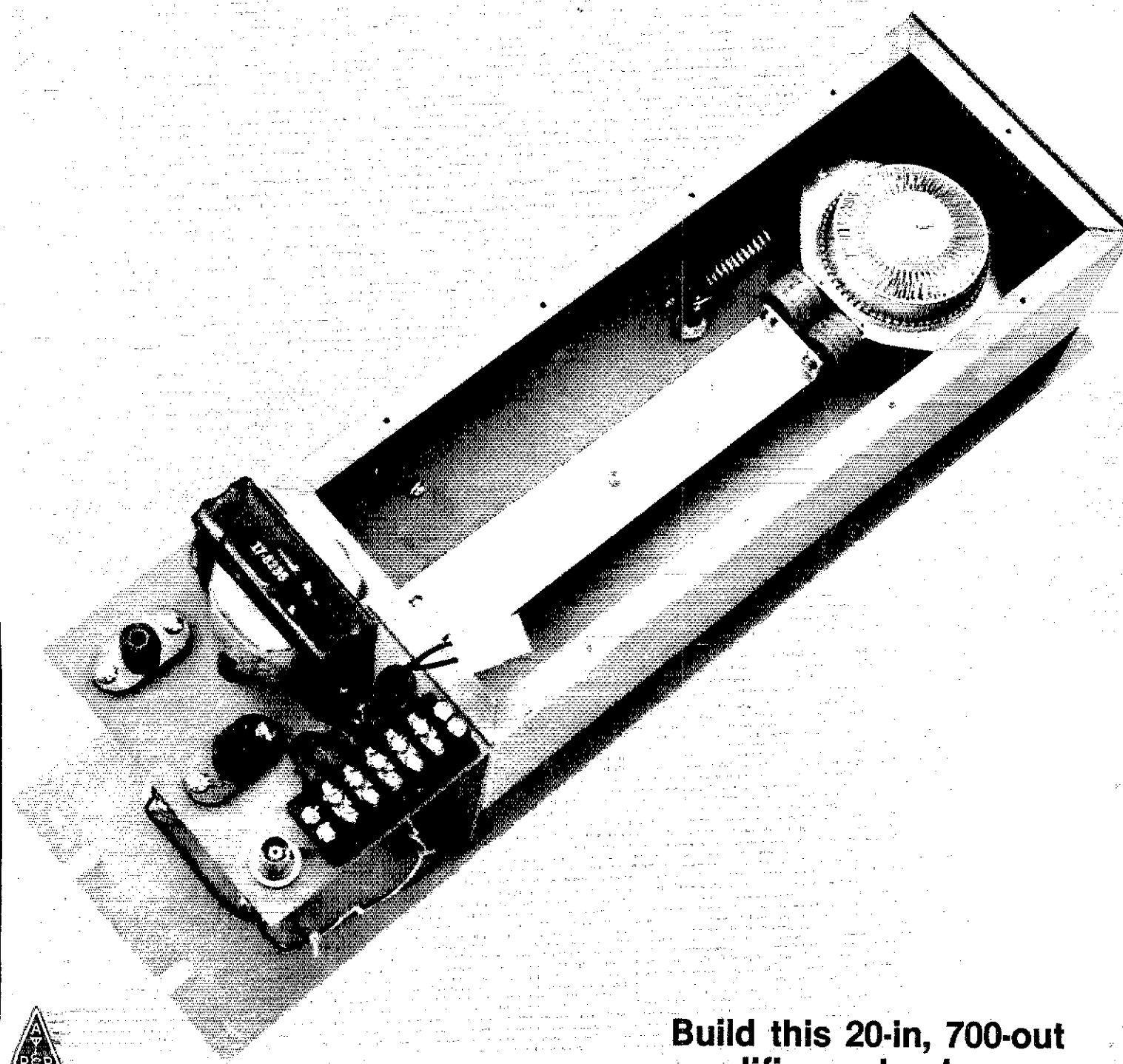
April 1984 $2.75

# QST

devoted entirely to Amateur Radio



**Build this 20-in, 700-out amplifier and gain some respect on 2 meters**


# the tempo S-15

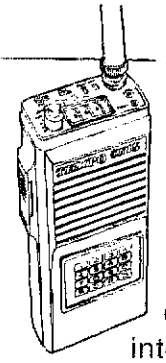
# ...a no nonsense radio that provides more power, broader frequency range and simplicity of operation

**...the kind of hand held most people want...simple, rugged, reliable, easy to use. The S-15 offers a full 5 watts of power...power that extends your range and improves your talk power. Its state-of-the-art integrated circuitry provides far more reliability and ease of maintenance than conventional circuitry.**

**Consider these features before you decide on any hand held:**

- 5 watt output (1 watt low power switchable)
- 10 MHz frequency coverage: 140-150 MHz (For export only: B version 150-160 MHz, C version 160-170 MHz)
- Electrically tuned stages. Receiving sensitivity and output power are constant over entire operating range.
- Three channel memory. (1 channel permits non-standard repeater offsets. 200 micro amp memory maintenance (standby)).
- A new "easy remove" battery pack
- One hour quick charge battery supplied (450 ma/HR)
- Plug for direct 13.8 volt operation
- Speaker/microphone connector
- BNC antenna connector and flex antenna
- Extremely small and light weight (only 17 ounces).
- Ample space for programmable encoder.
- Fully synthesized
- Extremely easy to operate
- Its low price includes a rubber antenna, standard charger, 450 ma/HR battery (quick charge type) and instruction manual.

**OPTIONAL ACCESSORIES:** 1 hour quick charger (ACH 15) • 16 button touch tone pad (S 15T) • DC cord • Solid state power amplifier (S-30 & S-80) • Holster (CC 15) • Speaker/mike (HM 15)



*now available!*

## ...the new CS-15

It's a brand new version of the S-15... BUT for commercial use. It contains all of the features and fine quality that the S-15 is famous for...including 5 watt output, 10 MHz receiver coverage, fully synthesized, 10 channel internally programmable, AND it's FCC type accepted. It's all in a sturdy, ultra compact case and at a very affordable price.

**TEMPO M-I** Superb quality VHF marine band hand held. Synthesized for world wide use... all marine channels & 4 weather channels. Ch. 16 override. All offsets built in.

**TEMPO S-2** Use 220 MHz repeaters nationwide. Synthesized, field tested and dependable.

**TEMPO S-4** The first 440 MHz hand held and still a winner.

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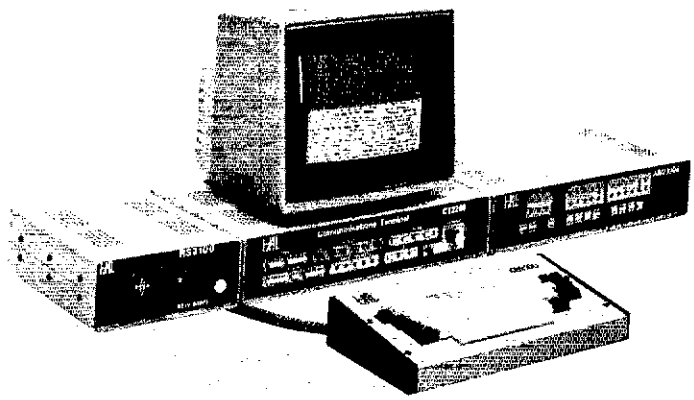
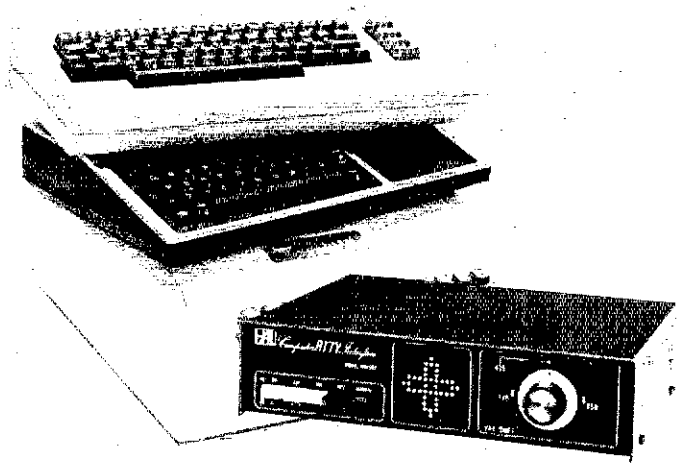
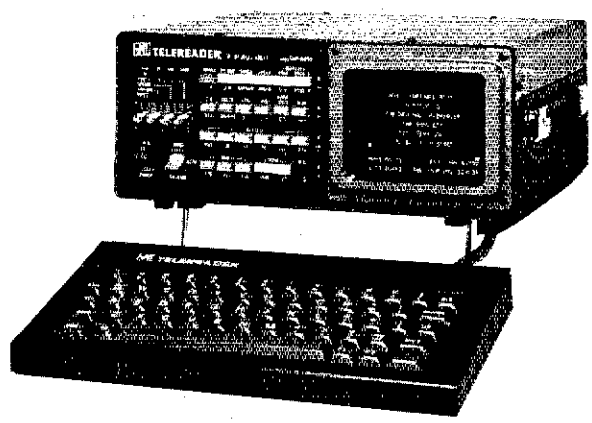
# RTTY FOR ALL

**MPT3100 + DSK3100 + ST6000:**
MPT3100—the acknowledged top-of-the-line system for both commercial and serious amateur RTTY and CW stations. HAL pioneered the radio mailbox technique with the MPT3100, and now the new DSK3100 disc drive option gives you 326,000 characters of message storage. The system is designed particularly for the amateur, commercial, or military operator who has to handle a large amount of traffic. You can collect, edit, and retransmit traffic perfectly with a minimum of effort. The ST6000 is renowned for its weak-signal performance and reliability. Add the ARQ1000 for full AMTOR operations, including an AMTOR mailbox. If you are serious about your code and need high performance and reliability, this system is the proven world leader.

**CT2200 + KB2100 + ARQ1000 + RS2100 + KG12:**
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!

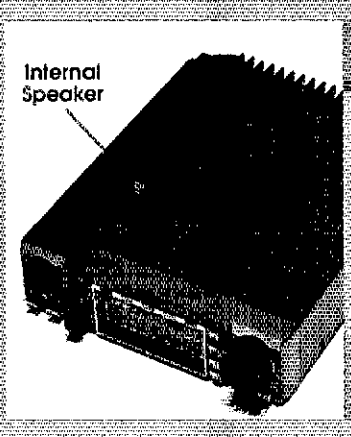
**CWR6850:**
Have a space problem or want portable RTTY? The CWR6850 is a one-package complete RTTY system. All you need is your transceiver and 12 VDC—the rest is in the CWR6850, including the screen. The high-performance RTTY demodulator for all shifts and either high or low tones is built-in. AND, 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.

**HAL COMMUNICATIONS CORP.**
**BOX 365**
**URBANA, IL 61801 • (217) 367-7373**

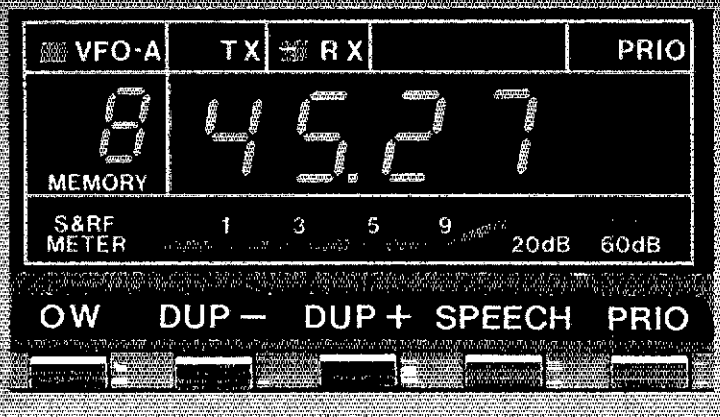
# ICOM IC-27A

## 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.


ICOM
The World System

ICOM America, Inc., 2112-116th Ave NE, Bellevue, WA 98004 **(206)454-8155** / 3331 Towerwood Drive, Suite 307, Dallas, TX 75234 **(214)620-2780**

All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. '27A284

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# CONTENTS

**OUR COVER**

If you're among those who haven't earned their 2-meter WAS Award, this amplifier won't be the whole answer. But it sure won't hurt! See page 11.

## TECHNICAL



## BEGINNER'S BENCH



## NEWS AND FEATURES



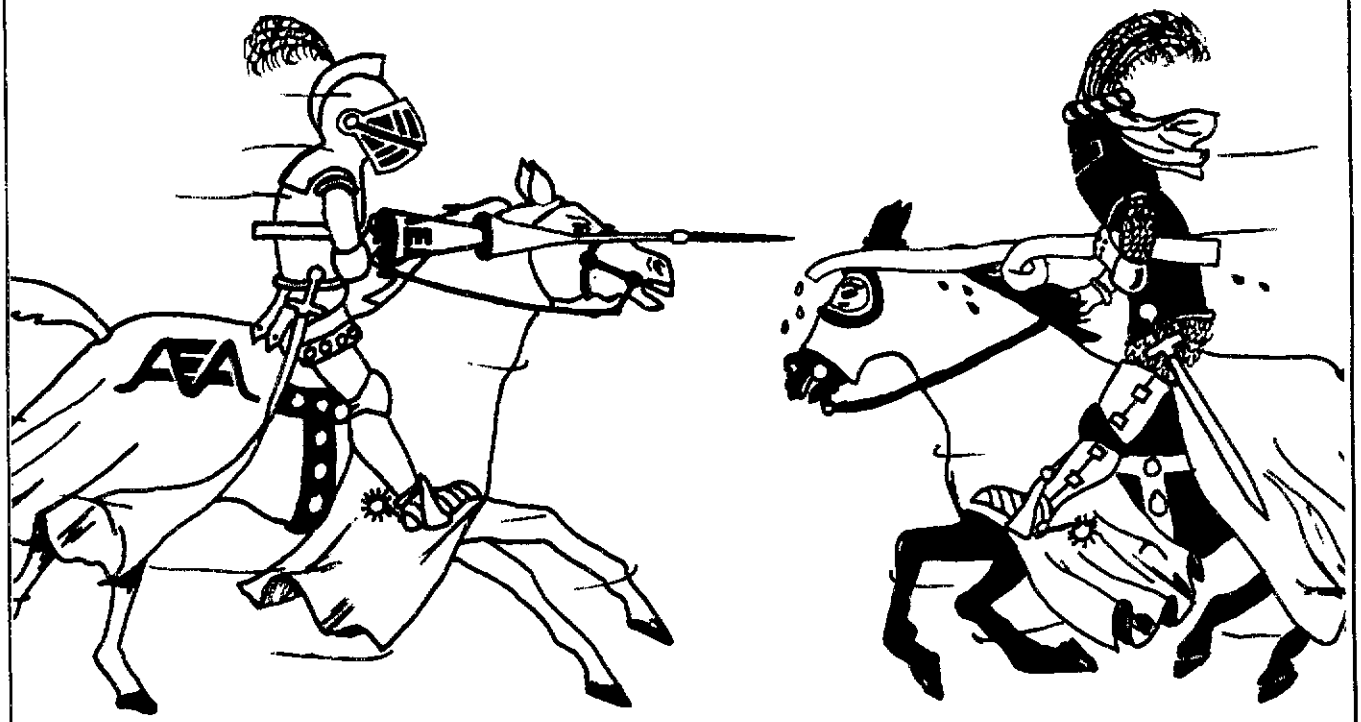
## OPERATING



## DEPARTMENTS

# 50 dB GAIN

## OVER A 1/4 WAVE WET NOODLE!



It sounds ridiculous..doesn't it? Amateur Radio advertising is not exempt from exaggeration. When facts are distorted by fabrication you may be induced to buy a product that ultimately is incapable of meeting the performance claimed by the manufacturer. Caveat Emptor (buyer beware)!

The **AEA IsoPole**™ antenna has dB gain over a dipole in free space. This is an honest and supportable claim. Yet other manufacturers claim as much as a 7 db gain for their antennas using no reference standard or a 1/4 wave antenna as reference. The 1/4 wave is not a recognized reference used by **reputable** antenna engineers because it is most difficult to properly decouple in a repeatable fashion.

The **IsoPole** antennas offer **the maximum gain attainable** for the length of antenna. This is a bold statement and one we know we can stand behind!

For any linear array antenna to outperform the **IsoPole** by 3 db or more on-the-horizon gain, it would have to be at least 20 feet long! Anything less and you can bet that advertising deception is being used.

Before you buy a VHF or UHF base station antenna, get some good **honest** facts about VHF antenna design. Send for your **FREE** copy of "Facts About Proper VHF Vertical Antenna Design" by Professor D.K. Reynolds, K7DBA. You'll be glad you did.

In the meantime, we would like to expose you to some of the comments we have received from customers that are using the **IsoPole**.

**Seattle, WA** — Compact & easy to install, quality & keeps XYL happy -looks good!!

**Half Moon Bay, CA** — Found repeaters I only heard about before from my QTH — Excellent. Amazed at light weight and low cost...

**Sturgis, SD** — The Isopole Antenna has exceeded my expectations.

**Lumberton, NC** — You really do what you say! The best 2 mtr. antenna I have ever owned!

**La Habra, CA** — Hooked up today, and it was a perfect match throughout the entire band. For the money, you can not go wrong.

**Tok, AK** — Truly a fine antenna, working better than the five element yagi it replaced.

**Sacramento, CA** — Assembly was remarkably easy, I needed an efficient, low profile antenna & your product fit the bill to a "T".

**Warsaw, IND** — AMAZED!!! Antenna ground mounted on required mast & outperforming a (R.R.) at 55' on top of tower.

**Loris, SC** — I'm a commercial radio salesman, and the Isopole is THE antenna I recommend.

**Seattle, WA** — Works well — excellent. Had (R.R.) at 80'. With the Isopole at 20 ft. I now hear repeaters and simplex I never heard with (R.R.) The Isopole will soon be at 80'.

**Freehold, NJ** — It is everything your ad says and more.

**Great Neck, NY** — Amazing difference between (R.R.), 10 db or better, raise rept. never heard before — SUPER, 73 and thanks.

**Richfield, OH** — Works extremely well, broke a repeater at 100 mi using 150 mw !

**Vernon, TX** — (The dealer) said the antenna WAS THE BEST ON MARKET and I AGREE! It IS AN EXCELLENT antenna & works to specs -Thanks.

**Prices and Specifications subject to change without notice or obligation.**

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# KENWOOD

*The Radio People*

## TS-930S "DX-traordinary"

# TS-930S

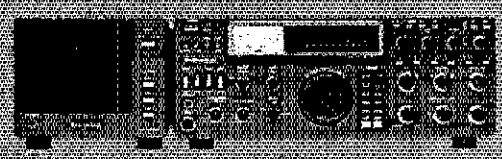
We call it "DX-traordinary" because the TS-930S has now become the favorite rig of the serious contester. Its superior capability for full break-in split-frequency operation, the speed and convenience with which its eight memory channels can be accessed, its unsurpassed receiver dynamic range and its 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, readily 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. Switchable 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, fan triggered average "talk-power" SSB monitor circuit, 4-step RF attenuator, 25-kHz, 100-kHz marker. AC power supply built-in for 120, 220, or 240 VAC.

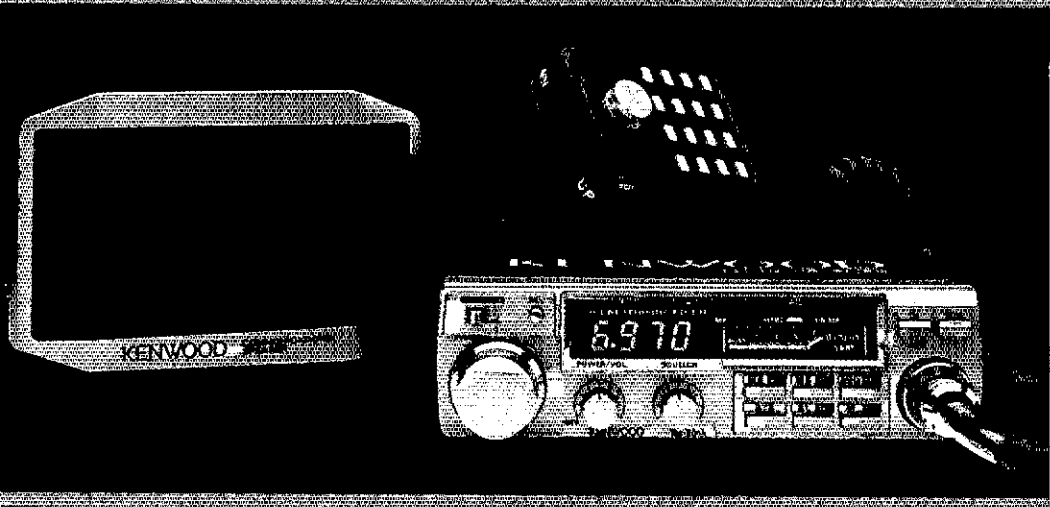
**TS-930S Optional Accessories:** AT-930 automatic antenna tuner, SP-230 external speaker with select-able audio filters, YK-88A-1 (500 Hz), YK-88C (1.8 kHz), YK-88CN-1 (250 Hz), YK-88SN-1 (500 Hz) CW filter, YK-88A-2 (6 kHz) AM filter, all plug-in type, TCXO commercial stability TCXO-3, MC-60A deluxe desk microphone, MC-80 and MC-85 communications microphones, MC-43S mobile hand microphone, TL-922A linear amplifier (not for CW QSK), SM-220 station monitor, PC-1A phone patch, SWR-200D SWR/power meter, 160-6 meter, SW-100A SWR/power/watt meter, 160-2m HS-4, HS-5, HS-6, and HS-7 headphones.

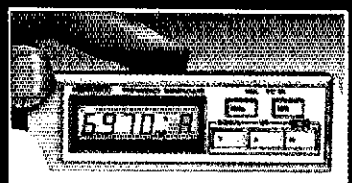
Isn't it about time you stepped into the winner's circle?

More information on the TS-930S is available from authorized dealers or The Kenwood Communications, 1111 West Walnut Street, Compton, California 90220.



# KENWOOD




**Optional FC-10 Frequency Controller**
Connects to the TM-201A or TM-401A. Convenient control panel for frequency UP/DOWN, MHz shift, VFO A/B, and MR (memory recall or change memory channel). A green LCD display indicates trans. and receive frequencies, memory channel number, ▲, ERT, and SCAN (with blinking MHz decimal).

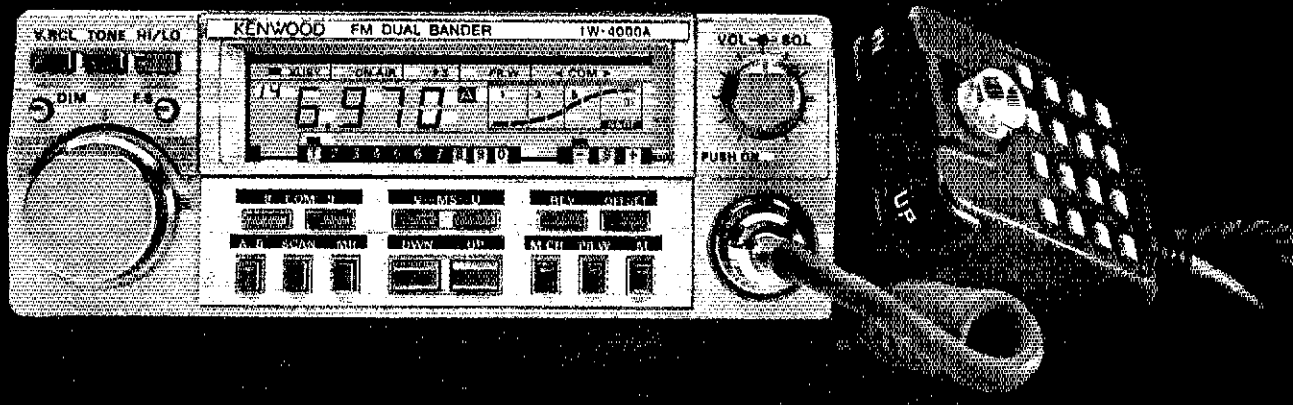
## TM-201A/TM-401A

**TM-201A/TM-401A "comp-ACT"... tough act to follow.**

The word "compact" best describes the TM-201A VHF 1a-big 25-watt/5-watt or the TM-401A 70-cm 12-watt/1-watt mobiles. Measures 6-5/8"Wx1-6/8"Hx7-3/8" D (inches) the TM-201A and TM-401A are the most compact rigs available, ideal in size.

Their performances are superlative. Each features a HI/LO power switch, dual digital VFO's, built-in 5 memories plus a "CALL" channel with lithium battery backup, memory scan, programmable band scan, one-touch alert scan, and GaAs FET front-end amplifier. They have a highly visible yellow-green digital display, a repeater offset switch, a reverse switch, a built-in "beeper" to confirm activation of various switches. For superior sound quality, the separate external speaker can be easily mounted to project the sound in the desired direction. A 16-key autopatch UP/DOWN mic allows easy remote operation of major front panel functions. Thanks to KENWOOD, compact radios are now available for the popular VHF and UHF bands, providing high performance and superior sound quality.

**Other TM-201A/TM-401A Optional Accessories:**
PG-3 Programmable two frequency CTCSS encoder, KPS-7A fixed station power supply, MA-4000 dual-bander mobile antenna with duplexer, SW-100A/B SWR/power meter, MC-55 mobile microphone with time out timer.




## TW-4000A

**TW-4000A FM "Dual-Bander"**

KENWOOD'S TW-4000A FM "Dual-Bander" provides new versatility in VHF and UHF operations, uniquely combining 2-m and 70-cm FM functions in one compact package. It covers the 2-m band (142.000-149.995 MHz, including certain MARS and CAP frequencies) and the 70-cm band (440.000-449.995 MHz), all in a package only 6-3/8"W x 2-3/8"H x 7-3/16"D (inches). RF output power measures 25 watts on either band. The TW-4000A features a large, easy-to-read LCD display, front panel illumination for night operations, 10 memories with DTMF set, recall, and lithium battery backup. Programmable memory scan, band scan in selected 1-MHz segments, priority watch function, call channel, "Home" channel scan, dual digital VFO's, repeater offset switch, GaAs FET front ends, a tuned-the-past feature, "beeper" through speaker, a mobile mount, and a 16-key autopatch UP/DOWN mic.

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

**Other TW-4000A optional accessories:**
The voice synthesizer VS-1, PG-4C programmable two frequency encoder, KPS-7A fixed station power supply, SP-40 compact mobile speaker, SP-60 compact mobile speaker, MA-4000 dual-band mobile antenna with duplexer, MC-85 mobile microphone with time-out timer, and a SW-100B SWR/power meter.

