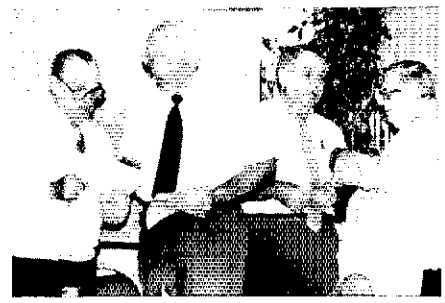
Edmond A. Metzger, W9PRN, Chairman	Central Division
Tod Olson, K0TO, Alternate Chairman	Dakota Division
William J. Stevens, W6ZM	Pacific Division
Clyde O. Hurlbert, W5CH	Delta Division
Leonard M. Nathanson, W8RC	Vice President
James E. McCobb, Jr., K1LLU	Treasurer (ex officio)

Membership Affairs Committee (Minute 65)

Frank M. Butler, Jr., W4RH, Chairman	Southeastern Division
George A. Diehl, W2IHA, Alternate Chairman	Hudson Division
Raymond B. Wangler, W5EDZ	West Gulf Division
Thomas B. J. Atkins, VE3CDM	Canada
Gar A. Anderson, K0GA	Vice President

Plans and Programs Committee (Minute 65)

John C. Sullivan, W1HHR, Chairman	New England Division
Mary E. Lewis, W7QGP, Alternate Chairman	Northwestern Division
George S. Wilson, III, W4OYI	Great Lakes Division
Fred Heyn, WA6WZO	Southwestern Division
Jay A. Holladay, W6EJJ	Vice President



L to r: Gay Milius, W4UG, Roanoke Division Director; Vice President Gar Anderson, K0GA; newly elected President Larry Price, W4RA; and George Diehl, W2IHA, Hudson Division Director, pair up for conferences.

directive that ARRL Counsel file a petition with the FCC to expedite phone subband expansion on the 75, 15 and 10-meter bands (Minute 72), and directives for studies of simplex autopatch (Minute 73), modes that should be permitted on an 18-MHz band amateur allocation (Minute 79) and Amateur Radio nets (Minute 99).

Public Relations and Publications

The Board also adopted several measures pertaining to news media recognition of Amateur Radio. While recognizing the public relations coups of W5LFL's operation from the Space Shuttle and the attention Amateur Radio got during the Grenada crisis, the Board made it clear that it wanted to continue to build on this recognition (Minutes 38, 39, 40 and 83). The Board, on behalf of the League membership, also expressed its appreciation to news media professionals who have donated their time and expertise assisting the League (Minutes 103 and 114). As to the League's own print media, several motions go to *QST* content. You will be seeing beginners' articles on teleprinter operations (Minute 116) and articles on current operating techniques involving net operation, repeaters, DX, CW, satellite operation, etc. (Minute 97). Also, a measure that would designate uncoordinated repeaters with asterisks in the ARRL *Repeater Directory* was referred to a committee (Minute 85).

Following This Article

Charts summarizing the actions taken by the ARRL Board of Directors appear elsewhere in this article. These charts are only thumbnail descriptions of what happened, and we urge you to read the whole text in the official Minutes.

The ARRL Board of Directors acts in your interest and establishes the policies of the League. If you would like to see who represents you on the Board, please turn to the list of names and addresses on page 8 of this issue. There is a lot of information on the following pages. We hope this article has served well as a key in helping you follow the workings of your organization, the American Radio Relay League. QST

Moved and Seconded...

MINUTES OF THE 1984 ANNUAL MEETING OF THE BOARD OF DIRECTORS THE AMERICAN RADIO RELAY LEAGUE, INC. March 26-27, 1984

AGENDA

1. Roll call
2. Moment of silence
3. Consideration of the agenda for the meeting
4. Approval of Minutes of Second 1983 Meeting
5. Supplementary oral reports by the officers
6. Receive reports and consider recommendations of the committees
7. Acceptance of reports
8. Election of Officers
9. Election of directors to Executive Committee
10. Appointment of Committees
11. Election of ARRL Foundation Directors
12. Consideration of Proposed IARU Constitution and Bylaws
13. Directors motions
14. Authorizations of certain administrative expenses for 1984
15. Consideration of dates for Second 1984 Meeting

1) Pursuant to due notice, the Board of Directors of the American Radio Relay Relay League, Incorporated, met in annual session at the Sheraton-Hartford Hotel, in Hartford, Connecticut, March 26, 1984. The meeting was called to order at 9:08 A.M. with President Carl L. Smith, WØBWJ, in the Chair and the following Directors present: Thomas B. J. Atkins, VE3CDM, Canadian Division; Frank M. Butler, Jr., W4RH, Southeastern Division; Lys J. Carey, KØPGM, Rocky Mountain Division; George A. Diehl, W2IHA, Hudson Division; Paul Grauer, WØFIR, Midwest Division; Jay A. Holladay, W6EJJ, Southwestern Division; Clyde O. Hurlbert, W5CH, Delta Division; Mary E. Lewis, W7QGP, Northwestern Division; Edmond A. Metzger, W9PRN, Central Division; Gay E. Milius, Jr., W4UG, Roanoke Division; Leonard M. Nathanson, W8RC, Great Lakes Division; Tod Olson, KØTO, Dakota Division; William J. Stevens, W6ZM, Pacific Division; John C. Sullivan, W1HHR, New England Division; Hugh A. Turnbull, W3ABC, Atlantic Division; Raymond B. Wangler, W5EDZ, West Gulf Division.

Also in attendance as members of the Board without vote were Larry E. Price, W4RA, First Vice President; Garfield A. Anderson, KØGA, Vice President; Richard L. Baldwin, W1RU, International Affairs Vice President; and David Sumner, K1ZZ, General Manager. Also in attendance at the invitation of the Board as nonparticipating observers were the following vice directors: Richard P. Beebe, K1PAD, New England Division; C. Richard Dyas, WØJCP, Midwest Division; Evelyn D. Gauzens, W4WYR, Southeastern Division; M. L. Gibson, W7JIE, Northwestern Division; Fried Heyn, WA6WZO, Southwestern Division; George W. Hippisley, K2KIR, Atlantic Division; John C. Kanode, N4MM, Roanoke Division; Stephen A. Mendelsohn, WA2DHF, Hudson Division; Marshall Quiat, AGØX, Rocky Mountain Division; Robert P. Schmidt, W5GHP, Delta Division; and George S. Wilson, III, W4OYI, Great Lakes Division. There were also present Past President Harry J. Dannals, W2HD; Honorary Vice President Robert York Chapman, W1QV; Treasurer James E. McCobb, K1LLU; Counsel Christopher D. Imlay, N3AKD; Canadian Counsel B. Robert Benson, QC, VE2VW; Assistant to the General Manager W. Dale Clift, WA3NLO; Club & Training Department Manager Stephen C. Place, WB1EYI; Communications Department Manager John Lindholm, W1XX; Membership Services Department Manager Harold M. Steinman, K1ET; Technical Department Manager Paul Rinaldo, W4RI; and Washington Area Coordinator Perry F. Williams, W1UED.

2) The assembly observed a moment of silence in recollection of Past President Victor C. Clark, W4KFC, mountaineer and arctic explorer Naomi Uemura, JG1QFW, and other amateurs who have passed away since the previous Meeting of the Board.

3) The Chair welcomed, as first time attendees at the meeting, Vice Director Robert P. Schmidt, W5GHP, and Club & Training Department Manager Stephen C. Place, WB1EYI.

4) On motion of Mr. Sullivan, seconded by Mr. Nathanson, it was unanimously VOTED that items 8 and 9 of the agenda be placed before item 4. Whereupon, without dissent, the agenda was adopted as amended.

5) The Board then proceeded to the election of officers. The Chair appointed Messrs. Beebe, Wilson and Mendelsohn as Tellers. The Chair declared that nominations for President were open. Mr. Stevens nominated Mr. Price. Mr. Grauer nominated Mr. Smith. On motion of Mrs. Lewis, seconded by Mr. Butler, it was unanimously VOTED that nominations are closed. Voting was by secret ballot. The tellers found 9 ballots for Mr. Price, 7 for Mr. Smith. Accordingly, Mr. Price was declared elected. (Applause.) The Board was in recess from 9:23 to 9:46 A.M. Mr. Price spoke briefly in appreciation for his election.

6) The Chair declared nominations open for First Vice President. Mr. Wangler nominated Mr. Smith, but Mr. Smith declined the nomination with thanks. Mr. Grauer nominated Mr. Metzger. Mr. Turnbull nominated Mr. Olson. Mr. Hurlbert nominated Mr. Nathanson. Mr. Carey nominated Mr. Anderson. On motion of Mr. Butler, seconded by Mr. Holladay, it was unanimously VOTED that nominations are closed. The tellers found 8 ballots for Mr. Nathanson, 5 ballots for Mr. Olson, 2 ballots for Mr. Anderson, and 1 ballot for Mr. Metzger. A clear majority not having been attained, a second ballot was taken. The tellers found 10 votes for Mr. Nathanson, 5 votes for Mr. Olson, and 1 vote for Mr. Anderson. Whereupon, Mr. Nathanson was declared elected. (Applause.)

7) The Chair declared nominations open for an additional Vice President. Mr. Olson nominated Mr. Anderson. Mr. Sullivan nominated Mr. Holladay. On motion of Mr. Metzger, seconded by Mrs. Lewis, it was unanimously VOTED that nominations are closed. The tellers found 10 ballots for Mr. Anderson, 6 ballots for Mr. Holladay. Accordingly, Mr. Anderson was declared elected. (Applause.)

8) The Chair declared nominations open for an additional Vice President. Mr. Grauer nominated Mr. Holladay. Mr. Nathanson nominated Mr. Stevens. On motion of Mr. Wangler, seconded by Mrs. Lewis, it was unanimously VOTED that nominations are closed. The tellers found 9 ballots for Mr. Holladay and 7 ballots for Mr. Stevens. Accordingly, Mr. Holladay was declared elected. (Applause.)

9) The Chair declared nominations open for International Affairs Vice President. Mr. Sullivan nominated Mr. Baldwin. Mr. Milius nominated Mr. Smith. On motion of Mr. Olson, seconded by Mrs. Lewis, it was unanimously VOTED that nominations are closed. The tellers found 9 ballots for Mr. Baldwin and 7 ballots for Mr. Smith. Accordingly, Mr. Baldwin was declared elected. (Applause.)

10) On motion of Mr. Hurlbert, seconded by Mr. Nathanson, at 10:21 A.M. it was VOTED, 9 votes in favor to 7 votes opposed, that the Board resolve itself into a Committee of the Whole to discuss election matters.

11) The Board rose from the Committee of the Whole at 11:58 A.M. On motion of Mr. Holladay, seconded by Mr. Stevens, it was unanimously VOTED to accept the report of the Committee of the Whole.

12) The Chair announced the opening of nominations for Secretary. Mr. Holladay nominated Mr. Sumner. On motion of Mr. Nathanson, seconded by Mr. Milius, it was unanimously VOTED that nominations be closed, and that Mr. Sumner be elected as Secretary by acclamation.

Hugh Turnbull, W3ABC, newly elected member of the Executive Committee, listens to debate.

13) The President declared nominations open for the office of Treasurer. Mr. Stevens nominated Mr. McCobb. On motion of Mr. Nathanson, seconded by Mr. Turnbull, it was VOTED that nominations be closed and that Mr. McCobb be declared elected. Mr. Grauer requested that he be recorded as voting opposed.

14) The Chair declared nominations open for the position of Honorary Vice President. Mr. Grauer nominated George Hart, W1NJM, retired Communications Manager of ARRL. On motion of Mr. Sullivan, seconded by Mr. Carey, it was unanimously VOTED that nominations are closed. Mr. Nathanson requested that voting be by secret ballot. There being 9 affirmative votes, Mr. Hart was declared elected as an Honorary Vice President. The Board was in recess for luncheon and the taking of the official photograph from 12:13 P.M. until 1:55 P.M., reconvening with all persons hereinbefore mentioned present.

15) The Chair declared nominations open for four Directors to serve on the Executive Committee for one year. Mr. Holladay nominated Mr. Turnbull. Mr. Metzger nominated Mr. Grauer. Mr. Butler nominated Mr. Wangler. Mr. Hurlbert nominated Mr. Milius. Mr. Stevens nominated Mrs. Lewis. Mr. Stevens nominated Mr. Carey. Mr. Holladay nominated Mr. Atkins. On motion of Mr. Olson, seconded by Mr. Nathanson, it was unanimously VOTED that nominations are closed. With nine votes required for election, at the end of the first ballot, it was announced by the tellers that Mr. Grauer and Mr. Turnbull were elected. After the second ballot, Mr. Carey was declared elected. A third ballot being inconclusive, on the fourth ballot Mr. Milius was declared elected. Thus, Messrs. Grauer, Turnbull, Carey and Milius are elected for a one-year term.

16) Returning to agenda item 4, on motion of Mr. Nathanson, seconded by Mr. Milius, it was unanimously VOTED that the Minutes of the 1983 Second Meeting are approved in the form in which they were issued by the Secretary.

17) Reports of the officers were the next order of business, at agenda item 5. The President's written report chronicled the shock and sadness with which the amateur community greeted the death of Victor Clark, W4KFC, President of ARRL. Top priority projects for 1983 had been implementation of a viable program for voluntary administration of license examinations and monitoring responsibilities; development of a more continuous Washington presence; revitalization of the Intruder Watch Program under the new name, ARRL Interference Reporting System; strengthening and revising the relationship between CRRL and ARRL during the course of a five-year program; changing of procedures to improve Board operating efficiency; field organization restructuring; and a program to establish a new class of club affiliation, called Special Service Clubs. Thirty additional subjects were listed as action items for 1983; 14 have been accomplished, 12 are presently in action and 4 await implementation. Foremost among accomplishments was dismissal of FCC's No-Code proposal; space-to-ground communication from W5LFL during the STS-9 mission; and the preparation of the "Amateur Radio's Newest Frontier" videotape by Roy Neal, K6DUE, and a team of assistants with the full cooperation of the National Aeronautics and Space Administration (NASA). Other items included expansion of the 20-meter phone band, recruiting of lawyer/amateurs as volunteer counsel, improvement of the staff retirement program, formation of a digital committee, support for and participation in the reorganization of IARU, reestablishment of the Hiram Percy Maxim Memorial Award, participation in the WARIC Conference organized by IARL for World Communications Year, and active participation in the IARU Region 2 Conference, Cali, Colombia. Attention was also focused on cable television interference problems, the seeking of federal preemption of amateur antenna regulation, efforts to effect implementation of the 18, 24 and 902-MHz WARC bands, regulatory efforts to address the biological effects of RF energy, and the seeking of a reciprocal-licensing agreement with Japan.

18) First Vice President Price presented his report, also beginning with the tragic news of Vic Clark's death which, among other things, resulted in Mr. Price becoming Vice President of IARU upon his becoming First Vice President. The report covered travel during the year to numerous hamfests and conventions throughout the country. Vice President Price also took part in meetings of several committees: Membership

Affairs, Management and Finance, Executive Committee, Forward Planning Committee and the Committee of Tellers. He also served as Chairman of the Ad Hoc Committee on the ARRL Interference Reporting System, and a subcommittee on volunteer monitoring. The AIRS program became operational early in 1984, and drafting of material in connection with the voluntary monitoring program continues. Goals for 1984 include efforts to achieve exemption for ARRL from property and sales taxes in Connecticut, reviewing and revising ARRL technical publications, a management training development program, and a grassroots program to recruit and retain League members.

19) Vice President Anderson presented his report, paying tribute to President Clark. Committee assignments included Membership Affairs, the Ad Hoc Committee on Volunteer Examining-Monitoring and meetings of the Executive Committee. Travel included attendance at the Dakota Division Convention in Sioux Falls.

20) International Affairs Vice President Baldwin presented his report covering two principal projects: restructuring of IARU through development of a new constitution, and seeking a reciprocal-operating agreement between the United States and Japan. Travel included a trip to Tokyo to participate in the first meeting of the Administrative Council, a visit to Germany and Geneva to discuss restructuring and visit ITU officials, participation in the World Amateur Radio International Conference in Japan and another visit to Geneva in October in preparation for the HF Broadcasting WARC.

21) General Manager Sumner highlighted and updated his report beginning with the tragedy and triumphs of November and December: the sudden death of President Clark, congressional action on VEC reimbursement, and final FCC action on No-Code. The General Manager reported his belief that the League today is stronger than it has been at any time in recent memory, effective in Washington both at FCC and on Capitol Hill and with membership growing in 1983 at a rate faster than the licensing figures. Public attention was focused on Amateur Radio during the Grenada crisis and by W5LFL's operation from space. Financial results were favorable, with an all-time high in general fund reserves at the $1.6 million mark. His report also covered actions in response to motions from previous Board meetings, finance and budget matters, personnel, and publications, particularly the new *Satellite Experimenter's Handbook*, a revised and greatly improved *Repeater Directory* now at the printer, a new edition of the *FCC Rule Book* and a new edition of *Tune in the World*, just received from the printer.

22) The report continued with a discussion of *QST* content and mailing, a new system for *QST* Product Review, and promotion of membership in ARRL, including lower multiple-year rates for ARRL membership of $47 for two years or $65 for three years that will become effective at the close of the meeting. The roster of Special Service Clubs has grown, but additional programs that are planned are needed to make this category still more attractive. Much has been done to upgrade and improve W1AW and other improvements are planned. Programs to standardize radio equipment connectors, to encourage experimentation with HF DF and discussion of the work in Washington concluded the report. During the course of this presentation, Mr. Schmidt took the seat for Mr. Hurlbert from 3:02 to 3:55. The Board was in recess from 3:18 to 3:43.

23) Mr. McCobb, Treasurer, reported that $185,000 was realized from interest and dividends in the regular portfolio, contributing to a peak in the ARRL general fund at $1,635,100. The number of Life Members rose to 18,760 from 16,062 at the end of 1982, and 394 were in the process of becoming Life Members. Funds for this group had a market value of $3,444,700 with a book value of $3,794,800. Comparable 1982 figures were $2,897,000 and $3,302,000. The Life Membership portfolio generated $325,000 in interest and dividends during the year.

24) Counsel Imlay presented and highlighted an extensive report. Some topics: WARC-79 frequency bands; request for authorization of F1 in the 160-meter band; efforts to obtain reimbursement in the VEC program; efforts directed toward federal preemption of local antenna regulation; the manner in which the League responds to requests for assistance in legal cases; Docket 83-806 in reference to RF-emitting light bulbs; cable television interference; the commercial linear amplifier ban between 24 and 35 MHz; expansion of RACES authorizations; simplex autopatch; and amateur antenna litigation on the local level.

25) Canadian Counsel Benson covered municipal regulation of antennas, the inadvisability of a separate foundation in Canada, Second Class mailing privileges for *QST*, and trademark matters.

26) Honorary Vice President Chapman, in his capacity as President of the ARRL Foundation, presented his report, which shows that 129 individuals have donated over $11,000 to the Barry M. Goldwater Scholarship Fund, while 186 amateurs have contributed more than $8200 in memory of ARRL President Victor C. Clark, W4KFC. Scholarship and organizational matters were also covered.

27) Next came agenda item 6: Receive reports and consider recommendations of committees. First was the Plans and Programs Committee report, presented by Mr. Carey, as Chairman. The Committee had discussed at length the opportunities and problems associated with new features in digital communication, including message storage centers and computer based message systems.

28) Mr. Sullivan, as Chairman, presented the report of the Membership Affairs Committee. It was moved by Mr. Anderson, seconded by Mr. Wangler, that Bylaw 32 be revised to read as follows (italicized words to be added):

> In the event of a *temporary* absence or disability of the President, the First Vice President shall preside at the meetings of the Board of Directors and in general act in his stead. Should the First Vice President be also absent or unable to act, the Vice Presidents shall succeed in order of their election. *In the event of the resignation, permanent incapacitation, or death of the President, the First Vice President shall succeed him, or in his absence, or being unable to act, the Vice Presidents shall succeed him in the order of their election.*

Steve Mendelsohn, WA2DHF, was one of the stars of the meeting. Not only did he provide his Apple (not Pineapple) computer and word processing skills for keeping track of Board Motions, he also managed to set an all-time record for the introduction of motions by a Vice Director!

It was moved by Mr. Nathanson, seconded by Mr. Hurlbert, that the motion be amended to add the words, "as determined by the Executive Committee," after the phrase, "permanent incapacitation." After further discussion, on motion of Mr. Stevens, seconded by Mr. Milius, the matter was laid on the TABLE.

29) On motion of Mr. Atkins, seconded by Mr. Milius, the following resolution was ADOPTED:

WHEREAS, interest has been expressed in the development of an information source, or clearing house, which would have on file the names and addresses of amateurs in the United States and Canada who are interested in exchanging vacations and/or making travel arrangements with amateurs in other countries,

IT IS THEREFORE RESOLVED that the Headquarters staff is requested to investigate the feasibility of setting up and maintaining a central register of amateurs wishing to participate in such an exchange plan, and also to explore the degree of interest and the possibility of participation by other IARU member-societies.

Mrs. Lewis requested to be recorded as voting in the negative.

30) On motion of Mr. Sullivan, seconded by Mrs. Lewis, it was unanimously VOTED that the Technical Excellence Award for 1982, an engraved pewter bowl, be presented to Wes Hayward, W7ZOI, for his article in May 1982 *QST*, "A Unified Approach to the Design of Crystal Ladder Filters."

31) Mr. Stevens, as Chairman, presented the report of the Management & Finance Committee. The committee had determined that a change to four-year terms for ARRL Directors was feasible; however, informal indications from Directors were that there was insufficient support for passage, so no motion was to be presented. Other subjects covered in the report included headquarters management development and training, the expenses of volunteers, a negative recommendation on basing Life Membership dues on actuarial assumptions, encouraging bequests for the ARRL Foundation, production of a sample ARRL display booth that is easily portable, audit and investment matters, a return to the 5-day work week for employees, and disposing of product review equipment by the highest mail bid. The Board was in recess for dinner from 5:41 P.M. until 8:35 P.M., reconvening with all persons hereinbefore mentioned present except Messrs. Hurlbert, Baldwin and McCobb. Mr. Schmidt took the seat for Mr. Hurlbert.

32) Mr. Butler, as liaison, presented the report of the VHF Repeater Advisory Committee, which continues to work on suitable band plans for 1240-1300 MHz and for the proposed band at 902-928 MHz, and on possible revisions to the 6-meter band plan.

33) Mr. Olson, as Liaison, presented the report of the Contest Advisory Committee. A contest code of ethics has been constructed, but the Committee has not yet reached consensus on adoption and forwarding to the Board of Directors.

34) Mr. Kanode, as Liaison, presented the report of the DX Advisory Committee. Topics included expansion of the DXCC awards program, country status of the Spratly Islands, accreditation criteria, a questionnaire on a wide range of DX matters circulated within the committee, and voting now underway on country status for the Pribilof Islands and 4U1VIC in Vienna. On motion of Mr. Stevens, seconded by Mr. Diehl, it was VOTED, that, in concert with the rationale presented in Minute 65 of the annual meeting of 1983 and with the recommendation of the DXAC, endorsements for RTTY DXCC shall be available beginning 1 August 1984 for contacts made on or after 15 November 1945. The same provisions as apply to the CW and phone DXCC awards would prevail, with the exception that there would be no Honor Roll.

35) On motion of Mr. Stevens, seconded by Mr. Diehl, it was VOTED that, in response to the recommendation of the DX Advisory Committee, the ARRL Awards Committee and the DXAC jointly develop the details of implementing additional endorsable DXCC awards with implementation of the same to begin no later than January 1, 1985, and with the Board to be apprised of such prior to implementation.

36) Mr. Sullivan, as Liaison, presented the report of the Emergency Communications Advisory Committee, which took the form of an exchange of letters between the Liaison and the ECAC members probing reasons for ineffectiveness of the committee. Directors were urged to monitor performance of advisory committee members, replacing those who are inactive.

37) At 8:55 P.M., Mr. Mendelsohn took the seat for Mr. Diehl.

38) As Liaison, Mr. Mendelsohn presented the report of the Public Relations Advisory Committee which was implemented by the following series of motions. On motion of Mr. Mendelsohn, seconded by Mr. Nathanson, it was unanimously VOTED that, with the obvious success of the STS-9 Owen Garriott Ham in Space Mission and the added recognition afforded our hobby by the recent Grenada situation, it has become evident to many that there has been a great deal of maturation in the ability of the Headquarters Public Information staff. Therefore, the General Manager is encouraged to consider that all public relations functions currently existing at ARRL Headquarters be centralized within the Public Information Office. This would include, but not be limited to, such items as topical press releases, press and public contact, and the writing of general information handouts for the press and public. Such items as recruiting pamphlets, however, would remain within the Club and Training Department.

39) On motion of Mr. Mendelsohn, seconded by Mr. Stevens, it was unanimously VOTED that the General Manager is directed to put into production the press kit as designed by the PRAC, the pamphlet, "Amateur Radio, A National Resource," as designed by the PRAC, and individual "targeted" pamphlets as displayed at the meeting.

40) On motion of Mr. Mendelsohn, seconded by Mr. Holladay, it was VOTED that the proposal of the PRAC, in accordance with minute 80 of the Second 1983 Board Meeting, to produce a slide and sound presentation designed to illustrate to potential user organizations, such as the Red Cross, the advantages and limitations of Amateur Radio participation in their public service events, be accepted. The President shall appoint a special committee to produce the aforesaid presentation. The committee shall consist of at least the board liaison, the staff liaison, and six members of the PRAC. Funding up to a maximum of $2000 is authorized for this project.

41) At 9:10 Mr. Baldwin returned to the meeting, and Mr. Diehl resumed his seat.

42) Mr. Holladay, as Liaison, presented the report of the VHF/UHF Advisory Committee. It continues its work on a number of band plans in conjunction with the VHF Repeater Advisory Committee, and expects to have the plans complete for the next meeting of the Board.

43) At the request of the Chair, Mr. Clift presented the report of the Executive Committee on the ways in which ARRL responds to requests for legal assistance received from members. The report recommended that the legal assistance program continue to be decentralized particularly by fostering the volunteer counsel program. Establishment of a better clearinghouse for legal materials, concerted efforts toward federal preemptive legislation, and participation in landmark cases as a friend of the court were urged. Proposals at state levels should be monitored especially by the state government liaisons appointed by the ARRL Section Managers. Finally, there should be adequate explanations of the legal assistance program in *QST*.

44) Mr. Price, as Chairman, presented the report of the Committee of Tellers. On motion of Mr. Price, seconded by Mr. Metzger, it was unanimously VOTED that the Standard Operating Procedures annexed to the report of the Committee of Tellers is adopted as a standing order of the Board.

45) Mr. Price, as Chairman, presented the report of the Ad Hoc Committee on the ARRL Interference Reporting System (AIRS) outlining the renaming of the old Intruder Watch system, selection and approval of AIRS members, microcomputer maintenance of the data base, appointment of an AIRS coordinator at Headquarters, printing and distribution of AIRS forms and activation of the system which was accomplished earlier this year.

46) Mr. Turnbull, as Chairman, presented the report of the Ad Hoc Committee on a More Continuous Washington Presence. The Committee had two tasks: developing a more continuous Washington presence for ARRL, and studying all facets of obtaining a Congressional charter for the League. In response to the first task, W. Dale Clift, WA3NLO, has been designated as staff backup for the Washington Area Coordinator, and has made several trips to Washington for indoctrination. In addition, Capt. Charles Dorian, W3JPT, has been retained as associate Washington coordinator on a consultant basis a few days per month. An intelligence network is in place, and a membership response procedure, for use when there are legislative or regulatory problems, has been presented to the Board. The report included a recap of the League's legislative and regulatory objectives and a summary of efforts in the Washington area by the Washington Area Coordinator and others, with the following issues highlighted: FCC's "no-code" proposal, the volunteer examiner program, legislation permitting recoupment of expenses, cooperation with the National Communications System, membership on the National Industry Advisory Committee, participation in the World Communications Year, assistance to the U.S. Telecommunications Training Institute, and participation in planning for Caribbean hurricanes under the auspices of the Department of State.

47) Mr. Atkins, as Chairman, presented the report of the Ad Hoc Committee on the Strengthening of CRRL. The implementation of the 5-year plan is proceeding on schedule and all matters planned for 1983 except for Canadian mailing of *QST* have been completed. Funds have been provided for operation of CRRL Headquarters in London, Ontario, for 1984. It was moved by Mr. Atkins, seconded by Mr. Sullivan, that existing paragraph 7 of the "Rules and Regulations Concerning Affiliated Societies" is redesignated paragraph 8, and a new paragraph 7 is added, as follows: "7. Amateur radio clubs and groups in Canada are invited to affiliate with the Canadian Radio Relay League, which shall adopt its own standards for affiliation. Canadian clubs and groups affiliated with ARRL as of December 31, 1984, are deemed to be affiliated with CRRL." A roll call vote being required, the question was decided in the Affirmative with all directors voting aye. Accordingly, the rules and regulations were AMENDED.

48) It was moved by Mr. Atkins, seconded by Mr. Sullivan, that Article 4 of the Articles of Association and By-Laws be amended to read: "The affairs of the Corporation shall be governed by a Board consisting of sixteen Directors, each representing a territorial Division comprising a geographical area as defined in the By-Laws. One Division shall be known as the Canadian Division, or alternatively as the Canadian Radio Relay League, and shall comprise the provinces and territories of Canada. Except for the Director of the Canadian Division, the Director shall be elected for terms of two years by the members eligible to vote. Seven Directors shall be elected for terms beginning on even numbered years and eight Directors shall be elected for terms beginning on odd numbered years. The President of the Canadian Radio Relay League as duly elected by that body shall serve as the Director of the Canadian Division. Election of other Directors shall be by mail vote in accordance with the rules and regulations prescribed in the By-Laws. The Board shall meet twice each year at times and places as provided in the By-Laws. The first meeting shall be called the Annual Meeting and the second shall be called the Second Meeting. Special meetings of the Board shall be called by the President upon written request of at least one-half of the membership of the Board as then constituted." A roll call vote being required, the question was decided in the affirmative, with all directors voting aye. Accordingly, Article 4 was AMENDED.

49) It was moved by Mr. Atkins, seconded by Mr. Sullivan, that Article 5 be amended by adding the following sentence: "The Secretary of the Canadian Radio Relay League, as duly elected by that body, shall serve as the Vice-Director of the Canadian Division." A roll call vote being required, the question was decided in the affirmative, with all directors voting aye. Accordingly, Article 5 was AMENDED.

50) It was moved by Mr. Atkins, seconded by Mr. Sullivan, that Article 7 be amended by beginning the paragraph with the following additional phrase: "Except in the Canadian Division ..." A roll call vote being required, the question was decided in the affirmative, with all directors voting aye. Accordingly, Article 7 was AMENDED.

51) It was moved by Mr. Atkins, seconded by Mr. Sullivan, that By-Law 23 be amended by deleting "Canadian, ..." A roll call vote being required, the question was decided in the affirmative, with all directors voting aye. Accordingly, By-Law 23 was AMENDED.

52) Mr. Anderson, as Chairman, presented the report of the Ad Hoc Committee on Volunteer Examining-Monitoring. The Committee report included a 90-page document, entitled "Background Material for Proposed Operating Agreement," developed to describe the ARRL Volunteer Examiner Program in detail. It was moved by Mr. Anderson, seconded by Mr. Nathanson, that the ARRL become a VEC on a national basis and therefore, on the effective date of rules adopted in PR Docket No. 84-265 to permit the recoupment of expenses by the Volunteer Examiner Coordinators in accordance with Public Law 98-214, the President and General Manager are hereby authorized to conclude, on behalf of the ARRL, an agreement with the FCC for the ARRL to serve as VEC for the 13 FCC-defined regions, such agreement to be consistent with "Background Material for Proposed Operating Agreement" annexed to the Report of the Ad Hoc Committee on Examining-Monitoring as amended at this meeting. It was moved by Mr. Wangler, seconded by Mr. Butler, that the motion be amended by deleting "on the effective date of rules adopted in PR Docket No. 84-265 to permit the recoupment of expenses by Volunteer Examiner Coordinators in accordance with Public Law 98-214 ..." The ayes and nays on the amendment being ordered by request, the motion was LOST 3 votes in favor to 12 opposed, with Mr. Atkins abstaining. Mr. Wangler requested to be recorded as voting in favor of the amendment. Whereupon, the question being on the motion as originally presented, the same was unanimously ADOPTED, Mr. Atkins again abstaining.

Chris Imlay, N3AKD, ARRL Legal Counsel, preferred mic over key for delivering his report to the Board.

53) Mr. Price, as Chairman, presented the report of the Ad Hoc Subcommittee on Volunteer Monitoring. Public Law 97-259 authorized FCC to use volunteers both in the examination process and in monitoring amateur activities on the air. The subcommittee was appointed to make recommendations in continuation and enhancement of amateur self-policing. A motion will be presented later in the meeting.

54) Mr. Dyas, as Chairman, presented the report of the Ad Hoc Committee for an ARRL International Humanitarian Award. The objectives of the award, the gathering of voluntary contributions to support the award and procedures for determining its winner are outlined in the committee report. On motion of Mr. Grauer, seconded by Mr. Milius, it was unanimously VOTED that the ARRL Board establish the ARRL International Humanitarian Award as proposed in the Ad Hoc Committee report.

55) On behalf of Chairman Andrea Parker, Mr. Price presented the report of the Goldwater Scholarship Committee. The committee developed a formal description of the Goldwater Scholarship and a formal application form. The report recommended continuance of the committee to serve as a screening and selection body for the initial recipient.

56) Mr. Holladay, as Chairman, presented the report of the Ad Hoc Committee on Forward Planning, comprising some 28 pages. In the course of its work, a survey of Section Managers was made, and a questionnaire designed to test the continued validity of the 1980 Florida State University survey results was sent to a small sample of amateur licensees. The recommendations of the committee will be made by separate motion later in the meeting. During the course of the above, at 9:56 P.M., Mr. Dyas took the seat for Mr. Grauer, and Mr. Beebe took the seat for Mr. Sullivan.

57) Mr. Olson, as Chairman, presented the report of the Ad Hoc Committee on Computer Based Message Systems. As a result of discussion, it was decided to build a test computer based message system for use by the Board and it is operating on a pilot basis. A list of information elements which might be of interest to Board members and an economic analysis of the cost of such a system were also prepared by the Committee.

58) Mr. Turnbull, as Chairman, presented the report of the Radio Frequency Interference Task Group whose work has included reviewing the text of the RFI chapter for the 1985 Handbook; reviewing radio frequency interference reports received at Headquarters; and cable television interference, including formation of a joint ARRL/National Cable Television Association Committee with FCC as a party to work out interference problems not resolvable at the local level. Members of the Task Group also visited a state-of-the-art cable system outside Washington. The Task Group also assisted in preparing ARRL comments concerning RF light bulbs and is participating in ad hoc committee C63 of the American National Standards Institute concerning the RF immunity of consumer devices. Harold Richman, W4CIZ, is in the process of updating the RFI assistance list. Mr. Turnbull has attended two symposiums on cable television, in Nashville and in Oklahoma City. During the course of the above report, at 10:15 P.M., Mr. Quiat took the seat for Mr. Carey.

59) Mr. Wangler, as Chairman, presented the report of the Committee on Biological Effects of RF Energy. The report covers local and state attempts to adopt their own limits on RF energy, the committee's preference for a national standard based on ANSI C95.1-1982, development of a guideline within the Environmental Protection Agency and efforts to have FCC adopt limited preemption of the field. The Committee assisted the preparation of a petition for expedited special relief and declaratory ruling in General Docket 79-144, which has been filed by the ARRL Counsel.

60) Mr. Quiat presented the report of the Ad Hoc Committee on Amateur Radio Digital Communication. On motion of Mr. Quiat, seconded by Mr. Butler, it was unanimously VOTED that the Ad Hoc Digital Committee, with the assistance of staff and counsel, is instructed to draft a petition for FCC rulemaking, such petition to authorize, specifically, automatic control of digital communications on all amateur bands, and include: (1) adequate provisions and safeguards, (2) unattended transmission and reception, (3) unattended message systems. This report shall be tendered by the Committee to the Board at the Board's second meeting of 1984.

61) On further motion of Mr. Quiat, seconded by Mr. Atkins, it was unanimously VOTED that the following interim recommendations of the Committee be approved as a standard for good practice for digital communications:

Establishment of New Systems

New CBMSs should serve a need within the basis and purpose of Amateur Radio as stated in Section 97.1 of the FCC rules and not simply add to congestion by duplicating services already available.

Frequencies should be selected in accordance with the ARRL band plans.

VHF and UHF channels should be coordinated with the appropriate frequency coordinator(s).

Frequencies in the HF bands should be time-shared with existing CBMSs to the extent possible in coordination with the other CBMS operators using that same frequency.

Where sharing of an existing frequency is not feasible, new channels should be selected near the upper portion of the particular RTTY subband, leaving

the lower parts of the RTTY subband to DX and other operator-to-operator QSOs.

Operational Safeguards

CBMSs should listen before transmitting. The system should sense activity on the channel and not transmit until the channel goes free. This can be accomplished by a carrier-detect circuit.
Incoming messages should not be retransmitted until read and released by the CBMS operator.
Until such time that the FCC permits unattended automatic operation of HF CBMSs, CBMS operators should monitor their transmissions (at least aurally) at all times that the CBMS is on the air and have a reliable method of terminating transmission in the event of malfunction. Monitoring may be done from a remote location.
The system should have software provisions to limit specific responses to a maximum of 10 minutes. Longer responses should be interrupted at least every 10 minutes for a go-ahead from the other station.
The system should have a hardware "watchdog" timer to limit individual transmissions to 10 minutes.
In order to make the channel available to other stations, CBMS operators should cull files that are out of date and offer user instructions for an s.a.s.e. by mail.
A CBMS operator should establish and make public a policy regarding acceptance of borderline traffic such as that relating to sale of equipment after reviewing current FCC rules and interpretations.

User Operating Practices

Monitor the frequency for a short period before calling a CBMS.
Do not interrupt another station using a CBMS.
Do not interfere with a QSO on or near the frequency.
Always properly identify your station.
Keep your signals on frequency.
Do not list "for sale" items without prior permission of the CBMS operator.
Make sure that you deactivate the CBMS by using that system's correct EXIT command.

62) Mr. Nathanson, as Chairman, presented the report of the Ad Hoc Committee on Legal Preemption. The Committee discussed the SMA TV ruling of the FCC, a favorable decision that may be expanded. The Committee has decided to seek a joint resolution of Congress preempting local or state regulations that would interfere, limit or proscribe Amateur Radio communications.

63) Moving now to agenda item 7, on motion of Mr. Stevens, seconded by Mr. Nathanson, it was unanimously VOTED that the reports of the officers and committees are accepted and placed on file.

64) The Board was in recess from 10:25 P.M. until 8:33 A.M. the following day, reconvening with all present except Mr. McCobb and Mr. Place. During the course of the second day Mr. Hurlbert left the meeting several times due to family medical problems; during his absences Mr. Schmidt took his place at the Table. Past Director L. Phil Wicker, W4ACY, was also in attendance.

65) Turning now to agenda item 10, President-Elect Price appointed the following standing committees:

Management & Finance — Mr. Metzger (Chairman), Mr. Olson (Alternate Chairman), Mr. Stevens, Mr. Hurlbert, Vice President Nathanson, Treasurer McCobb (ex-officio).

Membership Affairs — Mr. Butler (Chairman), Mr. Diehl (Alternate Chairman), Mr. Wangler, Mr. Atkins, Vice President Anderson.

Plans & Programs — Mr. Sullivan (Chairman), Mrs. Lewis (Alternate Chairman), Mr. Wilson, Mr. Heyn, Vice President Holladay.

66) The Chair presented the report of the Official Availability Committee for ARRL Foundation Directors; whereupon, on motion of Mr. Nathanson, Mr. Grauer, Mr. Diehl and Mr. Chapman were elected to the Foundation Board by acclamation. (Applause.)

67) Turning now to agenda item 12, on motion of Mr. Baldwin, seconded by Mr. Sullivan, at 8:44 A.M., it was unanimously VOTED that the Board resolve itself into a Committee of the Whole to discuss IARU matters.

68) The Board rose from the Committee of the Whole at 9:20 A.M. During the course of the Committee of the Whole Mr. Wilson and Mr. Wicker departed from the meeting. On motion of Mr. Nathanson, seconded by Mr. Wangler, it was unanimously VOTED to accept the report of the Committee of the Whole.

69) Turning now to agenda item 13, Directors' motions, there was extensive discussion and review of submissions of proposed logos for Special Service Clubs. On motion of Mr. Sullivan, seconded by Mr. Wangler,

ARRL General Manager Dave Sumner, K1ZZ, looks over a report prepared by Technical Dept. Manager Paul Rinaldo, W4RI (at right).

it was unanimously VOTED to accept the Special Service Club logo design submitted by Jeffrey J. Duquette, K1BE, of Southwick, Massachusetts, as the official Special Service Club logo. Runners up were submissions by Roy S. Blackshear, KH6BAI, Mike Bokulich, K8US, Jim Talcott, N6JSV, and Mike Lowden, N9CRA.

70) On motion of Mrs. Lewis, seconded by Mr. Milius, it was unanimously VOTED that the ARRL Headquarters Awards Committee, in conjunction with the DX Advisory Committee, take the necessary actions to clarify and define in greater detail the existing DXCC country criteria, these revised criteria to be printed on the ARRL DXCC Countries List.

71) It was moved by Mr. Stevens, seconded by Mr. Carey, that the Membership Affairs Committee study the purposes and objectives of the advisory committees to determine if it is necessary to modify their functions. On motion of Mr. Olson, seconded by Mr. Sullivan, it was unanimously VOTED that the motion be amended by striking all text after "advisory committees" and substituting therefor "to assure that they continue to provide a useful service to the Board." The question then being on the motion as amended, the same was unanimously ADOPTED.

72) On motion of Mr. Milius, seconded by Mr. Carey, it was unanimously VOTED, Mr. Atkins abstaining, that Counsel is directed to immediately prepare and file with the Federal Communications Commission a motion to expedite issuance of a Report and Order in Docket 82-83, which would expand the telephony subbands at 75, 15 and 10 meters as proposed in League comments previously filed in the proceeding.

73) On motion of Mr. Butler, seconded by Mr. Atkins, it was unanimously VOTED that the Executive Committee, with the assistance of staff and Counsel, study the use of simplex autopatch (simpatch) devices with special emphasis on their legality, propriety of use, and suitability for advertising in *QST*. The Committee shall report to the Board at the Board's next meeting.

74) On motion of Mr. Holladay, seconded by Mr. Butler, it was unanimously VOTED that the Board hereby adopts the statement of publications objectives of the ARRL as contained in the report of the Forward Planning Committee.

75) On motion of Mr. Wangler, seconded by Mr. Holladay, it was unanimously VOTED that in order to better acquaint the ARRL Board with the status and trends of the organizational aspects of international Amateur Radio, the Board does hereby invite members of the IARU Administrative Council and the Region 2 Executive Committee to participate in an informal meeting with members of the Board scheduled to be held in Hartford, CT, in the fall of 1984. Mr. Beebe took Mr. Sullivan's seat at the Table at 9:55 A.M.

76) On motion of Mr. Turnbull, seconded by Mr. Atkins, it was unanimously VOTED that the CEE-22 6 Amp standard for ac power connectors is adopted as an ARRL standard. The Amateur Radio equipment industry, and designers of equipment projects for home construction, are encouraged to use these connectors, as appropriate, in their designs.

77) It was moved by Mr. Turnbull, seconded by Mr. Butler, that the Anderson Power Products *Powerpole*® modular connectors, or equivalents, are provisionally adopted as the ARRL standard for 12-V dc power connections. The Amateur Radio equipment industry, and designers of equipment projects for home construction, are encouraged to use these connectors, as appropriate, in their designs. ARRL members are encouraged to share with the Headquarters Technical Department any experiences they may have which may bear upon the adoption of a permanent standard for 12-V dc power connectors. After discussion, on motion of Mr. Price, seconded by Mr. Milius, it was unanimously VOTED that the matter is laid on the Table.

78) On motion of Mr. Olson, seconded by Mrs. Lewis, it was unanimously VOTED that the General Manager is directed to implement a program whereby at the time of first appointment of each Leadership Field Organization Appointee and each Advisory Committee member, they will receive, gratis, the appropriate lapel pin signifying their appointment.

79) It was moved by Mr. Schmidt, seconded by Mr. Stevens, that Counsel be directed to petition the FCC for an 18 MHz amateur allocation on a deregulated basis, i.e., no subbands for the various modes, with all modes being permitted throughout the allocated frequencies limited only by the bandwidth of a conventional, state-of-the-art, SSB signal. After discussion, on motion of Mr. Nathanson, seconded by Mr. Milius, it was unanimously VOTED that the matter is referred to the Plans and Programs Committee for study.

80) On motion of Mr. Nathanson, seconded by Mr. Olson, it was unanimously VOTED that the Membership Affairs Committee is requested to study, and report to the Board at its next meeting, a recommendation for obtaining and distributing a uniform identification badge for the League Official Family for use at hamfests and other events. The Board was in recess from 10:10 until 10:40 A.M., at which time Mr. Sullivan resumed his seat at the Table, and Mr. Wilson returned to the room.

81) On motion of Mr. Sullivan, seconded by Mr. Milius, it was unanimously VOTED that the General Manager make available to the DX Honor Roll members a suitable plaque to recognize their achievement. The General Manager shall establish a suitable price for such a plaque.

82) On motion of Mrs. Lewis, seconded by Mr. Carey, it was unanimously VOTED that in *QST* publicity for events for which Eastern, Central and Pacific time are shown, that Mountain time be shown also.

83) On motion of Mr. Milius, seconded by Mrs. Lewis, it was unanimously VOTED that the Public Relations Advisory Committee is requested to develop new approaches of advertising the benefits of ARRL membership.

84) On motion of Mr. Butler, seconded by Mr. Wangler, it was unanimously VOTED that the Board take up the consideration of sites for the 1987 ARRL National Convention. Mr. Wangler submitted for consideration Dallas, Texas. Mr. Butler submitted for consideration Atlanta, Georgia. Mrs. Lewis submitted for consideration Portland, Oregon. Mr. Milius submitted for consideration Charlotte, North Carolina. It was moved by Mr. Stevens, seconded by Mr. Milius, that the matter be Tabled until such time as proper application papers are submitted to the Board, but the motion to Table was LOST. On motion of Mr. Butler, seconded by Mr. Carey, after discussion, it was unanimously VOTED that the 1987 ARRL National Convention shall be held in Atlanta, Georgia.

85) It was moved by Mr. Wangler, seconded by Mr. Stevens, that future VHF-UHF Repeater Directories published by the ARRL include within the directory a designation to show the difference between a repeater that has been coordinated and one that has not. This difference may be shown by those repeaters that are uncoordinated as being designated by an asterisk. After extensive discussion, it was moved by Mr. Sullivan, seconded by Mr. Grauer, that the matter be referred to the Membership Affairs Committee in consultation with the VHF Repeater Advisory Committee. It was moved by Mr. Stevens, seconded by Mr. Milius, that the matter be laid on the Table, but the motion to Table was LOST. The question then being on the motion to refer the matter to the Membership Affairs Committee in consultation with the VHF Repeater Advisory Committee, the same was unanimously ADOPTED.

86) On motion of Mr. Turnbull, seconded by Mr. Butler, with Mr. Atkins abstaining, the following resolution was unanimously ADOPTED:

WHEREAS the League has been committed to the concept of self-regulation for some fifty years through its Official Observer program, and

WHEREAS Public Law 97-259 provides for volunteer amateur assistance in on-the-air monitoring activities, and

WHEREAS the League is anxious to utilize its Field Organization to implement such formalized activities, and

WHEREAS the Federal Communications Commission Field Operations Bureau has indicated its desire to cooperate with the League to effect such volunteer assistance, now, therefore,

BE IT RESOLVED, that the General Manager is directed to sign, on behalf of ARRL, the agreement between ARRL and the Federal Communications Commission Field Operations Bureau to establish an Amateur Auxiliary as presented by the Subcommittee

on Monitoring to the Board.

87) On motion of Mr. Atkins, seconded by Mr. Nathanson, it was unanimously VOTED that the General Manager is directed to provide ARRL letterhead on tractor feed paper suitable for computer printers.

88) On motion of Mr. Olson, seconded by Mr. Sullivan, it was unanimously VOTED that the Management and Finance Committee prepare a plan to fund the activities to be supported by the ARRL prior to, and during, the next World Administrative Radio Conference. The plan is to be presented prior to the next Annual Meeting of the Board.

89) It was moved by Mr. Hurlbert, seconded by Mr. Nathanson, that the Board appropriate $5000 for use by the Louisiana Amateur Radio Exhibition, Inc. to assist in the operation and security of a booth at the 1984 World's Fair in New Orleans, Louisiana. Further, that the League, at a minimum cost, make available 50,000 handouts, printed on inexpensive paper for distribution to the most interested visitors to the booth. On motion of Mr. Olson, seconded by Mr. Butler, it was unanimously VOTED to amend the motion by striking the words "at a minimum cost" and substituting therefor "at a cost no greater than $1000." The question then being on the motion as amended, the same was unanimously ADOPTED.

90) On motion of Mr. Nathanson, seconded by Mrs. Lewis, it was VOTED that the Membership Affairs Committee is requested to study, and present to the Board at its next meeting, a recommendation on whether, and what, items of jewelry bearing the League emblem shall be sold, such items to include, but not be limited to, rings, money clips, tie tacks, lapel pins, and the like. Mr. Dannals left the meeting at 12 P.M.

91) On motion of Mr. Diehl, seconded by Mr. Butler, at 12:01, it was VOTED that the Board resolve itself into a Committee of the Whole to discuss elections for honorary office.

92) The Committee of the Whole rose and reported to the Board at 12:17 P.M. On motion of Mr. Diehl, seconded by Mr. Wangler, it was VOTED that the Board bestows upon Harry J. Dannals, W2HD, the title of President Emeritus. (Applause.) Mr. Dannals returned to the room and Mr. Beebe took the seat at the Table for Mr. Sullivan.

93) It was moved by Mr. Beebe, seconded by Mr. Grauer, that the following resolution be adopted:

WHEREAS, the Forward Planning Committee has reviewed the implementation and status of the Field Organization, now, therefore,

BE IT RESOLVED THAT:

1) the section level appointment of Assistant Section Manager be added to the list of appointments in item 9 of the Rules and Regulations of the ARRL Field Organization. This appointment will be optional at the Section Manager's discretion.

2) The field appointment of Awards Administrator be added to the list of appointments in item 10 of the Rules and Regulations of the ARRL Field Organization. The purpose of the Awards Administrator appointment is for the local administration of awards such as VUCC. Preference shall be given to the Special Service Clubs as a source of candidates with the Section Manager delegating appointment authority to the Affiliated Club Coordinator.

3) The Worked All States (WAS) award be added to the VUCC Award as being administered at the section level by the Awards Administrator.

It was moved by Mr. Olson, seconded by Mr. Hurlbert, that the motion be amended by striking the paragraphs numbered 2 and 3. It was moved by Mr. Nathanson, seconded by Mr. Stevens, that the matter be laid on the Table, but the motion to Table was LOST. After discussion, the vote being on the motion to amend, the same was ADOPTED. The question being on the motion as amended, the motion was ADOPTED. During the course of the motion the Board was in recess for luncheon from 12:24 until 1:18 P.M. Mr. Sullivan resumed his seat at the Table.

94) On motion of Mr. Sullivan, seconded by Mr. Baldwin, the following resolution was unanimously ADOPTED:

WHEREAS, Marion Bayrer has served the ARRL and its members loyally and faithfully for nearly half a century, 46 years, while attaining the position of Deputy Circulation Manager, and

WHEREAS, Marion has earned the trust and respect of many members, officials and staff personnel, now, therefore,

BE IT RESOLVED that the ARRL Board of Directors assembled March 27, 1984 extends their "thank you" for a job well done along with good wishes and the best of luck for Marion on the occasion of her well deserved retirement. Mr. Wilson took Mr. Nathanson's seat at the Table.

95) On motion of Mr. Wilson, seconded by Mr. Hurlbert, at 1:35 P.M., it was unanimously VOTED that the Board resolve itself into a Committee of the Whole to discuss staff matters. Officers, directors, vice directors, and counsels, were asked to remain in the room; others departed.

96) The Committee of the Whole rose and reported to the Board at 1:48 P.M. The General Manager was asked to report to the Board concerning the status of a four-day workweek for a number of Headquarters personnel. The General Manager confirmed the five-day workweek had been implemented on the recommendation of the Management & Finance Committee. On motion of Mr. Holladay, seconded by Mr. Wilson, this action of the General Manager was approved and he was further directed to continue to examine alternatives which could accommodate the desires of employees while preserving to the membership the benefits of the five-day workweek. The Management and Finance Committee will continue to monitor this matter in consultation with the General Manager. Mr. Nathanson resumed his seat at the Table.

97) On motion of Mr. Stevens, seconded by Mr. Milius, it was unanimously VOTED that the Editor of *QST* regularly publish articles on current, proper operating techniques from experienced operators on net operation, general repeater participation, DX, CW, satellite operation, and other modes and methods as may be appropriate.

98) It was moved by Mr. Milius, seconded by Mr. Nathanson, that whereas it is extremely advantageous to display the ARRL diamond prominently to bring about expanded awareness of the League, therefore, it is moved that paragraph 3 of the Rules and Regulations Concerning ARRL Conventions is amended by the addition after the words, "an ARRL display booth or table" the following: "and shall make every effort to use the ARRL diamond prominently displayed on the front of all advertising and program materials." A roll call vote being required, the motion was ADOPTED with all directors voting in favor.

99) On motion of Mr. Butler, seconded by Mr. Wangler, it was VOTED that the Executive Committee, with the assistance of the General Manager, perform a study of networks in the amateur bands to determine the adequacy of current regulations to handle problems which may exist, or can be expected to arise, and report to the Board not later than the second Board Meeting of 1984.

100) It was moved by Mr. Holladay, seconded by Mr. Wangler, that the Forward Planning Committee is instructed to study the structure and responsibilities of Board committees, seeking comment from members of the Board; and is requested to submit its recommendations for improvements no later than 60 days prior to the 1985 Annual Meeting of the Board, with a progress report to be rendered at the Second 1984 Meeting. After discussion, on motion of Mr. Olson, seconded by Mr. Metzger, it was VOTED that the matter is laid on the Table.

101) On motion of Mr. Atkins, seconded by Mr. Price, the following resolution was unanimously ADOPTED:

WHEREAS, Noel B. Eaton, VE3CJ, a former ARRL Canadian Director and Vice President, and President Emeritus of the International Amateur Radio Union, has a long and distinguished record of service to the American Radio Relay League and the worldwide amateur community, now, therefore,

BE IT RESOLVED that Noel B. Eaton is hereby elected a Director Emeritus of the American Radio Relay League. (Applause.)

102) On motion of Mr. Nathanson, seconded by Mr. Metzger, it was unanimously VOTED that Counsel is directed to seek such modification and/or waiver of Rule 97.112 as is necessary to permit operation of Headquarters station W1AW for general contacts by staff operators while on duty. Mr. Atkins abstained. Mr. Mendelsohn took Mr. Diehl's seat at the Table.

Frank Butler, W4RH, Southeastern Division Director, hears from his Vice Director, Evelyn Gauzens, W4WYR, prior to the Board's reconvening for another round of directors' motions.

103) On motion of Mr. Mendelsohn, seconded by Mr. Sullivan, the following resolution was unanimously ADOPTED:

WHEREAS, for many years Douglas Edwards has donated his talents on behalf of amateur radio and,

WHEREAS, Mr. Edwards has given freely of his time without any form of compensation on the many projects that have been requested of him such as the recent memorial tribute to ARRL President Victor Clark, now, therefore

BE IT RESOLVED that the ARRL Board of Directors, assembled at Hartford, Connecticut, on this 27th day of March, 1984, does profoundly thank Mr. Edwards for his work on behalf of the League and Amateur Radio. Mr. Diehl resumed his seat at the Table.

104) On motion of Mr. Olson, seconded by Mr. Metzger, it was VOTED to lift from the Table the earlier motion concerning the study of Board committees by the Forward Planning Committee. On further motion of Mr. Olson, seconded by Mr. Grauer, it was VOTED that the motion be amended by striking the words "Forward Planning" and replacing them with "Executive." The vote then being on the motion as amended, the same was ADOPTED. Mr. Wilson took Mr. Nathanson's seat at the Table and Mr. Kanode took Mr. Milius's seat at the Table.

105) On motion of Mrs. Lewis, seconded by Mr. Stevens, it was unanimously VOTED that the Board thanks the code experts who assisted in the drafting of the "Suggested Code Competition Guidelines" distributed at this meeting of the Board, and, to give the matter maximum consideration, they are requested to review the revised draft for a further report prior to the Second 1984 Meeting.

106) On motion of Mr. Stevens, seconded by Mr. Kanode, it was unanimously VOTED that the Board congratulates the staff on its recent efforts to improve the information made available to members who plan to operate overseas, and the General Manager is encouraged to continue these efforts with the objective of having for each country an information packet with licensing information, application forms with English translation, local regulations and operating practices, and name, address, and telephone number of the IARU member society or other local contact.

107) On motion of Mr. Stevens, seconded by Mrs. Lewis, it was unanimously VOTED that the Board of Directors express its appreciation to Stephen Mendelsohn for the use of his computer and the word processing of Directors' motions during this Annual Meeting.

108) It was moved by Mr. Kanode, seconded by Mr. Stevens, that the ARRL staff be directed to adopt a Standard Operating Procedure for all of the six advisory committees and that such information be given to all present and future members. After discussion, on motion of Mr. Stevens, seconded by Mr. Wangler, it was VOTED that the matter is laid on the Table.

109) On motion of Mr. Carey, seconded by Mr. Wangler, it was unanimously VOTED that the General Manager and staff are congratulated for the improvement in the Document concept of the Board Meeting workbook and are requested to make continued improvements. (Applause.)

110) On motion of Mr. Butler, seconded by Mr. Sullivan, it was unanimously VOTED that the Membership Affairs Committee study the feasibility of having Section Affiliated Club Coordinators participate in the affiliation process of new applicants, study to what extent such participation may be desirable and report its findings to the Board of Directors on or before the Annual Meeting of 1985.

111) It was moved by Mr. Butler, seconded by Mr. Holladay, that the President be authorized to sign, on behalf of ARRL, the draft memorandum of understanding between ARRL and REACT International, Inc., developed in response to Minute 75 of the April 1983 Board Meeting. A roll call vote being requested, the motion was LOST 10 to 5, with Messrs. Butler, Diehl, Holladay, Sullivan, and Turnbull voting aye, and all other Directors voting nay with the exception of Mr. Atkins, who abstained. The Board was in recess from 3:05 until 3:25 P.M.

112) On motion of Mr. Butler, seconded by Mr. Holladay, it was unanimously VOTED to lift from the Table the earlier motion concerning the Standard Operating Procedures for advisory committees. On motion of Mr. Holladay, seconded by Mr. Sullivan, it was unanimously VOTED to strike the text and substitute therefor:

The ARRL Headquarters staff is directed to develop recommendations for a Standard Operating Procedure for all of the six advisory committees. After review and approval by the Membership Affairs Committee, this information shall be given to all present advisory committee members and to all future members. Whereupon, the motion was unanimously ADOPTED.

113) On motion of Mr. Holladay, seconded by Mr. Sullivan, it was unanimously VOTED that the Management and Finance Committee study the desirability and

feasibility of ARRL Foundation administrative expenses being funded by the ARRL.

114) On motion of Mr. Holladay, seconded by Mr. Wangler, the following resolution was unanimously ADOPTED:

WHEREAS, the ARRL film "Amateur Radio's Newest Frontier" represents an excellent contribution to Amateur Radio public relations, and

WHEREAS, a very professional "Amateur" crew worked on the presentation, now, therefore,

BE IT RESOLVED that the Board of Directors, assembled at Hartford, Connecticut on this 27th day of March, 1984, thanks the following for their contributions to that effort: Roy Neal, K6DUE; Alan Kaul, W6RCL; Bill Pasternak, WA6ITF; Frosty Oden, N6ENV; Peter O'Dell, KB1N; Dave Bell, W6AQ; George Barker, WB8PBC; Bob Brandon; S. Larry D'Anna, WA3KOK; Duane Dahlberg, WB6WMA; Art Donahue, KA1GGG; Gary Eldridge, KC8UD; Burt Hicks, WB6MQV; William Robison; Ron Sanford; Ed Cannady, WB6NSN; Gary Hendrickson, W3DTN; Phil Lawler; Steve Mendelsohn, WA2DHF; Bill Orenstein, KH6QX; Justine Schmidt; Arnold Chase, WA1RYZ; and the Astronauts of STS-6, STS-7, STS-8, and STS-9.

115) On motion of Mr. Wangler, seconded by Mr. Holladay, it was unanimously VOTED that the General Manager is authorized to file, through Counsel, comments in response to the Notice of Proposed Rule Making in Docket 84-265. Such comments shall state the League's support of the proposal to provide reimbursement of VECs for out-of-pocket expenses incurred in amateur examination administration.

116) On motion of Mr. Wangler, seconded by Mr. Carey, it was unanimously VOTED that in view of the rapid developments in the field of Amateur Radio teleprinter communication, the editor of *QST* is encouraged to seek beginners' articles on current teleprinter techniques.

117) On motion of Mr. Atkins, seconded by Mr. Turnbull, it was unanimously VOTED that the Board adopts the cooperative agreement between the Quarter Century Wireless Association, Inc. and the American Radio Relay League, Inc. presented to the Board at this meeting. Mr. Milius resumed his seat at the Table.

118) On motion of Mr. Wilson, seconded by Mr. Hurlbert, it was unanimously VOTED that the staff is particularly commended for outstanding service in presenting the best side of Amateur Radio to the public during the recent Grenada crisis, and the flight of STS-9.

119) It was moved by Mr. Diehl, seconded by Mr. Grauer, that the Communications Department of the ARRL shall contact each area repeater frequency coordination group that is known to the League for the purpose of offering them a coposition with the local Official Observer in policing the spectrum above 30 MHz in accordance with the draft agreement between the FCC Field Operations Bureau and ARRL. Those coordinators responding would be offered OO status. On motion of Mr. Holladay, seconded by Mrs. Lewis, it was unanimously VOTED that the matter is referred to the Membership Affairs Committee.

120) Turning now to agenda item 14, on motion of Mr. Holladay, seconded by Mr. Butler, it was unanimously VOTED that the General Manager is authorized to reimburse the Division Directors for actual expenses incurred by them during the year 1984 in the proper administration of ARRL affairs in their respective Division, and in accordance with the Board policy, up to the amounts as follows:

Canadian	$9,500
Atlantic	11,000
Central	7500
Dakota	3800
Delta	10,000
Great Lakes	9500
Hudson	5600
Midwest	6000
New England	8500
Northwestern	13,000
Pacific	10,500
Roanoke	10,000
Rocky Mountain	5250
Southeastern	9,000
Southwestern	9,000
West Gulf	7,000

Mr. Quiat took Mr. Carey's seat at the Table.

121) On motion of Mr. Stevens, seconded by Mr. Wangler, it was unanimously VOTED that the General Manager is hereby authorized to reimburse the following Committees, Task Groups and Task Forces created by the Board for expenses incurred by them during the year 1984 in the proper execution of their duties, and in accordance with Board policy, as follows:

Ad Hoc Committee on Washington Presence	$2000
Ad Hoc Committee on Strengthening of CRRL	6000
Ad Hoc Committee on Monitoring	5000
Ad Hoc Committee on Computer Based Message Systems	3000
RFI Task Group	4000
Committee on the Biological Effects of RF Energy	3500
Committee on Amateur Radio Digital Communication	9000

122) On motion of Mr. Stevens, seconded by Mr. Metzger, it was unanimously VOTED that, to continue the Board's policy of reimbursing QSL bureau managers of the League for certain travel in furthering ARRL organizational objectives, the General Manager is hereby authorized to pay during the year 1984 a total amount not to exceed $4000 under terms prescribed by the general pattern established by the Board. Mr. Carey resumed his seat at the Table.

123) On motion of Mr. Atkins, seconded by Mr. Sullivan, it was VOTED that, to continue the Board's policy of reimbursing National Traffic System officials above the section level for certain approved expenses in furthering ARRL organizational activities, the General Manager is authorized to pay during the year 1984 a total amount not to exceed $16,000 under terms prescribed by the Communications Manager following the general pattern established by the Board.

124) Turning to agenda item 15, the Board considered the dates for the second meeting of 1984 and the annual meeting of 1985. On motion of Mr. Carey, seconded by Mr. Stevens, it was unanimously VOTED that the Second 1984 Meeting of the Board will be held in Hartford on October 25 and 26. On motion of Mr. Carey, seconded by Mr. Butler, it was unanimously VOTED that the tentative dates for the 1985 Annual Meeting of the Board are March 21 and 22. During the course of these motions Messrs. Wangler, Nathanson and Hippisley departed the meeting. Mr. Wilson took the seat at the table representing the Great Lakes Division.

125) There followed an opportunity for all present to make final comments, during the course of which Mr. Gibson took Mrs. Lewis's seat at the table. There being no further business, the Board adjourned *sine die* at 4:35 P.M. Total time in session as a Board: 12 hours, 23 minutes; as a Committee of the Whole: 2 hours, 47 minutes; total direct authorizations: $194,650.

Respectfully submitted,
David Sumner, K1ZZ
Secretary

MINUTES OF EXECUTIVE COMMITTEE
No. 413
March 25, 1984

AGENDA

1. Recognition of new Life Members
2. Affiliation of clubs
3. Approval of conventions
4. Report on QCWA Cooperative Agreement
5. Report from Mr. Imlay on FCC and antenna/RFI matters of special interest to the Executive Committee
6. Eligibility of George Hart, W1NJM, for office of Honorary Vice President
7. Deficiency appropriation for Forward Planning Committee
8. Request for Article 11 ruling from Al Berg, WB7SIC
9. Report on signing of cooperative agreement with APCO
10. Reimbursement of 1983 section-level expenses

Pursuant to due notice, the Executive Committee of the American Radio Relay League, Incorporated, met at 2:15 P.M. Eastern Standard Time, Sunday, March 25, 1984, at the Sheraton Hartford Hotel, Hartford, Connecticut. Present were President Carl L. Smith, WØBWJ, in the Chair; First Vice President Larry E. Price, W4RA; and Directors Paul Grauer, WØFIR, Jay A. Holladay, W6EJJ, Gay E. Milius, Jr., W4UG, and Leonard M. Nathanson, W8RC. Also present were Vice President Garfield A. Anderson, KØGA; International Affairs Vice President Richard L. Baldwin, W1RU; Directors Thomas B. J. Atkins, VE3CDM, Frank M. Butler, Jr., W4RH, Lys J. Carey, KØPGM, George A. Diehl, W2IHA, Clyde O. Hurlbert, W5CH, Mary E. Lewis, W7QGP, Edmond A. Metzger, W9PRN, Tod Olson, KØTO, William J. Stevens, W6ZM, John C. Sullivan, W1HHR, Hugh A. Turnbull, W3ABC, and Raymond B. Wangler, W5EDZ; Counsel Christopher D. Imlay, N3AKD; Past President Harry J. Dannals, W2HD; and several Vice Directors and members of the ARRL staff. The Chair conveyed the regrets of Secretary and General Manager David Sumner, K1ZZ, at his inability to attend owing to illness.

1) On motion of Mr. Milius, the Committee recognized the names of 75 newly elected Life Members, and directed the General Manager to list their names in *QST*.

2) On motion of Mr. Milius, the affiliation of the following clubs was approved (Category I unless otherwise noted): Alford Memorial Radio Club, Stone Mountain, GA; Beaumont UHF Association, Beaumont, TX; Bryan Amateur Radio Club, Bryan, TX; Central Iowa Technical Society, Indianola, IA; Centerville Amateur Radio Society, Spring Valley, OH; City College Amateur Radio Society, New York, NY (Category III); Data General Research Triangle Park ARC, Research Triangle Park, NC; Douglas County ARA, Douglasville, GA; Eastern Shore ARC, Parksley, VA; Huber Heights ARC, Dayton, OH; Metroplex Amateur Communications Assn, Inc., Leonia, NJ; IBM Amateur Radio Association, Houston, TX; IBM ARC of San Jose, San Jose, CA; Jersey Shore Chaverim, W. Long Branch, NJ; Lakewood High School Radio Club, Lakewood, NJ (Category III); Milford Amateur Repeater Assn. ARC, Milford, CT; Nappanee Amateur Radio Club, Nappanee, IN; Radio Amateur Club of Elyria, Elyria, OH; Southern Illinois University ARC, Carbondale, IL (Category III); Volunteer Amateur Radio Club, Burns, TN.

With this action, the League has the following number of active affiliated clubs: Category I, 1641; Category II, 11; Category III, 167.

3) On motion of Mr. Nathanson, the Committee approved the holding of the following ARRL conventions: Oklahoma State, July 20-22, 1984, Oklahoma City, OK; Northern Florida Section, August 4-5, 1984, Jacksonville, FL; Delta Division, September 15-16, 1984, New Orleans, LA; Great Lakes Division, September 29-30, 1984, Louisville, KY; Iowa State, October 12-13, 1984, S. Sioux City, NE; Tennessee State, October 27-28, 1984, Chattanooga, TN. Southeastern Division, February 2-3, 1985, Miami, FL; Florida State, September 6-8, 1985, Melbourne, FL; Midwest Division, September 6-8, 1985, Omaha, NE; Delta Division, October 26-27, 1985, Chattanooga, TN. Missouri State, April 12-13, 1986, Kansas City, MO.

Mr. Milius noted that the holding of a West Virginia State Convention at Jackson's Mill, WV, on June 30-July 1, 1984, was desired. On motion of Mr. Nathanson, it was agreed that the application would be given consideration by mail vote when it is submitted.

4) The Chair reported on efforts to find suitable language for a cooperative agreement between the Quarter Century Wireless Association and the ARRL that had continued since the January 13-14 meeting of the Committee. It now appears that suitable language has been found. On motion of Mr. Nathanson, it was agreed that the Committee would take no action on the matter and that it would instead be referred to the full Board for consideration at its meeting the following day.

5) Mr. Imlay reported briefly on FCC and local antenna matters of particular interest to the Executive Committee, noting that an extensive report would be presented to the full Board the following day.

6) The nomination of George Hart, W1NJM, for the office of Honorary Vice President was next considered. Mr. Grauer had presented the nomination at the January 13-14 meeting of the Committee, thus meeting the requirements of guidelines adopted by the Board for the handling of such nominations. After discussion, a motion by Mr. Nathanson that the application be forwarded to the full Board without recommendation was carried.

7) On motion of Mr. Nathanson, the General Manager was authorized to reimburse an additional $3000 in expenses of the Forward Planning Committee.

8) A letter from Al Berg, WB7SIC, requesting a ruling on his eligibility as a candidate for Vice Director under Article 11 of the Articles of Association, was presented. On motion of Mr. Milius, it was voted that the matter be tabled until such time as a valid nominating petition is received, and that the Secretary notify Mr. Berg of this action.

9) The Chair reported that the cooperative agreement between ARRL and the Associated Public Safety Communications Officers, Inc. (APCO) authorized at Minute 46 of the Second 1983 Meeting of the Board, had been signed by himself and by APCO President Craig M. Jorgensen.

10) A request from Director Lewis for the additional reimbursement of 1983 Montana Section expenses in the amount of $314 was presented. Mr. Nathanson moved that the General Manager be authorized to reimburse this additional amount; but, after discussion, on motion of Mr. Holladay, the matter was referred to the Management and Finance Committee.

There being no further business, the Committee adjourned at 3:45 P.M.

Respectfully submitted,
David Sumner, K1ZZ — Carl L. Smith, WØBWJ
General Manager — President

Happenings

Conducted By Richard K. Palm,* K1CE

- *FCC Names First Volunteer Examiner Coordinators; Releases Instruction Set*
- *160-Meter Power Limits Dropped*
- *ARRL Seeks 24- and 902-MHz Access*
- *President Reagan Lauds Grenada Efforts*

FCC Proposes Volunteer Examiner Cost Reimbursement

The Federal Communications Commission has proposed the reimbursement of out-of-pocket costs incurred by Volunteer Examiners and Volunteer Examiner Coordinators. PR Docket 84-265, released March 9, will implement recent Congressional amendments to the Communications Act of 1934, which gave FCC the authority to allow this cost recovery. VEs and VECs would be able to recover costs for preparing, processing or administering license exams. (In the Volunteer Examiner Program, the Volunteer Examiners will give the tests to the candidates. The Volunteer Examiner Coordinator is the regional umbrella organization, overseeing the entire program in its jurisdiction.)

On December 7, 1983, ARRL filed a *Request for Agency Action* requesting that the Commission implement the legislation as soon as possible by Order. FCC declined, saying that since large numbers of people would be affected, public comment and notice are being provided in this *Notice of Proposed Rule Making*.

Under FCC's proposal, both Volunteer Examiners (VE) and Volunteer Examiner Coordinators (VEC) could be reimbursed for out-of-pocket expenses. Specifically, VEs who administer an exam may be reimbursed for the expenses they incur in the process. Similarly, VECs would be reimbursed for costs incurred in preparing, distributing and processing exam papers to and from the field Volunteer Examiners. The total reimbursement, however, can not exceed $4 per exam.

FCC declined to specify *how* the fee is to be divided among the VECs and VEs. It said that VECs will incur costs in printing, assembling and distributing exams, while VEs will incur costs related to transportation, lodging and postage of exam mail. Other costs may arise, but all reimbursement must be for those costs that are necessarily and prudently incurred by uncompensated volunteers. The FCC leaves the decision on how to divide each exam reimbursement to the VEC and individual Volunteer Examiners.

In no case will Volunteer Examiner Coordinators or the field Volunteer Examiners be *compensated* — that is, derive a profit for personal or organizational gain. The FCC has also left the decision as to who will collect the fee to the VEC and VE. The amount of the fee will be associated with *one* application. One application may result in a code exam and one or more written exam elements. All of these elements would be covered under one reimbursement amount. Once the application is acted upon by grant or by dismissal, however, the reimbursement amount is final. If an examinee fails an exam and later submits a new application, a new fee may be collected.

Concerning future adjustment of the fee guideline, the FCC proposes to allow the amount of reimbursement to be adjusted for inflation every January 1 as reflected in the Labor Department's Consumer Price Index. The new maximum amount would be stated annually in a public notice.

If fees are charged, both the VE and the VEC would be required to maintain records of out-of-pocket expenditures and to certify annually to the FCC that all costs for which they were reimbursed were necessarily and prudently incurred. The Commission would cancel a VEC agreement in the event the VEC recovered more than out-of-pocket costs.

The Commission concluded its proposal by stating its belief that cost reimbursement will make the Volunteer Examiner Program more attractive to volunteers and will contribute to its overall effectiveness. The FCC also cited its dwindling exam offerings as a need for speedy implementation of the program. Comments were due April 16, 1984; replies to comments by May 1.

On March 27, 1984, the ARRL Board of Directors authorized the conclusion of an agreement with the FCC for the ARRL to become a VEC for the 13 FCC-defined regions only after new rules adopted in PR Docket 84-265 become effective. The new rules must permit the recoupment of expenses by VECs. The Board also directed the staff to prepare comments in the matter supporting these rules. See March 1984 *QST* for a special article on other recent events surrounding the ARRL's role in the Program.

FCC NAMES FIRST VECs; RELEASES INSTRUCTIONS

The Commission has appointed the Anchorage (Alaska) Amateur Radio Club as its first Volunteer Examiner Coordinator (VEC). It is the role of the VEC to accredit Volunteer Examiners in the field to administer exams in a specific FCC region. The Anchorage group will coordinate the Volunteer Examiner Program in the State of Alaska, the Commission's Region 11.

Also named as VECs were the Dayton Amateur Radio Association (Region 8); DeVry Amateur Radio Society, Chicago, Illinois (Region 9); Director, Military Affiliate Radio System (MARS), Cidra, Puerto Rico (Region 12); and Metroplex Amateur Communications Association, Leonia, New Jersey (Region 2).

Qualified amateurs who wish to volunteer their services as examiners may contact the newly appointed VECs directly for accreditation. For a look at recent events in the development of the Volunteer Examiner Program, see March 1984 *QST*, p. 48.

FCC Releases Instructions to VECs

In a document entitled *Instructions To Volunteer Examiner Coordinators* dated February 27, 1984, the Commission spells out its commands to the umbrella organizations will oversee the Volunteer Examiner Program in their respective regions. The instruction set starts by charging each VEC as "a major safeguard to the integrity of the volunteer examiner program," as "the link between volunteer examiners in your region and the FCC." The Commission requests the name of a contact person and an alternate to conduct day-to-day communications with its staff. One of the contact persons should be available during working hours to answer questions that may arise during FCC processing of applications. FCC lists their contact persons in Gettysburg.

The Commission encourages the VEC to publicize its existence and its volunteer examiner recruiting efforts. FCC suggests the VEC contact Amateur Radio clubs in their Region to help spread the word, and states that it will forward inquiries about the program to the VEC. FCC encourages the VEC to recruit Extra Class licensees since only they can administer all exams as Volunteer Examiners. Advanced class operators can administer only the Technician class exams. The FCC will not accept the services of the Novice, Technician or General operator classes as VEs in this program.

The Commission goes on to suggest a VE application form to help VECs determine the qualifications of potential Volunteer Examiners. Instructions concerning exam coordination include providing sessions throughout the region

*Deputy Manager, Membership Services, ARRL

so candidates needn't travel far or take extensive time off from work to sit for an exam. Hamfests and other organized events are suggested for exam opportunities. FCC notification of exam sessions is provided in the instructions. Unique identifier codes are to be given to successful applicants who will ID with the code when using their new privileges.

Volunteer examiners must issue certificates of successful completion to applicants who pass exam elements. These certificates serve two purposes: They give code test credit, and temporary operating authority similar to that provided by the interim permit concept.

The FCC mandates the use of Form 610 for all exam applications, and states that a new form is being developed to incorporate the provisions of the volunteer examiner program. Distributing and collecting exam papers are covered in the instruction set. FCC suggests developing a system of accounting for the whereabouts of test materials at all times so that a VEC will immediately become aware of missing or compromised test materials.

VECs must date stamp and screen each application form upon receipt. Forms must be checked for VE accreditation, VE Team Report, elements passed by the applicant and VE certification. The VEC must make sure the Form 610 has been filled out properly by the applicant. Instructions are included in the case of VE or applicant errors on application forms, and for forwarding applications to Gettysburg.

The FCC instructs the VEC to establish a system of records for the date and time of each exam session, with the names of the VEs and their qualifications, and candidates' names and test results. An important role of the VEC is to evaluate the clarity and accuracy of exam questions, and to promote exam integrity at the exam sessions.

ARRL SEEKS AMATEUR ACCESS TO WARC 24- AND 902-MHz BANDS

In a *Petition for Rule Making* filed with FCC on March 28, 1984, the League has asked the Commission to propose to allow amateurs on 24.890-24.990 MHz, and 902-928 MHz. WARC-79 opened the door to the League's request when the final agreements provided a worldwide primary allocation for amateurs at the 24-MHz segment and a Region 2 secondary amateur allocation at 902 MHz. A footnote in the new ITU Radio Regulations provides for a smooth exit of current Fixed operations from the 24-MHz segment by July 1, 1989. Amateurs are to occupy the band by the same date.

And now, discussions between ARRL and FCC staff have indicated that sufficient reaccommodation of Fixed Service stations has occurred such that amateurs could have access immediately, subject to a noninterference posture regarding any remaining fixed users. ARRL said that other countries have already acted, and that FCC could amend its rules accordingly, consistent with ITU regulations. It also said that the groundwork for Part 97 amendment was laid in the *Second Report and Order* of the Commission's WARC-79 implementation proceeding when FCC changed its U.S. frequency table to reflect the amateur allocation at the segment 24.890-24.990 MHz.

The League requested that the lower 40 kHz of the band be reserved for A1 and F1 emissions, and the upper 60 kHz be available for A1, A3, A4, A5, F3, F4 and F5 emissions modes. ARRL said the FCC should take action soon to reflect the United States' continuing role as a world telecommunications leader. "It is quite inappropriate that the United States is among the last to permit its amateurs to utilize the 24 MHz band," the League stated; the ARRL Petition then listed countries that have already afforded 24-MHz privileges to their hams.

At 902-928 MHz, ARRL said, slightly different considerations apply. WARC-79 agreements allocate this band for primary use by fixed services, and secondary use by amateurs, mobile services and radiolocation services, in ITU Region 2 (North and South America). An ITU footnote to this allocation, though, states that in the U.S., Radiolocation will enjoy primary status from 890-942 MHz. Another footnote designates 902-928 MHz for industrial, scientific and medical (ISM) applications, and states that services operating within this band must tolerate interference from these ISM devices. Examples of such devices include microwave ovens and industrial materials heaters. Thus, the road seems clear for FCC implementation of the band along the above lines. Again, the groundwork for amending Part 97 is laid in the FCC's domestic frequency table, Part 2, which was amended by the WARC implementation proceeding's *Second Report and Order*.

The League said it is understood that limitations on amateur operation at the 902-928 MHz segment will exist, and that they should be incorporated in appropriate amendments to Section 97.61 of the Rules. The League also said it would alert hams through *QST* to potential interference problems with respect to Government stations and future automatic vehicle monitoring systems (AVM), both of which have priority over Amateur Radio. The 902-928 MHz segment offers unique opportunities to amateurs for development of UHF communications, propagation research and experimentation.

ARRL TELLS FCC: EXPAND PHONE BANDS NOW

Citing the severe overcrowding on the present HF phone bands, the League has asked FCC to expand these bands at an early opportunity. In a March 28, 1984, *Motion For Expedited Action*, ARRL specifically requested FCC to adopt its frequency proposal put forth in the Commission's *Further Notice of Proposed Rule Making*, released April 11, 1983. The plan calls for expansion of the 80-meter phone segment to 3750 kHz; 15-meter phone to 21.200 MHz; with 10-meter phone remaining an open question. (See June 1983 *QST* Happenings.) ARRL supported expansion to 28.3 MHz.

In support of its request, the League said the proposal has met with great interest and anticipation by the amateur community. It would relieve some of the crowded conditions, especially at 75 meters, and would reduce the incidence of unintentional interference and poor communications. The League pointed out that the phone-band-expansion proceeding is two years old, and that the overcrowding and interference conditions continue to grow. The regular influx of new hams and propagation changes were cited as reasons these conditions have worsened.

The League concluded by saying, "Further postponement of telephony subband expansion will surely disserve the amateur community and the Commission itself, as amateur-to-amateur interference complaints will continue to increase until such expansion is effectuated."

FCC DROPS SPECIAL 160-METER POWER LIMITS

In an *Order* released March 27, 1984, the Commission has removed the special geographical power limitations in the 1900-2000 kHz segment of the 160-meter band. These limits had applied to amateurs operating here to protect the priority Loran-A radionavigation stations. With the cessation of Loran operations, there was no longer any need for continued special power restrictions on amateur operations. The Commission axed these limits on March 22, in response to a request from ARRL (see Happenings, April 1984 *QST*).

To update Part 97 in *The FCC Rule Book*, Second Edition (red cover), make the following changes:

1) In the table in Section 97.61(a), first line, change "1800-1900" to read "1800-2000."

2) In the same table, *delete* the second line (which reads "1900-2000 A1, A3 1,2").

3) Delete Section 97.61(b) (1), and insert "(Reserved)."

4) Delete Section 97.61(b) (2), and insert "(Reserved)."

5) In Section 97.185, paragraph (b), remove limitation designator one (1) in the table.

6) In Section 97.185(c), *delete* the text of limitation one (1) in its entirety, and insert "(Reserved)."

ARRL SEEKS RF BIOEFFECTS STATEMENT

On March 20, 1984, ARRL asked FCC for an interim policy statement and status report concerning a possible federal guideline on RF exposure standards. Specifically, the League seeks the Commission's consideration of the appropriateness of the American National Standards Institute Standard C95.1-1982 as a U.S. guide to help stem the tide of unreasonable state and local attempts to regulate Commission licensees.

Labeled *Petition For Expedited Special Relief and Declaratory Ruling*, the League's request first noted that it had urged FCC to adopt the ANSI guideline in 1982 in response to its *Notice of Proposed Rule Making* in General Docket 79-144. This docket, opened in 1979, looks into the Commission's responsibility to consider biological effects of RF radiation when authorizing the use of RF devices.

The docket remains open as the FCC looks to the Environmental Protection Agency for guidance in the issue. It is likely that much more time — possibly two years — will pass before EPA issues a recommendation.

Interim measures are needed, the League said, because of two circumstances: (1) the absence of *any* Commission statement concerning a reasonable standard by which to judge the potential biological effects of RF energy makes it difficult for local regulators to address increasing public concerns in the issue; and (2) this fact has led state and local governments to adopt or consider adopting their *own* standards.

The League backed up its claims with several examples. New Jersey said it is proposing its own standard specifically to fill this vacuum. In Connecticut, a state bill, if passed as written, would require every operator of RF devices in the 300 kHz to 100 GHz range to first obtain a permit from the state's environmental protection commissioner, with fee. The League said radio

amateurs should not have to get an additional license to operate their federally sanctioned stations.

Specifically, ARRL wants FCC to state its position on what services or radiation conditions are *not* likely to be problems, and to consider ANSI's standard as an interim guide for FCC licensees until a federal standard can be implemented. The League said radio amateurs should "be able to continue their normal operations without causing concern about undue RF exposure of the public." An interim FCC report would greatly assist hams in responding to questions from the public on the issue and head off unreasonable local regulation, the League concluded.

PRESIDENT REAGAN RECOGNIZES GRENADA NET

The following letter from the White House says it all about the good work hams performed during the Grenada crisis of last October. For the complete Grenada story, see December 1983 *QST*.

THE WHITE HOUSE

WASHINGTON

March 8, 1984

Dear Mr. Naftzinger:

I am writing to express my appreciation for your role in organizing and coordinating the International Assistance Net, which provided valuable assistance to Americans on Grenada during the recent mission there. I understand that you have been in frequent contact with the Department of State since 1979 to offer the assistance of the net to the people of the Gulf and the Caribbean during periods of emergency. I wish to thank you and the members of your net for the many hours you have spent on this project and the dedication you have shown in providing assistance to our country.

Sincerely,

Ronald Reagan

Mr. George Naftzinger
11260 Southwest 176th Street
Miami, Florida 33177

ARRL RIDES SATELLITE ANTENNA COATTAILS ON FEDERAL PREEMPTION ISSUE

The League has fired another salvo in its continuing fight against unreasonable and improper state and local efforts to regulate Amateur Radio. (For more on this subject, see It Seems to Us, this issue.) On February 24, 1984, ARRL filed *Comments On Petition For Clarification* with FCC in a satellite dish antenna proceeding (CSR-2347) requesting the agency to extend to Amateur Radio the scope of a policy statement spelling out the limitations on local authorities to adopt zoning regulations that interfere with and retard the full development of communications in the home.

The Society for Private and Commercial Earth Stations (SPACE) opened the door to ARRL's comments when it filed its request that FCC clarify its November 17, 1983 order on the issue. Such a statement would assist amateurs, too, in stemming the tide of unreasonable local antenna restrictions, the League indicated.

In support of its request, ARRL said Amateur Radio has struggled for its existence in residential areas since its infancy. Since 1927, radio amateurs have sought to convince local governments that Amateur Radio is interstate commerce, and thus needs to be protected from unreasonable local regulation to make it possible to accomplish the goals set for the service by the federal government. Despite many state court zoning cases holding Amateur Radio to be normal, reasonable and incidental use of residential property, amateur antennas and transmitters are routinely regulated to the point of uselessness by local governments under the guise of zoning authority. "Were such local regulation clearly necessary in furtherance of the protection of health and safety of the local citizenry, little could be said about it," the League stated.

SPACE requested that the Commission issue a "policy clarification that it has preempted local zoning requirements applicable to private cable (SMATV) and single home installations not specifically and demonstrably related to public safety concerns." In its comments, the League suggested a more narrow action, that the language contained in the *Order* itself would be adequate. The League said the following FCC language adequately and correctly draws the line between local and federal authority over communications systems:

> Local authority over such concerns must be exercised so that a local jurisdiction in fact does not inhibit or interfere with the delivery of interstate signals through the exercise of its authority. Certain countervailing state interests may be legitimate but would interfere with the federal interest in establishing and maintaining interstate (communications). Our ruling herein applies to those aspects of a state or local regulatory process that, while otherwise legitimate, are inextricably connected with the delivery of interstate signals . . . The potential for such state regulation to chill the development of (radio communications) service conflicts with our Congressional mandate, as embodied in the Communications Act, to foster the development of national communications service . . .

The League thus only requested that this analysis be declared applicable to installations of amateur antennas, as well as to SMATV systems.

ARRL said there shouldn't be any routine conflict with a local government's legitimate and reasonable duty to protect the health and safety of its citizens. There are ample guidelines, building codes for example, that assure safe radio antenna installations. Concerning aesthetic interests, ARRL said that such zoning would be permissible as long as it did not significantly impede effective station performance.

The burdens on the Commission posed by the League's request should be minimal, as FCC would not be required to intervene in individual local disputes. FCC has stated that licensees could raise federal preemption arguments in their own behalf, but until now there was no federal guideline that an amateur could wave in front of his town's government. ARRL cited the court decision in *Guschke v. City of Oklahoma City* as an example of a decision that could possibly have been averted had a firm federal mandate — such as that suggested in the League's comments — existed. In this case, the court decided in favor of the city, upholding its denial of Guschke's antenna height variance request. The court held that the degree of impairment of the amateur's ability to transmit and receive caused by the lower antenna height is immaterial. The court said, "The fact that Plaintiff will be unable to use all the frequencies which has been allocated, while unfortunate, does not constitute such a burden that local police powers must be abrogated."

The League closed by requesting that the Commission issue an *Order* extending its federal preemption analysis and determination contained in its SMATV ruling to the issue of preemption of unreasonable local regulation of Amateur Radio antennas.

GREEN PETITION FOR BIANNUAL CODE TESTS DENIED

Wayne Green, W2NSD, in a February 6 *Petition For Rule Change*, proposed that "all licensed radio amateurs be required to demonstrate their Morse code skill at a mimimum of every two years." Additionally, Green proposed that the code speed requirement be increased by 5 WPM for each two-year test until the speed of 35 WPM is reached. "Any amateur not able to pass this skill test should be given 60 days to either pass the required skill level or turn in the amateur license until the skill level is reached," Green requested. The amateur then could apply for a new license, with accompanying written test, under the proposal.

The request was made in response to the overwhelming amateur response to the no-code matter (PR Docket 83-28) "wherein hundreds of individual amateurs and many amateur radio clubs endorsed the continued importance of Morse code skills for amateurs." Green said, "It would seem that this importance should be reflected better in the amateur rules and regulations."

Green reasoned that "any amateur not retaining this (code) skill would not be working in the best interests of the amateur radio service or the country." Further, since emergency communications requires the handling of large volumes of traffic with minimum error, "it would obviously follow that amateurs should be required to not just maintain a demonstrated minimum level of skill, but should increase this skill." The Green petition was received at FCC on February 10, and denied March 9 by Commission staff acting under delegated authority.

ATLANTA RADIO CLUB TO AWARD SCHOLARSHIPS TO GRADUATING HIGH SCHOOL SENIORS

The Atlanta, Georgia Radio Club announces that three cash $750 scholarships will be awarded to graduating high school seniors who enter an accredited college or university in the fall of 1984. Recipients must be licensed U.S. Amateur Radio operators at the time of application. Final selection will be based on scholastic attainment, work and progress as an active Amateur Radio operator, and future potential or promise.

For additional information and application forms, write to Phil Latta, W4GTS, Secretary, Atlanta Radio Club Scholarship Committee, 259 Weatherston Pkwy., Marietta, GA 30067. Completed applications along with the required high school transcripts must be received no later than June 30, 1984.

INDIANAPOLIS AMATEURS TO GIVE $1000 TO ARRL GOLDWATER SCHOLARSHIP EFFORT

The Indianapolis Amateur Radio Association will present ARRL Foundation representatives with a $1000 check at the July 8 Indianapolis Hamfest and Indiana Section ARRL Convention. The group's support will be earmarked for the League's exciting new scholarship program

Be a Charter 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* and be a *Charter Contributor*. All Charter Contributors will have their name and call listed in a commemorative book to be presented to Senator Goldwater prior to the awarding of the first scholarship in his honor. The deadline for donations by Charter Contributors is August 1, 1984.

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.

Charter Contributors of $25 or more (as this is being written) include: ARRL Vice President and Mrs. Garfield Anderson, KØGA; Arthur Altarac, WA2KXE; Ronald Apelquist, KTØR; Richard Bechtel, W3CBF; Earl Boesenberg, Jr., KA9QIK; Warren Braschwitz, K8KUH; Southeastern Division Director Frank Butler, W4RH; Mike Capito, WB4POL; James Collier, K2QB; George Denniston (ex-W2HXE); Weldon d'Allemand, KØUDW; Robert Dexheimer, W4DIT; David Goggio; Joel Goings, AA4P; Charles Gspann, W2ZEE; Graham Hicks, W5IHP; Joseph Kolb; Joseph Mullan, W3RLR; John McGrath, KB2JT; Eldon Mueller, KA9NOQ; Norwood Amateur Radio Club; Hawley Oefinger, W1GUP; Mr. and Mrs. Leland Patience; Donald Ramras, KD6GR; James Saunders, W1BDV; Howard Siegel, KB2FI; Robert Stoner, W3MP; Malcolm Tindall, KA8GOB; Senator John Warner; James Webster, W6WZX; William White, KB6SI.

honoring Senator Barry M. Goldwater, K7UGA.

Why should a hamfest make such a contribution? In the words of IARA President Richard McKenna, WA9FUD: "A hamfest should have as its goal the satisfaction of the amateur community for a chance at enjoyment and socialization with other amateurs. The primary purpose of a hamfest should be for the betterment of Amateur Radio." Cornelius Head, WB9ZQE, adds: "Senator Barry Goldwater has gone out of his way for the betterment of Amateur Radio, over a long period of time. The right scholarship fund has come about. Let's do our part to make it go."

The Association makes the donation on behalf of the thousands of amateurs who have supported the Indianapolis Hamfest over the years, and challenges other hamfest groups around the country to offer similar support in honor of Barry.

For details on how you can contribute, see the sidebar story elsewhere on this page.

SCRRBA JOINS 2310-2390 MHz FIGHT

Last month, we reported on the League's *Petition for Partial Reconsideration* with respect to the Commission's decision in the WARC implementation proceeding (General Docket 80-739) removing amateur access to 2310-2390 MHz (Happenings, April 1984 *QST*). The Southern California Repeater and Remote Base Association (SCRRBA) also took issue with the Commission's decision, and asked the agency to reverse its decision. This decision was made in order to protect aeronautical flight test telemetry operations as proposed for the band in the WARC proceeding and a new *Notice of Proposed Rule Making* in General Docket 84-186.

SCRRBA provided evidence that there is no technical need for deleting the Amateur Service secondary allocation from this band. It noted that flight test operations as contemplated by the Aerospace and Flight Test Radio Coordinating Council (AFTRCC) must be conducted in remote areas, where there is little chance of significant amateur activity on this band. SCRRBA suggested that it is Amateur Radio Service stations that are likely to receive interference from the flight test operations, while the test operations would not suffer interference from amateurs.

RACES RECONSIDERATION: BRING IN 52-54 MHz

The Southern California Repeater and Remote Base Association (SCRRBA) has filed a *Petition for Partial Reconsideration* in the RACES frequency revision matter in PR Docket 83-254. When the FCC adopted the *Report and Order* amending Part 97 to reflect a wider range of frequencies for RACES station use in declared emergencies, it expanded the RACES allocation on 2 meters to include the repeater subbands. SCRRBA believes FCC should have expanded the RACES allocations on the 6-meter band to include the entire repeater subband, 52-54 MHz. Similar petitions were filed by Gary David Gray, WB6HUG, and Orange County (California) General Services Agency, both asking for RACES 52-54 MHz access.

ARRL has been made aware of military contingency use plans for the 50-54 MHz segment, and in a spirit of cooperation with these government interests, is not supporting these requests at the present time.

SECTION MANAGER ELECTION NOTICE

To all ARRL members in the Southern Florida, North Dakota, West Indies, Oklahoma, Minnesota, Connecticut, Idaho, Western New York and Ohio Sections: You are hereby solicited for nominating petitions pursuant to an election for Section Manager. Incumbents are listed on page 8 of this issue. [Editor's Note: Solicitations for petitions in Canadian Sections appear in Canadian NewsFronts.]

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 ...).

An SM candidate must have been a member of the League for a continuous term of at least two years and a licensed amateur of Technician class or higher immediately prior to receipt of petition at Headquarters.

Petitions must be received at Headquarters on or before 5:30 P.M. Eastern Local Time June 8, 1984.

Whenever more than one member is nominated in a single Section, ballots will be mailed from Headquarters on or before July 2, 1984. Returns will be counted August 21, 1984. SMs elected as a result of the above procedure will take office October 1, 1984.

If only one valid petition is received for a Section, that nominee shall be declared elected without opposition for a two-year term beginning October 1, 1984.

If no petitions are received for a Section by the specified closing date, such Section will be resolicited in October *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

REPEAT NOMINATING SOLICITATION

Since no petitions were received for the Eastern Pennsylvania Section by the petition deadline of December 9, 1983, as a result of notices in the October and November *QST*, nominating petitions for this section are herewith resolicited. See the above notice for details on how to nominate.

SECTION MANAGER ELECTION RESULTS

The following were elected for a two-year term of office beginning July 1, 1984:

Uncontested

Illinois	David E. Lattan, WD9EBQ
Indiana	Bruce Woodward, W9UMH
Maine	Clevis O. Laverty, W1RWG
Northern Florida	Phillip O'Dwyer, WF4X
Oregon	William R. Shrader, W7QMU
Vermont	Ralph T. Stetson III, KD1R
Wisconsin	Richard R. Regent, K9GDF

SM APPOINTMENT

In the Idaho Section, Lemuel H. Allen, Jr., W7JMH, has been appointed to complete the term (September 30, 1984) of Dennis L. Hall, KK7X (resigned).

In the Eastern Pennsylvania Section, Mark J. Pierson, KB3NE, has been appointed to complete the term (September 30, 1984) of Karl W. Pfeil, W3VA (resigned).

AUDITED ARRL FINANCIAL STATEMENTS RELEASED

The audited financial statements reprinted below set forth the League's financial condition as of December 31, 1983, as compared to a year earlier. The statements show an after-tax net gain of $302,070 on total revenues of $6,508,715 for the calendar year 1983.

The financial statements and supplementary financial information will appear in the 1983 *Annual Report*, which should be available in late spring. Affiliated clubs that returned the request form sent to them late last year will be receiving a copy of the *Annual Report* as soon as it is received from the printer; members may obtain a copy for a $1 postage and handling fee.

Price Waterhouse

ONE FINANCIAL PLAZA
HARTFORD, CT 06103
203-525-4800

February 29, 1984

To the Board of Directors of
The American Radio Relay League,
Incorporated

In our opinion, the accompanying balance sheet and the related statements of revenues and expenses and changes in general fund balance and of changes in financial position present fairly the financial position of The American Radio Relay League, Incorporated at December 31, 1983 and 1982, the results of its operations and the changes in general fund balance and of changes in financial position for the years then ended, in conformity with generally accepted accounting principles consistently applied. Our examinations of these statements were made in accordance with generally accepted auditing standards and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

Our examinations were made for the purpose of forming an opinion on the basic financial statements taken as a whole. Schedules I and II are presented for purposes of additional analysis and are not a required part of the basic financial statements. Such information has been subjected to the auditing procedures applied in the examination of the basic financial statements and, in our opinion, is fairly stated in all material respects in relation to the basic financial statements taken as a whole.

Price Waterhouse

THE AMERICAN RADIO RELAY LEAGUE, INCORPORATED

BALANCE SHEET

	December 31, 1983	1982
Assets		
Current Assets: -		
Cash (including time deposits of $777,558 in 1983 and $1,086,834 in 1982)	$ 952,756	$ 1,253,986
Accounts receivable:		
Shawmut Bank	150,000	-
Other (less allowance for doubtful accounts of $26,500 in 1983 and 1982)	419,506	376,258
	569,506	376,258
Due from life membership operations	179,516	-
Accrued interest receivable	52,356	32,682
Inventories	235,188	273,302
Prepaid expenses	34,060	22,207
Total Current Assets	2,023,382	1,958,435
Life Membership Proceeds:		
Due (to) from current operations	(179,516)	51,878
Accrued interest receivable	104,266	70,851
Marketable securities, at cost	3,794,753	3,302,286
Life membership plaques	4,216	9,310
	3,723,719	3,434,325
Regular Portfolio:		
Marketable securities, at cost	673,356	585,157
Cash Surrender Value of Life Insurance	42,979	40,753
Fixed Assets:		
Land	1	1
Buildings	1,148,929	1,153,902
Furniture and equipment	942,295	829,058
	2,091,225	1,982,961
Accumulated depreciation	(837,401)	(713,775)
	1,253,824	1,269,186
Goodwill, Trademarks and Copyrights	1	1
	$ 7,717,261	$ 7,287,857

See accompanying notes to financial statements.

THE AMERICAN RADIO RELAY LEAGUE, INCORPORATED

BALANCE SHEET

	December 31, 1983	1982
Liabilities and General Fund Balance		
Current Liabilities:-		
Accounts payable:		
R.R. Donnelley & Sons Company	$ 91,772	$ 310,063
Other	366,568	128,697
	458,340	438,760
Due to life membership operations	-	51,878
Accrued liabilities	254,604	132,543
Deferred membership fees and subscriptions - current portion:		
Life members	298,802	291,782
Term members	1,205,174	1,222,622
Current portion of mortgage note payable	26,970	24,596
Income taxes payable	216,156	209,379
Total Current Liabilities	2,460,046	2,371,560
Deferred Membership Fees and Subscriptions:		
Life members	3,353,036	3,099,215
Term members	112,536	298,005
	3,465,572	3,397,220
Mortgage Note Payable	67,479	94,449
Loan Payable	36,500	36,500
Reserves:		
For promotion of amateur radio overseas	5,594	6,075
For Colorado Convention Fund	5,177	4,896
For Project Goodwill	20,219	21,426
For OSCAR Station Construction		1,127
For H.P. Maxim Award	21,571	1,000
	52,561	34,524
General Fund Balance	1,635,103	1,355,604
	$ 7,717,261	$ 7,287,857

See accompanying notes to financial statements.