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

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*Manitoba* — Peter Guenther, VE4PG, Box 149, Landmark R0A 0X0 (204-355-4521)
*Maritime-Nfld* — Donald R. Welling, VE1WF, 36 Sherwood Dr., St. John, NB E2J 3H6 (506-696-2913)
*Ontario* — L. P. Thivierge, VE3GT, 34 Bruce St. W., Renfrew K7V 3W1 (613-432-5967)
*Quebec* — Harold Moreau, VE2BP, 80 Principale, St. Simon Co., Bagot J0H 1Y0 (514-798-2173)
*Saskatchewan* — W. C. "Bill" Munday, VE5WM, 132 Shannon Rd., Regina S4S 5B1 (306-586-4963)

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*Eastern Pennsylvania* — Karl W. Pfeil, W3VA, 211 Schuylkill Ave., Tamaqua 18252 (717-668-3533)
*Maryland-D.C.* — Karl R. Medrow, W3FA, 702 W. Central Ave., Davidsonville, MD 21035 (301-261-4008)
*Southern New Jersey* — Richard Baier, WA2HEB, 1226 Audubon Dr., Toms River, NJ 08753 (201-270-9292)
*Western New York* — William Thompson, W2MTA, RD 1-Rock Rd., Newark Valley, 13811 (607-642-8930)
*Western Pennsylvania* — Otto Schuler, K3SMB, 3732 Colby St., Pittsburgh 15214 (412-231-6890)

**Central Division**

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*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**

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*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)

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*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)

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*Michigan* — James R. Seeley, WB8MTD, 14530 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., Copiague 11726 (516-226-4835)
*Northern New Jersey* — Robert E. Neukomm, KB2WI, 404 O'Brien Ct., Wyckoff 07481 (201-891-3064)

**Midwest Division**

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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)
*Western Massachusetts* — R. Donald Haney, KA1T, RD 1 Box 237, Harvard, MA 01451 (617-772-4126)

**Northwestern Division**

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*Idaho* — Dennis L. Hall, KK7X, 2415 N. Government Way, Coeur D'Alene 83814 (208-667-3591)
*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* — R. A. "Army" Curtis, AH6P, P.O. Box 4271, Hilo, HI 96720 (808-959-8985)
*Sacramento Valley* — Ron Menet, N6AUB, P.O. Box 244, Cedar Ridge, CA 95924 (916-272-4873)
*San Francisco* — Robert Odell Smith, NA6T, 320 Park St-P.O. Box 1425, Fort Bragg, CA 95437 (707-964-4931)
*San Joaquin Valley* — Charles P. McConnell, W6DPD, 1658 W. Mesa Ave., Fresno, CA 93711 (209-431-2038)
*Santa Clara Valley* — Rodney J. Stafford, KB6ZV, 5155 Shadow Estates, San Jose, CA 95135 (408-274-0492)

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*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**

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*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)

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*Northern Florida* — Billy F. Williams, Jr., N4UF, P.O. Box 9673, Jacksonville 32208 (904-744-9501)
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*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)

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*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 (512-831-4456)

THE AMERICAN RADIO RELAY LEAGUE, INC.

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

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

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

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

All membership inquiries and general correspondence should be addressed to the administrative headquarters at 225 Main Street, Newington, CT 06111 USA. Telephone: 203-666-1541, Telex: 643958 AMRAD NEWI.



# "It Seems to Us..."

## World Radio Amateurs Day

Every couple of years, we try to think of a new way to encourage you to *try something different* in your Amateur Radio operating. Amateur Radio is a smorgasbord of potential experiences; why settle for a steady diet of cheese sandwiches when there are tantalizing selections on the table, waiting to be sampled?

Of course, human nature being what it is, it's not easy to change old habits. Often it takes an outside stimulus to get us out of our comfortable ruts. With that in mind, we'd like to share a suggestion put forward by the New Zealand Association of Radio Transmitters (NZART) that makes a lot of sense, and just may catch on. The NZART proposal also observes the anniversary of an event which was very important in Amateur Radio history: the founding of the International Amateur Radio Union with the formal ratification of its first Constitution on April 18, 1925. In 1981, the IARU member-societies approved the proposal of the Liga de Amadores Brasileiros de Radio Emissao, the IARU member for Brazil, that April 18 be designated World Radio Amateurs Day. However, until now there has been no plan for the formal observance of this date.

Fred Johnson, ZL2AMJ, describes the NZART concept as follows:

"This is not a contest, but an activity in which every radio amateur can take part and should be encouraged to do so. The idea is to recognize the founding of the International Amateur Radio Union on April 18, 1925 by doing something you have not done before, sometime between 1200 UTC on April 17 and 1200 on April 19 each year. These dates and times represent the start and finish of April 18 at the International Date Line, and are chosen to show unification of all radio amateurs by observing the same period for this global activity.

"Your special activity could be to work new stations, to try a new mode or a new band, to at least listen to a satellite, to build a piece of gear, or just to exchange greetings with someone new. Anything to make World Radio Amateurs Day a 'special day' in your Amateur Radio experience. There are no prizes, no awards, no certificates, just the satisfaction of knowing that *you* have reactivated some amateur spirit; that *you* have recognized World Radio Amateurs Day and acknowledge the debt you owe to the International Amateur Radio Union for its achievements on your behalf. World Radio Amateurs Day need do no more than that for its aim to have been achieved.

"So go to it, do your particular thing, individually or as one of a group, to make April 18 a very special day on the Amateur Radio calendar. April 18, 1985 is the Diamond Jubilee of the founding of IARU. Let 1984 be an experimental year leading up to mass participation in 1985."

Your special activity doesn't have to involve a large investment of time or money. Chances are, you already have the equipment for a modest foray; if not, you may be able to borrow something from a friend for a few days, or to work out a temporary swap. Better yet, if you know someone who would enjoy doing something different but doesn't have the wherewithal to do it alone, invite him or her to join you in a project you'll both enjoy. Getting back to our "smorgasbord" analogy, perhaps your club could organize a "progressive dinner" of visits to members' shacks, permitting everyone to sample one another's operating interests. Food is optional!

While there will be as many ideas of what constitutes a "special" activity as there are participants, here are a few that come to mind.

- Listen for the OSCAR 10 satellite. All it takes is a receiver for 145.810-145.990 MHz that can tune CW and SSB, and a simple 2-meter antenna of the kind you might have used in listening to W5LFL from the Space Shuttle. There must be thousands of old 2-meter converters gathering dust in shacks around the country, and thousands more multimode 2-meter rigs that aren't often used except on FM. If you're on the West Coast you'll have a good shot at OSCAR 10 from about 1230 to 2200 UTC on both April 17 and 18; on both passes the satellite will be due west and well above the horizon. From the Midwest, try looking due west from about 1400 to 1800 UTC April 17, and from 1230 to 1900 UTC on April 18. The best bet from the East Coast will be 0300 to 0830 UTC on April 18, looking slightly north of east.
- Run QRP. You don't need special gear; with most rigs, all you must do is reduce the drive to the final amplifier until your wattmeter shows no more than 5 watts output. If you routinely run 100 watts output or more, you may be surprised at what you can work with QRP! Operating with battery power, instead of commercial ac, could add another new wrinkle for you.
- Try our new 10-MHz band. There was an initial surge of activity when the band was opened for U.S. amateurs in October 1982, but these days things are pretty quiet. Most of the "regulars" on the band like the noncompetitive atmosphere, but they're glad to welcome newcomers who share their low-key approach. If you can't string a 10-MHz antenna in time, you may find that your 80-meter dipole or vertical works quite nicely.
- Check into a traffic net. Most welcome visitors, and if you pay close attention to how the net session is conducted you'll be able to fit right in. You may not want to handle message traffic every day, but wouldn't it be nice to know how, in case you someday find yourself handling a communications emergency?
- Find an amateur in another country who doesn't have a pileup calling him, and try actually *talking* with him instead of swapping signal reports, rig description and weather. Express interest in his family and his job; ask if he has other hobbies; find out what the two of you may have in common. If he speaks another language, ask him to teach you a couple of common phrases.

If you have a particularly enriching experience on World Radio Amateurs Day, share it with others! Enthusiasm is contagious, and yours could lead others to expand their Amateur Radio horizons. — *David Sumner, K1ZZ*

# League Lines...

Five Volunteer Examiner Coordinators (VECs) were announced by the FCC on February 27. The newly appointed VECs are: Region 2 (NY, NJ) - Metroplex Amateur Communication Association, P.O. Box 237, Leonia, NJ 07605; Region 8 (MI, OH, WV) - Dayton Amateur Radio Association, P.O. Box 44, Dayton, OH 45401; Region 9 (IL, IN, WI) - DeVry Amateur Radio Society, 3300 N. Campbell Ave., Chicago, IL 60618; Region 11 (AK) - Anchorage Amateur Radio Club, P.O. Box 101-987, Anchorage, AK 99510-1987; Region 12 (U.S. territories in the Caribbean) - Director of MARS, P.O. Box 7388, Cidra, PR 00639. FCC gives credit to the Anchorage club as being the "first" VEC, on the basis of its having contacted the Commission on December 6. The Commission also released the instructions for Volunteer Examiner Coodinators on February 27. The Commission recommends that VECs recruit as many Extra class Volunteer Examiners (VEs) as possible, since only Extras can administer all amateur tests. The ARRL will apply for VEC status once the FCC has enacted rules permitting the recovery of VEC expenses (P.R. Docket No. 84-265). QST for May will have the full details.

UoSAT-B was successfully launched from Vandenberg AFB on March 1, 1984, at 1959 UTC. Following the deployment of the Landsat-D' satellite, UoSAT-B (now called UoSAT 2 or UoSAT-OSCAR 11), separated from the launch vehicle at 2111 UTC. (Landsat was the primary payload, an Earth resources technology satellite.) Initial telemetry indicated that the spacecraft was functioning nominally. However, on the second day of orbit, the spacecraft became silent, and the command station at the University of Surrey (England) was unable to command the satellite. Reports indicate that the beacons are on, but at a very reduced power output (on the order of a few microwatts!). In order to hear the beacons, an antenna array capable of moonbounce communications must be used. The cause of the problem had not been determined at press time. For the very latest UoSAT information, call the University of Surrey (England) for a recorded message. Their number is 011-44-48-36-1202.

The Goddard Amateur Radio Club station, WA3NAN, will retransmit Shuttle audio from the next flight, 41C, on frequencies near 3,860, 7,185, 14,295, 21,390 and 28,650 kHz. Launch is currently scheduled for April 4. Retrieval and repair of the SolarMax satellite promises to be the most spectacular aspect of this eleventh shuttle mission.

The ARRL petition for F1 (teleprinter) emissions on 160 meters (see Happenings, p. 62 of this issue) has been given a rulemaking number. It is RM-4774 with a comment deadline of April 4.

Wayne Green, W2NSD, filed a petition with the FCC February 10 requesting that all Amateur Radio operators be retested for their Morse code skill every two years. Green also proposed that the code requirements be increased in increments of 5 WPM at each retesting until the applicant reaches 35 WPM. Amateurs not able to pass this code test would be given an additional 60 days to improve their speed or turn in their license.

Please make this correction to the FCC exam schedule (Table 2) on page 49 of last month's QST. The August 6-19 exam session listing is wrong -- it should be August 6-10. The preregistration cutoff date remains July 15.

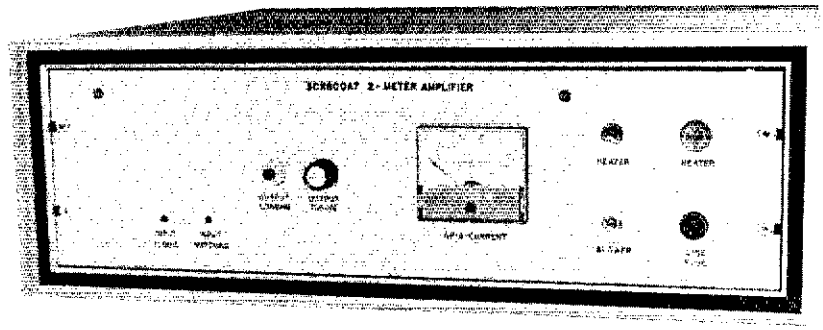
The FCC has released a new Amateur Radio license study guide. This new study guide (FCC PR Bulletin 1035) is reproduced in full on pp. 59-61.

The Club Supplement of the ARRL Amateur Radio Call Directory will soon be updated for the next edition. Trustees holding club licenses listed in the Club Supplement of the 1983-1984 Call Directory (beginning on p. 1091) are asked to respond promptly to the mail query they will receive shortly. All responses must be returned by June 1 for inclusion in the new edition. (These listings apply only to clubs with current club licenses.)

Amateur Radio will be highly visible at the Louisiana World Exposition May 12-November 12 thanks to the work of several clubs operating under the umbrella organization of the Louisiana Amateur Radio Exhibition, Inc. After skillful negotiations with the Exposition, LARE has been given 612 sq. ft. in the Convention Center Foyer. Rockwell-Collins, Ten-Tec, KLM, HyGain-Telex, Robot and HAL have already agreed to provide equipment for the show. If you are going to the World's Fair this year, be sure to see the ham radio exhibit!

Member-societies representing amateurs in China (BY) and the Republic of Vanuatu (YJ) have applied for International Amateur Radio Union (IARU) membership. See the article in IARU News, p. 74.

# A High-Power 2-Meter Amplifier Using the New 3CX800A7



Tired of hearing exotic DX on 2 meters but not being able to work it? Build this amplifier, and you'll transform your pip-squeak signal into a real rockcrusher.

By David D. Meacham,* W6EMD

The 3CX800A7 triode recently announced by Varian EIMAC has a plate dissipation rating of 800 W and modest cooling requirements. Its oxide cathode gives high emission with only 20 W of heater power. With full ratings up to 350 MHz, this tube is a scaled-up version of the 8874 — a proven performer in amateur and commercial gear.

The amplifier described here is based on a design presented by Raymond F. Rinaudo, W6ZO, in January 1972 *QST*. Most of the changes in the new amplifier (Fig. 1) are designed to accommodate the larger size of the 3CX800A7 and its attendant higher capacitances and currents. A plate-current meter is not included because my station power supply is already well metered. However, there is room on the front panel of the amplifier for a plate-current meter if another builder wishes to add one. Other changes to Rinaudo's design are minor.

### Construction

The amplifier chassis is mounted on a standard 19-inch wide, 5¼-inch-high aluminum rack panel (Bud No. SFA-1833).[1] A 5 × 13 × 3-inch aluminum chassis (Bud No. AC-422) is spaced 1¾ inches behind the panel by two aluminum end brackets. A 3½ × 4½ × 1-inch aluminum chassis (Bud No. AC-1402) houses the input circuitry and is mounted on the larger chassis between it and the front panel. The right-hand end bracket has a large lip on the rear for mounting the heater transformer and connectors. Fig. 2 shows mechanical details of the chassis and end brackets. The cabinet chosen is a lightweight aluminum unit made by Ten-Tec (No. 19-0525).

### Input Circuit

In the cathode-driven configuration, the input impedance of the 3CX800A7 appears as a nominal capacitance of 26.5 pF in parallel with a resistive component that varies with operating conditions but is typically about 49 ohms. The computer-designed input circuit of this amplifier operates at a loaded Q of about 2.1. It can be set anywhere in the 2-meter band for a VSWR of less than 1.3:1. C1 and C2 are predominantly matching and tuning controls, respectively; there is some interaction between them, however. When the input is tuned at 144.5 MHz, the input VSWR will be less than 1.4:1 from 144 to 145 MHz.

The tube socket is an EIMAC SK-1900 or a Johnson part No. 124-311-100. Its center is mounted 2 inches from the end of the input box, adjacent to the mounting bracket. The tube pins and input circuit are cooled by a small amount of air admitted to the input box from the pressurized output box. Three holes, made with a no. 50 drill, provide adequate flow. These holes are spaced in a close triangle and are located diagonally across from the variable capacitors. Air exhausts through the tuning holes. Fig. 3 shows details of the input circuitry.

The heater circuit includes two chokes, feedthrough capacitors, the filament transformer, a voltage-dropping resistor and a switch. The chokes are wound with a turn-to-turn spacing of about one-half the wire diameter. They are self-resonant (parallel resonant) just above the 2-meter band. Nominal heater voltage for the 3CX800A7 is 13.5 V. The closest available commercial transformer has a 14.0-V secondary, so R3 is used in the primary. Switching is set up so that the blower must be on before the heater can be activated. Conversely, this arrangement allows the blower to be left on after switching off the heater — a highly recommended practice.

Cathode bias is provided by a 5.1-V Zener diode, D3. R1 prevents the cathode voltage from soaring if the Zener fails. F2 will blow if excessive cathode current is drawn. R2 nearly cuts off plate current on receive. Because the grid is at dc ground, the negative supply lead must be kept above ground for grid-current metering by M1. R4 keeps the negative side of the plate supply from rising if M1, D1 and D2 all open up. D1, D2 and C3 protect the meter from transients and RF voltages.

### Output Circuit

The output tank circuit is a silver-plated quarter-wave strip line (Fig. 4) foreshortened by the tube, loading and tuning capacitances at, and near, its open end. It operates at a loaded Q of approximately 20. The silver-plated anode collet (Fig. 4) is made of 0.062-inch-thick brass sheet with Tech-Etch 134B finger stock soldered on the inside. It is supported by two Teflon® standoffs ½-inch in diameter and

[1]Notes appear on page 15.

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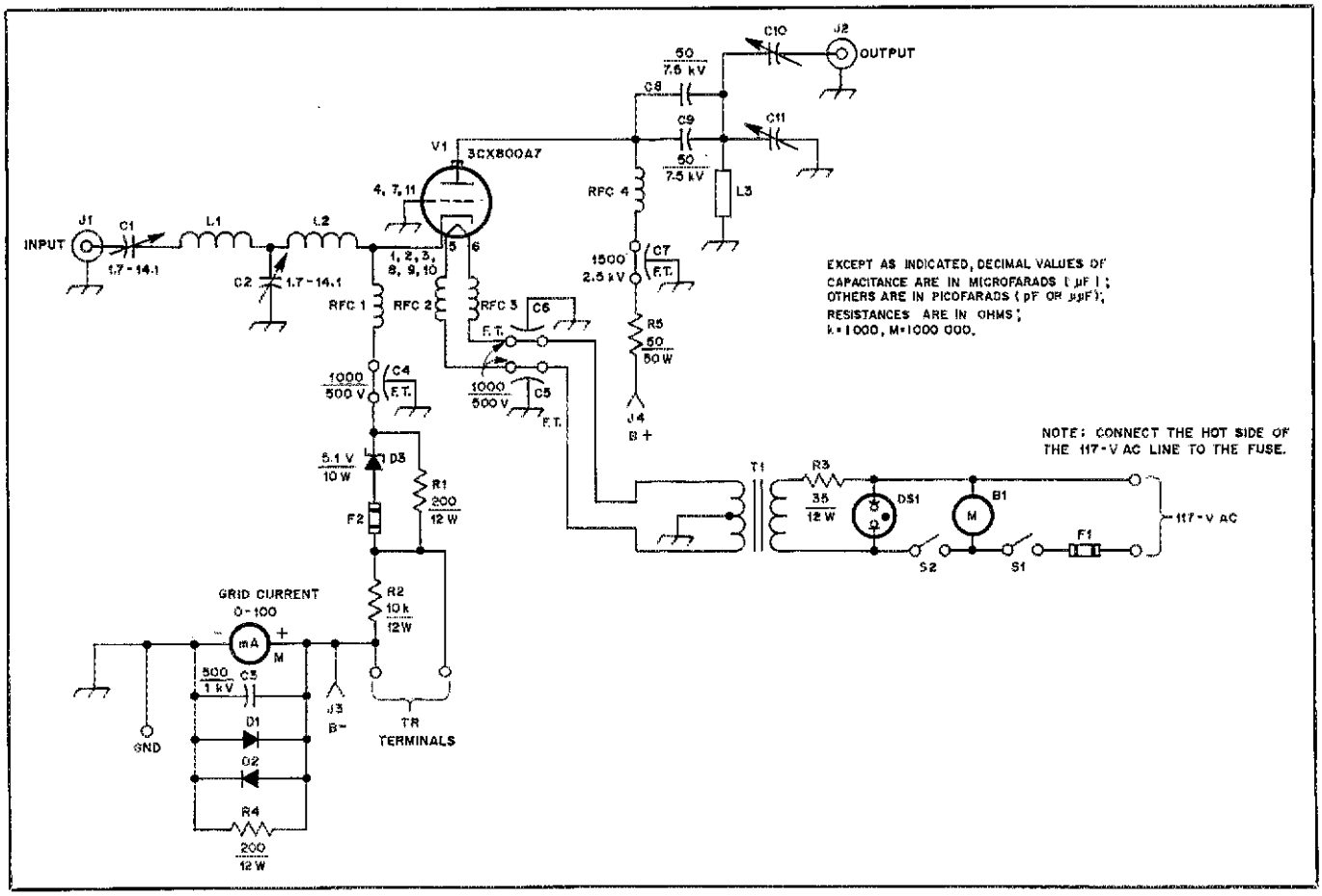



Fig. 1 — Schematic diagram of the 3CX800A7 amplifier.

B1 — Blower (Dayton 4C012 or equiv.); see text.
C1, C2 — 1.7-14.1 pF air variable (E. F. Johnson 189-505-4 or equiv.).
C3 — 500-pF, 1-kV disc ceramic.
C4, C5, C6 — Ceramic feedthrough, 1000 pF, 500 V (Erie 357-001).
C7 — EMI feedthrough filter, 1500 pF, 2.5 kV (Erie 1280-060).
C8, C9 — 50 pF, 7.5 kV, NP0 (HEC HT-50 852).
C10, C11 — See text.
D1, D2 — 1N4001.
D3 — Zener diode, 5.1 V, 10 W (1N3996A).
DS1 — NE51 in holder with built-in dropping resistor.
F1 — Slow-blow fuse, 2 A (Buss MDL-2 or equiv.).
F2 — 1.5 A fuse (Buss AGC 1½ or equiv.).
J1 — BNC bulkhead feedthrough connector (UG-492 A/U).
J2 — Type N female connector (part of C10 assembly — see text).
J3, J4 — High-voltage connector (Millen 37001 or equiv.).
L1 — 8 turns no. 16 tinned wire, 3/8-in ID, 11/16 in long.
L2 — 6 turns no. 16 tinned wire, 3/8-in ID, 11/16 in long.
L3 — Plate line, 1-5/16 in wide, 8-3/16 in long. See text and Fig. 4.
R1, R4 — 200 ohms, 12 W.
R2 — 10 kΩ, 12 W.
R3 — 35 ohms, 12 W.
R5 — 50 ohms, 50 W.
RFC1 — 1.0 μH choke, 300 mA (Miller 4602).
RFC2, RFC3 — 11 turns no. 20 HF wire on 3/8-in Noryl rod.
RFC4 — 10 turns no. 16 tinned wire, 1/2-in ID, 1-3/16 in long.
T1 — Filament transformer, 14.0-V, 2-A secondary (Triad F-215X or equiv.).

1 inch long. At the far end of the line, a silver-plated shorting block contacts the chassis and the strip line. This block (Fig. 4) is made from 7/16-inch-thick brass 1-15/16 inches wide and 1 inch high. EIMAC CF-800 finger stock is screwed and then soldered on both top and bottom. The chassis and stripline are both slotted to allow 5/16 inch of shorting-block travel to set the tuning range of the capacitive-tuning paddle. A 1-inch-long Teflon standoff supports the center of the line.

The tuning (C11) and loading (C10) paddles are 1-3/16-inch-diameter discs made from silver-plated, 1/16-inch-thick brass. They are spaced 1-3/8 inches center-to-center. The output loading paddle is nearest the tube, and its center is 1-13/16 inches from the tube cooler surface. Spacing between the paddle and line during operation is about 0.135 inch. The output tuning boss, EIMAC part No. 720362, is tapped for a ¼-28 threaded rod. The output loading control and output connector are two separate EIMAC assemblies combined into one unit. They are available from EIMAC as Support Assembly No. 720361 and Sliding Probe Assembly No. 720407. For this amplifier, the outer conductor was lengthened to reach the front panel. The grid collet is also available from EIMAC as part No. 720359.

In addition to RFC4 and feedthrough capacitor C7, an energy-absorbing resistor (R5) is wired in series with the dc plate supply. This resistor will protect the tube and power supply in the event of a high-voltage arc. It provides necessary protection while dissipating only 12.5 W at 500-mA dc plate current.

## Cooling

The blower specified provides a measured 25 CFM airflow through the output box and tube cooler at 0.42 inch of water-column static pressure. This amount of cooling is sufficient for 800 W of plate dissipation at sea level with inlet air temperatures up to 35° C. It is adequate for the same dissipation at 5000 feet of altitude with inlet-air temperatures up to 25° C.

Not evident from the photographs is the care taken to separate outgoing hot air from incoming cool air. This is accomplished by the addition of a simple dividing wall inside the cabinet running from the rear chassis cover of the output box to the rear of the cabinet. The material used is rigid fiberglass insulation — the kind you cut with a saw. It provides a measure of blower-noise suppression in addition to assuring cool inlet air.

Hot air leaving the anode cooler is directed to a homemade "honeycomb" RFI filter through a chimney made from

rolled-up Teflon sheet. The filter is made of brass tubing and sheet with the honeycomb material soldered in place. See Fig. 5 for construction details. This filter acts as a waveguide-beyond-cutoff having high attenuation at 144 MHz.

The equation for calculating attenuation by this type of filter is

$$A_a = 32 \frac{D}{d} \qquad \text{(Eq. 1)}$$

where $A_a$ = aperture attenuation (dB), D = length of pipe, and d = inside diameter of pipe. In this case, the "pipe" is each cell of the honeycomb. The basic material for the honeycomb is cadmium-plated brass heat-radiator core.[2] Each hexagonal-shaped cell has a width between flat sides (diameter) of 0.100 inch. The material is ½-inch thick. Plugging these values into the equation yields an $A_a$ of 160 dB — more than enough! From a practical standpoint, it is usually sufficient to make cell length at least three times the nominal cell diameter.

**Tune-up**

Initial work may be done with a dip meter, particularly on the output circuit. With the tube in place, but with no voltages applied, the shorting block on the end of the plate line should be set to give a paddle-tuning range that straddles the desired operating frequency. Bear in mind that when the tube is "hot," the resonant frequency will be somewhat lower than it is without electron flow.

The input-tuning capacitor can be dip-meter resonated with the matching capacitor set at one-half mesh for a start. Further work here must be done "hot" with a VSWR measuring device on the input.

Set the initial spacing between the output paddle and the plate line to 1/8-inch. Connect the output to a 50-ohm dummy load capable of handling at least 700 W at 144 MHz through an accurate VHF wattmeter, such as a Bird model 43. Connect a driver capable of delivering about 20 W to the input through a VSWR-measuring device.

The heater of the 3CX800A7 should be run for at least three minutes before applying plate voltage. After the warm-up, short the TR terminals and apply about 1000 V to the plate. This should result in a small amount of idling plate current. Next, apply enough drive to produce a rise in plate current, and adjust the plate tuning for a peak in output power. Now tune and match the input circuit for minimum input VSWR. Next, adjust the output loading paddle for maximum power output while keeping the plate current dipped with the plate tuning paddle. Apply full plate voltage and higher drive power, and then repeak the output tuning and loading controls. Touch up the input tuning and matching, and the amplifier is ready for service.

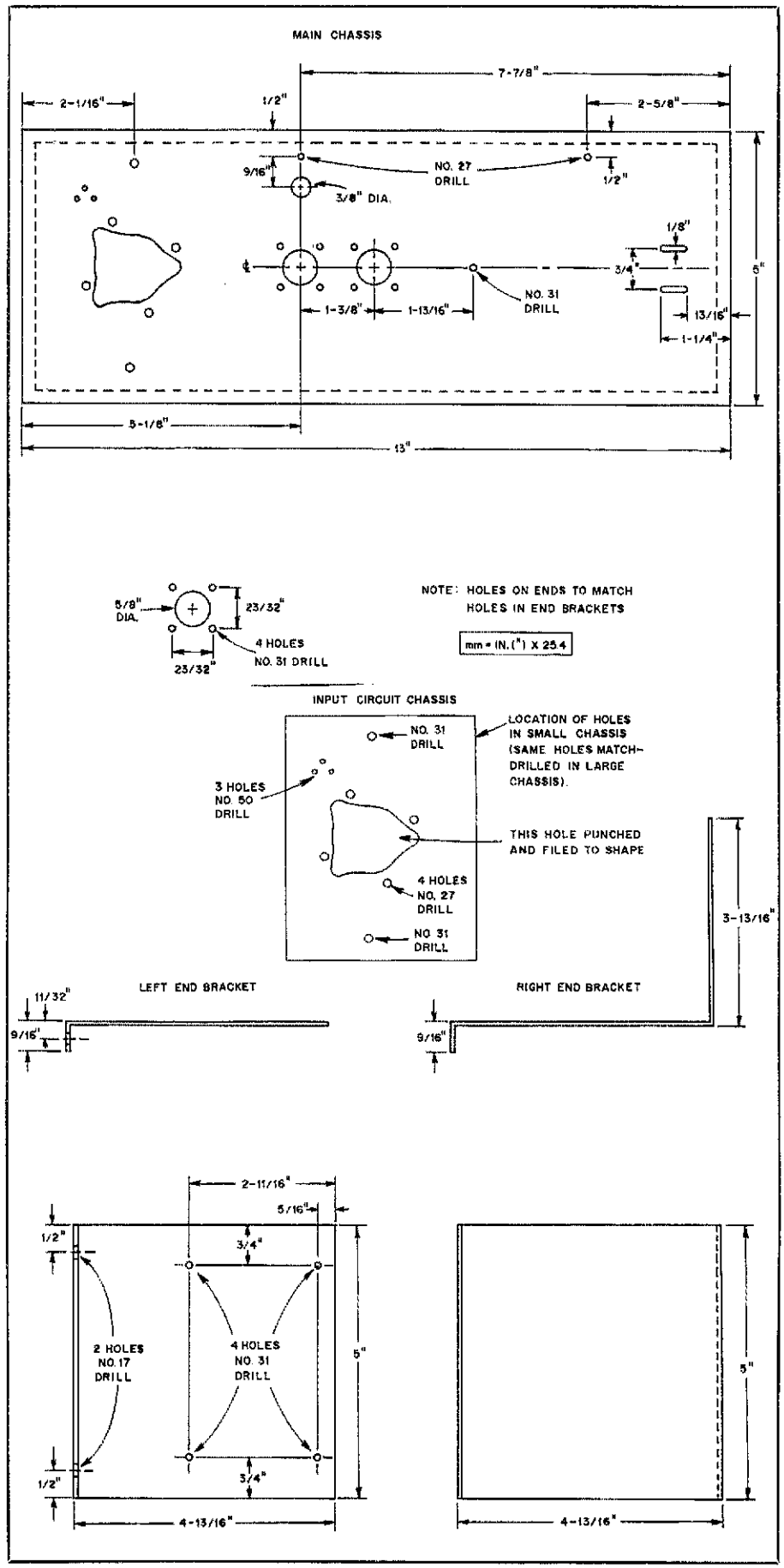



Fig. 2 — Mechanical details of the chassis and end brackets. The end brackets are made from 0.032-in aluminum, 5052 alloy or softer.

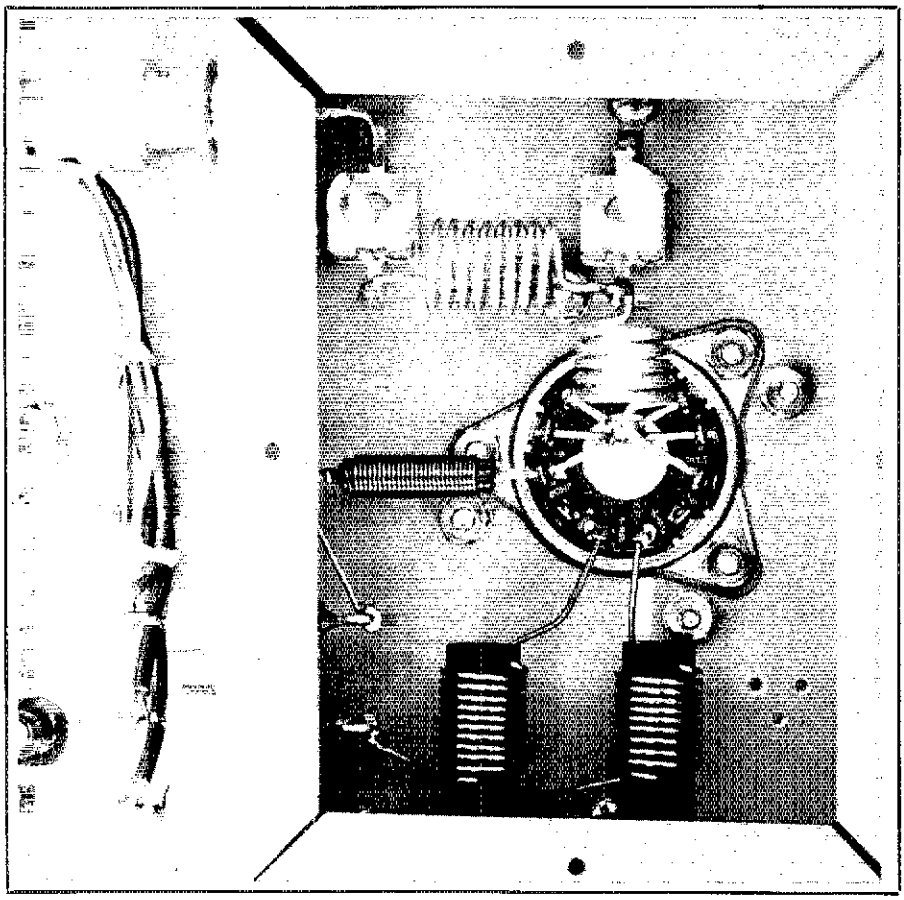


Fig. 3 — Close-up of the input circuitry and tube-socket wiring. Keep all leads as short as possible.

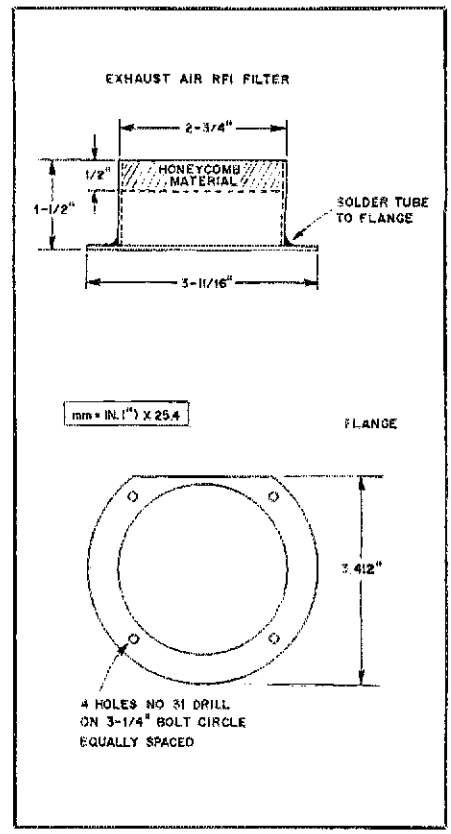



Fig. 5 — Mechanical details of the exhaust air RFI filter. The honeycomb material is soldered inside a 2-3/4-in OD, 0.065-in wall brass tube. The flange, which bolts to the chassis, is made from 0.125-in-thick brass sheet.

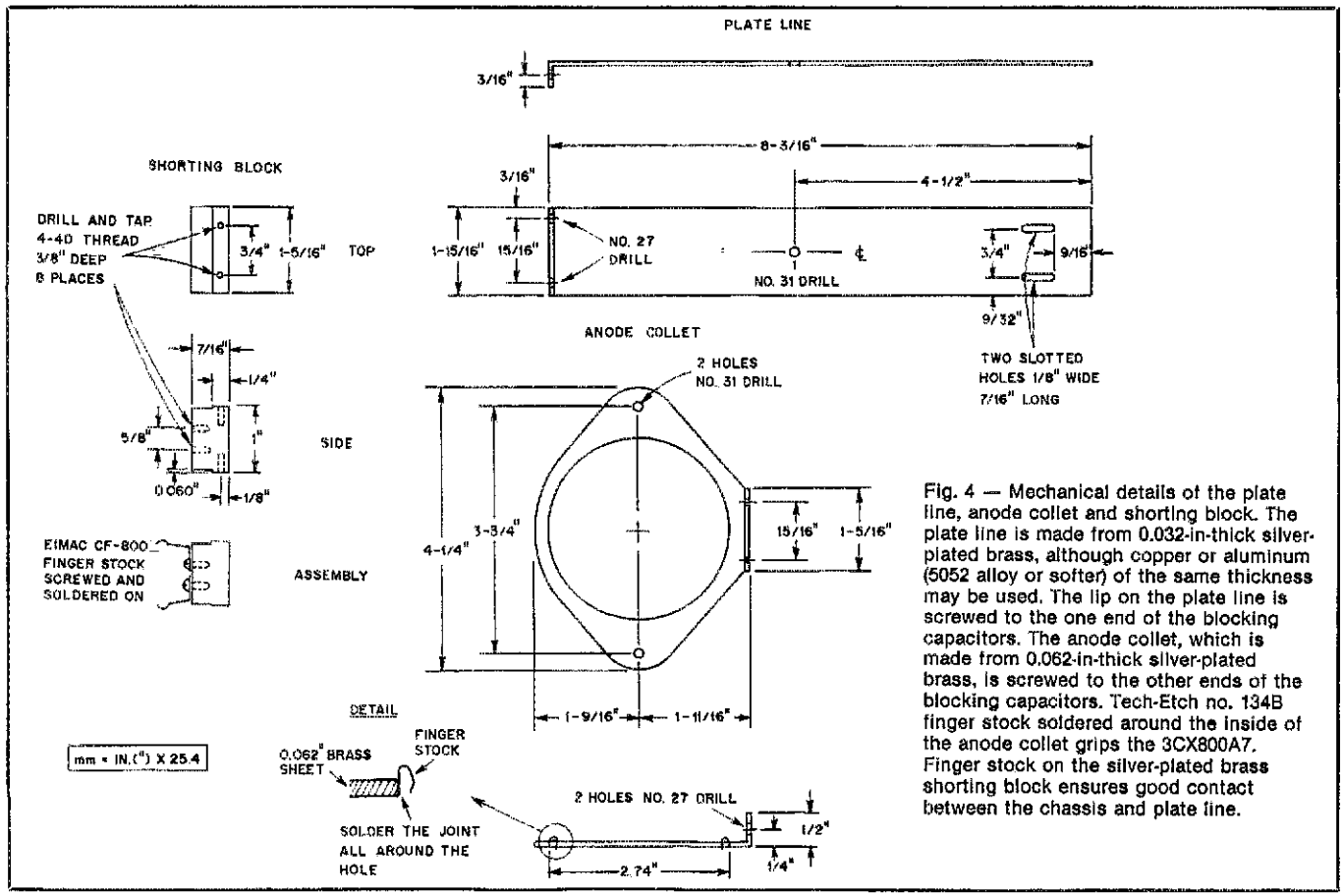



Fig. 4 — Mechanical details of the plate line, anode collet and shorting block. The plate line is made from 0.032-in-thick silver-plated brass, although copper or aluminum (5052 alloy or softer) of the same thickness may be used. The lip on the plate line is screwed to the one end of the blocking capacitors. The anode collet, which is made from 0.062-in-thick silver-plated brass, is screwed to the other ends of the blocking capacitors. Tech-Etch no. 134B finger stock soldered around the inside of the anode collet grips the 3CX800A7. Finger stock on the silver-plated brass shorting block ensures good contact between the chassis and plate line.

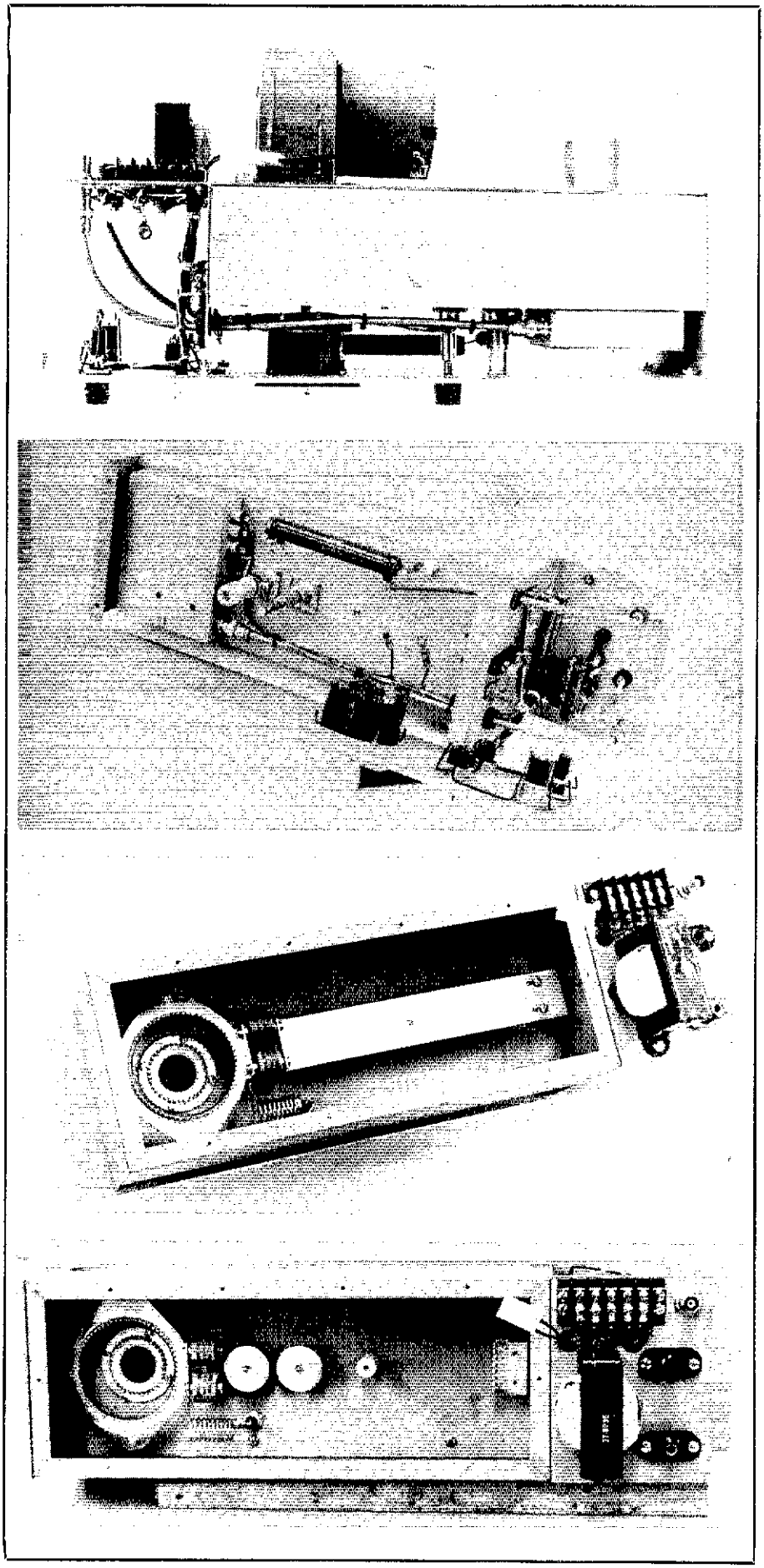


Fig. 6 — Various views of the completed 3CX800A7 amplifier.

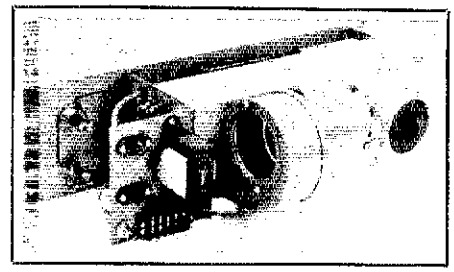


Fig. 7 — Rear view of the amplifier with the plate-compartment cover in place. Note the honeycomb RFI filter at the hot-air exhaust.

**Table 1**

**Operating Conditions for the 3CX800A7 Amplifier**

| | |
|---|---|
| Plate supply voltage | 2200 V |
| Zero-signal plate current† | 65 mA |
| Single-tone plate current | 500 mA |
| Grid bias (Zener bias) | −5.1 V |
| Single-tone grid current† | 40 mA |
| Driving power | 18.5 W |
| Output power | 707 W |
| Gain | 15.8 dB |
| Efficiency†† | 64% |

†Values may vary considerably from tube to tube.
††Actual tube efficiency is about one percent higher because of power loss in the 50-ohm series resistor in the plate lead (R5).

A few words of caution are in order. Remember that the heater voltage must never be applied without the blower running, and that the heater must warm up at least three minutes before applying plate voltage. Never exceed 60-mA dc grid current, even during tune-up. Also, because of the relatively low grid dissipation of the 3CX800A7, RF drive must *never* be applied unless plate voltage is applied to the tube and a suitable load is connected to the output. Following these simple rules will substantially increase tube life and amplifier reliability.

### Typical Operating Conditions

With Zener-diode bias, the 3CX800A7 is best operated in Class $AB_2$ for linear service. The data in Table 1 represent measured performance in linear service at 144 MHz. Complete data sheets are available from EIMAC. This amplifier is easily capable of conservative operation at 700-W output. Two of these tubes will run at the 1500-W output legal limit.

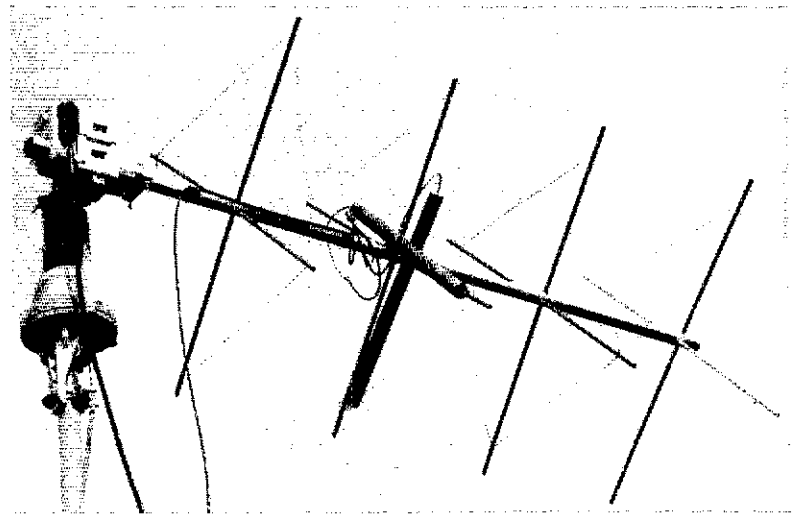
This amplifier uses straightforward construction techniques and is easily duplicated. Any builder will be rewarded with a great deal of satisfaction and a reliable amplifier.

**Notes**

[1]mm = in × 25.4; m = ft × 0.3048.
[2]One source for the honeycomb radiator core material is Technit West Division, 320 North Nopal St., Santa Barbara, CA 93103.

*David D. Meacham, PE, is a Senior Engineer in the Advanced Products Laboratory at Varian EIMAC. He is a registered professional engineer in the state of California. Mr. Meacham earned his BS degree in electrical engineering from Stanford University in 1955. In 1974, he received an MBA degree from the University of Santa Clara. A Life Member of the ARRL, Mr. Meacham has been licensed since 1948 as W6EMD.*

# The "Quadraquad"[1] — Circular Polarization the Easy Way



There are many ways to obtain circular polarization for space-communication antennas, but the VK5RN method can be applied to quad antennas for obtaining a simple, inexpensive solution for OSCAR 10 work.

By D. S. Robertson,* VK5RN

What's in a name? Take "Quadraquad," for example: It's a convenient condensation of an otherwise unwieldy title for an antenna. In the professional engineering literature, the same type of antenna might be entitled, "Circularly Polarized Cubical-Quad Antenna Using Double Feed in a Quadrature Phasing Arrangement." The professional literature is laced with such exotic titles as that, but for our purposes we will refer to this antenna as the "Quadraquad." It will be easier to remember, and we'll save a bit of *QST* page space!

When I first considered antennas for OSCAR 10, it seemed that the logical route to take would be that of crossed Yagis or a helical beam antenna. But, both seemed rather bulky and difficult to build and adjust. My thoughts then turned to cubical-quad antennas. After all, this antenna works for vertical or horizontal polarization. The polarization is simply a function of where we choose to connect the feed line. The parasitic loop elements will work for horizontal or vertical polarization without mechanical or electrical changes. For circular polarization, therefore, we need only to feed the driven element in two places while introducing a 90-degree phase delay in one of the feeders.

### Antenna Characteristics

The novel feature of the Quadraquad is the double feed. Hence, we need two feed points and a delay line to secure circular polarization. We can see that it is no more difficult to feed this antenna than is the case when using crossed Yagis: Both require two feed points and a delay line. But, the Quadraquad is simpler than crossed Yagis with regard to the parasitic elements: Yagis

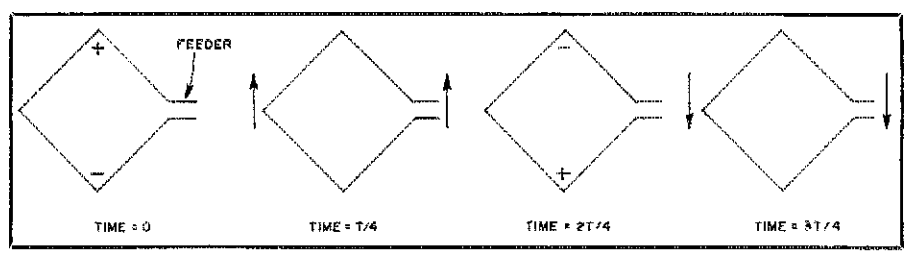



Fig. 1 — Current and polarity of bottom-fed quad loops versus time.

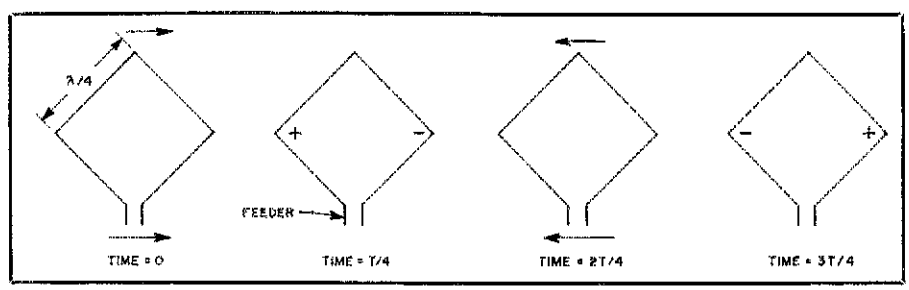



Fig. 2 — Current and polarity of side-fed quads versus time.

[1]Notes appear on page 18.

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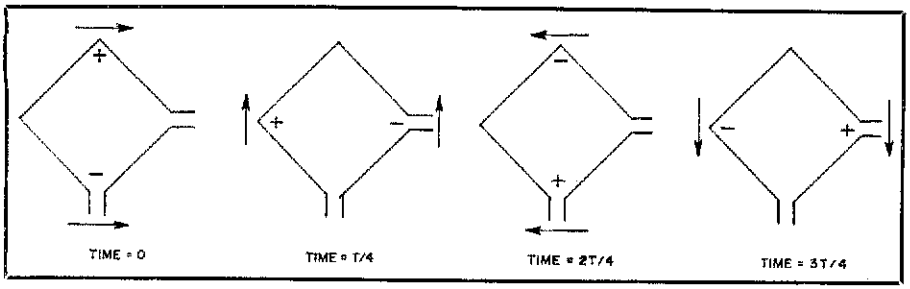



Fig. 3 — Bottom and side feed showing current and polarity versus time.

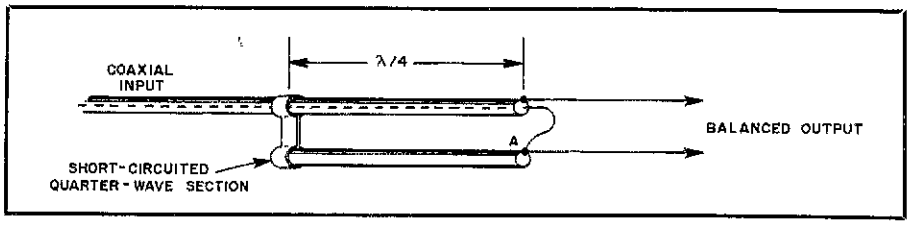



Fig. 4 — A Pawsey stub. At point A, the quarter-wave section presents a very high impedance, which prevents the wave from traveling over the surface of the transmission line. The λ/4-dimension given is as in air.

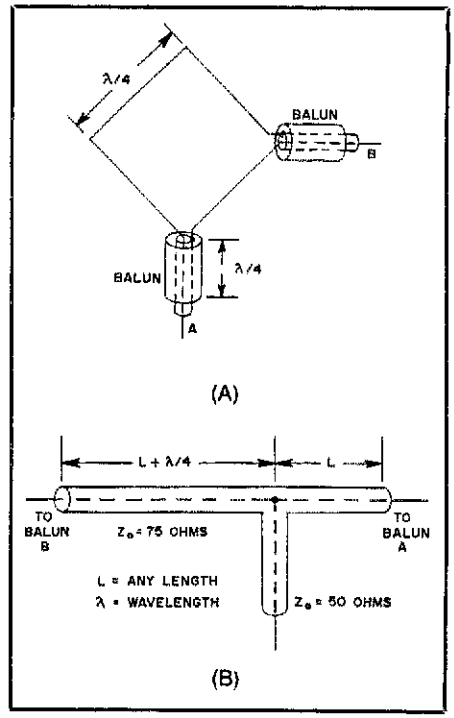



Fig. 5 — Balun transformers are shown at the two feed points (A). The feed-system delay line is illustrated at B.

require two sets of parasitic elements, whereas the Quadraquad needs only one set.

Our simplest way to see how this antenna works is to consider separately the vertical and horizontal modes of the driven element of a quad. Next, we combine the modes in quadrature (90-degree phase difference). Fig. 1, 2 and 3 show the evolution with respect to time. Current flow is indicated by the arrows. Charge or voltage is shown by the plus and minus signs. The four current and voltage distributions in each figure are 90 degrees apart, or separated in time by a quarter of a period (90 degrees), which can be defined by T/4.