THE AMERICAN RADIO RELAY LEAGUE, INCORPORATED

STATEMENT OF REVENUES AND EXPENSES
AND CHANGES IN GENERAL FUND BALANCE

	Year ended December 31, 1983	1982
Revenues:-		
Publications:		
Advertising QST magazine	$ 2,071,876	$ 2,039,133
QST newsdealers sales	133,188	139,200
Standard Handbook sales	416,289	473,494
Booklet sales	539,133	520,901
Booklet advertising sales	14,371	15,058
Tune in the World sales	135,676	128,520
Tune in the World advertising sales	12,425	-
Call Directory sales	68,993	-
QEX income	14,414	13,752
ARRL Letter	18,845	17,029
	3,415,210	3,347,087
Membership dues (including membership subscriptions to QST magazine)	2,766,888	2,593,180
Membership supplies sales	131,469	121,877
Interest, dividend and royalty income	184,932	231,485
Revenue from donated equipment, materials and supplies		

	-	2,228
Increase in cash surrender value of life insurance	2,226	2,372
Contributions	4,021	5,616
H.P. Maxim and other awards income	19,375	375
Cash discounts taken	3,182	2,775
Overseas QSL service income	31,911	38,714
Gain on sale of investments	19,663	47,386
Legal defense contributions	1,602	-
	6,580,479	6,393,944
Deductions from revenues:		
Discounts allowed	37,444	240
Exchange and collection charges	17,830	12,170
Sales returns and allowances	16,490	13,900
	71,764	26,310
Total Revenues	6,508,715	6,367,634
Expenses:		
Operating expenses	5,686,456	5,434,439
Administrative expenses - other expenses authorized by Board of Directors	309,780	333,444
Total Expenses	5,996,236	5,767,883
Excess of Revenues over Expenses before Income Taxes	513,479	599,751
Income tax on unrelated business income	(211,409)	(208,919)
Excess of Revenues over Expenses	302,070	390,832
General Fund Balance:		
Beginning of year	1,353,604	963,772
Reserve for H.P. Maxim Award	(20,571)	(1,000)
End of year	$ 1,635,103	$ 1,353,604

See accompanying notes to financial statements.

THE AMERICAN RADIO RELAY LEAGUE, INCORPORATED
STATEMENT OF CHANGES IN FINANCIAL POSITION

	Year ended December 31, 1983	1982
Financial resources were provided by:-		
Excess of revenues over expenses	$ 302,070	$ 390,832
Add (deduct) income charges (credits) not affecting working capital:		
Depreciation	212,527	167,082
Decrease in reserves	(2,534)	(372)
Working capital provided from operations	512,063	557,542
Decrease in marketable securities	-	177,607
Increase in cash surrender value of life insurance	(2,226)	(2,372)
	509,837	732,877
Financial resources were used for:		
Additions to furniture and equipment, net	197,165	168,369
Reduction in long term mortgage note payable	26,970	24,596
Net increase of life membership assets over life membership deferred fees	35,573	115,444
Increase in marketable securities	88,199	-
Decrease of deferred fees - term members - non-current portion	185,469	525,794
	533,376	834,203
Increase in excess of current liabilities over current assets	$ (23,539)	$(101,326)
Changes in components of working capital		
Increase (decrease) in current assets:		
Cash	$(301,230)	$(186,940)
Accounts receivable	193,248	(67,846)
Due from life membership operations	179,516	-
Accrued interest receivable	19,674	32,581
Inventories	(38,114)	14,065
Prepaid expenses	11,853	10,420
	64,947	(197,620)
(Increase) decrease in current liabilities:		
Accounts payable	(19,580)	53,394
Due to life membership operations	51,878	75,502
Accrued liabilities	(122,061)	127,490
Deferred membership fees and subscriptions - current portion:		
Life members	(7,020)	(56,114)
Term members	17,446	(28,477)
Current portion of mortgage note payable	(2,374)	(2,165)
Income taxes payable	(6,777)	(73,336)
	(88,486)	96,294
	$ (23,539)	$(101,326)

See accompanying notes to financial statements.

THE AMERICAN RADIO RELAY LEAGUE, INCORPORATED
NOTES TO FINANCIAL STATEMENTS

NOTE 1 - SIGNIFICANT ACCOUNTING POLICIES:

Business

The American Radio Relay League, Incorporated (the League) is a not for profit, tax-exempt organization formed to promote interest in amateur radio communication and experimentation. The League also publishes documents, books, magazines, newspapers and pamphlets necessary or incidental to its purpose.

Income Recognition

A portion of the revenue from membership fees and subscriptions applicable to acquisition costs is recognized at the time the memberships and subscriptions are received. The remaining portion is included in revenues on the straight-line basis ratably over the applicable membership or subscription period.

The League recognizes income on donated capital based on the fair market value of the item at the date of donation.

Deferred Life Membership Fees

By-laws of the League provide for a paid-up life membership in the League available upon payment of a fee of twenty-five times the annual dues rate. Life membership fees received are deferred and invested to produce income to defray the cost of servicing life members. Deferred life membership revenues are amortized to current revenues and funds are transferred to current operations based on a rate designed to offset the costs of servicing the life membership.

Income Taxes

The League is required to pay federal income taxes on unrelated business income, primarily net income received from advertising placed in its QST Magazine.

Investments

Marketable securities are carried at cost. Bond premium or discount is amortized to income over the life of the bond.

Inventories

Inventories are carried at the lower of cost (first-in, first-out) or market.

Fixed Assets

Fixed assets are recorded at cost. Depreciation is computed on the straight-line method for assets purchased prior to January 1, 1981. For assets purchased after that date, an accelerated depreciation method is used. Buildings are depreciated over a 40 year life. Furniture and equipment are depreciated over their useful lives ranging from 3 to 20 years.

NOTE 2 - INVENTORIES:

Inventories are comprised of the following:

	December 31, 1983	1982
Standard Handbooks	$ 51,541	$ 58,374
Booklets	112,465	129,897
Tune in the World booklets	19,798	9,317
Membership supplies	51,384	75,719
	$ 235,188	$ 273,307

NOTE 3 - INVESTMENTS:

	December 31, 1983		1982	
	Cost	Market	Cost	Market
Life membership proceeds	$ 3,794,753	$ 3,447,748	$ 3,302,286	$ 2,986,599
Regular portfolio	673,356	704,895	585,157	641,733
	$ 4,468,109	$ 4,152,643	$ 3,887,443	$ 3,628,332

Investments are comprised of the following:

	1983		1982	
	Cost	Market	Cost	Market
Certificate of deposit	$ 50,000	$ 50,000	$ 50,000	$ 50,000
Preferred stocks	207,347	135,525	207,347	136,045
Common stocks	336,599	369,023	309,170	339,364
Corporate bonds	1,698,546	1,448,228	1,141,713	909,732
Government agency and other issues	2,175,617	2,149,867	2,179,213	2,196,986
	$ 4,468,109	$ 4,152,643	$ 3,887,443	$ 3,628,332

The increase (decrease) in unrealized depreciation in the market value of investment securities for the years ended December 31, 1983 and 1982 was $56,355 and $(255,637), respectively.

NOTE 4 - LONG-TERM DEBT:

On March 1, 1977 the League signed a mortgage note in the amount of $225,000, the proceeds of which were used to finance a building addition. The interest rate on the mortgage note is 9 1/4% per annum. Monthly installments are $2,082 (including interest) through March 1, 1987. The note is secured by property, building and related equipment having a net book value of $1,253,824.

NOTE 5 - LIFE MEMBERSHIP FUNDS IN (DUE TO) OPERATING ACCOUNT:

As of December 31, 1983, life membership operations included $179,516 advanced from the League's operating funds to cover end of the year investment purchases. As of December 31, 1982 life membership operations had $51,878 in the League's operating cash account in order to receive higher interest rates.

NOTE 6 - RESERVES:

Reserves are established for purposes specified by donors or the League Board of Directors. Such reserves are administered by designated officials of the League in accordance with the directions of the donors or Board of Directors.

	For promotion of amateur radio overseas	For Colorado Convention Fund	For Project Goodwill	For QSCAR Station Construction	For H.P. Maxim Award
Balance, December 31, 1981	$ 6,329	$ 4,378	$ 21,978	$ 1,211	
Contributions					$ 1,000
Income earned		518			
Expenditures	(254)		(552)	(84)	
Balance, December 31, 1982	6,075	4,896	21,426	1,127	1,000
Contributions					20,571
Income earned		281		78	
Expenditures	(481)		(1,207)	(1,205)	
Balance, December 31, 1983	$ 5,594	$ 5,177	$ 20,219	$ -	$ 21,571

NOTE 7 - PENSION PLAN:

The League has a noncontributory group annuity retirement plan which covers full time employees. The League's policy is to fund pension cost accrued. The total pension expense for 1983 and 1982 was $168,765 and $160,292 respectively, which included amortization of past service cost over a 30-year period. Accumulated plan benefits as of June 3, 1982, the most recent actuarial valuation date, are as follows:

Actuarial present value of accumulated plan benefits:	
Vested	$ 387,903
Non Vested	58,797
	$ 446,700

At June 3, 1983 and 1982, net assets available for plan benefits (as reported by the insurer, including $156,382 in 1983 and $140,500 in 1982 payable to the insurer by the League) are $161,874 and $170,865. The assumed rate of return used in determining the actuarial present value of accumulated plan benefits for 1982 was 7.5%.

NOTE 8 - DEFERRED LIFE MEMBERSHIP FEES:

The following is a summary of deferred life membership fees and subscriptions activity:

		December 31, 1983	1982
Beginning balance		$ 3,390,997	$ 2,677,792
Additions:	Membership fees received	264,038	598,577
	Investment income	337,039	367,126
		601,077	965,703
Deductions:	Membership fee allocation	(114,766)	(106,809)
	Investment income	(337,039)	(367,126)
	Reserve maintenance	157,144	238,067
	Net transfer to operations	(294,661)	(235,668)
	Administrative Expenses	(45,575)	(16,830)
Ending balance		$ 3,651,838	$ 3,390,997

SCHEDULE I

THE AMERICAN RADIO RELAY LEAGUE, INCORPORATED

OPERATING EXPENSES

	Year ended December 31, 1983	1982
Publications:		
QST magazine	$ 1,107,475	$ 1,173,023
Standard handbook	113,034	121,095
Booklets	174,047	152,458
Tune in the World production costs	48,747	39,897
Advertising production costs	12,894	14,699
Advertising production costs credits	(8,654)	(8,885)
Call directory expenses	50,402	-
QEX production/other costs	13,262	21,656
ARRL Letter	22,149	3,852
	1,532,856	1,517,795
Salaries	1,892,745	1,747,373
Membership supplies	49,010	50,123
Postage	156,468	127,065
Forwarding expenses:		
QST subscriptions	312,408	357,651
QST newsdealers	7,341	6,902
Other publications	151,790	121,085
	471,539	465,638
Telephone and telegraph	47,224	41,595
Office supplies and expenses	128,435	132,008
General expenses	76,335	72,122
Laboratory expenses	12,126	8,700
Legal and professional fees	90,950	99,815
Stationery, printing and forms	175,994	125,736
Promotion and support	44,839	18,922
Payroll processing expense	2,497	2,154
Light, heat and water	56,020	50,897
Employee insurance and pension	256,820	239,688
Insurance	16,236	20,489
Interest expense	12,176	15,698
Travel expenses:		
Business	46,513	42,849
Membership contact	38,619	48,053
Overseas	14,926	10,423
	100,058	101,325
Automobile expenses	1,223	1,943
Building maintenance expenses	48,541	51,673
Property taxes	47,719	40,365
Payroll taxes	115,289	102,379
Sales and use taxes	807	389
Provision for depreciation	212,527	167,082
Awards	10,484	8,411
Headquarters station expenses	5,698	4,677
CRRL Headquarters expenses	19,978	8,281
Provision for doubtful accounts	19,486	12,781
Electronic data processing	4,252	92,470
Unemployment compensation	7,884	3,380
Overseas QSL service	32,384	49,967
Distribution of films	5,926	5,569
Computer study, consulting, and data conversion	2,462	1,303
Computer supplies and maintenance	22,965	17,961
House advertising preparation	10,503	5,737
Suggestion plan	-	110
Contribution - Smithsonian	-	2,500
	$ 5,685,456	$ 5,434,435

SCHEDULE II

THE AMERICAN RADIO RELAY LEAGUE, INCORPORATED

ADMINISTRATIVE EXPENSES - OTHER EXPENSES AUTHORIZED BY BOARD OF DIRECTORS

	Year ended December 31, 1983	1982
Division Directors expenses:		
Atlantic	$ 7,994	$ 4,499
Canadian	7,928	9,000
Central	5,799	5,690
Dakota	2,793	3,126
Delta	2,317	4,873
Great Lakes	4,071	4,253
Hudson	4,986	3,772
Midwest	5,000	4,543
New England	3,803	3,841
Northwestern	9,628	6,631
Pacific	8,372	6,731
Roanoke	8,423	8,360
Rocky Mountain	3,435	3,402
Southeastern	5,880	6,282
Southwestern	7,094	6,111
West Gulf	6,224	6,181
	98,556	97,340
Board of Directors meetings	51,214	56,353
Executive committee	12,361	13,373
President's expenses	19,555	15,787
Other committees	2,296	1,317
Advisory committees	244	207
National traffic system	9,071	2,425
Officers' expenses	27,651	26,722
Strengthening CRRL	2,040	334
Study of legal counsel	-	7,966
Membership affairs committee	5,521	4,697
Management and finance committee	9,446	9,834
Plans and programs committee	26	1,843
QSL Manager expense	2,106	1,985
Long-range planning committee	-	2,890
Public information assistants	335	478
Ad hoc committee on biological effects	1,129	2,559
Contribution to ARRL Foundation	-	10,000
Intruder Watch study	155	3,731
Board Procedures	747	56
Study of Washington Presence for ARRL	1,101	-
Digital Comunication Committee	5,054	-
Section level expenses	55,122	68,491
Committee for International Humanitarianism Award	58	-
Committee to study monitoring and licensing activities	2,486	-
Forward Planning Committee	3,574	-
	$ 309,780	$ 313,448

QST

Correspondence

Conducted By Peter R. O'Dell,* KB1N

"KEEBREEDERS" PART 2

☐ I really enjoyed reading Bill Edwards's (K5CN) letter regarding the "Keebreeder" CW folks March 1984 *QST*, p. 85)! While it is true that a number of pseudo-CW "operators" are *video-rangers*, there are also a lot of keyboard users who employ that device in order to *communicate* very-high-speed (60+ WPM) QRQ. I do not believe many veteran "brass pounders" would hold solid at these speeds; however, some probably can. I have had the pleasure of working Bill, K5CN, and his keying fist is not only the best I have ever heard, it is also the voice of experience, as Bill is a shipboard operator of many years standing.

I use a keyboard, however, due to my medical condition (horizontally polarized much of the time). I cannot effectively use a keyer or straight key. Many amateurs who are affected by MS, Parkinsons, arthritis, etc., have also resorted to keyboards in order to send *good* CW. I realize there are a lot of dyed-in-the-wool CW traditionalists out there who loathe the "confounded gadgets," but some of these same operators send "personalized CW" without regard to the poor devil at the other end trying to read what is being sent! As Bill points out, some OTs are well aware of the "signature CW" and are proficient at solid copy. I feel we should all tip our hats to these *real CW operators*, but at the same time recognize the need for using keyboards or any other device (other than a reader, of course) to communicate good CW, should the need arise. Thanks, Bill, and thanks to the Amateur Community at large for preserving Morse Code ... after all, it is the foundation of ham radio communications; let's honor it by using it with proficiency! — *Barry G. Yoder, W8SJO, Bradenton, Florida*

TESTAMENT

☐ This November, a film was released by Paramount Pictures that portrays Amateur Radio in quite a favorable light. The film, *Testament*, written by John Sacret Young, is a story of disaster at a distance, and the agonizing end of a family.

The only means of communication in the disaster is the local Amateur Radio operator, W6DN, played by Leon Ames. (The call letters were used with the permission of Dr. Robert Kogen, W6DN.)

The story of how *Testament* came to the theaters would make a movie itself: Briefly, the project was developed by the Public Broadcasting System for its series "American Playhouse." Due to the cost of this rather ambitious production, some additional funding was provided by a British source.

When the film, starring William DeVane and Jane Alexander, was completed in September it looked as if it might have the "legs" to be released as a feature in the theaters. It was also hoped that this would recoup some of the overseas financing.

No distributor was interested in releasing the film. By October, it seemed that *Testament* would be seen only on the "small screen."

Films of *Testament*'s quality are usually sent to the various film festivals, and the cameras of "Entertainment Tonight" (a syndicated television "magazine") were on hand as the audience filed out of the theater after seeing *Testament* at the Aspen Film Festival.

It was obvious that the moviegoers were deeply moved. Many were very emotional, and there were comments such as "The Russians ought to see this."

A Paramount Pictures executive was flipping the channels on his TV when he came upon "Entertainment Tonight." The film was released to the theaters the following week.

Many W6s contributed to the authentication of Amateur Radio in *Testament*. There is no credit for them on the film, and rightly so. The real compensation is for Amateur Radio itself. Those who complain about our towers and TVI, or who confuse us with CBers, should see this film. — *Harvey S. Laidman, N6HL, Encino, California*

A DETACHED READER

☐ Attached you will find what is left of the cover paper from my March 1984 *QST*. It arrived near, but not around the mangled *QST* you designed it to protect. The copy is shredded in places and totally unusable.

Can I receive another? The mailing label survived on the cover paper so that you can see my mailing address. The table of contents — legible, although partially torn — suggests a very lively and interesting issue. If you send me another copy, I certainly shall read it.

Unless you instruct me to return the issue, I shall hold it, ultimately returning it to nature through the social disposal systems. — *L. B. Cebik, W4RNL, Knoxville, Tennessee*

[Editor's Note: Starting with the April issue, U.S. copies of *QST* are being mailed in plastic bags instead of the kraft paper mentioned by Mr. Cebik. (Canadian and foreign copies will be mailed this way soon.) His problem was not an unusual one. We believe the plastic bags eliminate most similar problems.]

VE COMPROMISED?

☐ I want to raise an eyebrow about a "free offer" currently available to volunteer examiners, which could easily compromise the integrity of the volunteer examiner code tests. In one CB publication, I see a half page ad for a $60 Novice study program that includes a 5-WPM code test tape for the students' *volunteer examiner*. Another publication has an offer from the same source of free code test tapes for all license levels, offered to qualified volunteer examiners, "to stimulate" the volunteer-examiner program.

I don't want to impugn the motives of the businessman involved, but I do see this whole arrangement as ill-advised. Obviously, a business has an economic interest in getting students to pass, since it guarantees customer satisfaction with its study materials. But, if the test tape is in the possession of the student before the test, or if the business supplies *both* the practice tapes *and* the test tapes, the opportunities for abuse become patent. It would be an easy matter for the student to memorize all or portions of the *test* tape in his or her *practice* sessions — either directly from the test tape or through the possibility of having the same materials appear in the study tapes as appear (in various combinations) on the examiner's tapes. This would reduce the code test to demonstrating memory rather than code proficiency, since it is easy to memorize words and word groups on code-practice tapes. — *The Rev. John F. LaVoe, WB2YOU, Utica, New York*

BE SENSITIVE

☐ Let's hope it's just thoughtlessness and not malice that causes some of the improper responses on our bands. The amateur ranks include many who are handicapped in one way or another. Often we would have no way of knowing it if not told. Perhaps the keying gets a bit sloppy — and then we learn that the key was being worked by foot.

One handicap is the loss of normal speech after removal of the larynx. Voice communication can be possible, though with some difficulty, and if an electrical aid is used about the best that can be said is that the speech is intelligible. Should one whose speech depends on such a device be practically forced off phone? Certainly he may be a bit hard to tune and copy. If you don't want to bother, just don't. It's your loss. But degrading comments that reduce any proper amateurs' enjoyment of the bands are completely out of line. — *David A. Heller, K3TX, Yardley, Pennsylvania*

10-MHz FAN

☐ After reading the article on 10 MHz (Jan. 1984 *QST*, p. 71), I was moved to stand up as an avid and dedicated user of that band.

Let there be one band, one little tiny slice of the spectrum where there are no contests, no pileups and, above all, no lids! One little band where you can work DX with low power and a dipole antenna, and actually ragchew without some lid telling you to QRT because there's others waiting.

This band attracts a different breed of amateur, a breed that I am proud to be a part of. We don't want a split band, higher power limits, contests or awards. Just leave us alone to enjoy ham radio as it once was.

I ask that the ARRL support the real users of the 30-meter band, and help us keep it the way it is. Your contests and your award programs have all but ruined the low ends of all the bands. Any attempt to ragchew with a DX station during an early morning opening is averted by a mob of "big guns" who feel that they have to jump in on top of you just so that they can prove to themselves and their buddies that they are the original "Mr. Big."

Where can the little guy go? You got it: 10 MHz. See you there. — *Steve Eichman, WA6IVN, Stockton, California*

*Public Information Coordinator, ARRL

How's DX?

Conducted By Ellen White,* W1YL/4

The Indian Ocean

Looking at the Laccadives

Early this year, your column editor got a chance to look at an Indian Ocean Atlas (CIA version) available from the Superintendent of Documents, Washington, DC 20402, thanks to the kindness of peripatetic W4ZCB. This March 1979 reprinting is a fascinating look at the third largest of the world's oceans. This vast body of water and its adjacent seas covers 14 percent of the earth's surface and washes the shores of over 30 independent nations. For centuries, the Indian Ocean has been an important route of discovery and of commerce.

The coverage of the Laccadives was particularly relevant, what with the recent VU7WCY event. The Laccadives is an all-encompassing term for a group of tiny, low coral islands 100 nautical miles off the southwest coast of India. Although there are numerous lagoons behind protecting reefs, the islands lack harbors usable by any but small boats. Ten of the islands are thickly populated, and 12 others uninhabited (although some are cultivated). This Indian Union Territory of Lakshadweep (renamed this in 1973) comprises the Laccadive, Minicoy and Amindivi Islands. Minicoy, the southernmost island, flanks a major shipping lane between the Red Sea and the Strait of Malacca. The islands, collectively known as the Laccadives, were administered as parts of districts in India's Madras state until the union territory was formed in 1956.

The weather is always warm and humid, rarely very hot and never really cool, with temperatures ranging 75°-86° F. Most of the 55-60 inches of annual rainfall occurs during the southwest monsoon, May through October. Occasional tropical cyclones in October and November bring severe weather conditions.

Coconut products provide the main source of income. Fish, mainly tuna and shark, are important for both local consumption and export. The inhabitants of all the islands except Minicoy are related to the Moplas, a tribe native to the state of Kerala. The Minicoy people share the Moslem faith of their fellow islanders, but their ancestors came from Sri Lanka. Minicoy has a matriarchal social organization; the men, noted as seamen serving on Indian Ocean ships, sometimes remain away from the island for months at a time.

Travel to these islands is closely controlled. Permanent settlement by nonislanders, even by other Indian citizens, is officially discouraged. The difficulty in accessing the Laccadives, coupled with the Government attitude, would seem to indicate pretty clearly that VU7 will continue to be rare on the ARRL's DXCC List. [Note that the December VU7WCY Laccadives operation is creditable towards DXCC, what with the documentation now confirmed.]

More on the exotic "Islands in the Sea" in future issues.

THE AVERAGE DXer, CIRCA 1951

From June, 1951, *QST*: "We believe Mr. Average may be assumed to be wending tortuously upward toward the 200-country mark and we undoubtedly would find him equipped with some sort of rotary beam, probably with three elements, the tuning and feeding of which he will never be fully satisfied with ... Due to the extreme availability of many neat little commercial exciters, his home-building is limited to the final amplifier stage and TVI preventative paraphernalia associated therewith. Where space allows he often has more than one final stage to facilitate band change and also an extra receiver with which to keep his ear on a QRL rare one.

"His QSL file isn't a thing of outward beauty, most likely a shoebox combo, but contained therein is treasure worth more than its weight in uranium. He long since ran out of wall space for the proper display of his trophies.

"Though he swears once or twice a year never to become embroiled in another "rat race," the next DX contest will find his poor family faced with the back of his head as usual. And at such times it will be his unalterable opinion that conditions are never quite up to par.

"All but his closest lay friends believe he may be sometimes slightly screwloose; said closest friends are sure of it. But he wends his merry way having fun, doing a good job and, when conditions are poor enough to give him time, writing needling postcards to DX editors who appreciate them very much."

DXERS' LAMENT

I think that I shall never see
My five-band DXCC.
With ten not even scratch or noise,
And fifteen good for stateside boys.
Twenty's gone by zero zulu,
Forty's full of broadcast voodoo.
That leaves eighty good for me,
With just wire up a tree.
I haven't got a chance, you see,
To work a five-band DXCC.
(Tnx NB7R, Oregon)

PETER I ISLAND UPDATE

WB3KLQ, a friend of W6YO (a regular contributor to this column), was traveling aboard the motor vessel *Lindblad Explorer* on a 37-day Antarctic cruise when he had the opportunity to land on Peter I, with no trouble getting ashore with the ship's Zodiak rubber boats. The historic event occurred just this past February 8, but unfortunately no ham gear accompanied the landing. A few quotes from WB3KLQ seem to capture the flavor of this exciting happening: "On westerly course we passed by the eastern shore about 5 miles off and found no apparent beach, then around the north tip to the western shore where about half way down we found Kapp Ingrid Christensen (a precipitous, barren, rocky promontory). Landing by Zodiak (inflatable rubber type boat with 25 HP outboard motor) was easy by approach and somewhat tricky at landing due to surf. A pleasant little cove protected a beach covered with lava bits. Inshore lava covered mottled ice where tents and equipment can well be placed. Rocky highland all about the cove keeps the wind off this protected area of possibly an acre or so in extent. In 1982 or 1983 a Zodiak with 9 or so on board visited the island. We found a metal plaque from a Russian research ship Vostok as having had personnel ashore in 1983.

"Luckily we had an east wind which prevented landing on the east side even if accessible beach was available (none was apparent). On the lea side where we landed, the height of land provided much needed protection. A wind shift could be as hazardous as heavy ice. Recommended landing times would include late December, January to early February. Landing craft such as we used is recommended. Ice: This is the first year this ship has been able to get near the island, anchored at 35 fathoms 2 miles off the western side. On previous years they could not get closer than 5 to 12 miles." More interesting information should be available from WB3KLQ.

ALGERIA

In mid-December, KC2XK was welcomed to the 20th anniversary Annual General Meeting of the Amateurs Radio Algeriens. Andy notes that the club's president and founder, M. Yacoubi, 7X2SX, remains the motivator behind Amateur Radio in Algeria, and has defended and nurtured it for over 20 years. Some perspective on Amateur Radio in that country is afforded by Andy's letter:

"In Algeria, as in many countries, most of life is politicized. In this country, the ARA collectively and amateurs individually are acutely aware that they must not transgress certain barriers. Their continued existence depends on the view held of them by almost all the ministries, and particularly by the PTT, the Ministry of Defense, the Ministry of Interior and the Ministry of Foreign Affairs. Every amateur knows that to be seen to communicate with a station in a "pariah" country puts at risk the existence of the hobby and at the very least promotes the enactment of specific country restrictions — a bad precedent. Likewise, they're aware that their conversations on the air must be kept apolitical and beyond reproach; further, that they must not serve to convey messages — third party or not — that would impinge on the interests of the PTT. From the point of view of Algeria, Amateur Radio attracts students into studies related to telecommunications and so increases the pool of technically qualified potential employees, is an internationally recognized "sport" and puts Algeria "on the map" within a prestigious subculture, and holds potential as yet unrealized as a recreation for the handicapped (a major current interest of the government)."

Andy views the technical competence of Algerian amateurs favorably with those of others in developing countries, with main problems arising from lack of access to foreign exchange with which to purchase equipment, parts, literature. The amateur community has gratefully received some equipment donated from abroad, including rigs donated under the ARRL program.

An interesting insight. Thanks, Andy.

DXAC NOTES

The new Delta Division representative is K5OS, who is replacing the long-time active K5YY. New to the Atlantic Division (replacing K3KA) is K2NY, remembered by many OTs as hot-shot contester K2KTK. The Advisory Committee, in conjunction with Hq., is reviewing the DXCC accreditation criteria, hopefully to soon appear in your journal.

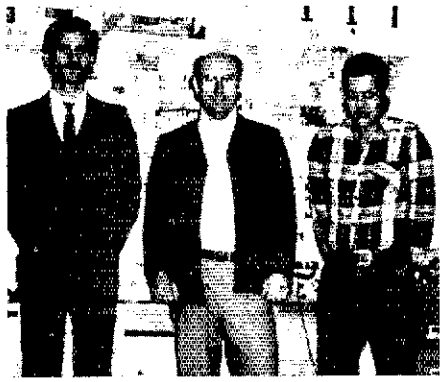
QRZ DX (February 20) contains a well-written "Examination of the DXCC Process," by K5NW. It continues to amaze and delight a participating DXer to note the interest shown in the mechanics of decision making and the understanding that the process is complex but does indeed involve the member, the DXCC "player," the volunteer committee people and the professionals at Hq. A "game" playing almost 40 years can't be all wrong!

K4YT'S TRAVELS

During February 1983, Karl was in Baghdad and visited YI1BGD. He notes that Iraq has been divided up into eight districts, YI1 through YI8, leaving YI9 for foreigners and YI0 for special-event stations. Until the tension in the Middle East is eased, however, the PTT will not issue personal licenses or call signs. From Baghdad, Karl flew to Karachi, where he visited

*19620 SW 234 St., Homestead, FL 33031

Left to right are K4YT, YB1PG, YBØACP, ORARI staff member and YBØKL



Kamal and Saad with K4YT (center) at YI1BGD

K4YT's BY1PK stop (l-r): Mr. Yan, KG3R, KB7NK, Mr. Tong and K4YT

Hamid, AP2HM (ex-C5ACA). He managed to operate a bit during the ARRL March 5 contest, and helped Hamid install 40- and 80-meter antennas. Next stop was Bombay, and entertainment by many of the friendly locals. Enroute to Kathmandu he stopped in New Delhi and operated VU2YOU, and had the chance to attend a ham radio club meeting at the Delhi branch of the ARSI, meeting VU2CK.

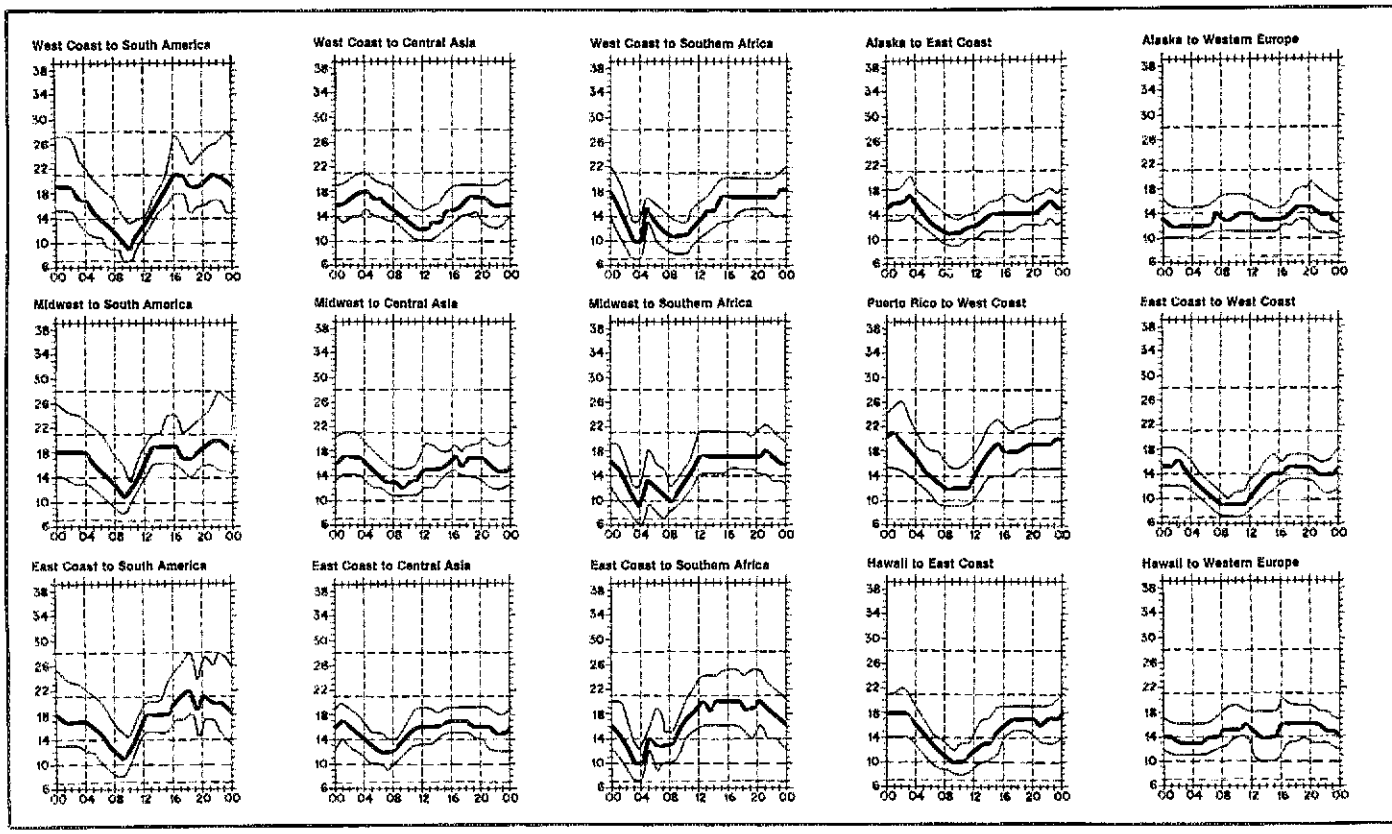
Karl notes that Kathmandu is high in altitude and quite cool, with the Himalayans in the distance. He had the good fortune to have dinner with Father Moran and also do some operating. After a week in Nepal he moved on to Colombo, Sri Lanka, but without permission to operate. From there he journeyed to Bangkok, where he was licensed as HS1AMT. Good timing had his stop coincide with the monthly RAST meeting, and Karl received a detailed explanation as to why there is no Amateur Radio in Thailand at present. The government had suspended all Amateur Radio operations, except for special contests.

From there, Karl's Asian trip took him to Jakarta, where he visited YBØACP (now YBØARA, K6DLV). Business commitments limited time. Even though there is reciprocity with Indonesia, you still can't get a license unless you possess a resident ID card, which is not easy to obtain. The next stop was Singapore, where he met 9V1VP, VM and YB4AQX (ex-AEP). 9V1VP (ex-ZE1CY, A2CCY, N6BPM) put his station at Karl's disposal, but propagation didn't cooperate.

From Singapore, Karl flew to Manila and ultimately received his /DU1 license. He was a guest of KB7NK/DU1 (ex-9G1RT, 5T5AZ, C5AZ), and was lucky in that his visit coincided with a PARA convention. He had eyeball QSOs with NØZO/DU2 and DK9VC/DU1, both of whom were responsible for relaying and taping much of the Spratly Island misfortune. The next DXotic stop was Hong Kong, where he renewed his old call, VS6EC, and operated as a guest of VS6BT.

From Hong Kong his trek took him to Guangzhou, and thence to Shanghai. Then, on to Beijing and BY1PK. With his YL, Janie, KG3R, and KB7NK/DU1, Karl visited BY1PK and enjoyed an hour of discussion with Mr. Tong and Mr. Yan. At that time the station included a TS-930S, an MFJ keyer and a Canadian 2-kW linear. From Beijing, their trip went to Tokyo via Shanghai. During the Tokyo visit, the JA Family DX Club (headed by JA1ELY and JH1ARJ) held a luncheon in Karl's honor. Unfortunately, work kept Karl from spending as much time as he wished to sightsee.

Next stop was Hong Kong with plans to operate in the June contest either from CR9 or VS6. Although this was the last operating stop, the trip home included stops in Manila, Hawaii and San Francisco.



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 the

THE CIRCUIT

☐ China: The Chinese Radio Sports Association, which represents the amateurs of the People's Republic of China, has applied for membership in the International Amateur Radio Union. Late May will see the results of IARU balloting.

☐ Vanuatu: Another application for membership in the IARU has been received, that from the Vanuatu Amateur Radio Society, representing the amateurs of the Republic of Vanuatu (formerly the New Hebrides). The same late May date as above will reveal IARU tallies.

☐ PJ7A: The station was operated by N2GC and N1EE during the CW ARRL DX event. QSL N2GC/PJ7, N1EE/PJ7 and PJ7A (Feb. 18-19, 1984 only) to N2GC.

☐ K7JA: Contest pro and Yaesu V.P. for Amateur Products Chip Margelli was invited to visit the People's Republic of China in late March. Chip expected to be accompanied by his XYL, WA7WMB, and VE3HC.

☐ Kermadec: All ZL8 calls for this mid-March planned event go to the corresponding ZL1s, except ZLØAJW/8, which goes to ZL1BQD. Before and after the Kermadec trip, ZLØAJW cards go to W6REC.

☐ 9F3USA: VE3IG still has logs for John Seibert's operation from April 7, 1971 to January 19, 1972. (Last call and contact was made with Maurice, FB8XX). Vic also has the logs for the operation of ET3USB from August 14, 1971 to November 6 that year. Of course, s.a.s.e. or IRC to cover the return mailing expenses.

☐ SPØOF: W8MAW got a chuckle out of the March QSL, relating a similar event in 1938 at the Chicago National Convention when a local walked the convention floor bearing a SMITH QSL!

☐ The Colvins: Following a 5500-QSO stint in Paraguay, Lloyd and Iris headed to Chile, with sights on both Easter Island and Juan Fernandez.

☐ KCDX: Congratulations to the Kansas City DX Club, celebrating its silver anniversary this year. A recent issue of the *Kansas City DX Club Newsletter* was both informative and entertaining. For example: question — What is the definition of an expert? Answer — He is just like you and me, only he's organized and has slides. This issue had a marvelous tribute to W4KFC showing Vic's outstanding DX contest scores since 1947 in both the ARRL CW event and CQWW CW. Nice going, KCDXC!

☐ Help! N9NB is desperate for QSL information for the following 1977 contacts: KG6JIH, 5V7WT, 9J2LM, A9XCC, C5AAB. Ted also wonders whether there was ZS2MI operation in late 1979?

QSL Corner

Administered By Joan Becker, KA1IFO

Here is some information for those of you who would like to QSL direct to the station location. It is passed along as we receive it and, therefore, may not be accurate. The call sign in parentheses is the QSL manager.

A22ME (AK1E)
A22TE (AK1E)
A22CA (AK1E)
A4XJW (N4WF)
CN8CX (HB9AGH)
FB8WG (W4FRU)
FB8YK (F6EWY)
FG7CO (FG7BT)
FO8JP (F1BBD)
HH2B (N4WW)
HL9FY (KCØLG)
HL9RC (KCØLG)
HR1DAP (K8CC)
J28DM (F6GYF)
J39BS (WB2LCH)
J73DF (N4CRU)
TI9CF (TI2CF)
TI9CRM (TI2CRM)
TU2NW (AK3F)
T2ADX (JA2VUP)
T2RAR (JA2VUP)
T2RTY (JA2VUP)
T2YKC (JA2VUP)
VP2KBV (KCØFW)
VP2KD (WA6ZEF)
VP2KM (WA6ZEF)
VP8KF (G3VPW)
VP2MGT (KC9LZ)
VP2MIU (AB1U)
VP2MJI (W2BJI)
VP2MKY (KY5R)
VP2MM (AB1U)
VP2MPB (N3CEX)
VP2MSS (K3RMX)
VP2MTY (WD4FHN)
ZS1CT (DL2MY)
ZD7CW (N4CID)
3X4EX (N4CID)
5W1DC (DF7CC)
8P6NX (WØSA)
9U5TB (ON5NT)

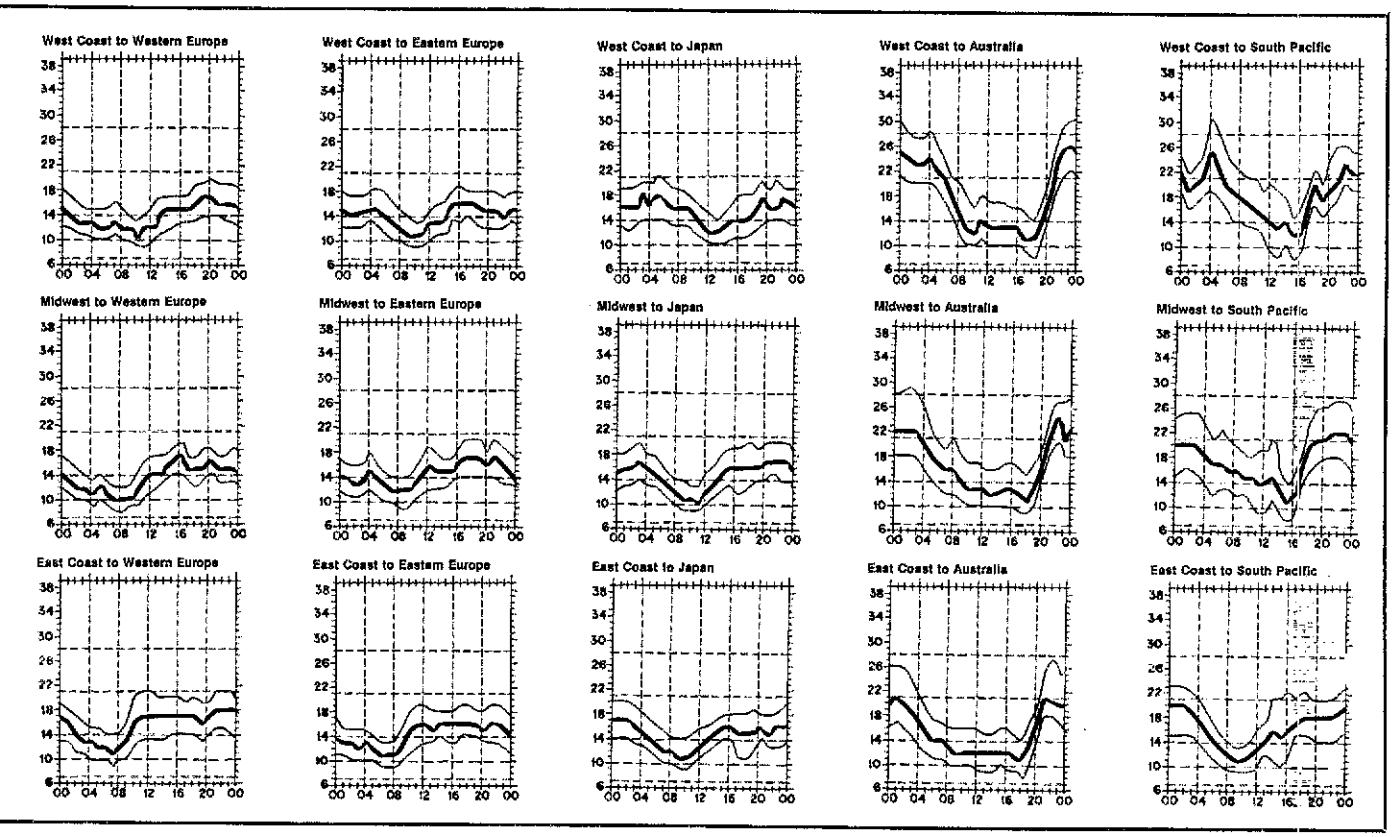
QSL Manager Volunteer

WA6ZEF (Caribbean and Pacific)

Special Notes

☐ A new address for the VP2V bureau: British Virgin Islands QSL Bureau, Box 653, Road Town, Tortola, British Virgin Islands.

☐ March 1984 QSL Corner, page 65, contains information on the operation of the ARRL Outgoing Overseas QSL Service. December 1983 QSL Corner, page 75, contains information and addresses for the Incoming Bureaus. For information on bureau operations (Incoming and Outgoing), send a self-addressed, stamped envelope to ARRL QSL Bureau, 225 Main St., Newington, CT 06111.



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 May 15 to June 15, 1984, assume a sunspot number of 51, which corresponds to a 2800-MHz solar flux of 103.

DX Century Club Awards

Administered by Don Search, W3AZD

The DX Century Club certificate is awarded to amateurs who submit written confirmations for contacts with 100 or more countries on the official ARRL Countries 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 February 1 through February 29, 1984. An s.a.s.e. will bring you the full rules for particpation in the DXCC, the DXCC list and application forms.

New Members

Mixed

CO2PY/154 HA5FK/110 JJ1UJK/109 JA6GXP/311 VE3NBG/106 WB1AGR/199 WA2JQW/101 ND5R/292 WD8PFI/236
DL2GBB/120 I8YRK/335 JR1GSE/111 LA2TAA/105 VE3NSZ/101 AC2F/206 WA2VXQ/106 KF6KR/103 AF9R/240
DLØKB/110 IK8AUC/119 JF2DJV/257 LA4DCA/114 VE4AGR/166 K2HPV/107 WB2CVL/301 NQ6U/100 KD9J/110
EA3DBO/110 JA1FKY/103 JF2HPA/252 LU9AAS/103 VE5VJ/124 KA2LGL/115 N3CRR/103 N7DDK/106 KM9G/126
EA4AYD/109 JA1WAE/285 JF2KBK/189 OE5SPW/230 VK9YB/106 KC2DE/100 N4DAD/106 K8UNP/140 KM9Y/271
EA7BYM/120 JE1MGE/309 JF2RJV/123 ON5WQ/241 YU2RVF/203 KZ2H/139 N4FKZ/HR/224 K8UNP/PJ2/101 KS9S/107
F8HLB/110 JH1OGT/112 JR2CFD/160 PW8ET/151 6Y5AG/129 KZ2L/102 W4VGL/103 KZ8I/110 WD9HZK/165
F6HWU/110 JH1WJR/240 JH3CKP/143 SMØNJJ/118 6Y5EE/152 NA2K/269 N5CFU/104 NA8D/100 KAØCWM/113
GM3YCB/102 JJ1UDI/125 JR4ISK/135 VE1UNB/211 KG1F/123 W2JAJ/101 N5DUQ/110 W8VSA/271 NØAZ/104

Radiotelephone

DA1GK/104 EA7BYM/114 JR1GSE/109 LA3JT/106 ZP5RAB/134 WA2JQW/101 WA4MJI/208 WA6QGH/101 KM9Y/237
DF2IS/110 EA7DGO/122 JF2DJV/253 LZ2KK/109 6Y5AG/129 WA2VXQ/105 WA4YLD/105 WB6FSR/103 W9LNQ/199
DF9SP/116 G3BRD/152 JF2HPA/232 ON4SW/196 6Y5EE/152 WB2KSQ/107 WB4ZAB/104 W7ODP/102 WD9HZK/165
DJ9DX/205 I7KBI/307 JF2KBK/186 PY1ACC/197 9G1MK/142 N3CRR/103 N5DUQ/108 K8UNP/135 KAØCWM/112
DU6JM/139 JA1WAE/166 JF2RJV/122 PY2WT/265 KG1F/120 KE4SN/103 ND5R/292 N8BDM/212 KBØWJ/112
EA3AWZ/105 JE1MGE/300 JH4INU/208 V2AN/104 AC2F/204 N4EZA/100 KF6KR/102 WD8CCC/107 WØOSK/157
EA3DDP/235 JH1WJR/228 JA6GXP/308 VE4AGR/165 KZ2H/106 W4RYG/105

CW

CE3CEW/112 F6HLB/107 JJ1CZR/104 JA7COE/230 OZ1CAR/109 K2HPV/100 N5CPG/101 K8IU/100 KD9J/110
CO2PY/102 G4KGG/101 JJ1UJK/109 LA1PBA/100 SP5LGT/103 NA2K/108 NA5C/119 KA8CPA/103 KM9G/104
DF3FR/104 HB9CBQ/100 JH3CKP/142 LZ2KK/106 VE3IRF/102 NE4G/108 AE6Y/204 KF8K/155 KM9Y/204
DK1GF/106 IØAOF/103 JJ3AFV/120 OE5SPW/105 VE7AAQ/272 NK4L/114 NQ6E/127 N8CQA/103 N9FC/131
DL2GBB/103 JA1WAE/114 JR6CET/112 ON4SW/198 XE1X/134 W4AAV/196 KM7Z/100 AF9R/160 W9NGA/197
DL2HD/208

RTTY

SM5FUG JR2CFD

160 Meters

GW3YDX W2TQC GM3YCB W1JZ G3RBP

5BDXCC

JA9AGX YU2AKL OE1BZL JA6VU SM6DYK 6W8AR AA4V LZ2KK JH7DNO
JA2LA WBØNHD K4WHN PAØTA

Endorsements

Mixed

DF5DP/231 JR1JFO/311 T77C/309 K2YGM/308 KB4Q/152 WB4NMA/176 NQ6E/202 N8ZA/301 W9KE/142
DJ1ND/281 JF2GYH/237 VE2BUW/163 KA2CDE/224 KC4OV/281 WB4OSN/308 W6BVM/354 NE8M/225 W9KQD/338
DJ6TK/329 JH2RWP/206 VE3AZJ/132 KA2MBC/155 KF4SA/151 WD4HRO/225 W6RFF/263 W8LZV/296 W9LIH/191
DK2UA/301 JI2MBN/129 VE4ADG/255 KC2CS/182 KF4YH/127 WS4E/225 W6TWZ/345 W8QFR/332 W9NYW/260
DK6ED/280 JA3AAW/331 VE5RA/306 KF2F/279 N4AXR/301 KC5M/291 WA6EZV/261 WD8OTZ/257 W9PWM/223
DL1QT/296 JJ3AFV/156 YS1GMV/200 KN2B/202 N4FKZ/289 KD5RO/272 WA6ODY/126 K9BWQ/319 W9ROK/202
DL7MAE/281 JJ3FOZ/154 YU1DZ/319 N2IT/220 N4GE/305 KX5V/280 K7RDG/311 K9DDO/204 W9WAQ/255
DL8GAE/151 JA5EN/323 YU4TU/316 N2LM/328 N4TX/308 N5CPG/133 KA7AUH/305 K9IL/317 WA9CYG/154
G2AFQ/234 JA5PUL/313 YU4ZA/175 N2OO/316 N4UU/315 NA5S/174 KD7H/201 K9TI/296 WA9YTQ/273
G3GMY/174 JA7COE/256 K1DP/300 W2SR/287 NE4G/250 W5GEL/347 KI7W/168 K9VAL/305 WB9MSV/301
GM4SID/144 JA8BMK/321 K1GVW/199 W2TO/258 NK4L/264 W5HTY/326 KI7X/153 KA9HDA/125 KAØIQR/239
HB9IK/341 JA8EL/321 K1PV/135 W2VYX/320 NV4O/195 W5JE/274 W7ALZ/260 KC9CQ/282 KBØTL/184
HB9TE/253 JA8MS/330 KA1JC/184 K3QIA/228 NX4N/250 W5VJW/181 W7EOI/317 KG9E/220 KBØU/300
HKØEHM/272 KP4BJD/291 N1CBM/155 KE3W/232 NX4Y/235 W5VSZ/302 W7KH/364 KM9W/155 KBØZU/150
IT9FWD/182 NL7J/260 W1CNU/275 W3TV/341 W4BRE/337 WA5YON/129 W7MCU/205 KO9Q/271 KD0Q/195
IT9TQH/263 OE1CPJ/305 W1CYB/252 AA4CM/296 W4RIM/322 WA5ZIJ/289 W7TVF/316 KR9S/182 WØGAX/262
JA1DFQ/332 OH2LU/321 WA1UDH/175 K4FY/311 W4ORT/334 WB5MTV/151 W7YF/185 N9ALC/272 WØJLC/268
JA1FHK/334 OH3XZ/317 WB1EAZ/290 K4JEZ/268 W4PRX/290 K6IR/323 K8ICE/228 N9BOK/204 WØJSN/258
JA1OCA/331 ON4SW/262 WB1FDY/125 K4QE/150 W4ZR/343 KB6WI/181 KC8JH/298 N9NS/304 WØOSK/157
JA1OYY/317 PY5EG/295 K2NY/325 K4YXJ/310 WB4BBH/209 KJ6V/325 KC8YW/193 W9KA/325 WØULU/291
JG1FVZ/236 SM5FUG/197 K2VV/327

Radiotelephone

CE3BBW/252 JG1FVZ/194 VE1JL/206 KC2CS/181 N4FKZ/282 WB4YNL/201 K6IR/323 W7KH/339 KA9HDA/125
DF5DP/229 JH1IED/262 VE4ADG/250 KC2JA/236 N4FKZ/HR/211 WB4ZIM/252 KB6BW/250 W7KOI/273 KR9S/174
DJ2YL/315 JF2GYH/228 VO1CU/322 KZ2P/290 N4UU/277 WR4V/206 KC6X/226 W7TVF/255 N9AZK/225
DK1HG/134 JH2RWP/206 VP2MO/256 N2LM/307 NE4G/226 K5GZ/300 KE8DN/151 WA7JUJ/224 W9KQD/316
DK2WH/301 JA3DY/310 YS1GMV/200 NA2K/267 NK4L/261 K5IH/277 N6DHX/175 N8BIB/261 W9OKL/270
DL7MAE/261 JJ3FOZ/154 YV5AMW/195 WB2CVL/300 NV4O/172 KA5GRP/178 W6FAH/175 W8JIN/353 WB9JBH/269
DL9DE/203 JA4CUY/300 ZP5JCY/234 WB2WEO/155 W4AXR/335 KC5JW/297 W6KTE/342 W8NDJ/275 WB9JXT/281
G2AFQ/234 JA4ZA/338 KA1JC/184 N3CWP/150 W4KHW/290 KC5M/290 W6OMR/309 W8VSA/270 WB9MSV/270
G3KLL/251 JA5PUL/311 N1API/270 WB3ABS/286 W4ZCB/306 NA5C/277 WA6EZV/261 WA8KMK/150 KD0Q/252
HB9BR/175 JA7EPO/254 N1CBM/155 K4PDV/340 W4ZR/343 NA5S/174 WA6IVO/207 WD8SDL/178 KQ0J/215
HKØEHM/272 JA8BMK/294 W1CYB/252 K4QM/244 WA4GKT/280 NK5Y/251 WB6POP/315 WD8OTZ/257 NØCXE/208
I2YBC/322 JA8EL/297 W1WXZ/300 K4RSB/304 WA4PMF/125 W5HTY/326 KA7AUH/303 WD8PFI/232 WØGAX/205
I3DSE/300 LU3AJW/308 WB1EAZ/290 K4FY/293 WA4WTG/319 W5LLU/269 KB7SU/276 WD8RKT/271 WØJLC/159
I8ACB/313 OE6HCG/134 KA2CDE/223 KC4BX/251 WB4KTG/294 W5MQV/224 KI7X/152 K9BWQ/318 WØJLU/290
JA1DFQ/315 PAØKB/309 KB2EF/262 KC4OV/279 WB4NCJ/203 W5VSZ/292 W7CMO/341 K9TI/286 WA0LHK/225
JA1NLI/279 PP2ZDD/226 KB2XP/225 KF4YH/127 WB4SWI/290 WB5CBJ/295 W7EOI/317 K9VAL/301 WBØCGJ/268
JA1OYY/317 PY5EG/294 KB2XP/VE3/165 N4AXR/300

CW

DF2PI/202 JA5PUL/263 SM5FUG/152 KA2DIV/232 K3QIA/214 WB4BBH/130 W7TVF/190 K9IL/272 W9RTD/202
DK6NC/187 JA8BAR/194 SM6INC/214 N2IT/218 AA4CM/280 WB4MAI/221 K8PXG/191 K9TI/266 WB9MSV/180
DL7MAE/222 LA1ND/225 TG9NX/300 W2SR/269 KV4F/250 WB4OSN/280 KC8JH/214 W9KQD/289 KBØTL/158
GM4SID/137 OH2VD/210 K1PV/127 W2TO/201 N4FKZ/206 W5KC/280 W8FWQ/126 W9LIH/177 KD0Q/227
JG1FVZ/132 ON6NW/193 K2UFM/270 W2TQC/265 N4UU/227 KI6O/203 WD8KZS/128

DXCC NOTES

Honor Roll corrections: Phone, W9WHM 315/358

The World Above 50 MHz

Conducted By
Bill Tynan,* W3XO

For the Birds!

Radio amateurs are known for responding to requests for assistance from deserving causes in which our talents are needed. Prime examples are the furnishing of communication for local parades, helping with charity telethons or participating in emergencies and the drills so necessary to prepare for them. Although many of these activities require our abilities as communicators and many employ VHF frequencies, seldom do they particularly tax the unique skills possessed by VHFers.

One of these is the ability to utilize very weak, and sometimes short-lived, signals. Now, the assistance of the amateur community is being sought for a project that does require the utmost in capability to copy very weak and fleeting signals. This is why this plea is being aimed especially at hams who specialize in the bands above 50 MHz.

The project involves the fitting of very small, low-power transmitters to birds in order to determine their migration routes. A suitable transmitter, containing a digital identification circuit and with battery life sufficient for one year of operation, has been developed and a number constructed. These tiny units put out about 2 mW of RF power on 164.5375 MHz and transmit the data as frequency-shift keying (FSK). The intention is to place a number of them on Peregrine falcons this summer to track the flight of this endangered species. Their trek begins in early fall from breeding grounds in Greenland and ends in South America. A few special low-noise receivers, which are capable of picking up and decoding the signals from these transmitters and printing out a message identifying each specific bird, are being built. These receivers will be provided to selected volunteers who reside along the migration route, which generally traverses the Eastern seaboard of the U.S.

To increase the coverage and provide additional data, others are asked to participate by furnishing their own equipment. It will not be necessary for them to construct circuitry to decode the digital information, but merely to record it on audio tape. The signal levels will be quite low, optimistically estimated at about – 110 dBm for a bird 30 miles away and flying high enough to provide line-of-sight propagation. Obviously, if the bird is farther away or is below line of sight, signals will be much weaker. Therefore, it will be necessary to use weak-signal receiving techniques. A low-noise converter for 164 MHz operating into an SSB/CW HF receiver or VHF multi-mode transceiver would appear to be the way to go.

The digital data, transmitted in short bursts about 250 ms in length every 30 to 40 seconds, can then be recorded as audio tones. The tapes would then have to be labeled with the location and time of reception, and mailed to a central collection point. Those receiving the tapes will construct the necessary equipment to accomplish decoding in the presence of quite a wide variety of tone frequencies; thus, precise tuning on the part of the persons taking the data should not be necessary. If a stereo tape recorder is used, WWV can be put on the second channel to provide a time reference. A VOX type circuit could be used to activate the tape machine when transmissions are received. This will allow a single cassette or reel of tape to last for a considerable period, and will permit unattended operation.

It's a real challenge for accomplished VHFers, especially those who like to spend their time digging for weak signals. Those interested in participating may contact Dr. Paul W. Howey, G4BBP/W3, Johns Hopkins Applied Physics Laboratory, Johns Hopkins Rd., Laurel, MD 20707.

ON THE BANDS

6 Meters — Just as almost everyone had buried it, F_2 DX proved that reports of its demise were somewhat exaggerated. KA9MGR writes that he worked LUs 1YBV and 1YYO (8YYO — Ed) at about 2045Z March 4. The WA5IYX report for the period between January 1 and March 5 contains a number of reports of openings to South America, including several occurrences of TV Channel 2 propagation. Around 2000 on both February 27 and 29, Pat heard weakly the signals of LU8YYO. The latter day also produced Spanish FM communications just below the band. Then on March 2, between 2230 and 2330Z, he observed backscatter signals from K6HCP, W5FF and KH6IAA, all peaking southwest. The following day, from 1820 to 2130Z, the HC2FG beacon was in with signals varying between S3 and S9. It is nice to know that this beacon is still operating. The last day of the report, March 5, Pat's notes show LU8YYO beginning about 1900Z and the HC2FG beacon at S9 plus 20 dB about the same time. A few minutes later, he observed strong video from TV Channel 2 but no sound. The fact that the sound was not received would indicate that the propagation was F_2 rather than E_s. Before things faded out about 2130, he heard LU8YYO work an XE, and was able to detect the backscatter signals of WA4UAS and WB7OHF. LU3EX reports that on February 29, he heard PJ2DW, 9Y4VAN, YV5CSL, HK1BAU, HK4CZE and the FY7THF beacon along with K6HHJ, who was in QSO with LU8YYO.

It is interesting to note that the 10.3-cm solar flux reading ranged between 157 on February 27 to 120 on March 4, and that the earth's magnetic field was disturbed on both February 27 and March 2. Once again, north/south path openings follow a magnetic storm.

Speaking of the solar conditions and other related information, a recent letter from NOAA indicates that, because of budgetary cutbacks, consideration is being given to dropping the 18-minute-after-the-hour solar information broadcast on WWV as well as the weekly summaries they have been publishing. Comments on the need for these services may be addressed to Mr. Harold Leinbach, Acting Director, Space Environmental Laboratory, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, 325 Broadway, Boulder, CO 80303. Let's make a strong pitch to retain both of these valuable services.

As of his letter dated February 27, K6QXY had not heard any 6-meter DX since December 10 when KH6IAA was in. Bob's approach is to go moonbounce. He says that his fully steerable 6-meter EME array, consisting of eight 7-element KLM Yagis at 55 feet, is almost complete.

For those wishing a QSL from TG9NX, I have been informed that cards may be sent directly to Frank at the address listed under his U.S. call, N4FKZ. He does not have a QSL manager, as erroneously reported several months ago in this column. I am sorry if this has caused confusion.

2 Meters — The major 2-meter news this month, as well as that for 70 cm, concerns the very successful EME DXpedition by Mike, K6MYC, Ken, K6HCP, and Dave, K7OMA, whose QTH at Kaialua Kona on the Big Island was used. The three certainly did an outstanding job on both bands. The 2-meter equipment included an 8877 and four of the new KLM 28-foot-long 16LBXs. The setup accounted for a total of 75 stations in 24 states and 15 countries. Among the more outstanding accomplishments was a contact with ZS6ALE for what is said to be a new moonbounce record of 12,000 miles, or 19,200 km. For this schedule, they had a common moon window of only 11¼ minutes. Another highlight was a QSO with W5UWB, who was using a single Yagi. From the many letters I have received saying that their K6MYC/KH6 contact represented the final state, it appears that the three accomplished their mission of swelling the WAS rolls. A pair of 4CX250Rs and eight of the new KLM 22-foot 30LBXs handled business on 70 cm. On that band, they worked 36 stations in 17 states and 9 countries. That would represent a FB total if only the one band was involved, but since it represented only part of their effort, it was great going, indeed. I am sure that I can speak for the gang on both bands in expressing gratitude to Mike, Ken and Dave for their considerable expenditure of time and money to put on this fine DXpedition.

Aurora furnishes the other piece of 2-meter news. N9AQ noted buzz sessions on the evenings of February 3, 4, 13, 14 and 22. KA2BTD New Jersey reports working 15 stations on the 13th to bring his grid total to 50. Aurora does provide a fine opportunity to pick up new grids. WA2ZPX New York caught auroras on February 4 and 11. Rich says that the latter was the best he has heard in quite some time.

WD5HRO New Orleans says he is new on 2 meters, having bought an FT-726R for OSCAR 10, but found that there are other things to use it for as well. Bill's fortuitous location near the Gulf has enabled him to work stations from Florida to Laredo, Texas, on the Mexican border. He says that W5VAS has taken the lead to start a Gulf States Sideband Net. The group meets Thursday evenings at 2000 Central Time on 144.220. Check-ins are most welcome.

1¼ Meters — It is with great pleasure that I announce the latest of those few who have succeeded in working all 50 states on 220 MHz. It couldn't happen to a more deserving pair. One of them has worked tirelessly for a number of years to promote SSB and CW work on the band, especially the moonbounce mode. Most readers will have guessed by now that I am describing Lee Fish, K5FF. Lee joined the WAS ranks on Saturday evening, March 10, when she worked WA4MVI/South Carolina. The portable station was lent by K7NII. Her OM, Fred, W5FF, drove to Arizona to get it, and then trucked it all the way to South Carolina, where he was joined by WA4MVI. There, he and Jim set up and began the operation. The day after the K5FF contact, Lee worked them again, this time signing W5FF so Fred could collect the state, too. It was no mean task to run the station, including the 32-foot dish all by herself, but she did it and her long quest is over. I'll have more next month on the rest of the details of the South Carolina operation. For now, congratulations to all who had a part in it.

The Higher Bands — What is believed to be the largest 70-cm net in the world, The Southeastern VHF Society's Wednesday evening get-together, is still alive and well, according to a letter from WD4MBK. Charlie notes, however, that check-ins from the Northeast have declined somewhat in recent months. The net provides a fine opportunity to check out a new piece of 70-cm equipment, including that rig bought with only the satellites in mind. Charlie says that new check-ins from this source have already been noted, thanks to missionary work done by NI4Z, WB8ZTV, WD4FAB and other active OSCAR users. The current net schedule calls for WA4ZIA Charlotte to look east beginning at 2100, southeast at 2110, toward Jacksonville at 2120, toward Pensacola at 2125, at Atlanta from 2130 to 2145, west at 2150 and into Tennessee at 2155. W4GJO in north Georgia is often on hand to help with western and northwestern stations. At 2200, K4CAW Greenville, North Carolina, takes over net control beginning

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

50-MHz DX Standings

DXCC countries based on information received as of March 17, 1984. Space limitations dictate that continental U.S. and lower-tier Canadian stations with fewer than 15 countries, except those who claim WAC, not be listed. Crossband totals listed are those not duplicated by 6-meter two-ways. Credit has not been given for contacts made with stations known not to be authorized 50-MHz operation at the time of the contact; otherwise, countries are those listed in latest ARRL DXCC Countries List. Unless stated otherwise, totals are those worked by individual or club stations at a single location or multiple locations within a radius of 150 miles. Deadline for next update is September 1.

	1	2	3	4
JA4MBM†	77	76	0	0
VE1YX†	75	75	17	16
KH6IAA	73	70	0	0
K8WKZ†	69	68	17	16
LU3EX†	69	67	0	0
VE1BNN	67	67	6	6
WB4OSN†	67	66	0	0
W5VY†	67	63	11	9
K5FF†	66	65	3	3
JA1RJU†	65	65	0	0
W4OO†	65	61	0	0
WD4IYS†	65	53	15	13
W2IDZ†	64	64	12	11
K1TOL†	64	64	0	0
JA1VOK†	63	63	0	0
W5FF†	63	62	2	2
ZD8TC†	62	62	10	—
W8CMS	62	60	12	9
N3AHI†*	62	59	13	11
WA4OWO†	62	54	0	0
JA3EGE†	61	60	0	0
JA2DDN†	61	60	0	0
W5HUQ/4†	61	59	17	9
WA4UAS†	61	59	0	0
WA7JTM†	61	57	1	1
WA8LXJ†	60	55	18	18
WA5IYX†	60	54	10	8
W3XO†	60	52	15	6
JA5HTP†	59	58	0	0
K4KUZ†	59	57	0	0
W6XJ	59	—	3	—
W4WHK	58	54	18	8
KA1PE†	58	54	0	0
LU9AEA	57	56	0	0
W4CKD†	57	54	20	18
W3JO	57	54	9	4
WA2BPE†	56	56	14	6
WB2CZB†	55	55	15	12
K1ZFE†	55	55	5	5
LU3DCA	55	55	0	0
KA1BRD†	55	55	0	0
W6BJI†	55	54	2	2
JE1TGN†	54	54	0	0
WA6BYA†	54	53	0	0
WB7OHF†	54	52	1	0
N6AJ†	54	51	1	0
LU7DZ†	54	48	0	0
W3IWL†	53	52	15	15
W7KMA†	53	52	2	1
K8EFS†	53	51	18	15
JA2ODM†	53	48	0	0
W5UWE†	53	42	0	0
WB8BKC†	52	52	16	15
JA0AGA†	52	52	0	0
K4CKS†	52	46	18	13
WA6JRA†	52	18	3	1
WA1OUB	51	51	16	13
W8SF†	51	51	0	0
W1QXX	51	50	14	12
K5ZMS†	50	50	2	0
K5SW†	50	49	10	10
WB2PMP/4†	50	49	10	9
W6SMS†	50	48	1	—
PY2XB†	50	47	2	1
WB7TOV†	50	47	0	0
N6CT†	50	44	1	1
N6LL†	49	48	8	8
WA9AHZ†	48	48	14	14
WA7EPU	48	48	1	1
N5DDB†	48	46	1	1
W2MPK†	48	44	13	7
K3QMX†	47	47	12	11
JF3KQA	47	47	0	0
WA1UQC†	47	45	16	3
W1EJ†	46	45	14	12
WB8GEX†	46	44	14	12
K0GJX†	46	44	3	2
K2QIE†	46	43	7	2
K2QWD†	46	39	13	11
K1ICM†	45	45	15	8
JA9DUR†	45	45	0	0
W1JR†	45	44	10	9
WB8GEW†	45	44	5	5
W2RTW	45	44	0	0
WB2WSV†	45	42	2	2
WA8ONQ†	45	41	7	7
W3BWU	44	43	11	11
K8UNV†	44	42	2	2
K1MNS†	44	42	0	0
JA2GHT	44	42	0	0
WA8PEV†	44	41	3	3
WA5HNK†	44	38	14	14
K2YOF	43	43	13	13
WA3DMF	43	42	17	17
AE3T†	43	42	14	14
WB8KAY†	43	42	0	0
KS2T	43	41	0	0
W5DZF/4	43	22	4	0
WB4NMA	43	—	0	0
K5CM	43	—	0	0
W4NVW/3	42	41	3	0
KA0AYN†	42	41	0	0
KG6DX	42	42	0	0
KG6JDX†	42	38	0	0
KH6FLD	42	35	0	0
CX8BE†	42	29	0	0
N5BBO†	41	41	5	5
WA1AYS	41	40	15	14
K1FWF†	41	40	18	10
W5KRH†	41	39	3	3
WB4RUA	41	39	0	0
WB5CHW†	41	37	7	4
JG3AOD†	41	37	0	0
K7ICW	41	37	1	1
WA0CSL†	41	15	6	4
VP2VGR†	41	—	11	—
K4VPK†	40	39	7	7
WB8YFE†	40	39	5	5
K6QXY	40	39	0	0
K8KLY	40	39	0	0
KA1A	40	39	0	0
WD4FAB†	40	38	7	5
XE1GE	40	37	1	1
W5HN†	40	35	0	0
VP2MO	40	34	0	0
WB6KBZ†	40	29	1	0
N5KW	40	—	0	0
N9CEX†	39	39	6	6
K1SF	39	35	8	3
WB6BMB†	39	34	0	0
LU8BF	38	38	0	0
JA1NVG	38	38	0	0
KA1DHO	38	37	13	9
WA7UJH†	38	37	0	0
K1FJM/4	38	36	7	6
W1AIM†	38	36	3	0
N7AKB†	38	34	1	1
VE3ASO†	38	31	0	0
WA1CRE	37	36	5	4
K0TLM†	37	35	5	5
JA7QVI	37	35	0	0
WB5JAR†	37	33	7	6
K3ICH/4	37	32	0	0
W3OTC	37	30	0	0
K7GGJ	37	28	0	0
WB0ZKG†	37	20	4	3
WD2AKA	36	34	9	6
N5WM†	36	34	6	2
WA0SBZ†	36	33	3	2
K4QXX	36	33	0	0
K0AYN†	36	33	0	0
W6ABN†	36	32	3	3
JH3WXB	36	32	0	0
K3HCE	36	31	6	4
WA9ETW†	35	34	2	2
WA5UFH†	35	33	0	0
ZL1MQ	35	33	0	0
K4QXX	35	33	0	0
K0UDZ†	35	32	3	1
KC2TX/5	35	32	1	1
N6AMG	35	27	0	0
W2VO†	35	26	0	0
K0US†	35	21	1	1
K4GOK	34	34	13	12
N7DB	34	34	0	0
K1DAT	34	33	8	5
W0IJR†	34	33	0	0
W5NZS†	34	33	0	0
WA6CRA/4	34	31	8	8
KA0ETE†	34	31	0	0
WA1ZUB	34	30	11	7
WD2AFH	34	28	4	0
WA5VJB	34	27	1	1
VP2MJ	34	26	1	1
K6JYO†	34	22	0	0
W2LT	34	20	9	0
W2CNS†	33	32	10	4
WA7GCS	33	32	0	0
W2RLV	33	31	3	2
KA4AOK	33	30	11	6
N6RZ	33	24	1	1
AE9M†	33	23	11	1
WB8PAT†	32	32	11	9
K6GSS	32	32	0	0
K5VVV†	32	31	3	0
AD1C	32	31	0	0
KS4J†	32	31	0	0
K2OVS	32	30	12	9
WB8IGY	32	30	9	7
N6VI	32	30	0	0
K6QAX	32	29	0	0
K1ZKR	32	29	0	0
WB2QLP/4	32	26	5	4
W5NKG	32	25	2	1
K4LFF	32	21	0	0
K8TGC	31	30	4	4
W3WFM	31	30	1	1
WA2EQK	31	29	6	6
N4VC	31	29	1	0
VE3DSS†	31	28	13	7
W1GXT	31	27	13	2
K6PHE	31	27	0	0
WB6NMT	31	26	2	1
VE1RC	31	26	0	0
W2BN	31	24	4	1
W1SC/7	31	14	2	1
LU6DLB	31	16	0	0
WB2MAI	30	29	9	7
WB0PKN†	30	29	6	5
N4CD	30	27	12	8
K6JZK	30	27	0	0
N4TL	30	25	3	3
JG3RGG†	30	22	0	0
KC3EP	30	22	0	0
K4ROM	29	27	5	5
WA0NOK	29	27	2	1
K8RZB†	29	26	8	3
WB2TMD	29	25	6	4
WA8OGS†	29	25	0	0
8P6KX	29	24	8	2
WB7SLY	29	20	1	1
C5AEH†	29	—	13	—
VK2BA	28	28	0	0
KB4CRT	28	27	1	1
KC8J†	28	27	0	0
N5JM	28	25	3	3
N5DDS†	28	25	2	2
W9TC	28	25	—	—
N7AQM†	28	22	1	1
VE3EVW	28	17	13	7
WA5QCP	27	27	0	0
KQ0J†	27	25	0	0
N6AMD	27	25	0	0
KA7IXS	27	23	0	0
K9SM†	27	21	6	4
YV4UY	27	20	0	0
N2ASC	26	26	3	3
VK2DDG	26	25	2	—
VE5LY	26	24	2	2
K9XY†	26	22	0	0
WA9DYT	26	22	0	0
K0SE†	26	21	2	2
NP2AE	26	21	0	0
KA1CDZ	26	13	15	3
WA2YWP	26	13	4	2
VK3OT	25	25	0	0
N9ANO†	25	25	0	0
N7EIJ	25	25	0	0
KA0CDN	25	25	0	0
K1LPS	25	22	4	0
JF3TDC	25	22	0	0
W0RGU†	25	21	3	3
VE5JQ	25	20	2	2
N8AXA†	25	19	5	4
9Y4LL	25	13	0	0
W8NE/4†	24	24	1	1
WA4TJW	24	24	0	0
K0SFH†	24	23	1	1
W9NAW	24	20	2	2
JM1LCW	24	17	0	0
WA9DYV†	23	22	1	1
KJ3F	23	22	0	0
KA5CAW	23	20	0	0
WA5OLT	23	17	5	5
HC8VHF†	23	—	4	—
OA8V	23	—	0	0
VK2VC	22	22	0	0
N4MM	22	22	0	0
W7KNT	22	22	0	0
WB6AAG	22	22	0	0
WB0RJR	22	19	4	2
W7HAH	22	19	0	0
WB2QLP	22	18	5	4
KA1YQ	22	17	7	1
K7NV	22	16	1	1
KB7N	22	16	0	0
PY2TTV†	22	15	0	0
KA5FLE†	22	14	0	0
KA1GIY	22	12	2	1
JE3YIA	22	12	0	0
HC1MD/HC5	22	—	2	—
KA0CDN	21	21	0	0
WD0FOY	21	21	0	0
WB6CTQ	21	19	0	0
K6ZMW	21	18	0	0
NI6E	21	16	0	0
K1HTV/3	21	15	17	3
9Y4JW	21	12	1	1
WD8OXK	20	19	2	2
JG3JLC	20	19	0	0
KD4HP	20	18	4	2
W8QOI	20	18	2	2
K2JF	20	17	5	5
VE1BUF	20	16	4	3
KA6ING	19	19	0	0
WA8LLY/6	19	19	0	0
ZB2BL	19	18	8	4
W9OEH	19	—	0	0
VE6CX	18	18	1	0
W0LSD	18	18	0	0
N0AJU	18	16	0	0
WA4TNV/KL7	18	15	0	0
WA0OFO	18	14	1	1
KC4KK	18	14	0	0
K9LCR	17	17	3	3
VK3AMK	17	17	0	0
WB9OPD	17	16	1	0
KB7Q	17	16	0	0
VK5LP	17	15	0	0
VK4AYX	17	14	0	0
KA4CRT/5	17	14	0	0
HK4EB	17	13	0	0
WB4SLM	17	10	0	0
W0PVL†	16	16	0	0
K0CJ	16	15	5	2
KL7GLL/4	16	14	0	0
W0PKN	16	12	1	1
W8SMD	16	11	5	5
OA8CW	16	—	0	0
K0WM	15	15	1	1
W7IDZ	15	15	0	0
WB4WXE	15	15	0	0
VK3AUI	15	14	0	0
VK3AQR	15	14	0	0
VK3AVI	15	14	0	0
WA6HXM	15	13	0	0
8P6CX	15	11	2	1
VK4TL	14	11	0	0
V2ADX	14	4	0	0
KL7JAI	13	13	0	0
VK3NM	13	11	0	0
EI2W	13††	—	—	—
WA0LHK†	12	12	2	1
VP9WB	12	11	4	1
W1QXX/KP4	12	10	0	0
G4BPY†	11††	11	34	30
AL7FH	11	11	0	0
AL7C	11	11	0	0
J6LOV	11	9	2	2
JN1DQO	11	5	0	0
GW3LDH	11	—	3	—
VK6OX	10	10	1	1
KL7WE	10	10	0	0
KL7JJH	10	10	0	0
KL7IKV	10	10	0	0
ZD7BW	10	10	0	0
FK8EB	10	10	0	0
SZ2DH	10	—	0	0
XE2BC	10	—	0	0
G5KW	9	4	35	—
WB4WXE/KL7	9	8	0	0
VK6RO	8	8	3	3
VP2VDL	8	6	0	0
G3COJ	8	5	20	4
GI3ZSC	8	—	—	—
8P6MH	6	6	4	1
G4JCC	6††	4††	37	35
G4GLT	6	—	13	—
G3PWK	6	—	12	—
GW3LDH	6	—	—	—
GW3MHW	6	—	—	—
GU2HML	5	—	16	—
G4HUP	5	—	—	—
G4HVP	5	—	—	—
G4JLH	5	—	—	—
G2AOK	4	—	—	—
G4BAO	4	—	—	—
GM4FZH	3	—	—	—
VK2ZDI	2	2	0	0
SM7BAE	1	1	6	3
SM6PU	0	0	23	10
G4IDE	—	—	18	—
DJ2RE	0	0	14	9
DK6JL	0	0	11	4
SV1DH	0	0	10	—
GM4WOJ	—	—	9	—
CT2EE	0	0	5	2
OZ9QV	0	0	5	1
G3VZJ	0	0	4	4
G3PLP	0	0	4	2
I5CTE	0	0	4	0
GJ3YHU	0	0	4	—
G4ANT	0	0	3	2
G3TAA	0	0	3	2
F6EMT	0	0	3	2
HA6NP	0	0	3	—
HB9QQ	0	0	2	2
G3RDQ	0	0	2	2
OE1HGW	0	0	2	1
OZ7IS	0	0	2	—

1 — 6-meter two-way claimed
2 — 6-meter two-way confirmed
3 — Crossband (6 to 10) claimed
4 — Crossband confirmed

*— Some contacts made from locations more than 150 miles apart
†Indicates 6-meter two-ways claimed with all continents

††Includes 4- to 6-meter crossbands and 4-meter two-ways

with his antenna aimed northeast. At 2210, A1 looks for stations in West Virginia and western Pennsylvania; 2215, eastern Pennsylvania and New Jersey; 2225 to 2235, Virginia, Maryland, New York and more distant northern states. Net frequency is 432.090. WA4ZIA is due to move to a new and better QTH soon, so he may be temporarily QRT. It is expected, however, that others will fill in during Dex's absence.

WD4MBK says that one of the recent uses for the net has been to set up 23-cm skeds. He notes that activity on that band has really picked up in his part of the country recently. Speaking of 23 cm, W4WSR writes describing his commercial line of tube amplifiers and a power mixer. One model, using a pair of 7289s, is listed as capable of over 100-W output. From the pictures passed along with the letter, the units look very nice indeed. Those wishing further information should write to P.O. Box 387, Jupiter, FL 33468.

The March issue of the *432 and Above EME News*, edited by K2UYH, contains a very disturbing item. According to F1FHI, 70-cm operating authority in France is in danger because of a new radar known as Syledis. It is said that the system is already causing reception problems to amateurs on the coast of France as well as on the south coast of England. It is said that 70-cm amateur operation also causes it problems. On our side of the pond, WD4MBK reports that a Pave Paws installation is to be constructed at Robins Air Force Base, Georgia, with completion slated for 1986. With it will probably come the restrictions already faced by 70-cm operators in other areas where this type of long-range surveillance radar is operational. To date, I know of two sites that are on line in the 48 continental states: Otis Air Force Base on Cape Cod, and Beale Air Force Base, California. I guess this is the price that must be paid for the troubled world in which we live.

On a happier note, W7CI reports from Sierra Vista, Arizona, that 70-cm activity in the Southwest is at a high point, with regular work being done from his QTH to Phoenix, a 200-mile path, as well as to southwest New Mexico and El Paso, 250 to 300 miles. Steve is also gearing up for EME on the band and has recently got on 23 cm with low power. He is hearing K7JTG and W7GBI over a 200-mile mountainous path on that band using just a single 15-element quagi. QST

The New Frontier

The World Above 1 Gig

Conducted By Bob Atkins,* KA1GT

An Interdigital Mixer for 3.4 GHz

The interdigital mixer is a well established mixer for use at microwave frequencies. It was originally described by Reed Fisher, W2CQH, in the January 1974 issue of *QST*, p. 11. This original article deals with mixer designs for 1296 and 2304 MHz and has been reproduced in many editions of the ARRL *Radio Amateur's Handbook* (see, for example, 1984 Handbook, p. 9-24). Readers are referred to this article for the basic constructional details of the interdigital mixer.

Shown in Fig. 1 is the basic layout and dimensions for an interdigital mixer suitable for use at 3.4 GHz (preferred frequency 3.456 GHz). The interdigital elements are made of brass or copper and may be either solid rod or tube. Tubing may be preferred since it is easier to solder to. The sidewalls of the mixer are made from brass bars 4.8" long, ¾" high and ¼" thick.

The interdigital elements may be mounted by drilling 3/8" holes in the bar and inserting the elements through the holes such that 5/8" projects into the mixer. If the elements are made about 1" long, the portion projecting through the wall may be soldered to the wall on the outside of the mixer. If solid elements are used they may be secured to the sidewalls by means of screws. It is important for the stable operation of the mixer that the elements make a good electrical and mechanical contact with the mixer walls. Top and bottom walls of the mixer (which may be of copper, brass or double-sided pc board) are secured to the mixer walls by short 4-40 screws as shown.

The mixer is tuned by two 10-32 brass screws. T1 tunes the signal side of the mixer, and T2 tunes the local oscillator (multiplier) side of the mixer. The screws are secured in position by locknuts after tuning. The mixer diode D1 can be a readily obtainable HP 2800. This will give a fairly poor noise figure of around 16 dB, but with the availability of low-noise transistors, the construction of preamps should present no real problem. If the mixer is intended for use without a preamp a low-noise-figure diode should be selected, e.g. MA-40423 (4.5 dB) or MA-41504 (5.5 dB). In addition, since without a preamp the IF amplifier noise figure adds directly to the mixer noise figure, a low noise (GaAsFET) IF amplifier should be used. With a BXY28 multiplier diode, the LO injection can be ~300 mW at 368 MHz (×9 multiplication for a 144-MHz IF at 3456 MHz). No doubt other multiplier diodes could also be used, e.g. HP5082-0300 or 5082-0113 (1N5163). The LO injection can be at a higher frequency, e.g. 414 MHz (×8) or 552 MHz (×6). The higher the LO injection frequency, the less power required and/or the less efficient multiplier diode needed.

*103 Division Ave., Millington, NJ 07946

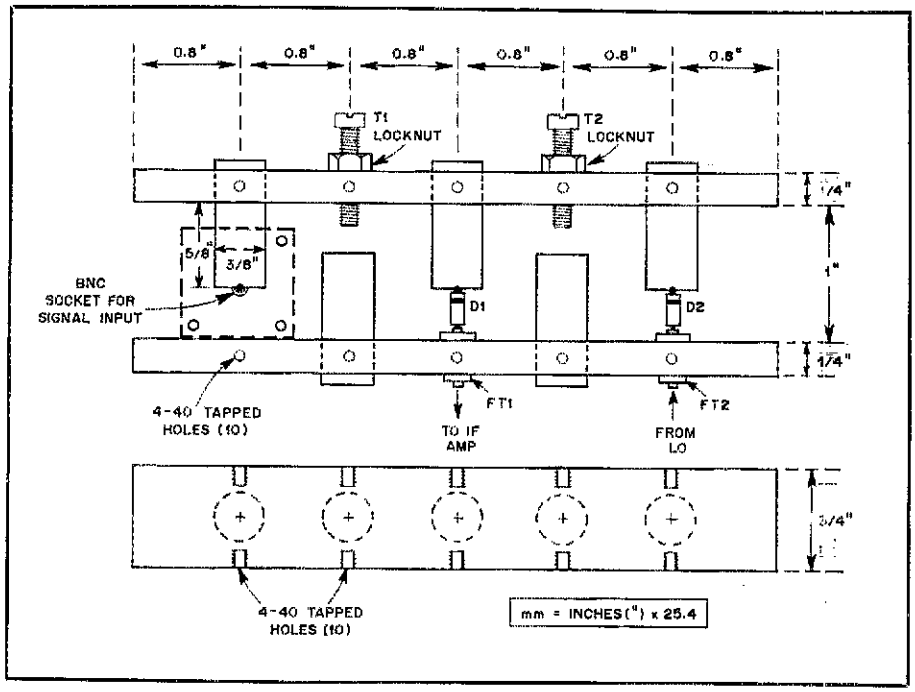


Fig. 1 — Layout and dimensions for an interdigital mixer suitable for use at 3.4 GHz.
D1 — Mixer diode
D2 — Multiplier diode
FT1, FT2 — Insulated feed-through capacitors
T1, T2 — 10-32 brass tuning screws

UHF PREAMPLIFIER

The February 1984 issue of *Microwaves and RF* magazine contains an interesting preamplifier based on the Motorola MRF966 dual-gate GaAsFET. Designed by Motorola, the preamp can be tuned to cover the range 400 to 512 MHz. When tuned for maximum gain at 430 MHz (21 dB) it shows an associated NF of 0.6 dB. When tuned for optimum NF (0.5 dB) it shows a gain of 19 dB. The circuit uses lumped elements (coils, not microstrip) and achieves output matching by the use of a 9:1 impedance transformer. *Microwaves and RF* is a trade journal published by the Hayden Publishing Co. and may be available through your local library. The article appears on pp. 141-145 and is titled "UHF Preamplifier centers on budget dual-gate FET" by Gary Barbari. It also contains interesting information on the design procedure for low-noise preamps.

TRANSISTOR NEWS

NEC has available two general-purpose silicon devices for use up to 2 GHz. The NE68337 has a gain bandwidth product of 4 GHz and has a maximum available gain of 14.5 dB at 1 GHz. It is priced at $1.50 (1-10 quantity). The NE99532 has a maximum power output of +25 dBm at 500 MHz and sounds as though it could be a useful driver for microwave local oscillator multipliers. It is priced at $1.30 (1-10 quantity). These transistors are available from California Eastern Laboratories Inc., 3005 Democracy Way, Santa Clara, CA 95050.

Strays

Texas A&M University club station W5AC recently received a commendation from the Red Cross for providing communications support for three days last August during Hurricane Alicia. Brazos County EC N5ETD (center) presents the Red Cross Certificate of Appreciation to W5AC Chairman WD5INB (left) while West Gulf Vice Director and W5AC faculty advisor N5TC looks on. →

QST congratulates . . .

☐ the following radio amateurs on 50 years as ARRL members:

- Lester W. Israel, W8BHV, of Richfield, Ohio
- Leslie V. LaRue, W3LPZ, of Scranton, Pennsylvania
- Maurice W. Mitchell, WØIQZ, of Denver, Colorado
- Walter R. Pierson, W4OKI, of Sarasota, Florida

YL News and Views

Conducted By Jean Peacor,* K1IJV

DX à la Mail

Last July's YL News article, "Opinion Time," elicited an interesting and most constructive response from Helen Douglas, W5LGY, of Commerce, Texas. One of her thoughts pertained to unusual hamming experiences. Licensed since 1945, Helen has had some novel experiences and is sure that many YLs must have many interesting tales that could be shared. She agreed to take the lead in this vein by sharing the following chain of events.

A YL's Unusual Ham Experience

May I preface this by saying that I must have been one of the most ignorant Class A licensed amateurs to go on the air. My Stancor 100-W rig came in a kit, which I assembled. It was my first experience at building electronic equipment. It was an MOPA — master oscillator (616) and power amplifier (812A) with four tubes in the speech section. There were no step-by-step directions for its assembly as are found with Heath kits today. It stated that the four tubes in the speech section were to be located on the left side of the chassis with their sockets mounted, in proper order, of course, so that all socket keys faced the left chassis side apron. (Until then, I didn't know that a chassis wore an apron.) It was called orienting the sockets. I don't remember how I managed to figure this out.

With construction completed, my problem was in getting enough drive (35 mA required) to make the 812 load properly. Since the 812 tube was made by General Electric, I wrote to their tube division. Back came a tube data sheet and a helpful letter from W2RYT. We exchanged several letters. I had sent him my questions and the circuit diagram.

Problems continued, so I sent questions and the diagram to the Standard Transformer Corporation, since it was their accumulation of parts that I had assembled. They advised me that trying to get enough drive to the 812 was a common problem with this tube. Using my diagram, they made suggestions as to where to look for problems.

I must not have known how to use the information received, so I sent questions and the rig diagram to *QST* Technical Director F. V. Fitzhugh. He in turn published my letter in Letters to the Editor, December 1946 *QST*. I was not a reader of this column, so I had no idea what was in store for me in the weeks that followed. DX by mail, if you please.

My first surprise letter arrived Thanksgiving week of 1946 from Phil Padberg, W3KWI/Ø, in Independence, Missouri. He wrote, "I have just read your Letter to the Editor in *QST* and can understand how you feel about not getting your rig working." He worked for TWA and held a First Class Commercial phone license and a Second Class code license, and was a Class A ham. He had a transmitter similar to mine. He drew the circuit diagram, explained what each component did in the circuit and provided much valuable information.

Helen Douglas, W5LGY, and Joey. Since 1931, marionettes and their construction has been another of her many hobbies.

In a few days, a second letter came from Charles Campbell (ex-1AAE in 1921) in Dorchester, Massachusetts, who said, "I have just read your letter in *QST* and it struck a very responsive chord up here." He told about his 1AAE (no Ws then) spark transmitter and then later teaching for the Navy's Radio Technical Courses during WW II. He was trying to get back on the air. [Editor's Note: He did get back on the air as W1AAE. My OM and his family can attest to this fact since he was their next-door neighbor in Stoneham, Massachusetts, for many years.]

In December, another *QST* reader, Fred Schrader, W5JKD, in Priddy, Texas, saw my plea for help. He told how baffled he was in his early days of hamming and described his station. He wound up coming to my home with a 20-meter doublet and some books to help me. One was the *Engineer's Handbook*, which I had never heard of.

Then, in January 1947, my DX letters arrived — one from Australia, one from Switzerland.

Hello W5LGY, Noticed your howl in December *QST* and you have all my sympathy. I am building my own rig at present. Out here we too build the whole "works," ... no radio stores, shelves crammed with HRO's, etc. (How I wish that there were!) But, I am mailing under separate cover a copy of a local magazine which contains a circuit for a QRP rig which may be of interest to you. Will be using this rig myself when I get a ticket (have failed in regulations at each examination so far). See you on 20 meters some time. W. A. Easterling, Surry Hills, New Australia.

Dear Helen, I have just read your letter to the editor. Being a member of ARRL myself, I receive *QST* every month, a little later of course.

It happens very often to me, too, that the rig I had built did not work and I, therefore, can share and understand your thoughts and feelings entirely. I know, too, how happy and thankful I was to everyone who helped me in my troubles or showed me the way for any further steps. I'm a student now at our Federal Institute of Technology in Zurich, Switzerland, and take courses in electronics, physics and engineering. To be able to study here I just had to earn money and, therefore, worked some years in different electronic labs.

At the first laboratory they were looking for an experienced engineer. I asked for that job pretending to be and to know everything they wanted. I got that job. When I had it and when they asked me to do new research, I very often had no idea what to do and, believe me, was thankful for any suggestions. With much "feeling" and this help from time to time, I was successful and they never found out I was not an engineer.

So, if you have any troubles getting your rig to work, or if you have any questions, please let me know and I will try to do my best to help you in making things clear. I shall be happy if I succeed together with you to make your rig work and probably some day we both will be able to have a QSO. As soon as my transmitter is finished I intend to apply for the license and call letters. Sincerely yours and 73, Gabriel Schnarzkopf, Zurich, Switzerland.

After receiving all of this valuable information, two real pros, W5AJ and W5KI, visited me and really got things corrected. They showed me where I had failed to understand lots of the good advice provided in my correspondence.

To this day, I receive much help from the OMs who are so determined that I stay on the air. In spite of all of the past (and future) frustrations, I find Amateur Radio the most progressive hobby anyone can find to ride. There is no standing still in this game. The most interesting part has been the finding of many fine friends. It is a joy to exchange bits of information with each one. I realize that I have come a long, long way since the first day that I laid eyes on a radio book.

RESULTS, 44TH YL ANNIVERSARY PARTY

CW		*Phone*
DJØEK	Gold Cup	DJØEK
K4AOH	Second Place	WD4NKP
WD4NKP	Third Place	KC9V

Top 15 CW Scores — DJØEK, 1500*; K4AOH, 1332*; WD4NKP, 1250*; CT1YH, 1187*; KM8E, 840*; VE7BIP, 750; IIMQ, 748*; WD8MEV, 725*; K8ONV/4, 688*; KA5GIS/7, 625*; W8YL, 617*; NY4H, 616*; VK3KS, 552; K4LMB, 540*; WA2NFY, 522*.

Top 15 Phone Scores — DJØEK, 13,688; WD4NKP, 13,360*, KC9V, 13,110; DJ1TE, 11,632*; VE1BWP, 9693*; WD8MEV, 8877*; KM8E, 8840*; NY4H, 5793; N4DDK, 5640*; W2GLB/5, 5145; WD5FQX, 4950*; IT9JLA, 4725*; WA1UVJ, 4180*; WD8DQG, 3997*.

*low-power multiplier

*Country Club Dr., Monson, MA 01057

UPCOMING CONVENTION

The YL International Sideband System's annual convention is June 21-24, 1984. See Hamfest Calendar for details.

IARU News

Conducted By Richard L. Baldwin,* W1RU

International Assistance and Traffic Net

This net, which holds routine daily meetings at 1130 UTC on 14.303 MHz, and which functions to provide service to people in the Gulf and Caribbean areas, has just received a letter of appreciation from U.S. President Ronald Reagan, addressed to IATN Net Manager George Naftzinger, W4PPC. In his letter President Reagan said, "I wish to thank you and the members of your net for the many hours you have spent on this project and the dedication you have shown in providing assistance to our country." A copy of the letter appears in Happenings, this issue, page 65.

RECIPROCAL CALL SIGNS

In this column we have previously made mention of what is surely a more sensible arrangement of reciprocal call signs, a system that is already in use in the Federal Republic of Germany: having the country indicator come first. K1ZZ operating in the FRG would sign DL/K1ZZ, for example. We have just received another letter of support for this system, from KA8PIV/IV3, who writes as follows:

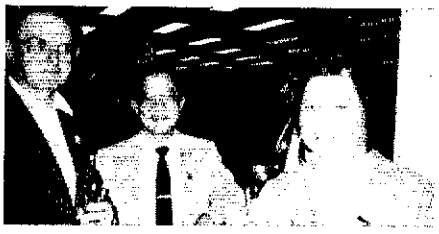
" . . . Currently I am operating in Italy on the third three-month temporary permit, under the U.S.-Italy reciprocal agreement, and have to use the call sign KA8PIV/IV3. Many times on the air, before I can spit out all 10 characters of that call sign, the recipient has caught the KA8 and takes one of the following actions:

1) points the beam toward the USA
2) ignores my call, thinking it's just another USA station
3) or is delighted to contact a USA station, only to be disillusioned on hearing the final IV3.

"If the international system of reciprocal call signs were reversed and I could use IV3/KA8PIV, all listeners would know immediately from whence the call originates, thus saving frustration and embarrassment all around . . . "

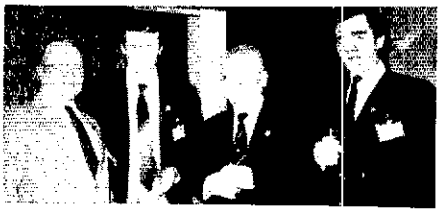
*President, IARU

Leaving the annual banquet of the International Amateur Radio Club, held in Geneva in January, are Ted Robinson, F8RU, IARC President, and Richard E. Butler, Secretary-General of the International Telecommunication Union. Mr. Butler is patron of the IARC, and a good friend of Amateur Radio. (Note the ARRL *Handbook* under his arm!) *(all photos by Mrs. W1RU)*



At the IARU reception held during the HF BC WARC in Geneva in January are, left to right, Zbyszko Kupczyk, SP5ZK, Roberto Dizon, DU1RD, and Sylvia Marcelo, DU1SM.

At the IARU reception at the HF BC WARC, are Mr. Jean Jipguep and W1RU. Mr. Jipguep is the deputy Secretary-General of ITU and, although not yet himself a radio amateur, is most supportive of the Amateur Radio Service. During the Conference he was presented with an ARRL *Handbook*, which he has promised to read from cover to cover.



Again at the IARU reception are W1RU; UA2FB, Yuri Pianykh, third assistant secretary at the Soviet Mission in Geneva; A. L. Badalov, Deputy Minister of Post & Telecommunications of the USSR; and Vladimir Soudovtsev, head of the foreign languages department, Ministry of Telecommunications, USSR. Mr. Badalov is prominent in the work of the ITU, and never misses an IARU reception, where he is one of the more personable of our guests.

Strays

I would like to get in touch with . . .

☐ any radio amateurs who served aboard the *USS New Jersey* during WW II. Robert J. Westcott, W2MAS, 17 Button Mill Rd., Bridgeton, NJ 08302.

☐ any radio amateurs who served aboard the *USS Semmes* at the start of WW II. Donald Miller, W2MQB, 517 Accabonac Hwy., East Hampton, NY 11937.

QST congratulates . . .

☐ Editor Dick Sine, KB3WN, and the American Philatelic Society on the 1000th issue of their magazine, *The American Philatelist.*

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*.

Advisory Committee Members	March 1984, p. 60	MARS Information	April 1984, pp. 86-87
AMSAT-Stoner Challenge Cup	April 1984, p. 57	Pending Dockets	Feb. 1984, p. 65
Board Standing Committees (Minute 65)	This issue, p.61	QSL Bureaus Incoming	Dec. 1983, p. 74
Call Sign Assignment System	June 1983, p. 61	Outgoing	March 1984, p. 65
FCC Exam Schedule	Jan. 1984, p. 59	*QST* Abbreviations List	Jan. 1984, p. 53
License Renewal Information	Jan. 1984, p. 51	Reciprocal-Operating Countries	Nov. 1983, p. 71
Major ARRL Operating Events and Conventions — 1984	Jan. 1984, p. 52	Section Emergency Coordinators	Oct. 1983, p. 95
		Third-Party-Traffic Countries	April 1984, p. 87
		U.S. Amateur Frequency and Mode Allocations	Jan. 1984, p. 51

On Line

Conducted By Stan Horzepa,* WA1LOU

Your Logging Program

Society's ways are changing — rapidly — and Amateur Radio is keeping pace. Not long ago, single sideband was deemed extraordinary despite it merely being rediscovered. Today, the means of modulation that was universally accepted yesterday, namely AM, is rarely heard.

Straight keys and bugs gave way to keyers and paddles. Carbon mics were put away in favor of dynamic ones. Transistors replaced tubes. Transmitters and receivers were merged into transceivers. Clanking Model 15s that were associated with wide-band signals were replaced by silent computer-like machines and narrow signals. Now comes the advent of ASCII, packet radio and AMTOR, to say nothing of hand-helds aboard orbiting vehicles!

The New Wave

This flood of new communication equipment has been accompanied by a wave of inexpensive but powerful computers. These machines (with associated electronics) can produce RTTY and high-speed CW signals. The necessary stability for these transmissions and the capability of separating two adjacent signals have been with us for some time. While these developments are interesting, the average Amateur Radio operator is frugal of mind and effort and, if possible, prefers doing one thing instead of two. If one could only log as one transceives, it would save a step. A typewriter keyboard provides hard copy, but a computer keyboard does not necessarily do so.

Using the latter alone may force us to continue to enter our logs manually. At least, this was our problem. Now, with new, state-of-the-art, but inexpensive computers, this labor can be obviated. We can complete our logs with computer keyboards. Simply, type the data and "dump" it to disk or tape for later retrieval.

Programming Made (Not So) Easy

This sounds good and is possible, but it is not that simple. One does not sit at a computer and type into a log. More than a computer is necessary. "Programs" are required to do this, as well as to transmit CW or RTTY. Programs (software) are as necessary to computers as direct current is to a transmitter. This fact is known by many hams who, lacking software, decided not to use a computer on the air. These operators may have thought that learning to program would be easy (or so it is made to appear by computer manufacturers), but when "push comes to shove," programming a computer for practical use is not easy. One can program simple things, but a log requires a complete program. Thus, despite the inundation of Amateur Radio by reasonably priced computers, many owners or potential owners are not using a computer to generate their logs. And this is unfortunate, but unnecessary.

I say this because I was in that group that said I would wait until tomorrow before I invested in a computer. Besides, I liked my keyer and the CW it produced. That is, I said that until WØANZ and KØPCG nudged me into buying one. And since that day, I have seen the tremendous advantages of its presence, and I am not talking merely about the RTTY and high-speed code it can transceive.

Impersonal Logging Programs

I am talking about the potential use of a computer for logging and all that that implies. Software is available without the need to know how to program so that one can keep an accurate accounting of QSLs, countries worked/confirmed, beam headings, names of ops, dates/times worked, and on and on, limited by one's personal needs. These programs are packaged and sold everywhere. However, using someone else's software has one drawback: It never seems to be exactly what you want. Someone gives you a tie and it is just a wrong shade of blue; someone gives you a ticket to the ballgame and, invariably, it is in the wrong part of the park.

The same problem exists for packaged software for an amateur station. The programs for DXCC records are good for one mode of transmission, perhaps, but I want to keep track of at least three modes; the log software does not leave any space for the ops' names, or the space allowed is too small as far as I am concerned. Similar deficiencies can be cited by anyone buying programs off the shelf.

Personalized Data-Base Software

I have no quarrel with any program on the market, except that I would like to have in my log what I want in my log, not what somebody else thinks I want. That's why I (and others) do not buy printed logbooks. Instead, I produce my own with columns where I want them and with widths I require. So, why should I have to accept computer logs designed by others? I can devise my own using a data-base-management program.

How can I do that without going to a school for computer programmers? Simple! Purchase a data-base-management program. One of these will provide the means to list all sorts of variables (date, QSL information, call, RST, mode, band) as you want them listed. Furthermore, these programs allow you to punch in a call, and it will display the information you've entered (yesterday or last month) into the computer.

This capability is not unique to data base management programs as such, however. Many packaged log programs will do the same thing if you are willing to accept the programmer's specifications. Using a data-base-management program, you can call up dates, names, bands — anything you have entered. Not all data-base-management programs have each frill you might want, although chances are you can satisfy yourself if you are not too picky.

So what about cost? Take your pick. Data-base-management programs on tape or disk are sold widely. Consult any computing magazine and see for yourself. Some choices will not be for you, depending on your equipment. You must have at the very least a tape recorder matched to your computer or, better still, a disk drive.

Try it! Computerized logging and QSL-tracking is here to stay. You will enjoy its ease and its accuracy; you will really appreciate its factor of anti-drudgery! — *Charles J. Ellis, WØYBV*

The Data-Base Ballgame

A "data base" is any collection of information. For example: Your radio logbook is a data base, and your back issue collection of *QST* is a data base. These data bases are not too manageable, however. To find anything, you must search manually through the logbook or the *QST* Contents page (and chances are you won't find what you wanted). If you had all of your log entries or each issue of *QST* stored in a computer, you could command the computer to do the searching; if the information is there, you can be sure the computer will find it.

Of course, it would be impractical to store each issue of *QST* in a computer. A logbook would not be difficult. And once the logbook is on line, you can search, sort, modify, add, and delete log entries ad infinitum.

For example, you need Delaware confirmed on 10 meters to complete 5BWAS. Instead of looking through years of logbooks and old 10-meter contest logs, the computer can do the search almost instantaneously. Most data base management programs allow the user to first create a data-base and then manage it. In the creating process, the user defines what information he wants to be in his data base. Once he has made that decision, he enters all of the information, and on completion, he can juggle (manage) the information as needed.

A word of caution: When creating a data base, you should plan ahead because once it is created it cannot be changed without starting all over again! For example, you created a logbook data base in which each call sign is assigned six characters. After you have entered half of your log into the data base, you come across a call sign like WA1LOU/XW8. You can only enter "WA1LOU" in the data base because you assigned only six characters per call sign. To change the data base to accept 10 characters per call sign, you would have to start all over again. So, think ahead!

Strays

I would like to get in touch with...

☐ an amateur in Cuernavaca, Mexico, who is willing to establish a weekly sked from January to March 1985. Glenn Churchill, NA2Z, Box 504, Hudson Falls, NY 12839.

*75 Kreger Dr., Wolcott, CT 06716

Silent Keys

It is with deep regret that we record the passing of these amateurs:

KA1ACV, Louis D. Mingace, Newtonville, MA
K1AF, Alan A. Borden, Wallingford, CT
W1EFC, Charles R. McLam, Southbridge, MA
W1FLR, Clare A. McElroy, Little Compton, RI
WA1JHT, Thomas P. Marshall, South Berwick, ME
K1QPS, Walter M. Becker, New Castle, NH
WA1RLT, Richard H. McEvoy, Spencer, MA
W1YXB, Karl H. Kalbfleisch, Guilford, CT
W2AWV, Ralph S. Iadarola, Orange, NJ
N2BBK, Mark Daubenspeck, Vineland, NJ
W2BOR, William T. Axton, Glen Falls, NY
KA2CPP, Marsden E. Kenyon, East Syracuse, NY
K2DLD, Harold A. Hornbeck, Scotia, NY
K2DRZ, Albert H. Harris, Slingerlands, NY
W2GVB, George L. Connelly, Pennsauken, NJ
W2JR, Earl J. Westfall, Williamsville, NY
W2LSE, G. B. Illenberg, Middletown, NY
W2PZC, John W. Walwrath, Rochester, NY
WB2SDA, Leo G. Eddy, Gowanda, NY
W2SMJ, Everett S. Ackerman, Sr., South Plainfield, NJ
WB2SRS, Eleanor R. Anderson, Titusville, NJ
W2VFV, Lewis O. Shea, West Seneca, NY
*K3AO, Richard Vincent, Bryantown, MD
W3CPM, Henry G. Weeden, Takoma Park, MD
W3DHU, William H. Keister, Oakmont, PA
W3KIC, George J. Meskinis, Philadelphia, PA
W3LEZ, Phil D. Boardman, Scotland, PA
WA3RDO, Betty S. Gussman, Harrisburg, PA
K4FVO, Louis J. Stenger, Bartow, FL
*KA4HRJ, Wilson L. Miller, Ormond Beach, FL
K4INC, Roy E. Dowle, Chandler, TX
K4IOR, Jack B. Duncan, Eustis, FL
K4MUW, Roy D. Hopkins, Appomattox, VA
W4NEJ, Merle L. Israelson, Palm City, FL
W4NLY, Arthur Hustwit, Desert Hot Springs, CA
KB4QL, Russell F. Moon, Charleston Heights, SC
W4RSC, J. W. "Andy" Andrews, Kershaw, SC
WB4SBU, Wyatt H. Harbin, Jeffersontown, KY
KA4VCE, Hubert G. Benson, Sr., Fredericksburg, VA
W4WHO, Paul A. Lain, Rockville, MD
W5AJ, Jennings R. Poston, Wills Point, TX
N5BAJ, Paul T. Ladzinski, San Antonio, TX
W5CTA, Russell R. Phelps, Beaumont, TX
W5FUW, William R. Beard, Stuttgart, AR
W5FZE, Alvin B. Skeeters, Nacogdoches, TX
WD5GMR, Ewell R. Williams, Navasota, TX
W5ITM, Robert S. Swope, Beaumont, TX
WB5NXM, Walsh H. Stuntz, Sr., Baton Rouge, LA
WA5OHQ, R. B. Collins, Calhoun City, MS
K5OUU, Lewis M. Nolen, Sr., Whitney, TX
*K5RHP, Alolph L. Fuiks, Jr., Dallas, TX
W5SNT, Charles A. Polmanteer, Pipe Creek, TX
W5VKH, Wendell W. Young, Farmers Branch, TX
KD6BJ, Norman E. Thompson, Rosemead, CA
N6BRV, John Anilaski, Riverside, CA
WB6DXV, Emery D. Sherwin, San Diego, CA
W6ELF, Ronald Piatt, Anaheim, CA
W6FGR, Harry W. Barner, Los Angeles, CA
W6IHF, Jack F. Fischer, Rancho Palos Verdes, CA
W6IXL, Richard A. Fetch, Citrus Heights, CA
W6LXH, Leonard R. Carroll, Tacoma, WA
**AA6M, Burr Stalnaker, Coronado, CA
W6OWM, Leo "Bud" Stoeckle, Aptos, CA
W6PLK, William C. Martin, Fullerton, CA
WA6PLK, Robert D. Hall, Costa Mesa, CA
*W6SCI, Walter C. Lockhart, Jr., Carlsbad, CA
WB6SFI, August "Ted" H. Husing, Littlerock, CA
W6YPM, Erwin A. Rasmussen, Redwood City, CA
WB6ZXV, James H. Jones, Long Beach, CA
W7CLZ, Vilas C. Johnston, Woodinville, WA
W7DKM, Edgar F. Adamson, Depoe Bay, OR
*K7JWZ, Dean W. Laughlin, Ririe, ID
*W7PRA, Arthur G. Reterstoff, Oregon City, OR
W7RPX, Kenneth M. Shaw, Sequim, WA
WB7UGR, Donald A. Sparks, Grantsville, UT
W7VS, Temple V. Ehmsen, Portland, OR
K8AJK, Charles E. Gross, Ballwin, MO
W8DQS, Donald R. Robertson, Norwalk, OH
W8GBZ, Lewis Lobenthal, Norwalk, OH
W8KLY, Theodore Belden, Boynton Beach, FL
K8NZU, David E. Butcher, Kent, OH
W8OAR, Mitchell I. Kohn, South Euclid, OH
W8OVJ, Forrest E. Hothem, Coshocton, OH
W8PDN, Walter A. Weiss, Cincinnati, OH
W8SUK, John C. Slade, Hamilton, OH
W8TS, Fred J. Kucklick, Olmsted Falls, OH
WD9ARC, Arthur H. Templeman, Milwaukee, WI
WB9BVS, John J. Parker, Chicago, IL
WD9DYF, Burbank Murray, Wauwatosa, IL
W9DZE, Grant Fitch, Milwaukee, WI
W9FY, Wesley D. Correll, Cedarburg, WI
W9GTI, Vernon J. Plettau, Mount Prospect, IL
W9KH, Stanley M. Durst, West Frankfort, IL
WN9KHL, William A. Kalweit, West Bend, WI
W9LMP, Michael J. Musante, Frankfort, IN
WA9QDN, Joseph J. Jablonsky, LaGrange Park, IL
WB9SZO, Arden B. Colligan, Oshkosh, WI
W9UX, Roy W. Weisbach, Chicago, IL
W9YBX, Samuel J. Keiffer, Jr., Olney, IL
WBØBFL, William C. Palmerton, Salina, KS
WDØESN, Charles H. Appleberry, Flat River, MO
WØGXM, Richard G. Miller, Denver, CO
WØKFP, Robert G. Van Nostrand, Ballwin, MO
WBØLAX, Billy K. Voss, Colby, KS
WBØMIO, Clarence B. Bowman, St. Ann, MO
KØPVE, Harold A. Baity, St. Louis, MO
KBØRN, Admiral N. Phillips, Salisbury, MO
WBØWWE, Randall J. Replinger, Marshall, MN
JG1QFW, Naomi Uemura, Tokyo, Japan
OH2VT, Ingram Lofman, Odilampi, Finland
OZ7AQ, Bent Johansen, Farum, Denmark

Feedback: Walter C. Lockhart, III, K4IGB, who was listed in the Silent Keys column of the February issue, is not a Silent Key.

*Life Member, ARRL
**Charter Life Member

In order to avoid unfortunate errors in the Silent Keys column, reports of Silent Keys will henceforth be 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

May 1934

☐ The American Radio Relay League is 20 years old, and a special section of *QST* commemorates the birthday. Editor Warner recounts our founding, prompted by the distance limitations of the crude apparatus of those days and the resultant need for a *relay* organization. President Franklin Roosevelt and Marconi are among many VIPs sending congratulatory messages to our own President Hiram Percy Maxim.

☐ A condensed version of "200 meters and down" recounts highlights of the past 20 years: transcons, wartime shutdown, back on the air with the ban off, c.w. replacing spark, transatlantic tests and two-way success, formation of the International Amateur Radio Union (having its own birthday, 10 years), and numerous instances of defense of the amateur radio service from other interests.

☐ C.w. enthusiast/expert W1TS shows his versatility with the design of a suppressor-grid modulated, low-power 160-meter 'phone rig, crystal controlled. The stacking of breadboard stages is particularly neat.

☐ Inspired by Jim Lamb's single-signal receiver articles, W9IJ built a deluxe version with a pre-r.f. stage, self-powered, single-control tuning and built-in monitor.

☐ An 830 amplifier, with 50 watts output on any of our four major bands, tops off George Grammer's earlier articles on oscillator and driver stages, along with power supply and rack construction details.

☐ Ardent DX contest participant W1SZ calls the 1934 fray the "greatest ever" and relates some of the early highlights. Apparent winner of the 9-day competition is NY1AB (Canal Zone) with 615 contacts and a score of 25,000; his peak QSO rate was 16 an hour!

☐ We can drool over the handsome half-kw, enclosed cabinet rig (on casters) built by W1NI, covering 3 bands without coil changing and having remote control provisions.

☐ Frederick Kolster, of decremeter and regulatory fame, is exploring u.h.f. areas, using as a tank circuit two copper shells (for inductance) with wide flanges face-to-face (for capacitance) which provide high-*Q*.

☐ W9AUH emerges the top scorer in last December's Sweepstakes, with 495 contacts and 63 (out of 69) sections. Three-fourths of participants used 50 watts or less, even though no multiplier applies.

☐ Regeneration is used to advantage by W6CGR and W6FMG in the tuned r.f. stage of their battery-operated portable receiver, while W1EAO adds preselection to his regenerative single-signal superhet.

☐ W8GZ leads the Brass Pounder's League with a traffic total of 2554. (Your scribe had a mere 817.)

25 Years Ago

May 1959

☐ Anniversary time here, too; the Editor takes note of 45 years of League progress.

☐ With klystrons, waveguides and parabolic antennas all over the place, W2UKL and W2RDL operated from mountaintops and established new records of 14 miles on 21,000 Mc. and 150 feet on 50,000 Mc., the latter possibly the highest frequency ever used for any communication

☐ The Collins KWM-1 doesn't cover 40- or 75-meter voice bands, so W1VLN shows us how to modify the transceiver to do the job.

☐ Our resident staff specialist on automobile ignition interference, W1CUT, describes methods of shielding the distributor, wires and plugs to get rid of annoying hash.

☐ Winner of the 1958 Sweepstakes contest, c.w. section, is Victor Clark, W4KFC, who worked all sections and amassed a score of 235,000. Mercifully, the competition is now limited to 40 hours in two weekends.

☐ K2MSU finds that 2N247 transistors, though rated only up to 30 Mc., still perform reasonably well at 50 Mc., and thus can provide a low-power but very inexpensive rig.

☐ Following on his modification of a BC-454 receiver for basic Novice use, W1ICP shows how that war surplus unit can be used as a selective i.f. strip for converters covering 80 through 6 meters.

☐ W6QYT describes the "electronic" iron curtain, experienced first-hand on a visit to the Munich relay base of the Voice of America, and helps explain some of those weird noises that plague the ham bands as well as short-wave broadcast reception here.

☐ A 32-foot wood triangular tower, self-supporting, can be lifted by one man and cost builder W7ACA only $17 for the lumber!

☐ Only a few years old, the Antique Wireless Association has several hundred associates in several countries, dedicated to preserving amateur radio history. W2ICE relates some of the current activities and describes the museum collection of thousands of early tubes, receivers, transmitters and other equipment, some dating back to 1850.

☐ Printed circuit board stock is widely available, and W1IPV finds it very useful for interstage shielding, especially in v.h.f. circuitry, and even for base plates.

☐ W8GRG and W5LAN present two versions of transistorized electronic key, control and monitoring units.

☐ From the advance announcement, it looks as though the National Convention in Galveston next month will be a real wing-ding. — *W1RW*

Canadian NewsFronts

Conducted By Harry MacLean,* VE3GRO

Just What Was Said

On February 16, representatives of British Columbia FM Association, British Columbia's Provincial Emergency Program Amateur Radio Group and Burnaby Amateur Radio Club, as well as one individual amateur, appeared before CRTC, the Canadian Radio-television and Telecommunications Commission. Purpose: To ask CRTC not to renew Vancouver Cablevision's licence until that company had taken steps to eliminate Channel-E interference in the 2-metre band. If the following exchange is any indication, it appears that the amateurs' message got through. Here's part of just what was said:

CRTC Commissioner Gower: You've talked about that you're willing to get together with the Amateur Radio operators. It seems to me that the problem was an awful lot broader than you gave credence to in your reply. There was considerable representation of a group, and you say there are only 500, and then you say there aren't that many calls for servicing, and that should be reflected. But surely, interference to the ham operators, there wouldn't be service calls on that. There would be service calls on *their* frequencies going into the cable system. I can understand that, but not the other way around. The first question I'd like to ask: They indicate that it's their spectrum you're using. Is that correct?

Mr. Bissonnette of Vancouver Cableviston: That's correct. They are the only licensed users of the 2-metre band. Our spectrum is a spectrum which is enclosed in a cable, and as you know, as per our BP23 [Broadcast Procedures 23], when there are instances of radio leakage, we are required to rectify that.

Commissioner Gower: Then that is clear. It's up to you to fix it. It's not up to them.

Mr. Bissonnette: That's correct.

Commissioner Gowar: Okay. They've got priority. The other thing I didn't quite understand: What is the problem with changing off Channel E? If the problem in Vancouver is so horrendous, that no matter what you do in sweeping the system and fixing drops, etc., you've still got a major problem ... The problem would be resolved by moving one channel, putting something else on it, not a broadcast signal like the Knowledge Network. Why not do that? I know you would have to negotiate with the provincial government. I know they want a uniform channel.

Mr. Bissonnette: Well, Frank is going to answer this. But let me say just one thing: ... the word "horrendous" is not the word we would use, is not the judgement we would give to the condition of our cable plant.

Commissioner Gower: I wasn't referring to your cable plant. I was saying "horrendous problem" ... Obviously they felt very strongly about it or they wouldn't have all bothered to come here. The problem is not horrendous from your standpoint because you're not being interfered with, but they are. So what's the problem with changing?

Mr. Frank Eberdt of Vancouver Cablevision: Aside from the preference of the Knowledge Network to be on that channel ... there is the issue of scarce resources. We anticipate within the next 12 months we'll be carrying anywhere from 5 to 10 additional channels as a result of a tiering decision, some of these being Canadian signals and some of these being U.S. — hopefully U.S. satellite signals. Once that occurs, there will be a necessity to use Channel 18 [This is the local designation for Channel E — Ed.] because there won't be any spare channels. There wouldn't be an opportunity to put the Knowledge Network somewhere else and leave Channel 18 free. The only way to avoid the problem is to leave the channel free.

Commissioner Gower: I wouldn't think that the provincial government would necessarily care if it's Channel E. They just want a uniform channel, whether it's G, F or P. They really wouldn't care, would they?

Mr. Eberdt: I don't think the problem is so much where the Knowledge Network is located as the requirement to have that channel available for a programming service.

Commissioner Gower: Okay. Now what about using it for an alphanumeric service? Do you have the same problem?

Mr. Eberdt: The same problem would occur.

Commissioner Gower: It wouldn't make any difference whether it's a broadcasting service or whether it's alphanumeric?

Mr. Eberdt: No, it wouldn't.

Commissioner Gower: So, in effect, you're saying that you would lose the channel.

Mr. Eberdt: That's correct.

Mr. Bissonnette: And as I indicated, Commissioner Gower, that would be the tip of the iceberg.

Commissioner Gower: You mean you're interfering on other channels too?

Mr. Bissonnette: Well, the insinuation ... would be that rather than making an effort to rectify the problem through precedent, the easier solution would become just to remove us from cable. Whereas, what we're saying is that given the information that we've received from Amateur Radio, which has been almost nothing, that we have proven that when we are referred to a problem, that we do respond and that we respond effectively and that we're committed to doing this. And rather than taking the easy way out, which I would consider removal from a channel to be, we're prepared to do it the right way, which is to replace, as required, defective hardware.

Commissioner Gower: But it seemed to me that *that* was all right. You get a complaint here, a complaint there, you go and fix that one particular thing. But it seemed to me that the problem was of large scope and I'm sure we'll check into this and see just how large it is, ... So how long before these people receive relief?

Mr. Bissonnette: Two years.

Commissioner Gower: Would that be acceptable to you if you were a ham radio operator?

In the end, Vancouver Cablevision admitted that even after two years of upgrading their system, there would still be problems. But they did not see this as cause to move off Channel E, one of *30* channels used by Vancouver Cablevision. They felt that amateurs ought to be willing to share the spectrum to benefit television viewers:

Mr. Eberdt: The intervenors pointed out that it is not strictly a matter of upgrading the plant, and even if the plant was squeaky clean, for want of a better way of putting it, there would still be problems such as wiring within a house which was of an illegal nature or inadequate wiring in apartments ... There is some limit to the extent that we can solve the problems ... The only way it can be looked at is on a co-operative basis where both sides have to see and have an appreciation for the problems the other has, and that what we are doing here is balancing the interests of the City of Vancouver in having available one channel, with a group of ham radio operators, and that's a very difficult equation to balance.

Obviously, cable companies have some pretty set ideas. We'll report on the outcome of this CRTC hearing next month.

SECTION MANAGER ELECTION RESULTS

Congratulations to Peter Guenther, VE4PG, of Landmark, Manitoba, who was re-elected Section Manager, Manitoba Section, for a two-year term beginning on July 1.

CRRL SUBMISSIONS TO DOC

In recent submissions, CRRL requested the following: (1) that DOC remove all operating restrictions on the 160-metre band, now that Loran-A operation on the band seems to have ceased, (2) that DOC reinstate RTTY operation on the 7050-7100 kHz portion of the 40-metre band and delete the requirement that amateurs identify their calls in CW or voice after RTTY transmissions, (3) that DOC allow specific Canadian amateurs to conduct low-power tests on the 18- and 24.5-MHz bands, enabling them to take an active part in the ARRL Antenna-Design Competition announced in March *QST*, (4) that DOC limit the punctuation used on Morse Code tests to period, comma, question mark, slant bar and double dash, and limit Q-signals used on Morse Code tests to those in common use, and (5) that DOC allow a few days grace, one way or the other as required, for amateurs wishing to write the Advanced Amateur exam "one year" after writing the Amateur exam, and for candidates for the Amateur and Digital exams wishing to use credits obtained on an examination written "one year" ago; DOC examinations do appear in the same months from year to year, but have not been *exactly* one year apart; this has caused problems at some DOC offices.

CRRL Past President Ron Hesler, VE1SH, mans the CRRL booth at the 1984 Miami Tropical Hamboree. That's where all of us should have been in February ... *(VE3CDM photo)*

DOC EXAMINATIONS

DOC will hold Amateur Radio examinations across Canada on June 20. If you plan to write, submit your application by May 18. Don't forget to practice your Morse Code *sending*. Remaining date for DOC examinations this year is October 20.

*163 Meridene Crescent West, London, ON N5X 1G3, Tel. 519-433-1198

Coming Conventions

LOUISIANA STATE CONVENTION
May 5-6, Baton Rouge

Dealers, forums, women's and children's activities, vendors, swap tables, awards and a Saturday Night Banquet are all part of this year's Convention. Admission is free. Purchase banquet tickets early ($16 per couple) because seating is limited to 100 persons. Arrangements for special-rate visitor accommodations are through Rodeway Inn at I-10 and S. Acadian Thruway, about six blocks from the Convention site at Catholic High School. Come early and visit Baton Rouge's newest attraction, WW II battleship *USS Kidd*, shop in Catfish Town and enjoy the hospitality of the city. Contact Dick Watson, KC5YT, 8930 Graham Dr., Baton Rouge, LA 70814, tel. 504-926-2035; or Jack Coffee, WD5ELJ, 10026 Hackberry, Baton Rouge, LA 70809, tel. 504-293-4764. For banquet reservations, contact Louis Bagot, WA5TXA, 6486 Audusson Dr., Greenwell Springs, LA 70739, tel. 504-261-5585. Special guest, ARRL President Larry E. Price, W4RA. League forums to include Delta Division Director Clyde Hurlbert, W5CH, and DXAC member Joseph A. Butler, K5OS. Talk-in on 19/79, 28/88 or 144.85/145.45. Plenty of parking is available for campers, but no hookups. Craftsmen/artists are welcome to display/sell for the price of a swap table. Everyone is welcome.

ATLANTIC DIVISION/NEW YORK STATE CONVENTION
May 19, Rochester, New York

The Atlantic Division/New York State Convention combined with the Rochester Hamfest will be Saturday, May 19, at the Monroe County Fairgrounds, Rte. 15A, Rochester. Commercial exhibits open at 8:30 A.M. The huge outdoor flea market opens at 6 A.M.

An attempt was made to conduct FCC exams, but we could not win FCC approval. Therefore, exams will NOT be conducted this year.

Programs begin at 10 A.M. They include AMSAT-OSCAR, by John Henry, VE2VQ; Synthesized Receiver Performance, by Bill Myers, K1GQ; and The Grenada Story, by Steve Mendelsohn, WA2DHF. Meetings include an ARRL forum with Atlantic Division Director Hugh Turnbull, W3ABC, Hudson Division Director George Diehl, W2IHA, and Canadian Division Director Tom Atkins, VE3CDM. Other meetings will be SAYLARC, with Jean Chittenden, WA2BGE; Western District Net, with Kathy Tyson, KC2QQ; and the National Traffic System, with Doug Zuckerman, W2XD. A highlight of the afternoon session will be the 5th Annual W2RUF Memorial Code Contest, conducted by Bill Thompson, W2MTA. Van service will be provided to the nearby Marketplace Mall, Rochester's newest and largest shopping mall.

The annual banquet will be on Friday, May 18, the evening prior to the Hamfest. Presentations will be made to the 1983 Code Contest Winner and to the 1984 Amateur of the Year. Immediately following the banquet there will be a show featuring comedian/magician Glenn Brooks. There is no charge for the show. Everyone is welcome to attend.

Hotel headquarters is the Rochester Thruway Marriott. You must contact the hotel reservations office (716-359-1800) during business hours to make reservations. Registration is $4 in advance, $5 at the gate; banquet, $18. Flea market permits, $2 per parking space. For tickets, write to Rochester Hamfest Tickets, 174 Croydon Rd., Rochester, NY 14610. For all other information, call 716-424-7184 or 716-424-1100 during business hours.

ALABAMA STATE CONVENTION
May 19-20, Birmingham

The ARRL Alabama State Convention and BirmingHamfest 1984, sponsored by the Birmingham Amateur Radio Club.

Dates and Time: May 19-20; doors open 9 A.M. each day.

Place: The Birmingham/Jefferson Civic Center, all indoors and completely air-conditioned.

Features: exhibitors, flea market, Wouff Hong, forums and meetings, CW and Homebrew contests, banquet, nonham activities, and more.

Admission: $4, valid both days; 12 years and under, free.

Flea Market: $6 per table per day. Reservations not needed; no one will be turned away for lack of space. Set up Friday, 6 P.M.; Saturday and Sunday, 7 A.M.

Banquet: Local hams will provide a home-cooked meal. Admission for out-of-towners is $5 single, $9 couple, $12.50 for immediate family of 3 or more. Contact Don Hodges, KA4TGW, for reservations.

Talk-in: W4CUE/R, 34/94.

Mail: BirmingHamfest, P.O. Box 603, Birmingham, AL 35201.

Call: Keith Landrum, KD4DQ, 205-823-1628, after 6 P.M. Central.

May 5-6
Louisiana State, Baton Rouge
May 18-19
Atlantic Division/New York State, Rochester, New York
May 19-20
Alabama State, Birmingham
May 25-27
Rocky Mountain Division, Aurora, Colorado
June 1-3
Northwestern Division, Seaside, Oregon
June 1-3
West Gulf Division, Dallas, Texas
June 2-3
Kansas State, Salina
June 16-17
Georgia State, Atlanta
June 29-30
Michigan State, Livonia
July 7-8
Indiana State, Indianapolis

ARRL NATIONAL CONVENTIONS
July 20-22, 1984
New York, New York
October 4-6, 1985
Louisville, Kentucky
September 5-7, 1986
San Diego, California

ROCKY MOUNTAIN DIVISION CONVENTION
May 25-27, Denver/Aurora, Colorado

The amateurs of the Rocky Mountain Division invite you to the ARRL Rocky Mountain Division Convention sponsored by the Colorado Section Clubs.

Take a vacation to the Mile High City and the mountains of colorful Colorado, and enjoy a fun-filled weekend. We have major dealers and manufacturers from all over the U.S. with display booths, and the indoor swap meet will be one of the best. We have gathered experts in their respective fields and will offer a full program of forums, exhibits, technical presentations, and demos featuring: antennas, contesting, CW proficiency, DX, mobile operation, packet radio, propagation, RTTY, satellite, traffic, UHF/VHF and an ARRL forum with Rocky Mountain Division Director Lys Carey, KØPGM, and ARRL Hq. representatives Sally O'Dell, KB1O, and Jim Clary, WB9IHH. There will be group events with ARES, CCARC, QCWA, MARS, NWS, NTS-CTS and MARCCO.

Several hospitality rooms are being sponsored by the Colorado Clubs and will be available throughout the hotel. Babysitting and child care are available. A Saturday night banquet will be held, with a prominent speaker. A Sunday brunch, and many surprises on both Saturday and Sunday. Ladies activities are scheduled for all day Saturday, with a get acquainted brunch, a presentation by Barbizon School of Modeling, a shopping trip and tour.

The location is the new Holiday Inn, Holidome Convention Center, I-70 & Chambers, Denver/Aurora, with every facility available. Talk-in on 34/94 or any metro-area repeater.

Registration is $5 in advance; after May 10, $7. Registration is good all three days and includes one free swap table per family. Additional tables are $7 each. Banquet is $15; brunch, $7. Hotel rate is $49.50 per night (four to a room). Those desiring banquet tickets, hotel rooms or swap space are urged to order in advance. For information or reservations, contact Colorado SM Bill Sheffield, KQØJ, 1444 Roslyn St., Denver, CO 80220, tel. 303-355-2488 or 355-6400.

NORTHWESTERN DIVISION CONVENTION
June 1-3, Seaside, Oregon

The 1984 ARRL Northwest Division (Oregon State) Convention, cosponsored by the North Coast Repeater Assn. and the Oregon Tualatin Valley ARC, will be held at the Seaside Convention Center, Seaside, Oregon, on Friday, June 1, through Sunday, June 3, 1984. Hours are 5 P.M. to 8 P.M. Friday; 8 A.M. to 5 P.M. Saturday; and 9 A.M. to 2 P.M. Sunday. Preregistration is $5 per single and $7 per couple, $2 for teens with parents. Children 12 and under free.

The convention will feature Mr. Roy Neal, K6DUE, as guest speaker at the banquet. His subject will be "STS-9: Behind the Scenes," and as an added feature he will make a QSL card presentation to Lance Collister, WA1JXN. Mr. Collister was the first radio amateur to make contact with a fellow ham orbiting in outer space. Mr. Neal, NBC News and Science Editor, was very active in the Ham in Space program, so this presentation is a fitting conclusion to the STS-9 activity.

Seminars: antennas, DXpedition, packet radio, computers and Amateur Radio, power supplies, and many more. Master of Ceremonies will be the Honorable Judge Greg Milnes, W7AGQ. Banquet cost is $13.50 per person. Talk in on 52 simplex and 145.45 (-600). For more information and/or reservations, write to Doc McLendon, W7GWC, P.O. Box 920, Seaside, OR 97132.

WEST GULF DIVISION CONVENTION
June 1-3, Dallas, Texas

The ARRL West Gulf Division Convention will be held in conjunction with Ham-Com '84 at the Northpark Inn Convention Center in Dallas, Texas, on June 1-3, 1984. This year marks the 7th annual Ham-Com Convention, with expected attendance over 5000. Thanks to the help of the ARRL, the DFW Metroplex-area Radio clubs and the Amateur Radio operators who support these efforts, Ham-Com has grown into a major regional convention. Ham-Com offers a wide range of activities for all members of the family, including a full day of programs, flea market, bus tour of historic homes, lunch on the river at Las Colinas, bus tour of movie studio, child care with a video room, and much more. There are two floors of exhibits by major manufacturers and distributors, an indoor air-conditioned flea market and so many programs that you won't be able to see them all. There's the DX program and the Xmtr Hunt put on by the Arlington Radio Club, Division Director Ray Wangler's ARRL forum and the Friday Night Hospitality Room sponsored by the Dallas ARC. On Saturday night is the popular Western barbecue and dance, with the Wouff Hong afterwards. There's more of the same on Sunday, and the SKYWARN School. We are trying to make Ham-Com the no. 1 convention in the country, and we promise to send you home exhausted and ready for more!

The preregistration information is: single preregistration, $6; family preregistration (one ham and up to three non-hams), $8.50; reserved flea market table, $10; Women's flea market table, $3; Women's bus tour, $20; western barbecue dinner, $14; western dance, free.

The preregistration deadline is May 25, 1984. Mail your registration request to Ham-Com/West Gulf Convention, Box 64, Richardson, TX 75080. For more information, call the registration office at 214-867-6766.

KANSAS STATE CONVENTION
June 2-3, Salina

The Central Kansas Amateur Radio Club (CKARC) of Salina, Kansas, will host the 4th annual Kansas State ARRL Convention in Salina on June 2-3 at the Red Coach Inn Convention Center at West Crawford and I-135. Technical talks by ARRL Technical Advisor Al Markwardt, W5PXH. DX program by Carl Henson, WB4ZNH. Hospitality suite Friday and Saturday sponsored by the Kansas DX Association. Banquet and Wouff Hong ceremony Saturday night. Preregistration $4, postmarked by May 26; at door, $5. Banquet, $8. Free flea market; bring your own tables. Free tables for commercial vendors. *Talk-in on 03/63 and 52* simplex. Information/reservations, vendor inquiries to Bill Oehlert, KBØEY, P.O. Box 1321, Salina, KS 67402, tel. 913-825-7131 or 827-4577 after 5 P.M.

Hamfest Calendar

By Marjorie C. 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.]

Arkansas (Rogers) — May 12: The Northwest Arkansas ARC, Inc., will hold its 4th annual Hamfest/Swapfest on Saturday, May 12, in the Rogers Youth Center Bldg., 315 West Olive, from 8 A.M. to 4 P.M. Doors open at 6 A.M. for setup only. Commercial exhibitors and flea market tables/space $2. First come, first served. General admission free. Many activities scheduled. Parking and snack bar on premises; restaurants nearby. Talk-in on 16/76 and 52 simplex. For more information, write to Roy Milliren, AF5W, 2014 So. 16th St., Rogers, AR 72756.

California (Sacramento) — May 5: The North Hills Radio Club, Inc., will sponsor the 12th annual Sacramento Valley Amateur Radio Hamswap on Saturday, May 5, from 9 A.M. to 3 P.M., at the Placer County Fairgrounds, Roseville. Tables and tailgate advanced reservation, $6; at the door, $8. Admission free. Talk-in on 144.59/145.19. For information, contact D. Long, 8810 Swallow Way, Fair Oaks, CA 95628.

†**California (Fresno) — May 18-20:** The 42nd Annual Fresno Hamfest, sponsored by the Fresno ARC, will be held at the Tropicana Inn in Fresno, May 18, from 7 P.M. to 10 P.M., and May 19-20, all day and evening. Golf, technical sessions, transmitter hunt, banquet, ARRL forum, women's luncheon, QCWA Meeting, swap meet. Alternative activities include a microwave cooking demonstration and a craft factory tour. Banquet speaker will be Alan Kaul, W6RCL, of NBC News. Full registration is $23 before May 11, then $25. Banquet-only tickets are $14 before May 11, then $16. Partial registration is $5. The women's luncheon and program is $6.50. Talk-in on 34/94. For more information and registration materials, please contact Fresno Hamfest, P.O. Box 783, Fresno, CA 93712, tel. 209-268-6314 or 209-225-4699.

Colorado (Boulder) — May 20: The Boulder, Colorado, Rocky Mountain VHF Society will hold the annual spring hamfest on Sunday, May 20, from 9 A.M. to 3 P.M., rain or shine, at the Boulder National Guard Armory, 4750 North Broadway. Admission donation is $3 per family, and there is no seller's charge. It is suggested that sellers bring their own table. Some tables will be provided; if any seller needs more than one table, they must contact the organizers in advance. We will again hold our popular technical demonstrations and seminars covering packet radio, fast-scan TV, microwaves, satellite communications, and more. Food and drink available. Talk-in on 16/76 and 52. For more information, contact Richard Ferguson, KAØDXM, 1150 Albion Rd., Boulder, CO 80303, tel. 303-499-2871.

Colorado (Lamar) — May 20: The Lamar ARC swapfest will be held on May 20 at the National Guard Armory, 2500 South Main, Lamar, from 8 A.M. to 4 P.M. (MDT). Talk-in on 01/61 and 52. For details, write to Charles Cunningham, 35 Paseo Pl., Lamar, CO 81052.

Connecticut (Putnam) — May 20: The ECARA will hold its 10th annual flea market on Sunday, May 20, at the Elks Hall in Putnam, from 9 A.M. to 2 P.M. Admission is $2; free parking. Advanced table reservations, $7; at the door, $9. Food and drinks available. Talk-in on 825/225 and 52 simplex. For further information, contact Richard Spahl, K1SYI, Lake Pkwy., Webster, MA 01570, tel. 617-943-4420 after 7 P.M.; or Donald F. Amirault, K1APE, 66 Labonte Rd., RR 1, Box 310, Thompson, CT 06177, tel. 203-923-2727.

Connecticut (Southington) — June 3: The Southington ARA Fleamarket will be held on June 3, from 10 A.M. to 4 P.M., at the Central Elementary School, Main St., Rte. 10, just outside Southington Center. Over 30 tables of new and used ham equipment. Admission $1. Tables are $7 in advance, $8 at the door. Two parties admitted with each table purchased. Cutoff for tables, May 18. Talk-in on 28/88 and 55 simplex. Send checks payable to S.A.R.A. with s.a.s.e., please, to P.O. Box 284, Southington, CT 06489. No tailgating.

†**Connecticut (Newington) — June 10:** The 1984 Newington Amateur Radio League Flea Market will be held at Newington High School, Willard Ave. (Rte. 173), on June 10, from 9 A.M. to 4 P.M. Dealers, 8 A.M. to 4 P.M. Admission is $2 at the door. Tables are $8.50 in advance, $10 at the door. Equipment swap (buy and sell). Guided tours of W1AW and ARRL museum between 10 A.M. to 2 P.M. Refreshments available. Talk-in on 144.85/145.45 and 52 simplex. A portion of the proceeds will be used for the NARL Scholarship Fund. For information and reservations, please contact Thomas Namnoum, KM1O, 55 Spruce St., Newington, CT 06111, tel. 203-666-1615.

Idaho (Coeur D'Alene) — June 9: The Kootenai ARS presents Hamfest '84 at the North Idaho Fairgrounds, Coeur D'Alene, on June 9, from 8 A.M. to 4 P.M. Swap tables will be available at no charge. RVs are welcome; *no* hookups available at site. Come early for annual Friday program, including a pot luck and dancing afterwards. For further information, write to Avon Anderson, WB7WBZ.

†**Illinois (Princeton) — June 3:** The Starved Rock Radio Club, W9MKS, presents the Starved Rock Hamfest on June 3, from 7 A.M. until late afternoon, at the Bureau County Fairgrounds, Princeton, conveniently reached via Rte. 80. Admission before May 20 is $2.50; at the door, $3. Free swap area, free coffee and doughnuts to each registrant at 8 A.M., exhibits by commercial vendors, ARRL seminar, plenty of parking, food served on premises, refreshments. At the ARRL booth, meet Central Division Director Ed Metzger, W9PRN, and Vice Director Howard Huntington, K9KM, ARRL Legal Counsel Christopher D. Imlay, N3AKD, and Assistant Director James C. O'Connell, W9WU. Talk-in on 12/72, 07/67 and 52 simplex. For information and reservations, contact George E. Keith, W9QLZ, R.R. 1, Box 171, Oglesby, IL 61348, tel. 815-667-4614.

†**Indiana (Evansville) — May 20:** T.A.R.S. Hamfest, sponsored by the Tri-State ARS, Inc., will be held on May 20, starting at 6:30 A.M. (CDT), at the 4-H Center Auditorium, Hwy. 41 N., Evansville. Grounds open at 6 A.M. (CDT). All indoors. Inside and outside fleamarket. Admission is $3; indoor tables $7.50; outdoor flea market $3. Talk-in on 75/15 and 19/79. For table reservations and information, contact Mike Anderson, KA9LQM, P.O. Box 3284, Evansville, IN 47732, or Blanche M. Elpers, KA9EIV, 840 Herndon Dr., Evansville, IN 47711, tel. 812-424-9182.

†**Indiana (Wabash) — May 20:** The 16th Annual Wabash Hamfest, sponsored by the Wabash County ARC, Inc., will be held at the Wabash County 4-H Fairgrounds located on State Rte. 13, from 6 A.M. to 4 P.M. Donation is $2.50 in advance, $3 at the gate. Advance reservations requested. Talk-in on 63/03, 34/94 and 52. Free overnight parking at fairgrounds. Motel lodging available locally. Flea market includes new and used gear in unlimited outdoor area. Major vendors in indoor area. Food available all day. For advance tickets, contact Don Spangler, W9HNO, 235 Southwood Dr., Wabash, IN 46992, tel. 219-563-5564.

†**Indiana (Terre Haute) — May 20:** The 38th Annual Wabash Valley Amateur Radio Hamfest will be held Sunday, June 3, at the Vigo County Fairgrounds, located on U.S. 41, ½ mile south of I-70. Open Saturday for overnight campers ($5 fee); open Sunday at 8 A.M. EST. Free outdoor flea market; covered flea market, $3 for 12 × 12 space. Some ac and tables available on first-come basis. Food and refreshments, giant shopping mall nearby. Computer and packet radio forums. Advance-sale tickets are $2 or three for $5; $3 at gate. Children under 12 free. Talk-in on 25/85 and 52 simplex. For tickets and information, send an s.a.s.e. to WVARA Hamfest, P.O. Box 81, Terre Haute, IN 47808.

Kentucky (Bowling Green) — June 9: The Bowling Green Hamfest will be held at the Southern Kentucky Fairgrounds. Air conditioned inside flea market. Big outside flea market — no set up fee. Sponsored by the Kentucky Colonels ARC; proceeds for emergency communications equipment. For information, contact Ed Gann, N4HID, Rte. 19, Box 92, Bowling Green, KY 42101, tel. 502-843-8911.

Maryland (West Friendship) — May 27: The Maryland FM Association's annual hamfest will be held on Sunday, May 27, at the Howard County Fairgrounds in West Friendship, about 30 miles west of Baltimore on I-70. Hours are 8 A.M. to 4 P.M. Talk-in on 16/76 and 52. Admission donation is $3; tailgating, $3. Inside tables, in advance, are $6 each; on day of hamfest (if available), $10. Commercial vendors must have proper tax license certificates available. Items offered for sale must be Amateur Radio-related. For table reservations or more information, write to MFMA Hamfest Committee, c/o John Elgin, WA3MNN, 8216 Styers Ct., Laurel, MD 20707, tel. 301-621-2352.

Massachusetts (Fitchburg) — May 20: The Montachusett ARA will hold an indoor flea market on Sunday, May 20, from 9 A.M. to 3 P.M., at the Fitchburg Civic Center, 1000 John Fitch Hwy., Fitchburg. Admission is $1; tables are $8 each. Refreshments available; free parking. Talk-in on 144.85/145.45 and 52 simplex. For space reservations, send check payable to MARA, c/o Jim Beauregard, 7 Mountain Ave., Fitchburg, MA 01420. Doors open at 8 A.M. for sellers.

†**Michigan (Midland) — May 19:** The Midland Hamfest, sponsored by the Central Michigan ARA, will be held at Midland Armory, Saturday, May 19, from 8 A.M. to 2 P.M. (set up at 6 A.M.). Admission in advance is $3; at the door, $4. All facilities under cover. Parking facilities for handicapped. Video presentation of CMARA repeaters and sites. Emergency communication demonstration. Tables, refreshments. Talk-in on 07/67 and 52 simplex. For advance tickets and reservations, contact Raleigh L. Wert, W8QOI, 309 E. Gordonville Rd., Rte. 12, Midland, MI 48640, tel. 517-631-5591.

†**Michigan (Chelsea) — June 3:** The Chelsea Communications Club Swap and Shop will be held at the Chelsea, Michigan, Fairgrounds on Sunday, June 3, from 8 A.M. to 2 P.M. Donation: $2.50 in advance, $3 at the door. Women and children under 12 free. Women's tables welcome. Table space: $7 per 8 feet. Trunk sale: $2 per space. Campgrounds available in area. Plenty of parking. Gates open at 5 A.M. for sellers. For more information call 517-764-5785, or write to William Altenberndt, 3132 Timberline, Jackson, MI 49201.

Minnesota (St. Paul) — June 2: The North Area Repeater Assn. swapfest and exposition will be held on Saturday, June 2, at the Minnesota State Fairgrounds in St. Paul. Free overnight parking of self-contained RVs on June 1. Talk-in on 25/85 or 16/76. Exhibits, booths, giant outdoor flea market. Admission $4. For more information or dealer inquiries, write to Amateur Fair, P.O. Box 857, Hopkins, MN 55343, tel. 612-420-6000.

†**Missouri (Marshall) — May 20:** The Indian Foothills ARC will sponsor a hamfest on Sunday, May 20, at the Saline County Fairgrounds Multipurpose Bldg. in Marshall. Admission tickets are $2 each or three for $5 at the door; 4 for $5 in advance. For information and tickets, write to Fred Fellers, 703 N. Main, Carrollton, MO 64633, tel. 816-542-0223.

New Jersey (Stirling) — May 13: The TCRA Flea Market, sponsored by the Tri County Radio Assn., will be held on Sunday May 13, from 9 A.M. to 4 P.M., rain or shine, at the Passaic Township Community Center, off Valley Road, Stirling. Everything indoors. Registration $2.50; tables $6. Talk-in on 147.855/255 or 52 simplex. For table reservations/information, call Dick Franklin, W2EUF, at 201-232-5955 or 270-3193, or write to P.O. Box 182, Westfield, NJ 07090.

New Jersey (Union) — May 20: The Irvington Roseland Amateur Club hamfest will be held at the Boys & Girls Club (of Union), 1050 Jeanette Ave., Union, on May 20, from 9 A.M. to 3 P.M. Admission is $1 in advance, $2 at the door. Tables $5. Refreshments, plenty of parking, no steps. For advance tickets/information, contact Walt Heineman, W2QR, 11 Coolidge Rd., Maplewood, NJ 07040, tel. 201-763-2280. Talk-in on 34/94 or 52.

†**New York (Owego) — May 5:** The 25th annual Southern Tier Amateur Radio Clubs Hamfest will be held on Saturday, May 5, at the Treadway Inn, Owego. Flea market opens at 8 A.M.; vendor displays and sales, tech and nontech talks, refreshments. There will be a dinner at 6:30 P.M. (advance tickets only for the dinner). Take NY Rte. 17 to Exit 65. Talk-in on 22/82, 16/76 or 52 simplex. For further info, please send an s.a.s.e. to C. England, KF2X, RD 1, Box 144, Vestal, NY 13850.

†**New York (Islip) — May 20:** LIMARC Spring Hamfair '84, sponsored by the Long Island Mobile ARC, will be held on Sunday, May 20, at the Islip Speedway, Islip Ave., Islip, from 9 A.M. to 4 P.M. Sellers may set up starting at 7:30 A.M. Sellers admission is $5 per

†ARRL Hamfest

*Convention/Travel Coordinator, ARRL

space. Buyers admission is $3 per person (spouses and children free). Food and refreshments available. Talk-in on 25/85 and 52 simplex. For additional info, contact Al, WA2FBQ, at 516-796-2965, or Bob, WB2DIN, at 516-221-8116.

New York (St. Albans) — June 3: The Ebonaire ARS hamfest will be held on Sunday, June 3, from 9 A.M. to 3 P.M., at Southern Queens Park, 119-09 Merrick Blvd., St. Albans Veterans Hospital (formerly St. Albans Naval Hospital) entrance, Merrick Blvd. Talk-in on 145.35/144.75 or 52 simplex. Donation: $2 to buyers (spouses, sweethearts, children free); $4 per exhibitor/per space. Free parking, refreshments available. For additional information, call (night only) Vince, 212-528-0416 or Art, 212-523-2319. There will be cover if it rains.

New York (Rome) — June 3: On Sunday, June 3, the Rome Radio Club, Inc., will present the 32nd edition of "Rome Ham Family Day" at Beck's Grove. Something of interest to everyone — games, contests and the largest flea market in the area. Good food and beverages available all day. Educational and scientific displays and presentations. The day will be climaxed with a dinner and the presentation of our Ham of the Year Award. For further information, write to Rome Radio Club, Inc., P.O. Box 721, Rome, NY 13440.

†**North Carolina (Durham) — May 19:** Durham Fest, sponsored by the Durham F.M. Assn., will be held at the South Square Mall in Durham on May 19, from 8 A.M. to 5 P.M. (EST). Admission is $3.50. Tailgating, tables, dealers, mall shopping, restaurants, movies. Talk-in on 147.825/225. For further information, write to D.F.M.A., P.O. Box 8651, Durham, NC 27707, tel. 919-471-6971.

†**Ohio (Medina) — May 13:** The Medina County Hamfest, sponsored by the Medina Two Meter Group, will be held at the Medina County Community Center Bldg., Lafayette Rd., State Rte. 42 S.W., Medina, on May 13, from 8 A.M. to 4 P.M. Vendors set up at 7 A.M. Advance admission is $2.50; at the door $3. Refreshments, free parking. Talk-in on 63/03. Further information from P.O. Box 452, Medina, OH 44258, tel. 216-725-5021 or 216-723-5010.

Ohio (Athens) — May 20: The 5th Annual ACARA Hamfest, sponsored by the Athens County ARA, will be held at the Athens City Recreation Center, 733 East State St. (U.S. Hwy. 50 East), from 8 A.M. to 3 P.M. Sunday. Admission is $3 at the gate. Vendors' indoor tables can be reserved for $3 by contacting club president, Joe, NE8R, at 614-797-4874. For those wanting to set up tables outside or tailgate displays, space is available at $2 in a large paved area; no reservations needed. Talk-in on 34/94 and 52. Rain or shine; plenty of parking and refreshments available. Inquiries should be addressed to ACARA, P.O. Box 72, Athens, OH 45701. Doors open at 7 A.M.

†**Ohio (Oak Harbor) — May 20:** The Sandusky-Ottawa County combined hamfest will be held at the Ottawa County Fairgrounds, S.R. 163, Oak Harbor, on May 20. Doors open to dealers at 6 A.M., public at 8 A.M. Admission is $2.50 advance, $3 at the door. Swap and shop, flea market, free parking and free trunk sales. Food and drinks available on grounds. Sponsors of the event are the Sandusky Valley ARC and the Ottawa County ARC. Talk-in on 675/075 and 52 simplex. For further information, contact John Dickey, W8CDR, 545 N. Jackson St., Fremont, OH 43420, tel. 419-332-8066.

†**Ohio (Columbus) — June 3:** The 4th annual Columbus Hamfest, sponsored by the Battelle ARC, will be held in the Ganyard Bldg., Franklin County Fairgrounds, Columbus, on June 3, from 8 A.M. to 4 P.M. Admission is $2 in advance, $3 at the door. Tables are $4 in advance, $5 at the door. Talk-in on 37/97. Reservations and further information from Bill Welch, W8LLU, 396 Brevoort Rd., Columbus, OH 43214, tel. 614-261-7053, or Kevin Schreiber, WA8OHI, 6489 Highlawn Dr., Columbus, OH 43214, tel. 614-891-2205.

†**Oklahoma (Lawton) — May 5-6:** The 37th annual Lawton-Ft. Sill Hamfest will be held in Lawton on May 5-6 at the Hotel Lawtonian. Features will include ARRL, MARS, QCWA and others. Preregistration is $6; at the door, $7. For more information, write to Lawton-Ft. Sill ARC, Inc., P.O. Box 892, Lawton, OK 73501.

Oklahoma (Mooreland) — May 20: The Great Plains ARC 3rd annual Northwest Oklahoma Eyeball & Swapmeet will be held in Mooreland on Sunday, May 20, starting at 9 A.M. Covered-dish dinner at noon. Local airport. Dealer and swap tables available at no charge. Camp sites available. Talk-in on 72/12 and 52 simplex. For further information, call 405-994-5394, or write to Gordon Richmond, KB5XI, Rte. 1, Box 12, Mooreland, OK 73852.

Ontario (Guelph) — June 2: The Guelph ARC (VE3ZM) presents the 10th annual Central Ontario Amateur Radio Fleamarket and Computerfest on Saturday, June 2, from 8 A.M. to 4 P.M., at Regal Hall, 340 Woodlawn Rd., W., Guelph. Doors open to vendors *only* from 6 A.M. General admission is $2; vendors admission $5 per 8-ft space. Children 12 years and under are admitted free. Lots of tables (3 × 8) available for inside rental at $5 each. Commercial displays, surplus dealers, and computer software and hardware. Indoor-outdoor displays. For further information, contact Henry Christiansen, VE3BYU, tel. 519-743-9022 (Kitchener), or Guelph ARC, P.O. Box 1305, Guelph, ON N1H 6N9.

†**Pennsylvania (Bedford) — May 13:** The second annual Southern Alleghenies Hamfest will be held on May 13, from 8 A.M. to 5 P.M., at the Bedford County Fairgrounds, located one mile west of Bedford on Rte. 30 and ½ mile west of the Rte. 220 Bypass. Sponsoring organizations are the Bedford, Altoona, Somerset and Cumberland (MD) ARCs and the Blue Knob Repeater Assn. Talk-in on the Bedford Repeater (145.49) and 52 simplex. Admission is $3; inside spaces, $5 each; outside tailgate spaces, $2. We are making arrangements for reduced rates to visit restored Old Bedford Village! For more information, call Tom Gutshall, W3BZN, tel. 814-942-7334.

†**Pennsylvania (Wrightstown) — May 20:** The Warminster ARC Hamfest, sponsored by the Warminster ARC, will be held at the Middletown Grange Fair Ground, Wrightstown, on May 20 (Sunday); 6 A.M., sellers; 7 A.M., buyers; ends at 2 P.M. Admission is $2 in advance, $3 at the door. Vendors, $2 per space. Many activities, ARRL booth, FM clinic. Talk-in on 69/09 and 52 simplex. For reservations and info, contact William Cusick, W3GJC, Apt. 706, Garner House, Hatboro, PA 19040, tel. 215-441-8048.

Pennsylvania (Pittsburgh) — June 3: The 30th annual Breeze Shooters Hamfest is Sunday, June 3, from 9 A.M. to 4 P.M., at the White Swan Amusement Park, PA, Rte. 60 (Parkway West), near Greater Pittsburgh International Airport. Free flea market spaces; free admission. Family amusement park, food on site. Registration is $2 or three for $5. Under-roof tables for vendors by advance registration only. Talk-in on 28/88 or 29 MHz. For further info, please contact Don Myslewski, K3CHD, 359 McMahon Rd., North Huntingdon, PA 15642, tel. 412-863-0570.

Pennsylvania (Drexel Hill) — June 3: The D.C.A.R.A. annual hamfest and auction will be held, rain or shine, on Sunday, June 3, at the Drexel Hill Middle School, State Rd. and Penn Ave., Drexel Hill. Set up at 7 A.M.; doors open at 8 A.M. Donation $3 each; spouse and children free. Sellers: inside, $8 per table (table provided; 110-V electricity available; bring your own ext. cord). Paid reservation held until 9 A.M. Tailgate are $3 per space, on first-come basis. Talk-in on 147.36 C/L (control link) 224.5 MHz and 52 simplex. Reservations: Delaware County ARA, P.O. Box 236, Springfield, PA 19064. Info: Barbara, KA3DLG, tel. 215-535-1616. Hours: Hamfest — 8 A.M. to 3 P.M.; auction — noon to 3 P.M.

Pennsylvania (Kingston) — June: The Murgas ARC (K3YTL) will sponsor the annual Wilkes-Barre Hamfest on Sunday, June 3, at the 109th Armory, Market St., Kingston (across the river from Wilkes-Barre). Set up only at 6 A.M.; general admission at 8 A.M. Admission is $3; women and children under 16 free. Tailgating $2 per space. Tables and commercial power available. Rain or shine, indoor and outdoor tailgating. Talk-in on 01/61 and 52 simplex. For further information, write to Hamfest Committee, P.O. Box 1094, Wilkes-Barre, PA 18703.

Tennessee (Knoxville) — May 26-27: The Radio Amateur Club of Knox County will hold its 18th annual hamfest May 26-27 at the Kerbella Temple Auditorium, just east of U.S. 441, at the Tennessee River, behind the Vol Inn Motel. Hours: Saturday, from 9 A.M. to 5 P.M., and Sunday, from 10 A.M. to 4 P.M. Admission is $3. Radio and computer forums, dealers, indoor and tailgate flea markets. Free parking. Talk-in on 90/30. For information, contact Larry Poore, N4EHR, 4320 Felty Dr., Knoxville, TN 37918, tel. 615-687-3154.

Texas (Lufkin) — May 4-6: Region Four U.S. Air Force MARS will hold their annual conference in Lufkin May 4-6 at the Rhodeway Inn. Friday night there will be an administrative meeting for region and state officials. Presentations all day Saturday and banquet in the evening, followed by an awards presentation. For further details, contact Ed Langston, AFA4KH/N5CIP, 1123 Sayers St., Lufkin, TX 75901, or George Hatt, AFF4P/KQ5H, 3102 Paul Ave., Lufkin, TX 75901.

†**Virginia (Roanoke) — May 27:** Mayfest '84, sponsored by the Roanoke Valley ARC, will be held at the Roanoke Civic Center Exhibit Hall on Sunday, May 27, from 9 A.M. to 5 P.M. Registration is $3 in advance and $3.50 at the door. QSO room; code proficiency tests; HF contesting, by John Dunker, KJ7K; flower arranging and other interesting programs. Talk-in on 146.385/985 and 52. For reservations and information, contact George Moore, KE4HD, 701 Apperson Dr., Salem, VA 24014, tel. 703-387-0746.

†**Virginia (Manassas) — June 3:** The Tenth Annual Manassas Hamfest, sponsored by the Ole Virginia Hams ARC, Inc., will be held on June 3 at the Prince William County Fairgrounds, ½ mile south of Manassas on VA Rte. 234. Tailgate setup at 7 A.M.; general admission, 8 A.M. Admission is $4; under 12 free. Indoor commercial exhibitors, 25 acres of tailgating, breakfast and lunch on grounds, CW proficiency awards, alternative activities. Talk-in on 37/97 and 52 simplex. Information from Bob Kelly, KA4NES, 7700 Anderson Ct., Manassas, VA 22110, tel. 703-361-9468.

Washington (Yakima) — May 12-13: The Yakima ARC (W7AQ) will hold the Central Washington State Hamfest on May 12-13 at the Hobby Bldg., Central Washington State Fairgrounds, Yakima. Hours: Saturday, from 9 A.M. to 5 P.M., with lunch available; and Sunday, from 8 A.M. to 2 P.M., with breakfast and lunch available. Registration is $4 in advance, $5 at the door. Activities include regional dealers' displays and a free swap and shop with plenty of tables. Talk-in on 01/61 and 34/94. For preregistration, contact Bob Rutherford, WB7WAM, P.O. Box 9211, Yakima, WA 98909.

†**Washington (Ft. Vancouver) — May 19-20:** The Ft. Vancouver Hamfair, sponsored by the Clark County ARC, will be held at the Clark County Fairgrounds, 7 miles north of Vancouver on I-5, May 19-20. Hours: Saturday, from 9 A.M. to 5 P.M. (dinner and entertainment, 6 P.M., Saturday only); Sunday, from 8 A.M. to 3 P.M. Seminars, swap shop, commercial dealers, women's activities, Sunday breakfast, snack bars. Talk-in on 84/24. Further information from Kit Kamahaku, N7EQD, tel. 206-254-8006.

Washington (Wenatchee) — June 2-3: The Apple City Radio Club, W7TD, will hold its annual hamfest and swap meet on June 2-3, at Rocky Reach Dam, approximately 3 miles north of Wenatchee. Talk-in on 146.07. Free camper parking and electrical hookups. Our new club president, George, W7OVE, welcomes all!

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.

Strays

GOOD VIBRATIONS

☐ What do a personal computer, a shoe and Morse code have in common? Combined, they enable Raymond Boduch, WA2GXI, of Buffalo, New York, to lead a fuller life. Having lost his sight and hearing at a very early age, Boduch relies on a computer to keep personal files. To use his computer, he activates a device inside his shoe. The device, developed by a New Jersey electronics expert and a student at Rensselaer Polytechnic Institute, transforms the words and numbers that appear on the PC screen into Morse code impulses that Boduch can "read" with his foot.

I would like to get in touch with...

☐ any amateurs who are interested in or collect reel-to-reel tapes of old-time radio shows and would like to join a net. Fred Korb, Jr., K9HWZ, 532 Cypress Dr., Naperville, IL 60540.

☐ any former Marines interested in starting an informal net. Anthony Engracio, N4FPO, 1850 N.W. South River Dr., Miami, FL 33125.

☐ any amateurs who served aboard the *light cruiser* (CL-57) *USS Montpelier* during WW II. Edward Ireland, W8HZF, 7633 Hillshire Ct., Saginaw, MI 48603.

Club Corner

Conducted By Sally O'Dell,* KB1O

"ALL THE NEWS THAT FITS, PRINT"

Do all club members know that the meeting place was changed from the Red Cross building to the Civil Defense building, but only for this month? Of course they do. It was an important topic of discussion at the last club meeting. Oh, yes, Jim and Mary didn't make it to the last meeting. They have a new baby. But they may want to come this month. They're both regular members, but they don't know about the new meeting place. And how about Arnie, who was out of town on a business trip? Did anyone remember to tell him about the change? Oh, someone must have . . .

Does this scenario sound like your club? If it does, maybe it's time to handle the situation. The solution may be a monthly newsletter.

There are approximately 2000 ARRL-affiliated Amateur Radio clubs, and 600 of them send a copy of their club newsletter to Headquarters every month. The club branch — WA2FTC and I — reads every newsletter that is sent in, along with our other duties. Some days, the pile is higher than others, but we don't skip a newsletter. They cover a wide range — from a postcard announcing the next club meeting to glossy, professionally printed magazines. Most newsletters fall between these two extremes. The audiences vary from a few local members to several hundred in several states. Many newsletter editors and club officers write to us each month asking for assistance in writing, editing and/or improving their club newsletter.

If your club is interested in printing a newsletter or in improving the one you have, these suggestions may help.

Format

The newsletter should use enough pages to cover all the news for the month. The basic formula — information that many clubs find important — can fit in 2 to 6 pages on 8½- × 11-in paper (both sides printed), but many variations are available, from a reduced-page format to legal size.

The top of the first page is the first thing that a reader sees; this is a good place to start. It should include the following: the name of the newsletter, club logo, name of the club, editor's name, and the editor's mailing address and phone number. (Some editors print the times they are willing to accept phone calls. The rest of the family may not be pleased with calls at midnight.) Also include month, year, issue number, and officers' names, call signs and phone numbers (same restrictions on officers' phones). Finally, the ARRL logo can be incorporated in the design if the club is affiliated. If the club has earned Special Service Club status, this may also be indicated.

Content

The next area of importance is monthly information that is valuable to club members. This consists of the next meeting time, date, location and program (if known). Additional articles can be included on a regular basis. Some ideas cover the following: highlights of the last meeting, minutes of the Board meeting, the president's message, an editorial, articles on topics of interest to the members, club classified ads and paid advertising.

Some newsletters include a monthly statement of the club's objectives. If the club's constitution and bylaws have changed, the changes should be printed. If the constitution has not changed but no one has seen it recently, it's not a bad idea to print it again.

And these suggestions don't cover all the possibilities. Don't forget irregular columns; these can include information on local hamfests and flea markets (with dates, times and locations). How about a monthly column devoted to one member of the club at a time, covering what she likes most about ham radio or when he made that first contact, or the funniest contact?

You can start off with a story on an exciting local happening or new FCC information, or an upcoming club contest. One yearly or monthly item is the club calendar. Northern Ohio ARS publishes a calendar for the year with photos of last year's events, club officers and good club times. Then, they list club meetings, club contests and other operating events in which the club will participate as a group. Other clubs publish a calendar page each month, but with one month's activities at a time.

Outside Assistance

Many clubs subscribe to a ham radio newspaper that offers information the magazines do not have. These newspapers offer this "scoop" sooner. The newspapers include *The ARRL Letter, W5YI Report* and *Westlink Report*. *The ARRL Letter* concentrates on ARRL, FCC and IARU news, and can be reproduced provided that credit is given to the *Letter*. Affiliated-club newsletter editors may subscribe at the reduced cost of $10 for a one-year subscription. For information or to subscribe, write to *The ARRL Letter*, ARRL, 225 Main St., Newington, CT 06111. The *W5YI Report* offers Amateur Radio, personal computing and emerging electronic news. It can be reproduced if credit is given to *W5YI Report*. Write to Fred Maia, W5YI, Editor, P.O. Box 10101, Dallas, TX 75207, for more information. The *Westlink Report* cannot be reprinted without written permission of the publisher. Contact them at 11119 Allegheny St., Sun Valley, CA 91352.

Clip art is available from Headquarters to help you illustrate your articles. Send a 9- × 12-in envelope with 37 cents postage to the ARRL Club and Training Department, and we will send you artwork. We are accepting donations of original contributions to future pages of clip art. We will, of course, credit the artist on the artwork itself. If you do donate a piece of clip art, please send a signed note indicating that the work is original and not copyrighted, and that ARRL has permission to reproduce it.

Contests

Some Division Directors run newsletter contests. The recently completed Roanoke Division contest had winners in three areas — (1A) 50 or fewer members, (2A) 51 or more members and (2B) 51 or more members with a commercially printed newsletter. The best club newsletter in the 1A category is Jackson County (WV) ARC *Loud and Clear*, edited by Bob Morris, WA8CTO. The 2A winner is Western Carolina (NC) ARS *Smoke Test*, edited by Robert Miller, W4EY. The 2B category has a tie: Triple States (WV) ARC *BNT*, edited by Ralph McDonough, K8AN, and the Mecklenburg (NC) ARS *News*, edited by Mary Weddle, WC4T, and Clyde Weddle, KF4WY.

Your club newsletter is an extension of the club. The winners of the Roanoke Division contest know that, and have included information that their members find interesting, valuable and entertaining. You, too, can produce a winning newsletter. It doesn't have to win a contest — just the attention of your club members. Then, everyone really wins. Good luck!

*Club Program Manager, ARRL

SSC Kudos and Contacts

Congratulations to the League's newest Special Service Clubs. These clubs are recognized for extended efforts on behalf of Amateur Radio and service to their communities. For further information on these clubs, contact them at these addresses.

Amateur Radio Repeater of Washtenaw (ARROW)
c/o P.O. Box 1572
Ann Arbor, MI 48106
Club membership — 111

Ausable Valley Amateur Radio Club
c/o 2268 Miller Rd.
Lewiston, MI 49756
Club membership — 29

Beaver Valley Amateur Radio Association, Inc.
c/o 501-10th St.
New Brighton, PA 15066
Club membership — 120

Greater Cincinnati Amateur Radio Association
c/o 2213 Smith Rd.
Hamilton, OH 45013
Club membership — 485

Hughes El Segundo Employees Association (HESEA)
c/o Bldg. R4, Mail Station 329
2060 East Imperial Hwy.
Los Angeles, CA 90045
Club membership — 203

Long Island Mobile Amateur Radio Club (LIMARC)
c/o 162 West Hudson St.
Long Beach, NY 11561
Club membership — 314

Pilot Knob Amateur Radio Club
c/o 620 Osage
Leavenworth, KS 66048
Club membership — 54

Motor City Radio Club
c/o P.O. Box 337
Wyandotte, MI 48192
Club membership — 88

Mountain Amateur Radio Club, Inc.
c/o P.O. Box 234
Cumberland, MD 21502
Club membership — 103

North Seattle Amateur Radio Club
c/o 3409 37th Ave., W.
Seattle, WA 98199
Club membership — 53

Radio Club of Tacoma, Inc.
c/o 12306 80th Ave., E.
Puyallup, WA 98373
Club membership — 347

Suffolk County Radio Club, Inc.
c/o 51 Bayport Ave.
Bayport, NY 11705
Club membership — 85

Green Valley (Arizona) ARC members work with the sheriff's department and provide emergency communication services during disasters and other emergencies. The van is the mobile command post of the Sheriff's Auxiliary Volunteers. From left to right are W7LTA, W8SXX/7, W0ROD/7, KA7EDJ and WB7ORC.

NEW ARRL VIDEOTAPES

You may now add the following to your ARRL film catalog: VT-28 — *All China Amateur Radio Direction Finding Competition* (30 min., color, VHS); VT-30 — *Amateur Radio's Newest Frontier*, Version 2 (28 min., color, U-Matic, VHS), post STS-9; VT-31 *Field Day 1983* (13 min., color, VHS); T-18 — *Vic Clark Memorial Services* (cassette).

As always, remember to indicate on form CT-20 the format you need. For further information, contact Karl Townsend, ARRL Film Librarian, 225 Main St., Newington, CT 06111.

In Training

WHAT'S NEW IN THE FCC STUDY GUIDE

The FCC revised the Study Guides (also called Syllabi) for the Amateur Radio Operator License Examinations in February 1984. The Study Guides for Elements 2, 3, 4A and 4B were released through PR Bulletin 1035, and are reprinted in April 1984 *QST*, p. 59. The major differences between April 1983 and February 1984 PR Bulletins 1035 are that there are now questions in the Advanced and Extra exams on how to administer Amateur Radio tests. These differences are primarily found in Subelement A of the Study Guides: Rules and Regulations.

Here is a useful tip that will help you identify the changes as you study or instruct from the FCC Study Guide: Each topic on the syllabus is numbered uniquely. For example, the first topic is numbered 2-A.1. The "2" stands for Element 2 (Novice); the "A" is for subelement on Rules and Regulations; and the "1" indicates the topic, Define: Amateur Radio Service.

Novice — Element 2

In June 1983, logging requirements for Amateur Radio stations were virtually eliminated. Only certain technical and documentary mandates for stations in repeater, remote control and auxiliary operation remain. In response to this, Rules 97.103 and 97.105 on station logging requirements were deleted. Point 2-A.22 on the syllabus, formerly logging requirements, now covers station identification rules. The remaining three points on Novice Rules and Regulations follow, leaving 25 points under Subelement A. Details on this rule change can be found in June 1983 *QST*, p. 56.

Technician/General — Element 3

There are no changes or additions between the April 1983 and February 1984 issues of PR Bulletin 1035.

Advanced — Element 4A

You'll find several changes in the Rules and Regulations section of the Advanced Class Syllabus. The station log requirements, point 4A-A.10, used to refer to Rule 97.103, concerning logs of stations in remote control, repeater and auxiliary operation. Since 97.103 no longer exists, the content of subsections 97.103(c) through (g) is now covered in Rules 97.85, 97.88 and 97.90. The Advanced Class Syllabus still has repeater, remote control and auxiliary station records in points 4A-A.3 to 4A-A.5. June 1983 *QST*, p. 57, reports these exact rule changes in Part 97.

Point 4A-A.10 is now "Antenna height limitations" in the February '84 Study Guide. The FCC simply divided point 4A-A.11 of the '83 Study Guide into two parts to take the place of station logging requirements.

One of two brand new sections in Element 4A is Prohibited Practices. Three topics are outlined: business communications, international communications, and remuneration for use of an Amateur Radio station. Both rules on business and international communications are new to Subpart E of Part 97. This is a response to last year's FCC clarification. November 1983 Washington Mailbox (p. 72, *QST*) discusses business communications and interprets Rule 97.110. New Rule 97.111 outlines the limitations on international communications:

"Transmissions between amateur radio stations of different countries, when permitted, must be limited to messages of a technical nature relating to tests, and to remarks of a personal character for which, by reason of their unimportance, recourse to the public telecommunications services is not justified."

Because radio amateurs now have a greater responsibility in the examination program, the FCC Study Guide contains a section on the new test procedures. Advanced class applicants are expected to know how to administer and grade a Novice exam. Volunteer Examiner requirements and conduct are also part of the new section. These rules were introduced last summer, and a September 1983 *QST* article, p. 56, discusses the procedures.

When the Report and Order on Volunteer Examining was released last fall, Volunteer Examiner qualifications were clarified in two areas: (1) Employer-employee and employee-employee restrictions were dropped from the rules, and (2) an employee who can demonstrate that he or she does not normally communicate with the part of an entity engaged in Amateur Radio manufacturing or publishing is eligible to serve as a Volunteer Examiner.

Extra — Element 4B

New rules about Volunteer Examiners contribute nine new topic points to Element 4B. New additions concentrate on rules for Volunteer Examiner Coordinators and Volunteeer Examiner Teams. Examination requirements, procedures, credit and administration are all topics on the outline. Although each topic in the syllabus is referred to a new or revised FCC Rule, you may use the December 1983 *QST* article, p. 51, as a handy resource to see how these new rules are organized to affect the Volunteer Examiner Program.

One other new item appears in Element 4B. You'll find a topic on how radio amateurs from a foreign country may apply for a reciprocal-operating permit and use it properly while in the United States. Subpart G has the exact rules on this matter. — *Steve Ewald, WA4CMS, Training Assistant*

FCC EXAM CORRECTION

The 1984 FCC examination schedule has an error in the August 1984 test dates. Amateur Radio exams will be held *August 6* through *August 10* at the FCC Field Offices. The preregistration deadline remains July 15.

Amateur Satellite Program News

Conducted By
Bernie Glassmeyer,*
W9KDR

UoSAT-OSCAR 11 LAUNCHED

The launch from Vandenberg Air Force Base on the California coast was letter perfect. At precisely 17:59 UTC Thursday, March 1, the sleek Delta 3920 rocket lifted into the azure California sky trailing a white, wispy plume. Aboard were the primary payload, Landsat D, and the secondary payload, UoSAT B/UoSAT-OSCAR 11.

UoSAT separated from the launcher while over Turkey at 1911 UTC, 72 minutes into the mission. According to Program Manager G3YJO, the satellite was then in view of the command station at the University of Surrey, Guildford, England. Early after the beacon was turned on, an instability in the beacon oscillator caused some concern. The command team at the university has been trying to diagnose the exact problem and is confident it will be solved. One of the safeguards built into the spacecraft computer is a "watchdog timer" that will shut down the beacons in 20 days.

Construction of UO-11 is very similar to OSCAR 9, and it has many of the same features. One exception is, the Digital Communications Experiment (DCE), designed and built by AMSAT and VITA (Volunteers In Technical Assistance) groups in the USA and Canada. There are two serial ports that can receive and transmit to the RF system and the 1802 computer.

An article describing the spacecraft in more detail is being prepared for future publication. (tnx to *Amateur Satellite Report* No. 74 and Roger M. A. Peel, G8NEF)

*Satellite Program Manager, ARRL

Another Ham in Space

ARRL officials have been conducting informal talks with NASA representatives regarding possible future Amateur Radio operations from the space shuttle. Astronaut Tony England, WØORE, is scheduled to fly a Shuttle mission in March 1985. There is the possibility of another ham flying shortly after that mission. Current talks suggest that the project will most likely be a refined version of the one from STS-9, with operations concentrating on 2-meter FM. A 10-meter FM or CW mode could be added if NASA engineers discover an acceptable means of feeding a signal through the bulkhead of the Shuttle to an antenna that would be located in the bay. Nothing has been officially decided at this time. The first step will be for ARRL to draft a formal proposal and present it to NASA. Suggestions for consideration should be forwarded to Peter O'Dell, KBIN, at ARRL Hq.

W5LFL QSL Cards Mailed

Thanks to the Poughkeepsie ARC, the Newington Amateur Radio League and Murphy's Mauraders who volunteered to process over 12,000 SWL QSL cards. The two-way cards, personally signed by Owen Garriott, will be handled by the ARRL Club and Training Dept. at Hq.

Determination of the incomplete calls list has been done. Sorry to keep you hanging in suspension. The new list will be published soon.

OSCAR-10 Packet Gateway (Teleport) Experiments

On Sunday, March 11, on orbit 560 of AMSAT-OSCAR 10, KA6M, in conjunction with the following stations, successfully demonstrated the interconnection of two packet radio stations with intermediate links using a terrestrial packet repeater and two AO-10 ground stations. This is probably the first all-digital interlink experiment performed on the AMICON channel.

Those involved were: Tom Clark, W3IWI, Clarksville, MD (Washington, DC area); Hank Magnuski, KA6M, Menlo Park, CA (San Francisco area); Harold Price, NK6K, Redondo Beach, CA (Los Angeles area); Jim Tittsler, AI8A/6, Los Gatos, CA (San Francisco area); and Ron McMurdy, WAØOJS, Monterey, CA (San Francisco area).

The first contact, at 1900 UTC, was between W3IWI and WAØOJS. Tom, working with a very-low-on-the-horizon pass, had limited time, and so only a short frag-

ment of text made it in both directions. About an hour later, at 2005 UTC, NK6K successfully chatted with AI8A for 10-15 minutes in what almost seemed like a local QSO.

Earn a Satellite ELMER Award

Last year, we announced the Satellite Elmer Award (see March 1983 *QST*, p. 52) and issued a few to deserving amateurs. What's an Elmer? An Elmer is a person who helps another accomplish an Amateur Radio goal. In this instance, the Satellite Elmer is awarded to the person who helps someone make his or her first satellite contact. Many of you have done this and already qualify. The award will be presented to anyone who has ever helped another make that "first" satellite contact.

If you recall who helped you, please let me know. If you would like to become an Elmer, we can help; just write. If you are active on the Amateur Radio satellites, all you have to do to get the award is send us details of whom you helped and we will see to it that you get an award. There is no better way to enjoy your satellite enthusiasm more than by helping another make that "first contact."

Monthly Listings

☐ *ASR* (Amateur Satellite Report) is available for $22 ($30 overseas) for 26 issues (1 year) from Amateur Satellite Report, 221 Long Swamp Rd., Wolcott, CT 06716.

☐ AMSAT Membership is available for $24 per year ($26 outside North America). Life Membership is $600. Subscription to six issues of *Orbit* magazine each year is inseparable from membership. Write to or call AMSAT Hq., P.O. Box 27, Washington, DC 20044, tel. 301-589-6062. VISA/MC cards accepted.

☐ ARRL members only send a 4- × 9-in s.a.s.e. with your call sign to ARRL for a complete, monthly orbit schedule for all operating Amateur Radio satellites. Please mark the s.a.s.e. with the month needed, to help us ensure that the envelopes are filled properly. A year's supply of s.a.s.e.'s may be sent in at one time, but be sure to send 2 units of postage for each s.a.s.e.

☐ A free package of information about AMSAT and the Amateur Satellite Program is available from ARRL Hq. This package is intended for those with no knowledge of the program.

Special Events

Conducted By Edith Holsopple,* N1CZC

Pitman, New Jersey: The Gloucester County ARC will operate W2MMD from 1700Z *May 4* until 1700Z *May 5* to commemorate the club's 25th anniversary. Phone operation in lower portion of General bands 10-80, and CW in Novice bands. Certificate via GCARC, POB 370, Pitman, NJ 08071.

Dickson, Tennessee: The Volunteer ARC will sponsor a special events station from 1500Z to 1900Z *May 5* to honor all old-timers during Old Timer's Day in Dickson County. Phone frequencies will be 7.240, 14.240 and 28.540. Certificate for QSL to NY4N, Box 74, Burns, TN 37029.

Southfield, Michigan: The Lawrence Institute of Technology will operate club station W8QOA from 1700Z to 2200Z *May 5* and 6 to celebrate the annual open house. Operation will take place in the General class phone portion of 15 and 40 meters. QSLs and certificates for QSL to W8QOA, c/o Prof. T. Masson, 10835 Borgman, Huntington Woods, MI 48070.

Madisonville, Kentucky: Hopkins County ARC will operate WB4JRO from Harps Hill from 1700Z *May 5* until 1700Z *May 6* in a first time operation from that location. Frequencies: CW — 3.725 7.125 21.125; Phone — 3.925 7.250 21.370. Certificate via WB4JRO.

Cape Canaveral, Florida: The Florida Solar Energy Center of the State University of Florida and the Indian River ARC will celebrate SUN DAY *May 5* and 6 from 1500Z until 2200Z. Station W4NLX will be operated using solar power on frequencies: phone — 7.240 14.240 21.370 28.518; CW — 7.040 14.040 21.040 28.003; FM — 146.28/88. A beacon will be on 1296.05. Certificate via FSEC, 300 State Road 401, Cape Canaveral, FL 32920.

Ogden, Utah: The Ogden ARC will operate station N7EZC from Promontory Point from 0001Z to 2400Z *May 10* to commemorate the 115th anniversary of the driving of the Golden Spike, which connected the East and West railroads. Frequencies: phone — 3.970 7.270 14.280 21.375. QSL via Ogden ARC, P.O. Box 3353, Ogden, UT 84409.

Maple Lake, Minnesota: The Courage HANDI-HAM System will celebrate their 15th Annual Spring Convocation by operating station WØEOQ from 0100Z to 0300Z on 3.900, from 1400Z to 1600Z on 40 meters and from 1600Z to 2100Z on 14.300 May 12; and from 2100Z *May 12* to 0300Z *May 13* on 3.900. Certificate to HANDI-HAMS, 3915 Golden Valley Rd., Golden Valley, MN 55422.

Jamestown, Virginia: The Virginia Amateur Communication Assn. will operate WB4YVE from 1300Z to 2100Z on *May 12* to celebrate the landing of the colonists on May 14, 1607. Frequencies: phone — 14.250; CW — 7.140. Certificate via WB4YVE.

Fairfield, Connecticut: The Greater Fairfield ARA will operate WB1CQO during the annual Dogwood Festival, from 1300Z to 2200Z *May 12*. Frequencies: 3.975 7.235 14.330 21.420. Certificate via GFARA, P.O. Box 1364 SM, Fairfield, CT 06430

West Point, New York: The Meadowlands ARA will celebrate Armed Forces Day by operating station N2BMN from the United States Military Academy at West Point from 1400Z to 2000Z *May 12* and from 1400Z to 1700Z on *May 13*. Frequencies: phone — 7.250 14.310 50.125 144.225; FM — 146.550. Certificate to POB 324, Little Ferry, NJ 07643.

Burlington, North Carolina: The Alamance ARC will operate station K4EG from the Regional Hot Air Balloon Race from 1100Z to 2200Z on both *May 12* and *13*. Frequencies will be 10 kHz inside the lower portion of the General class phone portion of 40 and 15 meters, and 7.125 21.130 in the Novice bands. QSL to K4EG, POB 3064, Burlington, NC 27215.

Memphis, Tennessee: N4EWA will operate a special events station at the International Barbecue Cooking Contest in Memphis from 0000Z to 2400Z *May 19*. Two stations will be on at all times, one on CW and one on phone. Look for operation on 40 meters at night and 20 meters during the day. Certificate via N4EWA.

Delavan, Wisconsin: The Lakes Area ARC will operate station WB9PZH from 1700Z to 2300Z on *May 19* from the 19th Century Circus Capital. Phone frequencies will be 25 kHz up from the lower edge of the General class bands on 40, 20 and 15 meters. Certificate via WB9PZH.

Millington, Tennessee: W4ODR will be operated from Naval Air Station Memphis on *May 19* from 1400Z to 2200Z in celebration of Armed Forces Day. Frequencies: phone — 7.230 14.280 21.370; CW — 21.145; FM — 146.52. Certificate to W4ODR, POB 54278, Millington, TN 38054.

Wright-Patterson Air Force Base, Ohio: K8DMZ will be operated from 1400Z to 2200Z on *May 19* for Armed Forces Day. Operation will primarily be in the General class portion of the 75, 40, 20, 15 and 10-meter phone bands, with some work to be done in the Novice bands. FM and SSB operations are is also planned for 144, 220 and 432 MHz. Certificate via U.S. Air Force Museum, Wright-Patterson AFB, OH 45433.

Alamance, North Carolina: The Alamance ARC will activate K4EG from 1400Z to 2100Z *May 19* and from 1700Z until 2100Z May 20 from the "Fiddlers Picnic." Frequencies will be 10 kHz inside the lower General class phone-band edges on 40 and 15 meters, and 7.125 and 21.130 in the Novice bands. Certificate via K4EG.

Wheaton, Illinois: The Wheaton Community Radio Amateurs will operate N9BRO from the First Infantry Division Museum from 1700Z *May 19* to 1700Z *May 20*. Frequencies will be 50 kHz up from the lower edge of the General class phone bands, and 25 kHz up from the lower edge of the General class CW bands; RTTY on 14.087 21.087, and FM on 147.54. Certificate via WCRA, POB QSL, Wheaton, IL 60189.

Owensboro, Kentucky: The Owensboro ARC will operate K4HY from 0000Z to 0430Z *May 19* and 1500Z *May 19* until 0430Z *May 20* to celebrate their International BAR-B-Q Festival. Frequencies: phone — 7.237; CW — 7.125 7.150. Certificate via N4EKG, 1615 East 23rd St., Owensboro, KY 42301.

Crocker, Missouri: WØTT and friends will operate from Taum Sauk Mountain, Missouri's highest point, from 0001Z *May 19* until 2359Z *May 20*. Phone frequencies will be 7.285 14.285 21.385. QSL via WØTT or KØRDJ.

Cape Ann, Massachusetts: The Cape Ann ARA will operate station W1RK from 1300Z to 2100Z *May 26* to commemorate the 100th anniversary of the completion of the laying of the Transatlantic Cable. Frequencies: phone — 14.340 21.410 28.700; CW — 14.035 21.150 28.150.

Niskayuna, New York: The Niskayuna High School ARC will celebrate the 175th anniversary of Niskayuna by operating station WB2OKK from 1500Z to 2100Z *May 26*. Operation will take place 10 kHz up from the lower portions of the General class phone bands on 75, 40, 15 and 2 meters. QSL via WB2OKK.

Mount Carroll, Illinois: N9DLD will operate from the Mayfest Art Fair and 5-mile run on *May 26* and *27*. Operation will take place 25 kHz down from the upper edge of the General class phone band on 40 meters. Certificate via N9DLD, POB 66, Mt. Carroll, IL 61053.

Portsmouth, Virginia: The Portsmouth ARC will operate W4POX from the Portsmouth Seawall Festival from 1500Z to 2200Z *May 26, 27 and 28*. Phone frequencies will be 7.230 and 14.290. QSL via W4POX, POB 6503, Portsmouth, VA 23703.

Republic of South Africa: The Durban Branch of the South African Radio League will operate station ZS5RSA from 0001Z to 2359Z *May 31* to celebrate Republic Day. Operation will cover 3.5-28 MHz as band conditions permit. QSL via SARL, TAK Durban Branch, POSBUS 1058 P.O. Box, Durban 4000, RSA.

Note: The deadline for the receipt of items for this column is the 15th of the second month preceding publication date. For example, your information would have to reach Hq. by June 15 to make the August 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 signs of the special-event station are included.

*Communications Assistant, ARRL

Rules, 1984 IARU Radiosport Championship

You, the IARU Radiosport Championship participant, have been heard! An informal committee to study possible changes in the 1984 Radiosport Championship has received overwhelming response from the contest community that the Radiosport Championship in its present form is just fine. Therefore, the format of the 1984 contest will be exactly as it was in 1983.

To run up a big score, you'll need to strike a balance between a large QSO total and a large multiplier total. While 10 meters doesn't have the best propagation in July, and 80 and 40 meters are often very noisy with QRN; patience and good operating there will reward you with some extra multipliers.

For those not familiar with ITU zones around the world, a map of ITU zones is available from ARRL/IARU Hq. Send an s.a.s.e. or 1 IRC for the proper forms (including the map) early so you'll have them in time for the contest. Good luck!

Rules

1) **Eligibility:** All licensed amateurs worldwide.

2) **Object:** To contact as many other amateurs in as many parts of the world as possible using 1.8 through 148 MHz.

3) **Date:** Second full weekend of July (July 14-15, 1984).

4) **Contest Period:** 0000 UTC Saturday until 2400 UTC Sunday, with single-operator stations operating a maximum of 36 hours.

5) **Categories:**

A) Single operator: Phone-only, CW-only and mixed-mode sections. One person performs all operating and logging functions. Use of spotting nets is not permitted. Off-times must be at least 30 minutes. All operators must observe the limits of their operator's license at all times. Single-operator stations are allowed only one transmitted signal at any given time.

B) Multioperator: Single transmitter, mixed mode only; must remain on a band at least 10 minutes at a time. Only one transmitted signal allowed at any given time. All operators must observe the limits of their operator's license at all times.

6) **Contest Exchange:** All stations send signal report and ITU zone. The *complete* exchange must be logged for each valid QSO.

7) **Valid Contact:** The same station may be worked once per frequency band. Cross-mode, crossband and repeater QSOs do not count.

8) **QSO Points:**

A) Contacts within your ITU zone count one point.

B) Contacts within your continent (but different ITU zone) count three points.

C) Contacts with a different continent count five points.

9) **Multipliers:** ITU zones worked on each band.

10) **Scoring:** Multiply total number of QSO points by the sum of ITU zones worked on each band for the final score.

11) **Reporting:**

A) All entrants are encouraged to use forms available from IARU/ARRL Hq. (s.a.s.e. or 1 IRC).

B) Logs must indicate times in UTC, bands, calls, complete exchange. Multipliers and off-times should be clearly marked in the log. Cross-check sheets (dupe sheets) are required if more than 500 QSOs total are made.

C) Entries must be postmarked within 30 days after the contest (by August 15, 1984). Any entry received after mid-October 1984 may not be in time to be included in the printed results.

12) **Awards:** A certificate will be awarded to the high-scoring CW-only, phone-only, mixed-mode and multioperator entrant in each ARRL Section, each ITU zone and each DXCC country. In addition, achievement-level awards will be issued to those making at least 250 QSOs (1000-QSO sticker also) or having a multiplier total of 50 or more. Additional awards may be made at the discretion of each country's IARU society.

13) **Conditions of Entry:**

A) Each entrant agrees to be bound by the provisions of this announcement, by the regulations of his licensing authority and by the decisions of the IARU/ARRL Awards Committee.

B) Disqualifications: An entry may be disqualified if the overall score is reduced by more than 2%. Score reduction does not include correction of arithmetic error. An entry *will* be disqualified if more than 2% of duplicates are left in the log, or if the log shows excessive operating time (single-operator stations). A penalty of three QSOs will be assessed for each duplicate QSO found during ARRL/IARU log checking or for each miscopied call sign. See January 1984 *QST*, page 80, for complete details.

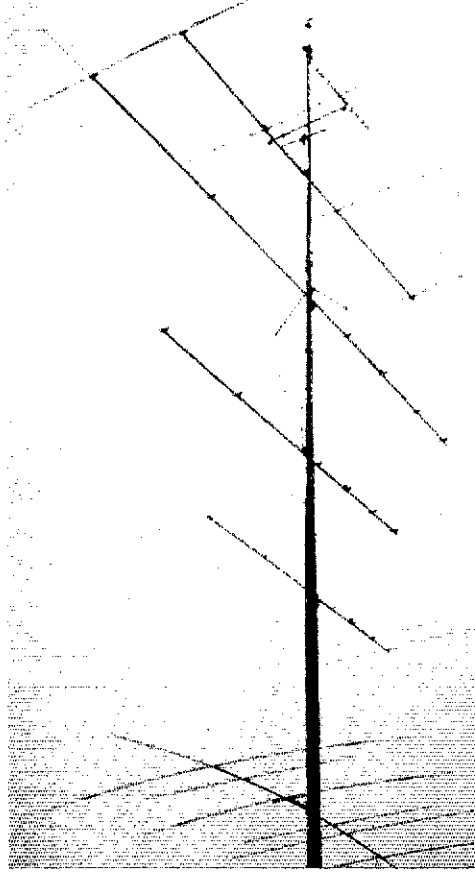
Prefix/ITU Zone

A2	57	FG	11	JY	39	PY0	13	UH8, UK8H	30	VS6	44	3D6	57
A3	62	FH	53	W1	08	PY0	15	UI8, UK8	30	VU	41	3V	37
A4	39	FK	56	W2	08	PZ	12	UJ8, UK8J/R	30	VU7	49	3X	46
A5	41	FM	11	W3	08	S2	41	UL7, UK7	30	VU7	41	3Y	67
A6	39	FO	10, 62, 63	W4	08	S7	53	UM8		XE	10	4S	41
A7	39	FP	09	W5	07	S9	47	UK8M, N	31	XF4	10	4U1ITU	28
A9	39	FR	53	W6, 7	06	SM	18	UO5, UK5O	29	XT	46	4U1UN	08
AP	41	FS	11	W8, 9	08	SP	28	UP2, UK2B/P	29	XU	49	4W	39
BV	44	FW	62	W0	07	ST	48	UQ2, UK2G/Q	29	XV	49	4X, 4Z	39
BY	33, 42, 43, 44	FY	12	KC4	67, 69, 70, 71, 72, 73, 74	SU	38	UR2, UK2R/T	29	XW	49	5A	38
C2	65	G	27	KC6	64, 65	SV	28	VE1	09	XZ	49	5B, ZC	39
C3	27	GD	27	KG4	11	T2	65	VE2	04, 09	Y2-9	28	5H	53
C5	46	GI	27	KG6/KH2	64	T30-1	62	VE3	04	YA	40	5N	46
C6	11	GJ	27	KH0	64	T32	61	VE4, 5	03	YB	54	5R	53
C9	53	GM	27	KH1	61, 62	T7	65	VE6, 7	02	YI	39	5T	46
CE	14, 16	GU	27	KH6	61	TA	39	VE8	02, 03, 04, 75	YJ	56	5U	46
CE0A	63	GW	27	KJ/KH3	61	TF	17	VK1, 2, 3, 5, 7	59	YK	39	5V	46
CE0X	14	H4	51	KL	01, 02	TG	11	VK4, 8	55	YN	11	6W	62
CE0Z	14	HA	28	KM/KH4	61	TI	11	VK6	58	YO	28	5X	48
CM, CO	11	HB	28	KP4	11	TI9	11	VK	60	YS	11	5Z	48
CN	37	HB0	28	KP6/KH5	61, 62	TJ	47	VK9	60	YU	28	6O	48
CP	12, 14	HC	12	KS6/KH8	62	TL	47	VK9	54	YV	12	6W	46
CR9	44	HC8	12	KV/KP2	11	TN	52	VK9	55	YV0	11	6Y	11
CT	37	HH	11	KW/KH9	65	TR	52	VK0	68	ZA	28	7O	39
CT2	36	HI	11	KX	65	TT	47	VK0	60	ZB	37	7P	57
CT3	36	HK	12	LA	18	TU	46	V2A	11	ZD7	66	7Q	53
CX	14	HK0	11, 12	LU	14, 16	TY	46	V3	11	ZD8	66	7X	37
D2, 3	52	HL, HM	44	LX	27	TZ	46	VP2E	11	ZD9	66	8P	11
D4	46	HP	11	LZ	28	UA, UK, UW/1,29, 30, 3, 4, 6	19, 20,	VP2V	11	Z2	53	8Q	41
D6	53	HR	11	OA	12	UA2, UK2F	29	VP2M	11	ZF	11	8R	12
DJ	28	HS	49	OD	39	UA, UK, UV, UW9-0	20-26, 30, 35, 75	VP2K	11	ZK1	62, 63	T7	28
DU	50	HV	28	OE	28	UB, UK, UT, UY5	29	VP5	11	ZK2	62	9G	46
EA	37	HZ, 7Z	39	OH	18	UC2, UK2A/C/I/L		VP8	16	ZL	60	9H	28
EA6	37	I, IT	28	OH0	18	O/S/W	29	VP8	73	ZM7	62	9J	53
EA8	36	IS	28	OJ0	18	UD6, UK6 C/D/K	29	VP9	11	ZP	14	9K	39
EA9	37	J2	48	OK	28	UF6, UK6F/O/Q/V	29	VQ9	41	ZS	57	9L	46
EI	27	J3	11	ON	27	UG6, UK6G	29	VR6	63	ZS6	57	9M2	54
EL	46	J5	46	OX, XP	75, 05			VS5	54	1S	50	9M6, 8	54
EP	40	J6	11	OY	18					3A	27	9N	42
ET	48	J7	11	OZ	18					3B6, 7	53	9Q	52
F	27	J8	11	P2	51					3B8	53	9U	52
FB8Z	68	JA	45	PA	27					3B9	53	9V	54
FB8W	68	JD	45	PJ	11					3C	47	9X	52
FB8X	68	JT	32, 33	PY	13, 15					3C0	52	9Y	11
FC	28	JW	18							3D2	56		
		JX	18										

Results, 50th Annual ARRL November Sweepstakes

Three Cheers for 50 Years!

By Edith Holsopple,* N1CZC and Bill Jennings,** K1WJ



N0NO's antenna farm in Minnesota harvested the highest crop of QSOs in the state as well as the top score in the CW portion of SS.

Sweepstakes signals have been "sweeping" the ether for 50 years now, as Sweepstakes enthusiasm has swept the amateur community during November for half a century. The ARRL Contest Branch is experiencing "front desk overload," as SS logs continue to pour in year after year. It's a true labor of love. Other than a few refinements to the rules, not a whole lot besides higher scores and increased equipment capabilities has evolved from the stone-age days of crystal control to the now popular solid-state "do everything" rigs. From the first SS contest results published in *QST* May 1930 (where readers were thoroughly berated for not reading and following the rules) until the present day, the debate continues to rage over the burning question of whether it is better to hunt Sections for multipliers or try to keep your QSO rate high.

To satisfy your curiosity over the origin of the contest's name, we are quoting from the January 1930 issue of *QST* where the very first SS was announced.

"History gives us some interesting information concerning various symbols of victory. A Dutch commander, Admiral Tromp, defeated the British fleet under Admiral Blake at Dover, England in 1652. Complying with the custom of the times, the Dutch commander sailed up the English Channel with a broom hoisted up the masthead of his flagship, denoting that he had successfully 'swept the seas.' Prizes in any contest may be referred to as 'stakes.' Webster informs us that among other things 'sweepstakes' signifies a 'clean sweep.' The highest scoring stations in our ... contest by virtue of skillful operating will be winners by virtue of having literally 'swept the air,' piling up points by a large number of successful QSOs with individual stations together with a surprisingly large number of sections contacted!"

Some of the minor rules changes that have evolved over the past half century of the SS are shorter on-the-air times, split weekends for each mode and shorter exchanges. Believe it or not, in 1930, contestants were required to originate a message with a minimum of 10 words for each QSO. Furthermore, the contest lasted a full two weeks. Yes, life is simpler now ... or is it?

A few rules have been cast overboard and a few pirates have walked the plank (of disqualification). In case you haven't noticed, 1930 was actually 54 years ago. SS sat in port during WW II when it was illegal to be on the air for other than military purposes. Despite the innovations, the main purpose of the original SS is still with us: to improve operating skills, learn message handling and have a good time in friendly competition. The skeleton of the con-

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**Assistant Communications Manager, ARRL

WD5AAM swept up 110,016 points, 72 Sections and the seventh place phone score from Southern Texas.

W9GXR made the top score for Missouri in the 25th SS. This year, he swept all Sections from his Wisconsin QTH.

Top Ten Single Op

Phone		*CW*	
KP4BZ	296,592	N5AU (K5ZD)	189,144
K5TA	257,076	N6TR	183,076
K0RF (W0UA)	251,156	W7RM (W7WA)	179,524
W7NE (WB3DNL)	250,128	K6LL	174,640
K0GU	249,084	K5TA	172,864
N5DU	244,792	K7NHV	172,568
K4VX (KR0Y)	243,608	K0RF (W0UA)	172,134
N6IG	243,164	W5XZ (K5GO)	171,976
K7OX	238,280	N2IC	171,680
WA7NIN (W6OAT)	236,356	K7GM	171,236

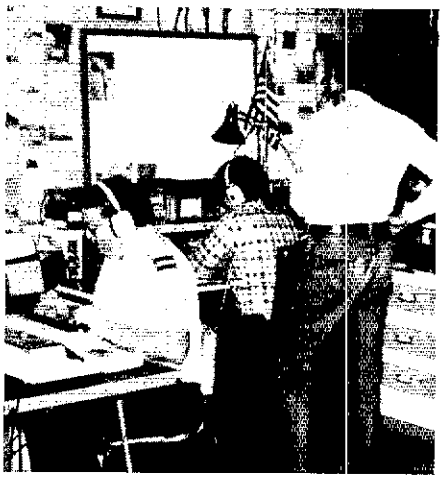
Top Ten Low Power

Phone		*CW*	
K7RI (K7SS)	194,620	N0NO	147,314
K4XS	184,544	K7JA	144,004
K7JA	184,112	W0IJR (K0EU)	139,860
KD6WW	176,564	K4XU	136,900
K4XU	165,812	N7TT	132,608
N2IC	164,872	N5JB	131,424
KJ9D (KK9V)	161,912	K4XS	129,648
WD8MGQ	154,364	KZ5E	127,296
W0IJR (K0EU)	147,556	AG7M	127,132
KE5CV	146,304	N6ND	125,268

Top Ten Multioperator

Phone		*CW*	
N4WW	268,472	K5CM	165,316
N5KW	247,900	WB8JBM	161,616
WB8JBM	229,252	KJ9D	141,636
NA5R	213,564	K0FVF/9	141,488
WD8CRY	192,992	K6AA	140,452
K5VWW and NM5L	190,476	AB0S	136,900
WB1ELC	187,516	K1LT	134,384
NV6K	186,924	K5VWW	124,392
AA2Z	186,332	K0UK	121,656
VE3GAS	180,288	AB2Y	121,472





Multiop station KC4DY and operators: N4FHL, in the white shirt; KC4DY, in the plaid; WB4QOJ, wearing a dark vest; KJ7K, in the stripes; and AB4U, wearing a sweater. These gents (from the Southwestern Virginia Wireless Assn., Roanoke) are being videotaped by WDBJ-TV. Together they scored 120,916 points and managed to find all 74 Sections on phone. *(photos by N4JED)*

test is still the same as it was in 1930, the first time it was held. As true today as then, skill and hard work are the necessary ingredients in a successful SS operation.