Fig. 3 shows what happens when we combine the horizontal and vertical modes with a 90-degree phase shift between them. We have a simple pattern of voltage and current that rotates counterclockwise once every cycle of RF energy. By reversing the direction of the 90-degree phase shift we can produce rotation in a clockwise direction.

The catch is that we have voltage and current maxima at all four corners. This is an unfamiliar concept when we are used to thinking about separate voltage and current antinodes on long-wire antennas and their feed lines. But, our closed loop is a different "kettle of fish." Loops can support different modes at the same time: It turns out to be remarkably simple to make them do just that.

### Obtaining the Circular Mode

To set up the circular mode in a loop, we must be able to drive current into the feed points, even though these feed points are also located at voltage antinodes. Sleeve types of balun transformers provide the answer to this problem. Pawsey stubs (Fig. 4) could be used also.[2]

I chose sleeve baluns and made them from 1-inch-diameter copper tubing for the outer sleeve.[3] A coaxtube was used for the inner coaxial line. The type of coaxtube I used has PTFE (Polytetrafluoroethylene) dielectric and copper tubing for the outer conductor. It is self-supporting: One polystyrene washer is needed a short distance down from the open end to support it firmly in the center of the sleeve. Be sure to leave drain holes in the washer so the water can escape. The coaxtube can be soldered directly to the sleeve at the shorted end. See Fig. 5.

Refer again to Fig. 5. Here we see the Quadraquad with the current fed via coaxial cable into two adjacent corners. The balun transformers present an open circuit to the in-phase voltages, so the corners are free to oscillate in voltage without driving currents down the outer conductor of the coaxial line.

A part of the assembled antenna is shown in Fig. 6. The BNC connectors are there only for temporary use: I found it necessary to be able to disconnect either of the drives for test purposes. So far, this is all theory. But, does the "beast" work?

### Configuring the Quadraquad

I used one reflector and two directors for my antenna. The element spacing is 0.2 wavelength. I obtained the dimensions from the *RSGB Radio Communication Handbook,* fifth edition.[4] I operated on the assumption that their value of 75 ohms for the feed point was right, so I used 75-ohm cable for the delay line. The main feeder splits into two lines for the two drives. This should cause a 37.5-ohm impedance at the T junction. Therefore, I used 50-ohm cable for the main feeder. Unfortunately, the characteristic impedance of the coaxtube is 50 ohms instead of the desired 75 ohms, so I used an electrical half-wavelength line at each feed point in order to repeat the feed-point impedance. The short extra length of coaxtube can be seen sticking out of the shorted ends of the baluns in Fig. 6. My test antenna was cut for 145 MHz.

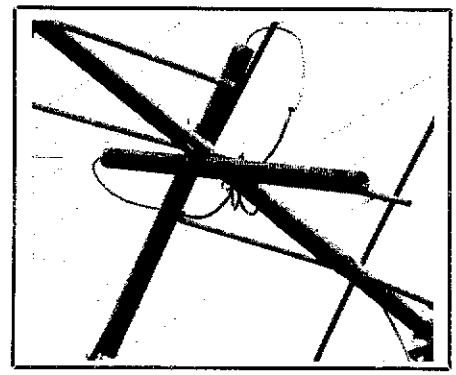


Fig. 6 — The assembled antenna (see text).

### Antenna Evaluation

I arranged a simple test range and used a signal generator to feed crossed dipoles at the transmitting end of the setup. I could then launch horizontally, vertically or, I hoped, circularly polarized waves. Unwanted reflections limit the accuracy of backyard antenna-performance measurements: The figures I am quoting are only rough ones. They are, however, reasonably accurate (to within a few decibels) and are

adequate to show that the system does work as intended.

I used the Quadraquad for reception. I positioned it by means of two rotators — an azimuth and an axial rotator. The axial unit is used to rotate the polarization angle. The antenna boom was clamped so that the antenna could be rotated about the axis of the boom for polarization measurements. I used the azimuth rotator for field-pattern measurements. Reception was by means of an ICOM IC-260A transceiver.

The SWR was measured first. It was 1.2, rising to 1.3 at the band edges. The front-to-back ratio appeared to be about 20 dB. A forward gain of roughly 10 dB was measured.

With incident horizontal polarization, within the limits of unwanted reflections, there was a ±4-dB variation in gain with an axial rotation of 180 degrees. I next set up the antenna for horizontal polarization by removing one of the feeders. When it was rotated to the vertical position, so the planes of polarization were crossed, I noted a null in excess of 30 dB.

### In Summary

The dual-feed technique can be applied to a variety of loop antennas. For example, a 3-wavelength loop looks attractive, and it should provide more gain than a 1-wavelength loop. I have yet to build one and make tests. I tried adding three more directors, but was unable to detect a change in the polar diagram.

The Quadraquad is a new approach to the generation of circularly polarized waves. It appears to be ideal for the home builder of antennas. Like the conventional quad, it is tolerant and of wide-band character. None of the dimensions seem to be especially critical. The baluns do require care in their construction, but no more than when building crossed Yagis.

Finally, I would like to express my thanks to Mac, VK5ZH, for his help in making the antenna measurements. I express my gratitude also to Sidney, VK5VN/G2HI, for taking the photographs in this article.

**Notes**

[1]Patent applied for.
[2]Information on Pawsey stubs can be found in the *RSGB Handbook* and the *RSGB Antenna Book*.
[3]mm = in × 25.4.
[4]RSGB publications can be obtained in the USA through the ARRL. [illegible]

# 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 March issue were:

- Notes on a "144/220-MHz Bandpass Filter," by Paul Drexler, WB3JYO
- Using "Sinclair Computers as Low-Cost Data Terminals for Amateur Radio," by Kenneth Heitner, WB4AKK
- An Update on FCC Rule Changes Affecting the Experimental Radio Services

*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.

### HAMFEST CALENDAR RULES AND REGS

☐ *QST* will list your hamfest in its monthly Hamfest Calendar, free of charge. There are certain guidelines, however.

*Hamfests will be listed only once.* Sponsors may specify the issue in which the announcement should appear. Normally, if the event will occur before the 10th of the month, we recommend listing it in the previous month's issue. The deadline for *receipt* of hamfest information is the 15th of the second month preceding publication. In other words, if an event is August 5, the announcement should be in the July issue, and will need to arrive in Newington by the 15th of May at the very latest. For an August 19 event, the sponsor could choose either the July issue, with the May 15 deadline, or the August issue, with a June 15 deadline.

We will acknowledge all information received at Hq. for Hamfest Calendar with a postcard stating the date of publication. If you do not receive an acknowledgment within two weeks, your letter may not have arrived at Hq., so please send us a duplicate copy.

Oh, yes, Hamfest Calendar is separate from the hamfest section of the Ham Ads. See the first page of the Ham Ads section in this issue for more information. — *Marge Tenney, WB1FSN*

### NEW MOSPOWER SUPPLIER

☐ M/A-COM PHI, Inc., has acquired the Siliconix MOSPOWER product line. ARRL has been informed by Gary G. Lopes, WA6MEM, the company's manager of UHF engineering, of their intent to maintain the same high level of support to the amateur community as was experienced with Siliconix.

M/A-COM PHI, Inc., will continue to supply all MOS power products produced by Siliconix. New products will be introduced in the future. The same device nomenclature will be used. Users of the product line will find the transition to be as transparent as possible. Because of the large volume of paperwork involved, single-unit quantities cannot be handled directly by the company. Single- and small-unit quantities can be obtained through M/A-COM distributors. The company's address is M/A-COM PHI, Inc., 1742 Crenshaw Blvd., Torrance, CA 90501, tel. 213-320-6160.

### STRAY HINTS

☐ "Strays" are those interesting fillers used when space allows in *QST*. Think you have an item with Stray potential? Here are some hints to help your submission become one. (1) Be sure the information will be of interest to most readers of *QST*. (2) Submit your material before deadline — the 8th of the second month preceding desired publication (i.e., arrive at Hq. before April 8 for June *QST*). (3) Any photographs you send should be good quality, black-and-white glossy prints. Color prints, slides and instant photos do not usually reproduce well.

Items submitted are normally acknowledged, but that doesn't necessarily mean that your Stray will be appearing in *QST*. We receive far more material than we can find room for. If you want your material returned, please include a statement to that effect and an s.a.s.e.

Follow the above hints and maybe your Stray will find a home in *QST*. — *Andrew Tripp, KA1JGG*

BEGINNER'S BENCH

# Receiver Preamps and How to Use Them


Tired old receivers and some poorly designed new ones need perking up for weak-signal reception. Do you know when to use a preamplifier, and how to build a good one?

By Doug DeMaw,* W1FB

What's that, you say? You can't dig the "weakies" out of the noise? But the ham across town hears and copies the same signal, and her antenna isn't as good as yours? Hmmm, could be your receiver has a noisy, low-gain front-end section. This could be true especially if your receiver is very old, or is of poor design. If reception with your once-good receiver has fallen off, it's likely that some repair work is in order. Adding a preamplifier between the antenna and first stage of that receiver is not the cure-all you need, however. This article is meant for those who need to "soup up" the performance of a receiver that never did "cut the mustard" to your expectations.

We won't get into the fine art of making noise-figure tests. The overall discussion will focus on the practical side of this topic. We'll learn the pitfalls of too much front-end gain, when to use a preamp and how to make the critter provide the best results in general use. Our discussion will include amplifiers for your use from 160 meters through UHF. There should be something here for each of you!

### Pitfalls of Preamplifiers

Suppose you have a well-designed, modern receiver in perfect working order. But, you feel that more gain after the antenna would really make you the weak-signal champ in your area. So, you buy or build a preamplifier to use ahead of the receiver. You install the new box and turn the system on. Wow! The S meter never read so high before, not even on the noise level that prevails in your area. The noise has gone from S2 to S5, and the signals are 18 dB louder than when the preamp is turned off!

Impressive, eh? In fact, you no longer need to operate your audio-gain control at as high a setting as before to enjoy comfortable copy. You tune through the band and revel in your new-found "secret weapon." Then, all at once, the receiver starts producing garbled signals and all manner of blurps and spurious responses that don't belong there! What has gone amiss? You tune through the band and find a strong local signal that is, perhaps, 30 dB over S9. You may conclude that he has something wrong with his rig, for after all you are hearing him at several frequencies on your dial, and his splatter is all across the band.

Suddenly you wonder if maybe your new preamp is acting up, so you turn it off. The band sounds normal again, but the loud guy is still operating. When you turn the amplifier on again, the problem returns. But, as soon as he stands by, the receiver works just great, even with the preamp operating.

What's going on here? Well, it's pretty simple: The receiver was carefully designed for low-noise, ample-gain reception. Additional gain ahead of the existing RF amplifier and mixer stages was the cause of the overturned apple cart, so to speak. The added 18 dB of gain from your preamplifier caused the RF amplifier and mixer in your receiver to "overload." This will cause spurious signals to appear in the band, and may even render your AGC (automatic gain control) inoperative to some extent. I have described one of the severe end results of using a preamplifier where one is not needed. The effects are generally less spectacular than those we have mentioned, but receiver performance will be vastly impaired when a preamplifier is used where it should not be.

A poorly designed preamplifier can cause receiver problems, even though it might not degrade the basic performance of the receiver by causing overloading. The preamp could be very noisy, and this could make weak-signal reception worse than without the amplifier. Also, the preamp might be unstable (self-oscillating), which can cause all manner of "unmodulated carriers" to appear in the tuning range of the receiver. We can see from this, and the discussion earlier, that using a preamp is

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

anything but a casual matter!

### When Should We Use a Preamp?

First off, if we are to add a receiver preamplifier, we should make provisions to switch it off (bypass it) when it is not really needed. It should be employed only when it aids reception of the weaker signals. At this point we need to recognize that some receivers may have an adequate front end in terms of noise figure and gain, but the designer was "out to lunch" when it came to providing ample *overall gain* in the system (IF amplifier, product detector and audio amplifier gain). The consequence is that the audio gain must be fully advanced to hear, say, an S3 signal via the loudspeaker. In this example, we might use a preamp to provide some 15 to 25 dB of additional overall receiver gain, which will make the output from the speaker much more acceptable. We must hope, however, that the preamplifier does not overload the front end of our receiver! A performance trade-off may be necessary in this kind of situation.

Let's suppose, on the other hand, that we have a war-surplus receiver, or a newer unit that is so weak it "needs crutches" during weak-signal reception. These inferior receivers may benefit greatly from the use of an outboard low-noise preamp. Similarly, we may have a homemade receiver that was designed purposely to have a minimum number of stages. We may even have left out the RF amplifier and routed the antenna directly to the mixer stage. Receivers of the foregoing classification are candidates for the "souping up" that we've been discussing.

We should look at one other potential problem in receiver performance before we conclude this part of the discussion: Our "hearing aid" may have a rather noisy RF amplifier built into it, caused by poor design. The noise generated within the RF amplifier may be so great that it masks the very weak signals (which is why the person across town hears them and you can't, owing to his better receiver). A low-noise preamplifier ahead of your ailing receiver could solve the problem. The gain of your preamp should, in this case, be set as low as possible, consistent with improving the noise figure. The preamp must be able to override the noise of the receiver front end so that its lower-noise characteristic can prevail.

### How to Design a Preamp

Our preamplifier must meet a few basic standards if it is to serve our needs adequately. Truism? Yes, but it is surprising to note how many beginners build these gadgets without considering the performance objectives. Most newcomers think only in terms of "How much gain can I get from this circuit?" Gain is not the name of the game, although it plays an important role in the amplifier design. We should keep the noise figure and stability of the amplifier foremost in our minds as we warm up the soldering iron. If we select the proper device and circuit for our preamp, the gain should be there without worrying about it.

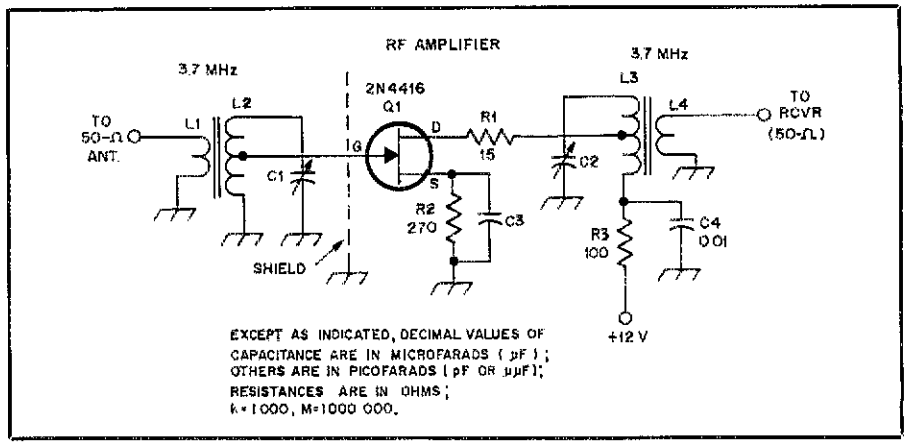



Fig. 1 — Circuit example of a preamplifier for use in text discussion only.

Let's examine Fig. 1. It shows a basic receiver preamplifier, and it will serve only as a model for this part of our text. Although we see an FET (field-effect transistor) as the device at Q1, it could be a bipolar transistor, IGFET (insulated-gate FET) or a triode vacuum tube.

*Stability:* This is often the stumbling stone for those who build RF amplifiers. Instead of amplifying, the darned thing *oscillates* — at times, wildly! The irony is that we may build an oscillator intentionally, but might have great difficulty making it oscillate. I think this has something to do with a syndrome called "Murphy's Law." But, let's think only of preventing unwanted self oscillations, or "birdies."

First, we need to understand that self-oscillation can occur at almost any frequency. It need not show up at or near the frequency of the tuned-circuit resonance (L2/C1 and L3/C2 of Fig. 1). Random oscillation may take place as low as audio frequency, or it may show up at VHF, even though we designed the preamp for 3.5 MHz. The greater the circuit gain, the more probable will be the instability of our circuit. There are a number of neutralization (stabilizing) circuits we might add to our preamp, but they are touchy to adjust, and are often effective only over a narrow frequency range. I'd rather skip those perplexing additions and concentrate on methods for obtaining stability without using neutralization.

Return to Fig. 1. You will see dashed lines that indicate a small shield partition between the amplifier input and output tuned circuits. This divider should be made from flashing copper, brass or PC-board material. Place it as close to the transistor body as possible, just next to the gate lead. It will discourage feedback between the two tuned circuits, caused by stray coupling. The shield may or may not be needed. It can be added after you exhaust the other stabilization techniques. Instability can be observed by connecting the preamp to your receiver and tuning C1 or C2 through its range. If things are afoul, you will hear "carriers" and popping noises in your receiver. A good preamplifier should be stable, even when no antenna is connected to the input terminal. Be aware, however, that instability can be present with no outward signs. This is especially true of VHF oscillations in a high-frequency preamp. These VHF oscillations often show up as a hiss noise in the receiver. A quick cure is often the addition of R1 in Fig. 1. It should be placed as close to the transistor as possible to minimize the lead length between the drain and R1. This parasitic-suppression resistor damps the VHF oscillations to ensure stability. A miniature ferrite bead can be used for the same purpose. Alternatively, you may place the bead or resistor in the gate lead of Q1 to achieve the same result. In stubborn cases it may require more than one bead to stop the oscillation. It is important to keep all three leads of Q1 as short as possible to aid stability. The source lead is especially critical in this regard. Keep it short!

The grounded-source FET of Fig. 1 has a very high input impedance. The gate exhibits an impedance of 1 megohm or greater, which encourages unstable operation when a high-Q input tuned circuit is used (L2/C1). We can discourage self-oscillation by tapping the gate toward the ground end of L2, as shown; likewise with the drain tap on L3. The tap points can be changed experimentally until the amplifier is stable. Don't move the tap any lower than necessary to obtain stability. By "tapping down," we have effectively lowered the gate and drain impedances by attaching those elements of Q1 at a lower impedance point on the coils. This can lead to reduced amplifier gain, and is an accepted design

trade-off used by many commercial engineers.

The leads of all of the components should be maintained as short as practical to prevent unwanted stray inductances in the circuit. Such parasitic inductances can prevent the bypass capacitors, for example, from operating effectively. This problem becomes more pronounced as the operating frequency of the circuit is raised. At VHF and UHF, it becomes a major consideration.

A double-sided PC board is recommended for use with all preamps. The unetched side serves as a ground plane to help stabilize the circuit. The ground plane should be connected at several points to the ground foils on the etched side of the circuit board. C3 and C4 must be high-quality capacitors, such as disc ceramics with short leads, to aid stability. R3 acts as an RF choke to prevent RF energy from flowing on the + 12-V line to the receiver, or vice versa. This is called "decoupling," and it also aids the stability.

*Noise Figure:* Here we find ourselves adrift in a sea of controversy and engineering skill. Ordinary test equipment is not suitable for making accurate noise-figure measurements. Therefore, I won't immerse you in a detailed discussion of this aspect of things. Two ARRL reference books treat the subject: *The Radio Amateur's Handbook* and *Solid State Design for the Radio Amateur.* In essence, we are concerned with keeping the internal noise of the preamp as low as possible to enhance the ratio of the received signal to the noise.

We mentioned earlier that inherent noise masks the weak signal to make it difficult or impossible to copy. Hence, we want the preamp to be as quiet as possible. How do we achieve this? First, we select a transistor that is capable of providing a low noise figure (NF). Where do you start in choosing a proper transistor? Data can be had by studying the data sheets for the various small-signal amplifiers. Some companies will supply the sheets free of charge. Others will not respond to your requests. You must play this operation by ear. But, for high-frequency amplifier work we can list some low-noise devices. See Table 1. Keep in mind that the atmospheric noise (static) and man-made noise (furnace motors, line noise, etc.) from 1.8 through at least 14 MHz is usually high in urban locales, so a low-noise preamp is not mandatory. That is, if your S meter reads S1 or greater on local noise, there is nothing to be gained by having a preamp with a 2-dB NF. A 10-dB noise figure will often be adequate with a full-size antenna.

The exception is when an inefficient antenna, such as a small loop or short random-length wire, is used. Then, the low-noise preamp will be needed because the signal level from the small antenna will be very low, as will be the pickup of man-made noise. I fell into this trap once when using a noisy preamp with a very small loop antenna for 160 meters.

**Table 1**
**Transistors for Preamplifiers**

| *Frequency Range* | *Bipolar Transistors* | *JFETs and IGFETs* |
|---|---|---|
| 1.8-30 MHz | 2N5179, 2N3572, 2N5031, 2N2857. | 3N211, 40673, MFE3004, 2N5484, MPF102, 2N4416. |
| 30-450 MHz | 2N5031, 2N5032, MRF501, MRF901, MRF904, BFR90. BFR91 | 3N211, 3N200, MFE521, 2N3823, 2N4416, U308, 2N5485. |

Various transistors that offer good performance in amateur and commercial low-noise preamplifiers. Modern devices other than those listed are also available.

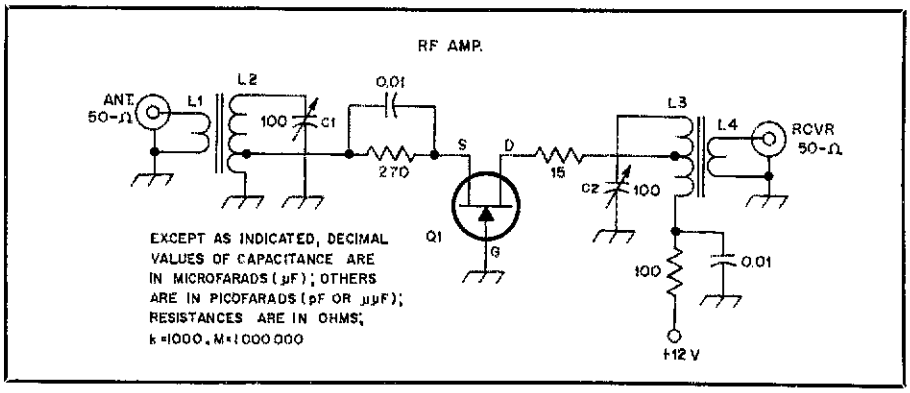



Fig. 2 — Example of a grounded-gate JFET preamp. The source and drain of Q1 are tapped toward the ground ends of the tuned circuits to ensure stability and obtain an impedance match to the load. See Table 2 for coil data.

The biasing of a preamp transistor also affects the NF. If you can build a weak-signal source for test purposes, you can adjust the bias for the lowest noise figure.[1] R2 of Fig. 1 can be varied during this test. Remember, though, that R2 will also affect the amplifier gain — another trade-off. For preamps that contain bipolar transistors, we can adjust the bias voltage to the base terminal for best NF.

The match (impedance) between the antenna and the preamp also has an effect on the NF. Interestingly, the lowest NF sometimes occurs when the antenna is not matched perfectly to the preamplifier input. Adjusting the number of turns on L1 of Fig. 1 may help in lowering the preamp noise.

When using the weak-signal source, we will experiment with the bias value and matching until the weak signal can be heard best above the noise floor or hiss level. Unscientific? Yes, but adequate for most amateur needs. Some hams use noise generators to optimize the NF, and the technique is entirely viable. A noise-generator circuit and related information is presented on page 167 of the text listed in note 1.

If there is a "bottom line" to offer here, it is "Don't be fooled by the published noise figure of a particular transistor." The number specified is the best we can expect from the device. The NF *we* achieve depends mainly on our circuit and how careful we are in setting it up.

*Impedance Matching:* Maximum power transfer is realized only when the input and output impedances of the preamplifier are matched to the input and output loads. Normally, we design our preamps for a 50-Ω load, which is standard for commercial equipment these days. If we use our sample circuit of Fig. 1 for this discussion, we will see that L1 and L4 are links that can be adjusted in turns count to provide a transformation ratio that results in a matched condition. Too many turns on the links will result in a condition we know as "overcoupling." This will impair the Q of the tuned circuits and lower the amplifier gain through mismatching. Too few turns will cause "undercoupling" and an increase in the tuned-circuit Q. This condition will encourage instability. If input and output networks with coils and trimmer capacitors are used, the capacitors should be set for the best noise figure and coupling condition. Here we need to experiment with the variable elements of the circuit. Intentional mismatches are frequently created in the interest of circuit stability and low NF.

## Some Practical Circuits

Enough about the mechanics of

[1]Notes appear on page 23.

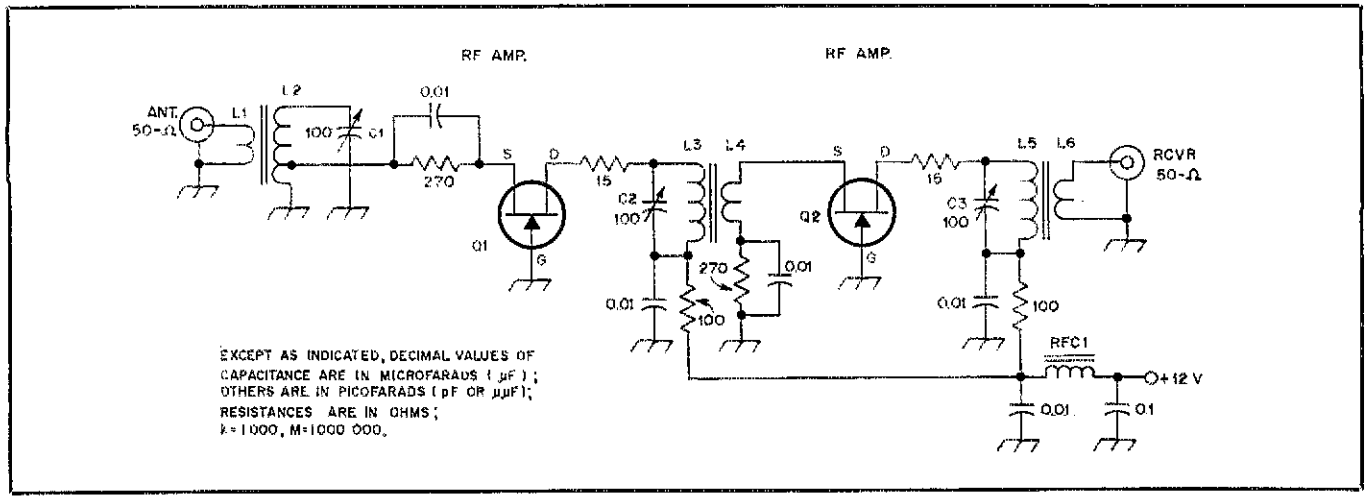



Fig. 3 — Two JFETs can be operated in series to increase the circuit gain over that of Fig. 2. C1-C3 are trimmer capacitors. Q1 and Q2 can be MPF102-family FETs for HF use. A pair of 2N4416s or equivalent FETs will serve well in this circuit from 1.8 through 148 MHz. See Table 2 for approximate coil values for the various HF bands. Fixed-value capacitors are disc-ceramic, and resistors are ¼- or ½-W carbon-composition types.

preamps. Let's look at some circuits that should be easy to build and get operating. Perhaps the least complicated of the circuits is the one shown in Fig. 2. This is a common-gate (grounded-gate) JFET amplifier. I have never had an instability problem with this circuit, provided the gate lead was short. The gain of this amplifier is lower than if it were set up as a grounded-source amplifier (see Fig. 1), but it is possible to get from 10 to 15 dB of gain with this circuit. This is adequate for many applications. The source tap on L2 should be located approximately ¼ the total number of turns above the ground end. A good rule of thumb for L1 is to use 10% of the total turns of L2. Final adjustment can be made later.