The first SS was won by W1ADW, who operated a Hi-C Hartley, using an 852 and a UV-203-A for the remainder of the contest. He worked 43 of 68 Sections. Scores have steadily risen since that first launching of the "S.S. National Relay."

SS number 50 rolled in on the weekends of November 5-6 (CW) and November 19-20 (phone) amid great expectations (after all you only have one golden anniversary!) with an added incentive of a commemorative expanded awards program. Contesters turned out in about the same numbers (1995 SS logs showed up for the '83 contest, while 1990 entries were submitted in 1982) as in the 49th Sweepstakes. SS '83 logged 943 CW entries and 1052 phone logs. In a deviation from the norm of past years, more folks were able to make the "clean sweep" on CW than on phone. All of 219 of the code operators found all 74 Sections for a 23.2% success rate, while 198 "clean sweep broom" awards will be given out to phone SS operators. Of the phone ops, 18.8%, made the clean sweep grade — not too bad at all — thanks (from 667 grateful CW operators) in part to NØTT's little trip to VE8 for the CW weekend. The normally "rare" VE8/VY1 Section was there for all takers while, surprisingly enough, the South Carolina, Mississippi, North Dakota and San Joaquin Valley Sections were the ones that most frequently made the difference between 73 Sections in the log and the coveted sweep.

The high-power (seems that 40% of the '83 SS CW operators ran an amplifier, versus 60% who went into the fray barefoot) CW operators encountered more stations on the air to be worked in '83 than they did in 1982. In fact, only three of the '82 Top Tenners would have made the grade for the same honors in '83. In a replay from the 1981 SS, K5ZD at N5AU and N6TR went "at it" for a shot at the first place among the code operators. When the dust had cleared, Randy, 'ZD had 41 more QSOs in his log than did Tree. Randy again takes the no. 1 code op honors. Randy really has the handle (paddle?) on how to make that N5AU station play. The rest of that Top Ten listing is filled out with "superstars" of years past while N2IC is the "new op on the block."

Division Leaders — Phone

Division	*High Power*	*Low Power*	*Multioperator*
Atlantic	W3LPL (WD4AXM)	KC3EK	W2OW
Central	K9RS	KJ9D (KK9V)†	W9YT
Dakota	KØIJL	KØFZG	WB3KMF/Ø
Delta	W5WMU	K4XU	W5GAD
Great Lakes	K8AZ	WD8MGQ†	WB8JBM
Hudson	W2YV (KQ2A)	WB2WIK	K2MME
Midwest	K4VX (KRØY)	KØRWL	WØSOE
New England	WB1GQR	KA1DZV	WB1ELC
Northwestern	W7NI	K7RI (K7SS)	K7LXC
Pacific	N6IG	KD6WW	W6BIP
Roanoke	KD4NI	WC4B	KC4DY
Rocky Mountain	K5TA	N2IC	NDØE
Southeastern	KP4BZ	K4XS†	N4WW
Southwestern	K7OX	K7JA†	NV6K
West Gulf	N5DU	KE5CV	N5KW
Canadian	VE7IN	VE6CHW	VE3GAS

†indicates new Division record

Division Leaders — CW

Division	*High Power*	*Low Power*	*Multioperator*
Atlantic	W3LPL	WA3FYJ	AB2Y
Central	K9DX	K9WA	KJ9D
Dakota	WØWDW	NØNO†	—
Delta	W5XZ (K5GO)†	K4XU	N4DW
Great Lakes	WA8YVR	KU8E	WB8JBM
Hudson	W2RQ	KY2P	N2EKS
Midwest	K4VX (KRØY)†	KØRWL	ABØS
New England	K1TO	W1OD	W1KX
Northwestern	W7RM (W7WA)†	N7TT	KS7T
Pacific	WA7NIN (W6OAT)	N6MG	W6BIP
Roanoke	N8II (KC8C)	KD8G	W4POX
Rocky Mountain	KØRF (WØUA)	WØIJR (KØEU)	KØUK
Southeastern	N4SA	K4XS	WC4E
Southwestern	N6TR†	K7JA	K6AA
West Gulf	N5AU (K5ZD)†	N5JB	K5CM
Canadian	VE5XK	VE3JTQ	VE3ART

†indicates new Division record

Low-power code operators in 1983 were able to better the '82 average Top Ten score significantly. NØNO, "right up there the previous two years," went for it and grabbed the top spot with a fine 1009-QSO effort. Steve still can't believe that he missed VE4 for the sweep. K7JA decided to try his hand at low-power operation in the SS. Chip made the Top Ten on both modes (no. 2 on CW and no. 3 on phone). KØEU at WØIJR, K4XU (always among the top low-power finishers) and K4XS also managed to make both low-power Top Ten lists.

The operators at K5CM took the top multiop slot handily, beating last year's champs at WB8JBM by nearly 4000 points. The 'JBM crowd was the only multiop station to make both Top Ten lists, and we'll bet that they have a few tricks up their sleeves to try to regain the top position in '84. Should make for some interesting competition.

The Top Ten phone scores followed the CW trend. High-power (51% of the phone entrants ran high power) scores were down from the 1982 levels, while low power Top Ten scores increased significantly. The West Indies Section was again the "magic" place to be to place first among the phone operators in SS. Tim, KP4BZ, was the only phone station to log 2000 QSOs in this contest. As with the High-Power CW Top Ten list, the phone "who's who" is filled (with one exception) out with stations from west of the Mississippi River — gladdens the hearts of the Midwest and West Coast operators. K7SS operated K7RI to the top of the low power phone

Phone — Division Leaders QSO Breakdown by Time

Cumulative Number of QSOs

Call	2200Z	0000Z	0300Z	0900Z	1500Z	2100Z	0300Z	Off-Times
W3LPL (WD4AXM)	101	248	486	874	988	1213	1455	2
K9RS	121	324	572	886	1001	1232	1522	4
KØIJL	56	221	372	490	581	874	1115	5
W5WMU	133	322	514	939	1012	1366	1612	3
K8AZ	122	269	499	791	879	1157	1322	4
W2YV (KQ2M)	81	219	425	669	813	1085	1304	5
K4VX (KRØY)	96	296	553	1014	1115	1446	1680	6
WB1GQR	75	245	477	686	879	1187	1297	5
W7NI	132	335	515	742	821	1211	1474	6
N6IG	136	367	642	925	1037	1396	1670	6
KD4NI	131	257	450	832	1050	1238	1416	3
KP4BZ	155	387	739	1030	1351	1860	2104	3
K5TA	153	366	674	950	1098	1495	1852	3
K7OX	131	372	548	837	913	1353	1676	2
N5DU	124	374	638	969	1102	1429	1682	7
VE7IN	97	268	400	518	618	801	1116	3

CW Division Leaders QSO Breakdown by Time

Cumulative Number of QSOs

Call	2200Z	0000Z	0300Z	0900Z	1500Z	2100Z	0300Z	Off-Times
W3LPL	81	220	410	712	776	946	1101	4
K9DX	61	169	349	642	764	914	1067	3
N6NO	69	178	335	612	696	878	1019	5
W5XZ (K5GO)	90	237	450	726	822	995	1179	5
WA8YVR	83	209	391	691	781	943	1093	5
W2RQ	81	206	382	682	773	926	1079	6
K4VX (KRØY)	80	230	412	724	818	1027	1152	7
K1TO	85	220	410	522	651	895	1039	1
W7RM (W7WA)	98	255	471	763	775	1021	1239	2
WA7NIN (W6OAT)	52	245	416	628	695	902	1088	2
N8II (KC8C)	64	203	373	679	744	876	1018	2
N4SA	73	163	368	658	739	938	1085	3
N6TR	80	243	457	740	790	1030	1245	5
N5AU (K5ZD)	103	279	509	794	925	1107	1283	8
VE5XK	77	240	466	667	704	978	1167	2

pack. Danny attributes his success to advice from his mentor, N7ZZ: "Old age and treachery will always prevail over youth and skill." Words to live by. K4XS obviously has the skill and handily took the no. 2 slot for low-power ops on phone in this year's contest.

The N4WW multiop team easily outdistanced the rest of the phone multiop Top Ten with their rate of 75.5 QSOs per hour for the entire contest.

By popular request, we brought back the boxes showing the Division Leader QSO Breakdown by time for each mode. It lets you compare your rates with those of the top stations in your Division.

Over the years, the SS Affiliated Club Competition makes for some interesting inter- and intra-club rivairies as club members go all out to add points to the club's total and vie for recognition as the top CW or phone operator in their own club. The club competition also provides the incentive for many "non-contesters" to try their hand at the SS for the sake of the club's aggregate score. More than a few top-notch contesters went into their first SS with this same thought in mind and came away hooked on contesting.

In the Unlimited Club Category with 71 individual entries, the Potomac Valley Radio Club continues to keep member interest and enthusiasm high, and again won the gavel in this category.

The North Texas Contest Club, led by club top scorers K5ZD (no. 1 code op in the contest) and WB5VZL at the microphone, both at the N5AU station, came from a fourth place finish in '82 to take the gavel in the Medium Club Category in 1983. In a "close-as-that" finish, the Mad River Radio Club bettered their own 1982 club aggregate score by 1 megapoint, led by club stars K8AZ (phone) and WA8YVR (CW), and moved from a 5th place finish in 1982 to a close no. 2 finish in the medium category in 1983.

It seems that the '83 SS club competition saw 12 fewer ARRL affiliated clubs (87 versus 99) in the listings than its 1982 counterpart. It means that a lot of the club names, standards in Sweepstakes of years past, have fallen by the wayside. A lot of the familiar clubs were not able to muster the three individual entries necessary to make the club listings. Maybe it's time to whip up a little enthusiasm for club participation in the 1984 SS at your next radio club meeting. Bright spots in the club listings were provided by those first-time clubs whose first club competition came with the 1983 SS. These clubs, with a little effort and experience, are destined to top the club competition listings in years to come. Welcome aboard!

We might hesitate to harp on the same thing year after year, but darn it, incomplete and sloppy SS entries are our number one problem. We can't credit an operator with a proper score listing if his/her entry is not complete or can't be read. Take a little pride in your paperwork — at least as much as you take in your operating. Do it right and we'll all benefit. 'Nuff said.

We'd like to thank Contest Aide Linda Kraut for her help in the preparation of this report.

Look for those special participation/achievement awards as well as the traditional certificates and, oh yes, the "clean sweep broom" awards to begin hitting the mails about mid-May.

It seems that many of the SS '83 participants took time to say "Happy 50th to SS" and expressed wishes that they would be around for SS no. 100. Let's take it one year at a time, and plan to operate SS no. 51 on the weekends of November 3-4 (CW) and November 17-18 (phone) in 1984.

CU THEN!

John Thernes, WM4T, of Covington, Kentucky, appears well suited for the job of earning 110,852 points and the fourth place KY code score.

Thirteen-year-old Brian Joy, KCØXK, placed third in Iowa on phone and fifth on CW.

SOAPBOX

It was a real pleasure to receive *two* "check" numbers that pre dated my own; that doesn't happen very often anymore (W4OO). Why do you guys always do this to me? SS was on my wedding anniversary, plus I was involved the day before in a rehearsal and a concert with the local symphony. Maybe I should ditch the XYL and burn my bassoon (K1PLR/3). We lived on beer, soft drinks, fried chicken, pizza and donuts, not to mention the aspirin and Alka-Seltzer. Our computer was a great tool! All we need now is an op who can type (W5GAD)! Since we worked all Sections except VE8 on phone, we propose an award next year for an almost clean sweep ... how about a toothbrush? (oprs. at WØIO). Talk about contest dedication. I drove 150 miles with a broken right leg to operate SS CW! I had my first clean sweep in five years and got it on both modes (KQ2M, opr. of W2YV). After 29 years of SS operating, it was exciting to finally make a clean sweep! Alas, however, it is embarrassing for this CW operator to do it on fone (W9GXR). Operating a university club station has its advantages! Toward the end of the contest, we had several alumnae helping us look for VE8! But alas ... it was all for naught. Thanks, alumnae (W9YB). I caught a bad cold on Thursday and my voice synthesizer broke Friday before phone weekend, but any misery is better than eating crow at dinner-bet payoff (N8RA). An interesting statistic: 85% of my 221 contacts were almost evenly distributed among hams licensed in the '50s, '60s and '70s. I had more contacts with hams licensed in the 30s than in the '40s. This is my 25th year as a licensed ham, but only my third SS. Boy, have I missed a lot of fun (K5SNO). At age 77, after 30 years off the air, I could not resist SS. I was section high in 1934, '35 '36 and '38. Things are more relaxed for me these days (WØAWP.) It figures I would have an English paper to do over the weekend. I had to decide between a high SS score or a high English grade (KA8NCR). My congratulations to the FB operators who pulled my 1-W signal out of the QRM, and my apologies for requesting repeats. A direct conversion receiver in a crowded band offers new challenges in CW copying (W4VQ). After 253 QSOs and 67 Sections with my straight key and indoor dipoles, my score looks like a lot to me, HI (WA2ASQ). Now SS is getting expensive. My wife spent the weekend in a Ft. Collins (Colorado) motel, and came home with 4 sweaters, 3 skirts, 2 blouses, a vest and a pair of gloves! (WA8MAM). Swell contest as always, but it was frustrating never to work ND! Hats off to those who managed a "sweep" (W4YE). I enjoyed SS and

Sixteen-year-old KM5R operated CW from station K5RX in Northern Texas. His 149,504 points are good for third place in his Section.

Armond, N6WR, turned in the no. 2 low-power phone score from the Sacramento Valley Section.

Clean Sweep — Both Modes

W2YV(KQ2M, opr.), K2AU, W2RQ, W2OW*, N3DAY, N3AD, W3MA, WD4AXM (opr. of N3RL on CW and opr. of W3LPL on phone), K3TM, WB3JRU, K3SA, K4BAI, K4FU, N4SA, N4BP, K1ZX/4, K4XU, N4ZZ, K5TA, AA5B, K5ZD (on phone and opr. of N5AU on CW), KZ5M, W6RGG, K7JA, KI6O, KF6A, W6BIP*, N6NF, N6MG, KD6PY, K7OX, K7HP, WA7NIN (W6OAT, opr.), W7NI, K7SS (on CW and opr. of K7RI on phone), W7WA (on phone and opr. of W7RM on CW), WA8MAM, K8MR, WB8JBM*, W8LT*, K9RS, K9ZO, W9OBF, W9TG, W9XT, KØFVF/9*, KBØG, WAØTKJ, KØVBU, K4VX (KRØY, opr.), KØRWL.

*denotes multioperator

Affiliated Club Competition

Unlimited Category	*Score*	*Entries*	*Phone Winner*	*CW Winner*
Potomac Valley RC	6,281,770	71	W3LPL	W3LPL
Medium Category				
North Texas Contest Club	4,408,454	43	N5AU	N5AU
Mad River Radio Club	4,326,166	47	K8AZ	WA8YVR
Texas DX Society	3,751,224	35	N5DU	K5LZO/N5JJ
Yankee Clipper Contest Club	3,088,936	39	W2YV	W2RQ
Murphy's Marauders	2,734,798	42	K1WA	K1TO
Northern California Contest Club	2,430,376	28	WA7NIN	WA7NIN
Ill. Wind Contesters	1,686,806	18	K9RS	K9DX
Grand Mesa Contesters	1,138,764	17	KØUK	WØKEA
Rubber Circle Contest Club	1,134,648	14	K7RI	W7RM
Kansas City DX Club	1,226,268	12	—	KBØG
Eastern Iowa DX Assn.	1,105,056	16	WØEJ	NØGA
South Jersey Radio Assn.	1,090,260	30	K2YY	K2AA
Murgas ARC	1,079,946	25	WB3EMG	WA3YON
Lincoln ARC	1,077,280	17	KØSCM	KØSCM
Frankford RC	827,578	19	N3DAY	W2GD
Western ARA	820,426	11	K7JA	K7JA
RC of Tacoma	802,290	16	AJ7Y	W7BUN
Western Washington DX Club	500,218	12	K7GEX	AG7M
Long Island Mobile ARC	404,554	14	KS2G	W2LPA
OH-KY-IN ARS	255,228	11	NB8K	N8FU
Local Category				
Colorado Contest Conspiracy	1,837,392	9	KØRF	KØRF
River City Contesters	1,279,024	10	KI6O	KI6O
New Mexico Big River Contesters	982,570	6	K5TA	K5TA
Northern Ohio ARS	853,354	10	KN8R	—
Mile Hi DX Assn.	839,398	7	N2IC	N2IC
Central Florida DX Assn.	836,570	7	—	N4SA
Twin City DX Assn.	806,242	8	—	NØNO
Central Arizona DX Assn.	638,454	6	K7OX	K7OX
Southern California Contest Club	571,804	9	N6TR	—
Reading RC	508,366	10	WA3SPJ	K3WGR
Kettle Moraine Radio Amateurs	492,486	10	W9XT	W9XT
Eastern Michigan ARC	484,686	7	K8DD	K8DD
Sevier County ARC	471,244	4	—	—
Ashtabula County ARC	426,538	9	AI8S	—
Schenectady ARA	418,538	5	W2ARQ	—
Binghamton ARA	385,460	6	WB2QPR	—
Willamette Valley DX Club	383,696	3	—	—
Point Radio Operating Society	381,138	3	—	—
Billerica ARS	379,890	10	K1AR	K1AR
South Florida DX Assn.	375,920	3	—	—
Gloucester County ARC	374,566	7	—	N2BK
Lynchburg ARC	369,904	8	AA4FF	AA4FF
North Florida ARS	366,982	4	—	—
Fort Wayne RC	355,608	6	KR9V	—
Rochester (NY) DX Assn.	332,098	6	AF2K	—
Southeastern DX Club	322,166	5	—	W4BTZ
Utica ARC	307,714	7	NA2A	NA2Q
Norwood ARS	292,614	6	WA1EOT	K1CB
Hollywood ARC	283,864	4	N4BP	—
Fox River Radio League	282,864	7	K9BQL	K9LUW
Central Michigan ARC	281,158	8	—	W8VPC
Wichita ARC	258,798	5	—	—
Split Rock ARA	256,150	6	WB2WIK	—
Morton Area DX Assn.	252,340	3	—	—
Robbinsdale ARC	250,200	4	—	WBØHRX
Rockford ARA	249,676	8	K9LJN	—
Ventura County ARC	227,668	6	K6VMN	—
Northrop RC	220,898	6	K6HRT	—
Eastern Connecticut ARA	210,052	5	—	W1ODY
Dayton ARA	209,100	3	—	—
Sandy River ARC	202,612	4	—	—
IBM Owego ARC	176,760	4	N2NW	—
Chautauqua County Amateur FM Assn.	167,558	5	WB2YQO	—
Valley RC of Eugene	162,210	4	AI7W	—
Providence Radio Assn.	145,694	5	—	—
Motor City RC	142,116	6	—	K8SIA
Rip Van Winkle ARS	139,804	4	—	—
Canton ARC	124,018	5	—	WA8ADA
Saginaw Valley ARA	123,080	4	—	KO8M
Rowan ARS	119,424	4	N4UH	—
West Park Radiops	115,839	5	AF8C	—
L'Anse Creuse ARC	112,616	8	WA8QAF	—
Grumman ARC	103,068	5	W2DKM	—
Cuyahoga Falls ARC	85,166	5	KD8GC	—
Dixie DXers Contest Club	84,952	3	—	—
Poway ARS	82,270	3	—	—
West Allis RAC	81,000	3	—	—
W/K ARC of Greater Milwaukee	75,346	3	—	—
Framingham ARA	74,756	3	—	—
Southern California Contest Club	63,412	3	AI6E	—
Tri City ARC	58,022	3	—	—
Davenport RAC	57,234	4	K9AYK	—
Middle Tennessee ARS	48,768	3	—	—
Overlook Mountain ARC	42,404	6	—	—
Megahertz Manor Maniacs	34,984	3	—	—
Columbus ARA	33,356	3	—	—

discovered I'm not the "crackerjack" CW op I thought I was. Oh well, perhaps next year (WB4J). I'll bet my new whisk broom that 1983 is a record year for clean sweeps (K3OO). I realized I could be in trouble when it took 450 QSOs to work next-door-neighbor NC (KX4V). Great contest. I made 503 QSOs with a straight key. Ouch! I should get bonus points, but I'll settle for sympathy (N1CKW). How about a special category for those with antennas less than 15 ft high? (WA1GUV). I worked the entire CW contest QRP 3.5 W and managed to get a clean sweep (AA2U). I have a new definition for frustration after this contest: hearing both VY1CC and VY1AO two hours before the contest ended, and then having the band die out (WA9BZW). Too bad that deer hunting season and SS phone fall on the same weekend (WB9YXY). Please accept this late entry. Believe it or not, it was locked in my trunk when I had an accident on the 18th (W9WI). It was fun to be back in SS, but these new-fangled call signs drive me nuts. (W9TG). We met lots of old friends, made some new ones, and only took two weeks to recover voices and lost sleep (WBØYUC and WDØFOF). Murphy struck after the contest when the dog chewed up two pages of my logs. It took me hours to piece them back together and recopy them. Come to think of it, these logs look like dog food anyway (KMØL). SS was harder this year, since WBØBBN seemed to beat me to my contacts. It takes longer to explain that you're really not a dupe (WDØBBN). I missed my own Section, although I heard it once. And there wasn't even a football game (KØEV). I sure hope that I'm around for the 100th SS (W8CNL). It must have been great in the lower 48. Everything was difficult from up here (NL7P). Howls of dismay followed the cloud of smoke late Sat. night, but it was only a cooked balun in the tuner and we pressed on (N7EDV). All in all, a very successful shakedown for the Jedi amateur station. Next year I hope the Force is with me on 40 meters (K7JA). This was my first phone SS with a cold, but it sure was a nice place to be sick (AI6V/KH6). Conditions were excellent. Two senior citizens, the Geritol Set, had a great time (W6BIP and WA6DTI). This was the first time in four years that we made it through the whole weekend without someone accidentally shutting the power switch off and knocking out our computerized log (WB7TXM). I really enjoyed my first SS. I am 12 years old and am a YL. I was first licensed in '83 as a Novice. Just this summer I received my Advanced class license. I am really looking forward to next year's contest (KA7PGW). When Murphy fails, watch out for an act of God; during the SS on Sunday morning, the new church 1½ blocks away gave me a frantic call. It appears that they were hearing the SS on their new PA system during the Silent Prayer. QRT!! (W7FGT).

FEEDBACK

Please refer to pages 89-98 of May 1983 *QST* for the following correction: The second place phone multiop station in Oregon should be K7GDN, not K7GON.

SCORES

CW scores are listed first, followed by phone. Within each call area, scores are listed by ARRL section. Within each section, single operator scores are listed first in descending numerical order, followed by multioperator scores. Each line score lists call sign, final score, number of QSOs, number of sections worked, hours operated and output power used (A = 150 watts or less, B = more than 150 watts). Example: In Connecticut, K1TO worked 1038 stations in 74 sections for a final score of 153,624 points. He operated for 22 hours and used more than 150 watts.

CW

1

Connecticut

K1TO 153,624- 1038-74-22-B
W1WEF 147,112- 994-74-24-B
K1XA 140,748- 951-74-24-B
K1WA 116,215- 796-73-23-B
AJ1G 109,062- 747-73-24-B
W1DD 106,656- 727-74-19-A
W1GNR 105,222- 741-71-24-B
K1RM 99,456- 672-74-17-B
W1ECH 85,988- 581-74-22-A
K8VHT 85,410- 585-73-24-A
AA2Z 82,732- 559-74-14-A
N1CC 81,944- 563-74-16-A
K1DW 79,240- 566-70-24-A
W1ODY 70,832- 514-69-16-A
KA1CI 66,920- 478-70-24-A
W1BIH 66,156- 447-74-12-B
K1GX 65,940- 471-70-11-B
K8KA/1 60,912- 423-72-21-A
K1YRP 60,168- 436-69-13-A
K1BV 53,170- 409-65-11-B
KA1VC 47,520- 396-60-24-B
W1HV 45,424- 334-68-23-A
WA1FCN 45,140- 305-74-18-A
WA2WIP 43,810- 317-65-11-A
KM1G 41,072- 302-68-18-B
KG1D 36,698- 311-59-18-B
KM1P 35,216- 284-62-12-A
WA1LJP 31,920- 296-57-17-B
KT1I 30,480- 254-60-24-A
K1NYK 30,250- 275-55- 9-B
W1PMR 28,404- 263-54-14-A
K1DM 26,880- 224-60- 9-B
KA1JQW 18,000- 180-50-22-A
W1XX 7168- 112-32- 2-B
WB1EYI 4896- 72-34-10-A
WA3VIL 4408- 58-38- 8-A
KB1R 3478- 64-26- 2-B
N1JWI + K1GX) 78,242- 504-71-19-A
WA1KOJ (+ WA1LVW) 66,718- 411-69-21-B

Eastern Massachusetts

K1XM 141,636- 982-74-24-B
K1VR 136,900- 975-74-24-B
W1WAI 109,364- 743-74-20-B
K1AR 107,310- 735-73-14-B
K1CB 98,256- 712-69-20-B
K1VUT 97,976- 662-74-24-A
WB1CNM 87,080- 622-70-24-B
WA2TBA 79,800- 570-70-24-A
WA1UDH 63,332- 446-71-19-A
KC1Q 61,410- 445-69-16-B
WA8AXH 59,432- 437-68-21-B
K1SEC 56,448- 441-64-24-B
W1HN 56,356- 386-73-13-B
W1KEE 55,522- 391-71-22-A
K5MA/1 51,272- 377-68-11-A
KA1GLV 45,440- 320-71-21-A
KC1F 42,380- 326-65- 7-B
W1RND 33,852- 273-62- 9-A
W8PS 31,584- 262-56-18-A
W1AX 29,600- 200-74-10-A
K1UCA 26,864- 184-73-17-B
KE1U 24,128- 208-58- 6-A
W1HH 23,760- 198-60- 8-A
KA1GEP 20,196- 187-54-19-A
KB2R 17,688- 134-66-12-A
N1QY 16,408- 107-72-16-A
KD1U 12,936- 132-49-16-A
KB1EW 10,208- 116-44-11-A
N1AJJ 8514- 99-43- 7-A
KQ1F 8510- 115-37- 7-A
W1PLJ 7812- 93-42-10-B
KB1KM 7800- 75-52-16-A
W1UU 6438- 87-37- 7-B
WA1EQT 5184- 81-32- 2-A
W1TUM 4158- 63-33- 6-A
AJ1I 2700- 50-27- 1-A
KC1X 2600- 50-26- 2-A
N1CLK 2100- 50-21- 6-A
N1CVK 2088- 36-29- 9-A

Maine

WB1GLH 41,480- 305-68-19-A
K5IG 32,864- 316-52- 6-B
AK1W 22,550- 205-55-19-A
KA1TJ 21,252- 161-66-14-A
W1KX (+ K1PV) 97,088- 656-74-24-A

New Hampshire

K1FWE 127,132- 859-74-23-B
W1JY 31,842- 261-61-13-A
K1GQ 27,120- 226-60- 5-B
W1ET (WA1UUA,opr) 14,400- 150-48- 4-B

Rhode Island

K1NG (KI1G,opr) 125,504- 848-74-24-B
KM1X 74,160- 615-72-17-B
K5IJ 69,414- 603-69-24-A
W1RFQ 9400- 100-47- 4-A
WA1RKL 180- 10- 9- 1-A
W1OP (K1s HGC,JNJ,KA1AWS, N1s, AKQ,BBM,W1GS, ops.) 52,542- 417-63-16-B
WB1FDY (+ KA1s DUV,KCD) 26,620- 242-55-17-A

Vermont

WB1GQR 122,544- 851-72-24-B
K1IK 30,384- 543-74-15-A
WA1GUV 64,610- 455-71-22-A
W1KQ 33,000- 300-55-11-B

Western Massachusetts

KB1W 109,964- 744-74-21-B
WB1RIH 77,248- 568-68-15-B
N1CKW 71,426- 503-71-23-A
WA1ZAM 29,116- 251-58-17-A
K1FIR 22,464- 208-54- 9-B
K5IN 20,384- 208-49-16-A
W1JP 6200- 100-31- 5-A
WB1FYL 2080- 40-26- 7-A
KA1KPH 1134- 27-21- 6-A
W1YK (AK1J,KA1KUB N1BLM, WA2YHZ ops.) 74,520- 510-56-11-A

2

Eastern New York

W2YV (KQ2M,opr.) 146,224- 988-74-24-B
W2AZO 124,912- 844-74-24-B
K1ZM 110,704- 748-74-23-A
WZ4RO 61,366- 473-71-24-B
W2CHS 63,980- 457-70-21-A
W2SZ (WA2SFM, opr.) 58,032- 403-72-14-A
W2LMO 38,148- 289-66-20-A
K2QF 34,980- 266-66-10-B
N2JJ 29,232- 203-72- 8-B
AA2Y 27,144- 244-58-12-A
KD1O/2 25,326- 203-63-15-A
W2DW 24,428- 197-62- 5-B
KU2Q 16,302- 143-57-13-A
K5NA 256- 16- 8- 2-B
N2FKS (+ W2GS) 44,656- 572-74-21-A
KW2D (+ KG2KK) 58,422- 407-73-24-A
K2MME (+ K2CIB,N2s,BJG,DVX WA8MAZ WB2UME) 44,980- 346-65-15-B
N2DRR (+ N2EK) 8140- 110-37- 6-A

N.Y.C. & Long Island

K2AU 118,252- 799-74-24-B
KA2AEV 94,868- 641-74-23-A
N2MG 86,876- 587-74-21-A
K2SX 83,788- 566-74-13-B
W2LPA 49,580- 370-67-20-A
WA2CBx 28,792- 236-61-10-A
WA2KRO 27,092- 229-59-11-B
WE1OR 20,900- 190-55-16-A
WB2EZG 20,675- 195-53- 5-A
WA2SCI 16,072- 184-49- 7-B
K2HVN 9024- 92-47-24-A
W2RTF 8320- 104-40- 5-A
WB2FMP 7138- 83-43-13-B
W20X 5700- 75-38- 4-A
KA2QQT 1200- 40-20-14-A
W2TNI 144- 9- 8- 2-A
N2RO 84- 7- 6- 4-A
N2CKN (+ W2NN) 1020- 30-17- 6-A

Northern New Jersey

W2RQ 158,804-1073-74-24-B
W2VJN (WA2ZKY, opr.) 144,004- 973-74-23-B
KZ2S 137,788- 931-74-24-B
FY2P 113,616- 789-72-24-A
AA2U 60,532- 409-74-24-A
KW4E/2 49,368- 363-68-15-A
KI2Q 41,340- 318-65-15-A
W2KWW 39,468- 286-69-14-A
WA2ASQ 33,902- 253-67-22-A
KT2B 29,760- 240-62-12-A
WA2UDT 22,880- 208-55- 8-A
W2TI 14,076- 153-46- 8-A
W2HCA 5624- 76-37- 7-A
K2BJG 5610- 55-51-24-A
WA2BYX 2520- 45-28- 6-A

Southern New Jersey

W2GD 158,212-1069-74-24-B
K2AA (W2LYI, opr.) 88,476- 606-74-24-A
K2YY 83,580- 597-70-10-B
K2MK 77,472- 538-72-24-A
W2PAU 54,144- 376-72-14-B
K2HPV 52,128- 389-67-18-A
N2BK 47,232- 369-64-23-A
K2OSV 45,540- 345-66-18-B
N2BCF 42,496- 332-64-17-A
WB2UVB 36,828- 279-66-17-A
WA2KOK 29,402- 241-61-15-B
W2CN 26,352- 216-61-20-B
W2FGY 19,260- 176-55-19-B
W2BIV 16,632- 126-66-12-A
N2EZ 5600- 100-43-13-A
KA2BLW 8400- 100-42- 6-A
W2HBE 7800- 100-39-11-A
WA2DHO 6764- 89-38-15-A
W2GNO 6566- 67-49- 5-A
N2MR 3016- 52-29- 3-A
KA2CQX 24- 4- 3- 1-A
AB2Y (+ AB2Z, WA2s NBL, VYA, WB2BYU) 121,472- 832-73-24-B

Western New York

K2BGW (WA2LCC,opr.) 133,940- 905-74-24-B
K2ZJ 119,428- 818-73-21-B
KQ2K 93,562- 661-71-24-A
W2TZ 91,642- 664-69-15-A
W6RUE 79,660- 569-70-22-A
W2HPF 78,256- 536-73-16-B
WA2DHS 74,888- 506-74-22-A
K2MOY 67,456- 499-72-14-A
N2EAW 44,432- 334-74-27-A
NA2O 48,422- 341-71-22-A
N2IW 47,320- 338-70-12-A
N2JC (K2VD, opr.) 44,574- 423-69-15-A
W2GJ 40,560- 412-65-10-A
WA2EYA 40,120- 295-68-16-A
K2YU 38,448- 267-72-12-B
KU2A 37,252- 278-67-23-B
KK2B 33,696- 234-72-24-A
WA2FQE 33,150- 255-65-22-A
N2GU 33,048- 243-68-19-A
N2KO 31,500- 250-63- 5-B
WB2YQB 28,400- 200-71-13-A
N4IW/2 16,610- 151-55- 7-A
KA1YE 14,280- 140-51- 9-A
KA2RDO 10,058- 107-47-21-A
K2UAN 7412- 109-34- 9-A
WB2YOO 1292- 34-19- 3-A
W2GW (N2s AEY,HR,NBN, ops) 80,960- 545-74-27-B
KW2J (+ KA2HJC,W2IMO) 60,066- 423-71-24-A
KA2OUO (+ KA2RSY) 53,196- 397-67-21-A

3

Delaware

N8NA 76,942- 527-73-14-A
K3HBP 16,280- 148-55- 6-A

Eastern Pennsylvania

KC3N 95,776- 656-73-24-A
KH6CP/3 35,312- 544-74-23-B
K3WGR 84,232- 578-72-23-A
K3DTD 73,032- 537-68-24-A
K3TX 72,100- 515-70-20-B
WA3ULD 71,424- 496-72-23-A
KC3M 62,604- 423-74-20-A
K3EGE 52,824- 372-71-14-A
WA3GLX 50,400- 400-63-11-A
K3VW 44,844- 303-74-24-A
WA3YON 40,524- 307-66-20-A
WA3DZH 37,536- 276-68-18-A
W3ADE 32,612- 253-62-15-A
KR3I 32,128- 251-64-10-B
W3GEI 31,598- 259-61-14-A
WA3MA 31,080- 210-74-13-B
WA3SPJ 30,500- 250-61-21-B
N3GAB 29,184- 256-57- 9-A
KA3EWT 27,960- 233-60-21-A
W3BGN 27,000- 250-54- 5-A
W3UPW 26,314- 223-59-22-A
N3DRF 24,966- 219-57-12-A
AG3G 24,948- 231-54-14-A
KB3GL 24,072- 204-59-15-A
W3ARK 24,012- 207-58- 6-A
WB3FYT 18,468- 171-54-16-A
K3ZUF 17,464- 118-74-15-B
Kb3IK 16,100- 161-50-10-B
WB3CAC 15,500- 155-50- 6-A
KC3CB 15,484- 158-49-15-A
N3KR 15,300- 150-51- 9-A
K3YD 11,730- 115-51- 4-A
N3AD 10,952- 74-74- 6-A
N3DAY 10,952- 74-74-14-A
W3CNS 8064- 96-42- 3-A
N3CZB 5148- 66-39- 8-A
WB3IWZ 4488- 66-34- 6-B
WA3XXW 3410- 55-31-10-A
KA3BXD 2856- 51-28- 6-A
KA3IWW 2408- 43-28- 8-A
K3YTL (AD3L, opr.) 84- 7- 6- 1-A
KQ3R (+ KF3Y,KQ3P N3DPN) 100,878- 709-71-24-B
WB4CAI (+ KB3QI) 56,712- 417-68-14-B
N3AY (+ K3EIP) 38,080- 280-68-18-A
K3OO (+ NET) 42,264- 318-74-10-A
K3NZ (+ NET) 28,564- 193-74-11-A
WB3FAA (+ KA3ILD,WB3JPC) 21,780- 198-55- 7-B
N3CSG (+ N3LR) 21,016- 142-74-20-A

Maryland - D.C

W3LPL 162,356-1097-74-24-B
N2FB 148,482-1017-73-24-B
N3RI (WD4AAM, opr.) 142,524- 963-74-24-B
N3AM 137,344- 928-74-24-B
K3NA 136,604- 923-74-24-B
KA1GO 120,768- 816-74-23-B
K3ZZ 120,324- 813-74-24-B
WA3KGY 119,144- 778-74-24-B
K3IM 110,260- 745-74-24-A
K3HPG 95,164- 643-74-17-A
W3FG 88,948- 601-74-24-A
K3SA 87,340- 590-74-15-B
KU1L 86,762- 611-71-14-B
W3HVQ 76,314- 553-69-18-B
W3UU 72,144- 501-72-14-B
W3FA 70,290- 495-71-19-A
WB3ERU 68,820- 465-74-14-B
W3BGM 64,532- 442-73-20-B
KJ1G 60,900- 435-70-24-B
K3DI 57,744- 401-72-13-B
W3GRF 56,420- 434-65- 9-B
W3EE 46,632- 348-67-16-A
K3RY 38,420- 263-70-22-A
W1FQE 35,680- 214-60-16-B
N3II 32,052- 169-74- 9-B
W3FX 11,750- 125-47-17-B
N3GBB 10,302- 101-51- 3-B
W3TFA 7548- 102-37-11-A
N2API 4488- 58-33-13-A
W3GN 4216- 68-31- 5-B
W3FZV 2016- 48-21- 3-A
WJ1T 1020- 30-17- 1-A
K4AA (+ K4ZNV,KA1s, EWV,JMH, KB4BYK, N3IE, N7IR) 47,570- 355-67-19-A

Western Pennsylvania

K3UA 160,876-1087-74-24-B
WA3FYJ 115,884- 783-74-24-A
K3LWM 105,376- 712-74-24-B
N3ZZ 72,864- 506-72-20-A
W3WC 51,336- 372-69-19-A
AG3H 46,040- 320-72-19-B
KG3V 42,340- 326-65-14-A
W3HDH 36,984- 258-69- 6-B
KC3DA 35,960- 290-62-19-B
WA3WAW 27,938- 229-61-11-B
W3NGO 19,400- 194-50-12-A
KA3GXP 13,566- 133-51- 9-A
K3WGA 10,220- 76-70-15-A
K3CR (KI3C,WB3KKX, ops.) 98,568- 666-74-20-B

4

Alabama

W4NTI 93,684- 633-74-20-A
K4IQJ 57,545- 417-69-16-A
K4GSK 10,952- 74-74-15-A
KB4EXX 9108- 99-46-19-B

Georgia

K4BAI 140,896- 952-74-24-B
W4BTZ 114,624- 796-72-24-B
K4BAM 90,864- 631-72-23-A
W4QO 67,344- 488-69-23-A
AA4GA 40,690- 313-65-11-A
K4EZ 34,968- 282-62- 8-B
NN4K 20,700- 207-50-23-B
N9ECB 16,968- 202-42-20-A
KI4Y 16,188- 142-57-10-A
AA4EI 4838- 89-21- 4-A

Kentucky

N4AR 156,880-1060-74-24-B
K4FU 118,696- 802-74-24-B
N4XM 112,036- 757-74-22-B
WM4T 110,852- 749-74-24-B
WB4FOT 83,952- 583-72-24-A
K3PI 83,860- 599-70-24-A
KD4U 34,432- 269-64-15-A
KF4AV 5304- 78-34- 3-B
NO4R (+ KA4'AY,N4s IRx,TY) 109,920- 740-74-23-B
AA4RX (+ KA4JEL, N4JLU, WK4D) 88,128- 612-72-24-A

North Carolina

WbNWS/4 74,806- 511-73-24-A
K4JEx 60,480- 432-70-12-A
K1ED 32,160- 268-60-12-A
NK4Q 31,682- 217-73-20-A
N4QY 16,016- 143-56-13-B

Northern Florida

N4SA 154,660-1045-74-24-B
K4XS 129,648- 888-73-24-A
N4WW 109,198- 769-71-16-B
NX4N 67,744- 484-73-11-B
K4VHI 38,912- 304-64-16-A
W4VQ 31,624- 236-67-11-A
W4ILE 23,540- 214-55-16-A
NU4Y 528- 33-16- 2-A
WO4E (+ AK4G) 105,840- 735-72-22-A
N4UF (+ NH4E) 84,680- 580-73-24-B

South Carolina

WQ4V 67,744- 464-73-12-B
N4EE 23,256- 204-57-14-A
K4ADI 2500- 50-25- 3-A
WA4JJZ 338- 13-13- 2-A

Southern Florida

K1ZX4 145,040- 980-74-24-B
N4BP 136,864- 918-74-24-B
W4WJ 122,544- 828-74-24-B
WD4AHZ 58,108- 398-73-19-A
N5HY 42,780- 310-69-23-A
KO4D 13,356- 126-53- 8-B
N4GVT 5148- 66-39- 6-A

Tennessee

K4XU 136,980- 925-74-24-A
N4ZZ 102,416- 692-74-24-B
K4OAQ 79,660- 569-70-16-A
WM4Z 63,948- 438-73-21-A
K4CQ 62,172- 471-66-15-B
NF4F 59,760- 402-74-14-A
WB4MUZ 38,486- 263-68-16-B
WB4FNN 12,480- 104-60- 9-A
K4XO 10,952- 74-74- 8-A
KF4TF 9374- 109-43-10-A
N4DW (+ KB4EX) 90,724- 613-74-21-B

Virginia

K4POL 136,604- 923-74-24-B
W4YE 119,574- 812-73-22-B
K2NA 119,288- 806-74-22-B
AA4FF 104,636- 707-74-24-A
W4XD 75,336- 516-73-17-B
N4UU 72,520- 490-74-19-B
K4FJ 71,000- 500-71-13-A
KJ7K 68,018- 479-71-17-B
W4RX 64,856- 484-67- 8-B
RX4V 64,468- 454-71-16-A
K4FPF 58,904- 398-74-22-A
N3OS 56,658- 399-71-20-A
N4MM 43,488- 302-72-20-A
K4TM 42,880- 320-67-10-A
WD4ELJ 39,072- 296-66-20-A
WB4J 38,860- 290-67-18-A
W4NM 28,248- 214-66-16-A
K4OD 27,572- 226-61- 7-B
K4JST 26,904- 236-57- 6-A
WM4I 26,460- 210-63-12-A
N4JHN 23,548- 203-58-11-A
W3YY 22,776- 219-52- 6-B
N4RA 20,280- 195-52- 5-A
KD4NI 18,408- 177-52- 5-B
W4KFC 14,994- 153-49- 3-A
K4JSI 13,348- 147-47-14-A
N3JT 10,952- 74-74-14-B
WA4MTP 9400- 100-47- 4-A
WC4B 2200- 50-22- 1-A
N3RC 1470- 35-21-24-A
KB4EXV 364- 14-13-12-A
W4POX (AA4AT,N4s FLF,GTU, WA4TDS, ops.) 49,152- 384-64- 9-B
WI4B (+ WB4WDM) 41,814- 303-69-19-A

West Indies

WP4B 35,880- 224-80-18-A

5

Arkansas

KM5G 108,576- 754-72-24-A
W5KL 17,360- 155-56- 4-B
NI5D (K5SVS,KA5s KNO,POG,PTY, ROK, KC5ZV,KD5FS,KY5M,N5s ERP,GGG,NM5O,W5s SED SW, WA5s ROP,VVT,WB5s GFA,WNG, WB5LRP,WD5s AHP,BIV, oprs.)
38,586- 327-59-24-B

Louisiana

W5XZ (K5GO, opr.)
171,976-1162-74-24-B
K5MC 88,596- 642 69-24-A
W5WG 49,420- 353-70-23-A

Mississippi

KC4WQ/5 100,594- 689-73-24-B
N5XA 34,000- 250-68- 7-B
WA5MUE 11,160- 93-60-10-A

New Mexico

K5TA 172,864-1168-74-24-B
W5JW 156,732-1059-74-24-B
AA5B 153,992-1054-74-24-B
WB7TE 31,850- 245-65-11-B

Northern Texas

N5AU (K5ZD, opr.)
189,144-1278-74-24-B
K5MM 153,772-1039-74-23-B
K5RX (KM5R opr.)
149,504-1024-73-24-B
N5JB 131,424- 888-74-24-A
N5RM 129,940- 890-73-22-B
AF5K 119,436- 807-74-22-B
N5TP 107,152- 724-74-20-B
K5MR 102,416- 692-74-16-B
N5EG 101,154- 733-69-20-B
KW5P 89,096- 602-74-23-B
W9PU5 86,250- 625-69-22-B
N5RZ 84,592- 622-68-13-B
KA5W 81,844- 553-74-22-A
KD4HZ/5 74,692- 526-71-22-A
KM5X 72,312- 524-69-14-B
K5BDX 62,900- 425-74-18-A
W5AH 62,160- 444-70-24-B
KB5UL 56,240- 380-74-18-A
NK5I 55,476- 402-69-14-A
N5OR 32,232- 237-68- 7-A
KE5C 31,496- 254-62-11-A
K5KJ 27,132- 238-57- 8-A
AF5B 27,060- 246-55-21-B
K5GH 27,000- 225-60-10-B
K5HM 26,786- 227-59-10-B
KE5AH 26,786- 227-59-12-A
N5DKW 24,396- 214-57-20-A
N4QS 22,572- 198-57- 5-A
W5USJ 10,120- 110-46-15-A
WB5VZL (+ N5HD)
110,448- 767-72-24-B

Oklahoma

KM5H 122,544- 828-74-24-A
K7CW/5 83,496- 588-71-24-B
KK5I 43,332- 314-69-24-B
W5LFS 17,760- 78-74-15-A
KK5M (+ N5s OG, KW)
165,316-1117-74-24-B

Southern Texas

K5LZO 167,536-1132-74-24-B
N5JJ 166,352-1124-74-24-B
K2SM 150,664-1018-74-24-B
K5RC (KN5H, opr.)
148,740-1005-74-24-B
N5DU 148,592-1004-74-23-B
NA5R 147,112- 994-74-24-B
NM5M 136,900- 925-74-24-B
NM5L 128,818- 863-73-24-B
KG5U 111,690- 765-73-22-B
AC5K 98,272- 664-74-24-A
W5ASP 95,768- 604-71-24-A
K5WA 79,380- 567-70-15-B
K5GB 77,700- 525-74-18-B
W5JQ 75,040- 536-70-13-B
W5SG 68,912- 472-73-19-A
W5PWG 58,838- 403-73-20-A
KC5CP 49,104- 372-66-23-B
KX5L 39,732- 301-66-14-A
KN5A 38,526- 301-64-16-A
W6NR 26,696- 278-65-14-B
K3ZM/5 30,360- 230-66- 8-A
K5SNO 26,962- 221-61-17-A
K5TU 13,158- 129-51- 4-A
W5EQD 12,192- 127-48-16-A
KA5SBS 3060- 45-34-14-A
WJ8DKJ/5 880- 22-20- 9-A
K5VWW (+ K2TNO)
124,992- 852-73-24-B
N5AF (+ WB5LVL)
46,200- 350-66-18-A

6

East Bay

KN6M 153,476-1037-74-24-B
W6RGG 132,756- 897-74-24-B
W6OSP 93,456- 649-72-24-A
K6ATV 64,184- 452-71-19-A
KS6H 60,384- 408-74-19-A
K2GMY 59,764- 446-67-22-A
N6EK 42,700- 306-70-24-A
N6RO 22,440- 204-55- 3-B
K6MBV 18,644- 158-59-18-A
NV6T 15,794- 149-53-12-A
N6GRM 98- 7- 7- 2-A

Los Angeles

N6HC 110,814- 759-73-24-B
NE6I 75,168- 522-72-16-B
K6YCB 51,612- 374-69-16-A
N6ZZ 29,100- 201-50- 4-B
N6IG 18,366- 126-73-12-B
W6OES 4158- 53-33-13-B
W6UE (WA6OTU, opr.)
3720- 62-30- 2-B
WA6JNN 2378- 41-29- 7-A
K6AA (+ K5TTE,WB6HEW)
140,452- 949-74-24-B
WB6OBO (AA4Q,W4PBC,WB6RNT, oprs) 68,320- 488-70-24-A
N6ME (+ K6RVB,KX6V,WA6UYB WB6BIM)
39,072- 296-66-24-A

Orange

WA6JAH 146,584-1004-73-24-B
K7JA 144,004- 973-74-24-A
KZ6E 127,296- 884-72-24-A
WA6NGO 67,890- 465-73-23-A
NU6Z 45,126- 327-69-23-A
W6TOO 20,048- 179-56-11-A
KE6VY 9936- 108-46-18-A
KA6SOP 7650- 85-45-21-A
WB6AJV 7482- 87-43- 6-A
AI6E 6960- 87-40- 2-A
W6Sx 2162- 47-23- 2-A
WA6GFR 570- 19-15- 3-A
N6FSK (+ KA6s NRH,RUX WMV, N6BCB,WB6WAJ)
27,816- 298-61-24-A

Pacific

KH6ND 107,892- 729-74-24-B
AI6V/KH6 92,300- 650-71-22-B
AH6EK (+ KH6XW)
176- 11- 8- 6-A

Sacramento Valley

KI6O 141,192- 954-74-23-B
N6GG 129,056- 872-74-23-B
K6SG 120,472- 814-74-24-B
NB6G 111,836- 766-73-21-B
KF6A 105,412- 719-74-20-B
KV6H 101,470- 695-73-24-B
Kx6Z 30,600- 255-60-16-A
W6EGX 30,600- 225-68-11-A
K6BPB 28,080- 216-65-17-A
W6NKR 26,460- 189-70-13-A
AA6DX 10,872- 116-46- 5-A
WA6BRV 4680- 65-36- 5-A

San Diego

N6ND 125,268- 858-73-24-A
NI6W 119,288- 806-74-23-A
K6ZH 62,160- 420-74-16-A
AA6EE 47,996- 338-71-12-A
W6JXA 24,240- 202-60-10-A
W6ZI 21,360- 150-71-23-B

San Francisco

K6ANP 119,232- 828-72-23-B
W6JII 67,392- 468-72-24-A
K6LRN 59,940- 405-74-19-A
WA6DHM 51,456- 384-67-22-A
W2VQ/6 31,752- 252-63-11-A
N6RA 21,164- 143-74- 9-B
W6BIP (+ WA6DJI)
118,696- 802-74-23-B

San Joaquin Valley

WA6IQZ 27,280- 220-62-16-A
N6AVY 11,520- 120-48- 6-B
WA6SIF 6776- 77-44-14-A
W6SX 70- 7- 5- 1-A

Santa Barbara

N6TR 183,076-1237-74-24-B
W6TKF 48,312- 366-66-13-A
WA6FGV 47,472- 344-69-20-A
KW6H 13,312- 128-52- 8-A

Santa Clara Valley

N6NF 145,780- 985-74-24-B
AJ6V 129,940- 890-73-24-B
N6AUV 124,320- 840-74-23-B
N6MG 121,508- 821-74-24-A
N6SJ 88,704- 616-72-24-A
N6KV 80,592- 552-73-24-A
W6IO 79,110- 535-73-20-A
AD6E 45,780- 327-70-12-B
W6OKK 45,760- 352-65-10-A
KD6PY 38,184- 258-74-10-A
K6OMB 28,438- 241-59- 9-A
W6PRI 27,032- 218-62-24-A
NS6V 27,008- 211-64-10-A
N6RK 23,856- 213-56- 8-A
W6KZJ 16,014- 157-51-10-B
KA6URQ 3528- 49-36- 8-A
K6AYB 3300- 50-33- 3-A
KA6SIQ (+ N6GTI)
336- 14-12-11-A

7

Alaska

AL7GQ 127,896- 876-73-24-B
KL7DG 280- 14-10- 3-A

Arizona

K6LL 174,640-1180-74-24-B
K7GM 171,236-1157-74-24-B
K7OX 158,804-1073-74-24-B
W7ZMD 99,900- 675-74-22-A
N7CPL 75,044- 514-73-21-A
W7YS 67,104- 466-72-27-A
W7FGT 64,416- 488-66-18-B
KC7V 34,710- 267-65-10-B
K7HP 12,284- 83-74-12-B
KA7RHP 6840- 90-38-12-A
W7LUY 2262- 39-29- 6-A
WA7NWL 870- 19-15- 3-A

Idaho

K7NHV 172,668-1165-74-24-B
K7TM 110,668- 758-73-21-A
K7QD 109,938- 753-73-19-A
K0EJ 101,232- 703-72-22-A
K7JD 77,540- 511-70-15-B
KN7W 69,412- 518-67-24-A
W7ZRC 35,754- 303-59- 6-A
KK7A 2754- 51-27- 5-A

Montana

KE7X 127,458- 873-73-24-B
KBPP/7 89,836- 607-74-24-A
WB7CFL 67,824- 471-72-24-A
W7LR 1610- 35-23- 2-A
KS7T (+ KA7GVI)
86,240- 616-70-20-B

Nevada

WA7NIN (W6OAT, opr.)
158,248-1076-74-24-B
WA7UEC 151,404-1023-74-24-B
AK7G 73,414- 517-71-21-A
W7IWR 30,736- 226-68-16-A

Oregon

W7NI 148,148-1001-74-24-B
W7WHO 117,292- 826-71-24-A
K7KJM 88,704- 616-72-24-A
W7TC 82,232- 578-72-24-A
K7PBZ 35,904- 264-68-17-A
WB7UFJ 35,200- 275-64-22-A
WA7OFM 32,890- 245-67-12-A
K7DBV 27,206- 223-61-10-A
N7DG 19,800- 180-55-10-B
KJ7GDN 1872- 39-24- 6-A
W7YAQ 50- 5- 5- 1-A

Utah

N5CT 70,356- 533-66-13-B
K7CPC 41,976- 318-66-18-A

Washington

W7RM (W7WA, opr.)
179,524-1213-74-24-B
N7TT 132,608- 896-74-24-A
AG7M 127,132- 859-74-24-A
KR7G 124,172- 839-74-22-B
KE7C (WB7OJV, opr.)
104,784- 708-74-24-A
W7BUN 91,296- 634-72-19-B
KT7G 88,948- 601-74-17-B
W7LKG 76,254- 537-71-21-B
WB7FEF 75,624- 548-69-17-B
W7GB 74,304- 516-72-18-A
W7NG 73,730- 505-73-18-B
K7SS 72,668- 491-74-14-A
WB7WUM 41,448- 314-66-13-B
N7EPD 36,530- 281-65-12-A
K7MX (KB7G, opr.)
36,226- 307-59- 6-A
KL7UR 29,768- 244-61-21-B
W7BYK 29,184- 228-64-14-A
K7UU 16,848- 162-52- 4-A
K7WA 14,200- 142-50- 7-A
W7IEU 9260- 100-46-12-A
WA7UVJ 8280- 90-46-10-A
K7LXC 8260- 118-35- 4-B
K7XX 7254- 93-39- 3-B
KB7G 6180- 88-35- 2-A
WB7FAH 2240- 40-28- 5-A
N0AX/7 (+ KA7MVM)
47,740- 341-70-24-A

Wyoming

WA8MAM 108,632- 734-74-24-A
K7IO 78,912- 548-72-18-B
N7DKX 63,050- 485-65-22-A
KW7L 32,860- 265-62-24-A
KC7QY 28,920- 241-60-17-A
NC7O 17,490- 158-55-13-A

8

Michigan

WA8YVR 159,100-1075-74-24-B
K8CC 152,144-1028-74-24-B
KN8P 133,792- 904-74-24-B
WA8RRR 128,464- 868-74-20-B
K8DD 108,336- 732-74-15-B
KJ8A 98,420- 703-70-24-B
AC8Y 91,522- 683-67-23-B
KC8JX 78,788- 547-72-20-A
W8UE 78,440- 530-74-22-A
W8UMP 73,982- 521-71-23-A
KS8O 67,592- 476-71-24-B
W8VPC 65,808- 457-72-18-A
AG8F 58,546- 401-73-24-A
N8EA 54,120- 410-66-10-A
WD8CJJ 53,312- 392-68-24-A
KO8T 52,000- 400-65-11-B
K8SIA 49,270- 379-65-11-B
KA8NCR 49,266- 391-63-21-A
KO8M 48,106- 356-67-16-A
K8RDJ 45,500- 325-70-16-A
W8QM 44,958- 381-59-21-B
K8JLB 41,676- 302-69-10-B
K8MW 40,700- 275-74-16-A
KW8G 37,772- 268-71-15-B
NA8G 36,848- 329-56-20-A
KA8IIN 34,974- 261-67-21-B
K8SB 34,692- 294-59-11-A
K8IFF 33,300- 225-74-18-B
W8URM 30,866- 253-61-11-A
W8JKU 30,660- 210-73-21-B
WA8OJR 29,512- 238-62-14-A
W8PVI 27,392- 214-64-13-A
WA3EYL 25,956- 206-63-13-A
WB8SYA 25,200- 210-60-16-A
WB8AAX 23,548- 203-58-11-A
W8EGI 23,082- 181-61- 8-A
N8QQA 22,068- 187-59-15-A
W8GBR 15,808- 152-52-12-A
K8SAK 13,624- 138-49-10-A
N8AOE 8600- 100-43- 6-A
W8TKW 8120- 116-35-10-A
KN8S 8084- 112-36- 4-B
KE8X 270- 15- 9- 1-A
K8AQM (+ KA8POW,KB8RH
KC8KQ,W5ONU)
100,196- 677-74-24-B
K8JRK (+ K8JM,KT8Y)
76,020- 543-70-17-B

Ohio

W8WPC (N9AG, opr.)
140,008- 946-74-24-B
W8FN 137,240- 940-73-24-B
K8NZ 129,500- 875-74-19-B
W8LNO 128,612- 869-74-24-B
K8AC 124,616- 842-74-23-B
KU8E 109,520- 740-74-24-A
KR8Y 95,484- 654-73-24-A
K8MR 92,796- 627-74-12-B
KV8Q 91,908- 621-74-24-A
K8BL 75,036- 507-74-15-A
N8BJO 74,016- 514-72-20-A
KA8ETK 72,864- 506-72-23-A
W8UPH 60,340- 431-70-15-B
W8IDM 60,336- 419-72-19-A
AA8S 57,226- 403-71-13-B
K8AZ 43,632- 303-72-24-A
N8FU 42,194- 289-73-11-A
W8GOC 40,740- 291-70-16-A
AD8I 39,618- 279-71-24-B
K8MN 37,888- 256-74- 7-B
K8ES 37,296- 256-63-16-B
W8PN 32,340- 245-66-12-A
W8VOI 29,298- 207-67-13-A
AD8P 28,340- 218-65- 4-B
WA8ADA 28,320- 240-59-17-B
W8EAR 25,636- 221-58-11-A
AF8C 23,064- 186-62-14-A
AE8L 20,760- 173-60-10-A
W8RSW 19,536- 148-66- 6-B
K8ATQ 16,724- 113-74-24-A
W8DWP 16,500- 125-66-10-A
N8EKS 14,520- 121-60-17-A
KB8LH 8888- 101-44- 9-A
AD8C 7920- 99-40- 7-B
W8CY 7644- 91-42- 7-A
WD8NMV 6750- 75-45-11-A
W8LNJ 4422- 67-33- 3-A
N8CW 4056- 75-27- 3-A
K8MNG 2300- 50-23- 2-A
N8EGU 1638- 39-21- 8-A
KB8IZ 1452- 33-22- 3-B
KC8YR 966- 23-21- 6-A
WB8DXT 874- 23-19-13-B
KA8NRC 198- 11- 9- 4-A
K8HF 98- 7- 7- 1-A
WB8JBM (KC8s MK,XK,KW8N,N8s ATR,DCJ,DMM,EDE,WB8s JMP LSN,WD8IJP, oprs.)
161,616-1092-74-24-B
K1LT (+ K8ND)
134,384- 908-74-24-B
W8LT (KJJT, WB8s PHI,WKB,WD8s DPF,IXE,LXr, oprs.)
110,556- 747-74-24-B
W8XY (+ KA8OMS)
7400- 100-37- 5-A
KO8KU (+ KA8MRG)
4032- 63-32-11-A

West Virginia

N8II (KC8C opr.)
147,314-1009-73-24-B
N8RR 121,064- 818-74-24-B
KD8G 106,856- 722 74-23-A
KB8FJ 85,100- 575-74-18-B
W4NW 78,884- 533-74-15-A
WA3EOQ 71,978- 493-73-22-B
W8IWX 20,886- 177-59-23-A
W8TN 160- 10- 8- 2-A

9

Illinois

K9DX 164,216-1042-74-24-B
K9KM 153,160-1035-74-24-B
K9RS 142,524- 963-74-24-B
K9BG 117,808- 796-74-20-B
K9WA 109,964- 743-74-24-A
KK9A 107,136- 744-72-24-A
WA9AVL 105,984- 736-72-24-B
KM9P 104,044- 703-74-24-A
K9ZO 101,084- 683-74-18-B
K2PLF 100,962- 711-71-24-B
K9JU 97,056- 674-74-23-A
N9TI 85,484- 602-71-15-B
KB9GN (N9EP,opr.)
84,952- 574-74-22-A
N9AEJ 82,800- 575-72-20-B
W9RW 79,624- 538-74-12-B
WD9DBC 73,500- 525-70-20-B
N9CW 71,852- 506-71-24-A
K9LUW 62,900- 425-74-21-A
WB9EEE 38,184- 268-74-20-A
AG9F 34,100- 275-62-19-A
K9BQL 31,944- 242-66-15-A
K9PPW 30,080- 235-64-11-A
WA9MRU 30,016- 224-67-10-A
KA9JNN 25,132- 206-61-15-A
WD9FSE 22,848- 208-56-19-A
WA9ZYG 21,168- 189-56-15-A
K9UQN 19,700- 197-50-18-A
W9HBI 15,698- 167-47-10-A
W9REC 15,006- 123-61-12-A
W9ZEN 12,690- 135-47-16-A
KA9LDS 9180- 102-45-15-A
AK9Y 7524- 93-38- 6-A
KA9NZI 3816- 53-36-10-A
N9DRO 3360- 56-30-11-A
W9AGM 3300- 50-33- 3-A
W9PNE 1886- 41-23- 6-A
N9ANK 1302- 31-21- 7-A
KG9Z (+ N9AX)
20,866- 253-61-17-A

Indiana

W9TG 146,372- 989-74-24-B
WY9YB (N9NB, opr.)
134,088- 906-74-23-B
KE9I 110,112- 744-74-23-B
W9OBF 100,860- 699-74-24-A
W9XO 89,644- 614-73-24-A
W9UOO 74,408- 524-71-23-A
W9LT 59,892- 434-69-11-B
W9RE 53,600- 400-67- 7-B
W8UT 47,334- 343-69-18-A
W9QI W 18,684- 173-54-13-A
N4FKF 16,848- 162-52-12-A
K9KB 4608- 72-32- 4-B
KA9ORN/N 288- 12-12- 5-A
KJ9D (+ KK9V)
141,636- 957-74-22-B
KK9W (+ KM9O,KS9J,KX9G)
93,586- 641-73-24-B

Wisconsin

W9YT (WB9PYE, opr.)
134,758- 923-73-24-B
AC9C 130,670- 895-73-24-B
W9NA 124,616- 842-74-21-B
W9XT 112,628- 761-74-24-B
K9VGE 105,080- 710-74-18-B
WB9YXY 100,010- 685-73-24-B
N9NE 97,680- 660-74-24-A
K9LJN 95,184- 661-72-74-A
W2WOE/9 93,024- 646-72-24-B
W9GXR 83,922- 591-71-24-B
KB9S 79,948- 563-71-16-B
W9WI 70,416- 489-72-17-A
KO9Q 58,320- 405-72-14-B
WB9HRO 56,304- 408-69-21-A
WA1UJU/9 56,030- 431-65-20-A
K9GDF 52,780- 406-65-10-A
N9DSK 49,714- 371-67-24-A
AJ9U 34,036- 254-67-16-A
N9TD 30,240- 216-70-10-A
W9HF 26,586- 211-63- 6-A
N9KS 26,334- 209-63-11-A
W9KHH 24,128- 208-58-17-A
K9KR 23,200- 200-58-15-B
KB9W 22,204- 182-61- 7-A
N9EZ 13,056- 136-48- 6-A
AI9YCV 9680- 88-55-24-A
WA9YSD 4352- 64-34-15-A
KA9PBX 18- 3- 3- 1-A
K0FVF/9 (+ K0TG,KM0O
W0s UC,ZZ,WA0HBW)
141,488- 956-74-24-B
N9BYK (+ N9DZQ)
56,840- 406-70-24-A

Ø

Colorado

KØRF (W0UA, opr.)			
	122,144	1179-	73-24-B
NZIC	171,680	1180-	74-24 B
WØYK	153,008	1048-	73-24 B
N9NC	152,292	1029-	74-24 B
WØUJR (KØEU, opr.)			
	139,680	945-	74-24-A
KYØS (NØEBM, opr.)			
	133,052	899	74-22-B
WØKEA	123,284	833	74-23-B
AC0S	106,128	737	72-18-B
KØBN	87,756	618	71-23 B
KØØG	86,578	593	73-23 B
W2FV/Ø	81,252	549	74-22 B
KIØJ	46,500	350	65-23 A
WØDK (KRØU, opr.)			
	43,692	331	66-18-A
NØCNV	41,600	325	64-19-A
WØSG	40,896	284	72-17-A
WØGOR	33,528	254	66-21 B
KA1JOD	23,932	193	62-18-A
WØRSG	23,826	209	57-16-A
WØIZV	4,352	56	32- 7-A
K4MWM/Ø	2408	44	28- 7-A
KØUK (+ KD7EY)			
	121,656	822	74-24-B
KCØD (+ KDØY, WAØUJO)			
	118,992	804	74-24-B

Iowa

NØGA	149,036	1007	74-24-B
KØLUZ	143,226	981	73-24-B
WØEJ	125,652	849	74-24-B
KØIS	89,318	629	71-24-A
KCØXK	59,540	458	65-23-B
NØBB	52,706	361	73-20-A
WØUTG	26,780	206	65-11-A
WDØGVY	24,192	218	56-16-A
WØSS	22,344	196	57- 6-A
WØIZ	21,312	144	74-20-A
KCØQ	20,720	140	74-10-A
WØYBV	8056	76	53-24-A
WØIO (KAØPFC, NØEBA, oprs.)			
	63,784	476	67-20-A
KAØLUZ (+ KAØPHJ)			
	48,688	358	68-20-A
NØEEN (+ NØELV)			
	38,916	282	69-18-A

Kansas

KBØG	138,676	937	74-24-B
KØVBU	102,860	695	74-21-A
WAØTKJ	92,056	622	74-18-B
N7DF	84,840	605	70-14-B
WØAWP	32,912	242	68-21-A
KFØM	30,222	219	69- 8-B
WAØCFZ	24,768	233	52-22-A
KVØU	21,804	158	69-15-B
WDØHAG	2	1	1- 1-A
AØOS (+ KØWA)			
	136,900	925	74-24-B

Minnesota

NØNO	147,314	1009	73-24-A
WØWDW	122,840	830	74-24-B
WØHW	119,706	843	71-24-B
KØIJL	105,080	710	72-22 A
K3WT	97,820	670	73-24-A
WBØHRX	87,636	654	67-20-B
WAØOIT	86,620	610	71-24-A
KSØT	79,200	550	72-23-A
KNØD	78,810	555	71-23-A
WØYCR	76,020	543	70-16-B
KØIHG	66,240	460	72-15-A
KØMPH	62,832	462	68-18-A
KØFZG	62,764	442	71-21-A
NØBSH	53,960	360	71-18-A
WBØBJP	46,200	330	70-23-A
WAØWWW	45,866	320	71-22-A
WA2HFI/Ø	33,098	247	67-16-A
NØBG	30,104	212	71- 7-A
WBØUKI	21,708	402	54- 8-A
WAØVQX	15,820	113	70-24-A
WAØWHT	13,362	131	51-10-A

Missouri

K4VX (KRØY, opr.)			
	168,128	1136	74-24-B
KØRWL	132,544	828	74-24-A
KMØL	114,902	797	73-23-B
KØDEQ	76,896	534	72-14-B
WØHBH	75,600	540	70-18-B
NØEVC	75,568	226	59-17-A
KAØP	20,608	184	56- 8-A
WØKCG	9112	68	67-10-A
WØBDL	4602	59	39-14-A
KAØKKV	680	20	17- 9-A
KMØR (+ KMØP)			
	61,320	448	70-16-B
WØEEE (+ KAØs GOR,JJX,WØOS YKG,ZGD,WDØELL, oprs.)			
	7560	108	35- 5-A

Nebraska

KØSOM	112,924	763	74-21-B
KBØN/Ø	96,052	649	74-23-A
KVØI	77,280	562	70-13-A
KØHA	70,840	506	70-18-B
WØKK	29,868	262	57-15-B
KAØOSK	4864	64	38-11-A
KØDI (+ KØNB)			
	114,594	807	71-24-B

North Dakota

KLSV/Ø	86,496	636	68-20-B
WØLHS	7442	61	61- 8-A
KAØNUQ	966	23	21-14-A

South Dakota

WØØCXU	92,868	654	71-14-B
WA3PWL/Ø	53,676	378	71-11-A

VE

Maritime - Newfoundland

VO1AW	18,240	160	57- 8-B

Quebec

VE2DPO	54,288	377	72-23-A
VE2AQP	51,982	366	71-17-B

Ontario

VE3JTQ	103,660	710	73-23-A
VE3IRF	39,274	286	73-24-A
VE2WA/3	11,554	109	53- 5-A
VE3ART (VE3s ABG,ATD,DEO,GAS, GLD, oprs.)			
	115,588	814	71-22-B

Manitoba

VE4RF	34,452	261	66-12-A
VE4ALO	23,790	195	61-13-A
VE4AEX	22,050	175	60-22-A

Saskatchewan

VE5XK	160,432	1084	74-24-B

Alberta

VE6QU	98,420	665	74-15-A
VE6WU	95,922	657	73-18-B
VE6UX	72,964	493	74-23-A
VE6CQG	37,122	269	69-24-A
VE6BND	13,668	134	51-15-A
VE6ATT	1680	20	24- 4-A

British Columbia

VE7YU	80,928	562	72-18-A
VE7IN	78,540	561	70-20-A

N.W.T. - Yukon

NØTT/VE8	97,382	667	73-21-B
VE8UG	37,896	304	62-17-A

PHONE

Connecticut

K1WA	121,824	846	72-17-B
KG1D	94,752	658	72-18-B
K1GX	81,608	574	71-12 B
K1EF1	77,562	524	74-21-B
KM1P	73,292	502	73-16-A
WR1EYI	69,000	500	69-24 A
K1NYK	68,310	495	69-16-A
WA1LJP	62,444	466	67-21-B
N1JW	60,168	436	69-10-B
W1GNR	60,048	417	72-20-A
K1THP	53,592	406	66-11-B
KA1JQW	52,184	419	63-24-A
WA2WIP	46,512	342	68-13-A
K1IN	38,682	307	63-18-A
KG1D	36,698	311	58-18-B
KH6WZ	33,804	313	54-16-A
K1YRP	32,508	258	63- 9-A
K1RM	32,400	270	60- 5-B
K1DM	28,644	231	62- 7-B
KA1GI	27,548	388	71-17-A
K1DII	24,840	224	55- 4-A
W1BIH	21,608	148	73- 5-B
W1PMR	18,040	220	41-14-A
W1SG	12,636	89	71-10-B
WA3VIL	9450	105	45- 5-A
K1KI	7560	90	42- 1-B
K1CC	4466	77	29- 1-B
KA1EBI	1800	45	20-10-A
KB1N	1558	41	19- 1-B
W1xx	1530	45	17- 1-B
AA2Z (+ W1QD,KBKAI			
	186,332	1259	74-24-B
K1DW (+ K1NCD,N1ACM)			
	118,368	822	72-23-B
WA1KOJ (+ WA1LVW)			
	72,484	541	67-18-B

Eastern Massachusetts

K1VR	170,496	1184	72-24-B
K1AR	156,880	1060	74-14-B
W1FM	97,488	677	72-22-A
KQ1F	88,892	626	71-20-B
WA2TBA	76,212	522	73-22-A
WA1EOT	74,004	556	67-11-B
K1VUT	72,414	517	71-17-A
KB1EW	71,612	374	69-24-A
KB1GN	48,440	346	70-16-B
K1CB	42,906	306	70- 8-B
N1AU	35,092	263	62- 8-B
W1TUM	31,616	247	64-15-A
KB3MB	31,580	243	65-24-A
KA1EKR	24,308	206	59-16-A
W1AX	18,768	146	69- 6-A
KE1U	11,324	149	38- 4-A
N1CVK	11,000	110	50-19-A
KC1Q	10,560	110	48- 3-A
AJ1I	10,396	113	46- 2-A
KB1KM	8256	86	48-10-A
AI3E	6240	106	40- 3-A
W1HN	6000	100	34- 2-B
K1KZL	5244	69	38- 4-A
W1PLJ	4154	67	31- 6-B
K1UCA	612	18	17- 1-A
N1CLK	400	25	5- 4-A
K5NA	150	15	5- 1-A
W1IKZ (K1s BA,UR, KA1s IKW, JWF, N1s AOY,CPF,WB1TDA oprs)			
	68,896	496	68-22 B
K1HM (Multiop)			
	1564	34	23- 2-A

Maine

K1JR	110,544	777	71-20-B
KB1CV	51,060	370	69-20-B
K5IG	26,680	290	46- 5-B
KA1ZX	23,940	210	57-17-B
K1PV	19,684	133	74-14-A
W1OTQ	12,688	122	52- 9-A
WB1GLH	7656	87	44-12-A
W1KK (+ KA1s JGF,TJ,KR1JF)			
	64,588	482	67-21-A
K1RM (Multiop)			
	2500	50	25- 4-A

New Hampshire

AF1T	142,350	975	75-22-B
AK1K	51,180	437	70-24-A
WA1PAX	13,800	138	50-11-A
W1ET (WA1DUA,KA2GKV oprs.)			
	24,924	201	62- 8-B
K1RM (Multiop)			
	364	14	13- 1-A

Rhode Island

KM1X	85,960	614	70-16-B
K1YSJ	67,820	483	70-21-B
WA1EXP (WB3HVS, opr.)			
	51,408	378	68-14- A
K5IJ	33,536	262	64-13-A
AJ1K	22,244	170	67-13-A
K1DS	16,810	151	56- 6-A
W1RFO	7442	61	61- 7-A
KA1AWS	4980	83	30-10-A
KM1G	4312	77	28- 4-A
W1QP (N1BBM,WA1RKL,WB1FDY, oprs)			
	61,372	458	67-17 B

Vermont

WB1GQR	188,340	1290	73-24-B
WA1GUV	20,384	182	56-10-A
KD1R	16,450	175	47-15-A
K1WUU	13,736	101	68-22-A
WB1ELG (+ K1FWL, KB1J)			
	187,516	1267	74-24-B
KK2B (+ K2OZV,KA2s,CFH GWT, M1B,WA2AZA)			
	60,306	437	69-24-A

Western Massachusetts

KA1DZV	105,216	748	71-24 A
WA1ZAM	101,470	695	73-22 A
WB1EYL	53,460	405	66-16-B
N1CKW	53,268	386	69-21-A
K1KNQ	35,040	240	73-10-A
N1SR	31,812	241	66-14-A
WB1HIH	3400	50	34- 2 B
K51N (+ KB1W)			
	148,464	1031	72-23-B
N1XZ (+ WA1VEB			
	114,912	746	75-24 B
N1CC (+ KR1B)			
	103,952	712	73-19-A
W1YK (AK1J,KA1KUB,N1BLM, WA2YHZ,WO4NXE, oprs.)			
	53,760	420	64-21-A
K1RM (Multiop)			
	392	14	14- 1-A

2

Eastern New York

W2YV (KO2M, opr)			
	191,512	1294	74-24-B
W2ARO	128,304	891	72-24-B
W2TR	113,220	715	74- 9-B
W2CR5	96,336	669	72-24-B
KO2AG	88,324	622	71-20-B
N2ECD	75,904	593	64-13-B
KB2HQ	48,552	357	68-18-B
W2HES	35,490	273	65-13-B
W2DW	28,810	215	67- 6-B
WB2MJC	24,592	212	58-12-B
KO2H	23,358	229	51- 9-A
W2AZO	21,364	218	49- 5-B
WA2STM	17,056	161	53- 7-A
N2JJ	14,030	115	61- 5-B
KY2J	13,200	150	44-12-A
WB2KHE	11,508	137	42- 6-A
K2MME (+ N2s BJG DVX,WA8, MAZ, WB2s IEE,NEG,UME)			
	52,440	460	57-13-B
KW2D (+ KC2KK, WA2UYM)			
	43,632	303	72-13-A
WA2KHP (+ N2EIK)			
	4356	66	33- 8-A

New York City - Long Island

N2MG	123,516	846	73-23 B
K2AU	111,148	751	74-22-B
WB2DHY	91,494	663	69-21-B
KS2G	77,616	539	72-19-A
KC2XQ (WB2DIN, opr.)			
	76,648	572	67-18-B
W2DKM	61,920	430	72-19-A
KA2AEV	48,990	346	71- 9-A
W2LPA	36,828	273	66-19-A
WA2SOI	34,800	290	60-12-B
N2RO	34,404	252	61-16-B
W2GKZ	22,800	200	57-10-B
WB2FMP	16,400	154	50-10-B
KK2E	14,560	182	40- 3-B
K2OVS	14,000	100	70-12-A
K2DOO	10,010	143	35- 8-A
WA2TQT	9600	100	64-10-B
W2KZE	6784	106	32- 5-B
WA2FBQ	3306	87	38- 3-B
W2DX	2100	50	21- 4-B
W2TNT	1850	37	25- 8-A
W2KTF	1540	35	22- 1-A
K2LJH	484	22	11- 2-A
AE2E (+ KA2AAN,WA2KRO)			
	39,910	307	65- 5-B

Northern New Jersey

KZ2S	151,060	1079	70-20-B
WB2WIK	107,018	753	73-21 A
W2RQ	75,184	508	74- 6-B
K2RF	46,944	326	72-19-A
W2KXD	39,456	274	72-17-B
KW4E	35,376	211	60-13-A
WA2UDT	25,200	200	63- 5-A
W2GNW	13,344	139	48-12-A
KI2Q	11,760	126	47- 6-A
N2CQR	10,384	116	44- 6-A
K2BJG	8848	79	56- 4-B
KB2ZQ	4158	63	33- 2-A
AA2U	1512	36	21- 1-A
KC2OM (+ KA2OAR)			
	24,940	215	58-13-A

Southern New Jersey

K2YY	171,504	1191	72-24-B
WA2KOK	98,214	658	73-22-B
KZ2I	81,176	556	73-22-A
W2FGY	54,924	398	69-22 B
K2JLA	43,824	332	66-17-B
W2OBA	41,400	300	69-14-B
N2DZY	39,990	303	65-12-A
WB2KQC	30,552	228	67-16-A
N2OMK	23,246	197	59-21-A
KA2SGD	23,210	211	55-17-A
KB2GW	20,670	195	53-13-A
WB2FRI	20,196	187	54-16-B
WB8ZAH	17,136	153	56- 8-B
W2CN	17,034	167	51-11-B
WB2UVB	16,116	158	51-12-A
N2EZ	13,272	158	42-14-A
WA2AWS	12,508	118	53- 6-A
WA2DUE	11,508	137	42-13-A
W2REB	6724	82	41- 5-A
KD2AE	6106	71	43-12-B
KA2KFO	5120	64	40-12-A
W2HBE	2600	50	26- 5-A
N2AWC	2600	50	25- 8-A
AB2Y (+ AB2Z,WA2VYA,WB2RYU)			
	135,196	926	73-24-B
WA2DHD (Multiop)			
	48,100	370	65-19-A

Western New York

K2IGW (WA2LCC, opr.)			
	194,326	1331	73-24-B
N2NW	113,184	786	72-24-B
AF2K	68,466	623	71-21-B
WB2YQO	61,400	560	74-22 B
NA2A	61,040	436	70-20-B
KE2B	45,014	317	71-18-A
WA2FQE	40,936	301	68-22 A
WA2RKO	39,126	292	67-18 B
KA1YE	38,430	315	61-13-A
KC2UA	36,432	276	66-13 B
K2SOT	35,700	255	70-17-B
KB2SE	34,304	256	67-11-B
WA2PNQ	31,500	250	63-19-A
KB2NU	30,900	220	70- 7 A
NA2Q	30,102	260	58-11-A
W2FXA	29,670	215	69-10-A
W2VDX	29,376	204	72-14-B
WB2YQH	28,800	200	72-12-A
WA2DHS	27,972	228	61- 6-B
WB2OPR	23,424	192	61-11-A
N2CIC	23,302	189	59-20-B
N2CU	20,200	202	50- 3 B
KD2CZ	13,716	127	54- 7-A
W2PHT	8640	101	45- 6-A
WB2SGS	5254	71	37- 5-A
N2GU	1152	32	18- 2-A
N4TW/2	48	6	4- 1-A
W2OW (K2OC,KA2ODE,KG2Y,KI2P, N2s AEY,HR,N6IN,oprs)			
	178,044	1203	74-24-B
W2OFQ (+ K2s GVI,YAI,KA2s FTU, NIL,TAX,KBs 2YU,3RG,KC2RN K2OH, N2s DKB,DLG,DSV,NJD,U N5RGY,W2HAX,WA2s FLX,NKC, WB2s HEY,MNA,RBA)			
	95,760	665	72-24-B
KF2X (+ N2BXC,N2CFN)			
	75,776	512	74-21-B
KA2GUO (+ KA2RSY)			
	52,966	373	71-20-A
KC2GL (+ KA2HVB)			
	9306	99	47- 8-B

3

Delaware

N8NA	35,518	301	59- 6-A
W2LTP	10,608	102	52- 7-B
AC3T (+ KA3B)			
	132,568	908	73-23 B
KZ6E (WA2NXK,WB2s,ANM,SNN, oprs)			
	16,986	149	57-15-A

Eastern Pennsylvania

WA3SPJ	162,352	1112	73-23-B
WB3EMG	137,824	944	73-24 B
WB3FAA	116,156	818	71-22-B
KH6CP/3	88,256	599	72-24-B
K3MRG	86,190	663	65-19-A
K3WGR	79,520	560	71-16-B
WB3FYT	76,032	528	72-21-B
N3CHL	60,480	420	72-20-B
KB3YJ	60,048	417	72-21-A
N3DAY	52,392	354	74-16-B
WB3CIW	44,352	308	72-10-B
N3AVZ	41,496	364	57-15-B
WA3YON	40,170	309	65-13-A
W3DZH	37,800	270	70-18 A
WB3FNZ	37,264	274	68-12-A
N3AD	32,116	217	74- 6-B

WB3CAI 29,498- 301-49-16-A
WA3KBH 28,910- 245-59-19-A
KC3AD 27,984- 212-66-14-A
W3ARK 26,790- 235-57- 8-A
KB3JK 25,960- 220-59-11-B
KA8AVA 25,308- 222-57-19-A
WB3EPW 24,510- 215-57-12-B
AA3B 17,802- 207-43- 5-B
N3CWS 15,370- 145-53-14-A
W3KOK 14,700- 150-49-18-A
KB3FZ 11,844- 130-47-10-A
W3MA 10,952- 74-74- 7-A
N3DRF 10,350- 116-45- 6-A
KC3M 10,224- 72-71- 8-B
KA3BXD 9870- 106-47-12-A
WB3BOT 9416- 107-44-10-A
KB3QI 7720- 95-38- 7-A
WA3JXW 7400- 100-37- 5-B
N3CXB 7128- 81-44- 3-A
KR3I 6336- 88-36- 6-A
W3HMR 4930- 85-29- 4-B
KA3FWW 4234- 73-29- 6-A
WB3AAL 3422- 59-29- 4-A
K3MWA 2430- 45-27- 3-A
N3CZB 972- 27-18- 9-A
WA3LGG 98- 7- 7- 2-A
KQ3R (+ KF3Y,KQ3P,N3DPN)
144,414-1017-71-22-B
WB3IWZ (+ N3AXB,WA3NVS)
63,648- 468-68-20-B
KM3N (+ KK3W)
30,464- 224-68-22-B

Maryland D.C.

W3LPL (WD4AXM, opr.)
212,972-1439-74-24-B
N2FB (KC8C, opr.)
190,032-1284-74-24-B
K3ZJ 186,480-1260-74-24-B
KA1GD 184,398-1263-73-23-B
K3TM 151,562-1024-74-21-B
K3ZZ 138,672- 963-72-24-B
N3RL 134,758- 923-73-21-B
K3DI 129,600- 900-72-22-B
N3GB 118,844- 814-73-24-B
K2ITG 113,812- 769-74-20-B
W3ICM 106,416- 739-72-21-B
W3UJ 102,950- 725-71-16-B
KC3EK 82,436- 557-74-22-A
KI3L 74,976- 528-71-12-B
W3HVM 62,580- 447-70-16-B
W3JP1 62,480- 440-71-22-A
K3ZNV 58,926- 427-69-15-B
K3HPG 54,288- 377-72-11-A
W3AZ 52,682- 371-71-18-B
N3AOE 49,140- 351-70-24-A
WB3JRU 48,988- 331-74-24-B
WA3VPI 38,040- 317-60-16-A
KA3DXZ 37,654- 281-67-15-A
W3FA 37,170- 295-63-18-A
K3TW 30,932- 209-74-14-B
K3RY 30,096- 209-72-23-A
K3SA 29,600- 200-74- 9-A
WA3RGH 28,644- 231-62- 8-A
W3IOT 26,840- 220-61- 6-A
W3FOE 22,458- 197-57-17-B
W3EE 18,256- 163-56- 8-A
N3API 17,052- 147-58-10-A
W3EVQ 10,250- 125-41-17-A
N3II 4480- 70-32- 2-A
W3GNO (+ W3FG)
112,036- 757-74-22-B

Western Pennsylvania

K3UA 183,668-1258-73-19-B
K3LWM 154,468-1058-73-23-B
KB3WX 76,896- 534-72-21-A
AG3H 63,344- 428-74-16-A
AD8J 36,594- 321-57- 4-B
WA3WAW 35,168- 274-66-10-B
W3QII 25,296- 204-62-16-A
KF3C 24,120- 180-67-17-A
KA3AUX 5040- 72-35- 3-A
K1PLR 1806- 43-21- 4-A
WA3PCX 1080- 27-20- 3-A
W3KWH (AK3J,K3RYA,KA3s IVB, LIW,N3AOK,W3SVJ,WB3s BRY, KXX,WN3VAW, oprs.)
72,380- 517-70-17-B
W3WC (+ N3BOP)
38,500- 275-70-19-A

4

Alabama

N4KG (KC4ZV, opr.)
189,884-1263-74-24-B
W4NTI 94,720- 640-74-17-B
K4IQJ 67,482- 489-69-20-A
KF4FN 50,924- 439-58- 6-B
KA4PKB 40,020- 290-69-15-B
WD4PVI 26,840- 222-60-14-B
K4GSK 10,082- 71-71-15-A
W4CUE (KA4s WMM,LEN,TGW, KB4AQQ,KD4DQ,W4EVD,WA4s QLA,RAJ,RNP,WD4IXE, oprs.)
42,250- 325-65-18-B

Georgia

K4BAI 175,824-1168-74-24-B
KC9BC 56,700- 225-54-12-B
K4KKJ 46,782- 339-69-15-A
K4BAM 34,928- 236-74-10-A
KE4XT 29,078- 217-67-12-A
AA4GA 23,562- 187-63- 5-A
KV4A 19,920- 166-60- 7-B
KI4Y 13,144- 124-53- 9-A

Kentucky

K4FU 150,664-1018-74-23-B
ND4Y 62,338- 439-71-10-B
WA3DNC 50,256- 349-72-16-A
WB4OSS 47,952- 329-74-15-B
W4XT 40,740- 582-70-22-A
NO4R (+ KA4TAY, NM4M,N4IRX, WD4LAM) 162,352-1112-73-24-B
AA4RX (multiop)
20,184- 174-58- 3-B

North Carolina

N4QY 94,752- 658-72-23-B
N4UH 76,886- 520-74-12-B
K4JEX 68,180- 487-70- 6-B
W6NWS/4 67,044- 453-74-24-A
WD4AVY 59,184- 411-72-19-A
WB4VIM 30,132- 243-62-17-A
K4NHO 22,572- 198-57-19-A
KA4RTJ 13,708- 149-46- 9-A
WB4AQK 12,814- 149-43-10-A
N4ZC 10,962- 74-74- 9-B
N4QYG 8400- 100-42- 9-A
K1ED 8240- 103-40- 4-A

Northern Florida

N4SA 194,472-1314-74-21-B
K4XS 184,544-1264-73-24-A
NU4Y 131,254- 899-73-22-B
WG4E 131,034- 829-73-20-A
W4IIR 55,188- 378-73-17-B
N4MS 15,732- 138-57- 8-B
N4HKQ 15,456- 138-56-16-A
W4VQ 10,400- 100-52- 5-A
N4WW (+ NX4N)
268,472-1814-74-24-B
N4UF (+ NR4E,WB4YEY)
150,220-1015-74-24-A

South Carolina

WQ4V 110,852- 749-74-14-B
K4ADI 75,920- 520-73-22-A
AE4Y 28,928- 228-64- 5-A
WA4JJZ 27,636- 229-61- 9-A
N9KS 23,316- 201-58-12-A

Southern Florida

N4BP 148,000-1000-74-17-B
K1ZX/4 108,336- 732-74-10-B
WA4FSP 92,796- 627-74-24-A
WA4FIB 70,140- 501-70-21-A
N5FIY 7332- 78-47- 9-A
W4JM 3465- 51-34- 2-A
W4OO 1680- 42-20- 2-A
KA4UBC 18- 3- 3- 1-A
W2AAN 2- 1- 1- 1-B

Tennessee

K4XU 165,612-1119-74-24-A
WM4Z 104,784- 708-74-20-A
N4ZZ 80,958- 547-74- 9-B
NF4F 66,930- 485-69-14-B
K4PJ 30,636- 207-74- 6-B
K3CO 26,544- 237-56-15-B
K4XO 10,952- 74-74- 8-A
WB4MUZ 9680- 121-40- 8-A
KA4MRR 1008- 28-18- 2-A
KE4TX (+ KB4PH)
600- 40-15- 2-A

Virginia

KD4NI 200,750-1375-73-24-B
W3YY 185,472-1288-72-24-B
N3JT 153,360-1065-72-21-B
N4UU 96,852- 662-73-21-B
AA4FF 84,242- 577-73-18-B
WC4B 77,904- 541-72-24-A
N4MM 76,960- 520-74-17-A
KC4B 75,190- 515-73-20-B
WN4VAU 56,012- 418-67-24-A
KB4NT 51,246- 351-73-17-A
W4XD 50,260- 375-67-12-B
WD4ELJ 45,408- 311-73-18-B
WB4J 41,076- 326-63-15-B
W4YE 39,000- 300-65- 7-B
K4YT 34,036- 254-67-10-B
W4JLS 32,384- 253-64-18-A
N4XD 31,880- 295-54-10-B
AF4O 30,080- 235-64-13-B
WB4ZPF 28,014- 203-69-18-A
N4JHN 27,348- 258-53-18-A
N4JGM 27,156- 219-62-24-A
W4NND 19,800- 180-55-13-A
N4RA 15,912- 153-52- 5-A
W4WWQ 15,622- 107-73-16-A
KA4ERK 15,048- 132-57- 9-A
KA4IUM 13,780- 260-53- 7-A
KF4FP 10,032- 76-66-11-B
W4KFC 8200- 100-41- 3-A
KC4DY (+ AB4U,KA4s BGZ,ZPT, KB4PV,KJ7K,N4s FHL,GNN,HON, JED,VG,VG,W4YV,WB4QOJ,)
120,916- 817-74-23-B
WI4B (+ WB4WDM)
34,048- 304-56-18-A

West Indies

KP4BZ 296,592-2004-74-24-B

5

Arkansas

WD5CAA (KA5NLY, opr.)
22,344- 196-57-17-A
W5EIJ 7968- 83-48- 4-A
W5KL 1344- 32-21- 2-A

Louisiana

W5WMU 228,068-1541-74-24-B
W5WG 41,464- 292-71-26-A
WD5CGC 17,760- 120-74-17-B
W5GAD (K5EF,KA5MSD,N5GSK, WA5s HAX,HOD,OZH,UJX, oprs.)
169,608-1146-74-24-B

Mississippi

N5DSK 104,636- 707-74-15-A
KC4WQ/M5 14,616- 116-63- 7-A
KV5F 13,674- 129-53- 6-A
WA5MUE 7260- 66-55- 2-A

New Mexico

K5TA 257,076-1737-74-24-B
AA5B 233,396-1577-74-24-B
K5QQ 150,072-1014-74-22-B
N5HH 89,836- 607-74-17-B
N5ACP 56,448- 392-72-21-B
N5EPA 32,760- 234-70-15-A
NJ5T 30,774- 223-69-13-B

Northern Texas

N5AU (WB5VZL, opr.)
235,912-1594-74-23-B
K5RX 225,256-1522-74-24-B
AF5K 220,168-1508-73-24-B
KA5W (KM5R opr.)
214,896-1452-74-24-B
K5RR (N5RZ, opr.)
210,160-1420-74-24-B
N5EG 195,804-1323-74-24-B
K5QY 195,064-1318-74-23-B
K5ZD 184,106-1261-73-19-B
WD5GSL (WB0TEV, opr.)
163,392-1104-74-24-B
KE5CV 146,304-1016-72-21-A
N5JB 109,224- 738-74-17-A
AF5B 70,596- 477-74-20-B
K5RJ 66,008- 446-74-22-A
WB5CRG 64,512- 448-72-16-A
K5MM 61,776- 429-72-12-B
W5LMG 59,160- 435-68-21-B
KD5BE 54,234- 393-69-21-A
N5QA 52,560- 385-72-21-B
KD5RO 39,600- 300-66- 7-B
K2SCU/5 26,840- 206-70- 9-B
WA5DTK 27,008- 211-64- 5-A
KC5PU 23,310- 185-63-15-A
N5AW 10,878- 111-49- 3-A
KB5UI 9840- 71-70-17-B
W5AE 6972- 83-42- 5-B
W5AH (+ KM5X)
150,480-1045-72-24-B
K5MR (+ N4OS)
114,610- 785-73-18-B
KC5EA (+ N5AU)
87,220- 623-70-10-B
WB5RMQ (+ KA5s FSJ,LAQ, KC8JB,N5HFR,WB5YAZ)
55,042- 377-73-24-A

Oklahoma

KM5H 113,664- 768-74-21-A
K7CW 37,572- 303-62-10-B
K5QEC 18,666- 153-61- 9-B
WB5OSM 3060- 51-30- 3-A
N5KW (+ K5CM,N5CG)
247,900-1675-74-24-B

Southern Texas

N5DU 244,792-1654-74-24-B
KZ5M 197,284-1333-74-24-B
KB5FU 159,988-1081-74-22-B
K5WA 157,916-1067-74-13-B
N5DDO 140,744- 964-73-24-A
K5DX 124,024- 838-74-18-B
WD5AAM 110,016- 764-72-23-B
KC5CP 104,488- 706-74-23-B
WA5IYX 68,040- 486-70-23-A
AA5Y 66,008- 446-74-24-B
W5ASP 41,640- 347-60- 7-A
K5LZO 41,088- 325-64- 5-B
N5FRV 27,956- 241-58-16-A
W5UFA 27,060- 205-66-15-B
K5GB 25,760- 230-56- 6-B
KA5ABS 25,704- 204-63-14-A
W5LLU 15,846- 139-57-16-B
N5JJ 14,194- 151-47- 3-B
N5AF 14,040- 135-52- 7-A
WD8DKJ/5 112- 8- 7- 5-A
NA5R (+ K5GA,KN5H,N5EA)
213,564-1443-74-24-B
K5VWW (+ K2TNO,KC5M,KG5U, W5ASP)
190,476-1287-74-24-B
NM5L (+ K5IY)
190,476-1287-74-24-B
WA2PRB/5 (+ WA5ZUP)
160,728-1086-74-24-B
KN5A (+ KA5F,WA5PQK)
150,220-1015-74-24-B
N4BOS (+ K9RZE, KA5s QEC,RZU, KM5J,N5FN,NJ5O,W5PWG, WD5AAH)
92,994- 628-74-24-A

6

East Bay

N6IG 243,164-1843-74-24-B
WA3FET/6 176,712-1194-74-24-B
KB6JK 96,506- 661-73-19-A
K2GMY 87,312- 642-68-18-A
WB6FCR 82,584- 568-74-17-A
KS6H 54,460- 389-70-18-A
N8GRM 29,106- 231-63-16-A
K6XO 10,952- 74-74- 9-B
W6RGG 10,952- 74-74- 8-B
WA6BIS 6552- 84-39- 9-B

Los Angeles

N6HC 168,888-1141-74-22-B
W8AKS/6 75,118- 529-71-23-A
W6CN 73,704- 498-74-23-A
W6NOL 64,232- 434-74-20-A
WA6LOW 41,300- 295-70-24-A
KK6V 26,100- 225-58- 8-A
WA6JNN 26,000- 200-65-16-A
WB6DIB 17,784- 171-52-12-A
WB6BXP 16,562- 169-49- 5-A
W6NXB 8360- 95-44-10-A
G3MHV/W6 2970- 45-33- 6-A
W6OES 2700- 50-27- 6-A
KA6ZYF 1944- 36-27- 6-A
WB6NFO 1020- 30-17- 3-A
K6AA (KE6B,WB6HEW, oprs.)
132,714- 909-73-24-B
WB6OBQ (AA4Q,WB6s PLG,RNT, oprs) 94,752- 658-72-23-A

Orange

K7JA 184,112-1244-74-24-A
K6HRT 114,192- 793-72-24-B
AI6E 47,428- 334-71-19-A
K6EBK 42,918- 311-69-23-A
WA6NGO 39,650- 325-61-10-B
WB6KRI 39,618- 279-71-18-A
KA6ISX 26,934- 201-67-11-A
W6TCO 8820- 105-42- 4-B
KG6F/6 7200- 60-60- 6-A
NM6L 6992- 92-38-12-A
NV6K (+ KA6NXO,KF6OG,N6s AWF,DJW,DJX,ECA,FMD,RJI
186,924-1263-74-21-B
KX6V (+ K6RUB,KA6SOP,KX6V, WA6s,UYB,ZXN,WB6BIM)
70,416- 489-72-23-A
N6FSK (KA6s NRH,RRB,RUX,oprs.)
26,184- 211-62-17-A

Pacific

AI6V/KH6 128,464- 868-74-16-B
AH6EK (+ KH6XW)
4288- 67-32-11-A

Sacramento Valley

K16O 200,540-1356-74-23-B
KV6H 161,622-1107-73-24-B
K6SG 153,008-1048-73-22-B
KF6A 112,332- 759-74-20-B
N6GJC 79,140- 501-70-22-A
N6WR 33,098- 247-67-21-A
WB6KOE 9996- 119-42-11-A
WA6BRV 3596- 58-31- 4-A
N6JM 2392- 46-26- 3-A
AA6DX 2350- 47-25- 2-A
WB6UHQ (+ WA6ZGK)
23,370- 205-57-10-A

San Diego

N6NU 202,316-1367-74-20-B
W6IXA 24,662- 209-59-11-A
AA6EE 24,278- 199-61- 9-A
N6JMV 9996- 98-51-11-A

San Francisco

K6ANP 189,884-1283-74-24-B
W6KMW (KE6LV , opr.)
62,100- 450-69-20-B
WA8LLY 34,816- 272-64-15-A
K6LRN 33,654- 237-71- 9-A
WB6SRM 25,664- 212-61-12-A
W6BIP (+ WA6DJI)
153,624-1038-74-23-B
WA6DHM (+ AC6P, KB6AVU, KE6WLI) 48,300- 345-70-23-A

San Joaquin Valley

KD6WW 176,564-1193-74-23-A
W6SX 13,344- 139-48- 2-B
W6LXA 12,936- 132-49-24-B
WA6SLF 1102- 29-19- 4-A

Santa Barbara

K6VMN 93,744- 651-72-23-B
W6TKF 82,502- 581-71-12-A
N6MB 81,176- 556-73-16-B
WA6FGV 80,064- 556-72-21-A
NV6L 55,334- 379-73-15-B
WA6IJZ 35,624- 244-73-20-A
KD6LD 24,420- 185-66-21-A
KC7S 22,814- 187-61-24-A
KW6H 6840- 90-38- 6-A
N6TR 2640- 55-24- 2-A
KX6E (+ KA6VRW,KE6LO,KV6I,N6s DHU,GAU,JFD,W6ZZN,WB6HDG)
146,520- 990-74-24-B