The tap on L3 is made at the center of the total number of turns. It can be raised to the top of the coil (no tap), if desired, but this will broaden the tuned-circuit response somewhat. L4 has about 10% the turns on L3 for "starters." If Q1 is a 2N4416 or MPF102 FET, the circuit will be fine for use up to 60 MHz. The number of turns for the coils will depend on the operating frequency, but the tap and link ratios will remain the same. Toroid cores are recommended for the coils. I use Amidon red cores for up to 40 meters. Yellow cores are suitable through 60 MHz. Half-inch-diameter cores (T50-2 and T50-6) are suitable. The inductance needed can be computed by means of the ARRL L/C/F Calculator. Assume a capacitance of 60 pF at C1 and C2 for up to 7 MHz. Use 40 pF for the bands from 40 through 6 meters. C1 and C2 are adjusted for maximum gain while listening to a weak signal. Table 2 contains coil data for the various bands.

If more gain is desired, you can use the circuit of Fig. 3. It uses two grounded-gate amplifiers in series, or cascade. Gain will be on the order of 25 dB. Follow the coil information given for Fig. 2. RFC1 is a jumbo ferrite bead with 4 turns of no. 28

**Table 2**
**Coil and Capacitor Data for Circuits of Figs. 2 and 3**

| *Frequency (MHz)* | *L1, L6* | *L2, L3, L5* | *L4* | *C1-C3 (pF max.)* |
|---|---|---|---|---|
| 1.8-2.0 | 5 ts no. 28 enam. wire over main winding. | 28 μH. 52 ts no. 28 enam. wire on T50-1 toroid core.† Tap L2 at 13 ts above gnd. | 13 ts no. 28 enam. wire over L3 winding. | 280 |
| 3.5-4.0 | 4 ts no. 26 enam wire over main winding. | 9 μH. 42 ts no. 26 enam. wire on T50-2 toroid core. Tap L2 at 9 ts above gnd. | 9 ts no. 26 enam. wire over L3 winding. | 280 |
| 7.0-7.3 | 3 ts no. 26 enam. wire over main winding. | 6 μH. 35 ts no. 26 enam. wire on T50-2 toroid core. Tap L2 at 8 ts above gnd. | 8 ts no. 26 enam. wire over L3 winding. | 100 |
| 10.1-10.150 | 3 ts no. 26 enam wire over main winding. | 4 μH. 32 ts no. 26 enam. wire on T50-6 toroid core. Tap L2 at 7 ts above gnd. | 7 ts no. 26 enam. wire over L3 winding. | 100 |
| 14.0-14.350 | 2 ts no. 24 enam. wire over main winding. | 2 μH. 22 ts no. 24 enam. wire on T50-6 toroid core. Tap L2 at 5 ts above gnd. | 5 ts no. 24 enam. wire over L3 winding. | 100 |
| 21.0-21.450 | 2 ts no. 24 enam. wire over main winding | 1.5 μH. 19 ts no. 24 enam. wire on T50-6 toroid core. Tap L2 at 4 ts above gnd. | 4 ts no. 24 enam. wire over L3 winding. | 60 |
| 28.0-29.7 | 2 ts no. 24 enam. wire over main winding | 1.0 μH. 16 ts no. 24 enam. wire on T50-6 toroid core. Tap L2 at 3 ts above gnd. | 3 ts no. 24 enam. wire over L3 winding. | 60 |

†Powdered-iron cores from Amidon Assoc., Palomar Engineers or RadioKit (see *QST* ads)

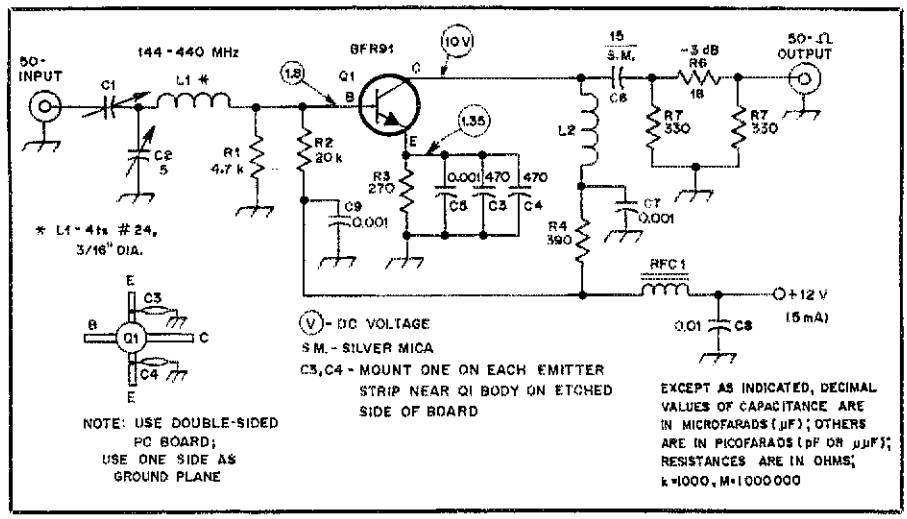



Fig. 4 — Circuit diagram for a VHF/UHF low-noise preamp (see note 2). C1 and C2 are miniature trimmers. Ceramic chip capacitors (without leads, soldered directly to the PC-board foils) are recommended in place of the S.M. units, if available. L1 has 4 turns of no. 24 enameled wire air-wound, 3/16" dia. L2 consists of 5½ turns of no. 22 wire on a 10-kΩ, ½-W resistor. RFC1 uses 4 turns of no. 28 enameled wire on a jumbo ferrite bead (Amidon Assoc.). An FT23-43 mini toroid core can be substituted for the bead. J1 and J2 are coaxial connectors of builder's choice, such as type BNC.

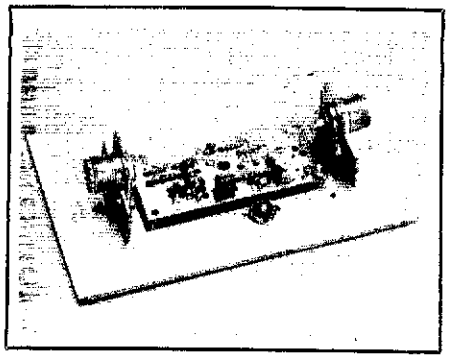


Fig. 5 — The assembled VHF preamplifier. The module is small enough to fit inside a number of commercial FM transceivers, should they need additional front-end gain or improved NF.

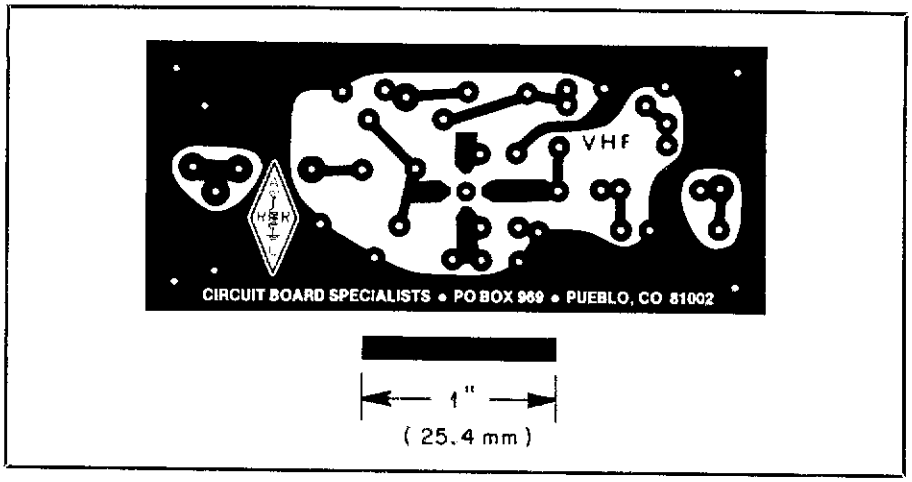



Fig. 6 — Parts-placement guide for the VHF preamplifier of Fig. 5, shown from the component side of the board.

enamel wire wound through it. It is part of the 12-V decoupling network.

### A VHF/UHF Preamp

Some older 2-meter FM transceivers are deficient in gain and NF. The circuit in Fig. 4 can be used to advantage if this is your problem. It uses a BFR 91 UHF transistor. The rated NF is 2 dB at 1000 MHz, and the minimum stated gain is 10 dB. The circuit is patterned after one that appeared earlier in *QST*.[2]

The input circuit provides a reasonable match from 144 to 440 MHz. C1 and C2 are adjusted for best NF and gain while we listen to a weak signal. L2 is broadly resonant at VHF and functions essentially as an RF choke. A 3-dB attenuator is used at the preamplifier output to provide a fixed termination over the frequency range of its use. This helps to ensure total stability, even when no load is attached to the preamp input. The 3-dB signal loss is of minor consequence in the interest of good performance. Proper adjustment should provide a NF of 3.5 dB or less at 450 MHz, less than 2 dB at 2 meters, and about 2 dB at 220 MHz.

Care needs to be taken in keeping all leads very short and direct. Do not keep sustained heat on the transistor leads, lest the device become damaged. Circuit boards and a parts kit for this project are available.[3] The completed amplifier is shown in the photograph of Fig. 5. A parts-placement layout is given in Fig. 6. A scale PC-board template is provided in Fig. 7.

This amplifier may be small enough to tuck inside your 2-meter rig. If not, it can be mounted in a box for outboard use. Be sure to break the antenna line to the existing RF amplifier and insert the preamp of Fig. 4 between the receive terminal of the changeover relay and the original input terminal of the receiver. *Warning:* Be careful to avoid inserting the preamp in the transmit lead!

### Closing Comments

I hope this article has given you some insight into the use, drawbacks and advantages of preamps. A little common sense and care of adjustment can make the addition of a preamp worthwhile — if your receiver is in need of one. But whatever you do, don't hang a preamp on a receiver that doesn't need one. It will only increase the S meter reading and may cause your already good receiver to collapse in the presence of strong signals!

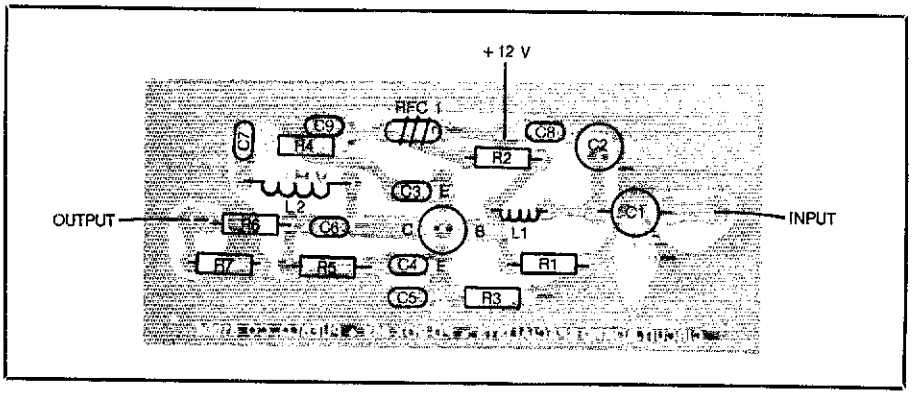



Fig. 7 — Circuit-board etching pattern. Black represents unetched copper, viewed from the foil side of the board.

**Notes**

[1]*Solid State Design for the Radio Amateur* (ARRL), test-equipment section.
[2]J. Hathaway and D. Belcher, "A State-of-the-Art 2-Meter Preamplifier," *QST*, April 1971.
[3]Circuit Board Specialists, P.O. Box 969, Pueblo, CO 81002. Negatives, PC boards and parts kits are available.

## Strays

***QST* congratulates...**

☐ Leo C. Haijsman, W4KA, of Cape Coral, Florida, on 60 years as an ARRL member.

**I would like to get in touch with...**

☐ any Chinese hams interested in forming a net. Chuck Lau, VE3EWW, 43 Southampton Dr., Scarborough, ON M1K 4V6, Canada.

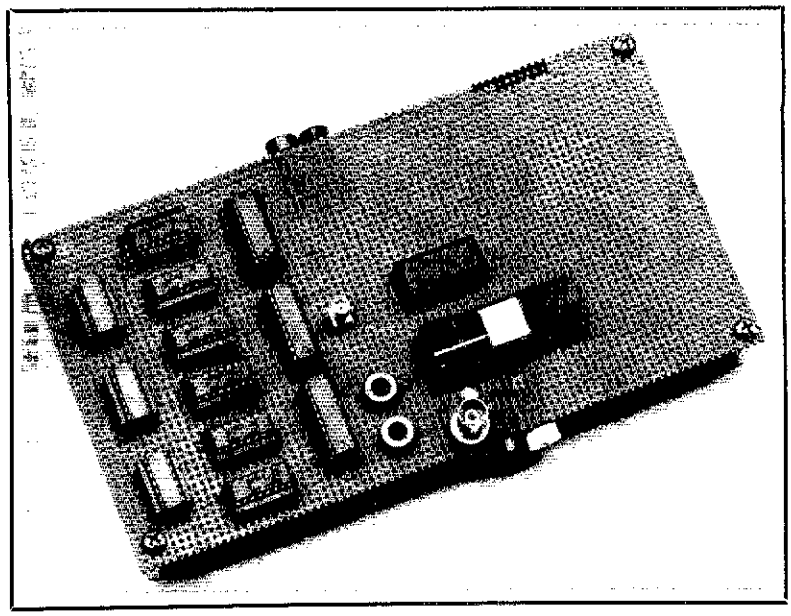
☐ anyone with 30-meter transmit modifications for the Kenwood TS-520. Steve Carroll, N2DDI, HHC, USAG Bldg. 403, Box 1056, Fort Meyers, VA 22211.

☐ any amateurs interested in sharing information on the HBR receiver (by Ted Crosby, W6TC). Bob Shook, WB5YUG, 205 Bristol Ct., Victoria, TX 77901.

☐ anyone who has a schematic diagram for a 1966 Lafayette monitor, Model HA-55. Richard Barnes, 2332 Vance Ave., Apt. 7, Alexandria, LA 71301.

☐ anyone interested in the Chaverim, an organization formed to promote a closer relationship among Jewish radio amateurs and their friends. Sylvia Soble, W3SLF, 9357 Hoff St., Philadelphia, PA 19115.

# A Digital Frequency Synthesizer



## Does your synthesized rig suffer from phase-noise problems? Read about a new type of synthesizer, and learn how to build a VFO with 1-Hz steps and almost no phase noise!

By Fred Williams*

Since the earliest days of radio, one of the constant challenges has been to generate stable, pure signals and be able to adjust frequency easily. Crystal oscillators can provide stable and pure signals, but only at one frequency. Even variable crystal oscillators (VCXOs) really don't change the frequency much. Grinding a crystal to change the operating frequency is no simple task.

People have designed variable-frequency oscillators (VFOs) of almost every conceivable configuration to get around this difficulty. But this often leads to oscillator stability and purity problems. Calibration can be difficult with either approach. Dial markings can be hard to read, and are unreliable if the oscillator drifts.

During the past 30 years, engineers have developed a new set of solutions to the problem of frequency generation. These are usually lumped together under the name "frequency synthesizers." The basic forms of crystal and variable oscillators haven't been eliminated — just incorporated as parts of a larger circuit that gives the desired performance.

Frequency synthesis can be accomplished three ways: direct synthesis, indirect synthesis and digital synthesis. In this article, I will describe all three methods, with emphasis on digital synthesis. I will conclude with a complete design for a high-performance digital synthesizer.

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### Direct Synthesis

The first frequency synthesizer to be designed was the direct synthesizer. The basic idea is that the desired final frequency can be produced ("synthesized") by adding several frequencies through a mixer. These frequencies can be made in one of two ways: You can have a large number of oscillators, or the frequencies can be generated using frequency multipliers and dividers.

A block diagram of the multiple-oscillator or "crystal-plexer" approach is shown in Fig. 1. This is how aircraft transceivers were first made. This approach suffers from the requirement for a large number of accurate crystals. In fact, many of those plentiful 8-MHz crystals you find in surplus stores came from aircraft radios. Usually, the crystals are switched into the oscillator circuit to reduce the number of parts used.

Aligning this kind of synthesizer can be very time-consuming. Each crystal must be adjusted independently. One of the good points, however, is that the output frequency can be changed almost instantly — especially if all the oscillators are running continuously. You'll have to look hard these days to find any amateur or consumer gear using this method of frequency synthesis. After all, the intent of synthesizer development was to get rid of all those crystals.

Another way of generating frequencies in small steps is to take a low-frequency oscillator and feed it into a harmonic generator, as shown in Fig. 2. These harmonic generators are sometimes referred to as "comb generators." The output of this circuit can be filtered with a tunable filter to select the desired output. The obvious problem with this approach is that you need a highly selective filter if closely spaced frequency steps are desired. The most common use of this technique is to create a few selectable frequencies in the microwave range.

One way of getting around the requirement for a highly selective filter is to break the process into stages, so filtering can be applied a bit at a time. This might require several oscillators and harmonic generators, and a number of filters. These filters can be fixed (in which case a large number are needed) or variable (in which case they have to track properly). A block diagram of this approach is shown in Fig. 3. This is not a simple approach, and it has not received a great deal of attention. However, calibrating this kind of direct synthesizer is much simpler than for the multiple-oscillator approach of Fig. 1.

One problem that both of the direct synthesizers have is spurious output signals. These are the frequencies used internally to generate the output frequency, and undesired sum and difference frequencies generated as side effects. Mixer imbalance lets signals through that should be suppressed, and filters that should remove them are not perfect. These spurs can cause

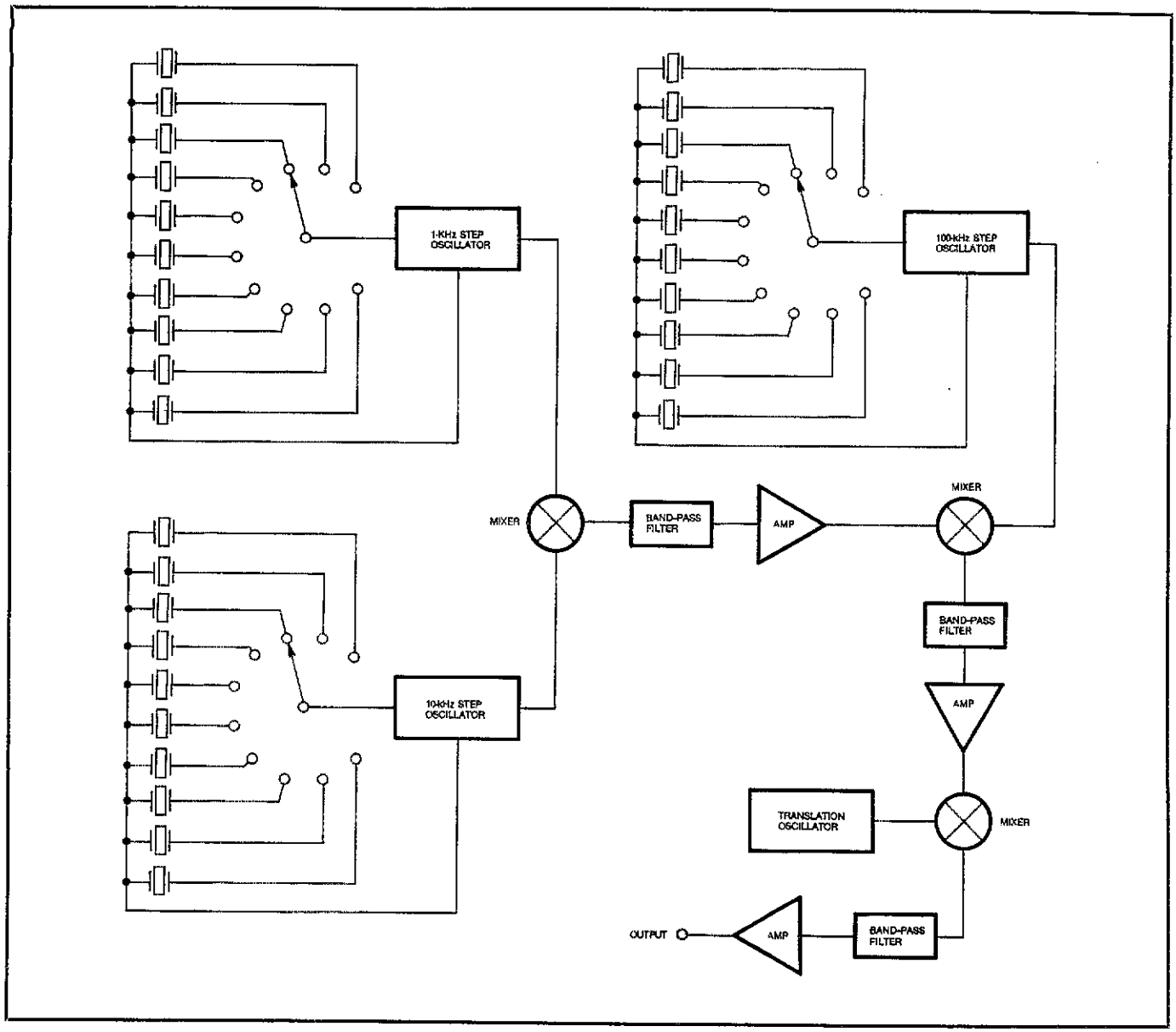



Fig. 1 — A block diagram of a multiple-oscillator direct frequency synthesizer, which uses a large number of crystals, with mixers, to generate the desired signal. This circuit provides 1-kHz frequency steps.

problems in transmission and reception. Not only can these signals jam your neighbor's TV, they can degrade your own receiver performance as well.

### Indirect Synthesis

With the development of integrated-circuit frequency dividers, the indirect method of frequency synthesis became practical. The characteristic of the IC dividers that made indirect synthesis practical is the wide range of input frequencies to which they will respond. Most previously used dividers would function only over an extremely limited range. Instead of using a harmonic-generator circuit to act as a frequency multiplier, we'll use a frequency divider. The output signal will be a multi-

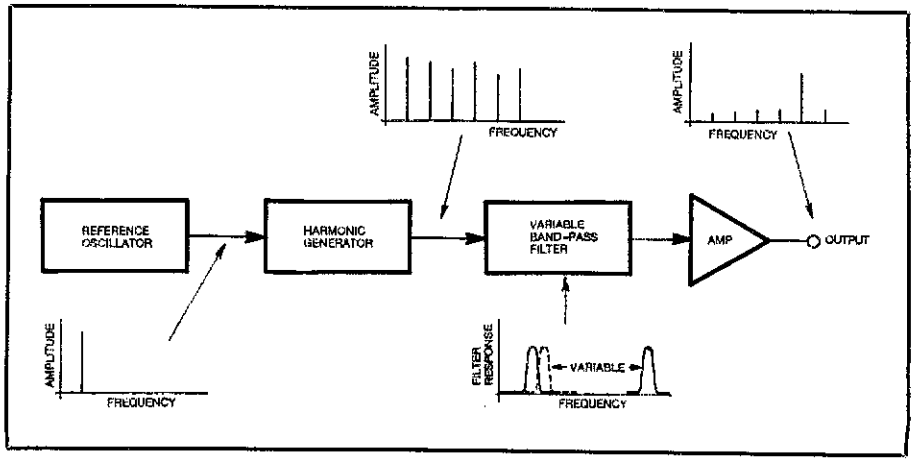



Fig. 2 — Illustration of a "comb generator" circuit for direct frequency synthesis.

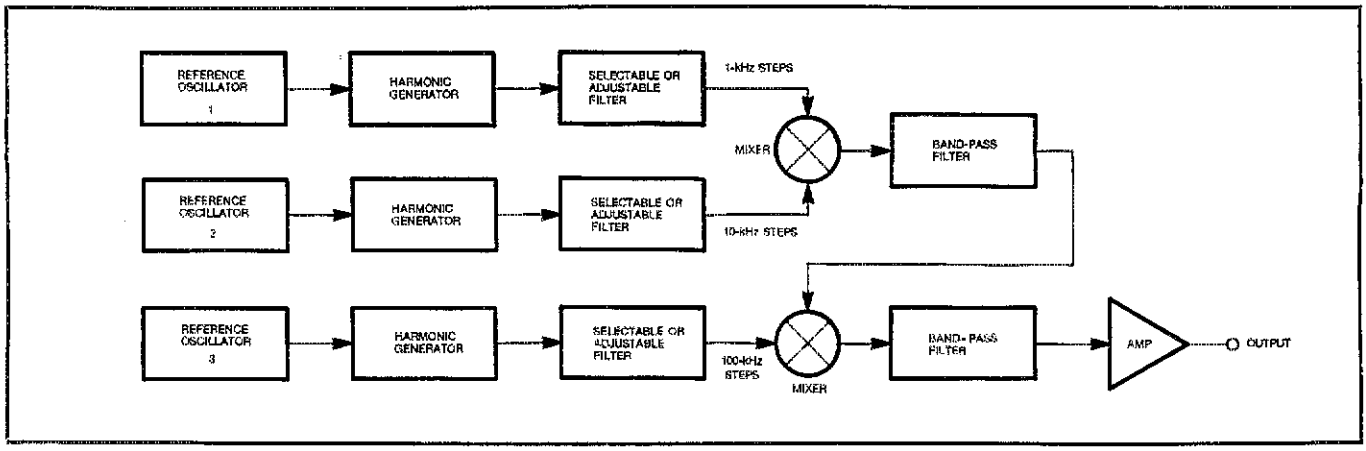



Fig. 3 — Block diagram of a "comb generator" circuit that will provide a purer, more accurate output signal.

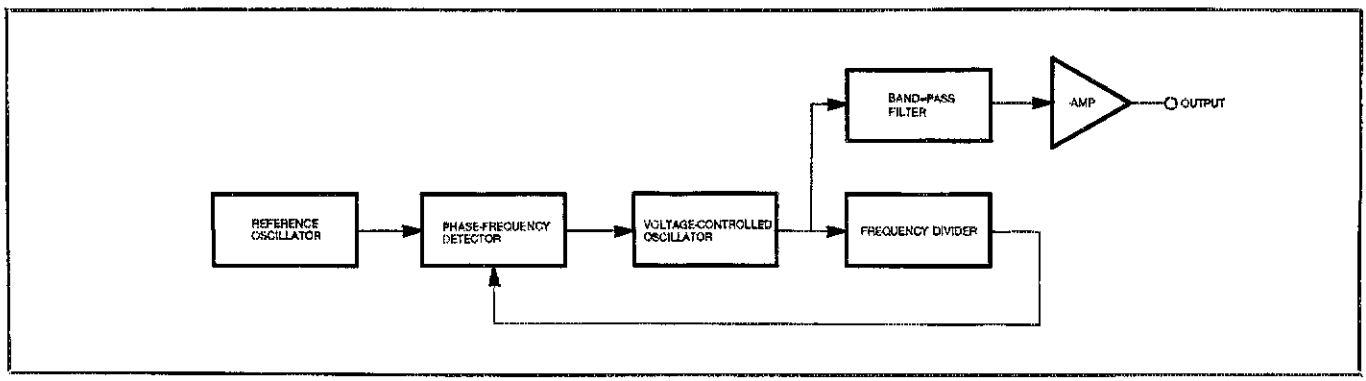



Fig. 4 — An indirect frequency synthesizer, which uses a phase-locked loop and a variable-ratio divider.

ple of the reference frequency, either way. Since all the other frequencies are not present, spurious signals will be much reduced.

The block diagram of a circuit using this basic idea is shown in Fig. 4. The output from a voltage-controlled oscillator is applied to a frequency divider, which divides its input frequency by some number. For the sake of this discussion, we'll call this number "N." This will give us a means to vary the way the circuit operates, allowing N to be set by the equipment operator. The output of that divider is compared with a reference frequency by the phase/frequency detector. If the frequency is too high, the output of the phase/frequency detector will decrease, causing the frequency of the oscillator to decrease. If the VCO is at too low a frequency, the output of the phase/frequency detector will increase, which will make the frequency of the VCO increase. If the frequency is correct, the detector output voltage remains the same.

The VCO will end up operating at N times the reference frequency. Ideally, the phase of the divider output will exactly match the phase of the reference input. This condition is called "phase lock," and so another name for indirect synthesizers of this type is "phase-locked loop synthesizer" (PLL). This is a classic example of negative feedback. The frequency error is reduced to zero, on the average.

The average frequency error is zero, but if the VCO is not stable when it is outside of the phase-locked loop, it will still change frequency when it is in the loop. The average frequency will be correct, however. So there is a lot of noise, which looks like phase modulation of the oscillator "carrier." This phase noise is directly audible in an FM or PM system. Even CW and SSB receivers suffer from the malady.

There is another problem with indirect synthesis that has not affected most synthesizer users yet. When you change the number in the divider, the frequency output of the VCO changes, but not immediately. The time that the VCO takes to change to the correct frequency is called "settling time." This time increases as the size of the frequency steps are decreased. That happens because the phase/frequency detector contains a filter to keep noise out of the VCO. The filter slows the response of the circuit when the frequency is changed. This is a problem in such sophisticated systems as frequency-hopped spread spectrum, as well as in such simple circuits as a scanning receiver.

## Digital Synthesis

Advances in IC dividers led to widespread use of the indirect synthesizer. Further advances in ICs that perform arithmetic functions and convert signals from digital to analog form have made the third kind of synthesizer possible. The digital synthesizer does not have the drawbacks of the other two types, which

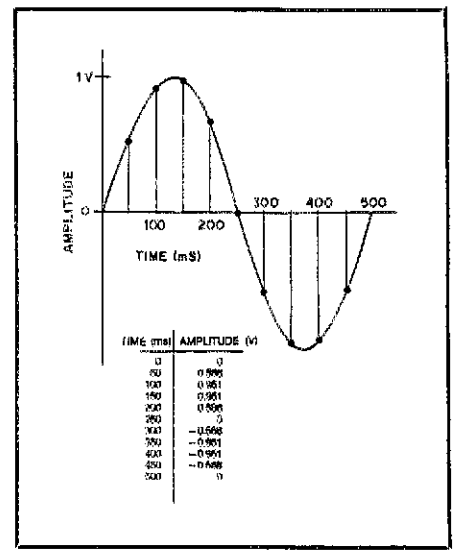



Fig. 5 — A 2-MHz sine wave is shown, with its amplitude sampled every 50 nanoseconds.

may increase its popularity.

Many readers are probably unfamiliar with the branch of engineering called digital-signal processing. I will describe the fundamentals that are needed to understand the operation of a digital synthesizer before discussing the details.

Let's think about a sine wave. Even if it's only one complete cycle, there are an infinite number of points at which it can be evaluated. Unfortunately, even modern high-speed ICs can only process a limited number of points in a second, so something has to give. Intuitively, it seems reasonable to represent a sine wave by using the amplitudes at some number of points, as shown in Fig. 5. To get the original signal back, we can use a low-pass filter to interpolate, or smooth out, between these points.

The question then arises, "How many points do I need to represent a sine wave and still get a good reproduction?" The answer is really quite surprising: any number greater than or equal to two. On the average, this will give a perfect sine wave at the output of a low-pass filter. For example, 2.1 is quite sufficient, if the filter is good enough. The number of sampled points per cycle doesn't have to add up to a whole number. Fractional (or even irrational) values are allowed (for example, 2.9, 4.7, 4.8). This requirement for two or more samples per cycle is called the Nyquist limit, after its discoverer, an engineer at Bell Labs.

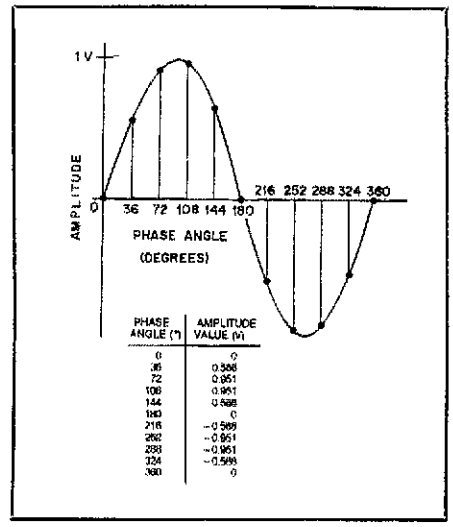



Fig. 7 — Any sine wave can be sampled at various phase angles (in this case, every 36°) and the values stored for later reconstruction of the wave.

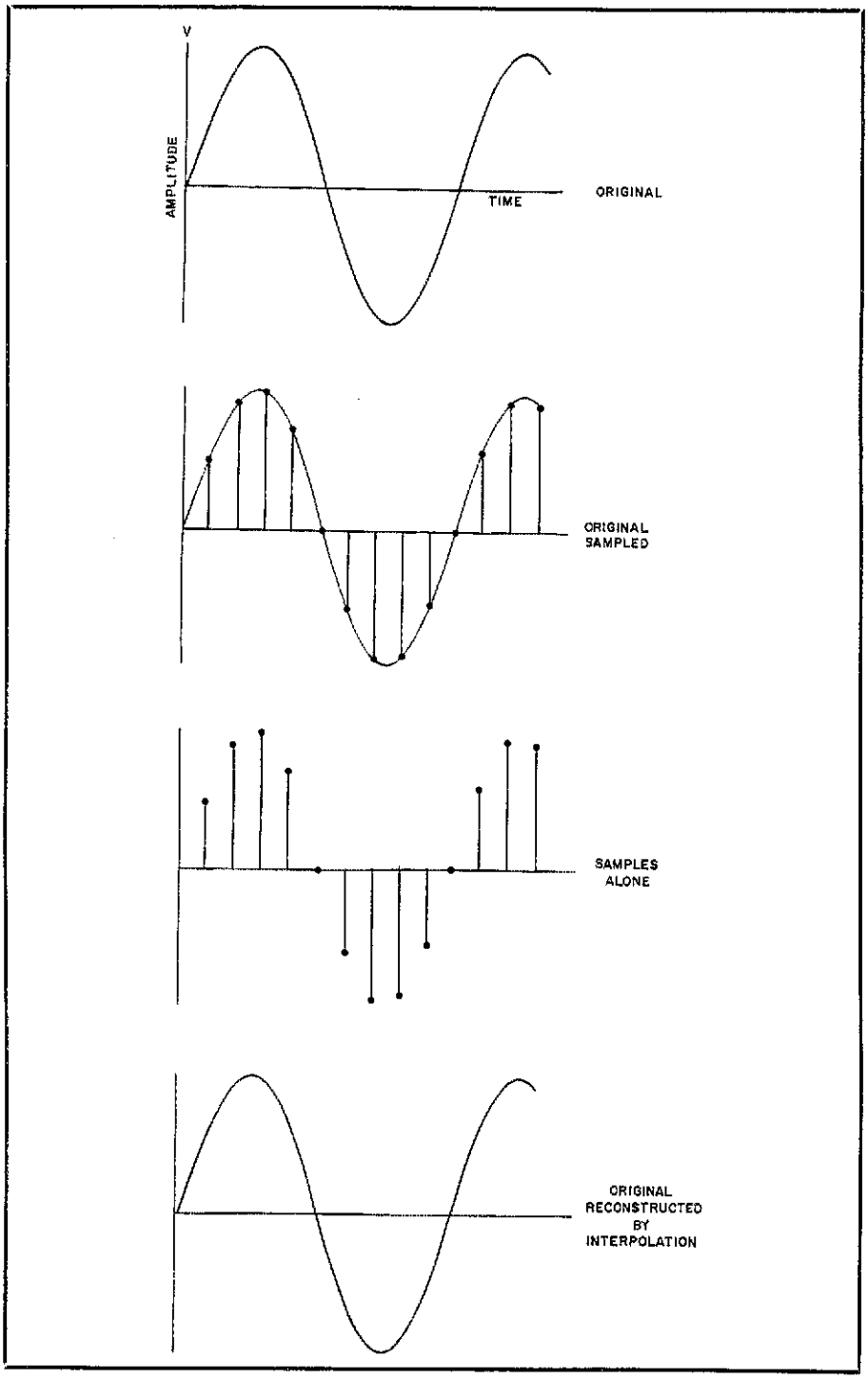



Fig. 6 — A sine wave can be represented by its value at a few points, and a replica of the original wave can be constructed from those values.

Suppose we take a perfect 2-MHz sine wave, which might come from a crystal oscillator. Let's look at it every 50 ns, as illustrated in Fig. 5. The time between samples will be determined by the maximum frequency we want to represent and the speed of the ICs that are available. The synthesizer described later uses a 59.6-ns time between samples. Since we have sampled more then two points per cycle, there will not be any problem with getting the original signal back if we need it, as shown in Fig. 6.

But if we are going to process the signal digitally there is another problem: We don't have infinite precision. Specifically, we only have eight "bits" (a "bit" is a binary digit — a number that can be only a 0 or a 1) or about 0.4% accuracy, in the arithmetic section of a typical synthesizer.

What is this effect going to be? Without delving deeply into the mathematics, the only effect caused by this lack of precision is to increase the harmonic content somewhat, and give a low-level broadband noise. What we have done so far is to reduce our 2-MHz sinewave to a sequence of numbers. If we want the sine wave back, we feed the sequence of numbers into a digital-to-analog converter (DAC), and follow it with a low-pass filter. It stands to reason, therefore, that to synthesize a sine wave, all we have to do is come up with the same sequence of numbers that we would get by measuring a sine wave, and feed that sequence into a DAC.

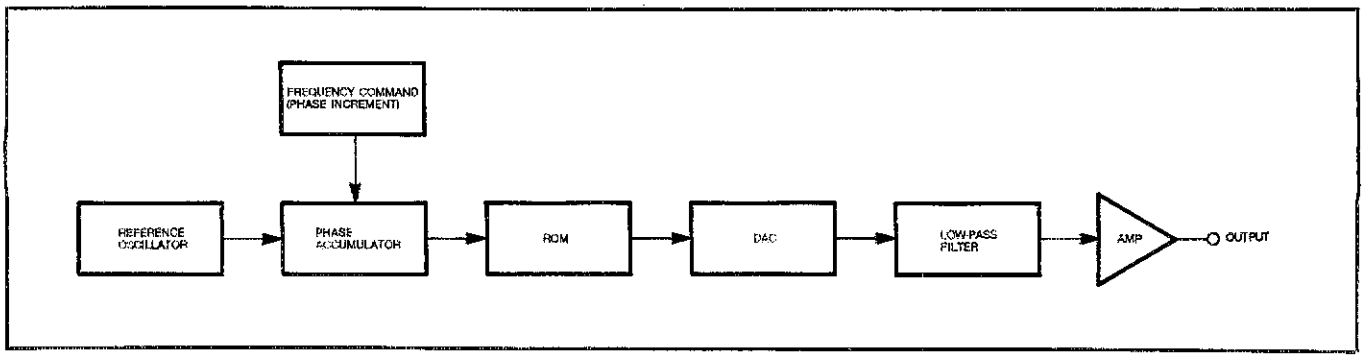



Fig. 8 — Block diagram of a digital frequency synthesizer.

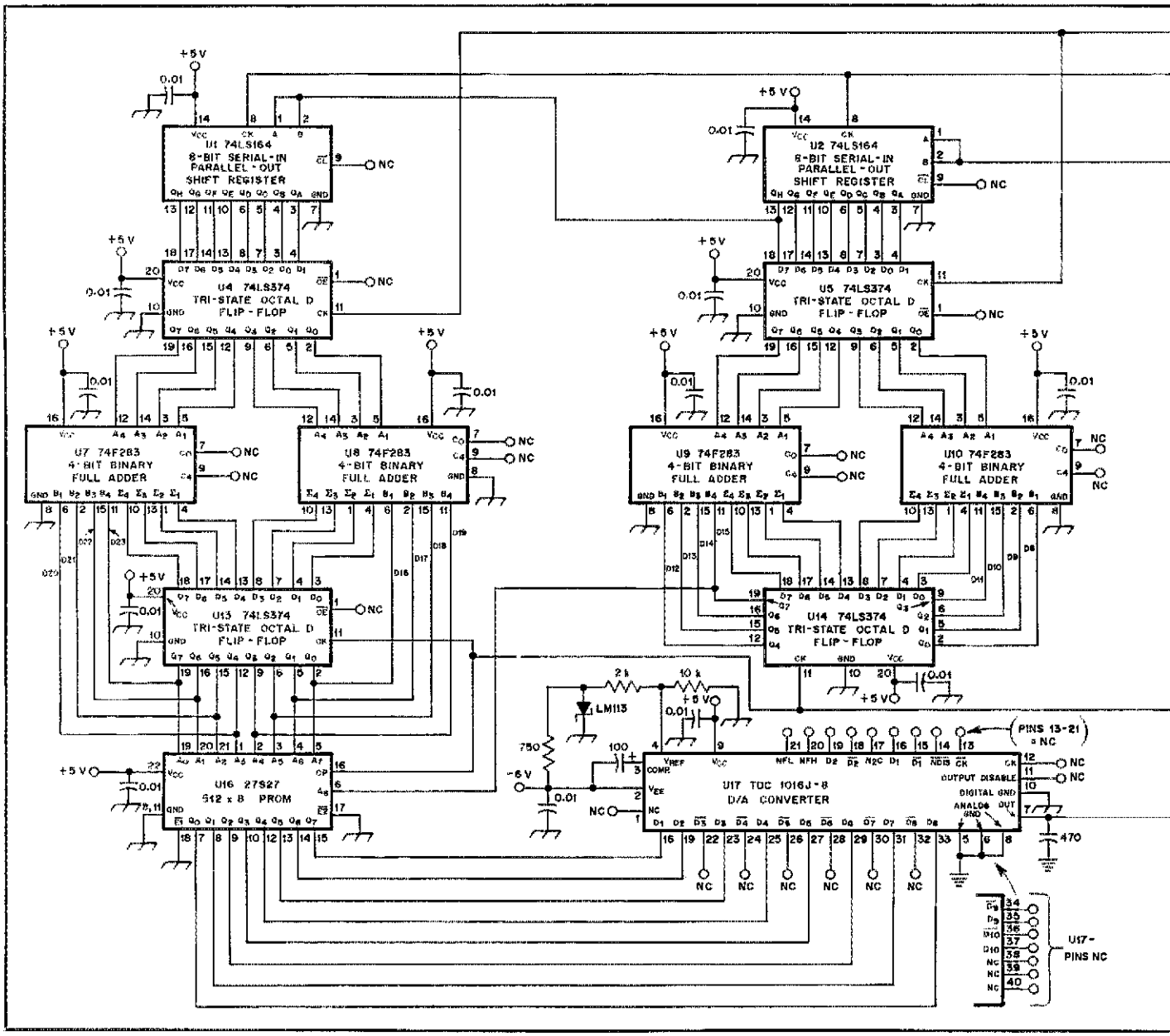



Fig. 9 — Schematic diagram of a 1- to 7.5-MHz digitally synthesized VFO.

L1 — 2.4-μH RF coil, Miller part no. 4606 or equiv.
L2 — 1.8-μH RF coil, Miller part no. 74F186 AP or equiv.
L3 — 100-μF RF coil, Miller part no. 4632 or equiv.
U1-U3 — 74LS164, eight-bit, serial-in, parallel-out shift register.
U4-U6, U13-U15 — 74LS374, tri-state octal D flip flop.
U7-U12 — 74F283, four-bit binary full adder.
U16 — 27S27, 512 × 8 PROM.
U17 — TDC1016J-8, D/A converter.
U18 — 74S04, hex inverter.
Y1 — 16.772-MHz crystal.

Let's look at another graph of a sine wave (Fig. 7). This one is not much different than the previous one. All we've done is change the X axis from time to phase angle. The value of the sine wave varies from +1 to −1, depending on the measurement angle. So, one way of getting that series of numbers is to find the angle of a sine wave at a particular point in time, and convert it to the amplitude value. This is done by storing the values for the sine wave in a read-only memory (ROM). But if we look at the phase angles, we notice something quite remarkable: They are all multiples of the same number.

The phase-angle values may look as though they can get huge, but every time we pass 360° we can subtract 360, so that the phase angle is always less than that. One way of getting this specific series of numbers is to take an adder and a storage register and just add the same number to the value in the register every 50 ns. If we program the read-only memory to contain one cycle of a sine wave, the number in the register will be a fraction of 360°.

**Table 1**
**Examples of "Overflow" Condition in Decimal or Binary Addition**

| Decimal | | | Binary | | |
|---|---|---|---|---|---|
| 00 | 47 | 94 | 0000 | 0110 | 1100 |
| +47 | +47 | +47 | +0110 | +0110 | +0110 |
| 47 | 94 | 141† | 0110 | 1100 | 10010†† |

†"Overflow" condition; the result is 41.
††"Overflow" condition; the result is 0010.

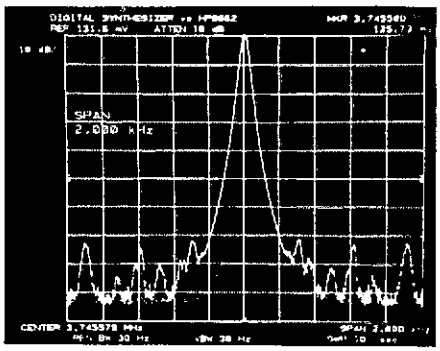
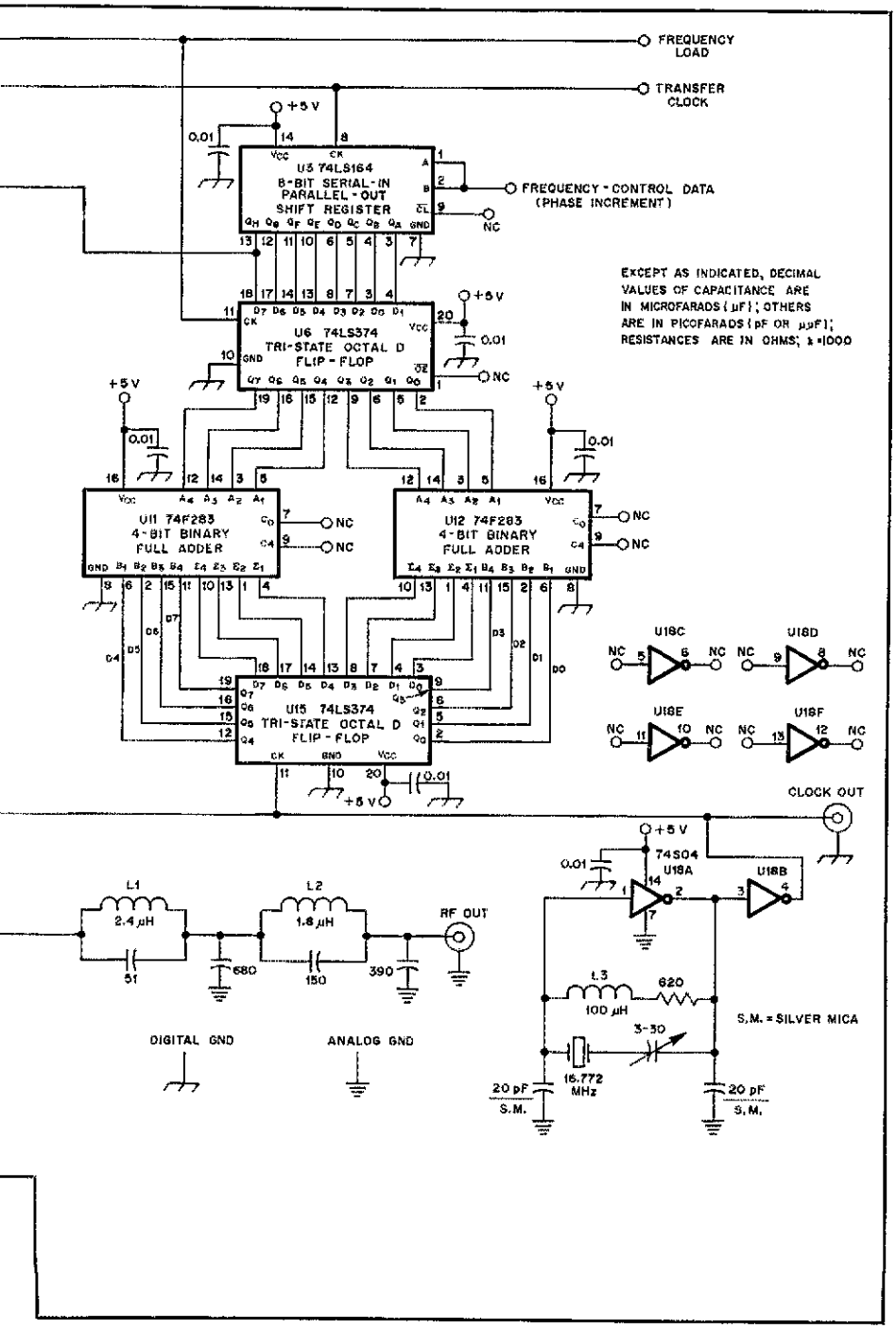



Fig. 10 — Spectrum analyzer display of the digital synthesizer output. The fainter line shifted slightly to the right is the output of an HP8662A synthesizer for comparison. Horizontal divisions are each 200 Hz, and vertical divisions are each 10 dB.




Since the number in the register is a fraction of 360°, every time the register overflows it has the same effect as subtracting 360°. This combination of an adder and a register is called a "phase accumulator," and the number that is added repeatedly is called the "phase increment."

So these are the blocks of a digital synthesizer, shown in Fig. 8: a phase accumulator, a ROM, a DAC and a low-pass filter. To make the synthesizer easier to use, a controller may be added to allow a dial or keypad to provide the required phase increment. As designed, the digital synthesizer requires a number with 24 binary digits (bits) to specify the frequency.

There are several possible ways of controlling the synthesizer. A personal computer with three serial I/O ports or one parallel port can provide the proper sequence of data. Individual switches can be used to enter the frequency directly into the accumulator. This would not require the shift registers. It may be okay for experimentation, but I would not want to use this method on a regular basis. Similarly, a multiple-position switch could be used to select a set of diodes, which would enter the frequency directly into the accumulator, again not using the shift registers. I decided to build a dedicated controller using a microprocessor IC. A description of that circuit is the subject of another entire article.

The frequency is entered as a 24-bit

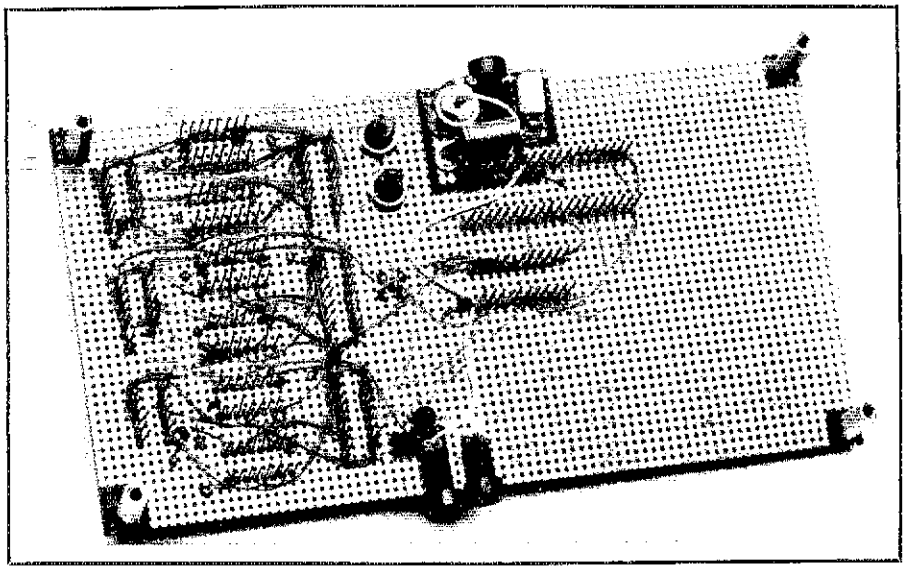


Fig. 11 — The author used wire-wrapping construction techniques to build a prototype digital synthesizer.

binary number, shifted in most-significant bit (MSB) first. If you are using the shift register, three signals are needed: data, clock and load. The data must be valid during the rising clock edge, and the load control must go high after the last data bit has been shifted in. The clock may be continuous or gated, as long as each data bit is present at the appropriate rising edge and the load control goes high before the next rising clock edge.

The schematic diagram for the digital synthesizer is shown in Fig. 9. It really is just a straightforward implementation of the block diagram. To get a 24-bit adder, six 4-bit adder chips are cascaded. Since the speed of the circuit is determined by the adders, I used Fairchild 74F283 adders. Slower units will not work at a 16-MHz clock rate. The 24-bit register is made out of three 8-bit registers. These don't need to be cascaded, just clocked at the same time. The nine most-significant bits of the output from the register go to the read-only memory, which contains the stored values of the sine wave. This data tells the ROM which phase value to send. The ROM can be any ROM with a short enough access time; the only reason I used the 27S27 is that I had access to a programmer for 27S27s.

From the ROM the signal goes to a video-speed digital-to-analog converter. I used a TRW TDC1016J-8 IC in this part of the circuit. This chip has a 75-ohm output over a wide frequency range, and makes the design of the low-pass filter, which interpolates the points, much easier. It can also provide ½-V peak-to-peak signals into a 75-ohm load without an external amplifier. (Many video-speed DACs provide a current output, which places some of the burden of getting good response on an external amplifier. These amplifiers can be more expensive than the DACs that drive them!)