Santa Clara Valley

N6NF 193,288-1308-74-21-B
KY6I 86,876- 587-74-22-B
K6GSS 58,460- 395-74-23-A
WB4YZC 42,180- 285-74-16-B
N6MG 38,184- 258-74-24-A
KD6PY 38,184- 258-74- 9-A
K6RTC 31,820- 215-74-10-A
W6OKK 19,152- 171-56- 7-A
WB6AMN 15,476- 146-53- 8-A
WB9AJZ/6 12,876- 87-74-24-A
AA6T (SM0DRD, opr.)
11,352- 129-44- 3-B
K6VGW 7040- 80-44- 3-A
W6YX (AP2ASM,DF2KR,GM4HAE, KA8IVA,KX6C,N1OO,N6IWN, NV6V,W3KF,WA1LTJ,WA7VXO, WB2TXI, oprs.)
84,456- 612-69-19-B

7

Alaska

AL7CQ 64,768- 506-64-24-B
NL7P 30,492- 231-66-15-B
KL7CQ (+ AL7EJ,KL7SK,NL7s BI,BS,CP,W7LD)
12,500- 125-50-18-B

Arizona

K7OX 238,280-1610-74-24-B
WB7FDQ 105,228- 711-74-12-B
W7FGT 104,720- 770-68-18-B
KC7V 85,544- 628-74-17-B
WA1UZD/7 71,632- 484-74-24-A
K7HP 45,880- 310-74-17-B
N7CIX 44,880- 440-51-12-A
W7ZMD 29,960- 214-70-10-A
WA7KLK 21,216- 221-48- 6-B
N7EDV (+ KB7XN,KD7RG,N7s CXF, FU,NF7E, W7YS)
179,524-1213-74-22-B

Idaho

K0EJ 113,174- 797-71-19-A
K7TM 111,592- 754-74-15-A
KK7A 36,010- 277-65-15-A
KD7EJ 9328- 106-44-11-A
W7KXA 1116- 31-18- 3-A

Montana

WB7CFL 109,008- 757-72-24-B
KE7X 61,124- 413-74-13-B
W7LR 1584- 45-22-11-A
KS7T (+ KA7GVI)
131,760- 915-72-24-B

Nevada

WA7NIN (W6OAT, opr.)
236,356-1597-74-24-B
KA7BRE 111,106- 761-73-23-B
WA7UEC 69,632- 512-68-11-A
WB7VVH 5928- 78-38- 7-B

Oregon

W7NI 206,904-1398-74-23-B
W7YAQ 120,960- 840-72-21-A
W7XU 110,408- 746-74-18-B
K7KJM 105,364- 742-71-22-A
AI7W 72,576- 504-72-19-A
WA7OEM 59,094- 441-67-10-A
K7GDN 43,884- 318-69-10-A
KB7WY 43,878- 309-71-21-A
K7EW 34,790- 245-71-13-A
KA7PGW 31,200- 260-60-19-A
W7GUR 28,644- 231-62-11-B
K7GWK 13,312- 208-64-16-A
KA7AGH 12,250- 125-49-14-A
WB7UFJ 306- 17- 9- 1-A
KA7MDM (+ WB7RPJ)
93,456- 649-72-24-A
WB7TXM (KA7s FTS,PGB,N7s ENZ EUF, WB7NML, oprs.)
50,508- 366-69-22-B
KF7D (+ WA7s WEP,WNQ)
33,960- 283-60-24-B

Utah

W7GXC 50,320- 370-68-12-A

Washington

K7RI (K7SS opr)
194,620-1315-74-24-A
N7TT 176,368-1208-73-24-B

KC7KU 166,736-1127-74-24-B
AJ7Y 163,096-1102-74-23-B
W7BUN 152,292-1029-74-17-B
WA7RWK 99,120- 708-70-16-B
K7GEX (WB7BNP, opr.)
77,996- 527-74-23-A
WA7PVE 74,480- 532-70-24-A
W7NG 68,302- 481-71-17-B
WB7AGZ 34,840- 260-67-19-B
K7IND 25,838- 213-63-13-B
W7DWJ 23,010- 195-59-15-A
N7RXS 18,768- 184-51-16-A
KB0CY 15,494- 227-61-18-A
W7DWW 14,628- 138-53-16-A
K7UU 13,272- 158-42- 2-A
W7WA 10,952- 74-74-12-B
KI7H 8282- 101-41- 4-A
K7WA 6068- 74-41- 2-A
KR7G 5616- 72-39- 2-A
W7WG 3536- 52-29- 4-A
KA7CXU 2916- 54-27- 6-A
WB7SOU 442- 17-13- 4-A
KA7GEK 384- 16-12- 4-A
K7GYP 80- 8- 5- 1-A
WB7QCW 6- 3- 1- 1-A
K7LXC (+K7HBN,KB7G,KC7RN)
158,360-1070-74-24-B
W7DK (K1PDO,K7s ETU,GYP,QLC, KA7CXU, KD7s LJ, OY, KG7V, KL7UR, N7DRT,WA7OII, WB7s QCW,SQU, oprs.)
66,660- 505-66-22-B
KC7FJ (+KA7s BCT,KFP,MWF,PJU, PJV,RCS,RDB,RDX,RDY,RGL,N7s AWJ,DAP,ELC,ELI,ESS,FPT)
22,620- 195-58-24-A

Wyoming

W7NE (WB3DNL,opr.)
250,128-1737-72-24-B
N7CG 125,356- 847-74-24-B
WA8MAM 99,900- 675-74-24-A
KC7QY 44,208- 307-72-14-A
NA7R 24,600- 205-60-20-A
NC7O 2052- 38-27- 4-A
KB7M (+KB7WN)
73,414- 517-71-22-B

8

Michigan

K8CC 167,184-1161-72-24-B
AI8S 160,892-1102-73-24-B
KO8T 160,162-1097-73-23-B
WD8MGQ 154,364-1043-74-24-A
K8DD 152,208-1057-72-24-B
KN8R 142,228- 961-74-24-B
AC8Y 89,836- 607-74-14-B
W8UA 89,244- 603-74-11-B
K8ICE 82,512- 573-72-15-B
N8BTU 81,480- 582-70-21-B
N8CXX 79,800- 570-70-17-B
AC8W 76,212- 522-73-18-B
WD9INF 75,180- 537-70-16-A
KU8V 71,142- 501-71-17-A
N8DET 63,758- 449-71-22-A
KS8Q 56,658- 399-71-24-B
KB8CU 53,992- 397-68-22-A
N8DEQ 45,990- 630-73-24-A
WD8RBW 45,780- 327-70-13-B
K8SIA 44,100- 350-63-10-B
KU8E 41,808- 312-67- 6-B
WA8MJY 41,208- 303-68-17-A
K8SAK 40,260- 305-66-13-A
N8BRQ 38,940- 295-66-16-A
KW8G 32,708- 221-74-13-B
WA8ZTQ 32,294- 241-67-14-B
KB8HO 32,160- 480-67- 7-B
KX8N 32,116- 259-62-15-A
WA8QAF 31,374- 249-63- 8-A
N8CEO 30,492- 242-63-12-A
KO8M 30,016- 268-56- 6-A
W8JKU 29,256- 212-69-21-B
KA8IIN 26,712- 212-63-17-B
W8CNL 26,344- 178-74-11-B
W8MOF 23,058- 189-61-14-B
K8KUH 22,320- 180-62-14-B
W8EGI 18,000- 150-60- 8-A
N8CQA 16,188- 142-57-11-A
WA8RRR 15,222- 177-43- 3-B
KA8PQH 15,000- 150-50-17-A
K8DJR 14,000- 140-50- 7-A
KA8BCL 10,300- 103-50- 6-B
KB8RT 10,080- 80-63-15-A
N8AOE 8000- 100-40- 4-A
KA8RZL 7400- 100-37- 7-A
N8BRG 5180- 74-35-10-A
AF8D 3080- 77-40- 4-B
N8ESK 3000- 50-30- 8-A
WD8LBJ 2912- 52-28- 5-A
N8EA 784- 28-14- 1-A
WD8CRY (+KBAQ,KA8s ALN,EEA, POW,QMI,KC8s A,KQ,W5ONL)
192,992-1304-74-24-B
NA8V (+WA8YVR)
109,008- 757-72-12-B
WA8YVR (+W8LVN, W8UA)
95,910- 695-69-14-B
KI8V (+WB8JYX)
64,380- 435-74-23-B
W8UM (N8s CBA,DKJ,WD8DPA, oprs) 64,184 452-71-22-B
W8VPC (+W8TJQ)
63,504- 441-72-19-B
N8ALL (+KC8LD,KT8Q)
57,744- 401-72-24-B
W8UE (+KA8NCR)
52,704- 366-72-19-A
KO8ID (+KC8TB)
51,584- 403-64-24-B
WB8GUS (+WB8WIM)
50,694- 357-71-24-A
WB8JZN (+WB8FBJ)
11,070- 246-45-11-A

Ohio

K8AZ 189,362-1297-73-24-B
K8ND 158,212-1069-74-18-B
KB8IZ 156,732-1059-74-24-B
K8MR 146,668- 991-74-17-B
KB8LH 124,764- 843-74-24-B
N8RA 114,902 787-73-24-B
W8FN 111,456- 774-72-17-B
W8LNO 105,120- 730-72-15-B
KC8JH 100,010- 685-73-18-A
N8LL 97,500- 695-70-19-B
W8UPH 86,286- 591-73-24-B
N8BJQ 78,548- 538-73-24-A
KB8HV (N8FJP, opr.)
76,358- 573-73-19-B
KB8OW 74,752- 512-73-21-A
K8MNG 71,040- 480-74-22-B
N8ATR 61,776- 429-72-24-B
N8CSL (WD8IVL, opr.)
58,788- 426-69-12-B
W8ICL 56,536- 382-74-14-A
WA8ADA 47,704- 356-67-13-B
K8JLB 45,792- 318-72-13-B
KA8CGF 45,252 418-54-19-B
AA8S 42,704- 314-68-10-B
KD8GC 39,192- 284-69-10-A
WD8RKT 38,340- 270-71-17-B
W8ANM 34,776- 252-69-16-B
KA8ESO 33,232- 268-62- 9-A
W8DXT 31,152- 236-66-23-B
KC8SO 31,104- 243-64-16-A
N8FKS 30,940- 221-70-17-A
NA8L 30,504- 246-62-13-B
KA8ETK 30,366- 241-63- 9-A
KC8YR 28,098- 227-63-21-A
NE8V 26,208- 208-63-11-A
AD8I 25,370- 215-59-24-B
NB8K 25,252- 214-59-12-A
KC8PQ 23,168- 181-64-10-A
K8BL 23,028- 202-57- 6-A
AF8C 20,160- 168-60-12-A
N8DPD 18,172- 154-59-10-A
W8OJW 17,936- 152-59-16-A
K8OOC 16,940- 154-55- 6-B
AD8C 16,800- 150-56-17-A
KA8ILT 15,840- 176-45-14-A
W8VPV (KA8NRC, opr.)
13,750- 125-55- 9-A
W8DWP 13,400- 100-67-10-A
KI8O 12,204- 113-54-12-A
W8IMF 12,006- 87-69-11-B
N8FAN 11,160- 124-45- 9-A
AI8S 10,434- 111-47- 7-A
KD8MX 9600- 100-48- 6-A
WD8KTM 7420- 106-35- 6-A
N8EGU 6720- 80-42- 7-A
N8CXQ 3456- 64-27- 4-A
KX8H 1380- 30-23- 2-A
K8HF 1260- 30-21- 2-B
W8IUM 270- 15- 9- 1-A
WB8JBM (KC8s MK,XR,KV8M KW8N N8s ATR,DCJ,DMM,FDE, W8CAR,WD8IJP, oprs.)
229,252-1549-74-24-B
W8LT (AD8I,K3JT,K8EM,KA8s MUF,TIH,N9s CJD,CYZ,WB8PHI WD8s IXE,LXX, oprs.)
151,108-1021-74-24-B
WB8JKR (+WB8CCL)
112,566- 771-73-24-B
WA8FZV (+N8CBY,WD8s JAV NMT,NMV,NNB)
75,774- 519-73-22-B
KV8A (+WA8OSK, WB8s FBD,SGL WD8BHA)
67,456- 544-62-19-B
W8FT (AC8J,AK8X,KA8s LON,PMK, N8s ADZ,AEH,CVK,DOD,EYQ NA8W,W8s AFR,KUZ, W8s EYT, YEW,WD8ODY, oprs.)
50,662- 347-73-21-B
KA8MRL (+WB8JHT)
33,600- 240-70-18-A
W8FW (AA8R,KA8s CBE,RHK, N8CLA,WB8PMG, oprs.)
32,982- 239-69-13-A
K8DHK (+N8FU)
31,392- 218-72-13-A
KD8KU (+KA8MHG)
21,204- 171-62-21-A

West Virginia

N8RR 169,460-1160-73-24-B
N8II 79,094- 557-71- 6-B
W8TN 63,344- 428-74-10-B
K8BS 36,400- 260-70-15-A
W8VEN 27,690- 213-65-19-B
W3IJT 22,156- 191-58-17-A
N8WV 3888- 54-36- 3-B
WB8BMX 600- 20-15- 1-A
KQ3S (+KA8HRD, K3LDE,W3s OQI, PYZ)
33,264- 231-72-24-A

9

Illinois

K9RS 215,340-1455-74-24-B
WB9HAD 160,580-1085-74-20-B
K9ZO 119,880- 810-74-24-A
K2PLF 104,044- 703-74-20-A
N9AEJ 75,888- 553-72-15-B
AG9E 67,488- 456-74-16-A
K9BG 63,802- 437-73-10-B
KB9AW 57,226- 403-71-20-B
WA9ZYG 55,160- 394-70-19-A
WA9DRE 47,600- 340-70-16-B
K9BQL 45,844- 314-73-15-A
WD9ALS 43,550- 335-65-16-A
KY9F 36,582- 273-67-20-A
K9GH 35,750- 275-65-18-B
K9PIG 34,146- 271-63-12-A
K9IKP 32,696- 268-61-24-A
KC9AT 31,416- 231-68-17-A
KS9B 31,390- 215-73-12-B
KG9N 31,376- 212-74-12-A
KB9E 30,954- 231-67- 9-A
AD0H 30,798- 261-59-18-A
WD9IRV 30,104- 212-71-15-B
W9QWM 30,080- 235-64- 8-A
K9JU 27,652- 223-62- 8-A
W9IL 26,908- 217-62- 8-B
KC9JT 25,704- 204-63-10-B
WD9DGE 23,780- 205-58-15-A
K9KM 22,400- 200-56- 3-B
WA9MRU 21,472- 176-61- 9-A
WD9IFS 21,248- 166-64-20-A
W9REC 16,244- 131-62- 6-A
N9ANK 13,250- 125-53- 9-A
WB9EEE 10,658- 73-73-20-A
W9RW 10,580- 115-46- 1-B
W9CA 8576- 67-64- 6-B
N9BPD 5916- 87-34- 6-A
N9DPP 4480- 64-35- 4-A
KC9DL 552- 23-12- 2-A
WA0AVL (+N9CXQ)
135,272- 914-74-24-B
KB9J (+KA9s, FTN,VI)
135,196- 926-73-21-B
KS9O (+KA9s DVY,HHC,N9BZR)
103,660- 710-73-24-B
K9LUW (+N9AG)
83,512- 572-73-22-A
N9DBB (+KA9EWX,N9DMK, WB9UQG)
49,536- 344-72-24-A

Indiana

K9JID (KK9V, opr.)
161,912-1094-74-24-A
WB9IWN 150,072-1014-74-21-B
W9OBF 118,252- 799-74-24-A
W9TG 106,412- 719-74-16-B
KR9U 103,600- 700-74-20-B
N9GX 103,156- 697-74-21-B
KR9V 88,800- 600-74-17-B
K9KB 58,328- 466-74-11-B
KC9FC 55,232- 453-72-20-B
W9JOO 52,622 441-71-20-A
W9NZW 47,596 326-73-20-B
WD9EWT 30,380- 217-70-14-A
N9DYE 29,040- 264-55-21-A
N9DHX 27,468- 218-63-18-A
KU9C 26,220- 190-69-14-A
KA9DIR 16,320- 120-68-18-A
W9QLW 576- 18-16- 2-A
W9YB (KA9s CVW,MHO,NOF,NOH KC9RG,KK9W,KS9J,KX9G,N9s,DKI NB,WB9GEJ,WD9GET oprs.)
95,338- 653-73-22-B
N4FKF (+KA9ORN, KC9UT)
52,796- 394-67-18-B

Wisconsin

W0UC/9 103,896- 702-74-20-B
W9XT 97,828- 661-74-24-A
WA9RZW 91,250- 625-73-23-B
WA1UJU 85,768- 604-71-23-A
WB9EGZ 77,700- 525-74-23-A
W9NA 73,982- 521-71-14-A
W9GXR 62,160- 420-74-19-B
K9KR 53,448- 393-68-16-B
WB9VOZ 48,620- 374-65-23-A
WB9YXY 45,584- 308-74-12-B
KB9S 41,400- 300-69-10-B
K9UJN 41,272- 308-67-10-A
AJ9U 36,270- 279-65-13-A
KB9DZ 32,890- 253-65-14-A
N9BOM 27,600- 200-69-12-B
W9GMV 25,668- 207-62- 9-A
WB9HRO 22,320- 180-62- 8-A
K1TMM 14,740- 134-55- 7-A
WB9IXS 13,630- 145-47- 9-A
K9GDF 9200- 100-46- 2-A
W9VTL 5544- 77-36-10-A
AE9K 5040- 70-36- 4-A
WB9JPJ 4200- 70-30- 9-A
N9DIJ 32 4- 4- 1-A
W9YT (AC9C,K9EC,KA0BZK,N2NU, W9s TR,WI,WB9YSE, oprs.)
178,996-1226-73-24-B
K0FVF/9 (+K0TG,KM0O, WA0RBW)
166,276-1137-74-24-B
K9FYZ (+N9BLR,N0AKC, N0BSH)
117,238- 803-73-24-B

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Colorado

KØRF (WØUA, opr.)
251,156-1697-74-24-B
KØGU 249,084-1683-74-24-B
WØYK 215,784-1458-74-24-B
KØUK 194,176-1312-74-22-B
N2IC 164,872-1114-74-24-A
WØIJR (KØEU, opr.)
147,556- 997-74-24-A
KCØFW 136,012- 919-74-18-B
KB3EI 134,208- 932-72-23-B
WØPSY 133,644- 903-74-24-B
KSØE 123,876- 837-74-24-A
KKØL 119,280- 840-71-24-B
WØOSK 118,252- 799-74-21-B
ACØS 103,222- 707-73-15-B
KG7Z 90,280- 610-74-20-A
WØGOR 83,176- 562-74-20-B
WAØJUX 70,656- 512-69-18-B
KCØWP 58,608- 407-72-23-B
WØUR 56,240- 380-74-14-B
NØEKK 54,908- 371-74-13-B
WBØNOH 49,536- 387-64-15-A
WAØBBI 43,818- 327-67-19-A
K9MWM 41,600- 320-65-18-A
KØTIV 33,264- 252-66-13-A
KDØOI 32,500- 250-65-20-A
KJØG 31,284- 237-66-14-B
KD7EY 29,250- 225-65-13-A
WØDK (KRØU, opr.)
20,886- 177-59- 8-A
KØGAS 13,608- 126-54- 9-B
WØBWJ 2178- 33-33- 4-B
NDØE (+KAØBAD,WØKEA)
169,164-1143-74-24-B

Iowa

WØEJ 170,200-1150-74-24-B
KØJGH 95,312- 644-74-24-A
KCØXK 91,440- 635-72-23-B
KBØV 66,430- 455-73-22-A
AKØM 62,752- 424-74-14-A
KØPCG 45,140- 305-74-13-B
K9AYK 42,600- 300-71-11-B
NØGA 41,860- 322-65- 5-B
WB9IOG 36,448- 276-57-13-A
WØPPF 34,272- 252-68-19-B
KMØO 31,220- 223-70-14-A
KAØD 30,104- 214-68-18-A
WBØRMT 25,620- 210-61- 7-B
KØEVC 17,760- 148-60-17-A
WØYBV 14,388- 109-66-10-A
WØANZ 12,540- 114-55- 6-B
WBØBHF 9494- 101-47-10-A
KØGT 8704- 68-64- 7-A
WBØFBP 8256- 86-48- 8-A
NØEJI 6318- 81-39- 3-A
KWØG 128 8- 8- 1-A
NØEEN 60- 6- 5- 1-B
WØIO (KAØPFC,NØEBA, oprs.)
81,468- 558-73-22-A
KØLUZ (+KØINR, KBØFP)
48,100- 325-74-12-B
KØINR (+KØLUZ,KBØFP)
32,708- 221-74-19-A

Kansas

KBØG 126,688- 856-74-24-B
WAØTKJ 55,944- 378-74-18-B
WBØYJT 39,476- 278-71-21-A
KDØFH 39,304- 289-68-11-A
NØCLV 38,352- 282-68-14-A
WAØHWH 38,340- 270-71-18-A
KØVBU 30,784- 208-74- 8-B
WØCY 17,168- 116-74-12-B
WØCM 14,060- 95-74-16-B
KVØD 12,876- 87-74-15-B
KAØLJK 10,710- 105-51-11-A
WØSOE (KFØM,WAØVJF WD5AGO, oprs.)
179,524-1213-74-24-B
KØWA (+ABØS,KBØEC)
175,972-1189-74-24-B
WBØTOC (+WØCEM,WAØGFZ, WBØWHB)
56,496- 428-66-16-B

Minnesota

KØIJL 157,968-1097-72-22-B
KØFZG 92,880- 645-72-24-A
WAØVQX 79,328- 536-74-24-A
WAØWWW 76,504- 524-73-24-B
ACØW 71,832- 492-73-24-A
WA2HFI/Ø 63,504- 441-72-19-A
KØMPH 27,528- 222-62- 6-A
NØBG 22,200- 150-74- 9-A
KJØK 21,904- 148-74-15-A
KSØT 4554- 69-33- 4-A
WAØQIT (+NØEOB)
75,372- 571-66-24-A
WBØYUC (+WDØFOF)
73,000- 500-73-21-B
WØUBT (+ADØT,NØCCI, WBØSCO,WDØHBW)
50,920- 380-67-20-B

Missouri

KØYX (KRØY, opr.)
243,608-1646-74-24-B
KMØL 136,456- 922-74-24-B
KØRWL 110,260- 745-74-23-A
WØHBH 100,492- 679-74-20-B
WBØBBN (WBØCDY, opr.)
94,462- 647-73-17-B
KUØG 68,820- 465-74-24-A
KMØA 53,340- 381-70-18-A
KØIFL 35,712- 279-64-13-B
WDØBBN 25,856- 202-64-10-B
NØBGL 18,008- 138-58-13-A
WØEEE (KAØs GCR,GPZ,JJX,ROJ WBØs YKG,ZGD,WDØELL, oprs)
83,620- 565-74-24-A

Nebraska

KØSCM 150,672-1032-73-20-B
KVØI 89,856- 624-72-13-A
KØHA 82,680- 636-65-19-B
KCØSV 34,560- 240-72-17-A
WØKK 24,660- 205-60- 9-B
WBØWNH 20,580- 210-49-11-A
KAØGON 13,158- 129-51- 5-B
KØDI 12,838- 131-49- 3-B
KØCQB 12,688- 122-52- 6-A
WBØWWA 12,240- 128-48- 8-B
KBØZU 9200- 100-46- 4-A
KDØEV 6020- 86-35- 5-A
WAØYPY (+KAØJOF,WAØASM WBØOYD)
126,000- 875-72-24-B
KØGND (+KBØQH,WØMCP, WAØWRI,WDØs DMS,EGK,EJJ)
103,222- 707-73-23-B

North Dakota

WAØQVC 29,256- 212-69-16-A
KFØA 17,680- 136-65- 7-B
KCØUM 1000- 25-20- 2-A
KCØW 928- 29-16- 2-A
WB3KMF/Ø (+KI3V)
166,420-1155-72-24-B

South Dakota

WBØMWJ 130,388- 881-74-19-B
WAØARZ 42,504- 322-66-12-A

VE

Maritime - Newfoundland

VE1BFI 9592- 109-44-15-A
VO1AW 1026- 27-19- 1-B

Quebec

VE2JQ 71,284- 502-71-14-B
VE2PI 24,400- 200-61-16-B
VE2DRN 11,984- 107-56-11-A

Ontario

VE3CDS 35,088- 258-68-21-A
VE3FFA 6786- 87-39- 3-A
VE3GAS (+VE3s QB,LNS)
180,288-1252-72-21-B

Manitoba

VE4GN 31,024- 277-56-17-A
VE4AHT 25,296- 204-62-11-A
VE4AH 11,130- 105-53- 6-A
VE4ALO 6536- 76-43- 3-A

Saskatchewan

VE5IO 17,568- 144-61-13-A
VE5QM (+VE5ABV)
36,940- 655-74-23-B

ALBERTA

VE6WQ 99,456- 672-74-13-B
VE6CHW 72,846- 513-71-21-A
VE6ATT 46,970- 385-61-10-A
VE6XS 43,680- 312-70-15-A
VE6CHS 480- 20-12- 3-B
VE6AO (VE6s AI,AP,CCB,CCL,CCM, CCO,CCX,CCY,CNW,COD,CPO, CQA,CQB,CQG,GQ, oprs.)
57,552- 436-66-22-A

British Columbia

VE7IN 165,020-1115-74-21-B
VE7FCK 26,136- 198-66-15-A

N.W.T. - Yukon

VY1AU 13,552- 121-56-12-A
VY1CW 10,452- 134-39-12-A
VE8XO 972- 27-18- 3-A

Checklogs

W2LPV,W2ZQ,WA2BYX,KA4ZZC/N, WA4YNP,NM5M,W6OSP,KB7P, KE7W,KB8FJ,KV8A,N8DUH, W8VUV,W9MSL,W9PNE,AG0M, KT0D,W0ZVW0WUU,VE3BAJ, VE4IN,VE8JG,VY1AB

Field Day Rules

Please note a change in this year's rules: The power multiplier is now based on output power (see Rule 8). This is a change in designation only, not in the allowed power limit.

1) **Eligibility:** Field Day is open competitively to all amateurs in the ARRL Field Organization (plus Yukon and NWT). Foreign stations may be contacted for credit, but are not eligible to compete.

2) **Object:** To work as many stations as possible and, in so doing, to learn to operate in abnormal situations under less-than-optimum conditions. A premium is placed on skills and equipment developed to meet the challenge of emergency preparedness and to acquaint the public with the capabilities of Amateur Radio.

3) **Dates:** June 23-24, 1984.

4) **Field Day Period:** From 1800 UTC Saturday until 2100 UTC Sunday. Class A and Class B (see below) stations who do not begin setting up until 1800 UTC Saturday may operate the entire FD period of 27 hours. Others must begin their setup no earlier than 1800 UTC Friday, and may operate no more than 24 consecutive hours; i.e., once on-the-air FD operation has started, it must end 24 hours from that point.

5) **Entry Categories:** Field Day entries are classified according to the maximum number of simultaneous transmitted signals, followed by the designation of the nature of the individual or group participation. Below 30 MHz, once a transmitter is used for a contact on a band, it must remain on that band for at least 15 minutes. During this 15-minute period, the transmitter is considered to be transmitting a signal, whether it is or not, for purposes of determining transmitter class. Switching devices prohibited.

(Class A) Club/nonclub portable: Club groups (or nonclub groups with three or more licensed amateurs) set up specifically for Field Day. Such stations must be located in places that are not regular station locations, and must use no facilities installed for permanent station use, nor any structures installed permanently for FD use. Stations must be operated under one call sign (except when the Novice/Technician position is used) and under the control of a single licensee or trustee for each entry. All equipment (including antennas) must lie within a circle whose diameter does not exceed 300 meters (1000 feet). All contacts must be made with transmitter(s) and receiver(s) operating independent of commercial mains. Entrants who, for one reason or another, operate a transmitter or receiver from commercial mains for one or more contacts will be listed separately at the end of their class.

Any Class A group whose entry classification is two or more transmitters (non-Novice) may also use one Novice/Technician operating position (Novice bands only) without changing its basic entry classification. This station (including antennas) should be set up and operated by Novice and Technician licensees and should use the call sign of *one* of the Novice/Technician operators.

(Class B) One- or two-person portable: Nonclub stations set up and operated by not more than two licensed amateurs will be placed in Class B. Other provisions are the same as for Class A. One- and two-person Class B entries will be listed separately in the results.

(Class C) Mobile: Stations in vehicles capable of operation while in motion and normally operated in this manner, including antenna. This includes maritime and aeronautical mobiles.

(Class D) Home station: Stations operating from permanent or licensed station locations using commercial power. Class D stations may count contacts only with Class A, B, C and E Field Day groups for points.

(Class E) Home stations — emergency power: Same as Class D, but using emergency power for transmitters and receivers. Work stations in Class A, B, C, D and E.

6) **Exchange:** Stations in any ARRL Section will exchange their Field Day operating class and ARRL Section (see page 8 in any *QST*). For example, if your club group was planning to operate in the three-transmitter, Class A category from Missouri, you would send "3 A Missouri." Foreign stations send RS(T) and QTH.

7) **Miscellaneous Rules:**

A) Operators participating in FD may not, from any other station, contact for point credit the FD portable station of a group with which they participated.

B) A station used to contact one or more FD stations may not subsequently be used under any other call during the FD period. Family stations are exempted.

C) Each phone and each CW segment is considered as a separate band. All voice contacts are equivalent, and RTTY/ASCII is counted as CW. A station may be worked once on each band. Crossband contacts are not allowed. The use of more than one transmitter at the same time in a single band is prohibited, except that a Novice/Technician position may operate on any Novice band segment at any time. No repeater contacts.

8) **Scoring:** Scores are based on the number of valid contact points times the multiplier corresponding to the highest power used at any time during the FD period, plus bonus points. Phone contacts count one point each, and CW contacts count two points each. Power multipliers: If *all* contacts are made using an output power of 5 watts or less *and* if a power source other than commercial mains or motor-driven generator is used (e.g., batteries, solar cells, water-driven generators), multiply by 5. If any or all contacts are made using an output power of 150 watts or less, multiply by 2. Multiply by 1 if any or all contacts are made using an output power over 150 watts. Batteries may be charged while in use for Class C entries only. For other classes, batteries charged during the FD period must be charged from a power source independent of the commercial mains.

A) **Bonus Points:** The following bonus points will be added to the score (after the multiplier is applied) to determine the final score. Only Class A and B stations are eligible for bonuses. Just check the box on the Field Day summary sheet to indicate that you qualify for the bonus, and attach the necessary proof.

1) 100% emergency power: 100 points per transmitter for 100% emergency power. *All* equipment and facilities at the FD site must be operated from a source independent of the commercial mains. Example: A club operating in Class 3A, using 100% emergency power may claim 300 bonus points.

2) Public relations: 100 points for public relations. Publicity must be obtained or a bona fide attempt to obtain publicity must be made, or operation conducted from a public place (example: a shopping center). Evidence must be submitted in the form of a clipping, a memo from a BC/TV station stating that publicity was given or a copy of material that was sent to news media for publicity purposes.

3) Message origination: 100 points for origination of a message by the club president or other FD leader, addressed to the SM or SEC, stating the club name (or nonclub group), number of operators, field location and number of ARES members participating. The message must be transmitted during the FD period, and a fully serviced copy of it must be included with the FD report. The message must be in standard ARRL message form or no credit will be given.

4) Message relay: 10 points for each message received and relayed during the FD period, up to a maximum of 100 points. Copies of each message, properly serviced, must be included with the FD report.

5) Satellite QSO: 100 points can be earned by completing at least one QSO via satellite during the FD period. The repeater provision of Rule 7C is waived for satellite QSOs. A satellite station does not count as an additional transmitter. On the summary sheet, show satellite QSOs as a separate "band."

6) Natural power: FD groups making a minimum of five QSOs without using power from commercial mains or petroleum derivitives can earn 100 points. Intuitively, this means an "alternate" energy source of power such as solar, wind, methane or grain alcohol. This includes batteries charged by natural means (not dry cells). The natural-power station counts as an ad-

Send For Your FD Package

Send Hq. a 9- × 12-in self-addressed envelope with 3 units of First Class postage for the official Field Day Entry Package. This package includes 1 Publicity Kit, 1 Field Day Summary Sheet, 1 large dupe sheet with instructions and a check list to ensure that your entry is complete. If you require more dupe sheets, indicate so in your request and affix 1 unit of additional First Class postage to your s.a.s.e. for each two additional dupe sheets requested.

W1AW Field Day Bulletin Schedule

In addition to the regular bulletin schedule detailed on page 78 of April *QST*, extra CW bulletins will be run at 1400 UTC (10 A.M. EDT), and extra phone bulletins at 1500 UTC (11 A.M. EDT) both Saturday and Sunday mornings.

ditional transmitter. If you do not wish to change your entry class, take one of your other transmitters off the air while making the natural-power QSOs. A separate list of natural-power QSOs should be enclosed with your entry.

7) W1AW message: A bonus of 100 points will be earned by copying a special ARRL FD bulletin sent over W1AW on its regularly announced frequencies just before and during FD (see chart). This message can be received directly from W1AW or by any relay method. An accurate copy of the received message should be included in your FD report.

9) **Reporting:** Entries must be postmarked by July 24, 1984. No late entries can be accepted. A complete entry consists of a summary sheet and a list of stations worked on each band/mode during FD, plus bonus proof. The list of stations worked on each band or mode may take the form of official ARRL dupe sheets *or* an alphanumeric listing of call signs worked per band and mode. This list may be computer-generated. Incomplete or illegible entries will be classified as checklogs. A copy of FD logs should be kept by your FD group, but should not be sent in unless specifically requested later by ARRL.

10) **Disqualifications:** See January 1984 *QST*, page 80.

Rules, June VHF QSO Party

Despite rumors to the contrary, multipliers in the 1984 ARRL June VHF QSO Party will be based on ARRL Sections (as well as Canadian Provinces and DXCC Countries — see rule 5B below), as has been the case in past years. However, entrants are asked to indicate their preference for 1985 — Sections or grid squares. In addition, all those nifty enhancements made to the June contest last year by the ARRL Ad Hoc Committee for VHF/UHF Contesting are still in effect. Keep reading, and enjoy the contest.

Official entry forms are available from ARRL Hq. for an s.a.s.e. It's to your advantage to get the correct forms so that we may list you properly in the results. The correct summary sheet for this year is form CD-68 (383). Please specify the contest *by name* when you request forms. Incomplete entries are classified as checklogs and are ineligible for awards.

Rules

1) **Object:** To work as many amateur stations in as many different ARRL Sections and countries as possible using authorized amateur frequencies above 50 MHz.

2) **Contest Period:** Begins 1800 UTC Saturday, June 9 and ends at 0300 UTC Monday, June 11.

3) **Categories:**

(A) Single operator: One person performs all operating and logging functions.

(1) *Multiband.*

(2) *Singleband:* Single-band entries on 50, 144, 220, 432, and 1296-and-up categories will be recognized both in *QST* score listings and in awards offered. Contacts may be made on any and all bands without jeopardizing single-band entry status. Such additional contacts are encouraged and should be reported. Also see Rule 9, Awards.

(B) Multioperator: Multioperator stations must locate all equipment (including antennas) within a circle whose diameter does not exceed 300 meters (1000 feet).

4) **Exchange:** Name of Section. VE stations send province name. DX stations send country name. Must be acknowledged by both operators for credit by either. A one-way exchange does not count. (Note: Exchange of signal reports is optional.)

5) **Scoring:**

(A) Count one point for each complete 50- or 144-MHz QSO. Count two points for each 220- or 420-MHz QSO. Count three points for each QSO on 1215 MHz and above. Crossband QSOs do not count.

(B) Multipliers count once per band. The following count as multipliers: (1) each ARRL section in the contiguous 48 states (max. 63 per band); (2) each Canadian province (Prince Edward Island, Nova Scotia, New Brunswick and Newfoundland/Labrador in the Maritimes; VE2 through VE7; Yukon — YV1; and Northwest Territories — VE8. Max. 12 per band); and (3) each DXCC country (excluding W and VE), including KL7, KH6, KP4, KP2/KV4, KG4, KH2, etc. Foreign stations may work only stations in the U.S., Canada and U.S. possessions for credit.

(C) Stations may be worked once per band, regardless of mode. Example: W6XJ (San Diego) works AI6V (San Joaquin Valley) on 50, 144 and 220 MHz. This gives W6XJ 4 points (1 + 1 + 2) and also three Section multipliers. W6XJ may contact other SJV stations on these bands for contact points, but no additional Section multipliers.

6) **Use of FM:**

(A) Retransmitting either or both stations, or use of repeater frequencies, is not permitted. This prohibits use of all repeater frequencies, including 146.76 and .94. Contest entrants may not transmit on repeaters or repeater frequencies on 2 meters for the purpose of soliciting contacts.

(B) Use of the national simplex frequency, 146.52 MHz, or immediate adjacent guard frequencies, is prohibited. Contest entrants may not transmit on 146.52 for the purpose of making or soliciting QSOs. The intent of this rule is to protect the national simplex frequency from contest monopolization. There are no restrictions on the use of 223.50 MHz.

(C) Only recognized simplex frequencies may be used, such as 144.90 to 145.10; 146.49, .55 and .58; and 147.42, .45, .48, .51, .54 and .57 MHz on the 2-meter band. Local-option simplex channels and frequencies adjacent to the above that do not violate the intent of (A) or (B) above or the spirit and intent of the band plans as recommended in the *ARRL Repeater Directory*, *may* be used for contest purposes.

7) **Miscellaneous:**

(A) Fixed, portable or mobile operation under one call from one ARRL Section only is permitted. A transmitter used to contact one or more stations may not be used subsequently under any other call during the contest period (with the exception of family stations where more than one call is assigned to one location by FCC/DOC); one operator may not give out contest QSOs using more than one call sign from any one location. The intent of this rule is to accommodate family members who must share a rig, not to manufacture artificial contacts.

(B) Only one signal per band (50, 144, 220, etc.) at any given time is permitted, regardless of mode.

(C) While no minimum distance is specified for contacts, equipment should be capable of real communications (i.e., able to communicate over at least a mile).

(D) Multioperator stations may not include QSOs with their own operators except on frequencies higher than 2.3 GHz. Even then, a complete, different station must exist for each QSO made under these conditions.

(E) Above 300 GHz, contacts are permitted for contest credit only between licensed amateurs of Technician class or higher using coherent radiation on transmission (e.g., laser) and employing at least one stage of electronic detection on receive.

8) **Reporting:** Entries must be postmarked no later than July 11, 1984.

9) **Awards:**

(A) Single operator

(1) Top single-operator score in each ARRL Section.

(2) Top single operator on each band (50, 144, 220, 432 and 1296-and-up categories) in each ARRL Section where significant effort or competition is evidenced. (Note: Since the highest score per band will be the award winner for that band, an entrant may win a certificate with additional single-band achievement stickers. For example, if K1FO has the highest single-operator all-band score in the Connecticut Section and his 50- and 220-MHz scores are higher than any other CT single ops, he will earn a certificate for being the single-operator Section leader *and* endorsement stickers for 50 and 220 MHz.

(B) Top multioperator score in each ARRL Section where significant effort or competition is evidenced. Multioperator entries are *not* eligible for single-band awards.

10) **Disqualifications:** See January 1984, *QST*, page 80.

Public Service

Conducted By Robert J. Halprin,* K1XA

ARES: A Team Concept

The ARRL Amateur Radio Emergency Service (ARES) is a natural function of Amateur Radio. In fact, our very existence is based on our capabilities for emergency communications. Shouldn't emergency communications be our number one priority?

For this reason, I accepted the position of emergency coordinator (EC) for Bay County, Michigan. What I found as EC was a grand array of information intended to achieve top quality emergency communications. Also included was much information on organizing the ARES, members and meetings. Members? Meetings? Wait a minute! What about our club members and meetings? I suddenly realized that what we had here was another type of club. Surely there must be a better way than starting from scratch.

Clubs Can Live with ARES

It became apparent that a new concept had to be developed if we were to exist alongside a strong, local club. A hint of competition always seems to become evident when a new organization enters the area. For ARES to function, an accepted, respected feeling must exist.

I had been active in our club for many years and wanted this to be a part of Amateur Radio in our local area. Our club is small, and it was necessary that any emergency function should include amateurs outside of the club also. If the concept was right, we could even draw amateurs from outside our area, even from other clubs. Now the requirements were becoming clear.

The Team Concept Development

The ARES team must not be a part of the local club, but it is important that the club accept it. It has to be a respected function for nonmembers and out-of-area amateurs to respond to an emergency. The team has to be ready at all times, so a plan has to be developed that shifts leadership quickly and efficiently.

Using the criteria that were becoming apparent, I realized that a team concept is the best workable program. A team functions as an efficient organization, and when substitutions are made, the new leader directs activity following a carefully written plan. This is important unless you have the advantage of selecting a leader who is available 24 hours a day, 7 days a week. With ideas in mind and pen in hand, we began to make the team concept a reality.

The ARES Team

The plan was organized and written to conform to the team concept. The introduction explains what our ARES region is composed of and why. We are interested in regional coverage and not only a town or city; emergencies do not recognize boundary lines.

The purpose is to provide public service communications. One key statement explains that flexibility is a necessity. The complete written plan should contain the minimum information required in an emergency. Why complete a multitude of pages to cover everything and discover that you missed one? Generalize and make it easy to adjust to any emergency.

The organization is explained in one sentence: "The total organization shall consist of a few highly trained Amateur Radio operators who believe the first priority of Amateur Radio is public service." That's it. There is not a page of people with flowery titles and many telephone numbers with priority call-in times.

Two people are organization leaders: The EC and the assistant EC. The rest of the organization consists of the emergency response (ER) team. The organization is open. By this I mean, there is no formal chain of command. This is the key to the flexibility. The ER team consists of Amateur Radio operators who are experienced in communication nets and message handling, and wish to provide public service communications as fast and efficiently as possible. They are appointed by the EC and are acting directors at the scene of an emergency until notified by the EC. This is the reason for flexibility. The first one on the scene is the site director. This gives the plan speed.

The first thing the site director does is to determine if Amateur Radio is needed or necessary. How many times have emergency programs been completely in place, only to find that Amateur Radio was not required?

Once it is determined that Amateur Radio can help, the site director establishes preliminary communications on a limited basis. The director then determines what equipment is needed, how many people are needed, how long the need will last and what other information will be required for people responding.

The site director then institutes a procedure to notify key people from various clubs and organizations to implement an efficient public service communications program. This is the way flexibility is built into the program. Any type of emergency can be handled, and adjustments are made as the program progresses.

Notice how key steps are done during the response. Is Amateur Radio needed? Yes. Start communications, now! Detail a plan and run it without waiting for a leader to arrive.

It Works

This concept has been in effect in the Bay City, Michigan, area for more than three years. We are here, but maintain a low profile. Area people accept ARES and are happy to help because it benefits all of Amateur Radio. The team is always ready, but quiet.

We have had three emergencies to respond to, and each time the concept adjusted to fill the need. None of these emergencies were major disasters, but they served to prove that this ARES team can work and exist with other groups. It simply allows amateurs who are interested in emergency public service communications to volunteer their time painlessly. — *Bob Cuthbert, N8BBR, Bay City, Michigan*

CAP/ARES AGREEMENT SIGNED IN CONNECTICUT

The long history of Amateur Radio's dedication to public service marked another milestone on January 31, 1984. Lt. Col. Urban Lang, representing the Connecticut Wing of the Civil Air Patrol (CAP), and Robert J. Koczur, K1WGO, ARRL Connecticut Section Emergency Coordinator, signed a cooperative operating plan that defines the guidelines, procedures and regulations under which Amateur Radio operators will supplement CAP Emergency Services communication.

CAP is chartered by Congress as an official auxiliary of the U.S. Air Force. Emergency Services, the most critical of the three CAP missions, is entirely dependent on communications for its effective operation. While CAP does have radio operators and equipment of its own to support the Emergency Services mission, radio amateurs have provided valuable assistance to CAP during numerous emergencies (several of which have been documented in this section of *QST*). Under the direction of K1WGO, the 250 dedicated and highly skilled ARES members bring to this communications team many years of experience, their own equipment, and special communications and technical skills, all of which are immensely valuable to CAP.

Now that the Connecticut ARES and Connecticut Wing of CAP have defined a mutually agreeable working relationship, both organizations will participate in training drills and exercises necessary to maintain and enhance the communications skills required to serve the public whenever the need arises. — *K1WGO*

Lt. Col. Lang (l) of the Connecticut Civil Air Patrol, and Connecticut SEC K1WGO at the signing of the cooperative operating plan. Looking on are W2FJT and Connecticut SM KA1KD.

VALENTINE'S DAY 1984 FLOODING

☐ A combination of heavy rains and warmer-than-usual temperatures created a flood emergency in Cumberland County, Pennsylvania in mid-February. Authorities requested the Cumberland County Amateur Radio Service (C/CARS) to supply a team of trained radio operators to the community of Mt. Holly

*Deputy Communications Manager, ARRL

Springs to assist with the evaluation of residents in that flooded area in the borough.

When the alert was called, N3CWD activated the C/CARS emergency response plan, which directed C/CARS members to pre-planned sites around the county. The regularly scheduled C/CARS training net on the K3WKK repeater was called at 7 P.M. EST. Local hams checked into the net while they were enroute to their assignments, as per the response plan.

At 8 P.M., county officials sounded the Mt. Holly Springs area sirens, which notified residents that an evacuation of all flood plain areas was advisable. The water level in Mt. Holly Springs continued to rise for a short time after the sirens were sounded. About 50 families were evacuated from their homes to mass care facilities outside of the flood-stricken area.

By 10:30 P.M., flood waters at the Mountain Creek Dam began to recede as quickly as they had risen; however, the problems were not yet over. Although the water level dropped at Mt. Holly Springs, it rose downstream, threatening a mobile home park outside Mechanicsburg.

N3CWD went to the mobile home park to report on flood conditions, as the water level was rising rapidly. He arrived shortly after midnight and advised the residents that an evacuation of low-lying areas was recommended.

Throughout the evening, the C/CARS team provided a continuous report of stream conditions, flood levels, numbers and locations of evacuees to the director of the Office of Emergency Preparedness (OEP), Cumberland County police and fire officials, and to representatives of the American Red Cross. At 1:48 A.M., the flood emergency abated and the C/CARS members were released. — *Donald L. Thompson, N3CWD*

☐ On February 14, at 5:15 P.M. EST, the Lycoming County Amateur Radio Emergency Service (ARES) was activated to standby status when a heavy rainfall caused small streams to flood. The Susquehanna River was rising rapidly as well. The condition was aggravated by frozen ground, which prevented rainwater from soaking into the soil. At 5:57 P.M., the Lycoming County ARES Net, with KB3OM acting as net control, was placed in emergency status at the request of the county Emergency Services director.

K3QFW went to the Red Cross office at 8:11 P.M. and requested that other ARES members be assigned to evacuation centers in the area as needed. The first center was opened at Round Hill School in Old Lycoming Township, which was hardest hit by the flooding of the Lycoming Creek. W3ILG and son KA3IDD were assigned to the Round Hill School location and were there until the next morning. Other centers were soon opened, and each was staffed with two ARES members.

The Lycoming County ARES net was in emergency session for 22 hours before area conditions were less critical. During the emergency, 50 ARES members assisted the emergency net, which was conducted on both the W3AVK and N3AFX repeaters. — *Richard C. Sheasley, K3DOA, EC Lycoming County, Pennsylvania*

COMMUNICATIONS SERVICE OF THE MONTH

For the second year in a row, the Contra Costa County Amateur Radio fraternity, under the coordination of KA6BSN, WA6AEO and WA6HAM, have teamed up with the Contra Costa Sheriff's posse on New Year's Eve to provide a free taxi service to those citizens who had imbibed too many spirits and did not wish to drive home.

The program, called "Your Place or Ours," is in its second year. It is becoming an institution in Contra Costa County as well as providing good working relationships between the sheriff's office and the ham radio community. Public service announcements are made on TV and radio describing the service and listing phone numbers, signs are donated and put up throughout the country, local automobile dealers and auto leasing dealers lend free unmarked new automobiles to be used, gasoline is donated by local service stations, food is provided by local businesses, and Amateur Radio operators furnish the communications for the New Year's Eve squad of 20 or so unmarked new cars driven by the posse volunteers.

Briefing begins about 8 P.M. December 31; within an hour, the vehicles are mobilized at strategic staging areas throughout the county. The vehicles are equipped with 2-meter "mag-mounts" and transceivers that are either battery powered or are supplied by suitable cables and adaptors from automobile 12-V dc cigarette lighter jacks.

The hams are given detailed locating maps of the county as well as passenger logbooks to be turned into the sheriff's communications center at the end of the evening's program. Each car is equipped with high-power flashlights; except for the 2-meter mag-mount antennas, the cars don't look at all unusual.

The procedure is simple. Customers call up the sheriff's dispatch center (Comm 7) and request the service. The name and address of the party to be picked up is physically handed to a sheriff posse runner, instead of transmitting the information by radio. The runner then physically hands the information to one of three Amateur Radio operators at the sheriff's communications headquarters. Of course, antennas have been installed previously and equipment has been checked out for interference and "intermod" problems.

The county is broken into four major sections: north, east, south and west. Two or more repeaters are used, depending on the location of the person needing a ride, and two or more dispatchers monitor continuously. The dispatcher receiving a call checks the origination point of the mission and locates the nearest vehicle to that point by using zone maps and magnetic flags that have on them the Amateur Radio call sign and unit number of the personnel. The appropriate unit is then dispatched and, upon successful pickup of the riders, radios into the dispatcher the time of arrival, the mileage traveled and the destination of that mission. If the unit is to cross a radio zone, instructions are then given by dispatcher for the unit to check into the appropriate frequency or repeater when the unit arrives at the destination. At that point, the unit is either immediately dispatched to another point or is assigned to a central waiting point.

It has proved helpful to mention alternate frequencies and repeaters numerically (e.g., frequency no. 2, no. 3) to discourage possible jammers. For units requiring emergency assistance, a special signal has been agreed upon in advance. Fortunately, no problems needing the use of that signal have yet arisen. All units are given forms to leave with their patrons indicating the location from which they were transported and the location of their vehicle, to facilitate the vehicle's retrieval the following day. Units are assigned to various parts of the county according to their familiarity with them. In addition, there are three or more "rover" units plus the "mobile command" unit that carries the sheriff and, of course, a ham radio operator.

This being only our second year, we have learned much that will help us to do an even better job in future years. We have found that it is best to have enough dispatchers as a backup, so that all designated frequencies are monitored continuously. We have also found that since most bars in our area close around 2 A.M., we have at that time experienced backlogs at the dispatchers because the amount of time it takes to transact the issuing and execution of missions on the few repeaters we utilize. Although before 1:30 A.M. there is not much need for extra dispatchers and repeater frequencies, it is most difficult to effectively transact 20 or 30 missions simultaneously on only one or two repeaters with only one or two dispatchers. Extra help at the dispatch center reduces delay between the initial phone call and the actual dispatch via the repeater.

During the 1982/1983 New Year's Eve program, the team of 18 local hams assisted slightly over 100 persons. This year, 24 hams helped by transporting 157 persons in more than 100 missions. Also this year, New Year's Eve was again free of any fatal traffic accidents in Contra Costa County. We hope that the joint effort of responsible neighbors and citizens such as the fine teamwork of business, sheriff's department and ham radio will be equally successful next year. This was a common effort by many citizens who all gave unselfishly of their resources and skills at no cost to the taxpayers. Operators were recruited from the Contra Costa ARES/RACES organization, the East Bay Amateur Radio Club, the Mount Diablo Amateur Radio Club and the Delta Amateur Radio Club. — *Donald Simon, NI6A, Assistant EC, Contra Costa County*

PUBLIC SERVICE DIARY

☐ Ackerman, Mississippi — March 11. While picnicking with his family on the historic Natchez Trace Parkway, N5DDV spotted a small fire that had the potential of being a forest fire. He immediately called NM5D through the WB5PCT repeater and requested that the National Park Service be notified. Within 30 minutes, a park ranger and fire-fighting equipment were on the scene to contain the fire. (N5DDV, SEC Mississippi)

AMATEUR RADIO EMERGENCY SERVICE REPORTS

☐ Whatcom County, Washington — October 3-4, 1983. Amateur Radio played a vital role in the search and rescue of an injured climber. When authorities realized that their communications systems were inadequate, they requested that an Amateur Radio link from the rescue base camp to the Whatcom County Court House be set up. Both the K7SKW and WB7OPZ repeaters were used to facilitate the increase in message traffic. Later, authorities requested ham operators to assist in the rescue efforts. Once the injured climber was located, he was transferred via helicopter and ambulance to St. Luke's Hospital for treatment. N7CUI operated a phonepatch and relayed the victim's condition information directly to the doctor on duty. (WA7RUB, Assistant EC, Whatcom County)

☐ Whatcom County, Washington — January 4-5. The Nooksack River began to flood because of a heavy snowmelt and excessive rainfall. Telephone lines were overloaded with calls, and N7PF was asked to set up communications between Whatcom County Department of Emergency Services (DES) and the Red Cross. N7CUI staffed the station in the DES, while W7SSF supplied a radio link for the evacuation shelter at Mt. Baker High School in Deming. The operation secured for the evening about seven hours later, but was resumed early the next morning to assist with monitoring and reporting of the Nooksack River depth gauging in Ferndale. Seventeen local amateurs helped with the flood watch, which was finally closed at midnight that evening when the river receded. (WA7RUB, Assistant EC, Whatcom County)

ARRL SECTION EMERGENCY COORDINATOR REPORTS

☐ For February, 42 SEC reports were received, denoting a total ARES membership of 22,428. Sections reporting were: AB, AZ, CO, CT, DE, ENY, IN, IA, KS, KY, ME, MI, MN, MS, MO, MT, NE, NH, NC, NFL, NTX, OH, OK, ON, ORG, PAC, SV, SDG, SF, SJV, SC, SD, SFL, TN, UT, VA, WV, WMA, WNY, WPA, WI and WY.

NATIONAL TRAFFIC SYSTEM

February Reports

1	2	3	4	5	6	7
Cycle Two						
Area Nets						
EAN	29	1787	61.6	1.172	98.9	
CAN	29	1166	40.2	.732	100.0	
PAN*	58	685	11.8	.499	98.9	
Region Nets						
1RN	56	746	13.3	.509	84.2	100.0
2RN	58	997	17.2	.591	80.3	100.0
3RN	29	482	16.6	.543	90.5	100.0
4RN	58	1182	20.4	.587	78.9	100.0
RN5	56	1116	19.2	.597	98.3	100.0
RN6	58	588	10.1	.405	93.1	100.0
RN7						100.0
8RN	58	738	12.7	.576	100.0	100.0
9RN						100.0
TEN	57	550	9.6	.420	85.8	100.0
ECN						93.1
TWN	57	238	4.2	.223	95.9	98.9
TCC						
TCC Eastern	83[1]	682				
TCC Central	82[1]	403				
TCC Pacific	89[1]	395				
Cycle Four						
Area Nets						
EAN	29	2117	73.0	1.635	98.3	
CAN	29	1103	38.0	1.145	100.0	
PAN	29	1225	42.2	1.208	98.3	
Region Nets						
1RN						100.0
2RN	87	1221	14.0	.889	98.7	89.7
3RN						100.0
4RN						100.0
RN5	58	639	11.0	.584	92.0	100.0
RN6	58	850	14.7	.753	94.0	100.0
RN7	58	639	11.0	.894	97.8	98.3
8RN	56	412	7.4	.486	92.0	100.0
9RN	58	610	10.5	.590	98.7	100.0
TEN	56	465	8.3	.486	82.1	100.0
ECN	58	277	4.8	.422	83.9	100.0
TWN	53	383	7.2	.402	90.0	96.6
TCC						
TCC Eastern	116[1]	770				
TCC Central	53[1]	458				
TCC Pacific	105[1]	718				
Sections[2]	7270	36,605	5.0			
Summary	8504	60,247	7.1			
Record	8724	62,816	24.3			

*PAN operates both cycles one and two.
[1]TCC functions not counted as net sessions.
[2]Section and local nets reporting (264): APSN ATN (AB), MG (AK), AENB AEND AENR AENT AENX AENY AENZ ATNM ECAEN WAEN (AL), ACN ATEN HARC

(AZ), SWN (AZ/NM), BCEN (BC), NCN SCN/1 SCN/2 SCN/V RTTY/V SVTN/1 SVTN/2 (CA), MDD (DE/MD), CFRM DEN ENMC FAST FMTN FPON FPTN GN LCEN LSTTN MFPM PBTN PEN PRVAN QFN SEFTN SPARC SVTN SWFTN TPTN (FL), CGVN GCN GSBN GSN GTFN NWGN RAEN (GA), CIARES I75MN ICN PCARES (IA), ILN ISN ITN (IL), ICN IRN ITN QIN (IN), 3ARES 5ARES 7ARES 11ARES BARES CARN KEN KNTN KRN KSN KTN KYN KYPON MKPN NKARC TSTMN WTEN (KY), CSTN KPN KMWN KSBN KWN QKS QKS-SS (KS), CITN EM2MN EMRI EMRIPN EMRISS HHTN NEEPN WMEN WMFN WMN WMTN/CW WMTN/C3 (MA/RI), MEPN WRIN MTN (MB), AEN CMEN MPSN PTN RACES SGN (ME), MACS MITN MNN QMN UPN (MI), MNAMWXNT MSN MSPN MSSN PAW (MN), APN (MR/NF), MTN (MS), BSN MTN (MT) CN (NC/SC), BRARES BVARES CCN EN2MARES MARES MNARESN NE40M NE75M NE160M NCN NCW NMPN NNN NSN PARCN PV2MN SBARESN WNN (NE), GSFM GSPN NHN (NH), HCATEN JSARS MCN NJM NJN NJPN NJSN NJVN OBTTN TCETN (NJ), NSN (NV), BAVTN CDN CNYTN EPN HVN NCVHFTN NLI NLIPN NYPON NYS NYS/1 NYS/M OCTEN SCVHFTN SDN WDN (NY), ALERT BN BNR BRTN BSSN COARES HCARES LCNWOARES LCTN NCTW NEON O6MN ONN OSN OSSN (OH), NWOSN OLZ ONON OPEN OTN OTWN STN QCWA-63 (OK), OLN OPN OSN OSN2 OSND KTN LEMO TIN (ON), BSN OHNN ORARES OSN PTTN SOFM THN WCN (OR), NWPA2MTN WPA WPA2MTN WPAPTN (PA), PTN (PAC), QSN (PQ), GPD2MN LC2MN SCNTN SCSSBN (SC), SDEEN SDTIN WCEN (SD), TNCN TNPN TNVN TSRN (TN), DFW NET TEX TSN TTN (TX), BUN DCESN UCN WXN (UT), STARES SVEN VLN VN VSBN VSN VTN (VA), VTN (VT), EWTN NTN NWSSBN PSTS WARTS WSN (WA), BEN BWN NWTN WCWTN WIN WNN WSBN WSSN (WI), WVARN WVFN WVMDN WVN WVNN (WV).

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — AVERAGE
5 — RATE
6 — % REP.
7 — % REP. TO AREA NET

Transcontinental Corps

1	2	3	4	5
Cycle Two				
TCC Eastern	116	71.6	1348	682
TCC Central	87	94.3	841	403
TCC Pacific	116	76.7	790	395
Summary	319	80.9	2979	1480
Cycle Four				
TCC Eastern	142	81.7	1530	770
TCC Central	58	91.4	931	458
TCC Pacific	116	90.5	1410	718
Summary	316	87.9	3871	1946

1 — AREA
2 — FUNCTIONS
3 — % SUCCESSFUL
4 — TRAFFIC
5 — OUT-OF-NET TRAFFIC

TCC Roster

The TCC Roster (February) *Cycle Two* — Eastern Area (W2CS, Acting Director) — AA4AT N1BHH WB1BYR N3COY WB2EAG K1EIC KA1GBS VE3GOL WB3GZU KO2H KB2HM VE3HTL K4JST WD8LRT W2MTA K8OZ W8PMJ W8QHB W1QYY WD8RHU K3RZR KA1T KB3UD KR4V AK1W N2XJ W1XX WB8YDZ. Central Area (N5AMK, Director) — N5AMK WA5BHF N5BT W5CTZ N5DFO W5FW KW9J W4JL WA4JTE W9JUJ K5KJN W5KLV KD5KQ WB9NVN WB5OXE KD5RC KB5UL K5UPN WF4X WB5YDD. Pacific Area (W0HXB, Director) — NI6A KT6A N7CSP N0CXI KU6D WD5ESV KB7FE W7GHT N6GIW W5JOV KR7L KB0MB K6OWA KF7R ND5T NV6T W7TGU K6UYK WB7WOW K6YBV. *Cycle Four* — Eastern Area (W2CS, Director) — AA4AT VE3AWE K1BA W3BBN KI3C WA4CCK N3COY W2CS N8CW KA3DTE WB2EAG W1EFW W2FR WD4FTK KA1GBS W2GKZ VE3GOL WB3GZU KB2HM WB9IHH W1ISO K4JST KN1K N4KB AH2M W2MTA W1NJM WB4PNY W3PQ W8QHB W1QYY W2RQ K3RZR KA1T KB3UD WB4UHC W4UQ W2VY VE1WF W2XD N2XJ W1XX N8XX WB8YDZ K4ZK W2ZOJ. Central Area (K5GM, Director) — W0AM W9CXY K0EZ W5GHP K5GM W0HI K5OAF W5RB N5TC W5TFB K5TL WB9UYU KB9X KV5X. Pacific Area (KN7B, Director) — AD0A K0BN KA7CPT KC0D W7DZX N0EBM W6EOT W7EP W7GHT K7HLR N2IC W6INH W5JOV W7LG W7LYA WB7NHR W0OGH ND5T WA7TEH W5UH W7VSE W6VZT KM7Z VE7ZK.

Public Service Honor Roll February 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 ARRL Hq.

225
K7VW

178
N2AKZ

163
N4GHI

159
KA3DLY

153
KJ3T

146
WA4QXT

144
KA8CPS

143
KA1GBS

141
WB3GZU

140
KB2HM

139
WB4RUJ

138
KC0UJ

137
KB0Z
WF4X
WB7WOW

133
WF4Y
KX7W

131
NG4J
WB2OWO

130
WA2FJJ
KA1KML

129
WB8WKQ

128
K4KDJ
KC2QQ

125
K2GXT

124
KC8CJ
WD8MIO
K4SCL
W1EOF

123
KK3F

120
K5HDT

119
WB2IDS
W9YCV
WB2EAG

118
WA4PFK
N1BGW
WD8LRT
N2XJ
W7VSE

117
WB1GXZ
W3YVQ

116
AL7W
WA4JDH

114
KC2TF

113
K7GXZ

K8ND

110
WA4EIC
KW9J
K4JST
WX4I

109
WD4ALY
N4PL
KC0AF

108
W4ANK
WB2MCO

107
W8UE
W1PUO

106
W9JUJ
W1KK

105
N8EVC
WA4CCK
WB1HIH
KA1BBU
KA4SAA

104
W2MTA
WD8RHU
VE3KK

103
WB4WYG
AA4AT
KZ8Q
WB2KLF
KA2OPG

102
KK1E
KC3LY
KB4WT
WB2OHR

101
KB4QZ
KC3Y
KS7I
N1ARI

100
K4IWW
WX4J
KB7FE

99
WA6ZUD
KR4V
WB0TED
WB2ZCM

98
K1CB
KA0EPY
KD7ME
WB2VUK

97
WB9IHH
KY4U
K4VWK
W7GHT
AK1W
KA0ARP
W2UYE

96
AF8V
KA4BCM
W6INH
WA0TFC
KT9I
WB1GLH
WB2RBA
W2GJ
KA2BHR
K2ZM

95
KA8NCR
K0SI
W1RWG

94
AG9G
K6UYK
KB0MB
VE3BDM
K1JHC
W0OYH

93
KB5UL
ND2S
WB2GHN
KT6A
KA1T
W4CKS

92
K2VX
VE3DPO
KA0BWM
W6RNL
N5BT
N5DKW

91
WB4WII
KI1M
WD8OUO
W5CTZ
KA8GJV
WB4YQP
N6AWH

90
KA4GUS
W1TN
WA3DUM
WB8SIW

N9BDL
KA9OBP
WD2AFI

89
W3VA
KA1EPO
WA4LXP

88
KA4MTX
WA4GYR
N3COY
W9DBO
VE3GOL
K0GP
KD5FR
K2ZVI

87
NW4R
VE3WM
N1BJW
WA2NKC
W2BIW

86
AG2R
WB5NCM
W2AET
W7LG

85
WB4HRR
WD5GKH

84
N5TC
WB5YDD
WB4TZR

82
KA1EXJ
W9QBH
KJ3E
KA0BCB
N0CFS
W2PKY

81
KC9NN
KA3JGN
N6GIW
KD2BE
WB8NHV

80
KA2QIK
ND0N
WD4HBP
WB5MMI
KS5V
KA4IUM
WB8MTD

79
WA2KOJ
WB2PID
N8CW
K6TP
WD4OCW

78
KC2YZ
KB4LB
W7JMH
W0IKT
W0KK
N1AJJ
KA3GJT
WD4BSC

77
KF8J
VE3GT
KA4IUM

76
KD0JM
W8QHB
N1ER
KA1GWE

75
KT5Y
W4JLS
KO7V
WB6QBZ

74
KZ9V
W9DM
W4LXB
KA5AZK
N0EEH

73
KX7T
KY2P
KL7IJG
N5DFO

AK2E

72
KA6BNW
N7BGW
KT6D
WA4EYU
WA2HEB
W6HUJ
NC0R
WB5CBR

71
WA3UNX
AI0O
KA2OIW
W2XD
WB1ABQ

70
K8KQJ
AF3S
K9BVE
K2HNW

69
W1JRA
KD9K
N9EM
N5EZM
WA8DHB
KR7F

68
K3JL
K4ZN
W5KLV
N2EOV
VE2GFH
WB0HOX
KF4U
KA9IKR

67
VE2FMQ
WB4UHC
W2ZOJ

66
KA6HJK
AF2K
W7LNE
N2BGP
WD0FWB
WD4PBF
WA4JTE
N1CPX
KC8OO
WA4RNP
AE1T
KP4DJ

65
KG9B
W4HON
KA3DTE
K4WJR
W0FRC

64
WD8PUH
WA6QCA
WD0AIT
KB3UD
KF7R

63
W2FR
KV7F
W6IPL
N6CVF
W4FMZ
KN1K

62
WB2QIX
K7OVK
KA7AID
WB4FDT
WA8GMT
WB3FKP
WA4YPQ
WB7NHR

61
AI6E
KA2DQA
K3NNI
W9IOH
WA8HGH
WD8KBW
KA4SKV

60
WA1YNZ
W2KB
K0PCK
K3CR
KB4OG
WA4LJI
K7LCA

KR7L
AJ0X

54
KA4BBA/T

48
KA4YHS/T

42
N0DGM/T

56
WB2TWQ/T

52
N2EQM/T

45
KA1HPO/T

41
N5GKF/T

Brass Pounders League February 1984

BPL Medallions (see April 1979 *QST*, page 77) have been awarded to the following amateurs since last month's listing: KR4V KC3DW N6GIW.

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 of 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	589	2872	3217	96	6779
K3NSN	849	1488	1480	8	3825
N0BQP	34	1548	117	916	2615
KA9CPA	10	1469	124	855	2458
W3VR	201	1031	1170	31	2433
W1EOF	3	889	1036	28	1956
KA1GBS	9	692	685	47	1433
WB8WKQ	0	691	674	36	1401
W9JUJ	5	624	647	13	1289
WF4X	15	621	601	41	1278
WA0HJZ	10	668	20	424	1122
WA4JDH	0	535	486	15	1036
KA1KML	4	453	536	40	1033
WB2OWO	21	497	446	35	999
WB2IDS	23	442	424	65	954
W7DZX	16	448	434	5	903
WB8MIO	101	398	332	45	876
WA9WYS	15	374	389	1	779
KA9FEZ	0	352	358	5	715
W7VSE	3	355	327	17	702
KC2QQ	18	324	296	30	668
VE3BSY	10	320	326	10	666
WA2NKC	4	311	329	3	647
N2AKZ	16	303	212	99	630
WA2FJJ	24	282	285	34	625
AA4AT	20	289	303	8	620
W3ATQ	2	310	295	12	619
K6UYK	30	288	287	10	615
W3EGK	0	292	291	5	588
KA8CPS	48	211	223	89	571
N5DFO	9	214	330	15	568
WB1GXZ	16	257	274	16	563
KC0UJ	170	110	224	56	560
W5CTZ	0	275	277	2	554
W4NFK	21	242	257	7	527
WB3GZU	13	253	220	40	526
WB7WOW	11	298	205	11	525
N1BGW	39	225	198	59	521
WB5YDD	3	262	227	25	517
N5AMK	1	287	224	4	516
K0JAN	0	294	29	179	502
K3NSN (Jan.)	1800	2941	141	93	4875
KN1K (Dec.)	2	372	390	29	793
Multioperator stations:					
W4DUG	4317	88	4337	2	8744
K2GXT	931	81	798	61	1871
K4KDJ	483	58	507	39	1087
W7SAA (Dec.)	643	0	652	0	1295
BPL for 100 or more originations plus deliveries:					
KB0MB	148				
WB2MCO	114				
WA1YZN	113				
N4GHI	110				
KH6B	106				
KA1BBU	102				
Multioperator station:					
W4LX	158				

1 — CALL
2 — ORIG.
3 — RCVD.
4 — SENT
5 — DLVD.
6 — TOTAL

Independent Nets (February 1984)

1	2	3	4
Amateur Radio Telegraph Society	29	639	365
Central Gulf Coast Hurricane	29	215	3010
Early Bird	29	1358	1413
Empire Slow Speed	29	99	411
Golden Bear	29	170	2212
Hit & Bounce Traffic	29	396	704
IMRA	25	906	1573
Mission Trail	29	128	1100
North American SSB Traffic	25	519	246
West Coast Slow Speed	30	409	83
20-Meter ISSB	27	2198	372
75-Meter ISSB	29	400	1053
7290 Traffic	22	675	3612

1 — NET NAME
2 — SESSIONS
3 — TRAFFIC
4 — CHECK-INS

Contest Corral

A Roundup of Upcoming Operating Events

Conducted By
Edith Hotsopple,* N1CZC

MAY

1

CW QRP Party, see April *QST*, page 89.

2

ARRL Spring Sprint, 432 MHz, from 7 P.M. to 11 P.M. local time. Single-operator only. Exchange and acknowledge grid-square locations (see Jan. 1983 *QST*, page 49) and call signs. Signal reports are optional. Count 1 point per valid QSO. Multiply QSO points by number of different grid squares worked for final score. Sprints are separate contests; there is no accumulation of scores. FM restrictions: Retransmitting either or both stations and using repeater frequencies are not permitted. A station may be worked for credit only once per band, regardless of mode. Crossband QSOs do not count. Stations are allowed only one transmitted signal at any given time. A transmitter used to contact one or more stations may not be used subsequently under any other call sign during the contest. Entries for each contest must be postmarked by June 20. Submit separate log and summary sheets for each Sprint entered. Logs must indicate time, call sign and complete exchange for each valid QSO. Multipliers must be clearly marked in the log. Include dupe (cross check) sheets with entries of more than 100 QSOs. Use the official entry forms, available from ARRL Hq. for an s.a.s.e. Each entrant agrees to be bound by the provisions as well as the intent of this announcement, the regulations of his or her licensing authority and the decisions of the ARRL Awards Committee. Disqualifications for excessive duplicate QSOs and/or call-sign/exchange errors.

West Coast Qualifying Run, 10-35 WPM, at 0400Z May 3 (9 P.M. PST May 2). W6OWP prime, W6ZRJ alternate. Frequencies are approximately 3590/7090 kHz. Underline 1 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/endorsement.

5-6

Late Spring QRP SSB Activity Weekend, see April *QST*, page 89.

Florida QSO Party, see April *QST*, page 89.

10

ARRL Spring Sprint, 1296 MHz. See May 2 listing for more details.

11

W1AW Qualifying Run, 10-35 WPM, at 0200Z May 12 (10 P.M. EDT May 11). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 147.555 MHz. See May 2 listing for more details.

12-13

A. Volta RTTY DX Contest, see April *QST*, Page 90.

CQ-M Contest, see April *QST*, page 90.

17

World Telecommunications Day, no information received.

19

ARRL Spring Sprint, 50 MHz. See May 2 listing for more details.

19-20

Armed Forces Day. This year marks the 35th anniversary of communications tests betweeen the Amateur Radio fraternity and the military communications system. Special commemorative QSL cards will be issued to amateurs achieving a verified two-way radio contact with any of the participating military radio stations. Those who receive and accurately copy the Armed Forces Day CW and/or RTTY message from the Secretary of Defense will receive a special commemorative certificate.

Crossband Radio Contacts. The military-to-amateur crossband operations will be conducted from 1300Z May 19 until 0245Z May 20. East Coast stations start operations at 1300Z May 19, while West Coast stations start at 1600Z. Military stations will transmit on military frequencies and listen in designated portions of the ham bands. Limit contacts to 3 minutes. The following stations will be active: *AIR*, 2045th Communication Group, Andrews AFB, Washington, DC: LSB — transmit 4025 kHz, receive 3800-4000 kHz; CW — tx 6995.5, rx 7025-7150 kHz; RTTY — tx 7306.5 kHz, rx 7080-7100 kHz; LSB — tx 7315 kHz, rx 7225-7300 kHz; RTTY — tx 13,986.5 kHz, rx 14,080-14,100 kHz; CW — tx 13,997.5 kHz, rx 14,000-14,150 kHz; USB — tx 14,408 kHz, rx 14,150-14,350 kHz. *NAM*, Naval Communication Area Master Station LANT, Norfolk, VA: all tx 14,400 kHz; CW — from 1300-1700Z, rx 14,000-14,150 kHz; RTTY — from 1700-2200Z, rx 14,080-14,100 kHz; USB — from 2200-0245Z, rx 14,150-14,350 kHz. *NAV*, HQ Navy-Marine Corps MARS, Radio Station, Cheltenham, MD: RTTY — tx 7372.5 kHz, rx 7080-7100 kHz; SSTV — tx 14,389.5 kHz, rx 14,225-14,235 kHz. *NMH*, Coast Guard Radio Station, Alexandria, VA: CW — tx 4015 kHz, rx 3500-3750 kHz; LSB — tx 7346.5 kHz, rx 7225-7300 kHz; RTTY — tx 14,440 kHz, rx 14,080-14,100 kHz; USB — tx 20,937.5 kHz, rx 21,250-21,450 kHz. *NMN*, Coast Guard Communication Station, Portsmouth, VA: CW — tx 7393 kHz, rx 7025-7150 kHz. *NPG*, Naval Communication Station, Stockton, CA: LSB — tx 4001.5 kHz, rx 3800-4000 kHz; CW — tx 4010 kHz, rx 3500-3750 kHz; CW — tx 6970 kHz, rx 7025-7150 kHz; LSB — tx 7301.5 kHz, rx 7225-7300 kHz; CW — tx 7365 kHz, rx 7025-7300 kHz; CW — tx 9991.5 kHz, rx 10,100-10,150 kHz, except 10,109-10,115 kHz; RTTY — tx 13,927.5 kHz, rx 14,080-14,100 kHz; CW — tx 13,975.5 kHz, rx 14,000-14,150 kHz; USB — tx 14,385 kHz, rx 14,150-14,350 kHz; CW — tx 20,998.5 kHz, rx 21,025-21,250 kHz; USB — tx 21,460 kHz, rx 21,250-21,450 kHz. *NPL*, Naval Communication Station, San Diego, CA: RTTY — tx 7380 kHz, rx 7080-7100 kHz; SSTV — tx 14,375 kHz, rx 14,225-14,235 kHz. *NZJ*, Marine Corps Air Station, El Toro, CA: RTTY — tx 7375 kHz, rx 7080-7100 kHz; USB — tx 14,480 kHz, rx 14,150-14,350 kHz. *WAR*, HQ Army MARS Radio Station, Fort Meade, MD: LSB — tx 4028.5 kHz, rx 3800-4000 kHz; CW — tx 6997.5 kHz, rx 7025-7150 kHz; USB — tx 13,992.5 kHz, rx 14,150-14,350 kHz; CW — tx 14,403.5 kHz, rx 14,000-14,150 kHz from 1500 to 1800Z and from 2200 to 0100Z; RTTY — tx 14,403.5 kHz, rx 14,080-14,100 kHz from 1300 to 1500Z, from 1800 to 2200Z and from 0100 to 0245Z; USB — tx 20,995.5 kHz, rx 21,250-21,450 kHz.

CW Receiving Test. Conducted at 25 WPM. A 10-minute call-up will begin at 0300Z May 20, followed by the text at 0310Z. The following stations will transmit the message on the indicated frequencies: *AIR*, Washington, DC: 6995.5 and 13,997.5 kHz. *NAM*, Norfolk, VA: 4005, 7393 and 14,400 kHz. *NAV*, Cheltenham, MD: 7372 and 14,389.5 kHz; *NPG* Stockton, CA: 4010, 7365 and 13,927.5 kHz. *WAR*, Fort Meade, MD: 4028.5, 6997.5 and 14,403.5 kHz.

RTTY Receiving Test. Transmitted at 60 WPM using 170-Hz shift. A 10-minute call-up will begin at 0335Z May 20, followed by the text at 0345Z. Stations and frequencies are the same as for the CW receiving test (see above).

Submit CW and RTTY test messages exactly as received. Indicate time, frequency and call letters of station copied. On the same page as the message text, include your name, call sign and complete mailing address. Entries must be postmarked by May 26. Stations copying *AIR* send entries to Armed Forces Day Test, 2045CG/DONJM, Andrews AFB, DC 20331. *NAM*, *NAV* or *NPG* entries go to Armed Forces Day Test, HQ Navy-Marine Corps MARS, 4401 Massachusetts Ave., N.W., Washington, DC 20390. *WAR* entries go to Armed Forces Day Test, Commander, 7th Signal Command, Attn: CCN-PO-OX, Fort Ritchie, MD 21719.

Georgia QSO Party, sponsored by the Atlanta RC, from 1600Z May 19 until 2400Z May 20. Categories: single op; multiop, single transmitter; GA mobile/portable outside home county. Work stations once per band and mode. No repeater QSOs. GA-to-GA QSOs allowed. Exchange QSO number, signal report and QTH (county for GA stations; state, province or country for others). Suggested frequencies: phone — 3.900 3.975 7.245 14.290 21.360 28.600; CW — 1.805 and 60 kHz up from lower band edges; Novice — 3.718 7.125 21.110 28.110. Try 160 meters at 0300Z; try 10 on the hour and 15 on the half hour from 1300 to 2300Z. GA stations multiply total QSOs by sum of states, VE provinces and continents worked. Others multiply GA QSOs by number of different GA counties worked (max. 159). Awards. Mail logs by June 15 to Atlanta Radio Club, Dave Thompson, K4JRB, 4166 Mill Stone Ct., Norcross, GA 30092.

19-21

Michigan QSO Party, sponsored by the Oak Park ARC, from 1800Z May 19 until 0300Z May 20 and 1100Z May 20 until 0200Z May 21. Work stations once per band and mode. MI-to-MI QSOs allowed. Work portables/mobiles again as they change county. No repeater QSOs. Exchange signal report, serial number and QTH (county for MI stations, state or country for others). Suggested frequencies: CW — 1.810 3.540 3.725 7.035 7.125 14.035 21.035 21.125 28.035 28.125; phone — 1.815 3.905 7.280 14.280 21.380 28.580 50.125 145.025 146.52. Count one point per phone QSO and two points per CW QSO. MI stations multiply by sum of states, countries and MI counties worked (max. 85). Others multiply by number of MI counties worked (max. 83). QSOs with club station W8MB count five points. VHF-only entrants may add multipliers from each band for total multiplier. Mail logs by June 30 to Mark Shaw, K8ED, 3810 Woodman, Troy, MI 48084.

23

W1AW Qualifying Run, 10-35 WPM, at 2000Z (4 P.M. EDT) May 23. See May 11 listing for more details.

JUNE

2

New York QSO Party, sponsored by the Salt City DX Assn., from 1600Z to 0400Z June 2. Work the same station on each band and mode for QSO points. Exchange: RS(T) and QTH (county for NY stations; state, province or country for others). Count one point for phone QSOs and two points for CW QSOs. For your final score: NY stations multiply total QSO points by number of states, provinces and countries worked; others use NY counties for multipliers. Suggested frequencies: phone — 1.835 3.905 7.280 14.295 21.380 28.580; CW — 1.810 3.540 7.035 14.035 21.035; Novice — 25 kHz up from lower band edges. Awards. S.a.s.e. for results. Mail before July 15 to John Carioti, K2ZJ, 3720 Dutchman Dr., Baldwinsville, NY 13027.

5

West Coast Qualifying Run, 10-35 WPM, at 0400Z June 6 (9 P.M. PDT June 5). See May 2 listing for more details.

9

W1AW Qualifying Run, 10-40 WPM, at 0200Z June 10 (10 P.M. EDT June 9). See May 11 listing for more details.

9-10

World Wide South America Contest, sponsored by *Electronica Popular Magazine*, from 1500Z June 9 until 1500Z June 10. 80 through 10 meters, CW only. Single operator, single band or multiband, and multioperator, single transmitter classes. No crossband QSOs. Exchange signal report and serial number. Work stations once per band. Count two points for QSOs with South American stations and multiply by total South American prefixes worked per band. Mail logs by July 31 to WWSA Manager, P.O. Box 18003, 20772 Rio de Janeiro, RJ, Brazil.

16-17

Summer SMIRK Party

9-Land CW Contest

All Asian DX Contest, phone

23-24

Field Day, see page 101 for the rules.

26

W1AW Qualifying Run

*Communications Assistant, ARRL

Section News

The ARRL Field Organization Forum

Coordinated By Jim Clary, WB9IHH

CANADA

ALBERTA: SM, E. Roy Ellis, VE6XC — SM/SEC: VE6XC. ASM: VE6AMM. STM, DEC, NM (APSN & ATN): VE6ABC. We were saddened to learn of the passinbg of VE6TG. He was an old timer and a former SCM for Alberta. Gov't surplus HF/SSB 10W portable transceivers are being readied for delivery to regular AARCS members. If interested, contact VE6XC. The AARCS Net doing better signal-wise on Sunday at 8:30 A.M. Local time on 3750 kHz. Drop in and contribute. Traffic: VE6BLY 91, VE6ABC 45, VE6QN 4, VE6BKP 3, VE6YW 1, VE6ZV 1.

BRITISH COLUMBIA: SM, H. Ernie Savage, VE7FB — British Columbia Emergency Net wishes to say thanks to VE7CSI, our net manager for four years, who is retiring from net and from work. May he be blessed with all our good wishes. BCPS net 3757 reports an active month again. NM VE7QC and ANM VE7DDF have mailed their latest net roster; really impressive number of net members. OO VE7AKG's monthly report shows a number of us amateurs are not behaving ourselves by poor operating habits, etc. Church service for VE7BQ was well attended by the amateurs. So many of the old timers were there to pay their last respect to an amateur that has done so much for the amateurs. Traffic: VE7BNI 267, VE7CDF 115, VE7ZK 104, VE7FB 32, VE7BZI 11.

MANITOBA: SM, Peter Guenther, VE4PG — ASM: AJE. SEC: HK. NMs: VJ TE IX NM. We regret the sudden passing of VE4AX. He was very active on VE4SSS and handled a lot of formal and informal traffic. VE4JA is in the hospital and is reported to be doing well. VE4FK at Pinawa will take over duties as SEC first of July. An interesting lecture by VE4CCC from the DOC on interference and other items was held at the Winnipeg RC. Checkins and traffic are holding steady on all nets. MEPN QNI 1250, QTC 19, sess. 29. WHIN QNI 299, QTC 1, sess 8. MTN QNI 118, QTC 39, sess. 29. MMN QNI 529, QTC 30, sess. 29. Traffic: VE4RO 33, VE4PG 31, VE4TE 31, VE4AJE 30, VE4AAD 16, VE4HK 7, VE4FK 6, VE4JF 6, VE4QO 6, VE4DS 4, VE4DT 4, VE4ADS 3, VE4AGR 3, VE4CR 3, VE4LB 3, VE4NE 3, VE4GW 1, VE4MG 1.

MARITIME/NEWFOUNDLAND: SM, D. R. Welling, VE1WF — ASM: VO1FG. NMs: VO1JN VE1WF. Still looking for volunteers to fill various appointments. Silent Key VE1RA. Hoping to be able to visit various clubs during the coming months. Would like to have invitations to visit clubs with dates of meetings mentioned. APN activity remains fairly good but there are several areas where steady checkins are needed. Results of court case re Illegal use of radio in N.S. has been announced. Result leaves a lot to be desired. APN: 29 sess., traffic 93, QNI 151, time 351. Traffic: VE1WF 379, VE1BKM 121, VE1BXA 14, VE1ALU 12, VO1CA 11, VE1BPM 4.

ONTARIO: SM, Larry Thivierge, VE3GT — BM: VE3IBV. PGL: VE3AR. SEC: VE3GV. STM: VE3HTL. TC: VE3EGO. NMs: VE3AJN VE3BDM VE3CYR VE3FGU VE3GFN VE3HTL. The following clubs/associations have provided me with a copy of their respective bulletins over the past number of years. A special thanks is in order to the executive, club members and, especially, their bulletin editors, for their help with this column. They are: CARTG, Guelph, London, Niagara Penbinsula, North Shore, Oakville, Ontario Trilliums, Ottawa, Ottawa Valley Mobile, Oxford Co., Peterborough, QCWA (Southern Ontario), Quinte, Seaway Valley, Skywide, SORT Inc., TFMSC Inc., Welland Co., Windsor ARCs. Bulletins from any other clubs would be most welcome. Congrats to NPARC's Amateur of the Year, VE3HGJ, and to VE3QA who was awarded a CRRL Certificate of Merit. VE3QA has the record of serving the ARRL for the longest period of time, and is a well known DXer serving on the DX Advisory Committee. Presentation was made by VE3FN at an Ottawa ARC meeting. The new executive of the Peterborough ARC is: VE3KXB VE3MT VE3NLB VE3SG VE3NUW VE3IQZ VE3MEW VE3MQB VE3APA VE3BAU VE3ACD. New appointment: ORS, VE3BCZ who was an appointee in the early '50s. VE3AFA, who has taken over the CNIB Amateur Radio Program from VE3CO after 13 years in that post, was a guest speaker at the Welland Co. ARC. VE3GFN was able to work Cook Island on RTTY. Ontario Trilliums weekend contest results were: 1st VE3IKC, 2nd VE3ARG, 3rd (tie), VE3BBQ and VE3CLT. Incidentally, the Trilliums will be celebrating their 19th anniversary this month. VE3APL has upgraded to a new TS-830. Mark your October contest calendar for the third weekend (20th and 21st) for the CARTG "Big Smoke" RTTY DX contest on all bands. Traffic: VE3KK 349, VE3CYR 239, VE3GHJ 206, VE3GT 180, VE3GOL 177, VE3DPO 114, VE3WG 108, VE3JSM 107, VE3KXB 102, VE3KCZ 88, VE3BDM 75, VE3BCZ 60, VE3BZB 45, VE3WM 44, VE3AJN 43, VE3FGU 43, VE3GFN 43, VE3WV 35, VE3BAJ 20, VE3MPF 20, VE3KLX 9. (Jan.) VE3JSM 99, VE3KLX 15.

QUEBEC: SM, Harold Moreau, VE2BP — STM: VE2EDO. BM: VE2ALE. PIO: VE2YW. TC: VE2ED. NMs: VE2EDO VE2FSA. VE2GFH did a good job pinch hitting for VE2EDO during February. Congrats to VE2AGP who now has 281 countries confirmed. The Sorel Hamfest will be on the 27 May. Felicitations a VE2AGP pour avoir 281 pays confirmes. Avec regret, je dois vous annoncer le deces de VE2VX at VE2AIA. Traffic: VE2GFH 162, VE2EC 49, VE2BP 43, VE2EKC 22.

SASKATCHEWAN: SM, W. C. Munday, VE5WM — STM: VE5HG. SEC: VE5RP. TC: VE5GF. NMs: VE5BAF VE5EX VE5HG VE5NJ VE5OI. It is with regret I report the passing of VE5MP and VE5PD. A committee from the Regina ARA, VE5ABT VE5SC and VE5HI, have been working with the Wascana Institute of Regina in the planning of their new building. The result is that there will be an Amateur Radio room in the building. The committees are working hard and arrangements are shaping up for Hamfest '84 in Swift Current June 30th. RARA members provided communications to the Waskimo 5 km run Feb. 19, and for the Scout/Guide Klondike Hike Feb. 25. Traffic: VE5AGM 22, VE5UX 14, VE5AFQ 8, VE5KZ 2.

ATLANTIC DIVISION

DELAWARE: SM, John Hartman, WA3ZBI — STM: W3DKX. SEC: W3PQ. PIO: N3DIP. PSHR: K3JL WA3DUM. Congrats to K3ZXP on upgrading to Extra. In conjunction with "AMATEUR RADIO WEEK," March 11th to 17th, as proclaimed by Governor DuPont, the AWARE club is sponsoring a dinner. Guests will include Senator Barry Goldwater, K7UGA, ARRL Pres, WØBWJ, Gov. DuPont and more honored guests. DTN: QNI 437, QTC 61 in 21 sessions. DEPN QNI 64, QTC 13 in 4 sessions. SEN: QNI 37, QTC 2 in 4 sessions. Traffic: W3QQ 144, WB3DUG 67, WA3DUM 37, K3JL 25, WA3WIY 23, WA3ZBI 21, N3AXH 15, W3FEG 13, K3ZXP 9, KC3JM 8, W3WD 4, KC3FW 2.

EASTERN PENNSYLVANIA: SM, Karl W. Pfeil, W3VA — ACC: KB3NE. PIO: W3AMQ. SEC: WA3PZO. SGL: N3CJP. STM: KB3LF. DEC: K3QXC KB3LR KB3UD N3AIA N3BFL W3EEK AA3C.

Net	Time	Freq.	QNI	QTC	Sess.
EPAEPTN	6 P.M. Dy	3917	473	294	29
EPA	7/10 P.M. Dy	3610	4415	271	55
PTTN	6:30 P.M. Dy	3610	241	120	29
PFN	5 P.M. Dy	3958	174	370	29

Local and VHF nets reports (QNI/QTC/sess): D3ARES 101/18/4; D6ARES 37/17/4; ATN 37/18/9; CCESN 31/1/5; LCARES 57/15/8 PWAARES 70/1/4; SVARES 35/1/4. BPL: K3NSN. OO report: W3KEK. OBS reports: KO3M W3CL W3VA. PSHR: KA3DLY KA3GJT KB3UD KC3LY N2BSK/3 N3COY W3KEK W3VA WA3JRL WB3FKP. New appt.: K3UWJ to OO. kKA3LLYE upgraded to Tech. New hams from the Warminster ARC fall class: KA3s MEM MEN MEO/PA MEP MEQ MER MES MET MEU (10 yrs), MEV MEW MEX LZO/PA LZP/PA LZQ/PA. Congrats and welcome aboard. New officers for 1984: Pocono ARC N3DHJ, pres.; N3COY, v.p.; KA3JDQ, secy./treas. Frankford ARC: N3GB, pres.; K3ZUF, v.p.; W3MA, secy.; KF3R, treas. Penn-Mar ARC had more than 25 people attend their first Novice class. Since this is my last report as Section Manager for EPA, I wish to take this means to thank everyone who helped make the past 4 years a very enjoyable experience. Please give the new SM the same wonderful cooperation you have given me. Traffic: K3NSN 3825, N3COY 368, KA3DLY 350, KB3UD 282, WA3WQP 262, W3IPX 251, WB8KPE 213, N3CD 121, KA3GJT 119, W3KAG 97, KC3LY 80, N3AIW 78, W3ADE 71, W3TWV 61, AA3B 60, KA3IME 56, W3VA 56, W3AQN 32, W3CL 19, N2BSK/3 13, WB3KUZ 12, WB3FKP 11, K3QXC 10, W3SD 9, WA3CKA 8, W3FAF 7, KO3M 4. (Jan.) K3NSN 4875.

MARYLAND — DISTRICT OF COLUMBIA: SM, Karl R. Medrow, W3FA — EC WA3TOY and ARES members W3VVN AB3F WA3TOX KC3GY K3KJZ W3GMI N3DQX KA3ACM K8BW and KB3VK put in 68 manhours on a 5-alarm fire and follow up help to the Red Cross. OO KA3R is ready for spring. KC3EK handled some emergency traffic along with his regular OO duties. KG3M is our new OBS in Balto area, 147.63/03, and on 7080 kHz on RTTY at 2100 local TTSn. W3ZNW is using mechanical help like RTTY! KB3WL runs the rescue wagon in the mountains. W3CDQ contesting in the YL/OM and OOTC on 20 meters. WB3KJT is devoting times to family. KC3AV held a MSN eyeball. This net trains anyone that shows up. W3VBM makes it back to Maryland from Fla on 80 mtrs real well. W3FZT sends the WC 2-Mtr Net report. KC3DW is temporarily sidelined with TVI at the apartment. WA2ERT/4 is a welcome addition to the nets. WB3BFK had a busy month. W3LDD's CW is short and sweet. KJ3T is moving to Fla. We miss you, Marla. N3QA is in the right place at the right time. KA3EWV has been tending KJ3E's spots while KJ3E is in FL. W3YVQ is pleased with a 7-county turnout on the latest RACES drill. W3FZV was in the QCWA party. W3UT is having fun on the NTS. KK3F says soon the tower and antennas! K3NNI likes the QSK feature of his new rig. KC3Y has many liaison duties. WB3GZU is looking to retirement as NCM on the MEPN. N3IT is an early bird. N3BDW reports the AARC Novice class underway. PIO KA3DBN is looking for club newsletters. W3FA will supply his to save costs. Our SEC is WA3TAI. ACC KA3DRO says congrats to the Mt. ARC which is now a Special Services Club. Is your club an SSC? Congrats to WA3KCY OO/RFI coordinator and to KA3ERP State Government Liaison appointees. Club notes from CARA, CBARA, GSFC, SMARC, LARC, Mt ARC, and the IBM ARC. The theme — pay your dues! With the nets: Net/Manager Sessions/QTC/QNI avg., MSN/KC3AV 29/90/10.4 (Net certificate to KA1KML); WC 2-Mtr Net/W3FZT 4/0/17; WR PON/WB3BFK 25/30/14; MDD/W3PQ 58/269/11.8; MEPN/WB3GZU 31/205/30. Brass W3FA, W3QQ andKC3Y. 100% W3BRZ. Three or less: WB3BFK W3FA WA3IHW W3LDD KJ3T and W3YVQ. Traffic: WB3GZU 526, KJ3T 260, K3NNI 160, KB3WL 147, W3YVQ 133, KJ3E 128, KK3F 119, KA3EWV 108, W3FA 103, KC3Y 101, W3UT 62, KC3AV 61, WB3BFK 59, N3QA 59, KC3DW 55. W3ZNW 24, WA2ERT/3 17, W3LDD 12, W3FZV 11, N3IT 9, KC3EK 6, WB3KJT 4.

SOUTHERN NEW JERSEY: SM, Richard Baier, WA2HEB — SEC: K2NE. STM: WA2HEB. ACC: K2IXE. SGL W2XQ. PIO: WB2RVE. BM: WB2UVB. TC: W2IJX. OO: KB2MY WB2UBG. The Penn-Jersey Repeater Council is alive and well. Who is the Penn-Jersey Repeater Council? This group has the responsibility of coordinating repeaters in the Southern New Jersey and Eastern Pennsylvania areas. In early February the council met to discuss ways to improve communications and turnaround on requests. Obviously much of PJRC's success will be receiving the support of established repeater groups and new groups or individuals thinking about putting a repeater on the air. The group also has a technical committee which is ready to assist when requested. Please support repeater coordination by supporting PJRC. They stand ready and willing to help all of us. Their address is: PJRC, P.O. Box 599, Kingston 08528. Welcome to new Official Observer, KB2MY. How about YOU becoming an OO? Please contact me for details. CU next month. Traffic: WA2HEB 84, KC2PB 33, KA2ANJ 15, W2IU 9.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA — SEC: W2BCH. PIO: WA2PUU. ACC: N2EH. TC: K2QR. STM: W2ZOJ. BM: W2GLH. SGL: KO2X. OO/RFI Coord.: W2AET. Appointments: KA2BHR DEC-Central; EC-W2BYO Allegany, K2DHR Orleans, KB2DP Oneida, W2FEY Genesee, WA2HSB Clinton, KA2MYD Chenango, WA2NAC Steuben, KA2OVL Cattaraugus, WB2QZL Niagara, WA2UKX Yates, WA2VAM Cortland, K2VTT Otsego, KC2YF Tompkins. Thanks to K2DUR and WB2JWD for past EC services. WB2MCO succeeds N2APB as NYS (cycles 3 and 4) net manager; many thanks to N2APB. BPL: WA2FJJ K2GXT WB2IDS WA2NKC WB2OWO KC2QQ. PSHR: W2AET WD2AFI KA2BHR KA2DQA WA2FJJ VE2FMQ W2FR W2GJ K2GXT WB2IDS AF2K WA2KOJ W2MTA WA2NKC WB2OWO WB2PID KA2QIK KC2QQ WB2RBA ND2S W2UYE W2ZOJ. HEARTY COLLEGE MISSIVES from SU and RIT made the circuits hum for St. Valentines. ARL ONE to all.

NYS/1*	3677	1000/Dy	WB2EAG	397-323-28
Mike Farad	3925	1300/M-S	VE2FMQ	199-108-25
NYPON*	3913	1700/Dy	WA2KOJ	743-761-29
NYSPTEN	3925	1800/Dy	WB2HKU	599-067-29
ESS	3590	1800/Dy	W2WSS	388-098-28
OCTEN/E*	34/94	1830/Dy	WB2HLY	652-107-29
Q Net	31/91	1830/Dy	KA2CMQ	356-011-29
WDN/E*	04/64	1830/Dy	KC2QQ	594-272-29
Blue Line	93/33	1900/Dy	WA2SEF	309-044-29
NYS/4*	3677	1900/Dy	WB2MCO	496-442-29
JCARCN	10/70	2000/Dy	WA2WAX	-29
OARC Net	25/85	2000/W	K2VTT	064-003-05
Black River	055/655	2100 Dy	WB2OFU	-29
CNYTN*	90/30+	2115/Dy	WA2PUU	460-242-30
OCTEN/L*	28/88	2130/Dy	WB2HLY	264-129-29
STAR*	99/39	2130/Dy	N2BLX	
WDN/L*	04/64	2130/Dy	KC2QQ	549-255-29
NYS/5*	3677	2200/Dy	WB2MCO	404-522-29

*NTS Net. ARES: WNYEN 3955 3rd Sun. 2000 Lewis Co. 146.415/147.015 Sun. 1800; St. Lawrence Co. 31/91 Sn 1930; WNYEN WB2PID 31/91 Sn 1200 and 1900 plus 3915 at 1230; Central District 40/00 3rd Sn 2030; Oneida Co. 34/94 Tue 1930; Chemung Co. 10/70 and 93/33 Sn 2100; W. Catskill 3540 M 1830; Traffic Handlers Info Net 3913 Sn. 1600; VHF THIN 04/64 Tue 2000. HAMFESTS: Owego May 5, Rochester May 18-19, Rome June 3, Cortland June 16, Batavia July 8, NYC National July 20-22, Trumansburg Aug. 26, Hamburg Sept. 8, Elmira Sept. 29, Syracuse Oct. 13. FB newsletters by OCTEN and WDN; club newsletters from all clubs are requested, too — cannot spread your news if not seen! Traffic: K2GXT 1871, WB2OWO 999, WB2IDS 954, KC2QQ 668, WA2NKC 647, WA2FJJ 625, W2AET 408, W2MTA 349, WB2QIX 278, W2FR 273, WD2AFI 268, VE2FMQ 249, KA2BHR 243, WA2KOJ 221, ND2S 172, W2UYE 171, KG2D 163, W2ZOJ 158, AF2K 139, WB2RBA 132, KA2DBD 105, KX2T 101, W2GJ 99, WB2PID 82, WA2SMZ 52, KA2HRS 50, KA2DQA 49, KA1QIK 40, WA2FGW 38, KB2KW 37, WA2RXO 35, KB3RG/2 30, WB3CUF/2 28, N2ARD 21, K2IUT 18, WB2NAO 13, WA2OEP 10, K2VR 5, K2RN 3, KC2SJ 1.

WESTERN PENNSYLVANIA: SM, Otto L. Schuler, K3SMB — SEC: AB3Q. STM: AC3N. ACC: N3EE. OO/RFI: KN3B. PIO: WB3IZJ. TC: W3FE. BM: WN3VAW. SGL: K3HWL.

Net	QNI	QTC	Sess.	kHz.	T/D
WPACW	412	300	29	3585	7 P/D
WPAPTN	479	261	29	3893	6 P/D
WPA2MTN	407	173	29	146.28/88	8 P/D
NWPA2MTN	—	—	—	145.13/53	1400UTC
PFN	174	370	29	3958	5 P/D

I have one Silent Key to list W3OJA; our condolences to his family and friends. I am sitting here gatting my thoughts together. My tribander is acting like a horizontal windmill, so I have a temporary longwire but here goes. New novices are KA3s MBD MBC MBB MFN MFH MFF MFA MFB MFC MFE MAO MFD & MAC. Kudos to them and their instructors. New General KA3HZS; Advanced N3DBE; Extra WB3JWJ. 1984 club officers Conemaugh Valley ARC: N3CHT, pres.; WA3BIX, v.p.; KA3IUJ, secy.; WB3JSW, treas. The South Hills BP & M, Inc.: WA3ZNP, pres.; K3MPJ, v.p.; WA3ZNO, secy.; N3AVE, treas.; W3MML W3QNI W3LUB, directors; WA3WNT WA3PBD W3IQD trustees. Winners in the PA QSO Party were N3DAY KN3L WA3QNT K3TUP K3ZUF K9BG N3KZ & KC3CL. See the *NARC News* for categories. Next party is Oct. 20 & 21. Congrats to winners. The Butler Co. ARC had an excellent show at the Butler Mall for Valentines Day visitors. An excellent explanation of the hobby was given about 360 messages were originated. The club has some excellent operators. It was so good that the mall people want them back for Mothers Day. I congratulate them. Traffic: W3EGK 588, AC3N 411, KA3JGN 306, W3OKN 258, WA3UNX 252, K3CR 162, KQ3T 158, WD8PUH 144, KA3COX 144, WN3VAW 138, WA3QNT 121, K3SMB 113, N3FM 107, W3KMZ 86, W3RUL 82, W3NGO 67, KQ3M 62, W3NEM 52, K3NPW 47, WB3EUM 35, W3KUN 31, KC3JQ 28, W3MML 27, N3CYV 26, K3LTV 26, KB3NV 25, KB3YC 16, K3HCT 11, W3SN 11, WA3DBW 10, W3TTN 7, N3KB 1. (Jan.) W3OKN 128, K3HCT 14.

CENTRAL DIVISION

ILLINOIS: SM, David E. Lattan, WD9EBQ — SEC: W9QBH. STM: KB9X. OO/RFI: K9MX. BM: K9ZDN. PIO: WD9EED. SGL: W9KPT. ACC: WB9SFT. ASM: K9ORP.

Net	Freq.	Times (Z Win)	QNI	QTC	Sess.
ILN	3690	0030/0400 Dy	703	308	56
ITN	3705	0100 Dy	303	80	29
ILPN	3915	2230 Dy (X Sn)	—	—	—
NCPN	3915	1300 Dy (X Sn)	451	59	25
NCPN	7270	1815 Dy (X Sn)	213	211	23
IEN	3940	1500 Sn	125	1	4
IARES	3915	2230 1+3 Sn	64	—	2
ISN	3905	0000 Dy	468	242	29

Illinois was represented 100% to 9RN by stations K9AZS K9PNG K9QEW K9SW N9DR N9TN KA9FEZ KZ9I KW9J KD9K KB9X W9INZ W9NXG and WB9NVN. Illinois was represented 100% to CAND. Illinois stations were WB9NVN W9HOT W9NXG KW9J and K9AZS. Special congrats to all the members of the Starved Rock RC past and present! SRRC is celebrating fifty years as an ARRL affiliated club. One highlight of their Golden Anniversary year will be the SRRC hamfest on June 3 at the Bureau Co. Fairgrounds. DD W9PRNI, VD K9KM, AD W9WU and ARRL Legal Counsel N3AKD will be featured guests. The newly elected officers for the Elgin ARS for 1984 are AA9D, pres.; WB9EEA, v.p.; KA9BNG, secy.; KF3D, treas. W9LNQ reports that he will be retiring in March and hopes that he will be able to get a little more hamming in without

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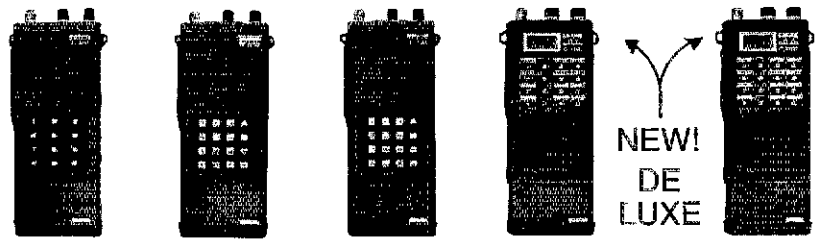

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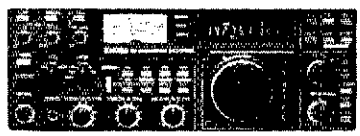

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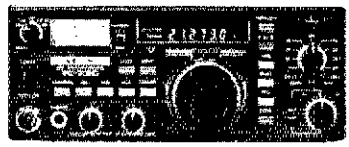

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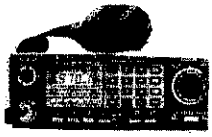

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work getting in the way, hi. PIO WD9EED scores again! He has been successful in securing a governor's proclamation proclaiming the week ending with Field Day 1984 as Amateur Radio Week in Illinois as he did last year. This year owing to WD9EED's prior planning, the proclamation is out early enough for us to capitalize in its PR value. SEC W9QBH reports a new EC, KA9KWO, and a new OES, KA9NNH. Congrats to W9TAL on his 50-year certificate from QCWA and 50 years continuous membership in HAMFESTERS RC W9DBO reports that he is now equipped for emergency standby power on 2 meters. This is a worthwhile goal that we should all try to achieve. On Wednesday February 22 the Illiana Repeater System sponsored its fourth annual storm spotters training session. The session was held at the Vermillion Co. ESDA office and was taught by Ray Hughes, OIC at the NWS WSO in Springfield. Hughes has been active in training AR spotters, this being his second session at Danville. He also attended the IL ARES seminar last year and is to be the featured NWS speaker at the seminar in 1984. The Danville session was attended by a record 67 persons, all but two of whom were affiliated with an ESDA FD or PD. IRS sponsors these events yearly and pays for lodging for the NWS official attending. They can take great pride in their part in providing this training for their part of Illinois Tornado Alley. Thanks to WB9YJF for the above report. Traffic: KA9FEZ 715, KW9J 491, WB9NVN 461, W9HLX 293, W9JIJ 261, W9NXG 219, K9ZDN 218 (WX), K9BVE 202, KB9X 162, K9QEW 106, N9EM 96, W9QBH 95, W9HOT 94, W9DBO 86, KD9K 65, W9TCO 50, WA9SHE 47, KZ9I 32, W9KR 28, N9TN 23, KW9L 18, KN9BAM 17, N9DR 15, W9LNQ 16, WB9WGD 14, WD9CJB 13, WD9HQW 13, WD9IBH 12, W9OBU 12, KA9EWN 10, W9VEY 8, WD9EED 7, KB9QX 7, WA9RUM 4, KA9BNH 3, AA9D 2.

INDIANA: SM, Bruce Woodward, W9UMH — SEC: WB9ZQE. STM: W9JUJ. OO/RFI Coord.: KJ9G. SGL: WA9VOO. PIO: K9DIY. SDXC: N9MM. BM: KC9TA. SRC: N9WB. ACC: K9TUS. SOC: W9OBF. TC: WD9ADB. SHC: WA9FUD. NMs: ITN-W9QYY; QIN-KJ9J; ICN-KA9CZD; IRN-KB9SU. VHF-W9MPT; IWN-KA9ERC.

Net	Freq.	Time/UTC/Daily	QNI	QTC	QTR	Sess.
ITN	3910	1330/2130/2300	2179	452	2642	87
QIN	3656	1430/0100/0400	696	411	2049	87
ICN	3708	0015	79	28	567	29
IRN	3629	0000	367	44	1244	29
IWN	3910	1310	1595	—	368	29
IWN VHF Kokomo			917	—	267	29
IWN VHF Bloomington			987	—	290	29

Hoosier VHF nets: QNI 9251, QTC 274, QTR 8390, bulletins 75 for 30 nets. D9RN 734 messages in 1584 minutes. IN 100% stns W9JUJ W9URQ K9CGS W9PRD KB9NR. CAND 1166 messages in 29 sess. D9RN 100% IN stn. W9JUJ. 9RN/cycle 4 QNI 375, QTC 610, QTC 1034 in 58 sess. IN 100% IN stns N9AEI W9EI N9HZ KJ9J WA9QCF W9QLW WB9UYU K9WWJ W9JUJ. Appts: DEC for Orange, Crawford, Washington, Harrison, Scott, Floyd, Jefferson and Clark Cos. N9AST. EC for Dekalb Co. W9GWI. EC for Gibson Co. WA9DBK; EC for Noble Co. WA9UGP; EC for Union Co. WB9QKK; EC for Vigo Co. W9MJI. OBS KD9EP WD9DWD. Silent Key K9ZSH. KX9W has been nominated from Indiana for the Maxim award. The Indiana State Police have appointed Trooper William Murray as the new Area 5 INCERT coordinator. There is a new Vincennes area RTTY net on 146.40 at 0030 on Tuesdays. WB9VPG is NCS. Terre Haute has a new RBBS on 146.43 run by N9CXI. If you wish information published in the *Bison* contact editor K9TUS in Fort Wayne. The volunteer counsel list for Indiana includes KC9DJ W9JGH WB9PGG K9VRE and KA9MXW. Congrats to the Blue River Valley ARS on becoming a Special Service Club. W9JUJ suggests we desparately need NOVICES checking into the Indiana Code Net (ICN). If this does not happen, we may have to drop the net. By delivering an ARRL 46 to W9GJS I found he started in Amateur Radio in 1919, and got his present call in 1928. He has all his original equipment. His home is like a museum. W9ASX also has a fine museum in his home. It is a pleasure to run into the OOTCers. They are not too numerous. Traffic: W9JUJ 1289, W9URQ 263, KJ9J 258, WB9UYU 181, W9EI 136, W9QYY 122, W9CNE 121, KB9HH 95, WA9QCF 87, N9AEI 65, N9HZ 62, W9PRD 60, W9QLW 59, K9WWJ 56, WD9HII 54, W9IOH 47, W9UMH 45, W9PMT 38, WD9DWD 32, KA9FFO 31, N9CQS 28, K9DCX 26, K9DIY 25, WB9OZZ 25, AB9A 24, N9DHX 21, KK9N 20, KW9D 19, W9JZV 18, W9RTH 16, W9ZGC 14, K9FVN 13, WB9AWI 12, WD9ART 10, KA9LAU 7, WD9CIV 6, K9SBW 4, WA9OKK 4, W9URS 4, W9UPI 3, K9OUP 3, W9BDP 3, WB9AJY 3, W9KMY 2, W9XD 2, WD9EXI 1.

WISCONSIN: SM, Roy A. Pedersen, K9FHI — SEC: W9OAK. STM: K9UTQ. BWN 3984 1200Z QNI 1248, QTC 1412 WD9IID. BEN 3985 1800Z QNI 688, QTC 319 WB9ESM. WSBN 3985 2330Z QNI 966, QTC 373 K9ANV. WNN 3723 0000Z QNI 215, QTC 32 KA9OBP. WSSN 3645 0030Z QNI 210, QTC 53 KC9CJ. WIN-E 3662 0100Z QNI 384, QTC 142 W9YCV. WIN-L 3662 0400Z QNI 222, QTC 101 K9LGU. XPO 3925 1831Z QNI 297, QTC 23 K9AKG. NWTN 3171.91 0030Z QNI 309, QTC 49 N9BDL. Gr. Bay .72/.12 Thur. 0245Z QNI 28, QTC 3 WB9NRK. WCWTN 3171.91 0030Z QNI 371 QTC 27 N9AUG. New officers Washington Co. ARC: KA9HLP, pres.; WD9GGA, v.p.; KA9OLS, secy./treas. Officers for WARAC: WB9PUB, pres.; W9YCV, v.p.; WA9YSD, secy.; WD9HTF, treas. Regret to report the following Silent Keys: WB9NON W9FY W9DZE. Ozaukee swapfest May 5. CWRA swapfest June 3, South Milwaukee swapfest July 7 Lake Shore swapfest July 14. WNA picnic Sept. 15 North Wood Co. Park. KA9QLU is now N9EJO. New Novice Stevens Point area KA9RFD. CWRA officers KA9ACE, pres.; KA9FAS, v.p.; WB9CC, secy./treas. KA9KUH, activity mgr. W9NYS, equipment engineer. New ACC AE9K; give him your full support. BPL to KA9CPA WA9WYS. When things don't run smoothly, take it on yourself to do it till things straighten out. KA9CPA 2458, WA9WYS 779, W9CXY 298, W9CBE 256, W9YCV 251, KC9CJ 246, WD9IID 244, KA9BHL 228, K9GDF 197, W9SO 142, KA9OBP 137, K9UTQ 137, W9UCL 135, K9FHI 133, KC9KO 133, N9BDL 90, K9AKG 85, KG9B 81, WB9ICH 69, N9BGE 65, WB9SM 61, WA9ZTY 61, N9AUG 57, W9FDY 54, AG9G 50, KZ9V 46, W9DND 42, N9BCX 39, K9JPS 38, KA9IKR 36, W9IHW 32, W9LDO 32, WA9USD 31, WB9JSW 27, WB8RGE 19, N9DCF 16, KV9U 16, KN9P 14, W9UW 10, KA9BHK 9, KY9P 9, KA9NOT 17. (Jan.) WD9FRI 73, KV9U 10, KA9NOT 4.

DAKOTA DIVISION

MINNESOTA: SM, Helen Haynes, WBØHOX — SEC: KAØARP. STM: KDØCI. Hello again! Congrats to the Robbinsdale ARC for another successful Midwinter Madness. Some 1500 folks registered and the new facilities were certainly a great change. Many of Minnesota's winter activities are aided by amateurs providing communications for these events. For example, WDØAKS & WDØAKT organized and acted as NCS for the Int'l Dog Sled Race held in Hibbing on Feb 4 & 5. Other stations participating

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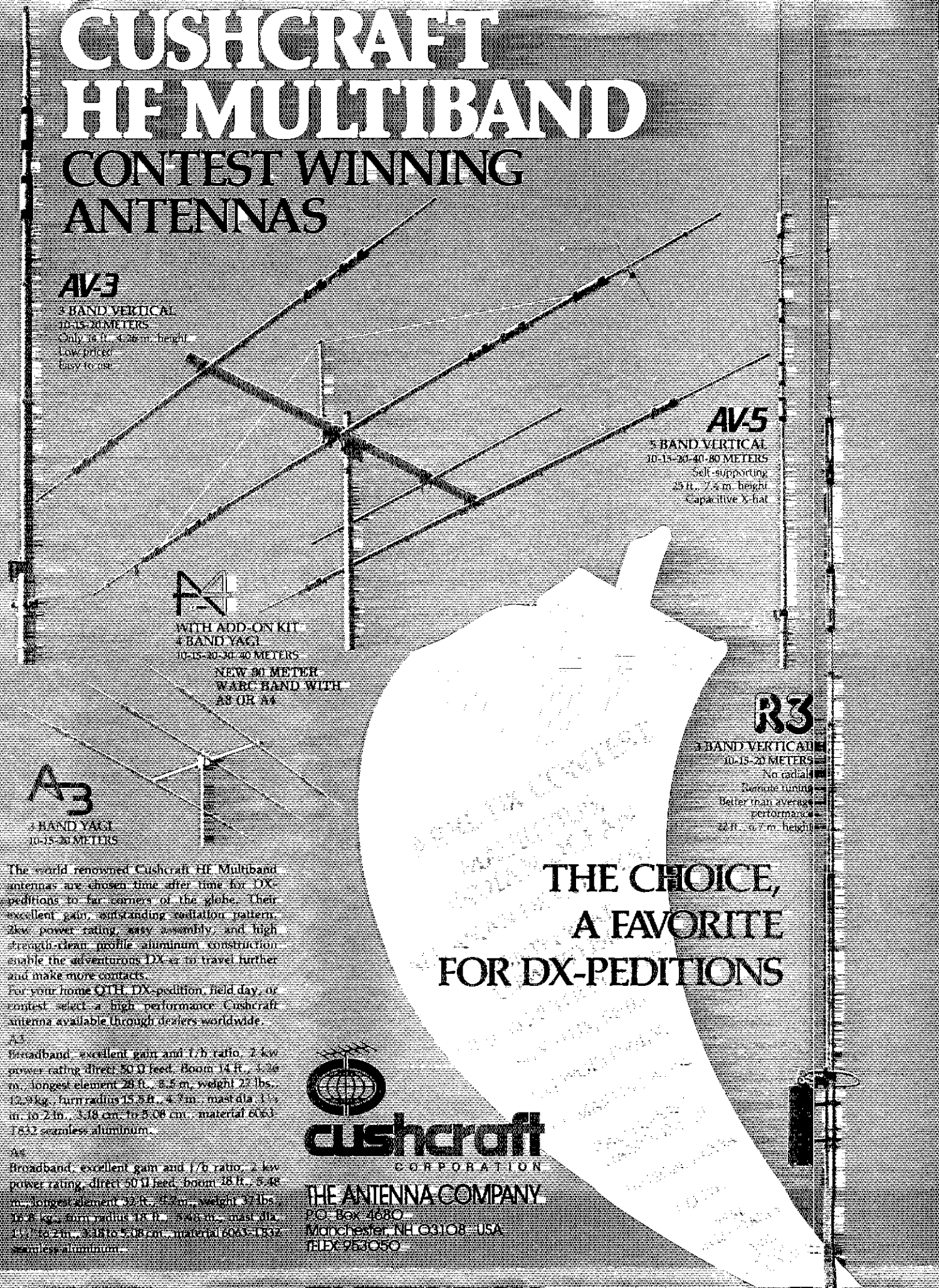

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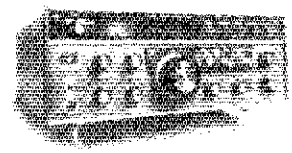

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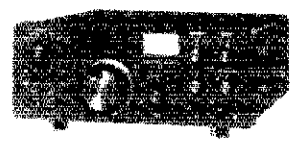

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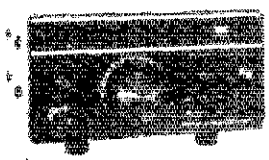

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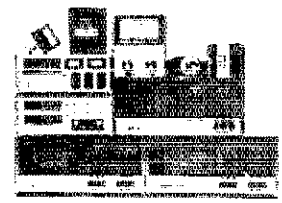

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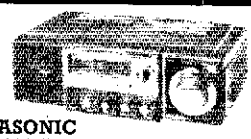

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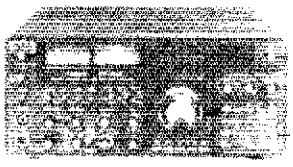

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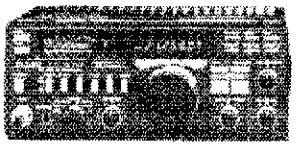

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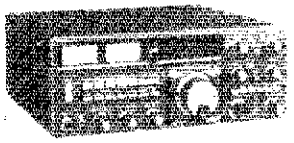

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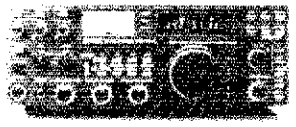

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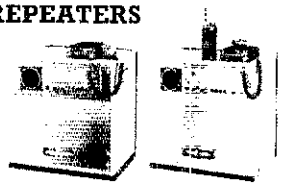

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were NØBTQ KDØCB WØDUW NØEUR and WBØZQZ. I had the privilege of joining a group organized by KAØEVR & KAØEXL of Mora for a communications net to assist the annual Vasaloppet X-Country Ski Race held Feb 19. Stations in that group included NØABR KAØAJF NØBPT NØBVM NØDWX NØDXI WØFFV WDØFMF WDØFNW WAØGWW KAØHYR KAØIHG KAØJFY WAØJQD/NCS KØKKQ KAØMCK KBØMF KBØMG WAØOHF KØSK WBØSYO and WØTZA. Net news: KCØUJ returns as net mgr of MSPN/E as of March 1. My thanks to WDØBGS for the super job as fill in. WØEHI informs me that he has picked WØGRW as his assistant on MSN/1. The move by MSSN to a 6 P.M. start seems to be working well. CW stations, especially Novices, are encouraged to join the MSSN group. By the way, our heartiest congrats to the following new Novices: KAØRTV KAØRWM KAØRWN KAØSAF KAØSBD KAØSBY KAØSCE KAØSCF KAØSCG; also to the following upgrades — Novice to General KAØPYA, and Tech to General KAØNAO. Tech to Advanced NØEUZ. Advanced to Extra WDØFMY. ARRL membership in the Dakota Division increased in 1983 from last year according to WØMGI. A reminder that the Duluth Area Hamfest will be Sat, May 5 at the Wessman Arena in Superior; hope to see you there! Finally, our condolences to the family of WAØWPP who is now a Silent Key. NET MGRS: MSN/1 WØEHI; MSN/2 KAØERY; MSSN WBØWXU; MSPN/N KAØJUX; MSPN/E WDØBGS; MNAMWXNT WDØBAC; PICONET WØHZU.

Net	Freq.	Time	QNI	QTC	Sess.
MSN/1	3685	6:30P	279	111	29
MSN/2	3685	10:00P	252	39	29
MSSN	3710	6:00P	143	19	26
MSPN/N	3945	12:05P	687	117	29
MSPN/E	3929	5:30P	1100	292	29
MNAMWXNT	3929	6:15P	584	431	29
PICONET	3925	DAILY	3515	198	25

Traffic: KCØUJ 560, WAØTFC 464, KBØMB 404, KT9I 348, WØEHI 206, WØHZU 184, KAØEPY 169, KDØCI 164, KAØOIR 144, KAØJUX 128, NØCLS 124, KAØARP 122, WAØONE 90, WØMFW 88, WDØHDD 75, KZØH 73, WBØHOX 58, KT9R 49, WDØBGS 40, KAØBFP 35, WØDM 35, KAØAJF 26, WBØFMI 23, NØJP 23, KØOGI 21, KØCSE 20, KØCVD 20, WAØEWC 18, NØEXP 18, KDØKK 17, WBØUKI 15, WØDUW 14, WØKYG 12, WAØAIN 11, WBØJUL 11, KN9U 10, NEØD 9, KBØWV 6, KXØV 1.

NORTH DAKOTA: SM, Ron Roche, KØALL — WØDM, SM of North Dakota for many years, is reported to be in intensive care at the United Hospital in Grand Forks. Take the time to write to him and let him know of your appreciation of his past efforts for us. Plan now to attend the Peace Garden Hamfest, July 14-15. Eight YLs enrolled in the Minot ARA's Technician license class. The MARA now meets on the 2nd Monday at 7:30. KAØLIL moved up to General class and WBØVHW to Advanced. AKØT appointed to the Dakota Division Contest Advisory Committee, a well deserved appointment. Goose River 77 QNI, 3 QTC; DATA Net 248 QNI 27 QTC. Net activity on the rise for February. Thanks for your support.

SOUTH DAKOTA: SM, Fredric Stephan, KCØOO — SGL: NBØD. STM: WØKJZ. SEC: WØYMB. BM: NØCFS. TC: KØAS. STM WØKJZ is making excellent progress and is very positive. Official bulletins were sent total of 52 times. SGL NBØD has been watchful of all pending legislation and potential effect on our section's Amateur Radio activities. NBØD also making regular reports. So far we have heard regularly from ECs WØYMB WØNRW NØEEH NØAMJ WAØBZD and WBØOME. We all need to pitch in and help them and those areas of the section aren't covered yet. We need more emergency coordinators. Contact our SEC in Mobridge, WØYMB. NTS DTEN liaison stations this month were WBØLTV WBØSUM KCØAF and KCØOO, PSHR: KCØAF NØCFS NØEEH KCØOO. South Dakota Evening Emergency Net QTC 41, QNI 198; South Dakota Traffic Information Net QTC 25, QNI 269; Walworth Co. Emergency Net QTC 10, QNI 25. Traffic: KCØAF 100, NØCFS 63, WØDVB 56, KCØOO 49, WBØLTV 35, WAØBZD 25, NØEEH 18, WBØOMF 15, WØYMB 15, NBØD 12, KAØKXG 8, WBØSUM 4.

DELTA DIVISION

ARKANSAS: SM, Joel Harrison, WB5IGF — SEC: N5BPU, STM: AE5L, TC: W5FD, SGL: W5LCI, ACC: AD5M, OZK 3760 0000 Dy 152 QNI, 14 QTC, W5MYZ, APN 3937 1100 M/S 381 QNI, 21 QTC, M-Bird 3928 2130 M/F 667 QNI, 19 QTC WA5ZWZ, ARN 3995 2330/Dy 940 QNI, 64 QTC. With regret we report KC5CE as Silent Key. Our sympathy to his family. Traffic: W5TUM 150, W9OK 45, W5UAU 44.

LOUISIANA: SM, John Wondergem, K5KR — SEC: WA4MUW. ACC: K5DPG. SGL: KD5SL. The last 25 years have seen many SCMs write this column: N5JM N5IB K5TL W5GHP W5PM and W5FMO to name a few. All have depended on news items, so if you have something, please write. There are several ARRL appointments open so inquire and learn how you can help your fellow hams. It's official! There will be a ham station at the World's Fair, thanks to much hard work by W5LDH KV5E and WA5ORS. Financial support is needed to see it through; contact W5LDH. May brings the always interesting B.R. Hamfest on the 5th and 6th. There will be an ARRL table, so drop by. The color images on 439.25 MHz belong to none other than KB5BB WB5JLZ WA5WXD W5OVV and W5ISS; best TV DX is 33 miles. Following a very successful hamfest, N5BYM turned the AARA prexy job over to K5ARH, with KE5FZ, v.p.; KA5PDP, secy.; WB5IWP, treas.; NF5I KA5DGX N5BYM, board members. Good luck, gang!

Net	Freq. (kHz)	Time	Mgr
LTN	3910	6:30 P.M. Dy	N5ANH
LAN	3615	7 & 10 P.M. Dy	N5BFV
LSN	3703	7:30 P.M. Dy	WA5ANV
LEN	3910	8 P.M. Mon	KA5PFB
CCTN	146.01/61	6:45 P.M. M-F	GNOARC

Traffic: WB5NCM 162, W5GHP 129, N5BFV 90, KA5HDT 68, K5WOD 33, WB5LBR 30, W5TVW 13.

MISSISSIPPI: SM, Tom Hammack, W4WLF — Most reports are being received late or many not at all. Please send them in early. AJØX has been appointed Bulletin Manager. He is active on the Autostart Net, 14087 RTTY, and mailbox on 14087.5 and 144.82 repeater. WB5PDP is now EC for Union Co. Thanks for stepping forward.

MTN	29	122	61
MSBN	29	2464	73

Traffic: N5AMK 516, K5OAF 274, AJØX 214.

TENNESSEE: SM, John C. Brown, NO4Q — ASM/ACC: WA4GLS. OO/RFI: W9FZW. PIO: WK4V. SEC: WA4GZQ. SGL: WA4GZZ. STM: NG4J, TC: W4HHK. Have been advised of a special class of handicapped in a Novice class under the guidance of KB4BLL. Your SM is looking forward to their entry into the amateur fraternity. The annual hamfest season is well on the way and we have plenty for all in this section. The section staff will be looking for-

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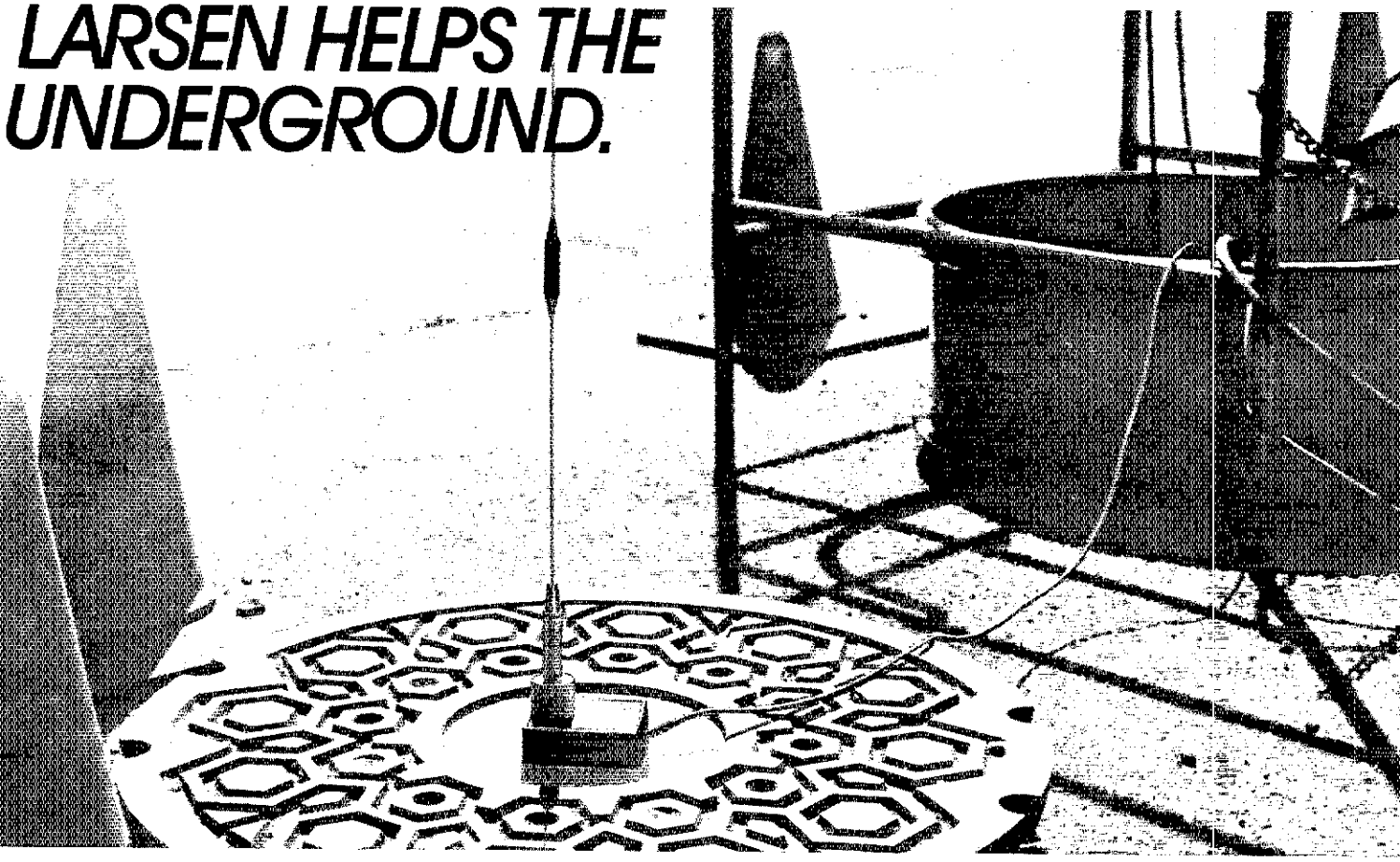

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ward to seeing as many as possible thoughout the season to discuss all phases of the operations within the Tennessee Section. Will be interested in your comments. Have been advised that the Music City hamfest is looking toward a two-day affair next year. Would like to request that all clubs in the section place your Section Manager on the mailing list of the club newsletter. Might be able to use an item from them for this report. Chance to get items in for club. Use the address on page 8 of this QST. How about getting some or all the new Novices involved in the TSN for some gud traffic handling training. Notice a lack of them in the TSN Honor Roll. This month's Honor Roll is as follows: K9IMI W4DDK WV4E NG4J NN4D K4HVA KA4BSG. The section participation in DRN5 did not make it to 100%, but close-96.47%. How aboput joining the TN DRN5 team with K4WWQ. Nets: LF — sessions 93, QNI 4798, QTC 93; VHF-sessions 86, QNI 2171, QTC 804; CW — sessions 60, QNI 437, QTC 130. There are many stations with a lot of activity not shown in the following list. How about giving a report? Traffic: NG4J 250, W9FZW 236, W4WXH 208, K4WWG 149, W4DDK 119, W4MRD 101, WV4E 74, W4ZJY 72, WD4GYT 60, KA4BSG 50, WD4SGI 38, KE4LS 27, W4PFP 23, W4TYV 2, KA4ZNU 20, K4JGW 19, K4WOP 17, W4PMP 12, WM4U 10, WB4YPO 9, NN4S 8, KB4UQ 8, KA4MNH 6, W4PSN 4, W4EWR 3.

GREAT LAKES DIVISION

KENTUCKY: SM, Ann Jackson, KA4GFU — SEC: WA4JAV. STM: KA4BCM. OO/RFI: N4GD. BM: WA4AGH. PIO: K4TAJ. ACC: W4OYI.

KRN	3959	1130Z	WA4IUW		
MKPN	3959	1330Z	KA4SAA	1225	149
KTN	3959	0000Z	KA4SKV	1195	112
KYN	3600	0100Z	WD4IYI	150	54
KSN	3600	0330Z	KZ8Q	165	76
KNTN	3727	0000Z	KB4OZ	288	68

KYPON 67/5, KEN 89/11, BARES 82/8, CARN 123/16, NKARC 42/0, TSTMN 519/66, WTEN 53/6, 3ARES 30/1, 4ARES 74/4, 5ARES 58/1, 7ARES 37/0, 11ARES 90/8. Traffic: WA4JTE 312, KA4SAA 176, WD4BSC 167, WD4IYI 76, KA4BCM 73, K4HOE 48, KA4SKV 47, K4MHL 44, WK4D 36, WA4JAV 36, WA4EBN 34, KA4MTX 34, W4WQV 28, WA4AVV 24, WD4RWU 20, WD4PBF 19, N4HZT 12, WD4IYH 12, KF4YP 12, W4PKX 11, WA4SWF 11, WA4YPQ 11, WA4AGH 10, WD4CJQ 10, KA4GBZ 10, KA4YIV 9, WA4NOG 7, WD4IXS 6.

MICHIGAN: SM, James R. Seeley, WB8MTD — ASM: WA8DHB. SEC: WA8EFK. STM: WD8RHU. ACC: K8SB. PIO: KC8K. SGL: N8CNY. TC: WB8BGY. BM: KZ8V.

Net	Freq.	Time/Day	QNI	Tfc	Sess.	Mgr.
MITN*	3953	1900 Dy	688	388	29	WD8EIB
MACS*	3953	1100 Dy**	656	357	29	K8LNE
OMN*	3663	1800 Dy**	1053	312	87	KV8U
MNN*	3722	1730 Dy**	318	85	58	KA8NCR
UPN*	3922	1700 Dy	812	74	43	WA8DHB
GLETN	3932	2100 Dy	765	61	29	WD8IBY
WSSBN	3935	1900 Dy	733	34	29	WB8EYM
TASYL	3922	1900 M	15	3	2	WD8DUG
VHF nets	13 reports		1247	123	77	W8CUP

*NTS nets, Times local. **QMN late net, 2200; MNN late net, 2000; MACS Sn, 1300, ARES net Sn, 3932, 1730. Traffic Workshop Sn, 3953, 1600; ARRL Info Net, Sn. 3953 1500. 3932 is MI HF emer. freq. The MI Certificate of Meritorious Service was awarded to K8KQJ for his outstanding contributions during his term as NM for MITN. Congrats to ARROW, Inc. on their achievement of S5C status, number three in MI's ever growing list. For our Ohio friends, congrats of sympathy, whichever is appropriate, on DARA's getting the nod as VEC for the 8th "region." I am sure they will bring honor to this vital role. I enjoyed my get-together with the Branch Co. (Coldwater) ARC. This is a club which makes few headlines but which deserves much credit for consistently "doing things right." They are especially strong in public service and community relations, qualities which make a club a valuable asset to the hobby these days. WB8HSN reports on the "flipping" of the Chelsea repeater to 147.255/.855 as of Apr. 1. This is a good move. Users of the Wyandotte machines especially are sure to be pleased. This is another commendable example of self-discipline and voluntary cooperation in the Amateur Ranks. Is REACT a dirty word? How about MEP? MES? Believe it, Virginia, Amateur Radio and CB CAN live together when it comes to emergency and public service operating. This is particularly true in the barren northern reaches of our state, as numerous reports to this office bear out. Where the hams are spread thinly, help is needed, and serious CB ops often can be of invaluable help if proper link-ups can be worked out. Make note of WB8WKQ's 1401 traffic total for February. This beats anything I've seen for MI, and most surely is a record for recent times. Excellent! BPL: WB8WKQ KA8CPS. Traffic: WB8WKQ 1401, KA8CPS 571, W8QHB 359, WD8LRT 217, W8UE 196, WB8SIW 156, AF8V 154, WD8RHU 134, KA8OWN 123, WD8MJB 122, WA6YMH 107, WB8MTD 102, KA8NCR 93, WA8DHB 90, K8OCP 85, N8EBG 80, WD8OUO 76, K8KQJ 73, K8GXV 67, KA8KAK 61, W8IHX 60, W8CUP 53, K8UPE 49, WB8YDZ 46, WD8EIB 45, K8EQO 41, KI8Q 39, K8ZJU 37, KS8P 36, W8SCW 35, N8CNY 32, W8YIQ 30, KA8JCL 28, KA8PQH 27, KA8PQO 26, N8EBN 24, W8VIZ 24, WB8TTA 19, N8EOR 16, WBTBP 15, W8URM 15, W8LDS 14, WB8YRY 11, KB8TD 6, KV8U 6, WB8YWA 6, W8YZ 6, KF8M 5, N8EOI 3, KT8G 3, WB8HSN 3. (Jan.) KA8OWN 23, KA8PQO 4.

OHIO: SM, Allan L. Severson, AB8P — SEC: K8AN. STM: K8OZ. ACC: K8US. PIO & SGL: N8CVK. TCC: KB8MU.

Net	QNI	QTC	Sess.	Time (local)	Freq.
BN	363	283	58	6:45/10 P.M.	3.577
BNR	330	80	29	5 P.M.	3.605
BSSN	403	185	54	9:45 A./7:15 P.	3.927
ONN	168	39	23	6:30 P.M.	3.708
OSN	248	102	29	6:10 P.M.	3.577
OSSBN	2433	1326	87	10:30 A.M. 4:15 & 6:45 P.M.	3.9725
OSSN	102	26	25	6:45 A.M.	3.577
O6MN	—	—	—	9:00 P.M.	50.160

After a week of reflection, I still think this year's Ohio State Convention in Cincinnati on the last weekend of February was one of life's memorable events. A little strong, you say? Perhaps, but not very. K8JE WA8SSI W8ALW W8AUV WA8STX N8XX and all the others really made it work. Roll on 1985 when Cincinnati ARRL '85 will startle and amaze us as its elder sisters have done! And it was terrific to see so many friends and to make a number of new ones. I hope to see many more of you at this season's hamfests. Here's a challenge for all of us Ohioans: Representative Robert Netzley, Laura, Ohio, has introduced House Bill 713, hoping to eliminate the power of local zoning jurisdictions to enact restrictive antenna or tower ordinances. Under the proposed bill, their jurisdiction will be limited to regulation for proper maintenance or manner of construction to protect public health and safety. I think this

is something all areas of Amateur Radio in this state should support, especially those of us, like AB8P and K8YUW, who had the specter of no antennas at all facing them. But this is going to be a much longer and more intensive fight. My thanks to N8EEO for his work with Rep. Netzley, and, of course, to Rep. Netzley. I hear that the NOARS folks are planning even more operating modes for this year's USS Cod (the WWII sub moored on Cleveland's waterfront). RTTY? Watch for their operations. Congrats to NF8I (ex-WD8IRZ) who just upgraded to Extra in spite of (or perhaps, because of) numerous serious medical problems. Appointments: EC, Sandusky Co.: WB8KWD. Welcome back!

Local Nets	QNI	QTC	Sess.
ALERT	111	8	8
BRTN	248	108	29
COARES	99	2	3
LCNWO	249	142	36
LORAIN CO	73	17	21
NCTW	16	8	10
Medina Co.	314	57	29
NEON	125	45	23
RARA	67	5	5
TSRAC	1031	91	31
VWCEN	35	2	4

Traffic: WD8MIO 876, W8PMJ 482, KV8Q 398, WB8DMF 363, WD8KFN 337, K8QZ 326, WB8KWD 307, N8FCO 262, KA8CGF 227, WB8MEK 226, W8QZK 203, WB8MRL 196, K8ND 183, W8BO 172, KA8GJV 156, AB8P 143, N8EVC 126, WA8HGH 109, KF8J 109, N8CW 105, W8SKP 96, W8EK 92, K8JE 89, KA8IAF 87, WB8UBR 83, WB8HHZ 79, WA8GMT 75, K8AN 72, WA8HED 65, WD8RGS 63, W8WEG 62, WD8RGP 57, KA8ICH 54, K8TVG 52, N8AKS 49, WD8IKC 47, WD8KBW 46, N8AEH 44, WB8YTD 41, WB8JGW 39, WB8SRC 36, KA8GMF 34, K8CKY 30, WA8SSI 30, W8RG 29, K8VOY 25, W8BHL 23, N8DZA 22, W8UPD 22, K8RC 21, KC8JI 20, K8NJQ 20, WB8SIQ 20, W8ZM 20, WB8HMI 19, N8CJS 17, WD8OYK 15, K8LQM 14, WB8NHV 14, K8CMR 13, W8OQL 13, NC8Q 12, KA8GGZ 10, WB8VOA 9, W8FUP 8, K8YUW 8, WD8AYH 7, WD8EKI 5, KA8NEV 5, WB8NTR 5, N8AJU 4, WD9HDZ 4, N8CGM 3. (Jan.) KA8GJV 81, WD9HDZ 16, N8BHQ 4.

HUDSON DIVISION

EASTERN NEW YORK: SM, Paul S. Vydareny, WB2VUK — STM: WB2MCO. SEC: AK2E. ACC & TC: N2BFG. BM: WB2EAG. SGL: KB2HQ.

Net	Time/Day	Freq.	NM
EPN	2200Z	3.902	KC2TF
ESS	2200Z	3.590	W2WSS
NYS	2300/0200Z	3.677	WB2MCO
NYS/M	1400Z	3.677	WB2EAG
NYPON	2100Z	3.913	WA2KOJ
NYSPTEN	2200Z	3.925	—
CDN	2230Z	146.34/94	WB2ZCM
HVN	2330Z SSnM	144.535/135	N2BDW
HVN	2330Z T-F	146.37/97	N2BDW
SDN	0130Z	147.66/06	K2ZVI
SCRN	0000Z	147.735/135	KV2U

Nets: NYS/E/L QNI 900, tfc 964; NYS/M QNI 412, tfc. 343; EPN QNI 192, tfc. 143; ESS QNI 388, tfc. 98; NYPON QNI 743, tfc 761; SDN QNI 359, tfc 165; CDN 774 tfc 230; Schen. 2-Mtr QNI 69; Ulster RACES: QNI 28, tfc 6; THIN QNI 58. If your favorite net does not appear, NM either did not submit report or was too late! CLUB NEWS: Rip Van Winkle ARC reports KA2QYG new prez. AARA: W2ANB received 60-year ARRL plaque, also they have a new member WB2DGE; SARA had packet radio program Silent Key K2DLD; WARA had K8KA on digital comm. BPL: WB2MCO. PSHR: WB2EAG KC2TF WB2MCO KA2OPG WB2OHR WB2ZCM WB2VUK K2ZM K2ZVI W2BIW W2PKY AK2E K2HNW N2EQM. Traffic: KC2TF 480, WB2MCO 338, WB2EAG 337, WA2JBO 257, K2ZM 245, WB2VUK 240, WB2ZCM 240, W2PKY 237, K2ZVI 159, W2BIW 140, N2EKS 138, KA2OPG 135, K2HNW 93, WB2OHR 64, WA8MAZ 54, WB2TWQ 43, N2AWI 40, N2EQM 34, KA2MYJ 34, W2SWA 30, AA2Y 27, WB2HQK 24, N2BFG 16, WB2SON 12.

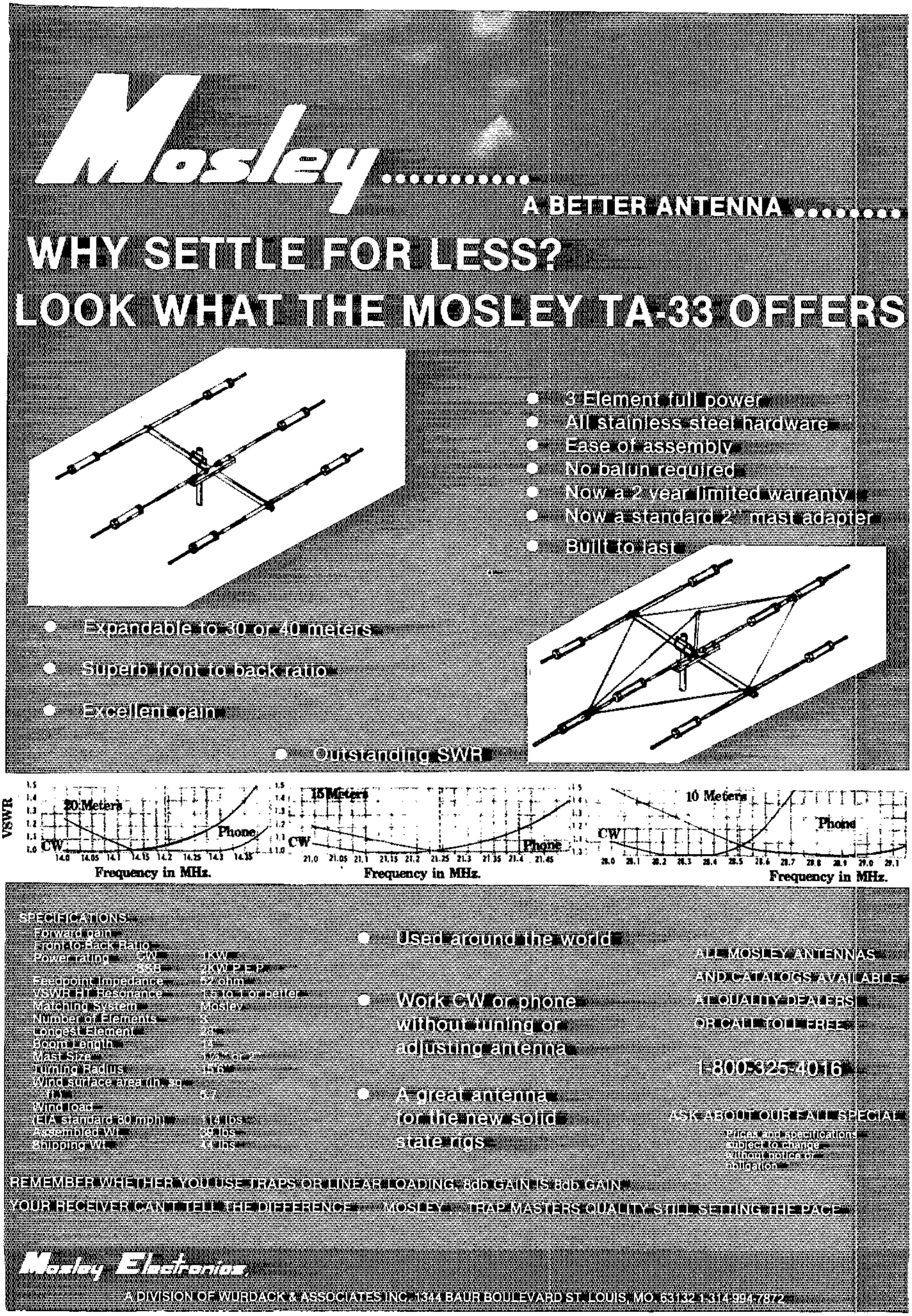
NEW YORK CITY — LONG ISLAND: SM, John H. Smale, K2IZ — SEC: WA2SUB. STM: K2GCE. ACC: WB2IAP. OO/RFI: NB2T. TC: W2JUP. PIO: W2IYX.

NLI CW*	3630	1900/2200	N2AKZ
NLIPN*	3928	1815	KS2G
NCVHF	6.145/745	1930 M-F	K2MT
SCVHF	4.775/.37	2030 M-F	WA2ARC
BAVHF	6.07/67	2000 M-F	WB2BNA
ESS	3590	1800	W2WSS
NYS/M	3677	1000	WB2EAG
NYS	3677	1900/2200	WB2EAG

*Denotes section net; all times are local; please try and help out by checking in whenever possible. Plan now to attend the ARRL National Convention, July 20-22 at the New York Statler. Dr. Owen Garriott, W5LFL, will be the guest speaker at the banquet. See the ads in *QST* for ticket info. KA2RGI is now the EC for the Town of Babylon. Anyone interested in a Commodore Users Group should contact the Long Island Commodore Users Group (LICUG), P.O. Box 92, Seaford 11783. WA2UJH has moved back to Nassau Co. after several years of moving about the country. The following members of Wantagh ARC have upgraded: KA2MCV, Novice to Gen; N2EPJ, Gen to Adv; KA2PDQ, Adv to Extra. Also, KA2PKZ is now KD2EP. The club also welcomed new member W2NJD. KA2MUM now has a Yaesu FT 290R. Radio Central ARC expresses their thanks to N2AOF who, through his place of work, donated an IBM Model 11 copy machine to the club. If you're in the area, why not stop in any Thursday at noon in the Rocky Point Diner for the "RCA" luncheon. This is the group from Radio Central. All are welcome. Congrats to KA2OKZ who upgraded to Gen. to and KA2IKT who passed his Tech. The Larkfield ARC is conducting a technical Q & A net after the Smithtown RACES net on the 145.43 rptr at 8:45 local on Monday nights; WB2AZT is NCS. NB2T reports that TUBORO has a RTTY net, at 1930 local on 145.62. Officers for TUBORO are KZ2W, pres.; N2RB, v.p.; N2CKK, treas.; NB2T, secy. Metroplex has been designated by the FCC to be the 2nd district Volunteer Examiner Coordinator (VEC). Their address is: Metroplex Amateur Communications Assn.; P.O. Box 237; Leonia, N.J. 07605. Congrats to N2AKX on making BPL. Traffic: N2AKZ 830, K2GCE 128, KC2YZ 110, W2GKZ 88, W2DBQ 68, N2BGP 59, N2BQD 33, WB2BNA 32, K2YQK 27, WB2T 20, KS2G 16. (Jan.) KC2YZ 36, WB2BNA 21.

NORTHERN NEW JERSEY: SM, Robert Neukomm, KB2WI — SEC: WB2VUF. STM: W2XD. BM: N2BOP. RCC W2CC. SGL: W2KB. PIO: WB2NQV. TC: AD7I. ACCs: KK2U KY2S. NMs: W2CC KB2HM WB2RMJ WB2IQJ WB2QMP N2XJ WB2ANK W2PSU.

Net	Freq.	Time	QNI	QSP	Sess.
NJM	3695	1000 Dy	182	87	29
NJPN	3950	1800 Dy	373	182	33
		0900 Sn			
NJSN	3735	1830 Dy	185	81	29
NJN/E	3695	1900 Dy	342	241	29



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• Superb front to back ratio
• Excellent gain
• Outstanding SWR
VSWR
20 Meters
CW
Phone
Frequency in MHz.
15 Meters
CW
Phone
Frequency in MHz.
10 Meters
CW
Phone
Frequency in MHz.
SPECIFICATIONS
Forward gain
Front-to-Back Ratio
Power rating CW 1KW
SSB 2KW P.E.P.
Feedpoint Impedance 52 ohm
VSWR at Resonance 1.5 to 1 or better
Matching System Mosley
Number of Elements 3
Longest Element 28'
Boom Length 14'
Mast Size 1½" or 2"
Turning Radius 15'6"
Wind surface area (in sq. ft.) 6.7
Wind load (EIA standard 80 mph) 114 lbs
Assembled Wt. 39 lbs
Shipping Wt.
• Used around the world
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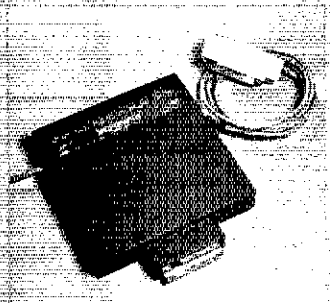
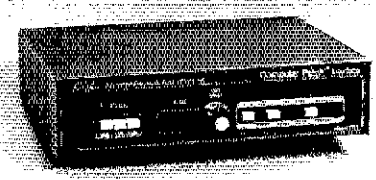
MICROPATCH™ Low-Cost/High-Performance Interface with Software



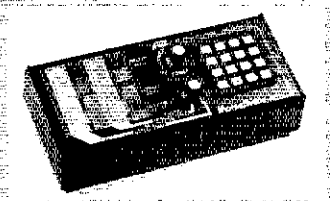
The **MICROPATCH™** computer interface is our latest example of engineering excellence bringing you superb value at a low, low price. The MICROPATCH is a COMPLETE RTTY/CW/ASCII PLUG-IN HARDWARE/SOFTWARE PACKAGE for either the Commodore 64 (model MP-64) or VIC-20 computer (model MP-20). The MICROPATCH includes MBATEXT™ software which is currently the most extensive and most user-friendly communications software available for the VIC-20 or C-64 computers. The hardware outperforms any competitive unit we have tested under $200, but is easily up-gradeable to the CP-1 Computer Patch™ without sacrificing $90 worth of software. You can also use it with any other computer by making use of the MICROPATCH hardware and procuring new software. The MICROPATCH is extremely easy to integrate into your station by simply wiring a mating microphone connector onto a cable pre-wired to the MICROPATCH and by providing audio to the 3.5 mm jack on the MICROPATCH from your receiver external speaker jack. The MICROPATCH comes complete with keyboard overlay prompting aid and operator's manual. Operates from 12VDC (power supply not included). For more information, see your dealer or use the coupon below.

COMPUTER PATCH™ Deluxe Interface



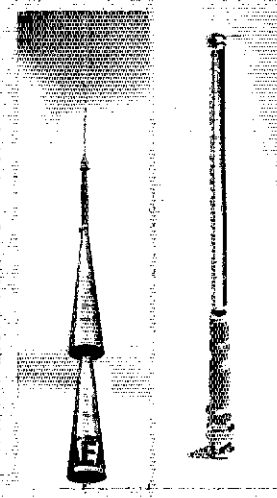
The **COMPUTER PATCH™** interface has earned a solid reputation for outstanding performance at a very reasonable cost. The COMPUTER PATCH features dual-channel Mark and Space filtering with a sophisticated Automatic Threshold Correction (ATC) circuit that allows for good copy even when either one of the tones is totally obliterated. The COMPUTER PATCH has become the new standard of excellence for computer interfaces. 117VAC wall adapter supply is included. AEA now has software available for most popular computers, including AMTORTEXT™ for the C-64 when used with the CP-1 or MICROPATCH.

MORSEMATIC™ Advanced Keyer/Trainer



AEA has developed the most sophisticated line of automatic microcomputerized Morse keyers and trainers in the world. AEA keyers and trainers are the standard against which all others have been judged and have fallen short. Two of our trainers (Model BT-1 and KT-3) are designed for people who have never learned the Morse Code. The BT-1 and KT-3 utilize our basic training program which actually teaches the code at 18 or 20 WPM character speed and allows you to go to 99 WPM. The proficiency training programs in the MM-2 and KT-2 are designed for the person who already knows the Morse Code, but wants to upgrade in the shortest time possible. All AEA keyers operate from 12VDC (power supply not included).

ANTENNAS



The **ISOPOLE™** patented antenna has caused more excitement in innovative VHF antenna design than any antenna in recent history. Initially called a "gimmick" antenna by our competitors, all the laughter has long since subsided as the ISOPOLE has proven to be a high performer, rugged yet sleek appearing, and easiest of all to assemble, with little chance for installation or tuning errors.

In the same vein, the AEA **Hot Rod™** antenna is shorter, lighter and less bulky than competitive 5/8 wave two meter handheld whips. Equally important, the Hot Rod does not have an out-of-phase current at the base that distorts the pattern as in the case of the 5/8 wave competitors. This means actual on-the-horizon gain for the Hot Rod relative to the 5/8 wave. In spite of the fact that a tuning network to match an end fed half-wave is far more difficult to achieve than for a 5/8 wave, the Hot Rod is priced to compete.

Since our beginning in 1977 with one unique and innovative product, our product line has grown to over 30 catalog items. For your free catalog describing all our fine products in detail, please fill out and return the attached coupon or better yet, see your dealer.

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More Than Parts from Amp Supply

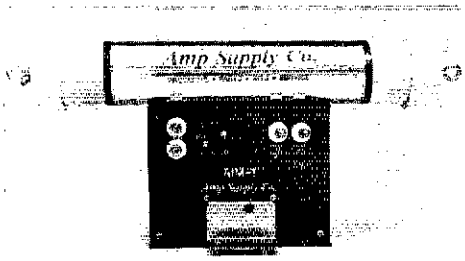
LA-1000A

The LA-1000A is a portable kilowatt now covering 160-15 meters. Typical drive requirement is 100 watts PEP yielding 1200 watts PEP SSB 700 watts CW. The compact linear uses four 6MJ6 tubes, has a tuned input and QSK built in and comes in an attractive gray-on-gray finish.

This is a super linear for all purposes, the LA-1000 excelled during the Heard Island DX pedition with over 30,000 contacts. The rugged design lends itself to continual use during contests and users are even running it on RTTY at 500 watts input.

LA-1000A **$399.50***

NEW LA-1000NT
No Tuneup Version **$489.50***



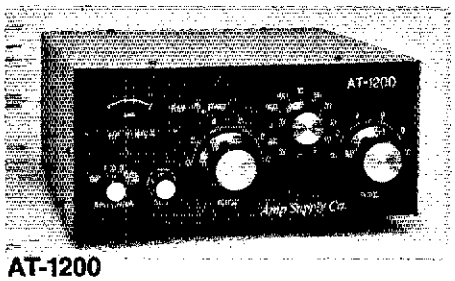
AIM-1™

Major Antenna break through!

The AIM-1 is an antenna impedance matching network for random, long wire or loop antennas. It provides continuous coverage from 500 KHz - 30 MHz, is completely *automatic*, no knobs to turn or coils to tap. Installation is simple; hook on wire antenna, ground, coax cable to station and balancing module at opposite end of wire. The antenna is ready for transmission from 1.8 - 30 MHz at up to 3KW PEP.

- SWR max 2:1, 1.5:1 average
- wire lengths should be 1/2 wave on lowest frequency for maximum efficiency.
- inverted V, inverted L, rombic, random wire or loop antennas
- weatherproof
- 2 year warranty

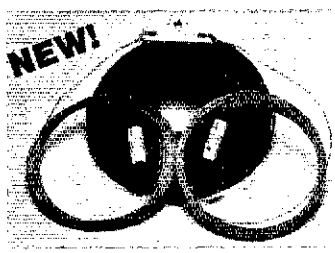
AIM-1 ..... **$129.50***
with 130' antenna wire and insulators $139.50*
Stranded Ant. Wire .08 ft.



AT-1200

The AT-1200 antenna tuner is the perfect companion for the LA-1000A or any amplifier running up to 1200 watts input. It covers 1.8 to 30 MHz, has an antenna selector switch for 3 coax positions and 1 long wire or balanced feedline, and a built in SWR bridge and meter.

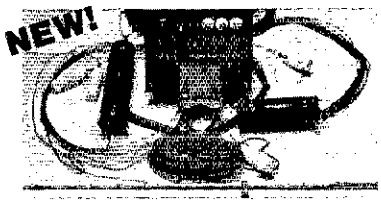
AT-1200 ..... **$179.50***



Original ALL BAND DOUBLET

The return of an old time favorite. This is the 160-10 meter wire antenna that has been held in high regard for years. The AMP SUPPLY "ALL BAND DOUBLET" features a strong heavy duty center insulator and is completely assembled ready to pull up into the air. This doublet is center fed with 100 feet of 470 ohm balanced transmission line and the antenna is 130 feet long. Purchase the AMP SUPPLY "BL-1500" 9:1 transformer and tune this antenna with your favorite antenna tuner on any band 1.8-30 MHz.

All Band Doublet **$39.50***
BL-1500 9:1, 5KW Pep Balun **$29.50**



SAS-1 Sloper Antenna System

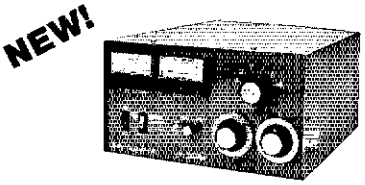
Another FIRST from AMP SUPPLY. The SAS-1 sloper matching and decoupling transformer. Simply bolt the SAS-1 weather-proof box to the top of your tower, hook up the 50 ohm coax feed line and a 1/4 wave piece of antenna wire and you're ready to go. The SAS-1 takes all the pains out of sloper antenna systems. The SAS-1 covers 1.8-10.5 MHz., and handles 5KW PEP. Purchase the SAS-1 matching box separately or you may want the complete system ready to go on 160, 80, 40 and 30 meters. We offer a complete sloper system covering 160-30 meters complete with all elements, ground rod, insulators, nylon rope and ground radials. The sloper antenna covering all these bands is only 60 feet long. The sloper antenna is also available separately. Transform your entire tower into a dynamite low frequency antenna system with the SAS-1 sloper system.

SAS-1
Sloper Matching Network **$49.50***
SA-4 Sloper Antenna
160, 80, 40 and 30 Mtrs **$44.50***
SAS-1 and SA-4
Deluxe Sloper System **$99.50***

* *

New Products

* *



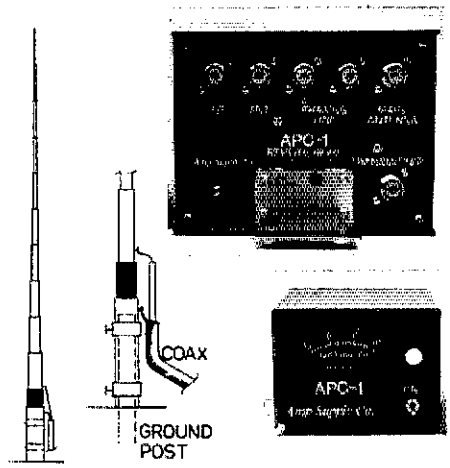
LK500ZA 2.5 KW AMPLIFIER

The all new Amp Supply LK-500ZA 2.5 KW Input Amplifier is the right amplifier, with the right features at the right price. The LK-500ZA is available in kit form or completely assembled and covers 160-15 meters. Two Eimac 3-500Z triodes in grounded grid are featured with a dual cooling system, one for the power supply and the other cooling the 3-500's. There's only one 2.5 KW amplifier with a pair of 3-500Z tubes in the world that sells for under $800.

The Amp Supply LK-500Z!

- 2.5 KW SSB PEP Input: 1500 Output
- 1.5 KW Input CW :900 Output
- 1 KW SSTV, RTTY Input: 600 Output
- QSK Full Break-in CW
- 9" H x 15" W x 15" D
- 117/234 AC 50/60 Hz

LK-500ZA
Wired and Tested **$799.50***
1500 Watt Output
All Mode with Hipersil Transformer .. **$999.50***



AEX-1, APC-1

The AEX-1 is a 33' self-supporting vertical full 1/4 wave on 40 meters (or any band). It is constructed of adjustable seamless aluminum, and will handle 4 KW.

The APC-1 is a two piece phasing control for verticals, dipoles or loops. The outside switching box and the indoor control system combine to eliminate all phasing guess work.

AEX-1 ..... **$79.50***
APC-1 ..... **$99.50***
APC-1 + 3 AEX-1 antennas .. **$299.50***
This combination provides complete 360 degree rotation.
80 Meter Add-on **$24.50***

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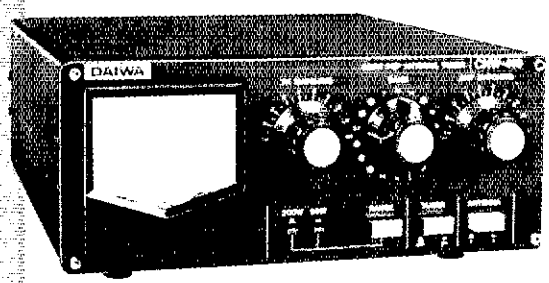


CNW-419 All Band Tuner

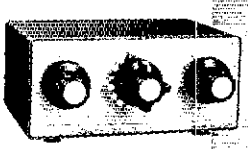
Specifications

●Frequency Range:1.8 ~ 30MHz, CONTINUOUS ●Power Rating:200 watts CW, 500 watts SSB ●Impedance Range:10 ~ 250 ohms ●Dimensions:225W × 90H × 245D(m/m)

CNW-518 High Power Tuner

Specifications

●Frequency Range:3.5 ~ 30MHz, (8 bands) ● Power Rating:1 kw CW (50% duty) ●Impedance Range:10 ~ 250 ohms ●Dimensions:225W × 90H × 275D(m/m)



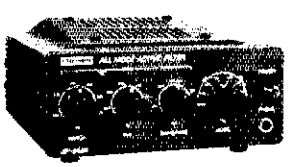
CL-680 Economy Tuner

Specifications

●Frequency Range:1.8 ~ 30MHz CONTINUOUS ●Power Rating:200 watts CW, 500 watts SSB ●Impedance Range:10 ~ 250 ohms ●Dimensions.165W × 75H × 970D(m/m)

DK-200/DK-210 Electronic Keyers

CW is both communication and art. Sharpen your "fist" with Daiwa precision!



AF-606K/AF-406K All Mode Active Filters

Luxurious selectivity at an affordable price!

CN-520/CN-540/CN-550 Cross Needle Meters

Daiwa cross-needle convenience in a compact case. Get SWR and Power readings in a single glance.

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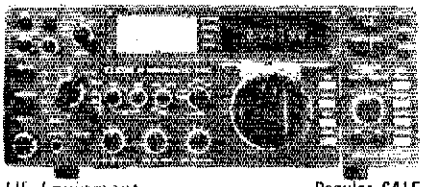
Exclusive U.S. Agents for these DAIWA products. Dealer inquiries invited.



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IC-740* 9-band 200w PEP xcvr w/mic	$1099.00	949.95

***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	599.95
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	899.95
FL-32 500 Hz CW filter	59.50	
FL-34 2.2 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	1229
PS-35 Internal power supply	160.00	144.95
FL-52A 500 Hz CW filter	96.50	89.95
FL-53A 250 Hz CW filter	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	
RC-10 External frequency controller	35.00	
CR-64 High stability reference xtal	56.00	
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	
CF-1 Cooling fan for PS-15	45.00	
PS-20 20A switching ps w/speaker	229.00	199.95

ICOM

Options - continued	Regular	SALE
CC-1 Adapt. cable; HF radio/PS-20	10.00	
CF-1 Cooling fan for PS-20	45.00	
EX-310 Voice synth; 745, 751	39.50	
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
MT-100 Manual antenna tuner	249.00	224.95
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	549.95

***$50 Factory Rebate - until gone!**

IC-551D 80 Watt 6m transceiver	$699.00	599.95
PS-20 20A switching ps w/speaker	229.00	199.95
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	TBA	
PS-35 Internal power supply	160.00	144.95
IC-271A 25w 2m FM/SSB/CW xcvr	699.00	629.95
AG-20 2m preamplifier	56.95	
IC-471A 10w 430-450 SSB/CW/FM xcvr	799.00	719.95
EX-310 Voice synthesizer	39.95	
PS-25 Internal power supply	99.00	89.95
EX-310 Voice synthesizer	39.00	
HM-12 Hand microphone	39.50	
SM-6 Desk microphone	39.00	
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-25A 25w, 2m, grn leds, up-dn TTP mic	359.00	319.95
IC-25H as above, but 45w.. (Special!)	389.00	339.95
BU-1H Memory back-up	38.50	

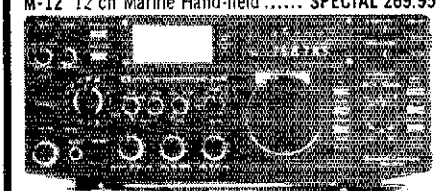
Limited Offer! **Get a FREE BU-1H Memory back-up with your purchase of an IC-25H.**

IC-27A 25w 2m mobile transceiver	369.00	329.95
EX-388 Voice synthesizer	TBA	
IC-45A 10w 440 FM xcvr, TTP mic	399.00	359.95
AG-1 15 db 440 Mhz preamplifier	89.00	79.95
EX-270 CTCSS encoder	39.00	
BU-1 Memory back-up	38.50	
RP-3010 10w 440 Mhz FM repeater	999.00	899.95
IC-120 1w 1.2 GHz FM transceiver	499.00	449.95
RP-1210 10w 1.2 GHz FM repeater	1199.00	
Cabinet for RP-1210 or RP-3010	249.00	
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-02A for 2 meters	$319.00	289.95
IC-02AT w/DTMF	349.00	314.95
IC-04A for 440 MHz	TBA	
IC-04AT w/DTMF	TBA	
Standard models	**Regular**	**SALE**
IC-2A for 2 meters	$239.50	214.95
IC-2AT with TTP	269.50	219.95
IC-3A for 220 MHz	269.95	234.95
IC-3AT with TTP	299.95	239.95
IC-4A for 440 MHz	269.95	234.95
IC-4AT with TTP	299.95	239.95

Accessories for Deluxe models	Regular
BP-7 800mah/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-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 BC30	49.50
CP-1 Cig. lighter plug/cord - BP3 or Dlx	9.50
DC-1 DC operation pak for standard models	17.50
LC-2AT Leather case for standard models	34.95
HM-9 Speaker microphone	34.50
HS10 Boom microphone/headset	19.50
HS-10SA Vox unit for HS-10 (dlx)	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
3A-TTN Optional TT Pad - 2A/3A/4A	39.50
SS-32M Commspec 32-tone encoder	29.95

M-12 12 ch Marine Hand-held ..... SPECIAL 269.95



Shortwave receivers	Regular	SALE
R-71A 100 Khz-30 Mhz digital receiver	$799.00	699.95
FL-32 500 Hz CW filter	59.50	
EX-310 Voice synthesizer	39.50	
RC-11 Wireless remote controller	TBA	
R-70 100 Khz-30 Mhz digital receiver	749.00	599.95
EX-257 FM unit	38.00	
IC-7072 Transceive interface, 720A	112.50	
FL-44A SSB filter (2nd IF)	159.00	144.95
FL-63 250 Hz CW filter (1st IF)	48.50	
SP-3 External speaker	49.50	
EX-299 (CK-70) 12v DC option	9.95	
MB-12 Mobile mount	19.50	

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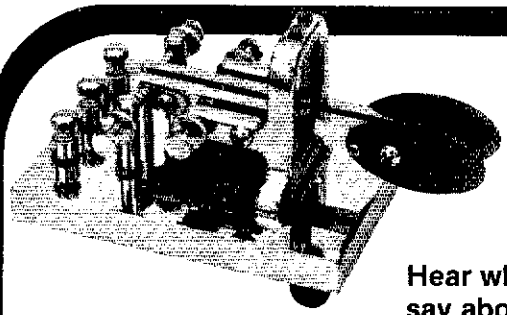

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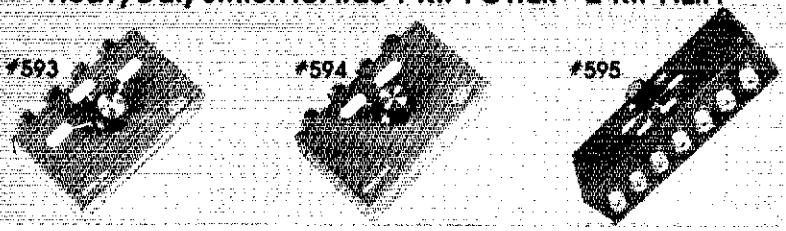

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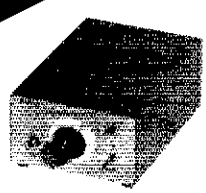

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Increased talk power: Up to 15 dB, adjustable (10 dB recommended under most operating conditions)
Frequency response: 350 Hz — 2.4 kHz at 3 dB down (200 Hz — 3 kHz at 12 dB down)
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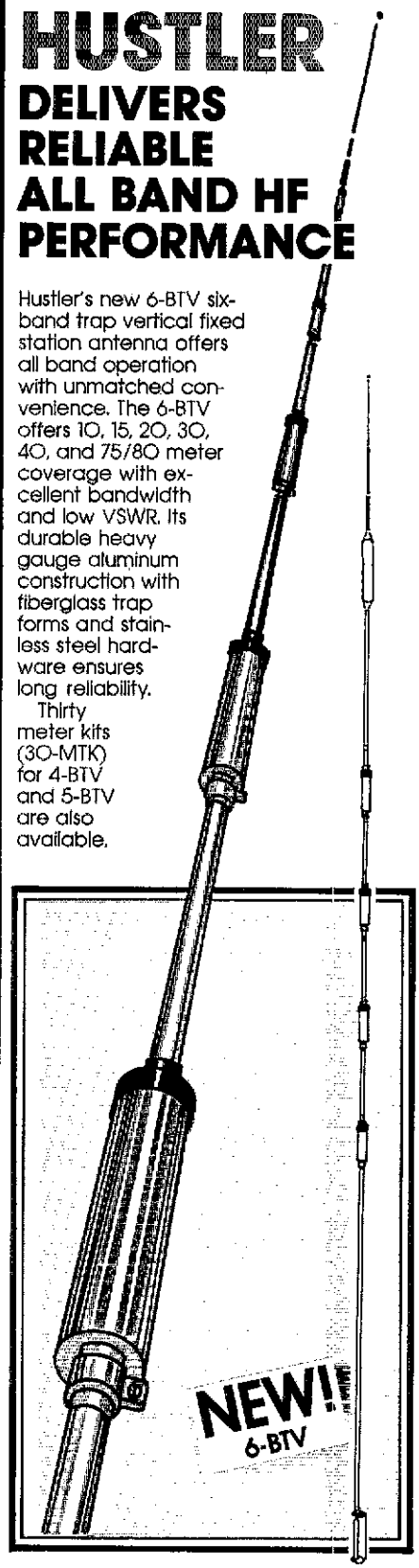
Thirty meter kits (30-MTK) for 4-BTV and 5-BTV are also available.



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OBTTN	147.12	2000 Dy	338	101	29
NJVN	49/49	2230 Dy	267	123	28
NJRTTY	147.51	Autostart			

From *The Propagator* of GSARA: The club raffled off a HW-101 at its March meeting. At this writing the winner is not known. W1OD, who is a member of the ARRL Hq. Technical Dept., gave a talk on his experiences at the St. Paul Island DXpedition. The local QCWA chapter will hold its annual dinner on May 6th at PJ Ruggies restaurant on Route 71 in Spring Lake Heights. Tri-County RA News: WB2RMJ reports that the club's repeater W2LI is now being used routinely after passing a trial period and they are available for all types of emergencies. They have been quite involved in providing communications for the Boy Scouts in the area. *BARA Bulletin:* K2UFM has been awarded the Outstanding Member Award for 1983. BARA celebrated its 29th anniversary this past year and he had the special events station at his QTH, and handled over 500 QSLs as a result of this activity. The Metroplex REPEATER system was shown on a video tape given by their VP WB2MGB. The next Novice class will start April 10. Contact Jim Greer, KK2U, for further information. On May 6th, BARA will hold a flea market at Bergen Community College. The Chestnut Ridge ARC held a flea market at the Reformed Church in Upper Saddle River. W2QQ is now a silent key. OO WA2QZD reports no discrepancies for the month. W2XD reports the need for more liaison stations to 2RN: any help? Upgrade: KA2THS to General. New traffic from Ocean is K2SC. WB1GXZ, assistant NM for NJSN, reports KA2SPH upgraded to General and that WB2IQJ is on the sick list. She also reports that 30 training messages were sent for the month. Join the New Jersey Slow Net to increase your CW speed and learn traffic handling. NJSN meets daily at 6:30 P.M. local on 3735. It is an excellent place to prepare you for your General CW exam. Many graduates now hold the Amateur Extra license. Traffic: N2XJ 403, KB2HM 316, K2VX 182, WB2KLF 163, AG2R 154, KY2P 99, W2XD 78, N2EOV 73, WB2GHN 71, KA2OIW 67, W2ZEP 62, KD2BE 38, K2SC 35, KC2YG 32, W2CC 25, W2RRX 25, W2KB 19, W2UH 14.

MIDWEST DIVISION

IOWA: SM, Bob McCaffrey, KØCY — SEC: WA4VWV. STM: KAØX. TC: KØDAS. PIO: KBØZP. SGL: AKØQ. BM: KØIIR. ACC: WBØQAM. Start your plans for FD and RAGBRAI if they are not completed. Congrats to WBØTEM (WAS #2 220 MHz) and WBØTEM WDØFOY for WAS 144 MHz. KAØLSL now NØFEL. Storm Lake rptr now on 146.175/775 at 310 ft. Hampton has been selected as the sitr of the 75M Picnic. Welcome to new calls KAØRXM KAØQYE KAØSDR KAØSDQ KAØSBI KAØSBJ and KAØSBK, who is in 5th grade. KAØCSI is now Advanced. Twenty five attended Novice class in Muscatine. New officers in Ft. Dodge are N5BZL KDØGH KØARA KØTDO. I am now receiving *NElowa Newsletter*, thanks. Davenport hamfest again a great success. NØETS and WBØZRC cited for their assistance in helping locate persons lost in February blizzard. New officers for CVARC are WBØOET WBØOAU NØCS WDØFRE WD9FQD WAØSYQ. I apologize to WØFO for embarrassing him; should have read WØFQ = 100% rpts. The 146.34/94 is now in IHP tower in DSM at 240 ft. Cass Co. ARES has installed RTTY machine at Red Cross; good coop. PSHR to NCØR KØGP WDØFWB.

Nets	Freq.	UTC	Days	QNI	QTC	Sess.
TLCN	3560	0030/0400	Dy	345	174	58
75-M Phone	3970	2330/1830	M-S	1985	163	50
ICN	3713	0100	M-F	110	54	21

Traffic: WDØFWB 324, KØGP 189, WØSS 118, NCØR 76, WØYLS 73, KAØADF 61, KØCY 58, WØHTP 36, WBØAWW 29, KDØBG 28, WØBW 27, KØTFT 26, KØØI 24, W4JL 20, WBØJFF 19, WØLFF 16, KCØSC 16, WDØGVY 14, KBØOZ 14, KCØXL 13, WBØMCX 12, WDØFOY 4, NØEFG 1.

KANSAS: SM, Robert M. Summers, KØBXF — Congrats to the lucky 4, NØLL KFØM, WAØVJF and WA6YBTØ all being confirmed as having worked W5LFL during his orbit of the Earth. Confirmations were received here after the writing of last month's column. A new ham in Hiawatha is WAØGDX. Big changes happening to the 25/85 repeater in Wichita. A move to new location, the eleven story Wesley Medical Center will increase the coverage. By the way, if you happen to be in Wichita on a Saturday morn, stop by the LaMurra Pancake House East Kellog east of Oliver and chew the pancake with the gang there. Clubs looking for a new program might keep these in mind if you haven't already considered them. An Old Timers Night; consult your QCWA chapters for assistance if need be. Don't forget the newest thing, computers. Several clubs are having demonstrations and discussions on computers. Being the beginning of the STORM WATCH season, no doubt you have already had a seminar with a weather bureau rep present. Sorry to hear the Parsons ARC will not hold their hamfest this year. Don't forget the Salina Convention in June. Contact KBØEY for more info. Net results follows (QNI/QTC): KSBN 1249/146; KPN 317/18; KWN 949/768; KMWN 678/617; CSTN 2009/97; QKS 370/111; QKS-SS 69/18. Traffic: WØFIR 206, WØKL 179, WØFRC 163, KSØU 151, WBØZEN 147, ACØE 117, WØHI 115, WAØLBB 114, KØBXF 96, WØOYH 69, WØFDJ 65, WØQMT 38, WØMYM 18, KDØJM 16, KØGSC 13, WØRBO 10, WØCHJ 10, WØPB 4, KAØE 4. (Jan.) ACØE 105.

MISSOURI: SM, Ben Smith, KØPCK — Club officers and committees for the Rolla Regional ARS are: KBØKD, pres.; WØRQL, v.p.; WØPIV, secy/treas.; programs and publicity, KØRDJ, chairman, KYØY KBØKB, members; club picnic KAØENC NØEAT, co-chairman, WØDLG KAØDFU KBØFS, members; Field Day NØBWW KAØCEU, co-chairman, WØNFI KAØBBL NØFDJ WBØYSI members with WBØWWD and KBØKD in charge of the club newsletter. Again this year the Central Missouri RA will underwrite the Amateur Radio booth at the Missouri State Fair, with KT5Y and KØPCK coordinating the operation of the booth. Thanks to all of the clubs and individuals who donated money to help finance the station and to those who came and helped operate the 1983 state fair station. It was very successful. We will be working to make the 1984 operation as successful. Donations for the state fair station may be snt to: CMRA, P.O. Box 283, Columbia 65201, or if you or your club would like to be put on the operating schedule, contact KT5Y or KØPCK. We would like to see more clubs schedule days as a club project. It was a very enjoyable afternoon for KT5Y and me when we attended to Lake Ozark ARC meeting. With over sixty members and a lot of enthusiasm, it is a club with the ability for a lot of accomplishments as already proven by the success of their local 2-meter and CW nets under the leadership of net manager WØRTL. It is with regret to report the following Silent Keys: KBØRN WDØESN. Eastern Ozark ARC 1984 officers are: AFØJ, pres.; WØZKY, v.p.; WØFWY, secy.; WBØUEV, treas.; ALØH WDØGGF KAØCUU, directors,

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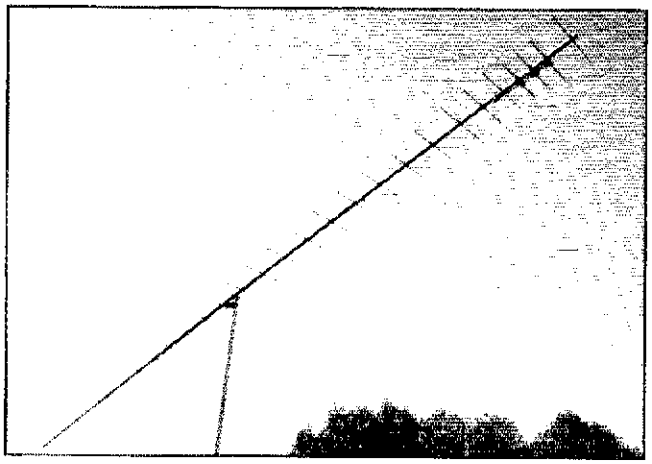
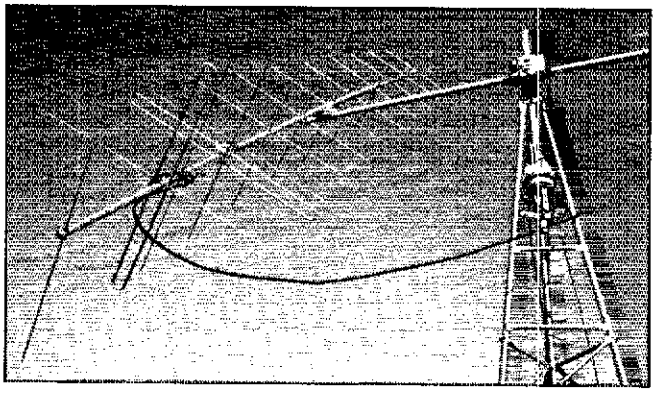
Four or more 2M-22Cs make an excellent array for Moonbounce (EME) by elminating Faraday fading.

Fiberglass/aluminum stacking frames are available as well as 2 and 4 port power dividers and phasing harnesses to optimize the performance of these type arrays. Watch for our new elevation drive system coming soon.



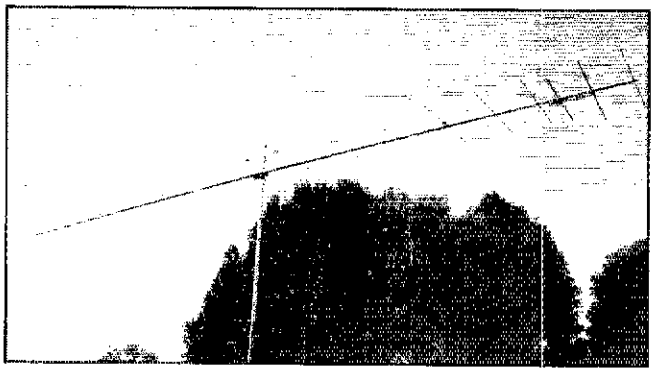
432-30LBX

BANDWIDTH	430–440 MHz
GAIN	
BEAMWIDTH	20°
FEED IMP	50 ohms unbal.
BALUN	included
BOOM LENGTH	21 ft. 9 in.
F/B	F/S
VSWR	1.5:1
WINDLOAD	1.43 sq. ft. (typical)
TURNING RADIUS	12 ft. 5 in.
WT. (lbs.)	9 lbs.



2M-22C

BANDWIDTH	144–148 MHz
GAIN	
BEAMWIDTH	34°
FEED IMP	50 ohms unbal.
BALUN	(2) 4:1 coax
BOOM LENGTH	19 ft. 1 in. (tapered)
VSWR	1.5:1
WINDLOAD	1.85 sq. ft.
ELLIPTICITY	3 dB max.
CIRCULARITY SWITCHER	CS-3 included
WT. (lbs.)	11 lbs.



2M-16LBX

BANDWIDTH	143–146 MHZ
GAIN	
BEAMWIDTH	(V) 28°, (H) 33°
FEED IMP	50 ohms unbal.
BALUN	4:1 RG303, Teflon
BOOM LENGTH	28 ft. 1 in. (tapered)
VSWR	1.4:1
WINDLOAD	(H) 1.75 sq. ft. (V) 2.44 sq. ft.
WT. (lbs.)	10 lbs.
TURNING RADIUS	15 ft. 6 in.

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MOSSB	29	922	93	KT5Y
PHD	4	88	7	WA0KUH
MON	58	381	298	K0SI
CALN	4	44	0	KS0B
CMEN	5	62	1	K0PCK
SARN	3	42	0	W0ENW
LORN	4	104	0	W0RTL
LOCWN	4	20	0	W0RTL
HBN	21	419	21	K0DSQ
MEOW	30	638	39	K0DSQ
RRARSBN	24	303	4	KA0BKR
JCCCARES	5	68	0	KC0SF
STLARES	4	212	3	N0BKH
MTTN	17	70	12	N0DDZ
LARESN	4	36	2	WB0RHC

Traffic: W0BMA 604, K0SI 297, AI0Q 281, K0PCK 118, K0BM 104, W0QAU 97, KT5Y 88, K2ONP 67, W0OUD 59, WA0YJX 53, N0DDZ 44, ND0N 36, KG0L 31, K0DSQ 22, KC0AS 18, N0EVC 13.

NEBRASKA: SM, Reynolds Davis, K0GND — A super Midwest Division Convention in Kearney! Congrats to the Midway ARC! Tornado season is upon us; SEC N0AIH reports that local nets are up and running when needed. Be sure than info from WX nets goes somewhere: civil defense, police, sheriff, WX bureau. Speaking of nets, don't forget the NE Novice Net nightly at 0200Z on 3737 kHz. Bulletin Mgr WD0EMR reports increasing interest in the weekly RTTY section bulletin at 12:15 P.M. Central Saturdays on 7085 at 60 wpm. Heard lots on NE stations on the ARRL DX contest; results will be interesting. Congrats to recent upgrades N0EXU K0VLA KA0IRY KA0FMQ KA0RBZ N0EGI & WA0KGD! A reminder that traffic must be numbered w/check to count. You fellas counting WX forecasts should be ashamed! Traffic: WB0TED 204, K0DKM 157, W0KK 145, KA0BCB 48, W0SGA 44, W0NIK 27, WD0EGK 26, K0IXY 23, W0HOP 21, W0ZNI 21, KA0BWM 16, WA0DXY 15, K0GND 14, W0HTA 14, W0RAM 13, KA0BOC 12, WA0BOK 12, N0DGM 9, KA0IOM 9, WB0GWR 8, WA0PCC 8, W0WKP 8, KA0ELI 5, WB0GMQ 4, KA0FEW 3.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Pete Kemp, KA1KD — SEC: K1WGO. STM: K1EIC. OO/RFI: KA1ML. ACC: N1AZF. SGL: K1AH. PIO: WB8TDA. BM: K3ZJJ. TC: W1HAD.

Net	Freq.	Time/Local	QTC	QNI	NM
CN	3640	1900/2200	257	282	K1EIR
CPN	3965	1800 Dy/1000 Sn	142	276	KA1BHT
NVTN	28/88	2130	102	297	WA1EMI
WCN	78/18	2030	161	400	WB1GXZ
RTN	13/73	2100	—	—	K1UQE

New station appointments: OO KE1K; OBS WA1HFE K1VKO W1GDZ KA1XZ KA1XG W1LUH; ORS KA1EGE KA1XG KA1XZ WA1EMI WB3DZD N1BWE WA1HFE KA1GWE KA1JAN. Upgrade: WA1HFE. New SCARA officers: AK1G, pres.; WA1WVJ, v.p.; KJ4D, secy. Congrats to WA3ZEV/1 for receiving his PhD, in Chemistry, from Yale. A new Amateur Radio club is now being formed at the Henry Abbott Regional Vocational Technical School. Best wishes to KA1KP & KA1IGK on their May 5th wedding. Novice class Volunteer Examiners should take notice of the recent FCC change concerning the "employee-employee" relationship. Silent Keys: K1AF K1HXO W1YKB. The KA2BZD RTTY repeater, 147.225, is now sporting a K1LTJ MSO, use "K1LTJ" to access for list of commands. KA1ECL now operating RTTY. All NTS nets now have an OBS station assigned. If you are unable to receive W1AW, then tune in to your local or section level nets for the latest Amateur Radio information. Happy Mother's Day. Don't forget Armed Forces Day and its related activities. Field Day operations are only a month away. NOW is the time to begin tying up all the loose ends in order to secure a productive and fun activity. Your Section Manager will be available to receive bonus points messages via the NTS nets or directly on the 147.12 repeater. Amateurs desiring callsign license plates should request form B-6 (Rev. 9-80) from the Special Plate Section of the Department of Motor Vechicles, State Street, Wethersfield 06109. Callsign plates are available for all types of vehicles. Traffic: WB1GXZ 563, W1EFW 437, K1EIR 257, KA1JAN 158, WA1HFE 121, KA1GWE 119, WB9IHH 114, K1AQE 101, KA1EGE 99, KA1XG 92, KA1BHT 63, W1BDN 53, KA1KD 49, N1BWE 36, W1DPR 30, KA1JJX 25, W1CUH 9, WB3DZD 6, W1QV 5.

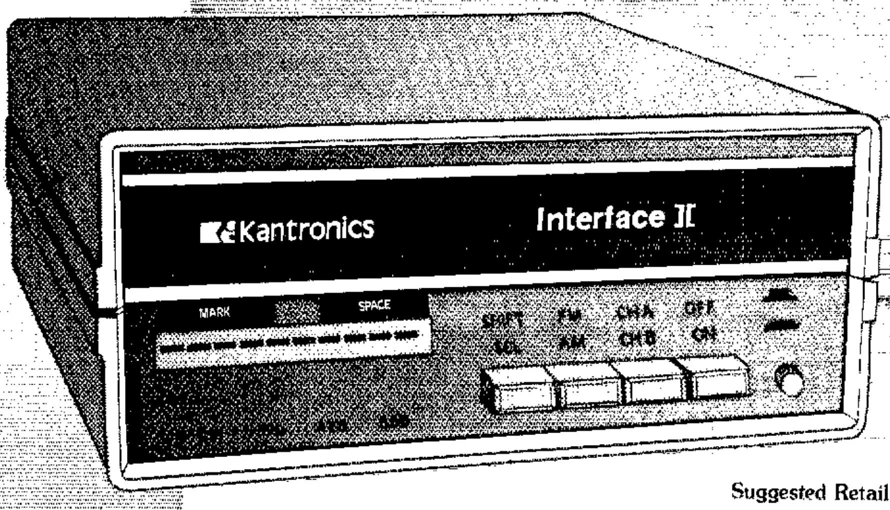
EASTERN MASSACHUSETTS: SM, Rick Beebe, K1PAD — STM: KA1GBS. SEC: W1IAY. ASM: K9HI. ACC: K1AZE. OO/RFI Coord. & BM: WA4STO. TC: KA1IU. PIO: WA1IDA. SGL: K1BCN.

Net	Mgr.	Freq.	Time (loc)/Dy	QNI	QTC
EMRI	WA1LPM	3.658	1900/2200/Dy	415	512
EMRIPN	N1BGW	3.959	1730/Dy	253	300
NEEPN	K1BZD	3.945	0830/Sn	73	11
HHTN	KA1MI	04/64	2230/Dy	498	453
EMRISS	N1BHH	3.715	2030/Dy	139	100
CI2MN	N1BYS	045/845	1930/Dy	200	85

As I write this I'm listening to the Teleconference Radio Net on the Billerica repeater. It is also being retransmitted on the Sharon machine. The program is about Amateur Radio and the law, with a short piece by W5LFL at the beginning. I encourage everybody to listen in to these interesting programs which now air every quarter. I had the privilege of visiting with the Cape Ann club recently and met W1PSG who was one of the few to have a two-way with W5LFL. Congrats! The Shriners are planning a large coordination effort for two parades that will be held in conjunction with their convention in early July. Contact K1FSU for details. Billerica club members had a mail demonstration to help them qualify for SSC status. Framingham members saw a video tape of last year's Field Day to inspire them on to a bigger and better effort this year. KA1MI and K1OJH gave talks at the Middlesex and Norwood clubs respectively. The New England Packet Radio Assn. is now the second largest in the country, and is actively working on linking all of New England and beyond via packet radio. Greater Lawrence club is preparing for an exhibit at the Methuen Mall. ARRL's K1CE was a guest speaker at the Colonial Wireless club. Massasoit club repeater ant on 78/18 went from vert to horizontal, although it seemed to still be working. Club members will fix it at first reasonable WX. W1HH gave an antique radio talk at Quannapowitt RA meeting. K1BA N1CGF and K1OGF provided a VHF rig adjustment session by bringing all of the appropriate gear to a recent meeting. Sturdy Memorial Hospital ARC member KA1MY provided a real service to the hospital by tracking down the source of noise on the repeater which was also getting into the ambulance arrival alarm at the hospital. It was Cable TV leakage which was fixed quickly by the company. Traffic:

Kantronics Interface II

The Interface For
Apple, Atari, TI-99/4A, TRS-80C, VIC-20, and Commodore 64
Computers



Suggested Retail Price 269.95

Interface II is the new Kantronics transceiver-to-computer interface. Interface II features a highly sensitive front end with mark and space filtering. Even the most discerning operator will be surprised with the Interface II's ability to dig out signals in poor band conditions. Our unique tuning system even displays signal fading.

X-Y scope outputs and dual interface outputs for VHF and HF connections make Interface II compatible with almost any shack. All three standard shifts are selectable, and Interface II is AMTOR compatible. Interface II is designed for use with Kantronics software.

Kantronics Software — The Industry Standard

Hamsoft

Our original program for reception and transmission of CW/RTTY/ASCII. Features include Split Screen Display, Message Ports, Type-ahead buffer, and printer compatibility. Apple Diskette $29.95, VIC-20 cartridge $49.95, Atari board $49.95, TRS-80C board $59.95, TI-99/4A cartridge $99.95.

Hamtext

All the features of Hamsoft with the following additional capabilities: text editing, received message storage, variable buffer sizes, diddle, word wraparound, time transmission, and text transmission from tape or disc. The program is available on cartridge for the VIC-20 or Commodore 64, and diskette for the Apple. Suggested Retail $99.95.

Hamsoft/Amtor

This program has Hamsoft features with the added ability of communicating in the newest coded amateur format-AMTOR. AMTOR offers error free low power communication. Hamsoft/Amtor is available for the Atari, TRS-80C, VIC-20, and Commodore 64 computers. Suggested Retail $79.95.

Amtorsoft

For the serious AMTOR operator using a VIC-20, Commodore 64, or Apple computer. This program is similar to Hamtext in capabilities, but can only be used for AMTOR. The Apple version includes both Hamtext and Amtorsoft on one diskette ($139.95), while the Vic-20 and Commodore 64 cartridge is just Amtorsoft ($89.95).

KA1GBS 1433, N1BGW 521, KN1K 431, KA1EPO 356, KA1EXJ 339, K1CB 263, K1CB 263, N1BHH 242, KA1BBU 225, N1AJJ 221, KO1O 197, WA1DXT 180, N1BQG 139, W1CE 121, K1ABO 111, N1ER 85, K9HI 75, KI1I 71, WA1FNM 52, K1BZD 37, W1ZHC 32, WB3FOC 30, KA1AMR 27, K1OGF 17, K1LCQ 6, WA1FCD 2. (Jan.) KN1K 454, W1CE 13. (Dec.) KN1K 793.

MAINE: SM, Cliff Laverty, W1RWG — ACC: KB1JF. BM: W1JTH. OO/RFI Coord.: W1KX. PIO: KA1TJ. SEC: KL7IJG. SGL: K1NIT. STM: AK1W. TC: KQ1L. KA1IXZ upgraded to General, congrats. The following Skohegam hams provided comms for annual "Dollars for Scholars": KA1CLF WA1YRO KA1DDA W1HHV N1BLZ. Abbott Village hamfest Aug. 12. Windsor Hamfest Sept. 8. KA1CNG appointed EC for Franklin Co. Mid-Coast ARRC appointed N1CST and KB1MA co-chrm Field Day activities.

Net	Sess.	Checkins	Traffic	NM
SGN	25	997	268	K1GUP
PTN	49	384	173	AC1G/WA1YNZ
CMEN	8	202	21	W1WCI
MPSN	4	68	12	KL7IJG
RACES	4	49	4	W1RWG
AEN	4	46	2	WA1YNZ

Traffic: AK1W 184, N1BJW 149, WB1BYR 147, W1RWG 118, N1BLZ 103, W1ISO 101, WB1GLH 88, KA1KFC 68, W1BMX 63, KL7IJG 61, W1JTH 46, KA1TJ 38, W1AHM 36, WA1YNZ 32, WB1CBP 22, KA1CNG 18, W1EZR 18, KA1FTL 15, N1BME 14, W1WCI 13, W1KX 12, KA1ENL 10, W1VEH 10, W1OTQ 3, W1CTR 2, KA1ENM 1.

NEW HAMPSHIRE: SM, Robert C. Mitchell, W1NH — STM: W1TN; NMs: N1NH KI1M KK1E. Director Sullivan and I are happy to announce the appointment of Bill Burden, WB1BRE, to the Public Relations Advisory Committee. Concord Brasspounders officers: KA1HSW, pres.; WB1EEY, v.p.; KA1CKX, secy.; N1BOD, treas. Welcome to new Novices KA1LJE KA1LGL KA1LJH KA1LJI KA1LJG KA1LJF & KA1LHF. K1IEE now Extra. KA1JOB & WA1FUG now Advanced. Carroll Co. EC N1ACB net meets Mondays at 7:30 P.M. on 3915 with problems of QRM. The Keene machine has new micro receiver & voice synthesizer controller. Traffic: KK1E 399, WA1YZN 310, N1CPX 265, KI1M 202, N1NH 186, W1FYR 161, W1TN 143, N1AKS 89, K1POV 80, AK1E 77, W1MHX 73, W1CUE 56, W1ALE 48, W1VTP 34, KA1HKB 29, K1YMH 28, KA1GOZ 27, N1ALM 23, WB1CFP 22, WA1PEL 20, N1BVI 18, KA1HPO15, K1OIQ 10, K1ACL 8, KU1D 6, W1OKU 4, W1HJF 4, N4FDL 3, W1YFZ 2, W1LCC 2, KA1HRH 2, N1CWB 1. (Jan.) K1ACL 10.

RHODE ISLAND: SM, Gordon F. Fox, W1YNE — SEC: KA1EHR. STM: W1EOF. TD: AB1D. NM: WA1OSL (RIEM2MTN). ACC: N1BEE. SGL: K1DA. Election results Easy Bay Amateur Wireless Assn.: KA1EHR, pres.; WB1DEZ, v.p./treas.; KC1J, secy. Providence RA amateur TV repeater is in operation. Freqs: video input 439.25 MHz; audio input 433.75 MHz; video output 421.255 MHz; audio output 425.75 MHz. Traffic: W1EOF 1956, KA1KML 1033, WA1CRY 43, K1AOS 30.

VERMONT: SM, Reed Garfield, WB1ABQ — STM: N1ARI. SEC: W1RNA. BM: AE1T. SGL: W1KRV. ACC: KA1AKI. It's beginning to look like we will survive another winter. By the time you read this, hopefully, spring weather will be abounding! Not much news in the section this month so will let you all get back to that antenna work and see you next month. Nets: VTN (NTS) 28/140/75; VSBN 29/480/146; VFMTN 28/349/90; GMN 25/399/33; VPN 4/70/6; Carrier 25/593/33; CVFMN 4/50/10. Traffic: N1ARI 155, AE1T 151, N1COB 121, W1KRV 70, WB1ABQ 66, KD1R 46, KT1Q 22, W1OAK 16. (Jan.) KD1R 44.

WESTERN MASSACHUSETTS: SM, Don Haney, KA1T — SEC: WB1HIH. STM: W1UD. TC: KA1JJM. OO/RFI: N1CM. PIO: WB1CJH. Pleased to appoint KA1EKQ and W1SJV as OES and ORS. Montachusett ARA is having flea market May 20 at Fitchburg Civic Center. Winter being nasty to 350 ft. doublet at W1ZPB but it's back up now. No wonder his QRP is so strong. Provin Mt. saving for solid-state repeater. Maybe KA1ERV can save some late night fuse trips. Good idea: HCRA chartering bus to ARRL National Convention in New York in July. Hope that NoBARC will have a long lease on the Greylock Tower by the time you read this. Worcester area reminder Central Mass Amateur Traffic Net nightly at 9 P.M. on 145.31. PSHR: W1PUO W1KK WB1HIH K1JHC KA1T W1JRA. Traffic: W1PUO 385, W1JRA 383, KA1T 244, W1UD 163, W1KK 80, K1PUG 67, K1JHC 60, KA1EKQ 57, WA1YYW 49, WA1OPN 38, KR1R 38, WB1HIH 35, W1JP 24, W1ZPB 17, WB1HKN 11, W1SJV 9, WB1FSV 8.

NORTHWESTERN DIVISION

ALASKA: SM, David W. Stevens, KL7EB — SEC: KL7QS. OO/RFI: AL7FL. STM: KL7T. PIO: NL7CP. I want to thank KL7LA KL7VY & AL7FJ for the interest in handling traffic. Their assistance has been instrumental in keeping the TCA working. On Memorial Day weekend is Kodiak's Crab Festival. All are invited to join SPARK, Kodiak's radio club, for the fun. MARC did a fine job running communications for the Junior Iditarod Dog Team Race. Two days, seven checkpoints, and 135 miles later, all of the 14- to 17-year-old mushers were tired but pleased with the communications. AARC has appointed Joyce Curman, KL7MQ, POB 209, Wasilla 99687, tel. 376-2188 as head of the club's VEC board. Traffic: AL7FJ 61, KL7LA 49, KL7VY 36.