Since people think and work in decimal, some way is necessary to convert from the decimal form that people use to the binary numbers that digital circuits use. That job is performed by the controller section. Since I built the synthesizer and the controller (which provides for keypad entry of the desired frequency) separately to make debugging easy, I wanted to keep the number of connections between the two as low as possible. The present design connects these two units with three wires — a data line to carry the information one bit at a time, a clock line to tell the synthesizer when to look at the data line, and one line to tell it that the new number is ready to use. This allows the use of different kinds of controllers. That's the reason for the three 8-bit shift registers. If I didn't mind a broadband burst of garbage every time I changed the frequency, the intermediate latches could be eliminated.

Now let's focus on how some of the numbers were chosen for this circuit. Some of them may seem arbitrary; however, there are good reasons for every choice. A synthesizer using the block diagram of Fig. 9 can be designed for different frequency steps. The maximum output frequency is determined through the formula

$$f_{out} < \frac{f_{clock}}{2} \qquad \text{(Eq. 1)}$$

Actually, it is best to leave some room for the low-pass filter to cut off. A good rule of thumb is

$$f_{max} = \frac{f_{clock}}{2.2} \qquad \text{(Eq. 2)}$$

The master clock frequency also determines the size of the phase accumulator (in bits) and the size of the frequency steps that you can get. There's a very simple formula for this:

$$\Delta f = \frac{f_{clock}}{2^M} \qquad \text{(Eq. 3)}$$

where $\Delta f$ is the frequency step size and M is the number of bits in the phase accumulator. This design uses 24 bits and a master clock frequency of 16.777216 MHz — which happens to be $2^{24}$. This gives a frequency step of 1 Hz.

These formulas work for any *digital* synthesizer that has been designed from this block diagram. If you want an audio synthesizer, a smaller clock frequency and phase accumulator size can be used to give the same performance over a more limited range. For example, a clock frequency of 65.536 kHz ($2^{16}$) and an M value of 16 bits will give 1 Hz steps from 1 to about 30 kHz. Standard 74LS-series parts could be used for everything in that case. If a step size other than 1 Hz is used, the phase increment is the desired frequency divided by the step size. Of course, this number must also be in binary form.

The ultimate stability of a digital synthesizer is a function of the stability of the reference oscillator. The one used in the synthesizer for this article is not perfect, and a better oscillator is not difficult to build. The broadband spectral purity is a function of the number of bits used in the ROM and the DAC, and of the low-pass filter response. If the synthesizer is used to replace a 5- to 6-MHz VFO in a transceiver, a band-pass filter can be used, which will give excellent performance. As the spectrum analyzer photograph at Fig. 10 shows, the phase noise performance of the synthesizer is outstanding. The speed of changing frequency is limited only by the time it takes to transmit the 24 data bits from the controller to the synthesizer. One nice feature of this approach is that the output is phase-continuous when the change is made. This means the sidebands generated by the change are minimized.

## Conclusion

No construction details or packaging information are given. If you decide to build a synthesizer to add to your rig, follow the schematic diagram and use good construction practices. Keep the digital and analog lines separated as much as possible. Different ground planes should be used for the digital and analog signals.

The lead photo and Fig. 11 show details of the unit I built. A PC board could be used also. Copies of the PROM listing are available for those who want to build a synthesizer.[1]

I hope this article stimulates some tnought and experimentation with digital synthesizers. My experience indicates that they provide performance that is superior to PLL circuits, at least in terms of phase noise.

[1]For a copy of the PROM listing, send $2 and an s.a.s.e. to ARRL Technical Dept., 225 Main St., Newington, CT 06111, and request the digital synthesizer PROM listing.

# A Computerized Frequency Counter

If your computer has a set of programmable parallel ports, all you need is a readily available kit and a few additional components to build a 100-MHz reporting counter.

By T. K. Davies,* VE7DHD

One of the recurring needs of today's amateur is an accurate frequency-measurement device. These days, the frequency counter has replaced the wavemeter. If you peruse the amateur journals of the last few years, you can find many fine counter construction projects. So, why another one? The *reporting* feature of this unit is what makes it unique. With a reporting counter and some custom software, your computer can take readings over a period of time, place the readings in memory, and allow you to do frequency stability calculations or any data manipulation you desire.

### Conception

While in the process of developing high-stability oscillators, I grew tired of spending hours writing down frequency-counter readings. If that were not painful enough, I then had to wade through the random results on equally random scraps of paper! It all got to be too much! One day, I threw the scraps of paper up in the air and, as they settled, along with mutterings of "there must be a better way," the idea of turning my idle computer into an obedient scribe came to mind. I did this by making some simple modifications and additions to an Intersil counter evaluation kit, adding some connections to the computer and writing a little software.

The computer is of immeasurable help when temperature compensating oscillators, checking LO stability and testing a VFO. Analysis is performed and data printed out according to your expressed wishes. Enough on the advantages of a reporting counter. Let's go on to the LSI chip that makes an eight-digit

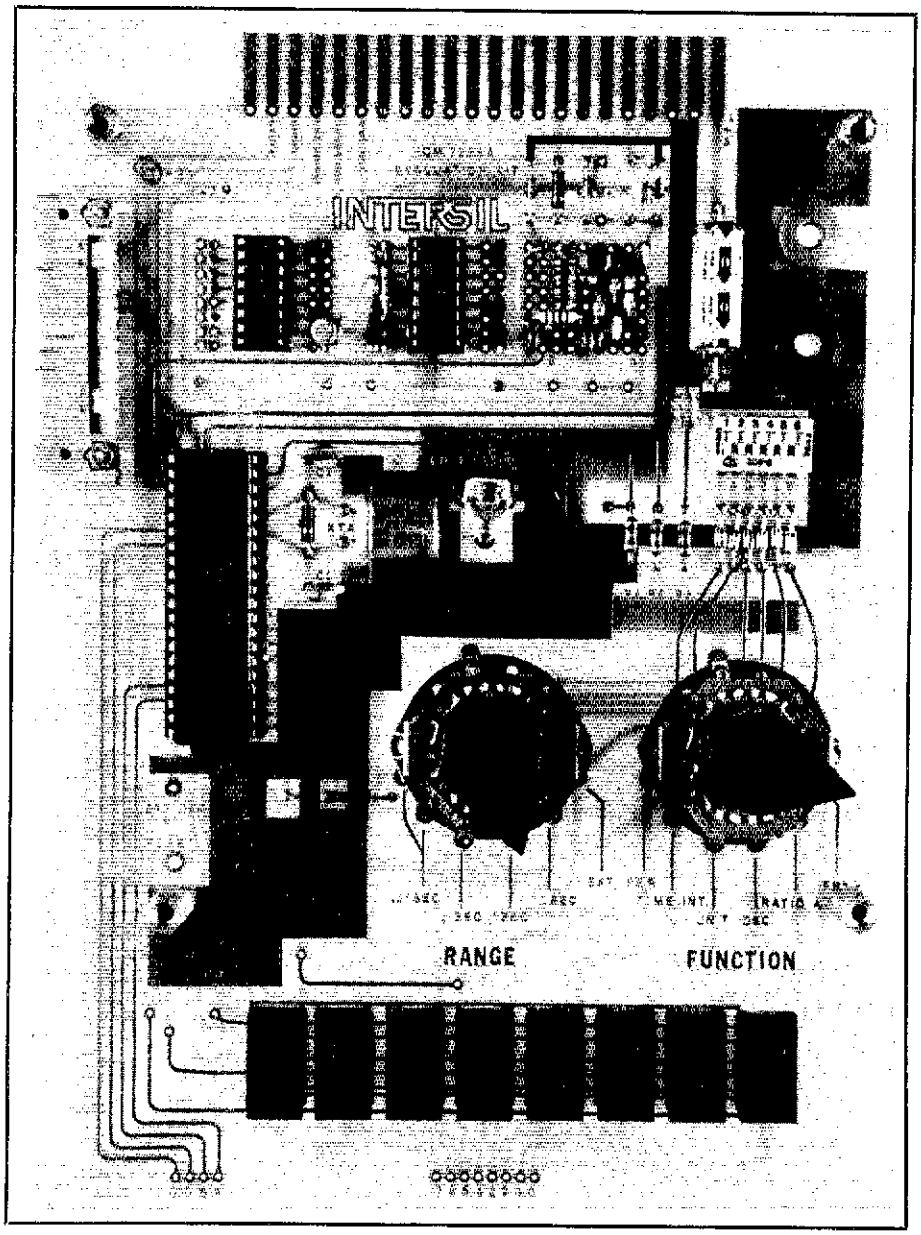



Fig. 1 — Note the connector in the upper-left-hand corner. The first IC from the left is the 74LS151 multiplexer; next are the 2N2907A level shifter and the 95H90 prescaler, and the amplifier components. Several components are mounted on the opposite side of the board.

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multifunction counter easy to build and use.

### The Intersil ICM7226A

This CMOS IC contains all the functions required for use as a universal counter. It is a frequency counter, a period counter, a unit counter, a frequency-ratio counter and an interval counter. There is also an on-board oscillator to use for the time base and the multiplexing of the display. The ICM7226A has signals that can control additional external prescalers and/or prescaler displays and a BCD output for computer interfacing.

A basic 10-MHz counter can be built by adding an eight-digit display, a crystal, three diodes, four switches and four resistors. Although the basic counter works well, the addition of a few more parts will provide several other features. The "best buy" counter is the evaluation kit. The Intersil 7226 EV/Kit includes all of the basic counter parts and some parts to prevent over-voltage damage to the counter input, a PC board and instructions on how to put it all together.[1] The board has spare IC pads that can be used to add a prescaler to increase the counter range and/or add a multiplexer for measuring more than one input. Both of these options are added to the unit shown in the photograph.

There are advantages to converting the evaluation kit rather than starting from scratch. The counter can be built and tested thoroughly before the computer interface is added or any additional features are installed. It is much easier to test the connections to the computer when you know what the counter reading should be. If you choose to build from scratch, or want more data on prescalers, contact Intersil for their counter-applications note. The note has 12 pages of data and includes circuits for 40- and 100-MHz counters using the ICM7226A.[2]

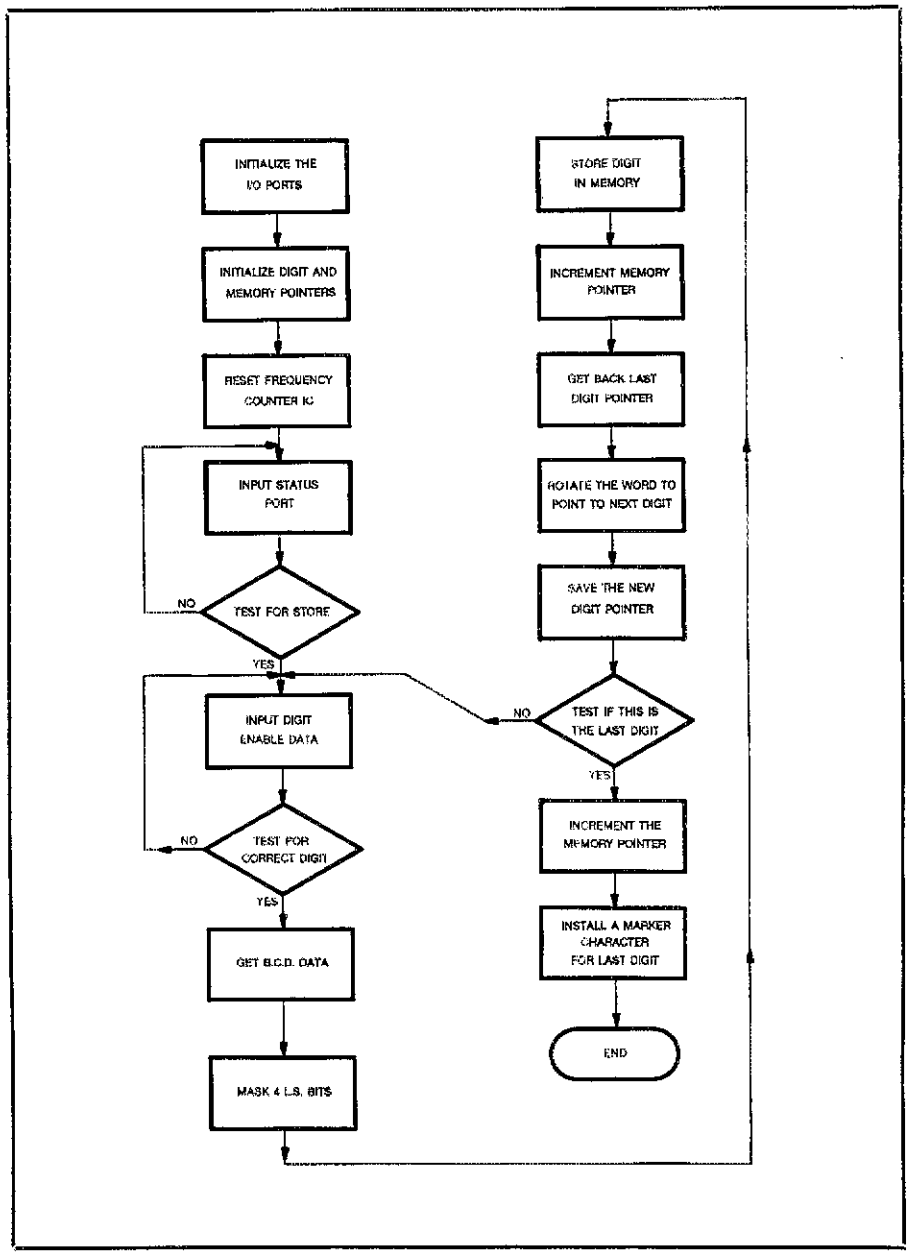



Fig. 2 — Frequency counter program flow chart.

### The Interface

The modifications needed to interface the counter with the computer should be made after the kit is assembled and tested, not before. All of the interface modifications are completely passive, so the counter will perform normally with the interface disconnected. Interconnection is accomplished using a 20-conductor ribbon cable terminated at the counter board with a plug and a wire-wrap header, which can be seen in the upper-left-hand corner of the photograph. The connector used for the other cable end is dependent on individual requirements. Connections to the counter board are wire-wrapped on the header end, and the loose ends are soldered to the appropriate pins of the counter IC. Computer port A is an input used to monitor the enable lines of the eight-digit display. This port tells the computer which digit is being addressed. Port B is a four-bit BCD data input used to pass the decimal value of the digit to the computer. Port C is a status/control port; one line monitors the DATA VALID or STORE line, and the other line sets or clears the RESET line to initialize the measuring sequence. Several lines of port C are not required for the counter and can be used to control the multiplexer to select inputs to the counter.

If the computer used with the counter has at least a three-port programmable interface adaptor (PIA), the wiring is direct and no additional components are required. The input/output ports are connected as shown in Table 1. If your computer does not have a PIA, a suitable parallel-port board will have to be built or purchased. A PIA is useful for other applications.

### Software

Fig. 2 is a flow chart of the counter program. A bare-bones listing for an 8080 system using an 8255A PIA IC is included in Table 2 for reference. Consult the flow chart for the programming of other microprocessors.

A computer can control more functions than those indicated in the flow chart. The program resets the counter, fetches the digit-enable data, waits in a loop until the most-significant digit is acquired, and then

[1]Notes appear on page 33.

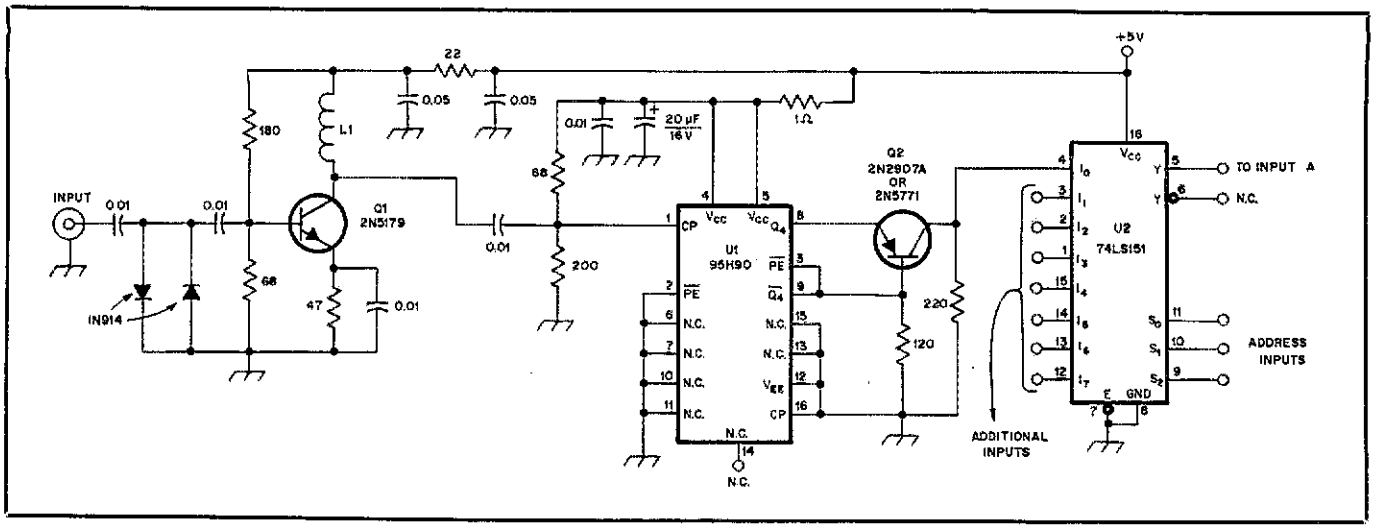



Fig. 3 — Amplifier/prescaler/multiplexer schematic diagram for the 100-MHz counter. L1 is eight air-wound turns of no. 26 enameled wire, 5/32-in-dia, 5/8-in long (mm = in × 25.4). From *Ham Radio*, Feb. 1976.

takes the BCD data from the four-bit port. Data is placed in memory, the digit counter incremented; the computer waits for the second digit, gets that data and continues the process until all eight digits are in sequential memory locations, then exits to the monitor. Once the data is in memory, some routine is needed to output the frequency to the screen or printer. Development of this routine is left to you, as it will be dependent on how the data is to be used.

### A 100-MHz Front End

The 10-MHz counter is a simple unit, and serves as a primer for those interested in a good reporting frequency counter. This counter is well within the construction capabilities of amateurs who do a little computer hardware dabbling. The addition of an amplifier/prescaler/multiplexer is the next step up in complexity. If you take care in modifying the PC board to fit the parts layout, a good 100-MHz counter can be built using the same board. By adding a 95H90 prescaler IC, the upper frequency limit of the counter can be increased to 100 MHz. With the addition of the amplifier, a sensitivity of approximately 200 mV from 5 to 100 MHz can be obtained. Finally, a multiplexer may be added, which will allow the inclusion of seven additional TTL-level input channels.

The prescaler circuit is one originally described by Emerson and elaborated on by Kitchens.[3,4] If you want to keep the counter board intact, or are concerned about your prowess in adding the amplifier/prescaler to the board, build the circuits on another PC board. Artwork for such a board is provided in the Kitchens article. Thoroughly test the outboard unit, then use one of the eight input channels as the prescaled input, or skip the multiplexer addition and switch the prescaler in and out with a mechanical switch.

**Table 1**
**7226A/8255 Interconnections**

| Port | Data | Function | 7226A Pin | 8255A Pin |
|---|---|---|---|---|
| PA0 | in | digit 1 | 30 | 4 |
| PA1 | in | digit 2 | 29 | 3 |
| PA2 | in | digit 3 | 28 | 2 |
| PA3 | in | digit 4 | 27 | 1 |
| PA4 | in | digit 5 | 26 | 40 |
| PA5 | in | digit 6 | 24 | 39 |
| PA6 | in | digit 7 | 23 | 38 |
| PA7 | in | digit 8 | 22 | 37 |
| PB0 | in | BCD 1 | 18 | 18 |
| PB1 | in | BCD 2 | 17 | 19 |
| PB2 | in | BCD 4 | 6 | 20 |
| PB3 | in | BCD 8 | 7 | 21 |
| PB4-7 | not used | | | |
| PC0 | in | Measure in prog. | 3 | 14 |
| PC1 | in | Store | 5 | 15 |
| PC2-3 | not used | | | |
| PC4 | out | Reset in | 19 | 13 |
| PC5 | out | Hold | 39 | 12 |
| PC6-7 | not used | | | |

**Table 2**
**8080 Program Listing**

```
;Port PA input= digit enable D0-D7
;Port PB input= BCD data (4bits used)
;Port PC  - PC0 to PC3 input status
;PC4 - PC7 output control
;PC1 = 1: low then B.C.D.data valid
;PC4 = 1: set low the counter will reset
;mode word  for the 8255A PIA 3 ports  interface chip
;with the above configuration = 93H

INIT:   MVI   A,93H     ;SET UP PORTS A,B,C
        OUT   PIA       ;LOAD MODE WORD
        MVI   C,80H     ;LOAD DIGIT ENTR (D7)
        LXI   H,MEM     ;LOAD MEMORY PNTR
        MVI   A,00H     ;LOAD RESET WORD
        OUT   PC        ;RESET THE COUNTER CHIP
        MVI   A,10H     ;LOAD RUN WORD
        OUT   PC        ;LIFT RESET ON COUNTER CHIP

START:  IN    PC        ;INPUT STATUS
        ANI   10H       ;IS IT STORE
        JNZ   START     ;LOOP UNTIL IT IS

START1: IN    PA        ;INPUT DIGIT ENABLE
        ANA   C         ;IS IT THE CORRECT DIGIT
        JZ    START1    ;LOOP UNTIL CORRECT
        CALL  INDIG1    ;F.O. SO GET DIGIT
        MOV   A,C       ;SET UP DIGIT ENTR FOR ROTATE
        RRC             ;MOVE DIGIT ENTR TO NEXT DIGIT
        MOV   C,A       ;SAVE IT
        JNC   START1    ;TEST IF LAST DIGIT
        INX   H         ;INCREMENT MEMORY PNTR
        MVI   M,0FFH    ;LOAD LAST DIGIT MARKER

END:    JMP MONITOR     ;GO BACK TO MON.

INDIG1: IN    PB        ;INPUT B.C.D. DATA
        ANI   0FH       ;MASK OFF 4 L.S.B.
        MOV   M,A       ;STORE DIGIT
        INX   H         ;PNT TO NEXT MEM LOC
        RET
```

### Summary

Regardless of the number of additions you make to the basic 10-MHz counter, do them one at a time, testing each addition. You'll get your counter running in much less time than if you try to build it all at once. So, plug in your soldering iron and get closer to counting a few hertz!

**Notes**

[1]Available from your local Intersil distributor or Circuit Specialists Co., P.O. Box 3047, Scottsdale, AZ 85257. The order desk number is 800-528-1417; stock/price checks, 602-966-0764.
[2]Intersil, Inc., 10710 N. Tantau Ave., Cupertino, CA 95014. Tel. 408-996-5000.
[3]F. E. Emerson, "Circuit Improvements for the Advanced Frequency Scaler," *Ham Radio*, Oct. 1973, p. 30.
[4]M. D. Kitchens, "VHF Prescaler for Digital Frequency Counters," *Ham Radio*, Feb. 1976, p. 32.

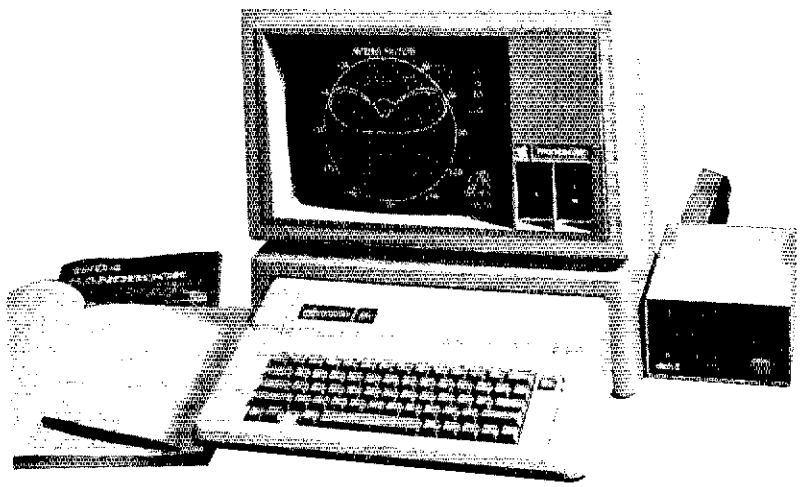
## Next Month in QST

Whether you swept the bands clean or just satisfied your competitive urge by joining the fray for an hour or two, you'll want to read the complete November Sweepstakes report in May *QST*. Elsewhere in the issue, you'll find

- a writeup on a spanking new Amateur Radio satellite, and an obituary for a now-dormant one.
- a nifty 30-meter VFO you can build in a weekend
- a rundown for beginners on inductors and transformers
- a way for computer-literate Novice examiners to produce exams quickly and easily

# The Effect of Real Ground on Antennas

*Part 2*[†]*:* Patterns of straight dipoles above perfect ground are easily found in antenna books. In Part 1, we analyzed straight dipoles above real ground. Now, we will study other dipole shapes.



By James Rautio,* AJ3K

In the real world, ground is not perfect and dipoles are not straight. This month, let's take a close look at several antennas that are dipoles but are not straight. We will analyze their performance over realistic ground conditions. Annie, the antenna analysis software described in part one of this series, will help us do this.[1]

One kind of "crooked" dipole we often see is a dipole without a center support. I encountered this situation last August when, after eight months of working on the computer program, I actually had time to do some antenna work. Annie had told me that my 80-meter dipole performed so poorly because it was only 20 feet (0.07 wavelengths) above an average ground.[2] The first thing I did was to cut the dipole for 40 meters. This is a tricky way to double the antenna height (in terms of wavelength). Not satisfied with that, I purchased a few more 20-foot 2 × 4s and raised the dipole to 40 feet. This placed the dipole at 0.28 wavelength, and the performance should be much better. With no center support, however, the dipole sagged about 5 feet, as shown in Fig. 1. Just how much does this affect antenna performance?

### The Sagging Dipole

To analyze a sagging dipole, we need to introduce another antenna term: monopole. Fig. 2A shows the usual dipole antenna-current distribution. As shown in Fig. 2B, a monopole is simply half of a dipole. All by itself, a monopole is of little use. But, put two of them together and you have a dipole. Since we can position each monopole any way we want, it's a simple

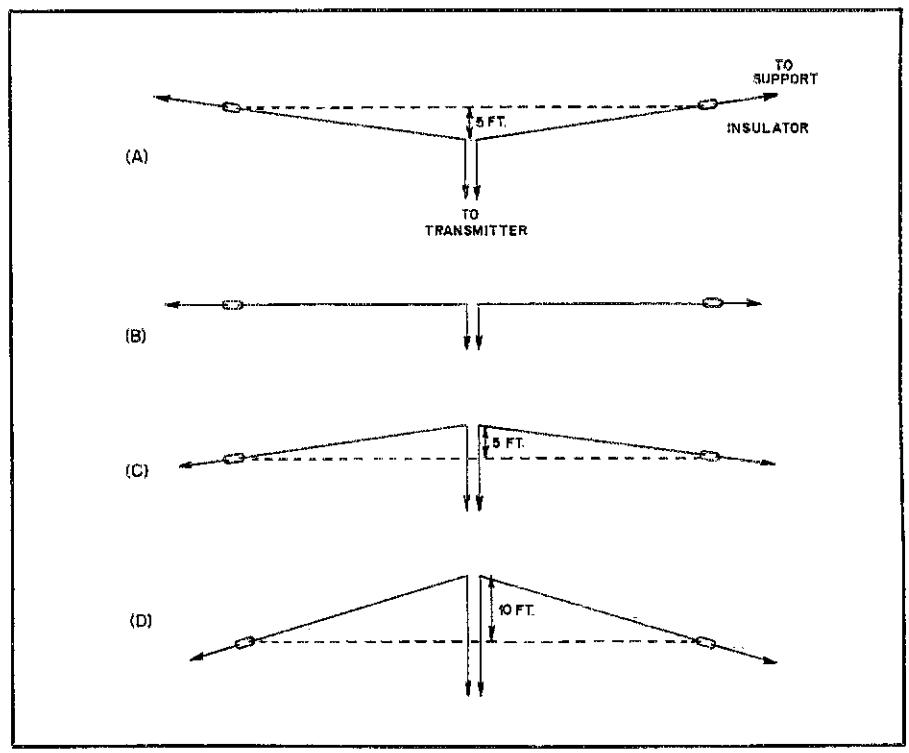



Fig. 1 — The sagging 40-meter dipole (A) is compared with a straight dipole (B), and two center-supported dipoles shown at C and D.