IDAHO: SM, Lem Allen, W7JMH — Dennis Hall, KK7X has been forced by the pressures of business to resign as Idaho SM. Lem Allen, W7JMH has been appointed to fill the remainder of the term. We congratulate KK7X for a job well done and wish him well in his business. KD7HZ is the Idaho SEC, succeeding W7JMH. CLUB NEWS: KARS meets 2nd Monday each month and will host a hamfest June 9 from 8 A.M. to 8 P.M. at the Kootenai fairgrounds in Coeur d'Alene. Magic Valley club has new IC4AT control link for the 16/76 machine at Twin Falls. K7ESY hosted the The Clearwater Valley ARC technical meeting, where W7FFD gave particulars of parabolic dish antennas. The Boise Club will furnish communications for the Special Olympics and soccer tournaments in April and May. Voice of Idaho Club elected KI7B, pres.; WB7DOW, v.p.; KI7K, secy.; WB7NSD, treas.; WB7RES, master-at-arms; W7ZRQ N7ALB KI7R W7OCR K7NWC (posthumously), directors, at their Valentines Potluck. Elmore Co. ARC meets 2nd Tuesday of each month at 7 P.M. at the Mountain Home Public Library, all welcome. N7AYL, pres.; K7JD, v.p.; N7FEB, secy/treas.

Net	Freq.	Time	Dy	Sess.	QNI	Tfc
ID CD	3990	8:10	M-F	22	822	14
FARM	3935	7 P.M.	Dy	29	1971	33
IMN	3635	8 P.M.	M-F	21	215	101
TV 2M	34/94	8:30 P.M.	Su	4	206	0

PEOPLE AND THINGS: Congrats on upgrading to KA7JTQ K7ARJ KX7C. WA7DNK has new TR-7950. KI7S back from trip to CA, AZ, etc. K7CXG W7IWU WB7ARG KC7UN all travelling in RVs somewhere warm. 73 all. Lem. Traffic: W7GHT 290, W7JMH 80, KA7GOP 39, KJ7V 22.

MONTANA: SM, Les Belyea, N7AIK. The Great Falls Area

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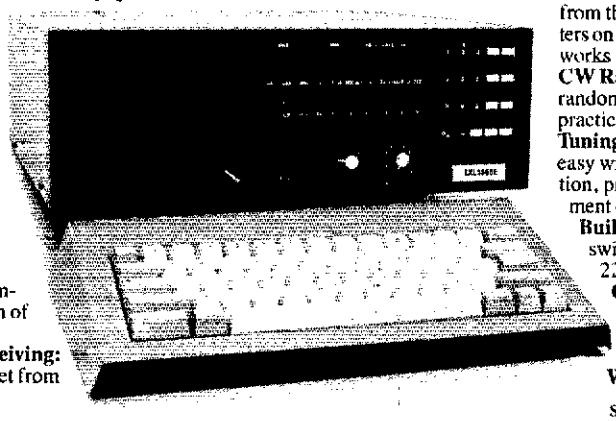
The world of CW, RTTY, and new DUAL AMTOR is as close as your fingertips with the new brilliantly innovative state-of-the-art microcomputer controlled* EXL-5000E.

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.
Photocoupler CW, FSK Keyer built-in: Very high voltage, high current photocoupler keyer is provided for CW, FSK keying.
Convenient ASCII Key Arrangement: The keyboard layout is ASCII arrangement with function keys. Automatic insertion of LTR/FIG code makes operation a breeze.
Battery Back-up Memory: Data in the battery back-up memory, covering 72 characters x 7 channels and 24 characters x 8 channels, is retained even when the external power source is removed. Messages can be recalled from a keyboard instruction and some particular channels can be read out continuously. You can write messages into any channel while receiving.
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.
Wide Range of Transmitting and Receiving: Morse Code transmitting speed can be set from the keyboard at any rate between 5-100 WPM (every word per minute). AUTOTRACK on receive. For communication in Baudot and ASCII Codes, rate is variable by a keyboard instruction between 12-300 Baud when using RTTY Modem and between 12-600 Baud when using TTL level. The variable speed feature makes the unit ideal for amateur, business and commercial use.
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.
LINE MODE operation: Characters can be transmitted by line groupings from the buffer memory.
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.
"ECHO" Function: With a keyboard instruction, received data can be read and sent out at the same time. This function enables a cassette tape recorder to be used as a back-up memory, and a system can be created just like telex which uses paper tape.
Cursor Control Function: Full cursor control (up/down, left/right) is available from the keyboard. Test Message Function: "RY" and "QBF" test messages can be repeated with this function.
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.
Built-in AC/DC: Power supply is switchable as required; 100-120 VAC; 220-240 VAC/ 50/60Hz + 13.8VDC.
Color: Light grey with dark grey trim — matches most current transceivers. **Dimensions:** 363(W) x 121(H) x 351(D) mm: Terminal Unit.
Warranty: One Year Limited

Specifications Subject to Change

Everything built in — nothing else to buy!

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**Dual Amtor: Commercial quality,* the EXL-5000E incorporates *two completely separate modems* to fully support the amateur Amtor codes and *all* of the CCIR recommendations 476-2 for commercial requirements.

ARC will be the sponsor of this years Glacier — Waterton Hamfest is to be held July 20-22 at the Three Forks campground. WIMU Hamfest will be at Jackson, WY in August. Thanks to the Gallatin ARC and under the direction of WB7AZJ, 20 new Novice students are waiting for their calls. Capital City ARC reports a class of 15 Novices and 7 Generals. W7LR is spending two months in Greece and Hungary. The ARRL Northwestern Division Net meets the first Tuesday of each month at 0500Z (Monday eve) on a freq of 3812 kHz. This will give you a chance to visit with your director and other division/section elected and appointed officials. KØPP is now working OSCAR 10. Sorry to report W7EBY and long time postmaster in Kalispell is a SK. DX note, KD7LF in Billings has over 260 countries worked while still in high school. PSHR: KF7R.

Net	Sess.	QNI	QTC	Mgr
MTN	29	1412	374	KB7SE
IMN	21	215	101	OPEN
BSN	12	103	11	WB7UTJ

Traffic: KF7R 44, N7AIK 43, WB7TNH 38, W7YB 16, W7JMX 4.

OREGON: SM, William Shrader, W7QMU — STM: W7VSE. SEC: N7CPA. PIO: KC7YN. SGL: KA7KSK. ACC: WB7WTD. RFI: AK7T. OO: N7SC. Upgrades: KA7RZG (Tech); N7FXJ (General); N7DGP (Adv). New officers for SOARC (Grants Pass) are: WB6ZCY, pres.; KA7CZG, v.p.; WB7BRW, secy.; KA7NCJ, treas. New Hoodview Club officers are: WB7BDD, pres.; NA7H, v.p.; WB7USF, secy.; KA7HIO, treas. New officers for SARC (Salem) are: KA7CYA, pres.; KA7NYL, v.p.; WA7ZAJ, secy.; KA7CVZ, treas. KD7HS was chosen as Portland ARC's "Ham of the Year." Congrats to the whole gang!! The Salem ARC station W7SAA operated a Christmas traffic station from Salem Greens Show on Dec. 2-4. Over 10,000 people were in attendance, and over 640 pieces of traffic were originated by the station. That is quite a feat. The ARRL Northwestern Division staff of Section Managers from the five states met with W7OGP decided to try an ARRL NW Div. Net to meet on the first Monday of each month at 2100 PST (0500Z) at 3812 kHz to discuss problems and to exchange ideas. This net is open to all ARRL members, especially appointed officials: Your input is desired, and if for some reason you can't meet with the net, get your info to one of the section officials in the list at the top of this column. OSN traffic QNI 556, QTC 497. Traffic: W7SAA 1292, W7VSE 702, KX7W 287, AL7W 194, W7ZB 162, K7OVK 116, KX7T 90, KA7AID 67, WB7OEX 66, KI7Y 58, KV7F 32, N7BGW 30, W7LNE 16, W7DAN 5, W7LT 3.

WASHINGTON: SM, Joe Winter, WA7RWK — STM: K7GXZ. SEC: W6IIH. PIO/SGL: W7CKZ. ACC: K7RS. OO/RFI Coord.: KB7WC. BM: KD7G. TC: K7UU.

Net	Freq.	Time(Z)	QNI	QTC	Sess.
WARTS	3970	0200	3079	165	31
WSN	3590	0245/0545	477	184	62
PSTS	145.33	0130/0630	180	103	62
NTN	3970	2000	1377	49	31
EWTN	146.04	0130/0630	78	88	62
NWSSB	3945	0230	1216	42	31

Field Day is coming June 23-24; see your FD chrmn or team up with a friend. Get in the field & have FUN. Set up your station to be visible by the public and demonstrate emergency comms. Get some PR. Plan now to make 1984 the best. See you at the Central Wash. St. HAMFEST May 12-13 in Yakima, and at the Fort Vancouver HAMFAIR May 19-20. Plan to attend either the Wenatchee HF June 2-3 or the ARRL Northwestern Division Convention June 1-3 at Seaside, OR. Roy Neal, K6DUE will speak on "STS-9 Behind the Scenes." Congrats to Yakima ARC '84 officers Pres NC7C, pres.; WB7WAM, v.p.; K7MGA secy/treas. More than 50 attended W7AQ Inst'n Dinner. KC7PH formed a school club and needs equipment. KA7CXU of the Radio Club of Tac. is working with 4 schools and is looking for equipment & instructors. More hams are needed to make the Ham Rad. On The Road (HROTR) prgm. a success. Contact ACC K7RS for info. We must bring the young people into Amateur Radio. Plans are on schedule at ARRL Hq. for vol exams, to start by Labor Day. I urge you to support the League's VEC program and to become a prospective Vol. Examiner (PVE). Teams need to be formed in your club/area (VET). See Mar. *QST* for details. Many teams throughout our section will make it convenient to be tested. We must do an excellent job. NOW IS THE TIME!! Chehalis VARS are starting a Novice net on 3745 at 9 P.M. PST on Thurs & Sun. Lower Columbia ARA demonstrated ham radio at the Triangle Shopping Center in Longview. KA7HWE was in charge. The 3rd annual Mike & Key ARC Electronics Flea Market & Computer Show at the Fairgrounds in Puyallup was a great success. Look for it next year!! Eighty members and guests attend the Radio Club of Tacoma Annual Awards Banquet where many were honored. The prestigious "Doc Spike Inspirational Award" was given to N7BXI. Congrats! Spokane: space KA7CSP rpts that the Spokane Dial Twisters and Spokane Radio Amateurs have merged and are known as the Spokane Radio Amateurs. We welcome WB7OGA as the DEC for District 8. Best wishes! SEC W6IIH rpts that he observed one of the best King Co. ARES SETs. Thirty one mbrs were kept busy by EC N7ACW's scenario. I'm advised that the Boeing Emp. ARS is proceeding to become a VEC for Region 7 (7th call area except Alaska). More info. later. Traffic: W7DZX 903, WB7WOW 525, KS7I 271, KD7ME 248, K7GXZ 188, KR7L 172, W7LG 142, N7ANE 134, N7DDP 89, W7GB 65, K7CTP 63, WA7BDD 60, W7IEU 49, KR7F 33, K7AGT 22, W7APS 17, KD7G 13, K7OXL 8, W7AIB 3, WA7RWK 3. (Dec.) KS7I 32.

PACIFIC DIVISION

NEVADA: SM, Leonard M. Norman, W7PBV — SEC: WB5VDV/7. STM: W7BS. W7NTW is a Silent Key. N7EAG is PIA and is conducting a Novice Class in Winnemucca. WA7GAE new ham in Round Mt. N7EGU active from Yerington. N7EE anyone for tennis? KA7AKM busy with AT&T micro-stn. K6LLF/7 back in hospital. Traffic: W7BS 49, W7CX 4, W7PBV 3.

PACIFIC: SM: Army Curtis, AH6P — Aloha and hafa adai to all of the Pacific. Your new SM is Jimmy Wakefield, AH6CO. I hope that all of you will welcome him to the new job and give him your full cooperation. This hobby needs all the assistance it can get, and to make it work well requires the efforts of many. Please contact him and ask how you can help. The Maui group did another outstanding job with the Maui Marathon, with good participation and a lot of fun in the bargain. FB! Hawaii Afternoon Net set another record with QNI 302 for February. KH6S finally got his generator up and running again. Hopefully, now he won't need it. Thanks to all for the past two years and keep up the good work. Aloha. Traffic: KH6B 212, KH6HIJ 98, KH6RQ 78, KH6S 45, KH6H 8.

SACRAMENTO VALLEY: SM, Ron Menet, N6AUB — STM: KY6Q: SEC: WA6ZUD. SGL: WB6WFG. OO/RFI Coord.:

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WB6TNC. We are still searching for someone interested in an appointment as Affiliated Club Coordinator for the section. If you think you might be interested, write me and I will send you full particulars. Time now to really get going with your plans for Field Day. I hope the section is well represented this year. Let me know of your plans and please send me a report of your activities/accomplishments. "Amateur Radio's Newest Frontier" video-tape (updated version is now available for loan or purchase from ARRL Hq. VHS $25, U-Matic $35. Work is afoot in Pacific Division to finish writing of *Emergency Coordinator's Handbook*. If you would like to help in this effort contact me or Bob Smith, NA6T, SM San Francisco Section. Watch next month for news of next section meeting in Red Bluff. Traffic: WA6WJZ 118, N6CVF 74, KY6Q 19, N6JTX 16, WB6ERZ 14, WB6SRQ 9, WA6ZUD 9.

SAN FRANCISCO: SM, Bob Smith, NA6T — SEC: KE6LF. The section emergency communications plans are taking shape under able guidance of KE6LF. The five-district concept should work out with FB with everyone's help; everyone pitch in and help where you can. The ACS dinner is in March, with WA6BXV as social chairman. The ARES/RACES net for Districts 4-5 is 1930 PST on Wednesday. Sorry to hear, WB6AAR, is a Silent Key. He was secy/treas. of FWRA for the past several years. He will be missed by all. Congrats to N6GBM & KA6TXO on the addition of to their family — KA6 LOGAN ANTHONY. The UARC club station is on the air in Ukiah, and should promote activity from the new Novices in the club, and possibly for FD '84. MARC has added a satellite station at the clubhouse at HAFB. Look for W6SG on the "Birds." UARC swap meet was in March, and SCRA swap meet is due in May? SFRC auction was in March. Lots of goodies for everyone. Traffic: W6IPL 461, W6NL 371, W6RNL 232, K6TWJ 85, K6TP 64, NY6F 42, W6GGR 14, WB6RTE 10, NA6T 10, K6LRN 6, KE6LF 4.

SAN JOAQUIN VALLEY: SM, Charles McConnell, W6DPD — SEC: WA6YAB. STM: N6AWH. TC: WA6EXV. Appointments renewed: ORS WD6FRS; EC KA6CUJ WA6EWR. KA6BMJ is a SILENT KEY. The Fresno ARc is celebrating 50 years as an ARRL Affiliated Club. The 42nd Fresno Hamfest on May 18-20 will celebrate this event. All former club members are invited to the hamfest, especially those from the years 1934 to the present. K6UJG and KA6VAF are ARRL Life Members. N6HWF is Extra. N6GUR is Advanced. KA8OEA is KF6YN. KB6CCJ is N6JSN. KA6YSF is N6JQT. W6FAH has a Kenwood TL-922 amp. WA6SDR has a TR-7950. KB6DJ and WB6QDN have TS 430s. W9KGW is chasing DX. WA6NCA now has his license renewed after it was expired about 14 months. More SJV amateurs are needed to handle traffic in all parts of the section. Get a *Net Directory* and find the net of your choice. For CW try the Northern California Net (NCN) on 3630 kHz at 7 P.M. or 8:30 P.M. every day. Try to attend the Fresno Hamfest May 18-20 at the Tropicana Inn, Fresno. Traffic: N6AWH 145, W6DPD 12, W6SX 6, WA6YAB 6, K9YBM.

SANTA CLARA VALLEY: SM, Rod Stafford, KB6ZV. The section was recently treated to a visit by Dr. Owen Garriott, W5LFL. He was present at Foothill College to give a talk and answer questions about the STS-9 flight. He gave an excellent talk about his amateur activities in space. W6ZM presented W5LFL with a plaque which conferred upon Dr. Garriott a place in the "Pacific Division Court of Honor." N6TX was there to present a plaque from S.J. City College for furthering educational interests in space communications. Welcome to the new Section Emergency Coordinator, K6ITL. He has been very active in the San Mateo RC activities, emergency preparedness and SCV section activities in general. He will be an asset to the section organization. KA6R deserves the thanks of the section for his efforts as SEC for the past 2 years. He has been deeply involved in the excellent service the amateurs have provided the public in times of emergency in the past two years. Please listen in on WB6QQS (146.76 MHz) on Tuesday evenings at 9 P.M. for the SCV Section Manager's Net. I am operating this net for the specific purpose of keeping ARRL members informed of ARRL activities and of other items of interest to amateurs. The net will give amateurs the opportunity to have on-the-air contact with the Section Manager and the section appointees. Please listen in and if you have something to contribute or if you have a question you would like to ask, please feel free to do so. By the time you read this column, I hope to have a second session of the same net on one of the repeaters in the northern part of the section to cover those parts of the section that QQS does not cover. Information about this will be available on the Tues. 9 P.M. net. Speaking of nets, the list of nets operating in the section is being updated. Please send the following info to either KB6ZV or W6PHT: day & time, frequency and the sponsoring group of the net. An up-to-date list will be sent to clubs when completed. STM W6PHT is looking for Official Relay Stations in all parts of the section. Please contact her if you want to become an ORS and be involved in the handling of traffic. The Coastside ARC has a 4-hour contest set for May for club members. They have chosen 15 meters as the only band to be used. Bonus points will be given for CW contacts in the Novice portion of the band. It's a great idea to spur interest in contesting within your club. Contact KY6I for details. At the Pac. Div. Directors "Cabinet Meeting" in March, it was decided that quarterly meetings were preferred to semi-annual. There will be another one coming up in June, so if you have any proposals or input, please let me know in advance of the meeting. Many were saddened to learn of the death of two section amateurs. K6LFZ and WD6FOI were both killed in plane crashes. K6LFZ was deeply involved in emergency communications in the San Benito Co. area. WD6FOI was a former president of the West Valley ARA. Both will be missed. Traffic: W6YBV 189, W6KZJ 134, W6PRI 53, W6VZT 48, N6JLJ 33, W6RFF 25, K6YKG 6. (Jan.) W6PRI 112, N6JLJ 37.

ROANOKE DIVISION

NORTH CAROLINA: SM, Ian Black, WD4CNR —

Net	Time	QNI	QTC	QND	Mgr.
CMN	7:45 A.M.	432	147	1092	WD4CNQ
CSN	6:00 P.M.	224	62	870	NJ4L
CEN	6:30 P.M.	496	278	528	K4NLK
CN	7 & 10 P.M.	526	278	1437	K4WJR (S.C.)
JFKN	6:30 P.M.	724	80	4446	WB4WII
THEN	7:30 P.M.	238	58	1937	WD4LRG

Two-meter nets liaisoning NTS: PETN 26, PCTN 27, CNCTN 29. Good work, guys. Thank you. Looking backward is not very profitable, but reviewing the good things is enjoyable. Most traffic handlers think the traffic system in NC is better now than for some time. The emergency system, both of training and organization is in place & running smoothly. The section owes W4EAT

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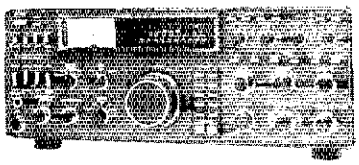

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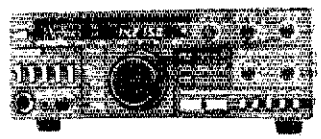

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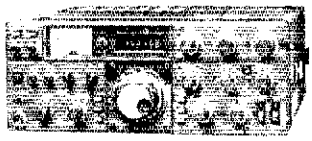

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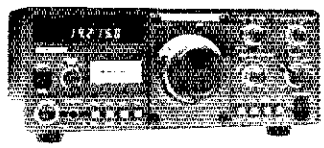

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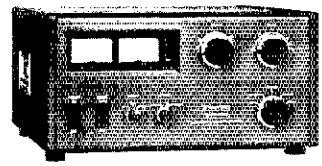

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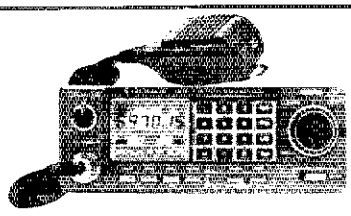

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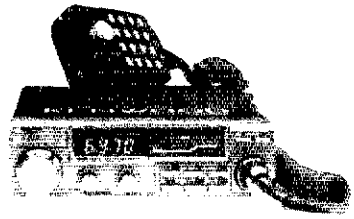

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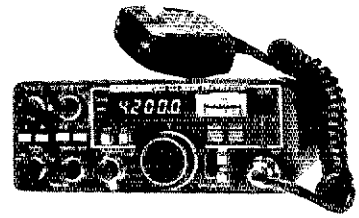

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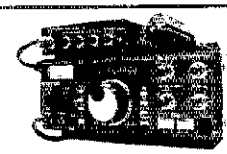

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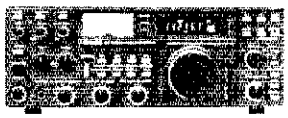

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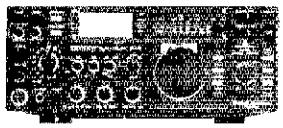

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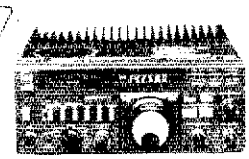
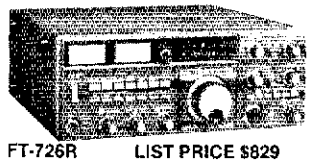
- Slide Lock Battery Pack

TR-2500 List Price $329.95
CALL FOR SPECIAL SALE PRICES



FT-757GX LIST PRICE $829
CALL FOR SPECIAL SALE PRICE!

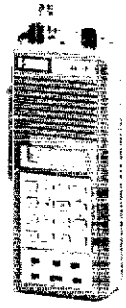


FT-726R LIST PRICE $829
CALL FOR SPECIAL SALE PRICE!

FT-208R 2M HT
List $319
FT-708R 440 MHz HT
List $319
- LCD Display
- 10 Memories

CALL FOR
SPECIAL PRICES!

SANTEC



NEW ST142μP
2M HT
- 3.5W/1W/0.1W
- 142-149.995 MHz
- LCD Display
- Programmable PL Option

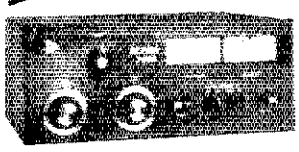
List 339.95
SALE $299.95!

ST144μP $259.95
ST222μP . . . . . CALL!
ST442μP . . . . . CALL!

SANTEC Accessories
SM3 Speaker Mic. $34.95
ST-LC Leather Case $34.95
ST-500 NiCad Battery . . $29.95
ST-4QC Base Charger . . $69.95

FACTORY AUTHORIZED DEALER FOR ALL MAJOR AMATEUR LINES

ETO ALPHA SALE!

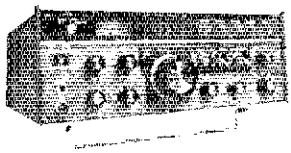


76PA $1899!

Model	List	Sale*
76A	$1985	CALL
76PA	$2395	CALL
76CA	$2695	CALL
374A	$2595	CALL
78	$3495	CALL

*Sale Prices Too Low To Print—
CALL & SAVE $$!

TEN-TEC SALE!



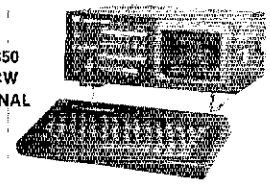
CORSAIR List $1169
Deluxe AC Supply List $199
Both Items—Yours for $1169!
All Ten-Tec Accessories in Stock
for Fast Shipment!

TEN-TEC
New 2M HT
Full Featured!
List $319
Sale $279.95!

4229 2KW Tuner Kit $189.95!

HAL SALE!
NEW RTTY/CW COMPUTER INTERFACES

CRI-100 List $249 SALE $229.95!
CRI-200 List $299 SALE $269.95!



CWR6850
RTTY/CW
TERMINAL

List $999 SALE $749.95!

Other HAL Products On Sale

CWR6700	$439.95	DS3100ASR	$1b89.95
CWR6750	$629.95	MPT3100	$2199.95
CT2100/KB2100	$749.95	RS2100	$289.95
CT2200/KB2100	$949.95	ST5000	$219.95
DSR3100	$1049.95	ST6000	$649.95
ARQ1000	$649.95	KG-12	$169.95

TOKYO HY-POWER LABS

HL-30V Reg. $69.95
SALE $59.95

HL-82V	$139.95	HL-90U	$329.95
HL-160V	$289.95	HC-200	$89.95
HL-200	$99.95	HC-2000	$289.95

KDK FM2033
List $339.95 Sale $299.95

JANEL QSA5 PREAMP $39.95!

QSA-6	$41	432PL	$59
PB-30	$25	PB144	$25
PB-50	$25	PB220	$25

AMTRAGE AMPLIFIER SALE!

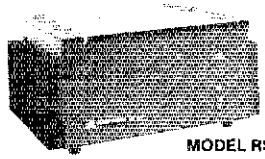
B1016
$249

Model	Band	Pre-amp	Input	Output	DC Pwr	Sale Price
B1015	6M	Yes	80W	150W	20A	$249
B2S	2M	No	2W	80W	8A	$ 79
B215	2M	Yes	2W	150W	22A	$259
B108	2M	Yes	10W	80W	10A	$159
B1016	2M	Yes	10W	160W	20A	$249
B3016	2M	Yes	30W	160W	17A	$199
C2S	220	No	2W	20W	5A	$ 79
C108	220	Yes	10W	80W	8A	$179
C1012	220	Yes	10W	120W	20A	$259
C2/4	440	No	2W	40W	8A	$179
C1010N	440	No	10W	100W	20A	$289

RC-1 Remote Control for Mirage Amplifiers $24
MP-1 and MP-2 Peak Reading Wattmeter $99

ASTRON POWER SUPPLIES
Heavy Duty · High Quality · Rugged · Reliable
- Input Voltage 105-125 VAC Output 13.8 VDC ± .05V
- Fully Electronically Regulated—5mV Maximum Ripple
- Current Limiting & Crowbar Protection Circuits
- M-Series With Meter—A-Series Without Meter

Model	Cont' Amps	ICS Amps	Price
RS4A	3	4	$ 39
RS7A	5	7	49
RS12A	9	12	69
RS20A	16	20	89
RS20M	16	20	109
RS35A	25	35	139
RS35M	25	35	144
RS50A	37	50	199
RS50M	37	50	229



MODEL RS-50A

CP-1 COMPUTER PATCH
List $239.95 SALE $189.95!

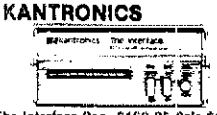
CP1-20	$219	CP1-64	$219
MP-20	$219	MP-64	$219
VIC-20 MBAText	$79	C-64 MBAText	$79

All AEA Keyers, Antennas & Accessories
In Stock!

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

KANTRONICS



The Interface Reg. $169.95 Sale $129.95
The Interface II Reg. $269.95 Sale $239.95

Apple Amtor Soft/Hamtext	$139	VIC-20 Hamsoft	99
Vic-20 Amtor Soft	89	Hamtext VIC-20	99
Model 64 Amtor Soft	89	Hamtext Model-64	99
Apple Hamsoft	79	Atari Hamsoft	99
		IBS-800 Hamsoft	99

MIETRON
MA1000B
AMPLIFIER
Solid State
1KW Amplifier
- No Tuning
- 13.8 VDC Operation
- Remote Bandswitching
- Compact
- Heavy-Duty Construction

List Price $995 SALE PRICE $895.95

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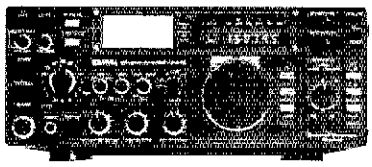
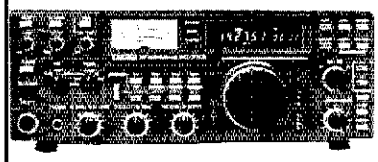


IC-745
NEW GENERAL COVERAGE-ALL MODE COMPACT HF TRANSCEIVER

- All Solid State
- SSB/CW/AM/RTTY
- FM Option
- Receives .1 - 30MHz
- Dual VFO w/16 Memories
- 12VDC Operation
- 100% Duty Cycle
- Speech Compressor
- Lithium Memory Backup
- Adjustable Noise Blanker
- IF Shift/Passband Tuning

LIST PRICE $999—CALL FOR SPECIAL SALE PRICE!



IC-751-ICOMS' BEST!
NEW-HIGH PERFORMANCE-SSB/CW/AM/RTTY/FM TRANSCEIVER-GENERAL COVERAGE RECEIVER

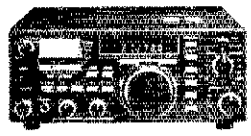
- All Solid State
- High Dynamic Range
- Full QSK Operation
- Receives .1 - 30MHz
- Dual VFO w/16 Memories
- 12VDC Operation or Optional Internal AC Supply
- 100% Duty Cycle
- Speech Compressor
- Lithium Memory Backup
- Adjustable Noise Blanker
- IF Shift/Passband Tuning

LIST PRICE $1399—CALL FOR SPECIAL SALE PRICE!

IC-2KL 500 WATT LINEAR AMPLIFIER

- 160-15mtr Coverage
- SSB/CW/RTTY Duty Cycle
- Auto Bandswitching
- IC-2KLPS Power Supply strapable 120V/240VAC Operation
- Broadband Tuning
- 500 Watts Output
- Full Final Protection

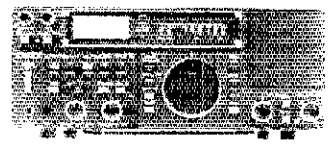
LIST PRICE $1795—CALL FOR SPECIAL SALE PRICE!



IC-730 COMPACT 80-10mtr SSB/CW/AM TRANSCEIVER

- All Solid State
- 100 Watt Output
- 12VDC Operation
- 80 - 10 Meters
- Dual VFO
- CW Filter Option

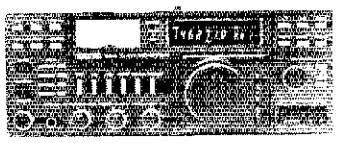
LIST PRICE $829—CALL FOR SPECIAL SALE PRICE!



R-70 HF GENERAL COVERAGE RECEIVER

- .1 - 30MHz Coverage
- Passband Tuning
- Notch Filter
- CW Filter
- SSB/CW/AM/RTTY
- FM Option
- Built-in 120VAC Supply or 12VDC Option

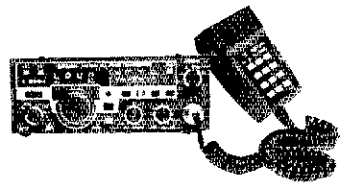
LIST PRICE $749—CALL FOR SPECIAL SALE PRICE!



IC-271A 2 Meter All Mode Base Transceiver
IC-471A 430-450MHz All Mode Base Transceiver

- SSB/CW/FM
- Dual VFO Tuning
- 32 Memories
- 25W Output - 2mtrs
- 10W Output - 430-450MHz
- Low Noise PLL Design
- Programmable Sub-audible Tones
- 12VDC or Optional 120VAC Operation

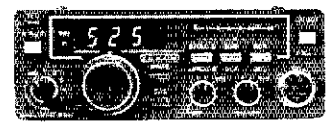
IC-271A List $699 IC-471A List $799
PLEASE CALL FOR YOUR SPECIAL PRICE!



IC-290H 2 Meter 25 Watt All Mode Mobile Transceiver
IC-490A 430-440MHz 10 Watt All Mode Mobile Transceiver
IC-560 6-meter 10 Watt All Mode Mobile Transceiver

- SSB/CW/FM
- Noise Blanker
- 12VDC Operation
- Dual VFO Tuning
- Memories

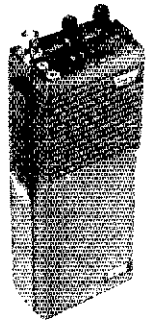
IC290H List $549 IC490A List $649 IC560 List $489
PRICES SHOWN AS LIST—CALL FOR YOUR SPECIAL PRICE!



IC-25A/H 25/45W 2mtr FM MOBILE TRANSCEIVER
IC-45A 10W 440-450 MHz FM MOBILE TRANSCEIVER

- Green LED Readout
- 12VDC Operation
- Dual VFO Tuning
- 5 Memories

IC-25A List $359 IC-25H List $389 IC-45A List $399
PRICES SHOWN AS LIST—CALL FOR YOUR SPECIAL PRICE!



WORLD'S MOST POPULAR HT's
PLEASE CALL FOR SALE PRICES!

IC-2AT 2METER H.T. List $269.50
IC-3AT 220MHz H.T. List $299.95
IC-4AT 440MHz H.T. List $299.95
PRICES SHOWN AS LIST—
CALL FOR YOUR SPECIAL PRICE!

- 1.5W Output - All Models
- Complete w/Nicad & Charger

All Accessories in Stock!

BP2 Battery Pack	$39.50
BP3 Battery Pack	$29.50
BP4 Battery Case	$12.50
BP5 Battery Pack	$49.50
BC30 Base Charger	$69.00
CP1 Lighter Cord	$9.50
DC1 DC Cord	$17.50
HM9 Speaker/Mic	$34.50
LC10 Leather Case	$34.95

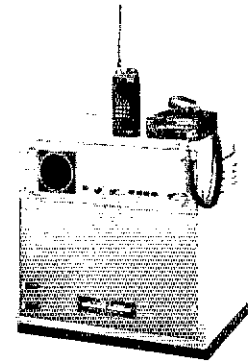
IC-02AT
NEW 2 METER TOP OF THE LINE HT

- Digital LCD Readout
- Scanning
- Programmable PL Tones
- Optional 5W Battery
- S-meter Function
- 10 Memories
- Offset Storage
- Lithium Memory Backup
- 13.8VDC Operation!
- Sealed Case

All These Features and Much, Much More!

SUGGESTED LIST PRICE $349
CALL FOR SALE PRICES!

PLEASE CALL FOR INFORMATION AND PRICES ON NEW ACCESSORIES FOR IC-02AT.



IC-RP3010
440 MHz REPEATER

- 10 Watts Output
- Microprocessor Controlled CTSS/DTMF/ID'ER
- Built-in 120VAC or 12VDC Operation
- Crystal Controlled

LIST PRICE $999
CALL FOR YOUR SPECIAL PRICE!
MOUNTING CABINET AVAILABLE—ONLY $249

IC-120
NEW 1200 MHz FM Mobile Transceiver

- 1 Watt Output
- Green LED Readout
- Programmable Offset
- 1260-1300 MHz Coverage
- 6 Memories
- Scanning

List Price $499—Please Call For Price and Delivery Information on the IC-120 and RP-1210 Repeater.

IMPORTANT—Prices shown are suggested by the Manufacturer. You can Save Money with a Big Texas Towers Discount! Call today for our Special ICOM Sale Prices and Save $$$!!

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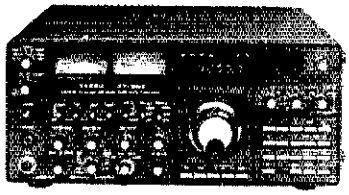
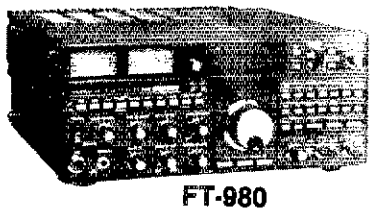


FT-ONE

GENERAL COVERAGE—ALL MODE DELUXE SOLID STATE TRANSCEIVER

Buy Now and Receive These Accessories Free:
300Hz CW Filter..$FREE 600Hz CW Filter..$FREE
800Hz CW Filter..$FREE 6Khz AM Filter..$FREE
Memory Backup..$FREE Installation.....$FREE

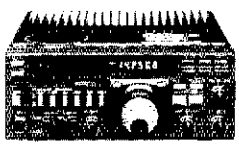
List Price $3074. CALL FOR YOUR SPECIAL PRICE!
Quantities Limited — Hurry!



FT-980

CAT SYSTEM—Computer Aided Transceiver
- Wide Dynamic Range
- Low Noise Front End
- General Coverage
- 10Hz Digital Readout
- All Mode Transceive—CW/SSB/AM/FM/FSK!
- Full Break-in CW
- RF Speech Processor
- Variable Bandwidth
- IF Shift
- APF/Notch
- AC Power Supply
- Adjustable Noise Blanker
- 12 Internal Digital VFO's with Memories
- Much, much more—call or write for info

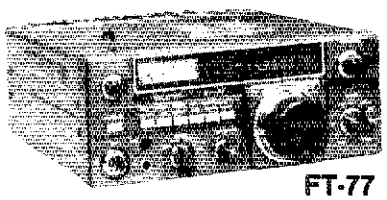
Computer Interface now in development—
Own Tomorrow's HF Transceiver—Today!!
Manufacturer's Suggested List Price $1499
Call For Your Special Price Today!!



FT-757 GX

Compact General-Coverage Transceiver
- General-Coverage Receiver
- Memory/Band Scan
- Speech Processor
- USB/LSB/CW/AM/FM
- CW Filter and CW Keyer included
- Dual VFOs
- 8 Memories with Lithium Backup
- 100 Watt Output/100% Duty Cycle
- IF Shift/IF Width Controls
- Many, Many Other Features

List Price $829. Call for Special Low Texas Towers Discount Price and Save $$$



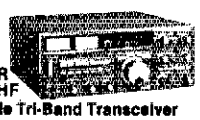
FT-77

New 80-10mtr Compact HF Transceiver
- Digital Readout
- Adj Noise Blanker
- CW/SSB/FM Modes
- CW Wide/Narrow
- Optional AC Supply, CW Filter, FM Unit External VFO, Antenna Tuner Available

List Price $599—Call for Special Low Texas Towers Discount Price and Save $$

FT-230R 2mtr FM.....$359
FT-730R 440Mhz FM.....$399
- 10 Memories
- Two VFO's
- LCD Readout
- 25W Out
- Memory or Up/Down Scan

Call today for Special Discount Price & Save $$



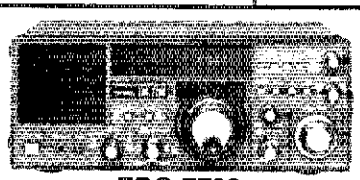
FT-726R VHF/UHF
All Mode Tri-Band Transceiver
- 50-54 Mhz
- 144-148 Mhz
- 10 watts output on all bands
- 430-450 Mhz
- 21, 24.5 & 28 Mhz option available soon

Please Call For Price & Delivery Information

VHF/UHF Multimode Portables

FT-690R 50Mhz.....$379
FT-290R 144Mhz.....$399
FT-790R 430Mhz.....$399

Call today for Special Discount Price & Save $$



FRG-7700

All Mode Digital Communications Receiver .15 to 29.99Mhz—Receives SSB/AM/FM/CW. Built-in S Meter, Speaker, Noise Blanker, Timer, FM Squelch, AC Supply and More!

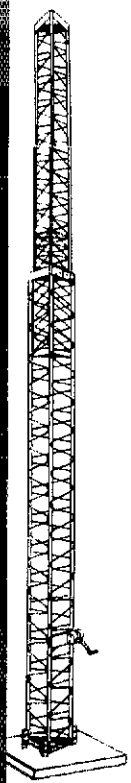
Manufacturer's List $499—Call today for Your Special Discount Price!!

FT-208R 2mtr HT.....$319
RF Out: 300mw/2.5W

FT-708R 440Mhz HT....$319
RF Out: 200mw/1.0W
- LCD Display
- 10 Memories
- Up/Down and Memory Scanning
- Complete w/Nicad Battery, Charger and Rubber Duck Ant

Accessories Available:
LCC-8 Leather Case.....$35
YM24A Spkr/Mic.....$39
FNB-2 Nicad.....$29
NC-8 Base Chgr.....$99
Call for Special Yaesu Discount Prices!!

IMPORTANT — Prices shown are suggested by the Manufacturer. You can Save Money with a Big Texas Towers Discount! Call today for our Special Yaesu Sale Prices and Save $$$!!



hy-gain

CRANKUP SALE!

All Models Shipped Factory Direct—Freight Paid*!

Check these features:
- All steel construction
- Hot dip galvanized after fabrication
- Complete with base and rotor plate
- Totally self-supporting—no guys needed

Model	Height	Load	Sale Price
HG37SS	37 ft.	9 sq. ft.,	$ 679
HG52SS	52 ft.	9 sq. ft.,	$ 959
HG54HD	54 ft.	16 sq. ft.,	$1499
HG70HD	70 ft.	16 sq. ft.,	$2399

Masts—Thrust Bearings—Other Accessories Available—Call! Prices Shown Are Your Total Delivered Price In Continental U.S.A.!

Tri-Ex®

These rugged crankup towers now available from Texas Towers! All models available On Sale for tremendous savings to you!

To save on freight costs, all towers are shipped directly from the Tri-Ex factory to you!

Check these features:
- All steel construction
- Hot dip galvanized after fabrication
- Complete with base and rotor plate
- Totally self-supporting—no guys needed

Model	Height	Load	Sale Price
W-36	36 ft.	9 sq ft., 50 mph	$579
WT-51	51 ft.	9 sq. ft., 50 mph	$999
LM-354	54 ft.	16 sq. ft., 60 mph	$1599
LM-470D (Motorized)	70 ft.	16 sq. ft., 60 mph	$2999

Masts—Thrust Bearings—Other Accessories Available at Sale Prices—Call!

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and KU4W a tremendous vote of thanks. To the clubs reporting via newsletter each month, thanks and Godspeed. To the individuals who gave so unselfishly of their time for the good of the section, also many, many thanks. To those of you who felt public service was more important than self service, your reward is from within and nothing my poor pen can do can make it greater. To a few very special people: K4NLK K4IWW AB4S WA4SRD N4UE WA4OBR WB4MJH and a very, very special WA4YTQ. My feelings cannot be expressed in words. For me, being able to say "my friend" to you all is sufficient. You understood the goal; you were aware of the cost; you never faltered. Future SMs will have other goals. They will not have better support. Traffic: K4NLK 241, WD4CNR 232, WA4OBR 232, WB4HRR 208, WD4LRG 135, WD4CNQ 130, WB4N 130, WA4YTQ 113, WA4MNR 98, K4IWW 87, WB4WII 83, NT4K 54, KU4W 50, WD4HTE 39, KA4KJI 34, K4DDY 29, KB4BXA 24, WB4CYN 21, W2JDB 19, W4TWD 14, W4EHF 12. (Jan.) NJ4L 300.

SOUTH CAROLINA: SM, Jimmy Walker, WD4HLZ — Public service was the major activity during February. Two 1800-pair cables were severed, disabling pone and computer communication between Charleston and Columbia NOAA Weather. N4CII W4OFP and W4TWW handled complex radar observations via VHF and HF for input into Columbia's computer. Exercise NIGHT TANGO I was conducted by NCS to evaluate the reliability of the ARRL, CAP and MARS networks for handling national emergency communications. W4ANK K4AQB W4FMZ N4GIQ and KA4WFX established contact with the NCS official via VHF and conducted the exercise without the use of land lines. Columbia ARC provided amateurs for two events. K4AXV N4CVJ N8DTN N4EPQ N4FVU NM4H N4HDJ KC4LB WB4OCB WB4QIJ N4RK and KE4VT provided communication for the 26-mile Carolina Marathon. N4FVU WA4GYM KC4LB KE4VT N4WR and ND4Z provided communication for five agencies within Columbia during a hazardous materials exercise. Each of you should make every effort to take part in an emergency exercise. It is too late to learn or be taught what to do during a disaster. At that time you will be needed but unwanted because of your inexperience. Traffic: K4WJR 291, K4ZN 261, W4FMZ 216, W4ANK 107, W4NTO 100, WB4UDK 58, W0IKT 56, K4FRX 39, WD4FJP 33, KA4LRM 32, K4ZB 31, W4DRF 2.

VIRGINIA: SM, Phil Sager, WB4FDT — Virginia Nets:

Virginia Traffic Net	1 P.M.	7260
Virginia Sideband Net	6 P.M.	3947
Virginia Slow Net	6:30 P.M.	3680
Virginia Net (CW)	7:10 P.M.	3680
Virginia Late Net	10:15 P.M.	3947

BPL to K4KDJ AA4AT and N4GHI. PSHR listing to N4GHI K4KDJ K4JST WD4ALY WA4CCK AA4AT KB4WT KR4V K4VWK KA4IUM WD4OCW W4JLS W4LXB WB4UHC KA3DTE WB4FDT and KB4OG. A total of 46 reports were received this month with a total traffic count of 7024. N4GHI new Extra. Va QSO Party activity seemed up this year, perhaps owing to the beautiful plaques that the sponsoring Sterling Park ARC was awarding. Much mobile activity on both SSB and CW as apparent. WA4LJI at UVA hospital but doing fine. This is my final report as your Section Manager. I have been proud to be Virginia's last Section Communications Manager (SCM) and first Section Manager (SM), and am pleased that this change went so smoothly. I want to especially thank WD4ALY for his yeoman work as Section Traffic Manager, and WB4UHC for his work as Section Emergency Coordinator, and to my other section-level appointees. It is with a deep sense of regret that I remember many Silent Keys over the past two years, especially that of Vic Clark, W4KFC. As his passing becomes more distant it becomes more obvious that he originated and helped to guide many amateur activities here in Virginia. For example, I have discovered that W4KFC originated the idea of a slow speed CW training net which later became the VSN. He also originated the idea of a Virginia State QSO Party. Certainly, one of the major reasons Virginia has been one of the ARRL's most active sections was because of W4KFC. Virginia was indeed fortunate that he lived here for almost 40 years. Traffic: K4KDJ 1087, AA4AT 620, W3ATQ 619, N4GHI 484, WA4CCK 477, W4JLS 389, WD4FTK 354, WD4OCW 311, WD4ALY 297, W3BBN 246, KR4V 217, K4JST 187, WB4FLT 177, KA3DTE 169, WB4PNY 164, KA4IUM 135, KB4WT 135, K4JM 124, KB4OG 106, WB4UHC 82, N4EXQ 76, K4VWK 73, WB4KIT 70, KB4PW 70, KA4JXZ 48, WB4FDT 36, NT4S 36, WB4EDB 32, KA4ZTB 29, K4GR 26, K4MLC 25, W3BBQ 24, W4LXB 22, N4FNT 13, WB2OMZ 12, WB4ZNB 11, K4LMB 8, NN4I 6, WB4MAE 6, W4PVA 5, WA4TVS 5, N3RC 4, WB4RDV 4, W4YE 2, W4TZC 1.

WEST VIRGINIA: SM, Karl S. Thompson, K8KT — SEC: K8QEW. STM: KD8G. ACC: WA8CTO. TC: K8CG. SGL: K8BS. Fayetteville H.F. on Feb. 26 was a nice affair as usual. Congrats to all of those responsible. Roanoke Division Planning Meeting (LPM '84) will be held at the Ramada Inn in S. Charleston on May 12 & 13. Please contact K8KT for more information and W8AH for preregistration. We need a strong turnout of WV hams. Note date change for Jackson's Mill — June 30 and July 1.

Net	Freq.	Time	QNI	QTC	Sess.	NM
WVN	3567	7:00	210	64	28	W8LYV
WVFN	3900	6:00	736	135	29	N8AJC
WVMD	7235	11:45A	765	53	29	W8FZP
WVNN	3730	6:15	253	54	29	KA8SWA
Hillbilly	14290	1600Z	139	18	4	KC8YU
KARC 2M	28/88	8:30 Sn	83	6	4	WD8AEW
KFC 2M	87/47	8:30M	46	2	4	N8ELD

Traffic: KZ8Q 250, WA3NUI 86, KA8OGF 82, W8JWX 52, K8KPF 40, WA8KCJ 39, KD8G 35, W8FZP 33, W8HZA 33, K8KT 23, K8QEW 20, KV8T 20, WB8ZMX 14, NC8G 7, WD8MJE 5.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Bill Sheffield, KQ0J — SEC: WB0FQB. STM: WD0AIT. OO/RFI: NC0F. ACC: WB0DUV. PIO: WD0HNQ. TC: K0BP. SGL: WD0GQL. BM: W0MDT. Surprise, if you didn't know, this month is devoted to ARRL Rocky Mountain Division Convention. Your statewide committee put their hearts into making it the best ever in Colo. Many dealer/mftrs will be displaying. The swapmeet will be one of the best. From our state we have experts in their field for our many forums. Visit with W0BWJ K0PGM KB1O & WB9IHH from ARRL. We will have many sur-prizes for you each day. Bring the family, as ladies activities and child/care have been arranged. Join us for a fun week in Denver/Aurora May 25-27. Come early & stay late as this is a holiday weekend. The banquet is limited, reserve your spot now. The registration fee is $5 till May 10th, then $7.00. Banquet $15, brunch $7. Swap table free per family w/registration. Hotel rate $49.50 a nite (4 to a room) at the Holidome-Holiday Inn I-70 & Chambers. Contact: KQ0J. 1444 Roslyn St., Denver 80220. Reminder

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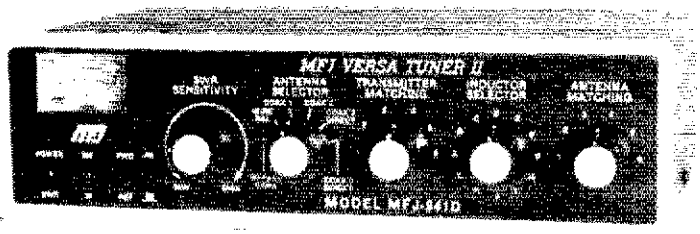
300 WATT ANTENNA TUNER HAS SWR/WATTMETER, ANTENNA SWITCH, BALUN. MATCHES VIRTUALLY EVERYTHING FROM 1.8 TO 30 MHz.



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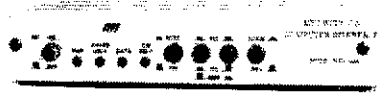
NEW FEATURES

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.
- **New airwound inductor!** Larger more efficient 12 position airwound inductor gives lower losses and more watts out. Run up to 300 watts RF power output. 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. 1000V capacitor spacing. Black. 11x3x7 inches. Works with all solid state or tube rigs. Easy to use, anywhere.

RTTY/ASCII/CW COMPUTER INTERFACE MFJ-1224 $99.95



Send and receive computerized RTTY/ASCII/CW with nearly any personal computer (VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64, etc.). Use Kantronics or most other RTTY/CW software. Copies both mark and space, any shift (including 170, 425, 850 Hz) and any speed (5-100 WPM RTTY/CW, 300 baud ASCII). Sharp 8 pole active filter for CW and 170 Hz shift. Sends 170, 850 Hz shift. Normal/Reverse switch eliminates retuning. Automatic noise limiter. Kantronics compatible socket plus exclusive general purpose socket. 8x1¼x6 in. 12-15 VDC or 110 VAC with adapter, MFJ-1312, $9.95.

RX NOISE BRIDGE

Maximize your antenna performance! **$59.95** MFJ-202B

Tells whether to shorten or lengthen antenna for minimum SWR. Measure resonant frequency, radiation resistance and reactance.

New Features: Individually calibrated resistance scale, expanded capacitance range (±150 pf). Built-in range extender for measurements beyond scale readings. 1-100 MHz. Comprehensive manual. Use 9 V battery. 2x4x4 in.

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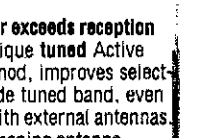
"World Grabber" rivals or exceeds reception of outside long wires! Unique **tuned** Active Antenna minimizes intermod, improves selectivity, reduces noise outside tuned band, even functions as preselector with external antennas. Covers 0.3-30 MHz. Telescoping antenna. Tune, Band, Gain, On-off bypass controls. 6x2x6 in. Uses 9V battery, 9-18 VDC or 110 VAC with adapter, MFJ-1312, $9.95.



$79.95 MFJ-1020

POLICE/FIRE/WEATHER 2 M HANDHELD CONVERTER

Turn your synthesized scanning 2 meter handheld into a hot Police/Fire/Weather band scanner! **$39.95** MFJ-313

144-148 MHz handhelds receive Police/Fire on 154-158 MHz with direct frequency readout. Hear NOAA maritime coastal plus more on 160-164 MHz. Converter mounts between handheld and rubber ducky. Feedthru allows simultaneous scanning of both 2 meters and Police/Fire bands. No missed calls. Crystal controlled. Bypass/Off switch allows transmitting (up to 5 watts). Use AAA battery 2¼x1½x1½ in. BNC connectors.

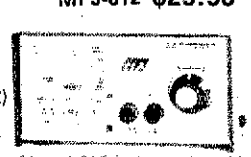
MFJ/BENCHER KEYER COMBO

MFJ-422 **$104.95**

The best of all CW worlds- a deluxe MFJ Keyer in a compact configuration that fits right on the Bencher iambic paddle! MFJ Keyer - small in size, big in features. Curtis 8044-B IC, adjustable weight and tone, front panel volume and speed controls (8-50 WPM). Built-in dot-dash memories. Speaker, sidetone, and push button selection of semi-automatic/tune or automatic modes. Solid state keying. Bencher paddle is fully adjustable; heavy steel base with non-skid feet. Uses 9 V battery or 110 VAC with optional adapter, MFJ-1305, $9.95.

VHF SWR/WATTMETER

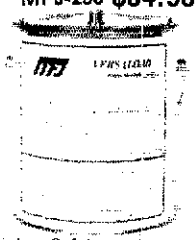
Low cost VHF SWR/Wattmeter! MFJ-812 **$29.95**



Read SWR (14 to 170 MHz) and forward/reflected power at 2 meters. Has 30 and 300 watts scales. Also read relative field strength. 4x2x3 in.

1 KW DUMMY LOAD

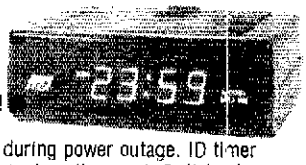
MFJ-250 **$34.95**



Tune up fast, extend life of finals, reduce QRM! Rated 1KW CW or 2KW PEP for 10 minutes. Half rating for 20 minutes, continuous at 200 W CW, 400 W PEP. VSWR under 1.2 to 30 MHz, 1.5 to 300 MHz. Oil contains no PCB. 50 ohm non-inductive resistor. Safety vent. Carrying handle. 7½x6¾ in.

24/12 HOUR CLOCK/ID TIMER

MFJ-103 **$34.95**



Switch to 24 hour GMT or 12 hour format! Battery backup maintains time during power outage. ID timer alerts every 9 minutes after reset. Switchable seconds readout. Elapsed timer. Just start clock from zero and note time of event up to 24 hours. Bright blue .6" digits. Alarm with snooze function. Synchronizable with WWV. Lock function prevents mis-setting. Power out, alarm on indicators. Black. 5x2x3 in. 110 VAC, 60 Hz.

DUAL TUNABLE SSB/CW FILTER

MFJ-752B **$89.95**

Dual filters give unmatched performance! The primary filter lets you peak, notch, low pass or high pass with extra steep skirts. Auxiliary filter gives 70 db notch, 40 Hz peak. Both filters tune from 300 to 3000 Hz with variable bandwidth from 40 Hz to nearly flat. Constant output as bandwidth is varied; linear frequency control. Switchable noise limiter for impulse noise. Simulated stereo sound for CW lets ears and mind reject QRM. Inputs for 2 rigs. Plugs into phone jack. Two watts for speaker. Off bypasses filter. 9-18 VDC or 110 VAC with optional adapter, MFJ-1312, $9.95.

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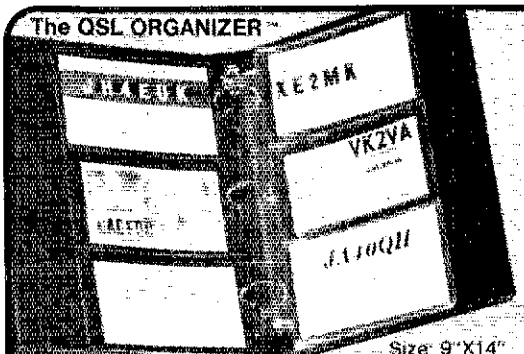

Lamar ARC is having their swapfest May 20th at the N.G. Armory, Lamar. Name droppers: EC WAØREX; SWN KØQBA; many other hams for passing over 75 welfare messages on 34/94 during a severe blizzard. 73, KQØJ. NETS: Colb QNI 887, QTC 36, inf 143, 22 sess., time 791; CWN QNI 149, QTC 129, 28 sess., time 600; CWXN QNI 2510, QTC 3123, 29 sess., time 2610, HNN QNI 1903, QTC 84, inf 420, 29 sess. time 1524. Traffic: NØBQP 2615, WAØHJZ 1122, KØJAN 502, WDØAUN 366, KØRXK 347, NØCXI 306, KBØZ 186, WØEJD 122, WDØBSZ 112, WDØAIT 103, NØEBM 90, WBØNHA 62, WØNFW 43, W5HRS 29, WØLQ 26, NØCYR 8.

NEW MEXICO: SM, Joe T. Knight, W5PDY — DEC: KB5XD. STM: KV5U. NMs: WA5UNO K6LL W5VFQ. Southwest Net (SWN) meets daily on 3583 at 1930 local and handled 264 msgs with 267 stations in. New Mexico Roadrunner Net (NMRRN) meets daily on 3.939 at 0100 UTC and handled 58 msgs with 1112 stations in. New Mexico Breakfast Club meets daily on 3.939 at 0630 local and handled 91 msgs with 1082 checkins. Yucca 2-Mtr Net 78/18 & 93/33 handled 23 msgs with 467 checkins. Caravan Club 2-Mtr Net 66/06 handled 9 msgs with 152 checkins. N5EBZ had his second open heart surgery on March 6th and we all wish him a speedy recovery. N5IA and the ZIA CONNECTION doing a FB job in linking 2-mtr repeaters over most of southern New Mexico and southern Arizona; a good public service. Traffic: W5UH 419, W5DAD 252, W5JOV 104, W5ENI 87.

UTAH: SM, Ron Todd, K3FR — STM: W7OCX. SEC: NA7G. BM: WA7MEL. OO/RFI: KD7FL. ACC: KB7XO. PIO: N7BHC. TC: K7RJ. Congrats to new ÇARC officers: W7ZDE KC7UB KA7KMO N7EZC N5CT. News this month is low so good luck to all who will be taking upgrade tests about this time. Hope to see many of you at the Rocky Mountain Division Convention in Denver at the end of May. Traffic: K7HLR 187, WA7KHE 88, W7OCX 27, K7UM 6.

WYOMING: SM, Dick Wunder, WA7WFC — SEC: W7TZK. STM: WØOGH. PIO & ACC: KC7QJ. I have a number of Leadership Official positions open. All those interested please contact me. Rocky Mountain Div. Convention is May 25-27 in Aurora, Colo. The Wyoming Hamfest will be held on July 14 & 15 at Meadow Lark Lake. I would like to get the Wyo. Council of Amateur Radio Clubs going again, so would like to see representatives of all repeaters present. Don't forget to check in to the VIC20/C64 Net, Sunday at 1 P.M. on 7.260 kHz. WB7QBC is net control. WJN — 25 sessions with 703 QNI & 0 QTC. WCN — 21 sessions with 778 QNI & 25 QTC. Traffic: WB7NHR 227, W7HLA 75, WØOGH 28, K7SLM 17, W7SQT 12.

SOUTHEASTERN DIVISION

ALABAMA: SM, Joseph Smith, Jr., WA4RNP — SEC: N4DMA. STM: N4JAW. SGL: KA4WVU. PIO: WO4W. BM: KF4VV. OO/RFI: K4ELV. I have appointed John M. Lord, K4ELV, as OO/RFI Coordinator. He is a life member of the League and a good amateur so give him all the help you can. If you would like to become an Official Observer, write him at 1620 Belvedere Dr., B'ham 35226. The Cullman club's new officers are: KD4ZD, pres.; KB4ACR, v.p.; N4GRU, secy. And from the Enterprise club the new officers are: KD4KT pres.; N4IXT, v.p.; KA4AFI, secy/treas. On a sad note we have four Silent Keys: W4EIB WB4OII W4FXZ WA4YTC. Word has come of these upgrades: WA4LXP K4IPF WY4K, all receiving EXTRA CLASS. Nets: CAND with 1166 messages in 29 sessions; rep by NW4X W4CKS and WX4I. RN5 had 639 mesages in 28 session swith Ala rep 98%. DRN5 1116 messages in 58 sessions rep by WA4JDH WB4IXA W4CKS NW4X WX4I KC4GS and W4WJF. PSHR: WA4JDH WX4I W4CKS WA4LXP WA4RNP. BPL: WA4JDH. The ARRL Info Net meets each Friday following the ATNM with the latest Section and League info. Traffic: WA4JDH 1036, W4XI 182, W4CKS 101, NW4X 86, WA4LXP 84, WB4IXA 45, KC4GS 26, WA4RNP 22, WB4TVY 12, W4WJF 12, K4HJX 8, W4DGH 7 WA4PJE 2.

GEORGIA: SM, Eddy Kosobucki, K4JNL — SEC: WB4ABY. STM & OO/RFI: K4VHC. ACC: WA4ABY. BM: W4BIA. PIO: WA4PNY. SGL: W4BTZ. TC: K4UDR. NWS: WA4PZD. Many, many tnx to Charles Griffin, WB4UVW of Clarkston for all of his undying efforts & lobbying before the GA State Legislature and for successfully getting a bill passed that will place "AMATEUR RADIO" on the bottom of our license tags. From all of us in the Ga. section, we salute you. Albany ARC's 2nd annual hamfest is scheduled for May 5 & 6. They invite all of you to attend. Might also mention that I have been informed by the ARC of Savannah that they are not scheduling a hamfest this year. If you desire to become a Volunteer Examiner and hold an Extra or Advanced class license, please send your name & call into the League. You DO NOT have to be a League member to qualify. WB4ABY, our vy capable SEC, informs me that he is looking for ECs in the following densely populated areas: Rome, Lagrange, Augusta, Brunswick, Albany & Athens. If U are interested please contact WB4ABY or me for an application. When U hear of a Silent Key, please try to get a copy of the obituary out of the paper & either inform me or send the info directly to the ARRL Hq. This will help expedite getting it into the column. Again I might mention that if UR community is thinking of any kind of a tower or antenna ordinance, please let me or SGL W4BTZ know immediately so that we may help. I don't know how many in the section are having any cable TV problems, but if you are, please take the time and send all information to the ARRL Hq. Summer is just around the corner and I am hoping that all have thawed out after the past hectic winter. Hoping to see all of you at some forthcoming hamfest or club meeting. Traffic: WB4RUJ 179, K4NM 83, W4PIM 81, KA4ATM 50, WB4NTW 50, K4VHC 32, W4HON 29, K4EV 27, N4BIM 24, W4BIA 22, K4BAI 16, N4UZ 7.

NORTHERN FLORIDA: SM: Billy Williams, N4UF — SEC: W4UEA. STM: WF4X. ACC: N4ADI. PIO: WA4PUP. BM: W4GUJ. SGL: KC4N Congrats to NO4J and NU4Y on their top place finishes in the recent WPX contest. Seems to be quite an interest in packet radio transmission. Statewide frequency is 147.465 MHz. Contact W1BEL for more information WØRAO had presentation on DXing in the Cayman Islands at recent LMARS meeting. Gainesville ARS reports good turnout at new club get togethers apart from regular club meetings. N4EC and W4GDJ presented a program on nets and traffic handling. Members of the Hernando Co. ARES participated in a search for a missing boy and were commended by the Brooksville City Mgr. N4DWY is new publicity chmn. for the Gulf Coast ARC. N4AYH is new editor of club bulletin. Playground ARC is very active in local public service events under the direction of N4GSS. W4LRC and W4ODW demonstrated SSTV at PARC. KB4IHR is XYL of KF4BU. KA4YLU has been nominated for the ARRL Maxim Award. Tnx to KC4N for the information on Chris' accomplishments. NOFARS has a new directed independent study course for the Novice

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MFJ-941D 300 WATT VERSA TUNER II

$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.

New airwound inductor! Larger more efficient 12 position airwound inductor gives lower losses and more watts out. Run up to 300 watts RF power output.

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.
MFJ-945, $79.95, like MFJ-940B with balun, less antenna switch.
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

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license. These are distributed only at regular club meetings. NX4F (ex-WD4IWD) recently retired from the FAA. Greater Jacksonville Hamfest is set for August 4-5 at the Orange Park Kennel Club near US 17 and I-295 South. Owing to an error at Hq. the December column was omitted. PSHR and BPL results were printed and credited. The SAR will be credited although no official word has been received as yet. Traffic: WF4X 1278, W4PL 734, WD4IIO 620, WA4QXT 502, WF4Y 340, WX4J 296, KB9LT 276, WD4HBP 240, WB4ADL 206, WA4EYU 173, NY4E 153, KB4LB 153, KD4KK 123, WB4TZR 104, WD4IUI 89, KF4U 88, WD4MLQ 81, W4GUJ 62, WD4EQB 54, NF4O 54, W4MGO 46, KD4QZ 38, NA4F 40, AH2AO 33, KB4T 29, N4ADI 28, N4GMU 28, WD4RIQ 26, WB4YOP 27, WD4HUZ 27, NQ4P 26, NS4C 24, KA4ETX 21, N4JAQ 20, N4JHI 17, N4BOY 14, WB4AWG 13, W4FI 13, N4HGD 13, W8IM 13, WA4STZ 13, KI4CQ 11, N4IP 10, N4UF 10, W4LUW 9, KF4GY 7, W1HXK 6, KB8GT 5, KV4HI 3, WA4PUO 2, N4HTU 1, WY4O 1, WA4PUP 1, KA4RBY 1.

SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFK — SEC: W4SS. STM: K4ZK. TC: KI4T. BM: WA4EIC. ACC: AA4WJ. PIO: W4WYR. SGL: KC4N. OO/RFI: W4SS. I am sorry to inform you that W4DDW of Kissimmee became a Silent Key. We will miss his chimes on the traffic nets. W4SS reports that the hams assisting in the nuclear disaster drill in St. Lucie Co. received a "good grade" from the Federal Energy Management Office. WB2OUK said that the new officers of the Lehigh Acres ARC are WB2OUK, pres.; WB4HYB, v.p.; WB4JLO, secy/treas. The Lehigh Acres Club will also put Glades Co. on the air for the Florida QSO Party and will have traffic originations at the Spring Festival March 18-24. WB2OUK also stated that the Red Cross is providing space for the Lee Co. ARES station in the new facility in Ft. Myers. K4JLL reported he participated in manning the club booth at the Southwest Florida Fair as well as the Edison Pageant of Lights. KA4FZI had a busy time at a difficult corner helping with parade communications for the floats during the parade in Ft. Myers. KA4RWV reported there were 38 amateurs assisting with manning the booth at the Southwest Florida Fair, and all were acknowledged in the *Ft. Myers Club Modulator* except KA4MBR, who was inadvertently left out. So, congrats to him also for a job well done. We had 132 SARs this month, largely in part owing to the yeoman efforts of Lee Co. amateurs. WA4EIC sent a bulletin report showing a total of 31 bulletins received and 49 sent by WA4EIC W4DL K4IEK AA4BN WD4KBW and NW4R. NW4R will be leaving shortly to work in Saudi Arabia. NW4R also qualified for ARRL 30 and 35 wpm code proficiency in February. W4DUG says thanks to all who assisted with the 1984 Florida State Fair traffic. Also thanks to W4DUG for helping give us such a high traffic total for the month, 25704 for the section. KE4O is rearranging his radio shack and getting ready for computerized opeation. W4JM says Lakeland's Wednesday luncheons at Season's Restaurant are averaging an attendance of 45. Everyone is invited! W4LLA made 44 phone patches this month. W1NJM says he will be less active in March and back home in April, then back here next December. Time flies; it seems as if he just got here. The Ft. Myers hamfest in early March was just great — and the best section forum that I've been a part of. W5KLV reported Florida was represented 100% on DRN5 in February. KB5W reported one session missed by Florida on RN5. WB4WYG reported that N4ET has had to resign as assistant manager of the Florida Phone Traffic Net. The Indian River ARC is planning a SUN DAY observance for May 5th and 6th. They will be operating SSB and CW on 40, 20, 15 and 10 meters with FM transmissions on 2 meters. 73 de WA4PFK. Traffic: W4DUG 8744, W3CUL 6774, W3VR 2433, VE3BSY 666, W4NFK 527, WA4EIC 478, WA4PFK 414, W4LX 320, W4DVO 320, K4SCL 311, K4IA 299, K4EUK 253, KY4U 244, W1NJM 205, WA4GYR 200, WD4CHO 193, WB2NVJ 187, KA4GUS 180, K4JHF 168, WB4WYG 162, W4PKP 151, KA4KSQ 141, W4YCL 132, WA4HXU 126, WD4KBW 115, K4FQU 114, W4DL 108, KF4JA 97, NW4R 92, KA4NXF 88, KA4RWV 81, NJ4O 81, K4FQS 79, WB4AID 78, WD9AEP 75, W4SME 62, W4LLA 60, K4JI 58, K4JLL 57, W4MPV 56, KF4RL 52, AF3S 48, KA4YHS 44, W3TLV 39, N4KB 36, WB4GCK 33, AA4BN 31, K5IHH 29, KA4OAA 26, KE4O 23, KA4FZI 23, N4APE 22, WA4TWD 21, K7LCA 19, WK4E 18, KA4BBA 17, K8BXT 15, W4WYR 13, KA4UIO 12, AA4WJ 12, WB2OUK 11, N4HAS 10, W3IJR 10, WT4F 9, WV4F 9, KA4SIH 9, KA4TTS 9, WD4AWN 8, K9EHP 8, K4IRT 8, KF4AX 7, KA4KDD 7, WD4PPA 7, KA9AKY 6, KB4AXD 6, W1DLP 6, KA4GDU 6, WB4HXB 6, N4IXO 6, W4JM 6, W4UIO 6, KA4GDU 5, WD8JPF 5, K4VSN 5, WD4MCC 4, W4MFD 4, KY8T 4, WB4GJH 3, KA2IXV 3, K4OCV 3, VE3SI 3, N4AKA 2, N4BXU 2, W3IJC 2, WB8SNT 2, W4AAA 1, KA4AGI 1, WA4CAP 1, W9CDG 1, NV5CK 1, KI4CS 1, WO4D 1, NBEL 1, WA4EVU 1, KE4EY 1, N4FGG 1, KM4G 1, DL9HAD/W4 1, KA4HLT 1, N4IKX 1, KA4JST 1, K8KBF 1, WA4LKY 1, WB2LXN 1, KA4MBM 1, KA4MBR 1, W4MKC 1, WA6OCJ 1, W4OUU 1, WA4PIL 1, WB8REJ 1, KA2RRU 1, K2SET 1, W2SKM 1, KA4USU 1, K4VGN 1, NX4N 1, KA4YAT 1, KA4YHF 1, KA4YLV 1. (Jan.) NC4H 136, W4SME 77, W8BZY 41, N4IXO 8, WT4F 4.

WEST INDIES: SM, Gregorio Nieves, KP4EW — West Indies Net Slow (WINS) daily 7 P.M. (2300 UTC) on 3.710 MHz. West Indies Net Central (WINC) daily 6:30 P.M. (2230 UTC). In the transmitter hunt activity, celebrated by the PRARC, nobody found the place, and the prize was declared vacant. The same activity will be held sometime later. The nearest one about a mile from the place was invited by the president KP4AOC for a get together after the activity in a restaurant near the town of Morovis where the transmitter was located. The next activities will be Sunday, March 11, when the YL club will be celebrating a mini-hamfest at the country home of KP4DDP. The PRARC will be celebrating two mini-hamfests soon, the first one April 1st at the Arecibo Country Club, and the other one on May 4-6 at Punta Santiago Beach Resort. Humacao, P.R. West Indies Net Borinquen WINS starts March 1 at 2200Z on 3931 kHz LSB. KP4DJ reports the following totals for WINS: QND 475, QNI 146, QTC 58, 29 sessions. Traffic: KP4DJ 70.

SOUTHWESTERN DIVISION

ARIZONA: SM, Erich J. Holzer, N7EH — STM: W7EP. NMs: WA7KQE WA7FDN. The month of February despite its extra day has passed by. W7CI reports completing 1st 2-meter WAS in AZ. TRA reports that the following participated in providing communications for the American Express Ride and Stride: K7CRN WB7VOM K7CET KA7FRY W8BID WB2KSU AF7M N7DZN K7OMR WB7ONS WB7OWA K7CO WB7CGQ N7EKT KB8IW WA7RKI K7KYW. ARA reports the following participated in providing communications for the American Cancer Society "Climb The Mountain-Conquer Cancer" climb: KA7DTT N7DFH KA7QWF K7LKL KA7FQO N7DOM W7WGW K7YVL K7YVK W3KMD KA7DRV. The Coconino Co. ARC reports the following participated in The AZ Citizen's Cup

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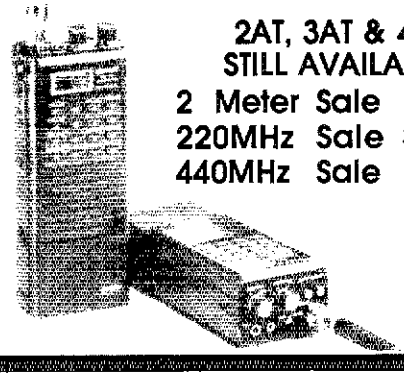

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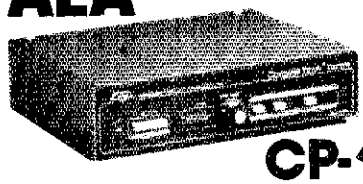

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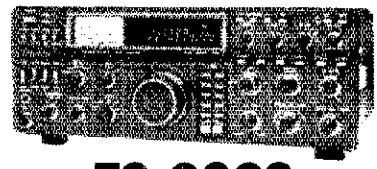

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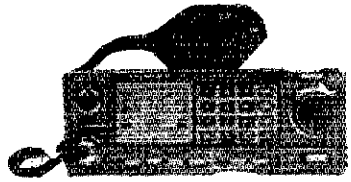

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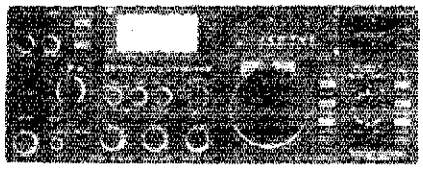

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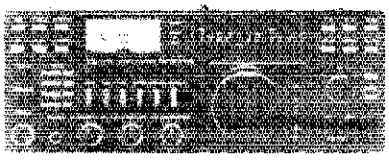

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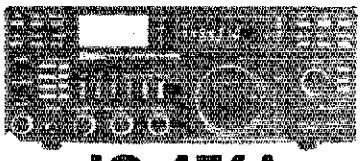

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VISA

Cross-Country Ski Race; KA7MGO KA7KMU WB7EVX N7CEE. CCARC also reports the following participated in the Special Olympics communications exercise: WA7NXL KB7XN WA7LTH N7FU NF7E N7CXF W7YS WA7YUL WB7EUJ N7CEE WB7EVX W7LUX KA7MGO N7FVK. The Supersition ARC reports that their special event station operation at the end of Jan. was a highly successful operation. KB7FE reports that he and the following provided comm. for the Annual Scout Parade: K7QCS K7BB KA7FQO K7TPW. PSHR: KB7FE KO7V. ATEN: QNI 1013, QTC 107. Cactus Net: QNI 731, QTC 115. SWN: QNI 267, QTC 264. K6LL is now NM for SWN. Vacancies still exist in field organization. Are you interested? New appointees: W7AMM OBS. Traffic: KB7FE 239, KO7V 110, W7AMM 56, W7EP 38, KA7HEV 32, KA7JNU 31, W7KXE 24, N7CQY 16, WA7KQE 15, K7NMQ 13, WB3LQQ, N7EH 5, W7DQS 3. (Jan.) W7AMM 10, W7DQS 4, KE7W 2. (Dec.) KE7W 8.

LOS ANGELES: SM, Stan Broki, N2YQ — SEC: N6UK. STM: W6INH. ACC: NF6D. Congrats to Hughes RC in El Segundo for being the first Special Service Club in LAX. ARES Subarea 4 worked on the Long Beach Marathon on Feb. 12. The LAOOC finally agreed to allow Amateur Radio operation from the Olympic Villages. All local ARRL members should have received a detailed package on who to contact to volunteer. Additional amateur support is requested by both the LA Police Dept. and the LA area Red Cross for Olympic assignments. DEC for the southern district has a new call, NR6O. OO reports: K6KA 19, WB6CGZ 5. The Valentines Day traffic pretty heavy this year; looks like a short dry spell for now however. Band conditions have improved considerably lately. W6INH has been on a rig-buying spree again — new FT-980 and FT-102 coming; hope the DX improves, hi. OCWA chapters will be having their spring dinners in May and June check with chapters 7 and 130 for place and date. 73. Traffic: K6UYK 615, K6YBV 351, AD7G 279, W6INH 271, AD9A 114, WA6OCM 98, N6DZQ 21, WB6FWZ 15, W6ORF 11, K6CL 8, W6NKE 7.

ORANGE: SM, Sandra Heyn, WA6WZN — SEC: W6UBQ. STM: WA6QCA. ACC: KA6NLY. BM: W6DXL. OO/RFI Coord: N6PE. PIO: NS6W. SGL: N6HIQ. TC: AA6DD. DECs (by counties): WB6JBI (Orange); W6LKN (Riverside); WA6IHK (San Bernardino); KA6HII (Inyo). W6UBQ attended Inyo Co. Emergency Relief Conference held at Furnace Creek in Death Valley where a county RACES is being formed with the current ARES. EC WB6VMR will head up comm for the Gordon Bennett Balloon Race which will begin May 5th in Palm Springs. San Bernardino new RACES repeater WA6IKH/R is now operating on 147.325 (+.6) from Crestline. Buena Park ARC has started a net Mon 7 P.M. on 147.495 simplex. Ladies ARA of Org Co. started a new 8 P.M. Thurs on N6ME/R 145.4 (–.6). Mt Wilson RA has begun Wed 7:30 P.M. computer net in addition to the weekly news net on Mon and swap net Thurs WA6JPI/R 146.40/147.435. Since RN6/D (7275 kHz) changed its first daily session to 9:45 A.M. RTTY VHF net has been changed to 9 A.M. operating on both 146.7 (–.6) W6IWC/R and 145.12 (–.6) WB6ZIR/R. Org Co. ARC 10/10 net control WA6HEL of Tues 7 P.M. net held on 28775 kHz is turned over to AG6O at the end to exchange RTTY and SSTV. Members of West Coast ARC have started an "Insomniac Net" daily 11 P.M. on 144.33 simplex. Fullerton ARC started weekly net Tues 8 P.M. on 147.495 simplex ("channel X"). SCDXC has weekly DX info net 7:30 P.M. Thurs on their DX repeater 145.48 (–.6) AD6P/R. Desert Amateur Transmitting Society (RATS) meets second Tues at the police training center in Palm Springs; their Mon 7 P.M. net on 146.94 (–.6) on K6AN/R provides location on their Wed/Fri luncheons. New club officers — So Counties Amateur Teleprinters Society (SCATS): WD6FWZ, pres.; N6GZP, v.p.; N6CPP, secy.; WB6INV, treas. Leisure World/Laguna Hills ARC: W6FAA, pres.; W6WDP, v.p.; KE6YV, secy/treas. OC Red Cross new chapter comm manager is WB6ORK with support from Hq staff W6RE, K6LJA and WB6NOA. KØOV is organizing ARES booth at Ca Emergency Services Assn. (CESA) conference to be held May 9-11. Western ARA held successful outing at Follows Camp near Azusa headed by N6DWR and WA6UYB. Anaheim ARA T-hunt has been changed to the 4th Sat at 7 P.M. at the Nohl Ranch Road starting location. KD6DA reported thanks to WB6BPT WB6GCT N6FFQ and KA7SCO 2 meters comm was used to locate RV in Bard, CA for priority traffic. PSHR: N6GIW WB6QBZ KA6BNW KA6HJK WA6QCA AI6E.

Net	Freq.	Time	QNI	QTC	NM
SCN/1 (20+)	3598	7 P.M.	295	334	AI6E
SCN/2 (13–)	3598	8:15 P.M.	178	70	AI6E
SCN/V (FM)	146.645	9 P.M.	522	355	WA6QCA
RTTY/VHF	145.12	9 A.M.	481	113	KA6HJK

Traffic: N6GIW 188, WA6QCA 182, KA6HJK 175, KA6BNW 145, WB6QBZ 132, AI6E 100, W6RE 80, K6GGS 74, W6NTN 44, W6PNS 24, K6ZCE 22, N6FRW 21, W6TKV 14, KA6HMS 6.

SAN DIEGO: SM, Arthur R. Smith, W6INI — STM: N6GW (222-5575). SEC: W6INI. PIO: WA6CUP. ACC: WA6COE. TC: N6NR. BM: WA6HJJ. ECs (by district): WD6CSS Southern; N6CQW Eastern; WA6EYX Northern; WA2NNT Tri-City; W6INI Central; WA6LAW Imperial. Volunteers are needed for Cal Dept of Forestry's Red Flag Patrol. Contact W6INI (273-1120) for info. The patrol operates during extremely high fire hazard weather generally associated with Santa Ana conditions. Indications are that we will have a long and severe fire season. Novices and Techs can participate in an ARES CW net each Saturday at 1930 hours on 3725 kHz, with WA6BCC as net control. Palomar ARC meets 1st Wed. at Glendale Fed S & L in Vista at 1930 hours. Poway ARS meets 3rd Tue at 1930 at 1st Baptist Church, 13604 Midland Rd, Poway. If you have 220 MHz capability, you are needed by ARES to participate in emergency and public service activities. Net meets each Saturday at 1900 hours on the 220 club repeater, 224.90 (–). Traffic: KT6A 434, W6HUJ 187, KU6D 145. KB6AI 104, N8AT 31, KF6TF 15, WA6IIK 14.

SANTA BARBARA: SM, Ernie Kapphahn, WB6HJW — Tnx for all the reports this month. Heard from W6POE WD6EVT W6PN K6SZS N6FOU K6YD W6POU and W6RIC. Section net handled 74 pieces of traffic. The net meets nitely at 2100 local on 145.18 rptr. The section net held its annual picnic get together on March 10 at Nojoqui Falls Park. March 10 was also the date of SCIR Cardiac Cyclists Club SYV bike tour. SYV RA (224.04) provided comms New licensees in the section include KB6DMD, mgr of Ventura Red Cross; KB6DHF, director of Safety Services for Ventura Red Cross; KB6DHG, Ventura Red Cross board member & S.O. Sgt. Ventura Co. Tnx to Poinsettia ARC (KA6BPG & WD6BKF, instructors) for bringing in these new licensees. KA6Q and others teaching Novice classes at police training facility in Santa Maria. Classes in Atascadero were delayed after instructor NF7U suffered a heart attack. We hope by the time that this column ap-

pears that NF7U and the classes are both going great guns. N6IR will head up license exams planned for the ARRL convention Oct. 12-14 at Santa Maria. Traffic: K6YD 100.

WEST GULF DIVISION

NORTHERN TEXAS: SM, Phil Clements, K5PC — ASM/ACC: NI5V. STM: W5VMP. SEC: W5GPO. PIO: N5FDL. SGL: W5UXP. TC: WB5IIR. BM: W5QXK. OO/RFI: WB5JBP. Storm season has started early this year, with several SKYWARN nets activated in Feb. and a tornado spotted near Greenville. W5OYS is new EC for Wise Co. DXers: Mark your calendar now for Hamcom '84 @ Dallas June 1-3 as the Richardson Wireless Klub will be in charge of a DX seminar featuring AD1S of Jarvis Island fame and many other interesting topics. Hamcom is again this year the ARRL West Gulf Div. Convention. The popularity of the home computer as a RTTY terminal is growing like wildfire! This will be a fabulous tool for health and welfare ttc in times of disaster. Let's designate freqs. on 80 and 40 mtrs for this operation. Your suggestions, please. W5GPO and I are hitting the hamfest trail, starting with Midland in March. Hope to see you and eyeball QSO on the circuit! PSHR: KB5UL KA5AZK N5BT KC5NN KD5FR N5GKF N5DKW N5EZM. Traffic: N5BT 291, KB5UL 247, KA5AZK 188, KD5FR 94, N5GRZ 84, N5DKW 61, NI5V 37, WB4HML 36, KC5NN 32, W5CUE 22, W5ERT 20, N5GKF 13, AE5I 13, N5GQG 12, K5HGX 6, K5PC 5, AJ5F 2.

SOUTHERN TEXAS: SM, Arthur Ross, W5KR — ASM: N5TC. TM: K5QEW. OOs reporting: K5DL K5RVF. BPL: N5DFO W5CTZ WB5YDD. Computer OBS (COBS) WB5FCO of Austin has been busy putting ARRL bulletins and other amateur bulletins into the Armadillo Computer Mail Box; works great. OBS N5DFO gave 35 bulletins 42 readins on 8 nets. OBS W5KLV gave 6 ARRL bulletins, 31 satellite bulletins, 5 propagation forecasts, 4 DX bulletins and 2 CRRL bulletins 98 readings on 4 nets. ORS W5TFB has moved to the "country" and uses "alternative energy" for much of his amateur needs. Happy birthday to Beaumont ARC; they celebrated in February the 4th anniversary of the club bulletin, *Beaumont Amateur Radio News; BARN* also reported WD5ACI won first place trophy in 10-meter QSO contest held by local 10-X International. N5DKW did a great job in his first effort at publishing the *Texas Slow Speed Net* bulletin. Brazosport ARC tried the idea of having a babysitter at club meetings; hope it works out. No reports on emergency communications received this month. CAND mgr W5KLV reports DRN5 represented 100%; STX stations KD5KQ N5DFO WB5YDD W5KLV. DRN5 mgr WB5YDD reports STX represented 100% by N5DFO W5KLV W5CTZ WB5EPA WB5FQU KD5KQ K5KJN KS5V W5TFB W5URN KD5CB WB5ATB WB5YDD. Traffic: N5DFO 568, W5CTZ 554, WB5YDD 517, W5KLV 228, N5TC 150, WB5EPA 113, K5GM 109, W5TFB 91, KS5V 61, K5OWK 60, WB5MMI 35, W5BGE 30, W5KR 29, WD5GKH 18, K5HZR 9.

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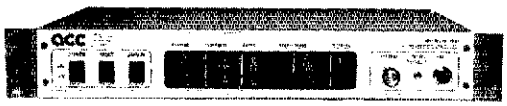

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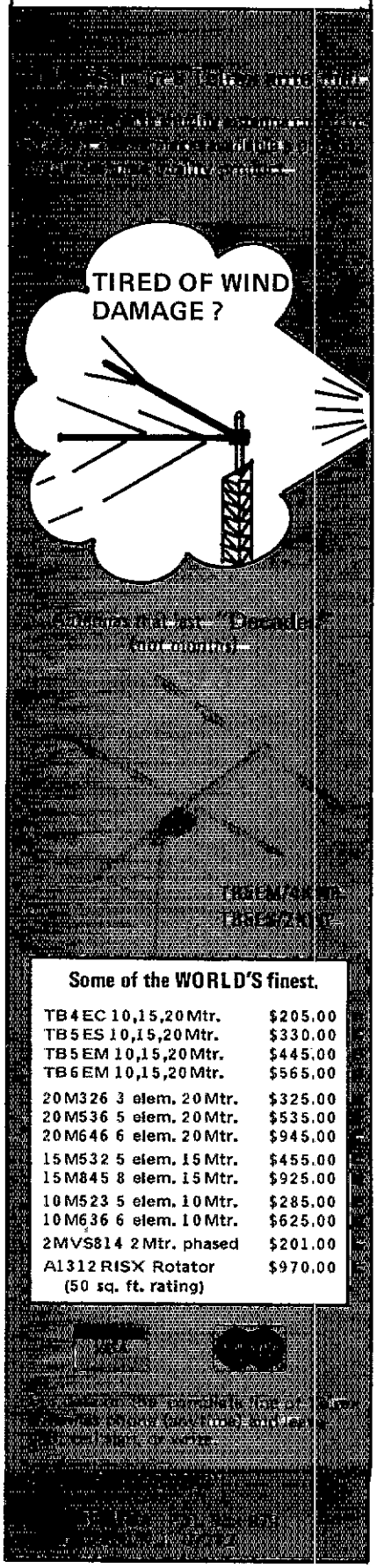

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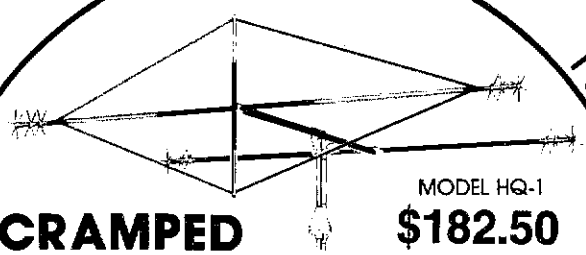

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Clubs/Hamfests

QCWA Quarter Century Wireless Association is an international nonprofit organization founded in 1947. You are eligible for membership if licensed 25 or more years ago, and presently licensed. It is not necessary to have been licensed the entire 25 years. Members receive QCWA publications and participate in QCWA activities. Come grow with us! Write QCWA, Inc., 1409 Cooper Drive, Irving, TX 75061.

PROFESSIONAL CW operators, retired or active, commercial, military, gov't., police etc. invited to join Society of Wireless Pioneers — W7GAQ/6 Box 530, Santa Rosa CA 95402.

IMRA-International Mission Radio Association Helps missionaries by supplying equipment and running a net for them daily except Sunday, 14.280 MHz, 1900-2000 GMT. Br. Bernard Frey, 1 Pryer Manor Rd., Larchmont, NY 10538.

THE Veteran Wireless Operators Association, a non-profit organization of communications people founded in 1925, invites your inquiries and application for membership. Write VWOA, Ed. F. Pleuler, Jr., Secretary, 46 Murdock Street, Fords, NJ 08863.

JOIN the Old Timers Club, an international non-profit organization. If you operated a radio station, commercial, amateur or Armed Forces 40 or more years ago, and have an Amateur license at present you are eligible. Join the real pioneers of ham radio. Write O.O.T.C. Box AA, Mamaroneck, NY 10543 for details.

HAVE A-M capability? Join S.P.A.M. (Society for Promotion A-M) Membership is free. Write: F.A. Dunlap (S.P.A.M.), 14113 Stoneshire, Houston, TX 77060 (S.A.S.E. please).

W.A.R.A. Warren Ohio Hamfest Aug. 19, 1984 at Kent State University, Trumbull Campus.

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.

ATLANTA HAMFESTIVAL 1984! Sponsored by the Atlanta Radio Club. June 16th and 17th will be held at the Atlanta Civic Center. 70,000 square feet of air conditioned exhibitor space and over 800 outdoor fleamarket spaces will be available. Write: Atlanta Radio Club, P.O. Box 77171, Atlanta, GA 30357.

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FOX-TANGO Newsletters — Since 1972, the prime source of modifications, improvements, and repair of Yaesu gear, free to Club members. Calendar-year dues still only $8 US, $9 Canada, $12 elsewhere. Includes five-year cumulative index by model numbers, or send $1 for index and sample Newsletter. Fox Tango Club, Box 15944, W. Palm Beach, FL 33416.

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THE MONTACHUSETT Amateur Radio Association will hold an indoor Flea Market May 20, 1984 at the Fitchburg Civic Center, 1000 John Fitch Highway, Fitchburg, MA 01420, from 9 AM to 3 PM. Talk-in on 145.45/85 and 146.52. Refreshments available. Free parking. Table reservations are $8 each in advance to Jim Beauregard KB1AY, 7 Mountain Ave., Fitchburg, 617-342-9847.

TCRA HAMFEST: Tri County Radio Association Rain or Shine Sunday, May 13, Passaic Valley Community Center off Valley Road, Stirling, N.J. 9 AM to 4 PM. Indoors, refreshments, rest rooms, free parking. Tables $6 registration $2.50. Table reservations call or write Dick Franklin, W2EUF 201-232-5955 or 270-3193 P.O. Box 182, Westfield, N.J. 07090.

JUNE 3 — SRRC Hamfest, Princeton, Illinois. S.A.S.E. to SRRC/W9MKS, RFD #1, Box 171, Oglesby, IL 61348 for complete details, map, registration materials, etc.

ANNUAL Evansville TARS Hamfest May 20, 1984 Vanderburgh County 4-H Fairgrounds. Open at 6 AM CDT. All indoor — inside and outside flea market. Admission $3. Indoor tables $7.50. Outdoor flea market $3. Talk-in on 147.75/.15 and 146.19/.79. For table reservations and information contact Mike Anderson, KA9LQM, Post Office Box 3284, Evansville, IN 47732.

10TH ANNUAL Northwestern Pa. Hamfest — May 5 — at Crawford County Fairgrounds, Meadville. Admission $3, children under 12 free; inside displays $4; outside flea market $2 per car space. Free auction. Commercial displays welcomed. Talk in 13/63 81/21,/63/03. Details: CARS, P.O. Box 653, Meadville, PA.

HAMFEST-The Annual Kankakee Hamfest will be held at the Kankakee County Fairgrounds on May 6. FCC booth, large flea market and many exhibitors. Take Exit 308 off I-57 to 45 South 1 mile. For further info contact Don Kerouac, 1377 Circle Dr., Kankakee, IL 60901.

NEW JERSEY — The Jersey Shore Chaverim are sponsoring the third annual Ham & Computer Fest on June 10, 1984 9 A.M. to 4 P.M. at the Jewish Community Center, 100 Grant Avenue, Deal, N.J. We have indoor space, 7,300 sq. ft. Admission is $3 per person (children under 12 and XYL's free). Refreshments available. Awards. Indoor table $8 and tailgating $3.50 per space. Spaces may be reserved by SASE and advance payment to "Jersey Shore Hamfest", P.O. Box 192, West Long Branch, N.J. 07764 by June 1. For information call Arnold W2GDS 201-222-3009. Talk-in on 147.045 + .6: 145.110 — .6 146.52 simplex. Deal, N.J. is less than 50 miles from NYC and 70 miles from Philadelphia.

BOSTON AREA Microcomputer Show and Computer Fleamarket (indoors), May 19-20 at Northeast Trade Center, Exit 39 of Route 128 in Woburn, Mass. Hours 10 to 4. Seller tables $50, Booths $250, Buyers $6.00 (with this ad). Call 617-437-0090 or 201-297-2526 for seller reservations with MC, VISA or AMX Card. W2TGH.

NEW JERSEY Microcomputer Show and Computer Fleamarket (drive-in covered parking area), June 2-3 at the Meadowlands Hilton Hotel, Route 3, Secaucus, NJ near Exit 16W of NJ Turnpike. Sellers $25 — NO reservations! Opens at 8:00 AM on both days for sellers. 9:00 AM for buyers. Buyers $6.00. Call 201-297-2526 for information. W2TGH.

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QSL's by W4TG: Prices from $16 per 1000. Send SASE to PO Box F, Gray, GA 31032.

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PICTURE QSL cards of your shack etc. from your photograph of 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.

QSLs, Catalog 50¢ N & S Print, 2523 West Orangewood Avenue, Phoenix, AZ 85021.

STAMP brings QSL catalog of new designs and samples, from $7 up. 22 years custom printing. WA6SOK, 4056 Acacia, Riverside, CA 92503.

RUBBER STAMPS: Name, Call and Address, $3.75 postpaid U.S. Floyd Durand, W5YZC, P.O. Box 67, Westwego, LA 70094.

NEW 3-D designs, including Space Shuttle, samples 50¢, 3-D QSL Co., P.O. Box D, Bondsville, MA 01009.

QUALITY QSL's reasonably priced, samples 50¢. QOF Press, P.O. Box 8111, Eau Claire, WI 54701-8111.

DAYTON HAMVENTION . . . Lola and I will be there — Booth #229. Drop by and chat a moment. QSL's By W4MPY, 704 Audubon Circle, Belvedere, SC 29841.

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General

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ICOM IC-751, brand-new, Yen. 200,000. ($870. approxi.) Makoto Takano, JA8OBL/1, D13-4 Nagahori, Tokai, Ibaraki 319-11 JAPAN.

GERMAN AMATEUR asks for techn.-modification for Rec.R-392, and try to find tubes 2 6FZ6, 2 6C6 and AF-ampl. module assembly (trans.) DC8XA, Bruns, Stupfstr. 2, D-8 Munich 19, W. Germany.

CLEANING SHACK. S.A.S.E. for list of ham and computer items. Monty Hart, VE3TA, Box 359, Stroud, Ontario, CANADA L0L2MO.

CANADIANS! Tempo One transceiver, external VFO, Digital Frequency Display, P.S./speaker. $450. David Weiner VE2QV/3, 332 Homestead Crt., London, Ont. N6G 2E9.

CANADIANS, Squire-Sanders SS-1R receiver and SS-IV Video Bandscanner $300; MFJ Speech Compressor LSP-520BX-II $45; Vibroplex Original DeLuxe $50; General Radio 583-A Output Meter $10; Johnson Matchbox model 250-23-3 $125; Heath Antenna Impedance Meter $5; 829B $15. C. Gutman, 7526 Mountbatten Rd., Montreal, Que. H4W 1J9.

WANTED SB-221 VE7EJ Callbook QTH okay or 604-596-9839.

MICROWAVE MODULES MMT 1296/144G $320, MMT 432/28-S $260, MMT 220/28 $220, MMT 144/28 $169, MMX 1268/144 $199, MMC 432/28-S $59, MMC 432/144 $59, MMC 144/28 $49, MMC 439/600 ATV $49. Hans Peters, VE3CRU, 416-759-5662.

SWAN 350: Need Sideband Switch and USB crystal plus 10K RF Gain pot with push-pull switch. VE3JQK, 36 Beaumaris, Ottawa K2H7K3.

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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.

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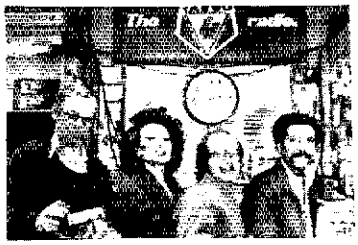

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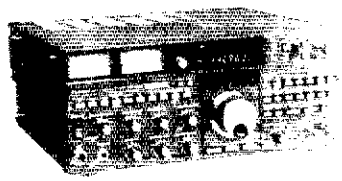

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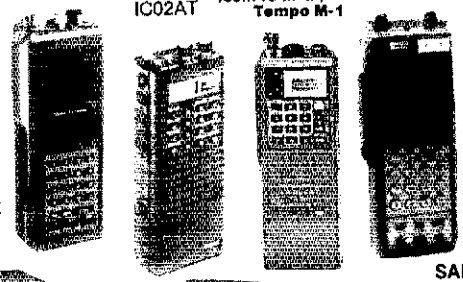

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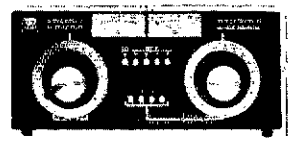

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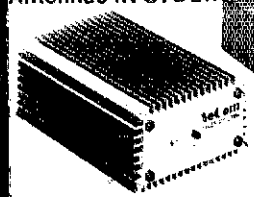

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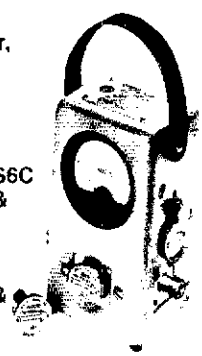

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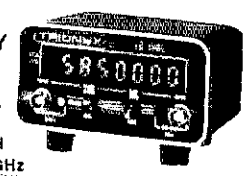

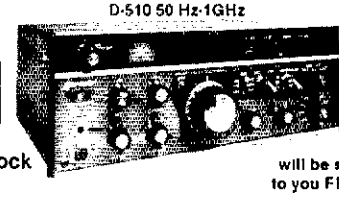

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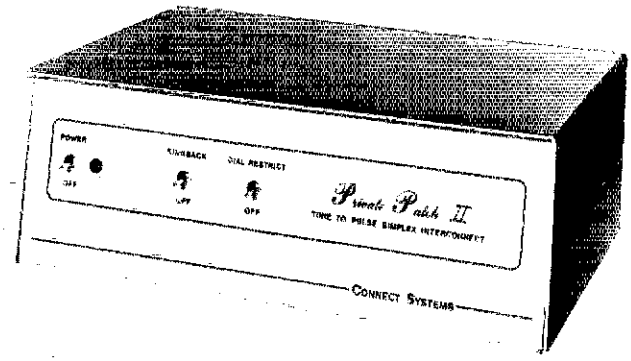

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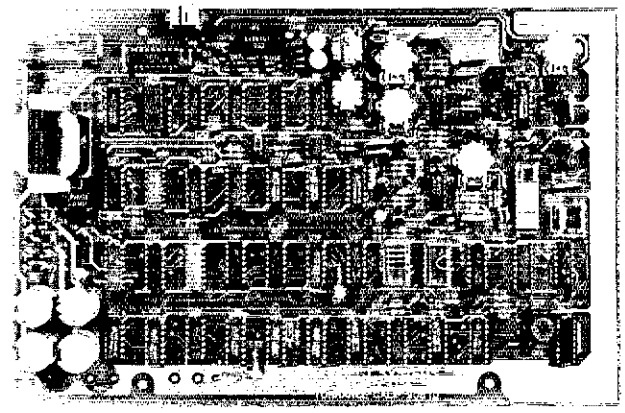

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Band selection is by means of a high reliability inductor switch with one position per band. The 10 through 80 meter inductor is teflon insulated air core construction. The 160 meter inductor is teflon insulated on a large toroid core. This inductor system provides maximum "Q" and efficiency in a compact space.

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WANTED Yaesu 220 MHz FT-127RA K7IJ POB 433 Sausalito, CA 94970.

WANTED: Bliley variable frequency crystals, VF-1, vicinity 3585 and 3865 Khz. Nagle, 12330 Lawyers, Herndon, VA 22071.

TENNATEST - Antenna noise bridge-out-performs others, accurate, cost less, satisfaction guaranteed. Send stamp for details, W8URR, 1025 Wildwood Rd., Quincy, MI 49082.

FOR SALE: Kenwood TS-930S, Alpha 76PA linear, Tetrex 3-ele. 15M & 20M beams. K1JO POB 431 New Milford, CT 06776. 203-354-9735.

HW-8 mods: reprints of the HW-8 series from CQ: Test Report and two-part modifications series, plus miscellaneous improvements. Proceeds support MILLIWATT DXCC QRP trophy program. $7. Ade Weiss, W0RSP, 83 Suburban Estates, Vermillion, SD 57069.

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MUST SELL: Drake TR-7, PS-7, MS7 4 filters, 2 fans, $800. Heathkit SB221 - $325. Dovetron MPC 1000R Mark Two RTTY Terminal Unit - $850. Complete OSCAR 10 station: Icom 251A, 451A, Mirage D1010, amplifier, MuTek pre-amp, KLM146 & 18C ant. with relay switching, $1,000. Info-Tech M300C 200F - $500. All equipment mint condition. KBØWY, Bill, 218-328-6198.

WANTED: National "Thrill Boxes" from 1930s: SW-2; SW-3; SW-4; SW-5; SW-32; SW-45; SW-68; NC-5 and HFC converters, others. Nagle, 12330 Lawyers, Herndon, VA 22071. 703-620-3066.

KENWOOD Dual-Band Mobile Antenna (MA-4000) Mounts. Guaranteed fit. Magnetic $23.; Body mount $15. Checks, VISA, Mastercharge. Postpaid USA. Harpole's Tait Towers, 6005 Rainier, Plano, TX 75023.

28ASR/Gearshift/Reperf $175; 28ASR/Reperf $100; Paper Winder $25; Model 19 (mint) $70; 15 Pedestal $10; 14 Reperf $30; 550 Picture Tapes/Cabinet $50; Oscilloscope $30; InfoTech M200F/300/9" monitor $600; SWTP Baudot Terminal $30; 12" Monitor $20; 120 Vdc/5A supply $5; DT600 $40; UT4/XB6 $120; UT2 $20; crystal AFSK $20; 2AP1A/bezel/filter/shield $20; 500 MHz Counter $60; Audio Generator $30; 5-88mH toroids $5; VTVM $15; Sonar 10W 2-meter FM/PS $70; 60' crankup tower $100; metal desk $10; 6'×19" rack cabinet/AC strip $35; high current +12V/−12V/+5V supply/Crowbar/Current Limiting $50. Call Dave K3KD 215-754-6285.

CONNECTICUT'S Ham Store - Rogus Electronics, 250 Meriden-Waterbury Turnpike, Southington 06489 203-621-2252.

KENWOOD TS830S, CW filters, Delux knob, mint, $695. TS820S mint $500, SP820 $45, Heath SB104A, power supply, NB, CW filter, SB604 speaker, manuals, excellent cond. $325. U-ship W7YOF, 602-967-1755.

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"And Part Of Which I Was — Recollections Of A Research Engineer" by George H. Brown. My adventures with antennas and color TV. $20 postpaid. Angus Cupar Publishers, 117 Hunt Drive, Princeton, NJ 08540.

SELL — R-390A modules and parts. SASE for list. Bob, W6ME, 4178 Chasin Street, Oceanside, CA 92056.

YAESU FT-101ZD, narrow CW filter, just returned from Yaesu overhaul, new finals, excellent. $475. WØVTP, 402-391-0188, 218 So. 95, Omaha, NE 68114.

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IC-25A & HM8 — exel - $200. N2WS - 212-596-7500 days.

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COMMODORE-64 Owners! Get "HAMFILE," a professional, automated logging system. Optional printer output. Full data search features. Unlimited data capacity. Cassette only. $10.95 p.p. John Kenney, 107 Foxwood Dr., Hendersonville, NC 28739.

WANTED: Kenwood TS-900 XF3 3.395 MHz CW filter. Call Witt, KA1KVZ, 617-522-8405.

COLLINS: Mint 75S3C & 32S3 Round Emblem plus 312 speaker ps. Package only $1500. Lyn, K4VBU, 1124 Plantation Road, Martinsville, VA 24112 703-632-3805.

COLLINS-32S-3, 75S-3B, $600 takes both. Hy-Gain TH6DXX & tower, $450. Robot 70A, 80A, make offer. WA7WOC (Phoenix). 602-867-2378.

WANTED: Model 8010 remote VFO for Tempo 2020 xcvr. Call collect 913-267-1575 or Compuserve E-Mail User No. 71336, 1270. Will pay all shipping charges. Tim Gorman WAØLYJ.

WE BUY, Sell & Trade all types of new & used amateur radios, scanners, antennas & accessories. Huge selection. Shaver Radio, 1378 S. Bascom Ave., San Jose, CA 95128. 408-998-1103.

RTTY TU!! *Selling Flesher TU-170* and homebrew TU with scope (Flesher boards) mounted in Heath SB-610 cabinet. Both in excellent condition. $100 for the TU-170, $75 for the homebrew. If you pick either up, you can have my Model 19 for $5. It's in beautiful shape, too, and has an interesting history. Reason for selling — going computer RTTY, and I need to make some extra room in the shack. Contact AC1Y, 35 Brookmoor Road, Avon, CT 06001.

WANTED: FM adapter for Heath HW-17 2-meter AM transceiver. W9OBP, 1118 County Line Rd., Batesville, IN 47006.

FOR SALE: Transformers 7.5 K.V.A. 480 or 240 Volt primary to 240 Volt primary to 240 or 120 Volt secondary; one KVA and 1.5 KVA 230 Volt to 115 Volt; 3 KVA 208 to 115 or 230 Volts; 1 KVA 240 or 480 Volt to 120 or 240 Volt; 1.5 KVA 120 or 240 Volt to 12 or 24 Volts; 5 KVA 120 to 120 Volt isolation trans. 1.5 KVA 480 or 240 to 120 Volt trans. 500 Watt 240 to 120 Volt; Stabiline 52 Ampere A.C. voltage regulator for 120 Volts, almost new condition. Merle J. Newton, K2KVU, 311 Main Street, Whitesboro, NY 13492, 315-768-7981.

FOR SALE: Complete 2M FM mobile station. Tempo VHF-1 with mic, 2/80; Drake 1525 EM Touch-Tone mic, Hustler 5/8 w. antenna with mount & coax. $150. W1VPI, 134 Ashbrook Dr., Coventry, CT 06238, 203-742-5027.

ICOM 202S and 402S SSB-CW transceivers $310 for both. HW-8 and p.s. $85. Dave ND5B, El Paso, TX. 915-821-7871.

DRAKE L4-B linear amp. Excel. Has 10 meters. $700. K6DZT. 805-927-3953. 5325 Oakhurst, Cambria, CA 93428.

ICOM 701 w/aps/mike $495. Sony ICF-2001 $125. Realistic 2020 FM VHF/UHF scanner $195. Emergency Beacon Corp. EBC-144JR FM xcvr w/acps/mike $195. M. Fein, 132 Locust Lane, Irvington, NY 10533.

WANTED: DG-5 freq. counter for TS-520S. Marty, WB2DZY, Valley Stream, NY 516-285-9464.

FOR SALE: Transformers. 1.25 KVA 115 Volt to 128/64/32/16/8/4 Volt secondary; 120 Volt 20 Ampere and 240 Volt 10 Ampere Variacs; audio compressor amplifier AN/GSA-33; Hickock model 188-X Signal Generator; 30 and 60 Amp. 600 Volt 3 phase fused switch boxes; Kleinschmidt Teletype keyboard and printer; Palomar Eng. Model PT2500A antenna tuner; 1kW link-coupled antenna tuner; 8 to 25 Henry 400 Milliamp to 40 Milliamp Swinging Choke; 10 Henry 400 Milliamp choke; milliammeters; microammeters; voltmeters; circuit breakers by Klixon, Heineman, Airpax, Wood, G.E., Westinghouse. Make offer. Merle J. Newton, K2KVU, 311 Main Street, Whitesboro, NY 13492, 315-768-7981.

SELL: Drake TR4CW, 300W, mic, speaker, AC4, all 10 mtr xtals, spare finals, Ex. cond. $425. WD4KDN 703-344-5694.

WANTED: Motorola MT-500 channel elements. Sell: New Mirage B1016 - $195. NLS MS-230 miniscope - $300; Charlie Tepper, 212-268-2654.

FACTORY FRESH matched tube sets: 6HF5, 6KD6, 6LQ6, 8122, etc. Spencer Tubes, RD2 Box 24, Corning, NY 14830.

WANTED: Two tubes, type 8875, also marine telegraph operator's Question And Answer Manual. NG7B - 1630 South 77th Street, Mesa, AZ 85208.

WANTED: Atlas 210X, please state price and condition, and 3-500Z chimney. K8HER/8, 208 E. Maple, Holly, MI 48442. Tel. 313-634-6943.

WANTED: Old keys for my telegraph and radiotelegraph key collection. Need pre-1950 bugs. All models of Vibroplex, Martin, Boulter, Abernathy, Shawplex, etc. Also need spark keys, Boston keys, sideswipers, unusual keys, Omnigraphs, Cricket and Bunnell miniatures. K5RW, Neal McEwen, 1128 Midway, Richardson, TX 75081.

WANTED: Motorola Motran or Motrac. Multifreq with common 2M pairs. Will trade for equivalent 6M or 10M radio, or buy if reasonable. K4TXK. 907-455-6904.

LICENSE PLATES wanted for collection. Want ham tags from anywhere, any year, any quantity. Also want D.A.V. keychain tags. Can anyone help me? Send to Frank Sutera, 5 Spencer Path, St. Peters, MO 63376. All shipping reimbursed. Pse qsl, tnx.

REPLACE RUSTED antenna bolts with stainless steel. Small quantities, free catalog. Elwick, Dept. 512, 230 Woods Lane, Somerdale, NJ 08083.

HEATHKIT H-89 computer. 48K RAM. Mint condition. BASIC programming course included. $795 or best offer. K1TZ, 214-867-6137.

SELL HALLICRAFTERS HT-44 80-10 sideband transmitter with PS-150 power supply. $130 or best offer. George Upton, WA1MXA, 190 Three Mile Road, Glastonbury, CT 06033 203-633-0410.

ANTENNA FARM: KLM KT34XA $350, 2m 13LMB $60, Wilson 61 crank-up $550, TX$_9$ rotor $200, all for $925. 817-735-9383, KA5IFU.

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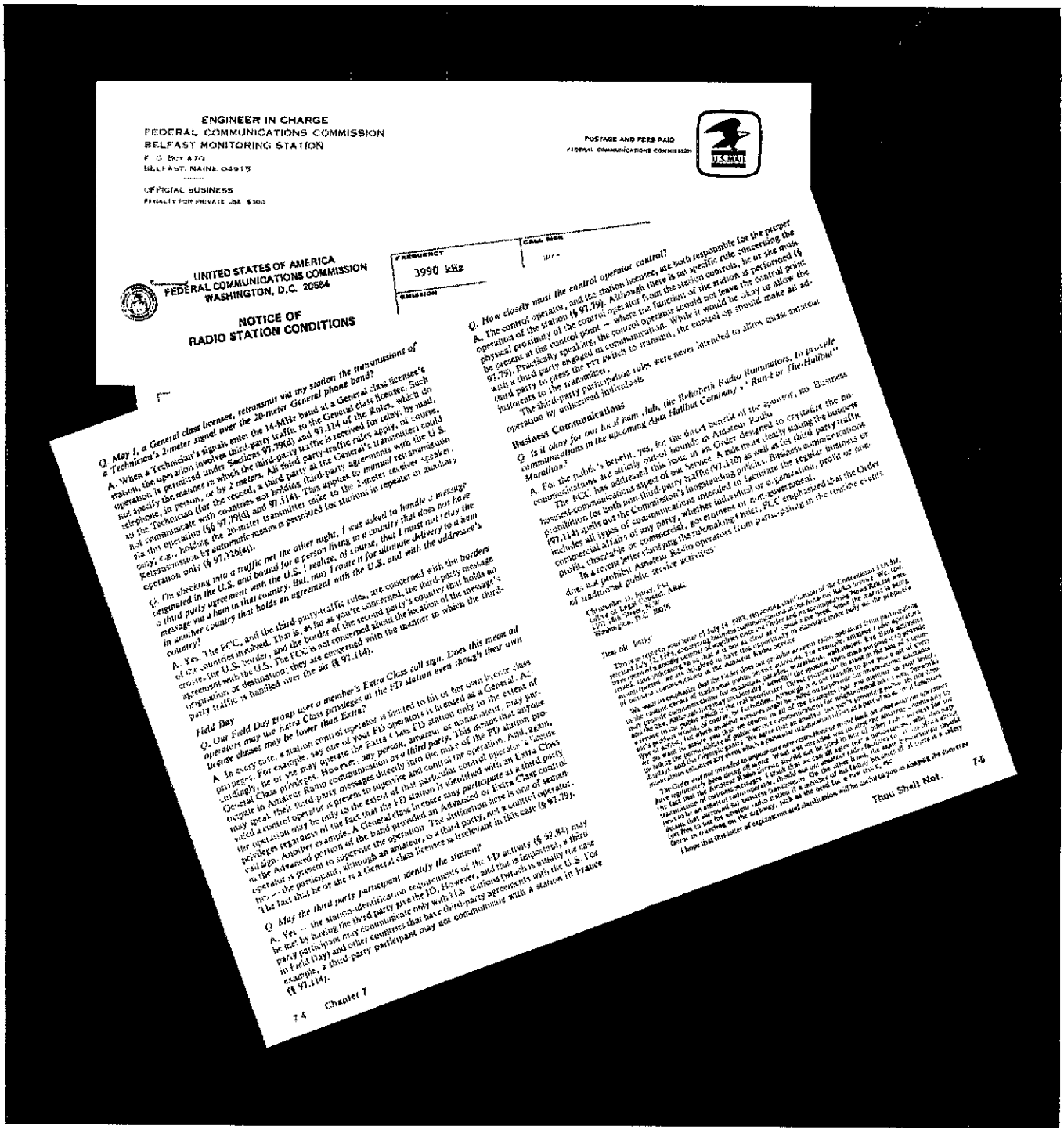
DRAKE RV-4 Remote VFO. Very good condition. $75. K1TZ, 214-867-6137.

VIC 20 HAMWARE® Programs: QSO Manager - Clock, 10-minute identification timer, notepad. Great for phone or cw QSOs. Ham List - QSO memory jogger. Fast search, entry/update of QSO data. Quick Log — Search by call, QTH. Auto time log. Excellent contest, standard QSO logger. Cassette, instructions $9.95/program. WA2RDA, 415 Elm St., Fayetteville, NY 13066.

20-20 HINDSIGHT?



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CALL SIGN
EMISSION

Q. May I, a General class licensee, retransmit via my station the transmissions of a Technician's 2-meter signal over the 10-meter General phone band?

A. When a Technician's signals enter the 14-MHz band at a General class licensee's station, the operation involves third-party traffic to the General class licensee. Such operation is permitted under Sections 97.79(d) and 97.114 of the Rules, which do not specify the manner in which the third-party traffic rules apply, or how. Such telephone, in person, or by 2 meters. All third-party traffic rules apply, of course, to the Technician (for the record, a third party at the General's transmitter would via this operation (§§ 97.79(d) and 97.114). This applies to *manual* retransmission only; e.g., holding the 2-meter transmitter mike to the 2-meter receiver speaker. Retransmission by automatic means is permitted for stations in repeater or auxiliary operation only (§ 97.126(a)).

Q. I'm checking into a traffic net the other night. I was asked to handle a message originated in the U.S. and bound for a person living in a country that does not have a third party agreement with the U.S. I realize, of course, that I must not relay the message via a ham in that country. But, may I route it for ultimate delivery to a ham in another country that holds an agreement with the U.S. and with the addressee's country?

A. Yes. The FCC, and the third-party-traffic rules, are concerned with the borders of the countries involved. That is, as far as you're concerned, the third-party message crosses the U.S. border, and the border of the second party's country that holds an agreement with the U.S. The FCC is not concerned about the location of the message's origination or destination; they are concerned with the manner in which the third-party traffic is handled over the air (§ 97.114).

Field Day

Q. Our Field Day group uses a member's Extra Class call sign. Does this mean all operators may use Extra Class privileges at the FD station even though their own license classes may be lower than Extra?

A. In every case, a station control operator is limited to his or her own license class privileges. For example, say one of your FD operators is licensed as a General. Accordingly, he or she may operate the Extra Class FD station only to the extent of General Class privileges. However, any person, amateur or nonamateur, may participate in Amateur Radio communications as a *third party*. This means that anyone may speak their third-party messages directly into the mike of the FD station. And, again, the operation may be only to the extent of that particular control operator's license privileges regardless of the fact that the FD station is identified with an Extra Class call sign. Another example: A General class licensee may *participate* as a third party in the Advanced portion of the band provided an Advanced or Extra Class control operator is present to supervise the operation. The distinction here is one of semantics — the participant, although an amateur, is a third party, not a control operator. The fact that he or she is a General class licensee is irrelevant in this case (§ 97.79).

Q. May the third party participant identify the station?

A. Yes — the station-identification requirements of the FD activity (§ 97.84) may be met by having the third party give the ID. However, and this is important, a third-party participant may communicate only with U.S. stations (which is usually the case in Field Day) and other countries that have third-party agreements with the U.S. For example, a third-party participant may not communicate with a station in France

Q. How closely must the control operator control?

A. The control operator, and the station licensee, are both responsible for the proper operation of the station (§ 97.79). Although there is no specific rule concerning the physical proximity of the control operator from the station controls, he or she must be present at the control point — where the function of the station is performed (§ 97.79). Practically speaking, in communication, the control operator should not leave the control point while a third party engaged in communication. While it would be okay to allow the third party to press the PTT button to transmit, the control op should make all adjustments to the transmitter.

The third-party participation rules were never intended to allow quasi amateur operation by unlicensed individuals.

Business Communications

Q. Is it okay for our Ace of Ham Club, the Robobrix Radio Rummators, to provide communications in the upcoming Quiz Halibut Company's "Run-I-on-The-Halibut" Marathon?

A. For the public's benefit, yes, for the direct benefit of the sponsoring, no. Business communications are strictly out-of-bounds in Amateur Radio.

The FCC has addressed this issue in an Order designed to crystalize the anti-business-communications aspect of the Service. A rule more clearly stating the business prohibition for both non-third-party traffic and third-party traffic (97.114) spells out the Commission's longstanding policies. Business communications includes all types of communications intended to facilitate the regular business or commercial affairs of any party, whether individual or corporate, profit or nonprofit, chargable or commercial, government or non-government.

In a recent letter clarifying the rulemaking Order, FCC emphasized that the Order does not prohibit Amateur Radio operators from participating in the routine events of traditional public service activities.

Christopher D. Imlay, Esq.
Lukas, McGowan, Nace & Gutierrez
1819 H Street, N.W.
Washington, D.C. 20006

Dear Mr. Imlay:

This is in response to your letter of July 14, 1989, requesting clarification of the Commission's July 3rd, 1989 Order in PR Docket 88-140, concerning amateur communications in connection with Radio Relay Press Releases. We agree with your interpretation of the Order and its accompanying Report and Order. Indeed, the Order was intended to permit the kind of activities described in your letter. Indeed, the use of Amateur Radio communications in connection with Radio Relay Press Releases is a prime example of the kind of activity that the Commission wishes to encourage. We want to emphasize that the Order does not prohibit or restrict routine communications in connection with traditional public service activities. Any such communications are permissible under the Order. Although the Order does not specifically address the question of whether amateurs may participate in Radio Relay Press Releases, we are of the opinion that such participation is permissible. Amateurs have been participating in such activities for many years, and we see no reason why they should not be allowed to continue to do so. We are also of the opinion that amateurs may participate in Radio Relay Press Releases even if they are not directly involved in the emergency. We believe that such participation is consistent with the Commission's rules and policies governing the Amateur Radio Service. We hope that this letter will help to clarify the Commission's position on this matter.

Sincerely yours,

Thou Shalt Not...

7-6

Chapter 7

7-4

You just got home from a trying day at work. Your spouse greets you with, "You got something from the FCC in the mail." There is a sinking feeling in your stomach as you open the notification from the monitoring station. You decide then and there to purchase an up-to-date copy of *The FCC Rule Book*, and become thoroughly familiar with the regulations. The new edition of this popular ARRL publication is just off the press. It's not just a copy of the rules; there are easy to understand explanations written in the popular "Washington Mailbox" style from *QST*. Available from your dealer or directly from ARRL. $3.00 in the U.S., $3.50 elsewhere.

THE AMERICAN RADIO RELAY LEAGUE, INC.
225 Main Street
Newington, CT 06111

HAMMARLUND - parts, service manuals, literature, and other items of interest to collectors. Send $2 SASE for lists. Receiver service by former factory service manager. Wayne Cordell, K4HCS, Blue Ridge Communications, 770 New Stock Rd., Weaverville, NC 28787 704-645-7070.

MUST SELL: Icom 740, mint condition, less than year old, filters & internal power supply, $800 prepaid USA. Dick Clancey, KA1SM, 25 Rolling Lane, Dover, MA 02030. 617-785-1760.

QST - complete 1962 thru 1979 - except 1973/11. Also 1961/2 1980/3. $50 ship freight collect only. Leo Saltz, 4137 Hardwoods Dr., West Bloomfield, MI 48033.

FREE SHIPPING in 48: Ten-Tec Omni-D, Series B and 252M/O ps, all filters and NB. $585. MFJ-496 Superboard $210. Leave message, Greg Andracke, W2HRX, 212-580-9964.

NEED an exciting DX presentation for conventions, banquets, or club meetings? See Nov. '83 QST, page 203. WA4WME.

WANTED: HEATHKIT HM-102 SWR/Watt Meter. Jim Simonson, KA0RNR, 415 5th Ave., N.E. St. Cloud, MN 56301 612-253-2167.

TWO-METER kilowatt: Pair 4CX250B's fully metered in 5' rack with spare finals $499. Cushcraft 32-19 19el horizontal 2M Boomer $50. Cushcraft 228FB 28el vertical 2M Jr. Boomer $100. Ham IV rotor $100. Rohn 20' tower w/thrust bearing $100. Pick-up only. Or, all of the above complete with huge gorgeous 5 BR house in Oakdale, L.I.N.Y. near water $179,990. Michael, WA2RAT, 516-567-9393.

FIELD DAY for Apple 2. Contester does it all. Walk away from Field Day with the paper work done. Accidental power failure - no problem. Copyable disk $30. KBØVT, P.O. Box 1185, Des Moines, IA 50311.

ENGINEERING SOFTWARE - free brochure. PLOTPRO - Scientific Graph Printing Program prints linear/log/semi-log plots on any printer. Multiple plots forced or autoscale, grid lines, labeling, $49.95. ACNAP - fast machine code analyzes active/passive electronic circuits. Monte Carlo, Worst Case, and Sensitivity analysis, $49.95. SPP - Signal Processing Program analyzes linear/nonlinear systems and circuits, LaPlace transfer functions, 512 Point FFT, transient analysis, more, $59.95. All programs share data files. Available for CP/M, MSDOS, PCDOS, TRSDOS. Add $3 each S&H. BV Engineering, P.O. Box 3429, Riverside, CA 92519 714-781-0252.

FOR SALE: Drake TR-4, with power supply. Francis L. Kirkpatrick, 1403 Malden Ave., Springfield, OH 45504. KA8RIX.

SELL MFJ Versa 1.5 kW antenna tuner with SWR watt-meter never unpacked $180 pp W9DI 13 E. Hickory St., Hinsdale, IL 60521 312-323-2419.

FOR SALE: Cushcraft A3 beam, $125, Ben, W5TWA, 108 Wilshire, Borger, TX 79007, 806-273-7294.

KENWOOD TS-520 with DD1K digital display. Owner & Service Manuals. $375. Microwave Module 144/28. $140. Robot 400 SSTV converter, $295. All mint condx. Call John, KC5GB, 713-376-1616.

FOR SALE: Kenwood TS900 xcvr w/ac power supply & manual - $400. Drake 2C receiver 2NT xmtr Hallicrafter's HA-1 VFO - $200. Please call Paul, KT1T 203-469-1783.

YAESU FT901DM, modified low-noise front end, other mods, CW filter, spare finals, shop manual, extender boards, $650. FTV901R xverter with 6M, 2M, 70CM modules including a Tokyo High Power HL20V 20W amp so you can drive bigger amps on 70CM. OSCAR Mode B modified for OSCAR 10 format. $460. Bruce WB3JMA 301-686-4023.

WANTED: Two TenTec 100-watt linear amps #405. Mario Daldone, W2LYZ, 212-979-3823.

HEIGHTS free-standing 80' aluminum tower with fold'over hinge and three monoband antennas (204BA, 155BA, TET4EL). $1500 firm. AG1Q/4 2413 Village Grove Road, Raleigh, NC 27612. 919-847-7586.

TEN-TEC 544, 252M power supply, Drake MN-4C matching network, hand mike and dust covers. Used very little, mint. $500 firm. D. T. Capasso. 100 Warwick Rd., Haddonfield, NJ 08033.

WANTED: E. F. Johnson ham gear, manuals, literature, and accessories. KA6NNR, Box 71703, Los Angeles, CA 90071.

TENTEC OMNI-D Series-B, 500, 1.8, 2.4 filters, Noise Blanker, factory installed WARC bands 10 and 24 MHz, original owner mint condition $495 you ship. W0KC, 10 Taylor Estates, Kirkwood, MO 63122.

SALE: Collins 62S-1, good condition, w/manual & 1 spare final. $450. Shipped C.O.D. in Continental U.S. Mack, WA4LIT, 260 Malta Dr., Hazel Green, AL 35750, 205-828-4719 - nights, 205-533-5175 - days.

DIGITAL DISPLAYS for FT-101's, TS-520's, Collins, Drake, Swan, Heath and others. Write for information. Grand Systems, P.O. Box 3377, Blaine, WA 98230.

DRAKE TR5, new condition, CW filter Noise Blanker, Shure mike, $575, WB3CEG/5 Baytown, TX 77520, 713-424-8728.

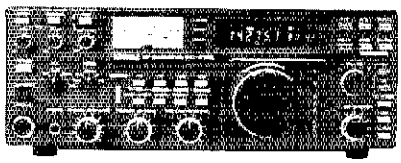
COLLINS Mechanical filter F455J05 for sale plug in for 75*A4 $100. John M. Kielbasa K9VQC 312-767-8734.

WANTED: JOHNSON "Ranger." K2GNE, 609-234-0661.

GENAVE GTX-200 2 meter transceiver 30 watts output. New in factory box. List $299. Sell $195 plus UPS. W4BLO, 3449 Dickens Drive, Virginia Beach, VA 23452.

TENTEC Argosy II - with 2.5 SSB filter, audio CW filter, dc card, mike, seldom used, like new. U ship C.O.D. $400. KB8RK, 313-669-2014 evenings.

ICOM KENWOOD YAESU



		Regular	SALE
IC-751	9-band Xcvr/.1-30 MHz Rcvr	$1399.00	Call
PS-35	Internal power supply	160.00	144.95
FL-52A	500 Hz CW filter	96.50	89.95
FL-53A	250 Hz CW filter	96.50	89.95
FL-33	AM filter	31.50	
RC-10	External frequency controller	35.00	
CR-64	High stability reference xtal	56.00	
IC-745	9-band Xcvr/.1-30 MHz Rcvr	$ 999.00	Call
PS-35	Internal power supply	160.00	144.95
CF5-455K5	2.8 KHz wide SSB filter	TBA	
IC-271H	100w 2m FM/SSB/OW Xcvr	TBA	
IC-271A	25w 2m FM/SSB/CW Xcvr	699.00	Call
IC-471A	10w 430-450 SSB/CW/FM Xcvr	799.00	Call
PS-25	Internal power supply	99.00	89.95
EX-310	Voice synthesizer	39.95	
IC-290H	25w 2m SSB/FM Xcvr		Call
IC-22U	10w 2m FM non-digital Xcvr	299.00	249.95
EX-199	Remote frequency selector	35.00	
IC-25A	25w, 2m, gm leds, up-dn-TTP mic.	359.00	319.95
IC-25H	as above, but 45 Watts	389.00	349.95

IC-27A	25w 2m mobile Xcvr	TBA	
IC-45A	10w 440 FM Xcvr, TTP mic.	399.00	359.95
EX-270	CTCSS encoder	39.00	
BU-1	Memory back-up	38.50	
RP-3010	10w 440 MHz FM repeater	999.00	899.95

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Deluxe models			
IC-02A	for 2 meters	$ 319.00	289.95
IC-02AT	w/DTMF	349.00	314.95
IC-04A	for 440 MHz.	TBA	
IC-04AT	w/DTMF	TBA	
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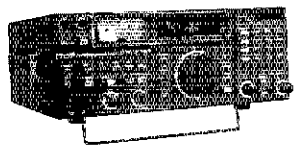
IC-2A	for 2 meters	239.50	214.95
IC-2AT	with TTP	269.50	219.95
IC-3A	for 220 MHz	269.95	234.95
IC-3AT	with TTP	299.95	239.95
IC-4A	for 440 MHz	269.95	234.95
IC-4AT	with TTP	299.95	239.95



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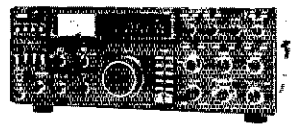

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TS-930S	1599.00	Call

COMPANY SPECIAL SALE

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TR-3500/PB25H		Call
TS-830S (choice CW filter 500 c/s or SP-230)		Call

TS-530SP	749.00	Call
VFO-230	169.95	
AT-230	194.95	
AT-130	144.95	
TS-430	895.95	Call
PS-430	149.95	
AT-250	399.95	
TS-130SE	629.95	Call
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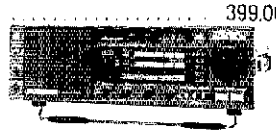
TL-922A	2K AMP	$1229.95	Call
SM-220		359.95	

TW-4000A		599.95	Call
VS-1			
TR-9130		529.95	Call
TS-780		995.00	Call
TR-7950		399.00	
TM-401		399.00	



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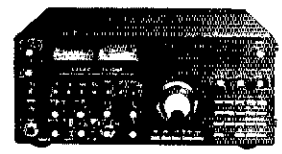
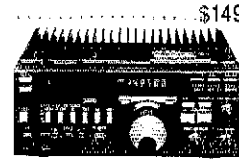


		Regular	SALE
FT-One/All	Optional (except key unit)		1995.00
FT-980		$1495.00	Call



FT-757GX	829.00	Call
FT-726R	899.00	Call
Optional modules in stock		Call
FT-230R	359.00	Call
FT-730R	399.00	359.00

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FV-101DM	359.00	195.00
FTV-901R	389.00	195.00
Cubic 103	1295.00	699.00
Cubic 151	995.00	595.00

FT-203R	New	239.00	215.00
FT-208R		319.00	279.00
FT-708R		319.00	Call
FT-102			Call Special
FRG-7700		549.00	395.00
	Short wave receiver		

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B-1010	319.00	289.00
B-1016	279.00	249.00
B-23	89.00	79.00

SANTEC

ST-142	Call
ST-220	Call
ST-440	Call

AEA

CP-1/20	229.00
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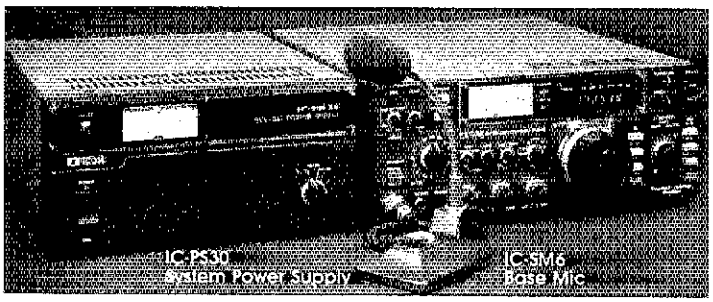
- **Full function Metering with a built-in SWR Bridge**
- **Optional Internal AC Power Supply**



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, all-mode squelch, program band scan, memory scan (frequency and modes are stored), receive and transmitter incremental tuning and VOX.

ICOM's proven transceiver designs and technology are used in the IC-745 all ham band transceiver which includes SSB, CW, RTTY, AM receive and an optional FM **plus** a 100KHz to 30MHz general coverage receiver.

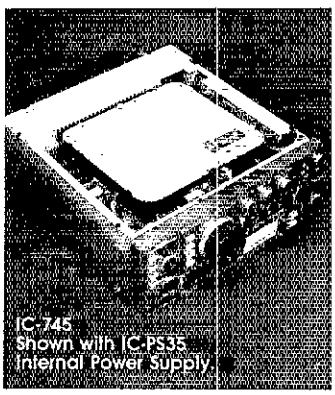
ICOM System. The IC-745 is compatible with ICOM's full line of standard HF accessories.

Accessories available include the IC-PS15 base supply, IC-PS30 system power supply (switching), IC-PS35 internal power supply, the IC-2KL linear amplifier, AT100 automatic antenna tuner, AT500 automatic antenna tuner, HP1 headphones, and HM12 hand or SM6 base microphone.

Options. The EX241 marker and EX242 FM module, plus a wide variety of filters for sharp audio reception are available.

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

The IC-745 is the only trans- ceiver today that has such features standard...the number of options and accessories availa- ble...and such an affordable price.



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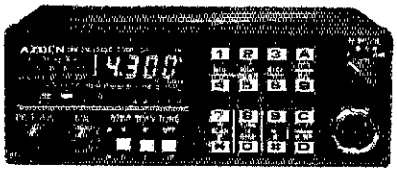
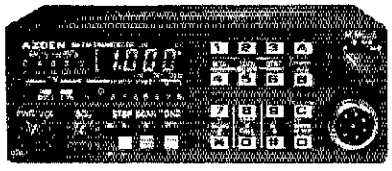
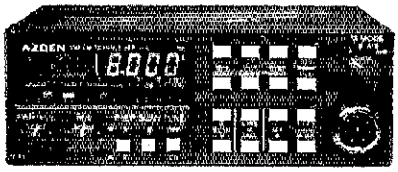


PCS-4300 70-cm FM Transceiver



PCS-4500 6-m FM Transceiver



PCS-4800 10-m FM Transceiver

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PCS-300
2m Handheld
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142-149.995 MHz

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- **TINY SIZE:** Only 2"H × 5.5"W × 6.8"D. COMPARE!
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APARTMENT GOT me. Pulling the plug! FT101ZD low hours $495. Infotech Model 300E tri-mode keyboard with Model 200E transverter with IO-1 modem interface for phone or tape. Has capability to send, receive Morse, RTTY, ASCII and display message on the 10 monitor. Manuals $495. KB4GK Apt 4, 3915 Constant View, Decatur, IL 62526. 217-875-5931.

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DRAKE TR4Cw with AC-4 ps and mike. Excellent condition, $400. Tom, N5ACP, 505-672-1792.

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WANTED - Macrotronics M-800 deluxe RTTY system for TRS-80. Bill, W8QDS. 1744 Indian Woods, Traverse City, MI 49684. 616-946-3730 or 946-3042.

WANTED: Hallicrafters SX-122A receiver, Heathkit GR-78 receiver, WDØFFL, 920 Inverness, Apt. 1912, Bellevue, NE 68005.

SELL like-new Dentron Clipperton-L HF 2 kW amplifier. $400 UPS paid in 48. Details K6WM, 850 Groff, Pomona, CA 91768.

HEATHKIT SA-5010 μ-Matic Memory Keyer, factory checked, unused $75. K6JQA, 2264 Barry Ave., Los Angeles, CA 90064, 213-479-4357.

WANT: COMDEL CSP-11 Speech Processor, MFJ 484 Keyer, Drake W-4, CE MM-2 Scope, SB-200, Cardwell TT-1050-US variable cap. WØAIH, 1616 South St., Eau Claire, WI 54701.

WANTED: clean top oper Gonset G66B, cables, manual, 12VDC mobile ps, and Midland 13-509 220 xcvr. Details, price, optional photo to WA6IYL, Box 306, Lakewood, CA 90714.

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ICOM 730 transceiver, HM-10 scanning microphone $495. RTTY CW terminal Kantronics interface, VIC-20 Hamsoft, Commodore VIC-20 computer, cables, manuals, $200. Icom PS-35 internal power supply for 745/751/271H $110. Dentron MT-3000A 2kW antenna tuner $150. Icom BC-30 drop-in rapid charger with BP-2 battery $75. K6KUQ, Box 3923, Visalia, CA 93278, 209-564-3960.

KENWOOD TS830S, VFO230 with memory, SP230 with filters 500 Hz CW filter, MC50 mic. $825. Drake T4X, R4A, MS4, $300. K2GG 201-267-1141.

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FOR SALE: Tempo One, 80M-10M, AC, outboard VFO, EV desk mike, $100; Tempo T-2000 amp, 80M-10M, $150; MFJ Logarithmic Speech Processor, $20; Heath PM-2 mobile tuning meter, $10; Heath HM-102 RF power meter, $20; Heath HD-15 hybrid phone patch, $20; Heath HN-31 dummy load, $10, CDE TR-44 rotor, needs repair, $20. Bill W8TXM, 517-323-7877, P.O. Box 22231, Lansing, MI 48909-2231.

SELL like new 75A4, speaker, 3 filters. $400 cash and carry. 617-774-8873, W1ZL.

ARGONAUT 505 Ten-Tec SSB/CW transceiver, improved dial and front controls; MFJ frequency standard; Ten-Tec antenna tuner; microphone, $160. Bernie, WA2YWA, 201-446-4622.

DENTRON MLA-2500 linear amp. 10-160 meters, mint condition, $500. Bill, WB5RNB, 918-423-3825.

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SALE: Antenna tower, Wilson MT-61B. Telescopic, 61 ft with 2 winches, $600 plus freight. Antenna rotator Alliance HD-73 with remote cable and monitor, $75. Gem-Quad antenna, 3 elements, triband, $250 plus shipping in original container. Vertical antenna, Buttemut 5BTV, $75. All equipment in mint condition, with manuals. KJ7Y 509-884-6152.

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EIMAC 4-1000A, have three at $200; also 4-400A, have two at $50. WB2DFK, 20 White Birch Drive, Guilford, CT 06437.

SELL: Alpha 76 PA amplifier. 3-8874 tubes. Excellent condition inside and out. Best reasonable offer. WBØWLI, 2810 Gray St., Denver, CO 80214. 303-232-0620.

YAESU FT-101ZD MKIII (WARC) with FA-9 fan, 350 Hz CW filter, SP901P (spkr-patch), FV101Z (VFO) YE7-A (hand mike), YH77 headphones and Shure 444D desk mike. All for $750 FOB Ft. Worth, TX W5IZ 817-295-3755.

75S3B, 32S3, 516F2, 312B4 $700. KWM2, PM2 $375. 75A4 $200. W1FBG 603-964-6658.

DRAKE: T-4XB, R-4B, AC-4, MS-4 and manuals. $475. 201-273-1380. 22 Madison Ave., Summit, NJ 07901. ND2M.

WANTED: Walter H. Candler Courses, original or zerox, on teaching telegraphy. Jerry Stryker, 819 Jefferson, Troy, OH 45373.

SB220 with 10 meters - $500. FOB Ft. Worth, TX W5IZ 817-295-3755.

TENNATEST - Antenna noise bridge out-performs others, accurate, cost less, satisfaction guaranteed. Send stamp for details, W8URR, 1025 Wildwood Rd., Quincy, MI 49082.

YAESU FT901 DM HF transceiver, SP901 speaker, CW filter, DC cable, manuals. All mint. $650. Yaesu FT227RA Memorizer 2-meter, standard & TT mikes, AC supply, mobile bracket, 80-watt amplifier kit. $250. Heathkit SA-2060 antenna tuner, never unpacked. $225. Dave, W7BER. 602-820-9111.

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YAESU FT-101ZD mint $470. Hustler 4BTV vertical antennas $40. Shur 444 mike $16. Uship. Walt, KD4ZZ, 813-839-6520.

225 QSTs 1965-83 complete except Feb. 66, Feb. 73, Mar. 75. $50 plus shipping. Durham, K4JA, Box 316, Boykins, VA 23827, 804-654-6342.

51J4, speaker, $350. Ten-Tec Delta, CWF, P.S., remote VFO; $650. SB-104A, CWF, P.S.; $388. Viking II, VFO; $95. HQ-140X, $95. KE-93, P.S.; $55. K6VRS, 33815 133rd S.E., Auburn, WA 98002. 206-833-7298.

DRAKE TR-4C with AC supply/speaker, D-104 mic, MFJ keyer and paddle, Heath SWR/power meter, spare final tubes and manual. Excellent condition. $350. 703-671-9044. K4YZT.

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FOR SALE - Microlog AVR-2, decoder video generator-CW RTTY AKB-1 keyboard-2k memory-all options installed - no reasonable offer refused. N2AWK, 914-965-7600.

160/40/15 METER or 160/30 meter dipole, 115 feet long, coax-fed, NO tuning, $45 postpaid. Tom Evans, W1JC, 113 Stratton Brook, Simsbury, CT 06070.

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SALE: Yaesu FT-101B with CW filter, hand mic, manual. Excellent Novice rig. $400. Bencher XZ-2 audio filter with power supply. New condition. $65. Ken, KF4DX, 404-449-4491.

WANTED: Vacuum variables, vacuum relays, and heavy-duty rotator like Ham-IV, Tailtwister, etc. K5UR, 501-988-2527.

WANTED: Metron: Magnus MA1000 1kW 12-volt amplifier. Reply Tom Berry, 1617 West Highland, Chicago, IL 60660, 312-262-5360.

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TS820S digital readout $500 plus shipping, Astatic 10-DA mike $30, Heathkit HM-102 2kW PEP power meter $25. Louis, N6EFO, 714-622-3248.

LOW HOURS TS930S with CW filters $1450. KE5C, 817-774-8376.

W3EON Estate Sale: McKay Dymek DR33 rcvr, DP40 preselector. DA100 antenna; MBA-RC Code Converter; KB-4900 Curtiss Keyboard; Heathkit IT-12, IP-18, SA-1480, HM-102, HN-31, HG-10B, DX-60B, IT-28, IT-3120; old QSTs. Located King of Prussia, PA, 302-994-7539, Kurt B. Augenblick.

HEATH HW-16, HG-10B, VFO. Full QSK, excellent. $150. Call Jerry Nevins, 203-349-1578, KA1JXT.

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COUNSELORS: Connecticut brother-sister camp. Completely equipped with ham radio station. Program includes electronics, kit building, code and communications. June 25 - August 22. Send resume: Lloyd Albin (N2DMQ) Ken-Mont and Ken-Wood Camps, 2 Spencer Place, Scarsdale, NY 10583.

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.

COUNSELOR — Ham Radio, cabin living, varied activities, 6/24-8/22, Northeastern Pennsylvania. Write: Camp Wayne, 570 Broadway, Lynbrook, NY 11563. 516-599-4562.

HAM RADIO instructor-counselor. June 21-August 17. 12811 Old Route 16, Waynesboro, PA 17268. Min age 19. Camp Comet.

HAM RADIO Counselor-General or higher class-College level preferred for Boys Camp in Maine. July/August. We own excellent rig, or bring your own. Must be creative and offer challenging program to Novice orientated campers. Good salary plus benefits. Write: Director-P.O. Box 178, Carle Place, NY 11514 or call: 516-334-5309 evenings.

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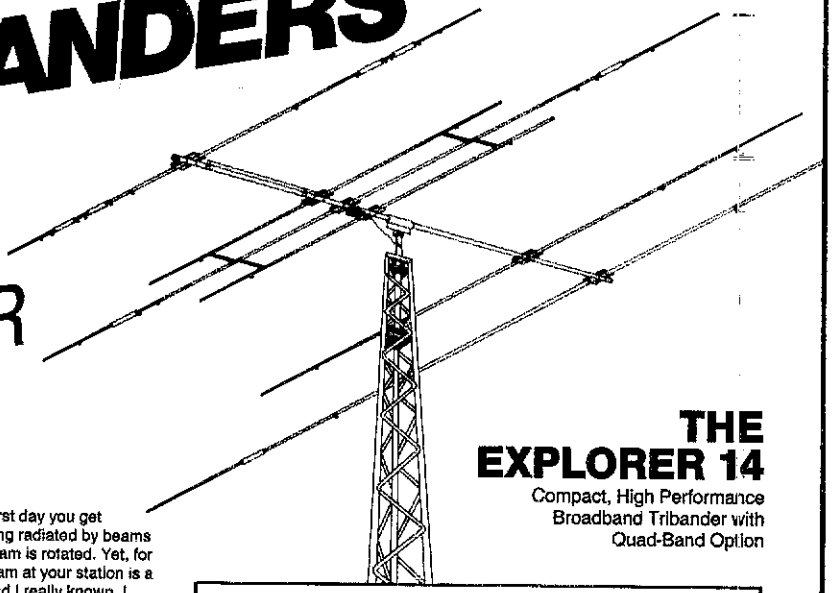

There is nothing like a beam!

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.

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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.

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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.

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- Separate Hy-Q traps for each frequency. Factory assembled and individually resonated to insure uniform performance.
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- Designed to survive winds of 100 mph (160 km/hr).

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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.

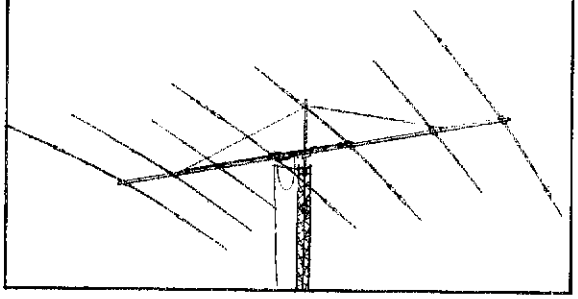
Congratulations!

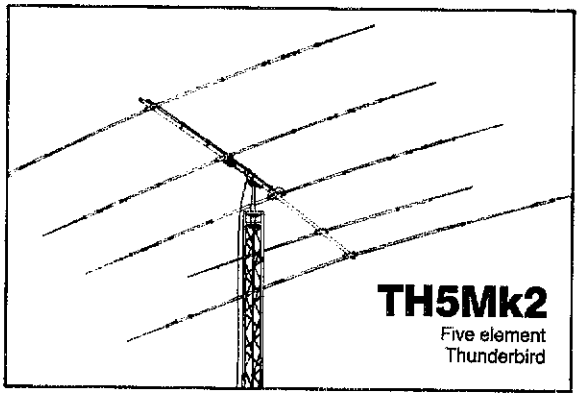
Jack Falker
W8KR

(W8KR has worked all countries but two!)

TH7DX

Seven element Thunderbird





TH5Mk2

Five element Thunderbird

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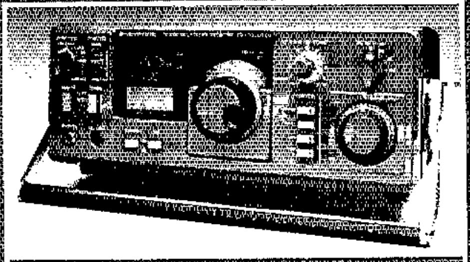
The R-2000 receives in the USB, LSB, CW, AM, and FM modes, and its ten memories allow moving from band to band without concern for mode of operation. The programmable band scan feature permits scanning over operator-selected limits, reducing scan cycle time. Memory scan allows the operator to scan all or only specific memories. Lithium battery memory backup (estimated 5 year life) is built-in.

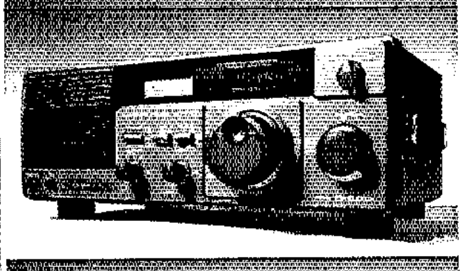
With the sensitive R-2000, only the best in selectivity will do. It has three built-in IF filters, with NARROW/WIDE selector switch, and an optional 500-Hz narrow CW filter is available. A noise blanker and an all-mode squelch circuit further enhance the operator's control of his listening environment. An AGC switch and an RF attenuator switch allow selection of the best signal-to-noise ratio. It has a large, front-mounted speaker, a tone control, an "S" meter, high and low impedance antenna terminals, and operates on 100/120/220/240 VAC, or 13.8 VDC, with an optional DCK-1 DC cable kit. Other features include a record output jack, an audible "beeper," a carrying handle, a headphone jack, and an external speaker jack.

The R-2000 places the world at your fingertips.

R-2000 optional accessories:
VC-10 VHF converter • HS-4, HS-5, and HS-6 headphones • DCK-1 DC cable kit • YG-455C 500-Hz CW filter



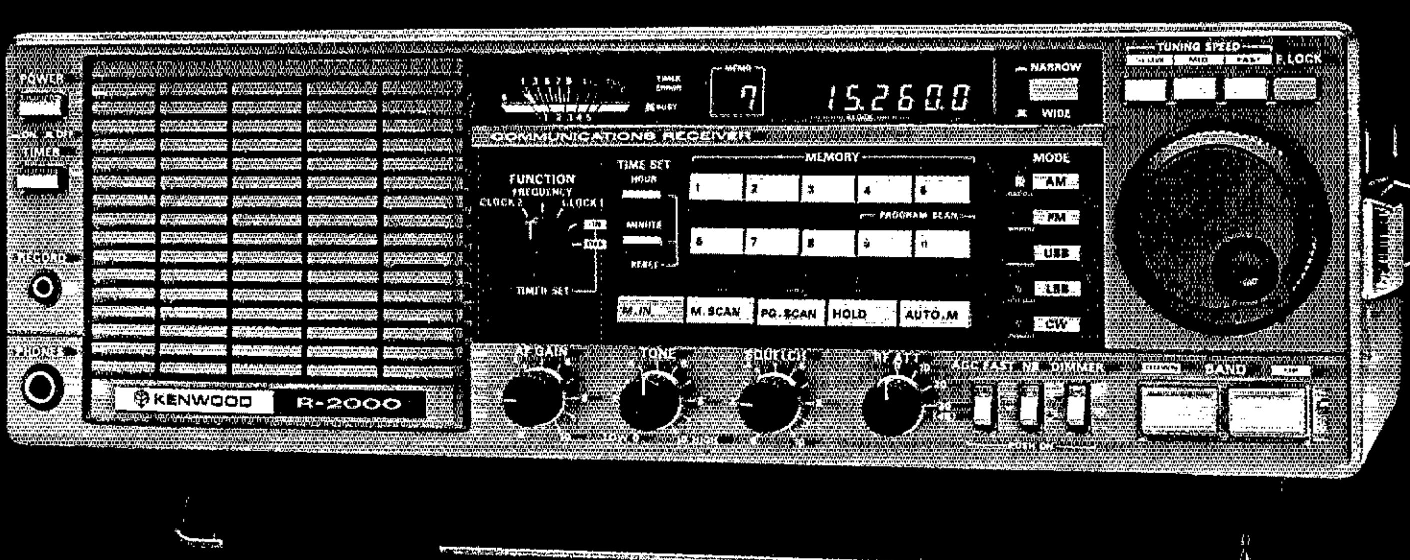
R-1000 High performance receiver • 200 kHz–30 MHz • digital display • clock/timer • 3 IF filters • PLL UP conversion • noise blanker • RF step attenuator • 120-240 VAC. (Optional 13.8 VDC.)



R-600 General coverage receiver • 150 kHz–30 MHz • digital display • 2 IF filters • PLL UP conversion • noise blanker • RF attenuator • front speaker • 120-240 VAC. (Optional 13.8 VDC.)

More information on these products 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.



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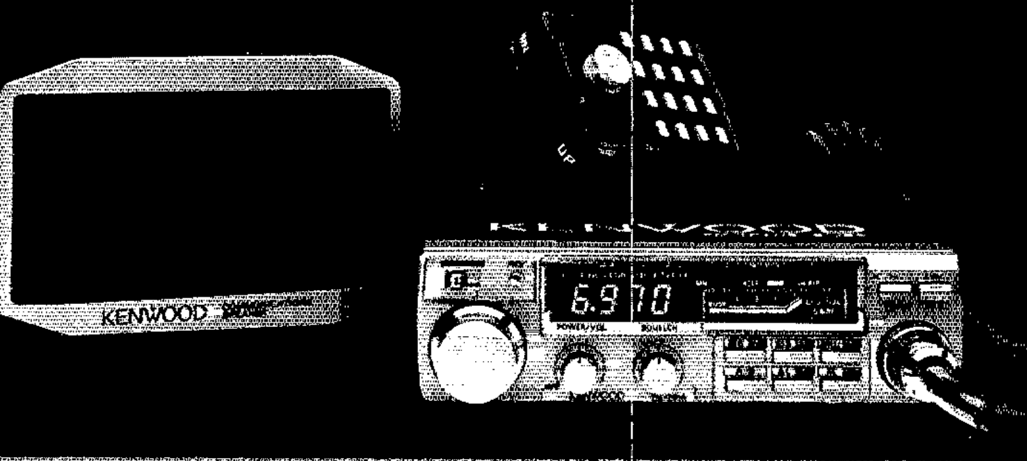
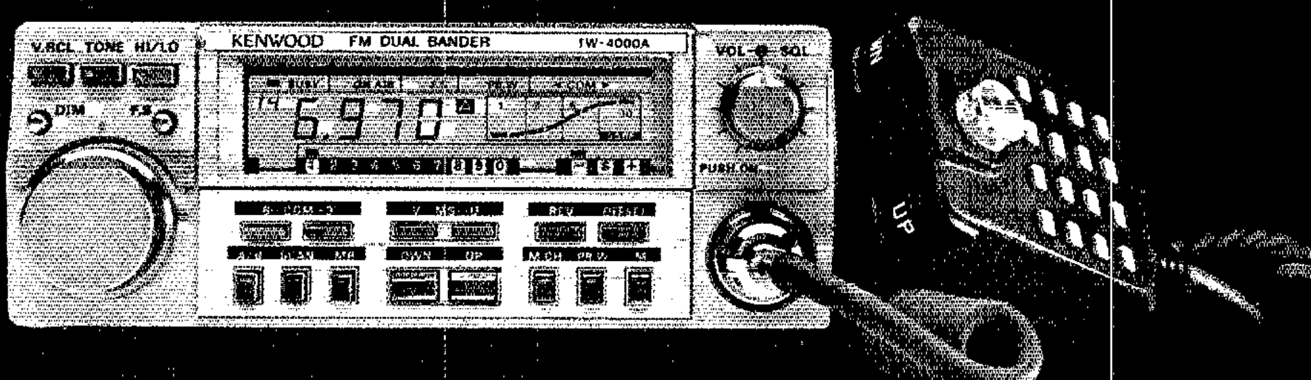


TM-201A/TM-401A

M-201A/TM-401A "compo-ACT"... tough act to follow.

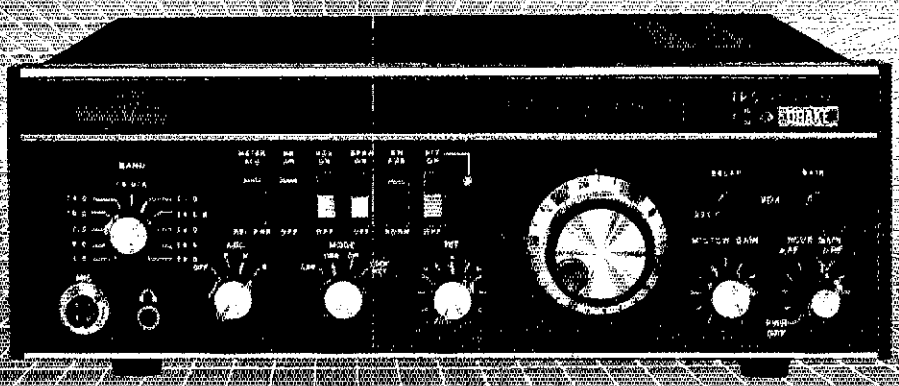


TW-4000A

W-4000A FM "Dual-Bander"

DRAKE

TR5 Transceiver



A NEW DIMENSION IN PERFORMANCE

• U.S. Made • Competitive Price • All Solid State • 12V DC • SWR Protected •
• Broadband • No Tune Up • Full Break-in CW • 150 Watts PEP, SSB or CW Input •
• High Dynamic Range • Excellent Sensitivity/Selectivity • Digital Readout •
• 160-10 Meters Plus WARC Bands and MARS Coverage* •

Front panel switching allows independent MODE and optional crystal filter selection.

A passive double balanced mixer is employed in the receiver front end. This stage is preceeded by a low noise high dynamic range bipolar rf amplifier to provide good, strong signal performance and weak signal sensitivity.

Accurate digital readout of operating carrier frequency is displayed to 100 Hz.

A rugged, solid-state PA provides continuous duty in SSB and CW modes. A cooling fan (FA7) is available for more demanding duty cycles, such as SSTV or RTTY. The PA also features very low harmonic and spurious output.

VOX GAIN, VOX DELAY, VOX disable, QSK, selectable AGC time constants, RIT and noise blanker selection are front panel controlled for ease of operation.

The TR5 is designed with modular construction techniques for easy accessibility and service.

GENERAL

Frequency Coverage: 1.8-2.0*, 3.5-4.0, 7.0-7.5, 10.0-10.5, 14.0-14.5, 18.0-18.5*, 21.0-21.5, 24.5-25.0*, 28.0-28.5*, 28.5-29.0, 29.0-29.7* MHz. (*With accessory range crystal).

Modes of Operation: Usb, Lsb, Cw.

Frequency Stability: Less than 1 kHz drift first hour. Less than 150 Hz per hour drift after first hour. Less than 100 Hz change for a ± 10% line voltage change.

Readout Accuracy: ± 10 ppm ± 100 Hz.

Power Requirements: 13.6 V-dc regulated, 2 A. 12 to 16 V-dc unregulated, 0.8 V rms maximum ripple, 15 A.

Dimensions:
Depth: 12.5 in (31.75 cm), excluding knobs and connectors.
Width: 13.6 in. (34.6 cm).
Height: 4.6 in. (11.7 cm) excluding feet.

Weight: 14 lb. (6.35 kg)

TRANSMITTER

Power Input (Nominal): 150 Watts, PEP or Cw.

Load Impedance: 50 ohms.

Spurious and Harmonic Output: Greater than 40 dB down.

Intermodulation Distortion: Greater than 30 dB below PEP.

Carrier Suppression: Greater than 50 dB.

Undesired Sideband Suppression: Greater than 60 dB at 1 kHz.

Duty Cycle:
Ssb, Cw: 100%.
Lock Key (w/o FA7 Fan): 30%, 5 minutes maximum transmit.
Lock Key (w/FA7 Fan): 100%.

Microphone Input: High Impedance.

Cw Keying: Instantaneous full break-in, adjustable delay.

RECEIVER

Sensitivity: Less than 0.5 uV for 10 dB S + N/N except less than 1.0 uV, 1.8-2.0 MHz.

Selectivity: 2.3 kHz minimum at – 6 dB. 4.1 kHz maximum at – 60 dB (1.8:1 shape factor).

Ultimate Selectivity: Greater than – 95 dB.

Agc: Less than 5 dB output variation for 100 dB input signal change, referenced to agc threshold.

Intermodulation: (20 kHz or greater spacing) *Intercept Point:* Greater than 0 dBm. *Two-Tone Dynamic Range:* Greater than 85 dB.

I-f Frequency: 5.645 MHz.

I-f Rejection: 50 dB, minimum.

Image Rejection: 60 dB, minimum below 14 MHz. 50 dB, minimum above 14 MHz.

Audio Output: 2 watts, minimum @ less than 10% THD (4 ohm load).

Spurious Response: Greater than 60 dB down.

ACCESSORIES AVAILABLE

Model 7021 SL300 CW Filter
Model 7022 SL500 CW Filter
Model 7027 SL1000 RTTY Filter
Model 7023 SL1800 RTTY Filter
Model 7026 SL4000 AM Filter
Model 7024 SL6000 AM Filter
Model 1570 PS75 AC Power Supply
Model 1545 RV75 Synthesized Remote VFO
Model 1531 MS7 Speaker
Model 1507 CW75 Keyer
Model 1558 NB5 Noise Blanker
Model 7077 Microphone

R. L. DRAKE COMPANY

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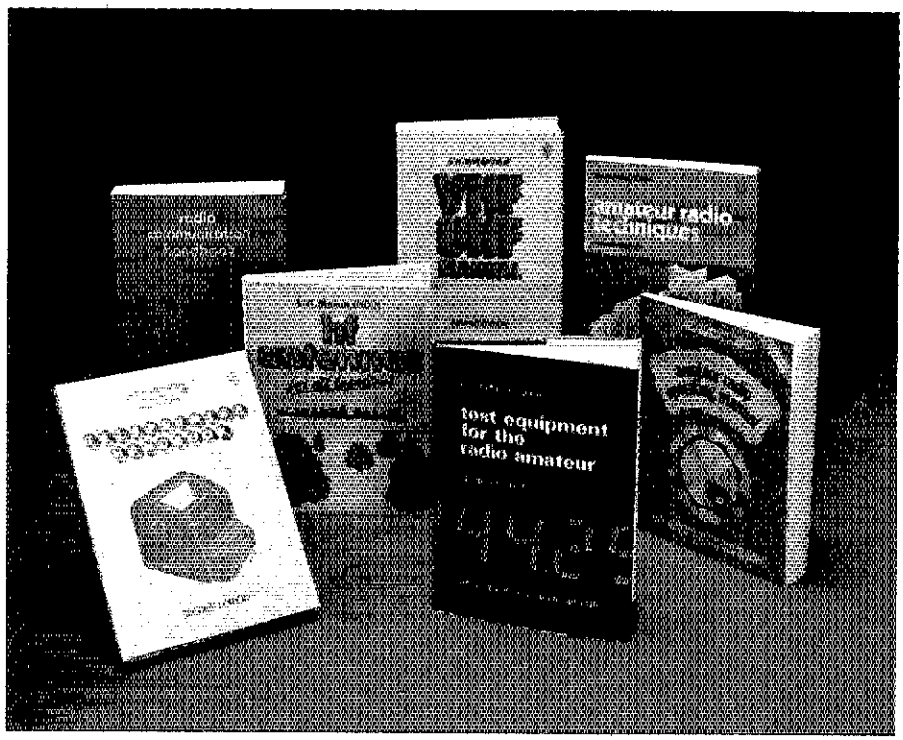

PUBLICATIONS FROM THE RADIO SOCIETY OF GREAT BRITAIN

VHF-UHF MANUAL by G. R. Jessop, G6JP. You will find the new fourth edition of *VHF-UHF Manual* jam-packed with practical theory and construction projects for the region above 30 MHz to 24 GHz. the microwave chapter has been expanded to 83 pages; and includes information on: converters, cavity amplifiers, Gunn diodes, waveguides, directional couplers, and antennas. Receivers and Transmitters for these bands are covered in 181 pages. The balance of this 512-page book contains chapters on propagation, tuned circuits, space communications, filters, test equipment, antennas, and a handy data section. (Since this is a British publication, there is little coverage of the 6-meter band, but many of the 4-meter band projects can be adapted by the experienced amateur for use on 6-meters.) Copyright 1983. Hardbound **$17.50.**

AMATEUR RADIO OPERATING MANUAL by R. J. Eckersley, G4FTJ. Get the British side of operating. Besides such chapters as Setting up a station, and Mobile, Portable and Repeater Operation, the reader will find information in the Appendices most useful. There are continental and regional maps which show the prefixes assigned to each area and listing of countries showing ITU callsign allocations, callsign systems for each country, notes on foreign amateur operation, addresses of licensing administrations and the names and addresses of National Amateur Radio Societies. 189 pages. Copyright 1979, 2nd Edition. Softbound **$10.00.**

HF ANTENNAS FOR ALL LOCATIONS by L. A. Moxon, G6XN. Contains 264 pages of practical antenna information. This book is concerned primarily with small wire arrays, although construction information is also given on a small number of aluminum antennas. Chapters include: Taking a New Look at hf Antennas; Waves and Fields; Gains and Losses; Feeding the Antenna; Close-spaced beams; Arrays, Long Wires, and Ground Reflections; Multiband Antennas, Bandwith; Antenna Design for Reception; The Antenna and its Environment; Single-element Antennas; Horizontal Beams; Vertical Beams; Large Arrays; Invisible Antennas; Mobile and Portable Antennas; What Kind of Antenna: Making the Antenna Work; Antenna Construction and Erection. Copyright 1982, 1st Edition, Hardbound **$12.00**

TELEPRINTER HANDBOOK with mechanical teleprinters available at inexpensive prices these days, this book shows how you can set up a RTTY station and keep the equipment running. Besides covering British made machines, the *Teleprinter Handbook* also covers maintenance, repair and operation of Teletype Model 15, 19, 28, 32, 33, and 43 units. Also covers reperforators, power supplies, demodulators, polar relays, keying methods, filters, and test equipment. 353 pages, Copyright 1983, 2nd Edition, Hardcover **$21.00.**

RADIO COMMUNICATION HANDBOOK 5th Edition. You probably have the ARRL *Radio Amateur's Handbook* in your library. Now you can have a second source of authoritative radio frequency and electronics information at your fingertips. Contains 23 chapters (778 pages); Principles, Electronic Tubes and Valves, Semiconductors, HF Receivers, VHF and UHF Receivers, HF Transmitters, VHF and UHF Transmitters, Keying and Break-in, Modulation Systems, and RTTY, Propagation, HF Aerials, VHF and UHF Aerials, Mobile and Portable Equipment, Noise, Power Supplies, Interference, Measurements, Operating Techniques and Station Layout, Amateur Satellite Communication, Image Communication, the RSGB and the Radio Amateur, and General Data. Now in one paperback volume. Copyright 1982, **$22.00**

AMATEUR RADIO TECHNIQUES by Pat Hawker, G3VA. Contains 800 diagrams and 364 pages of circuit ideas and devices which the author has gathered during 22 years of writing the *Technical Topics* columns in *Radio Communication*. It is not a text or handbook, but an idea book —RSGB's version of ARRL's *Hints and Kinks*, but on a larger and more in-depth scale. Copyright 1980, 7th Edition. Soft cover **$12.50.**

TEST EQUIPMENT FOR THE RADIO AMATEUR by H. L. Gibson, G2BUP. A great addition to the library of the Radio Amateur who builds his own equipment. Beside measuring techniques, you will find a wealth of test equipment you can build yourself. Construction projects range from simple dummy loads and attenuators to a 150 MHz digital frequency counter and timer. You will find simple signal sources for 1296 and 2304 MHz and 10 GHz. Chapter titles and number of pages devoted to each: Current and Measurement — 23, Frequency Measurement — 23, Wavemeters — 19, RF Power Measurement — 9, Aerial and Transmission Line Measurements — 9, Noise Measurements — 8, Components, Valves and Semiconductors — 12, Signal Sources and Attenuators — 12, Oscilloscopes and Modulation Monitors — 8, Power Supplies — 3, and Reference Data — 8. Copyright 1978, 2nd edition. Hardbound **$11.00.**

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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.

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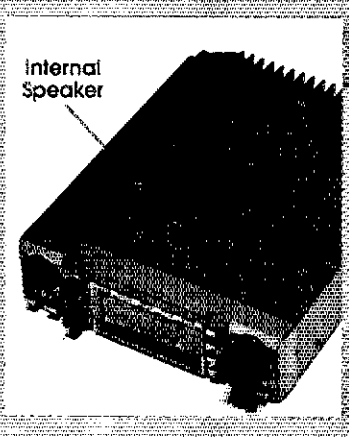
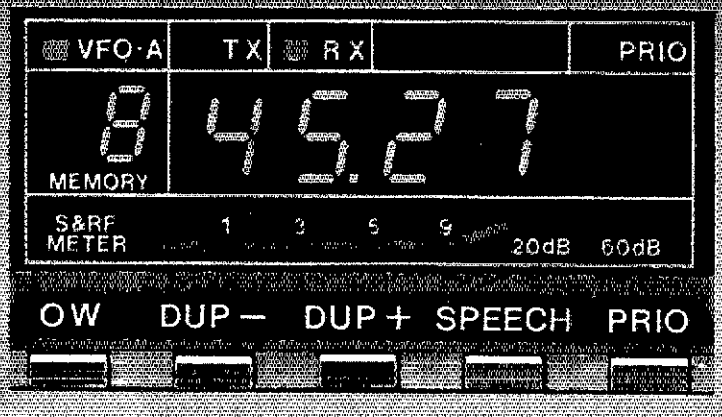
ICOM IC-27A

The Most Compact 2 Meter Mobile!

Now ICOM presents an important breakthrough in two-meter mobile communications, the IC-27A. The smallest two-meter mobile available, the IC-27A measures only 38 millimeters high by 140 millimeters wide. As an added bonus, the IC-27A, through ICOM engineering, is able to contain an internal speaker to provide ease of mounting and make the unit one small compact complete package.



25 Watts. In such an incredibly small package, the IC-27A is able to provide 25 watts of output power. And even though the IC-27A is the smallest available two-meter mobile unit, it has sacrificed none of the features found in fully featured VHF mobiles.



32 PL Frequencies. The IC-27A comes complete with 32 PL frequencies ready to go and controlled from the front panel knob. Each PL frequency may be selected by the main tuning knob and stored into memory for easy access along with frequency.

9 Memories. The IC-27A has 9 memories available to store receive frequency, transmit offset, offset direction, and PL tone.

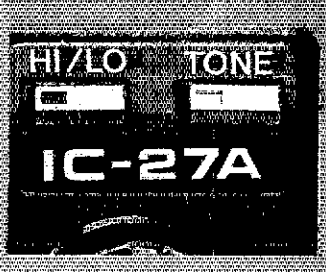
Memories are backed up by a lithium backup battery, which will store memories for up to seven years.

Speech Synthesizer. As an added plus, the IC-27A features an optional speech synthesizer to verbally announce the receiver frequency of the transceiver through the simple push of a button. This allows the operator to hear what frequency he is operating on without looking at the transceiver.

Scanning. Included with the IC-27A is a scanning system which allows scanning of memories or scanning of the band. Each memory may be scanned between programmable limits.

Priority Scan. Priority may be selected to be either a memory channel or a VFO channel. By using sampling techniques the operator can determine if a frequency he is interested in using is free or busy.

Microphone. Each IC-27A comes complete with a microphone which includes a 16-button touchtone pad for access to your favorite repeater or for dialing through an autopatch.



THE ICOM 27A is a superior piece of ham equipment engineered and built by ICOM to provide superb performance in the mobile radio environment. See the IC-27A at your local ICOM dealer.

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The World System

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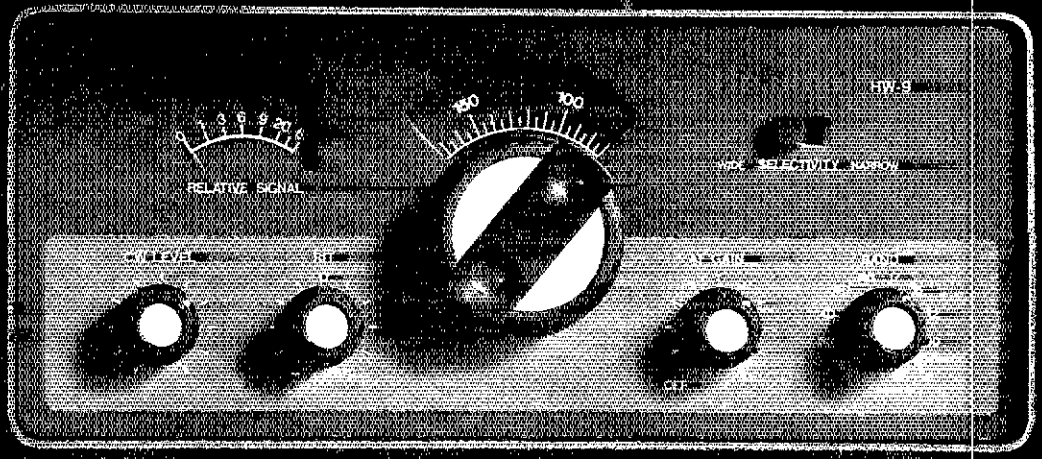
The Tradition Goes On.

HW-7
1972

HW-8
1975

HW-9
1984



Exceptional Performance in a Great New Design. The All-New HW-9 Deluxe QRP CW Transceiver.

Setting the competitive standard in QRP CW has been our tradition through two generations of Transceivers. Now that tradition for excellence in performance, price and value brings to a new generation Heathkit Transceiver state-of-the-art microelectronics and lightweight portability.

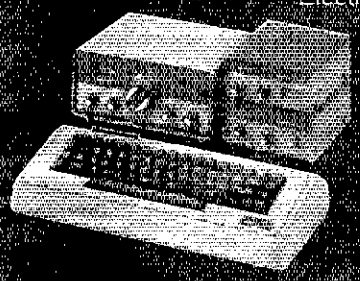
Designed for broadband coverage of 250 kHz of CW on 80, 40, 20 and 15 meters and expandable to the 30, 17, 12 (WARC bands) and 10 meters, the HW-9 brings greater versatility, reliability and ease of use to the field.

The HW-9 eliminates the necessity to fine tune each band. Its wide band front end uses a double balanced mixer and 4-pole crystal filter to pull in wide dynamic range signals. Solid state T-R switching provides for full break-in on any band. And the automatic AGC provides superior receiver performance and audio response.

The unit features single conversion in the main signal path, greatly reducing spurious responses while attaining outstanding image rejection. A full four watts of RF output power (three watts on 10 meters) is available on transmit. RIT (Receiver Incremental Tuning) permits tuning the receiver 1 kHz above or below the transmit frequency. And the tuning dial is calibrated in 5 kHz increments for easy identification of frequency.

Rugged and lightweight, the HW-9 is ideal for portable operation. Transceiver can be powered from batteries, a lighter socket, solar power units or 120 240 VAC with the HWA-9 compatible power supply.

FREE CATALOG!
Complete specifications on the HW-9 and other Ham products are available in the new Heathkit Catalog.
Write: Heath Company, Dept. 009-174, Benton Harbor, MI 49022
Or visit your local Heathkit Electronic Center.*



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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.

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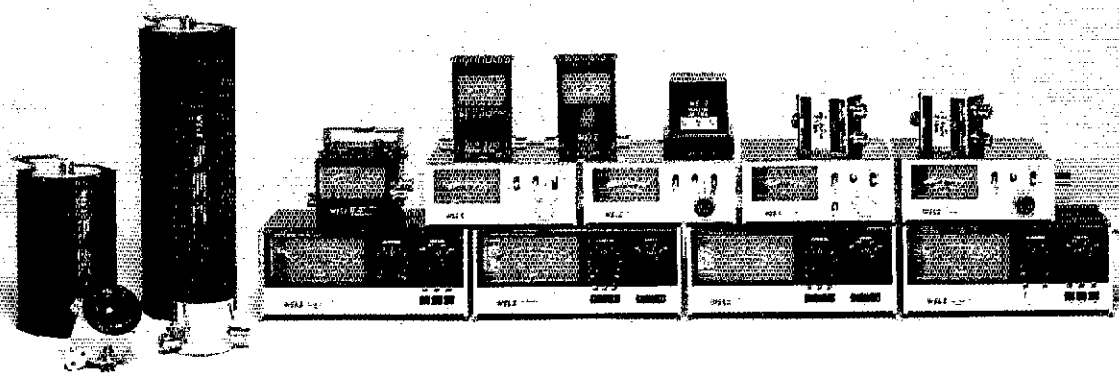
THE WELZ CORPORATION LINE OF STATION ACCESSORIES

WELZ specializes in WATTS. Measuring Watts and switching Watts, radiating Watts and dissipating Watts is what the WELZ line of winners is all about. Welz is the source for top quality, superior performing, affordable products to compliment your mainframe radio equipment from any source. Increase the versatility of your measuring capability with WELZ WIDE-Z Sensor (TM) power and V.S.W.R. meters, precision 50 ohm terminations. Conserve your coax dollars with the dual band Diamond Antennas for 144/430-440 MHz for base and mobile applications. Welz dual band duplexers let you feed two antennas on two different bands with one feed line with no switching or two transmitters onto one dual band antenna simultaneously. WELZ has wattmeters and V.S.W.R. bridges from 200 mW to 2000 Watts from 500 kHz to 500 MHz frequency range. When you need to measure in RF Watts WELZ has a winner for you. The full line of Wattmeters encompasses many different models, some of which are shown in this family portrait. In addition to both in-line and terminating type wattmeters the WELZ line of Winners includes several high quality dummy loads for testing and tuning plus applications requiring precision 50 Ohm terminations. Frequency ranges of the WELZ loads are typically wider than similarly priced items from other sources. WELZ has winners in the economy circle also. The performance value of the economy line of Wattmeters from WELZ is really superior. The instruments from WELZ are extremely well built and very easy to view. The portable units such as the SP-10x and the SP-380 provide reliable service in the field as well as in the fixed station. Send QSL type card for complete catalog of WELZ products.



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2m 25W Mobile Maxpack

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- **WIDE frequency coverage for MARS and CAP capability (142-149.995 MHz)**
- **New chrome front with soft pearl gray cabinet for today's auto decor.**
- **Memories with valid data scanned, blanks are skipped.**
- **Repeater reverse switch for monitoring repeater's input frequency.**

...g Soon
...MHz— FM-6033
440 MHz— FM-7033
220 MHz— FM-4033

The KDK FM-2033 represents a significant advance in user convenience and simplicity of operation for the user. The KDK '33' series provides excellent readability in any lighting condition for the operating frequency and the memory channel in use. Warm orange background LCD displays improve readability by providing easy-on-the-eyes contrast.

Simplicity of operation has always been the mark of the KDK design team and the FM-2033 is no exception. From the single knob frequency and memory selection to the automatic recall from memory of the desired repeater offset, the FM-2033 provides relaxed, comfortable mobile operation.

Once the 10 memory frequencies have been selected, a single knob is all that is required for operation on the standard simplex or repeater channels. Using the audible beep as the end-of-memory marker allows setting to a particular channel without even looking at the radio.

In the scan mode, scanning for a busy memory or pre-programmed band scan keeps you up to date on the happenings in the area. Very busy frequencies can be skipped by using the up key on the TM-2 microphone. If a full 10 memories are not used, the unused ones can be marked for scan skip so that no time is wasted checking them.

The FM-2033 provides a clean 25 watt output signal across 142-149.995 MHz to operate in balance with most repeaters and provide quieting for simplex operations. MARS (Navy too!) and CAP frequencies are also accommodated even with their unusual repeater splits.

You want convenience, reliability and easy operation for your mobile station and a tough-to-beat dollar value, right? Then check out the FM-2033 at your local dealer TODAY or send QSL for specifications. We think you will want one for yourself.

Specifications are nominal and are subject to change. All KDK transceivers meet or exceed FCC regulations regarding spurious emissions.

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AMPLIFIERS • PREAMPS • COUPLERS

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The THL line of amplifiers, pre-amps, antenna couplers and transceivers provides a broad line of solutions to help solve life's problems of needing "just a little more." Whatever it might be, look to THL helpful products to aid in solving the problem. THL can make your signal stronger, your receiving better and can make your HF transmitter happier with the match to the antenna. THL amplifies to a level of 160 Watts on VHF and 90 Watts on UHF.

Using THL amplifiers, handy radios can talk like mobiles with low power input models which provide 30, 100 or 160 Watts of output. Models for 10-14 Watts input power or 25 Watt output mobiles are available.

The THL line of antenna couplers provides fine quality hand crafted antenna matching networks for both low power applications and larger power amplifiers running the legal limit. The THL antenna coupler series has full features like built-in antenna switching for changing antennas or by-passing the coupler and an accurate V.S.W.R./power output indicator on all models. Sturdy construction and honestly rated components and capabilities make the THL series of tuners your best choice.

THL has introduced a unique 440 MHz handheld product, the MICRO-7 utility transceiver. This transceiver can be on the air for less than you would ever guess. THL now has 1 dB GAS-FET pre-amplifier for the 2 m and the 70 cm bands. See your THL dealer for details.

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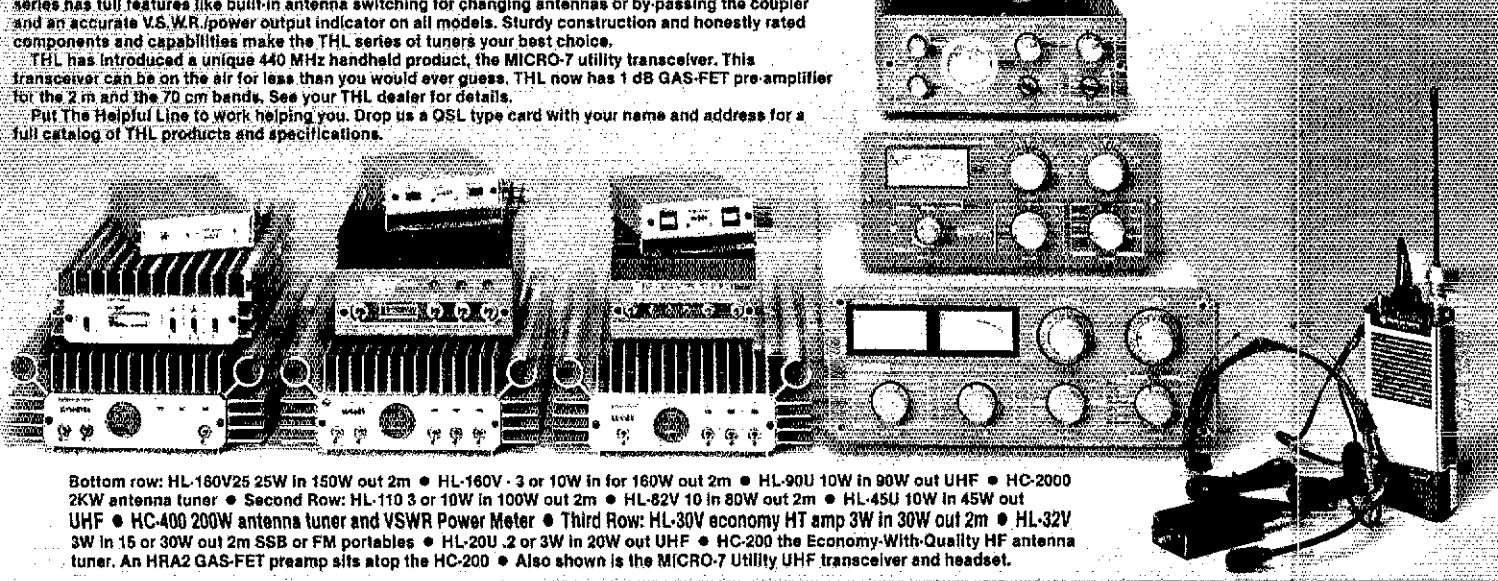

Bottom row: HL-160V25 25W in 150W out 2m ● HL-160V - 3 or 10W in for 160W out 2m ● HL-90U 10W in 90W out UHF ● HC-2000 2KW antenna tuner ● Second Row: HL-110 3 or 10W in 100W out 2m ● HL-82V 10 in 80W out 2m ● HL-45U 10W in 45W out UHF ● HC-400 200W antenna tuner and VSWR Power Meter ● Third Row: HL-30V economy HT amp 3W in 30W out 2m ● HL-32V 3W in 15 or 30W out 2m SSB or FM portables ● HL-20U .2 or 3W in 20W out UHF ● HC-200 the Economy-With-Quality HF antenna tuner. An HRA2 GAS-FET preamp sits atop the HC-200 ● Also shown is the MICRO-7 Utility UHF transceiver and headset.

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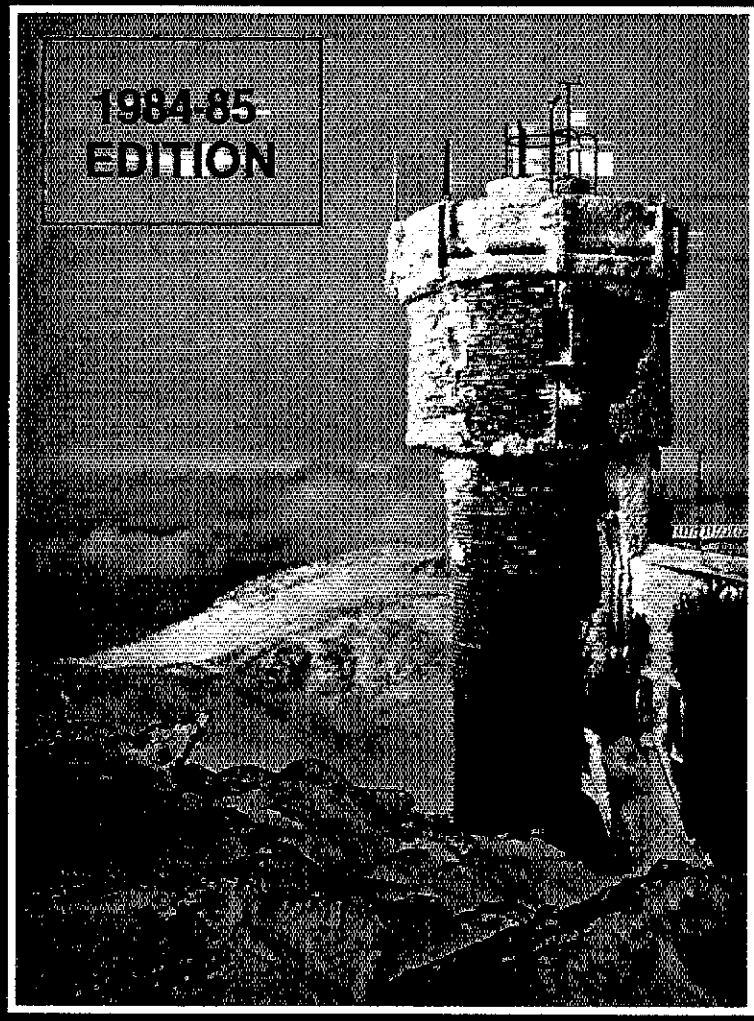

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Available in late April

If you use repeaters . . . you have to have a copy of the 1984-85 edition of the ARRL REPEATER DIRECTORY. There are 8,209 listings! Single copies $2.00, 5 or more copies, $1.75 each.

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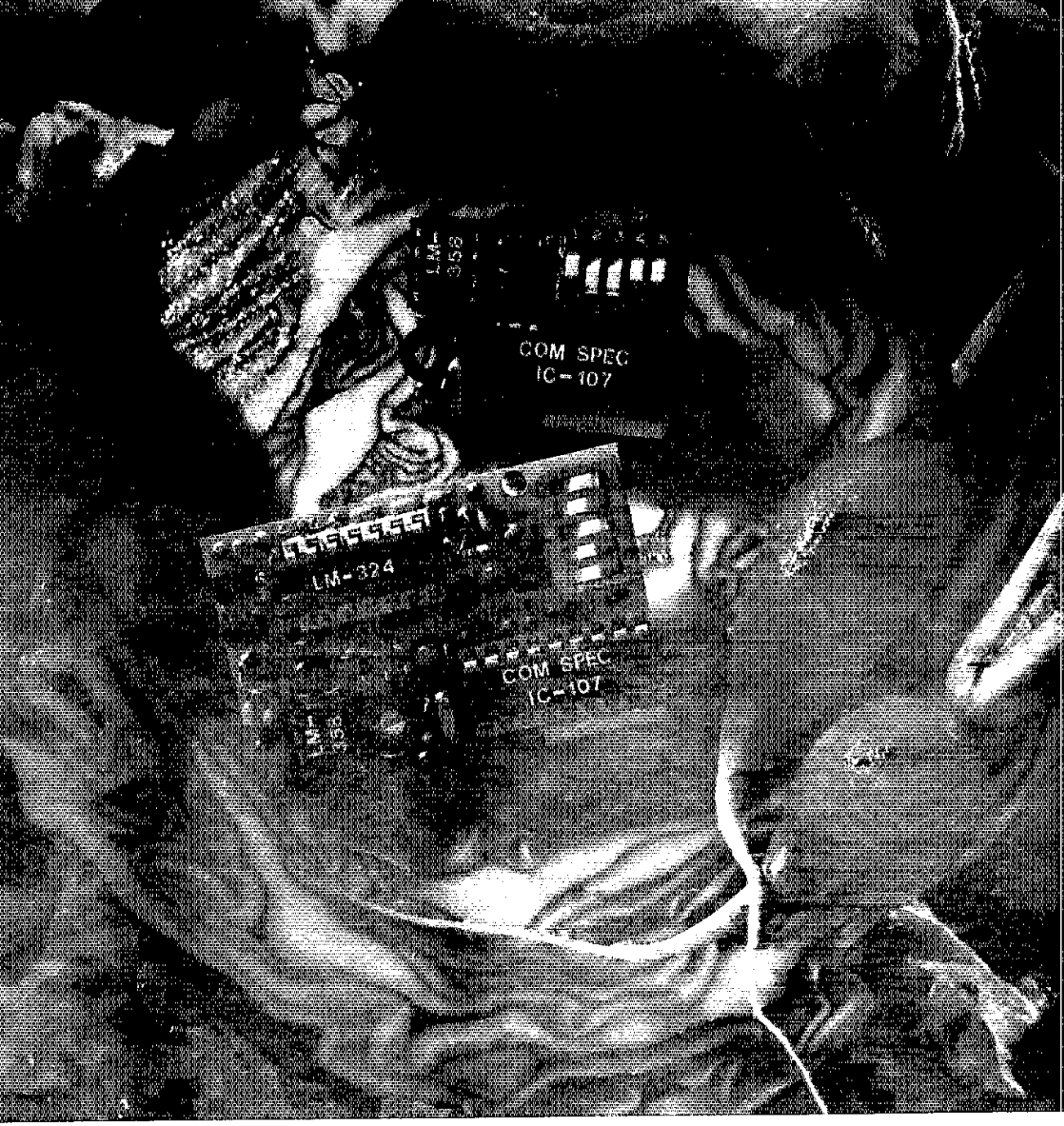

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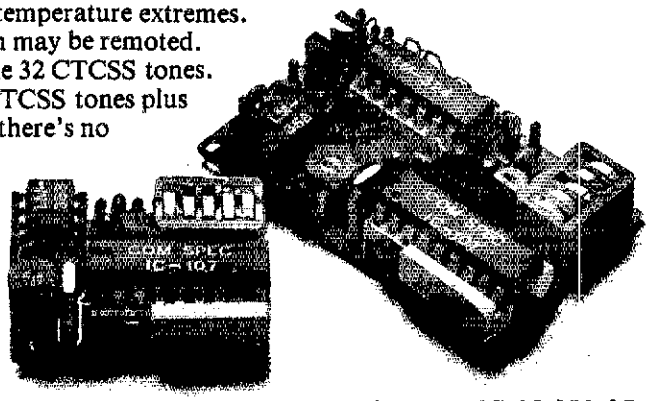
Our new crop of tone equipment is the freshest thing growing in the encoder/decoder field today. All tones are instantly programmable by setting a dip switch; no counter is required. Frequency accuracy is astonishing ±.1 Hz over all temperature extremes. Multiple tone frequency operation is a snap since the dip switch may be remoted. Our TS-32 encoder/decoder may be programmed for any of the 32 CTCSS tones. The SS-32 encode only model may be programmed for all 32 CTCSS tones plus 19 burst tones, 8 touch-tones, and 5 test tones. And, of course, there's no need to mention our one day delivery and one year warranty.



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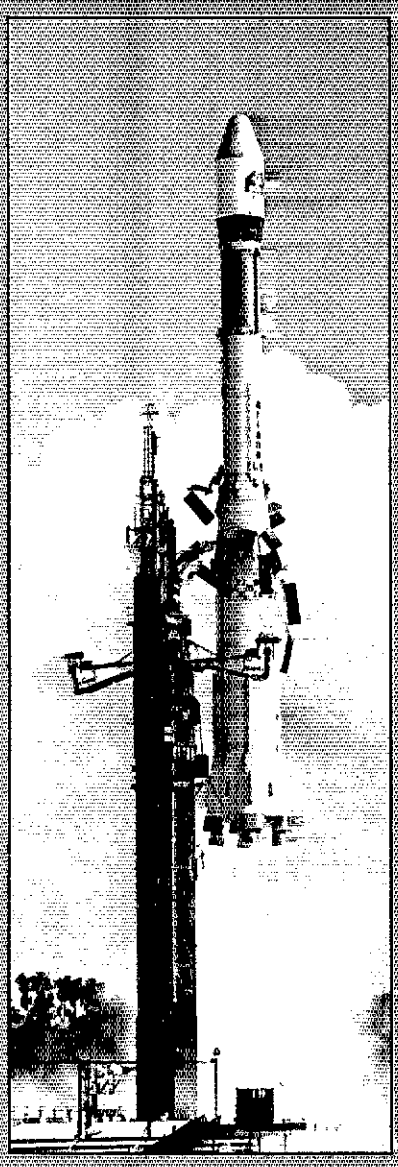
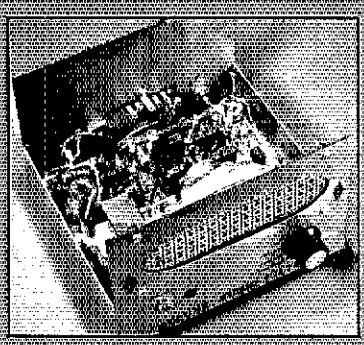
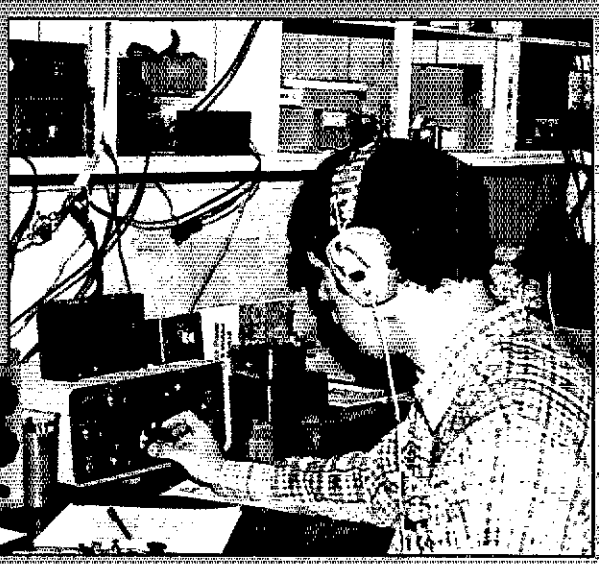
1984
THE RADIO AMATEUR'S HANDBOOK







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Each year the *Radio Amateur's Handbook* is updated to reflect changes in the state-of-the-art. The 640-page 1984 Edition is no exception. Here is what you will find:

- Tables on low-pass, high-pass and band-pass filters
- Updated section on the classes of amplifier operation (Class A through Class E)
- A new kilowatt amplifier for 160, 80 and 40 meters
- 4—1000 amplifier for 6 meters
- A refined version of the Deluxe Audio Filter
- A new solid-state regulator for automobile alternator systems
- The chapter on Specialized Communications Systems has been completely revised with new material on Packet Radio, AMTOR, Spread Spectrum, etc.
- The Interference chapter has been reorganized and updated
- A new and better index. All construction projects are indexed in a single listing as are bibliographies, glossaries and important tables and charts

The 1984 *Handbook* is available for $12 in the U.S., $13.00 in Canada and $14.50 elsewhere. The cloth-bound edition is available at $17.75 in the U.S. and $20 elsewhere. All payments in U.S. funds. Checks must be drawn on a bank within the U.S. Please enclose $1.00 for postage and handling.

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- Amateur Radio
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- Radio Design Technique and Language
- Solid State Fundamentals
- AC-Operated Power Supplies
- HF Transmitting
- VHF and UHF Transmitting
- Receiving Systems
- VHF and UHF Receiving Techniques
- Mobile, Portable and Emergency Equipment
- Code Transmission
- Single Sideband
- Frequency Modulation and Repeaters
- Specialized Communications Systems
- Interference
- Test Equipment and Measurements
- Construction Practices and Data Tables
- Wave Propagation
- Transmission Lines
- Antennas for High Frequency
- VHF and UHF Antennas
- Operating a Station
- Vacuum Tubes and Semiconductors (Tables)

The 1984 *Handbook* is available at your radio store or directly from:

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- Designed to operate on all Amateur Bands at "FULL" Legal Power Input.
- Automatic Band Switching (80/10 meters).
- Automatic Band Switching (160/10 meters) with optional model TBR-160 HD.
- IN STOCK for IMMEDIATE DELIVERY & LOOK at very SPECIAL PRICES . . .
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These rugged beauties are being offered at Big Discounts and - we are shipping them freight prepaid! Look over the specifications and pick the unit most suited for your needs, then - Call us to place your order with Mastercard/Visa or write and include your check for quick shipment - Freight Prepaid!

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Tower Model	Tower Ht.	Load Rating	Ship Weight	Tower Base	Tower Price	Base Price	Total Price
HBX40	40 ft	10 sq ft	164	BXB6	289	24	313
HBX48	48 ft	10 sq ft	303	BXB7	369	26	395
HBX56	56 ft	10 sq ft	385	BXB8	449	30	479
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All Models Shipped Factory Direct — Freight Paid*!

Check these features:
- All steel construction
- Hot dip galvanized after fabrication
- Complete with base and rotor plate
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Model	Height	Load	Sale Price
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$.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

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- Low Loss Foam Dielectric
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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
⅞" Heliax	50	.1	.2	.5	.9

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Lowest Loss for VHF/UHF!

½" Alum. w/poly Jacket . . . $.79/ft
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Cable Type	UHF FML	UHF MALE	N FML	N MALE
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Silver PL259 . . . $1.25 Nickle PL259 . . . $.90
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HUSTLER

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Bumper Mounts - Springs - Folding Masts in Stock!

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Model	Height Up	Down	Wind Load	List	Sale
W36	36.0 ft	20.5 ft	9.0 sq ft	$694	$579
WT51	51.0 ft	20.5 ft	9.0 sq ft	$1154	$999
LM354	54.0 ft	21.0 ft	16 sq ft	$2010	$1599
LM470D (Motorized)	70.0 ft	22.0 ft	16 sq ft	$4195	$2999
DX86 (Motorized)	86.0 ft	23.0 ft	25 sq ft	$6200	Call

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Model LT 200W UHF Type . . $19
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MINI-PRODUCTS HQ-1 only $159!

Wing Span - 11 ft
Boom - 54 in. long
Wind Area - 1.5 sq ft
1200W P.E.P. Input
6-10-15-20 mtrs

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Alliance HD73 (10.7 sq ft rating)	$109
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Standard 8 cond cable $.19/ft (vinyl jacket 2-#18 & 6-#22 ga)
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UNR-ROHN GUYED TOWERS

10 ft Sections 20G $37.50 25G $46.50 45G $107.50

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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			$249
45G Foldover Double Guy Kit			$269

*Above antenna loads for 70 MPH winds and Guys at Hinge & Apex.

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Foldover prices 10% higher west of Rockies.
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HPTG6700 Guy Cable (6700 lb rating)	$.69/ft
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9902LD Cable End (for 6700 cable)	$7.95
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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	$109
.25 in Wall	$69	$129	$189	$249

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

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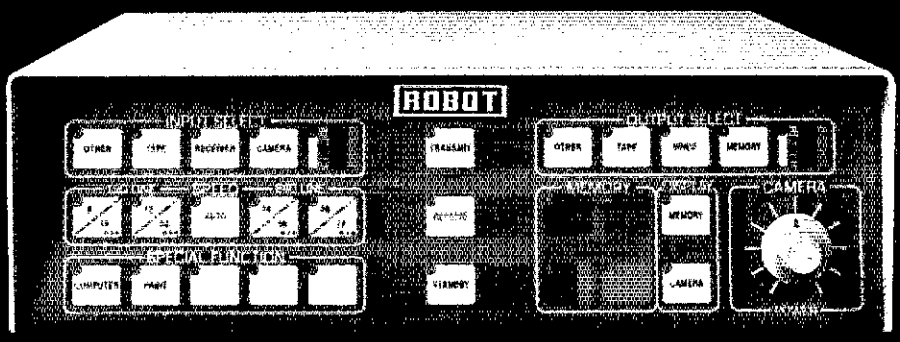
COLOR SSTV



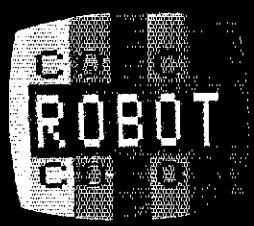
Introducing the Robot 450C and 1200C Single Frame Color SSTV Converters

Robot's new color slow scan TV converters provide you with a whole new dimension of Amateur Radio activity. Now you can exchange color pictures of your latest DX QSL card, the best stamp in your collection, or even that terrific sunset scene you shot last summer.

Robot's microprocessor controlled color SSTV equipment provides a significant breakthrough in the transmission of single frame color images known as "Time Multiplex Color Component System" (TMCCS). This method was chosen as being faster, easier to use and more reliable than the cumbersome frame or line sequential systems now in use, as well as being black and white compatible with the thousands of slow scan stations already on the air world wide.

In addition to having fast, single frame color capability as with the Robot Model 450C, the Model 1200C also offers sharp, high resolution color pictures that rival commercial broadcast television! With all their flexibility, interfaceability and dependability, the Models 450C and 1200C will be in the forefront of technology for years to come. Their new multi-dimensional SSTV standards will be the pace-setters in the industry.

There are even more features and capabilities too numerous to be listed here, such as computer interface, automatic fine tuning, multi speed operation and many more, so see your dealer today for literature and a demonstration, or write:



ATTENTION MODEL 400 OWNERS: Now you can have single frame color SSTV capability too by installing the Model 400C Update Kit to your unit. All necessary parts and hardware are included for an easy single evening installation.

Also introducing the new Robot Model 800C Super Terminal with color graphics capability when used with the new Robot color scan converters. Also has expanded memory with lithium battery back-up, and has both serial and parallel printer interface. A complete terminal for RTTY and Morse Code.

ROBOT RESEARCH, INC.
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World Leaders in Slow Scan TV, Phone Line TV and Image Processing Systems

KENWOOD

pacesetter in amateur radio

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 LCD 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 (if any), sub-tone number (if any), 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. 6 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-48 16-key autopatch UP/DOWN mic, SW-100A/B power meters, LF-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.