[1]Notes appear on page 36.

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[†]Part 1 of this series appeared in February 1984 QST.

matter to analyze a sagging dipole, as in Fig. 2C.

I entered the information for a sagging dipole into Annie and progressively raised the center, keeping the ends at a fixed height of 40 feet. The results are shown in Fig. 3. This graph is called a broadside theta cut. This means that the pattern is measured in a vertical plane, with zero degrees directly overhead. Since the dipole is perpendicular to the page, it is called a broadside cut. As you might expect, the differences amount to 1 or 2 dB as the center is raised.

Fig. 4 shows the calculated field-strength difference between a straight dipole and the sagging one (curve A), and between center-supported dipoles (5 ft and 10 ft at curves B and C) and the sagging antenna. Curve A shows that at angles close to the horizon, a straight dipole has up to ¾-dB advantage over a sagging dipole. The extra ¾ dB of low-angle radiation is taken from radiation near the zenith (90° above the horizon). This is exactly what we want to do: take power being radiated straight up and force it into low-angle radiation. Raising the center 5 feet above a straight dipole gives us the antenna of Fig. 1C with up to 1.3 dB gain over a sagging dipole. This is shown in Fig. 4, curve B. We can obtain an improvement of 1.6 dB over a sagging dipole by supporting the antenna center 10 feet above a straight dipole (Fig. 1D and Fig. 4, curve C).

One or 2 dB really isn't all that much, but let's look at its cost effectiveness, the dollar-per-dB figure of merit. For about $600, it is possible to buy 6 dB by using an amplifier to go from 250 W to a kilowatt. That's $100/dB. Now, to raise the dipole center, a TV-type push-up mast can be purchased for about $50. That figures to about $30/dB, a real bargain. In addition, if a couple of decibels can be gained at a few other places (for example, a lower-loss transmission line), it can really start to add up. Even 1 or 2 dB can make a difference in a contact that's down in the noise.

One thing that is working to our advantage in this situation is that the dipole is about ¼ wavelength above ground and we are pushing the center toward ½ wavelength high. If the entire dipole were ½ wavelength high, there would be a null toward the zenith, and the power previously being radiated straight up would be pushed to lower angles. You can see this trend in the curves of Fig. 4. The higher the antenna center, the less power goes straight up and more goes to lower angles. This means that the curves of Fig. 4 will be different for antennas at other heights. For the above calculations, I used a frequency of 7 MHz, a ground conductivity of 5 mS/m and a dielectric constant of 15.

## The Inverted V Problem

As we raise the center of a dipole while keeping the ends at a constant height, we make an inverted V. Since raising the center produces better performance, we might expect the inverted V to be a superb antenna. However, close inspection of Fig. 4 is cause for concern. Note that raising the dipole center from five feet above horizontal (curve B) to 10 feet (curve C) produces less than half the improvement of going from a straight dipole (curve A) to 5 feet. It is a disturbing trend.

In Fig. 5, we continue raising the center of the dipole while keeping the ends at 40 feet. The plots are in terms of apex angle, the angle formed by the two legs of the dipole at its center. An inverted V often has an apex angle of 90°. The dipole of Fig. 1C has an apex angle of 164° and that of Fig. 1D is 147°. Fig. 5 shows patterns of dipoles with apex angles of 120°, 100° and 90°.

We are keeping the ends of the dipole at 40 feet, so the closer the apex angle is to 90°, the higher the center of the dipole. But something very strange is happening. Even though the dipole center gets higher and higher, the pattern gets poorer and poorer. Because the current is at an angle to ground (see the arrows in Fig. 6), the current has both a horizontal and vertical component. But the vertical components are in opposite directions, and thus they cancel. This ef-

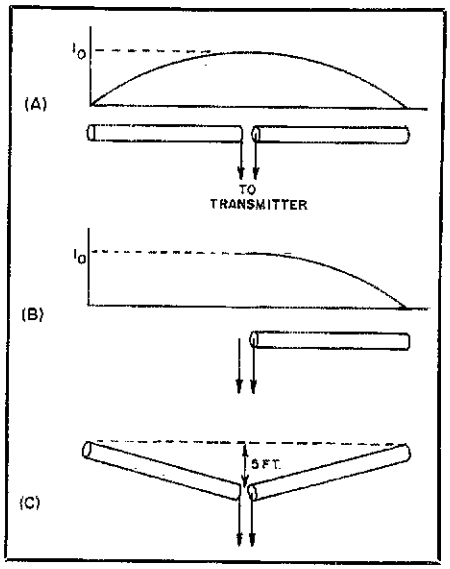


Fig. 2 — A dipole antenna has a sinusoidal current distribution, as shown at A. The monopole, shown at B, is half of a dipole and is not useful by itself. However, when two monopoles are put together with the proper orientation, as shown at C, they allow analysis of a large number of antennas.

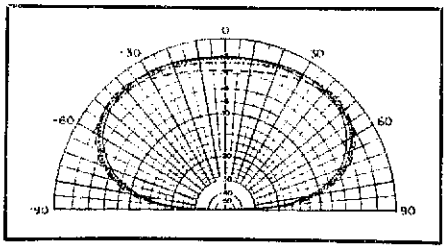

Fig. 3 — Antenna-pattern plots for some 40-meter dipoles. The solid line is for the sagging dipole of Fig. 1A. The dotted line represents a straight dipole; the dot-dashed line is for the supported dipole of Fig. 1C; and the dashed line is for the supported dipole of Fig. 1D. Add 6 dB to values shown.

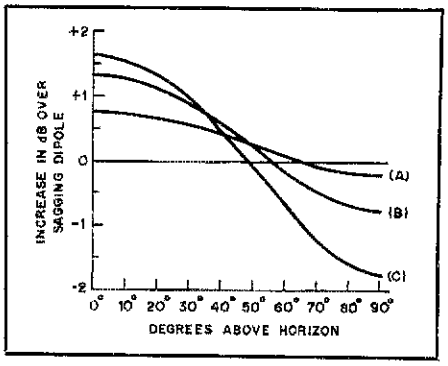


Fig. 4 — Graph showing the gain variation between a sagging dipole and the other antennas of Fig. 1. Curve A is the improvement afforded by a straight dipole over the sagging one. Curve B is the improvement provided by a dipole with its center supported 5 feet above the ends, and curve C is the advantage afforded by supporting the dipole center 10 feet above the ends. The dipole ends are 40 feet high in each case.

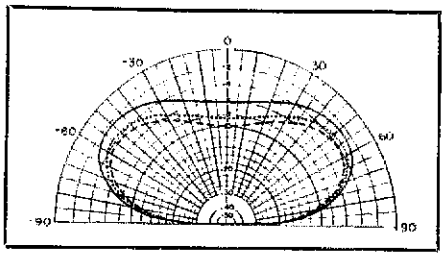

Fig. 5 — Inverted V performance depends to a high degree on the apex angle. The solid line is with an apex angle of 120°; the dotted line is for an angle of 100°; and the dashed line is for 90°. In each case, the ends of the inverted V are 40 ft high. Add 6 dB to values shown.

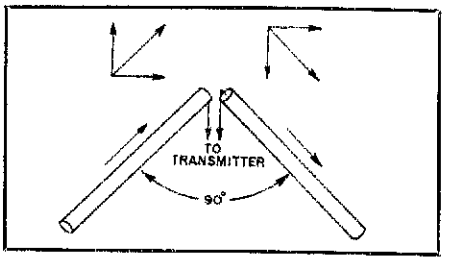


Fig. 6 — The inverted V antenna current can be broken into horizontal and vertical components, as shown. Since the vertical component of the current in one leg is in a direction opposite to that of the other leg, the radiation associated with these currents tends to cancel.

fectively cancels half the power that would otherwise be radiated. As the apex angle gets smaller, more of the current is cancelled. One would hope that because most of the antenna is higher, the effect of current cancellation would be counteracted. And it is, to a certain point. For this particular antenna, an apex angle of 140° is about optimum, given that the ends of the dipole can be no higher than 40 feet. Of course, if we could raise the whole antenna, not just the center, we would have an even better situation. The dollar-per-dB figure may increase, though. Apex angles of less than 90° result in poor performance (0° should give no radiation at all), and are to be avoided if at all possible.

Since an inverted V with the ends near the ground is a common antenna, a plot of its performance is shown in Fig. 7. The antenna has an apex angle of 90°, and the center is 0.2 wavelength above average ground.

As with the other plots, the outer edge is the best a single dipole above a perfect ground can possibly do. This inverted V is 7 dB down, even at its best. This means that if you have a 100-W transmitter, the effective power is less than 25 W.

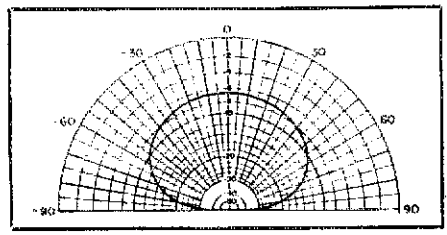


Fig. 7 — The antenna-pattern plot of an inverted V with an apex angle of 90°. The apex is 0.2 λ above average ground for this example. Add 6 dB to values shown.

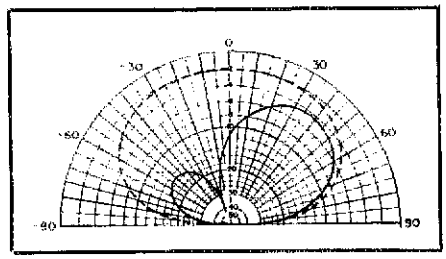


Fig. 8 — The solid line is the radiation from a 3-element V beam, and the dashed line is for a straight dipole. The center of each antenna is 0.2 λ above average ground in this example. Add 6 dB to values shown.

### The V Beam

To improve the performance of an inverted V, a few elements may be set up as a beam. Annie was used to place three copies of the inverted V shown in Fig. 6 one after the other with a spacing of ¼ wavelength. Each element was fed with ⅓ of the total power. Power was fed to the element at one end with no phase delay; the power to the center element was delayed by 90° and the power to the other end element was delayed by 180°.

The best response of this V beam (Fig. 8) is about 3 dB better than a single V by itself. For reference, a straight dipole, also 0.2 wavelength high, was plotted.

Fig. 9 shows the directivity of the V beam (at 30° above the horizon). This figure shows that if you have lots of signal to play with and want some front-to-back ratio, a V beam would be worth investigating. These results should be viewed with some caution because the effect of coupling between the elements of the array (i.e., mutual coupling) is not included.

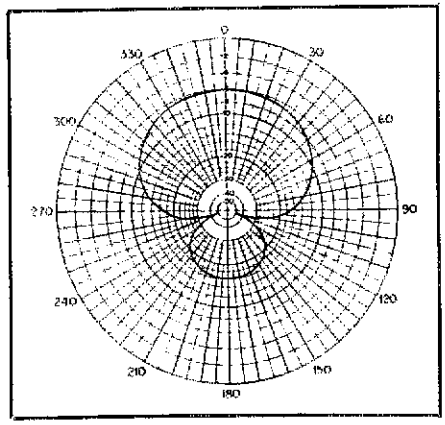


Fig. 9 — The directivity of the V beam provides a good front-to-back ratio. This pattern shows the radiation 30° above the horizon. Add 6 dB to values shown.

### The Flat Top

The FCC, and our fellow hams, get upset when an SSB rig starts "flat-topping." However, the flat-top antenna combines most of the dipole's advantages with some of the V's compactness. Fig. 10 shows a sketch of this antenna. Recall that the V's performance degrades because the vertical components of the antenna current cancel. Since most of the current is in the center of the dipole, we can just make the center section straight and let the ends drape down. This still requires two supports, but at least they no longer have to be a half wavelength apart. The ends can drape down at any angle, but we will look at 45°.

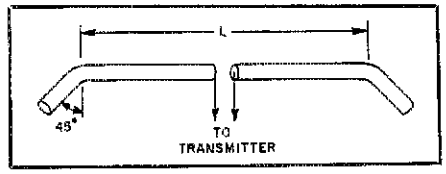


Fig. 10 — The flat-top antenna is a dipole with drooping ends. The flattened portion is of length L, and the remainder of the ½ λ dipole droops at some angle, 45° in this case.

Fig. 11 shows the patterns for L = 0.1, 0.2 and 0.3 wavelength where L is the length of the flat top. The top of the antenna is 0.2 wavelength above an average ground. Even a short (0.1-wavelength) flat top portion produces a substantial improvement over an inverted V. When the flat top portion is increased beyond 0.3 wavelength, the response is very nearly as good as a dipole.

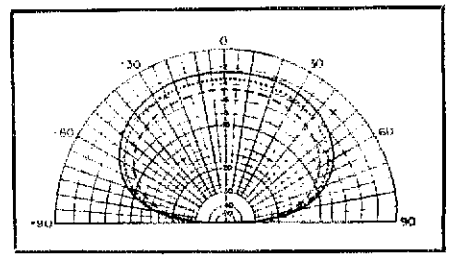


Fig. 11 — Antenna-pattern plots of three flat-top antennas. The solid line is for a 0.3-λ portion, the dotted line is for a 0.2-λ flat portion and the dashed line is for a 0.1-λ top. The antenna centers are 0.2-λ high in each case. Add 6 dB to values shown.

### Situation: Hopeful

If you have an inverted V, the situation is far from hopeless. You can increase the apex angle in any number of ways. The flat top can also provide a good compromise. If you have a dipole, a few more decibels can be squeezed out if it's possible to raise the center slightly. And speaking of squeezing a few decibels out of a dipole, we'll be checking out sloping dipoles in the next part of this series.

**Notes**

[1]Annie runs on the Apple® II+ (language card required) or Apple //e, with DOS 3.3. It is available for $49.95 plus $2 handling (New York residents add sales tax). Include full name and call. Alternatively, you may send a description of your antenna, and Annie will be used to analyze it for a modest charge. Write for details. Sonnet Software, Dept. Q, 4397 Luna Course, Liverpool, NY 13088.

[2]m = ft × 0.3048.

## Strays

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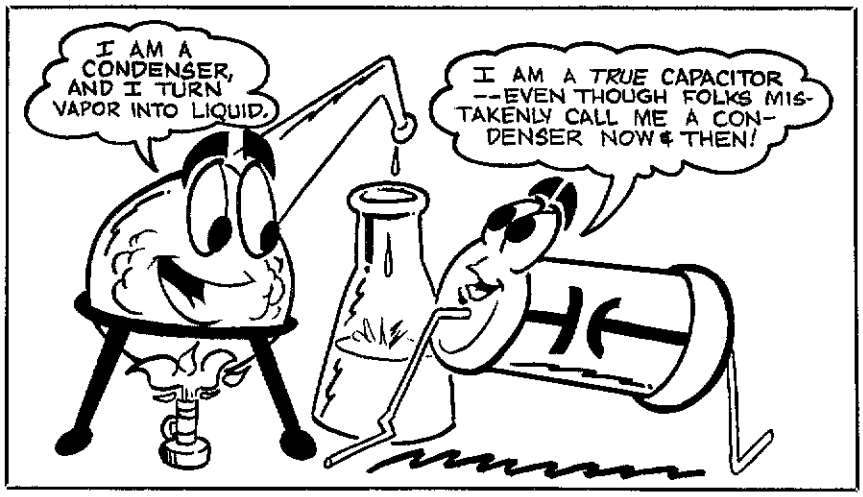
• *First Steps In Radio*

# Getting to Know Capacitors




*Part 4:* Along with resistors, which we explored last time, capacitors are an integral part of radio electronics. Don't bypass this installment.

By Doug DeMaw,* W1FB

What purpose do capacitors serve? We could compile a long list of functions if time and page space permitted. But, for this discussion we will examine their most common applications. You may have heard people refer to them as "condensers." That misnomer has been popular since the beginning of radio, but it does not describe the function of a capacitor. A retort in a chemistry lab is a *condenser,* since it converts vapor to liquid, but a capacitor can't function that way. Rather, it stores dc energy, but permits the passage of ac energy. In other words, the device has a *capacity* for storing energy, the magnitude of which is expressed in farads (F), microfarads ($\mu$F) or picofarads (pF). Capacitors are rated in some parts of the world in nanofarads (nF) as well. A capacitor is a component that consists of two electrodes separated by a dielectric (an insulator), such as air, or some solid material.

The *dielectric* material of a capacitor is the insulating medium between the electrodes, or *plates.* Generally, it is air for variable capacitors (sometimes called tuning, trimmer or padder capacitors). The insulation in fixed-value capacitors may consist of treated paper, mica, glass, polyethylene, polystyrene, Mylar or a host of other substances. Some variable capacitors (movable plates) have a solid dielectric between the plates. Smaller trimmer or padder capacitors have thin sheets of mica between their plates.

Each type of insulation has a different characteristic (factor) with regard to the voltage it can accommodate for a given thickness before breakdown (puncture). The dielectric factor ($\epsilon$) also determines the amount of capacitance for a specified plate spacing and area. Dry air and helium are considered to be the best dielectrics for capacitors that must be used in high-voltage circuits.

### Some Names and General Descriptions

Simply, we can think of a capacitor as a device that permits the flow of ac energy, but blocks the passage of dc energy. A basic capacitor is illustrated in Fig. 1A. The more plates we add, the greater the effective capacitance for a given plate spacing (Fig. 1B). The greater the plate spacing, on the other hand, the lower the capacitance and the higher the safe voltage rating. In the case of air-dielectric and other capacitors, an arc occurs between the plates when the voltage is too high for the insulation.

We will hear about and frequently use what is known as a "paper," or "tubular" capacitor. This type consists of many layers of treated paper or other insulating

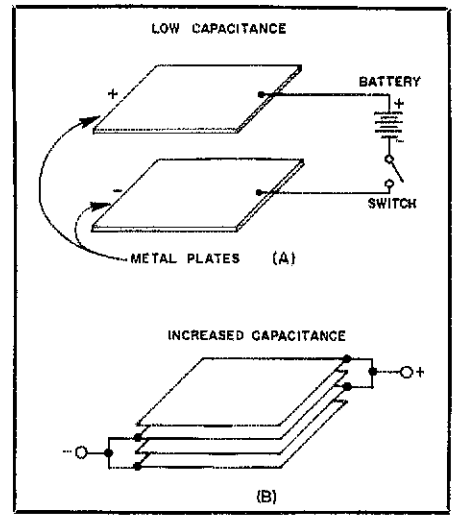



Fig. 1 — Example of a simple capacitor (A) that has two electrodes, or plates. A multiplate capacitor is shown at B. It has greater capacitance than the example at A.

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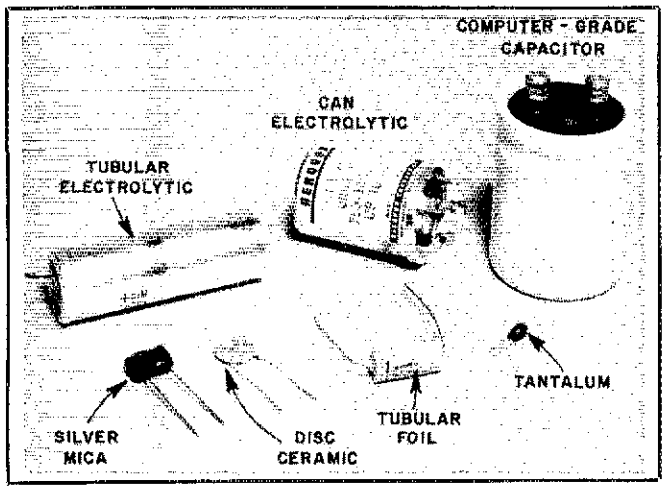


Fig. 2 — Various fixed-value capacitors are seen in this photograph.

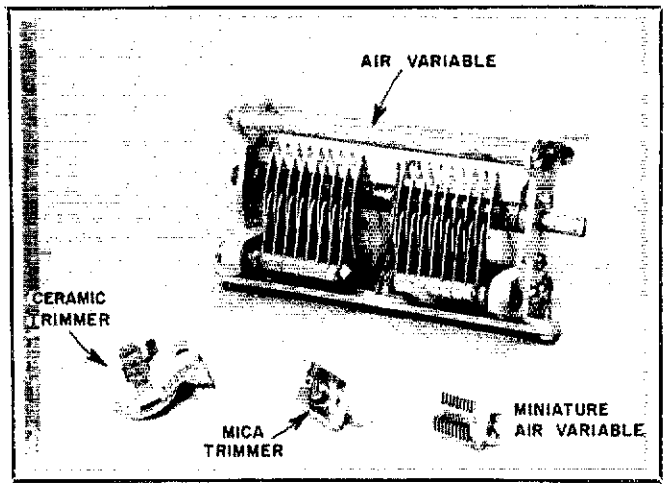


Fig. 3 — Examples of variable capacitors.

material, rolled into a cylinder. The surface of the insulation has a metallic electrode affixed to it. Two such electrodes are used in parallel, and each is insulated from the other. A wire lead is connected to one electrode, and another such lead is attached to the remaining electrode. If the capacitor is a polarized type, one terminal is marked with a minus sign (−) and the other has a plus sign (+). Some of these capacitors, when polarized, lack the plus and minus signs. Instead, there is a black band around one end of the capacitor to indicate the negative terminal. By rolling the electrodes and insulation into a tight cylinder it is possible to obtain large amounts of capacitance in a small package. This is not practical for variable capacitors.

You will hear also about "oil-filled" capacitors. These are designed for high capacitance and high voltage. The plates are insulated by an oil that has a high dielectric factor. We will find these units mainly in high-voltage power supplies.

The highest capacitance ratings can be found in what many people call "computer-grade" capacitors. These are large cylindrical units that contain a solid dielectric. They are encased in an aluminum cylinder. It is not unusual to find them with ratings of 50,000 μF or greater, and with dc-voltage ratings as high as 450.

Another type of high-capacitance device is the "tantalum" capacitor. These miniature low-voltage devices are ideal for use in printed-circuit-board assemblies because of their small size. They are considered to be high quality units, and have ratings well into the high-microfarad region.

Still another capacitor is the "vacuum" type. These units have the air evacuated from them at the time of assembly. They are built into glass containers with metal end caps. Because of this lack of true dielectric material (a vacuum), they can accommodate tremendous voltage levels without breaking down. They are expensive and large, but many amateurs use them in special circuits. Vacuum variable capacitors are also available as replacements for air variable capacitors.

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The most common of the fixed-value capacitors is the "disc ceramic." They are disc-shaped and have two wire leads coming from them. Most of these capacitors look like pieces of gum that someone has stepped on. Ceramic is used for the insulating medium. They are small and especially convenient for use on etched-circuit boards. Values as great as 0.1 μF are common, and voltage ratings as high as 1000 or greater are available for the lower-capacitance units.

Another common capacitor is the "mica" type, named for its dielectric material. The plates of the one variety are coated with silver, hence the name "silver mica." These are considered to be high quality components with reasonably good tolerance in terms of the marked values. They are often preferred to disc-ceramic capacitors when values less than, say, 2000 pF are needed in circuits that must be stable (such as in oscillators and filters for radio frequencies). They are not affected by heat as much as some other kinds of low-capacitance units. The effects of heat can be seen in a gradual change in capacitance value. Cold temperatures have a similar effect, but in an opposite direction with respect to net capacitance at a given instant. Some ceramic capacitors are specially manufactured to serve as "compensating" capacitors for various conditions of heat or cold. They are rated with particular "temperature coefficients."

You will use many capacitors that are called "electrolytics." These are designed for high values of capacitance (as are computer-grade and tantalum capacitors), and they have polarity marks on them. Electrolytic capacitors are used in power supplies (for ripple filtering) and in audio circuits as coupling and bypassing units.

Fig. 2 shows a collection of fixed-value capacitors. Variable capacitors appear in Fig. 3. To summarize this section of our lesson, we should remember that the farad (F) is the basic unit of capacitance. The μF is $10^{-6}$F; the nanofarad is $10^{-9}$F; the picofarad is $10^{-12}$F. Learning these relationships will help us to perform pertinent mathematical exercises when we become proficient enough to start designing our own circuits.

### Selecting and Using Capacitors

Some of you may have concluded after looking at schematic diagrams in *QST* that following or building a circuit is next to impossible. Not so! You need not fear the use of capacitors or resistors. Many beginners to electronics think they must use the exact item called for in the parts list; this is seldom a requirement. It is important, however, to know which types of capacitors are best for a certain kind of circuit. Table 1 provides a useful generalization concerning capacitors and the kinds of applications they are best suited for.

The value specified is not critical in many circuits. The notable exception is seen when a capacitor is part of a frequency-determining circuit (such as tuned circuits

**Table 1**

**Common Capacitor Types and Applications**

| *Application* | *Capacitor Type* | *Frequency Range* |
|---|---|---|
| Radio-frequency circuits | Disc ceramic, silver mica, tubular ceramic, polystyrene and air or ceramic variables. Mica trimmers and teflon trimmers are also suitable. | 50 kHz through VHF (see text). |
| UHF and microwave circuits | Ceramic chip capacitors. Glass piston trimmers and some small air-dielectric trimmers. Air disc variables are also used. | 150 through 1296 MHz, generally. |
| Audio and very-low-frequency (VLF) circuits | Tantalum, electrolytic, tubular, Mylar, oil-filled and all of the above. | 10 kHz through 500 kHz, generally. |
| Power supplies and voltage regulators | Tantalum, oil filled, computer grade, electrolytic and tubular paper. | 25 Hz through 3 kHz. |
| Tuned circuits at radio frequencies | Air variables, mica trimmers, ceramic trimmers, glass piston trimmers and tuning diodes. | 50 kHz through VHF and higher. |

in transmitters and receivers), or when they are used in what is known as a "timing circuit." The voltage rating is *always* important, though. If a specific voltage rating is listed, it's alright to use a unit with a higher voltage rating; but don't install a capacitor that has a lower voltage rating.

In circuits where capacitors are used for bypassing or coupling between stages, we can usually get by with values other than those specified. For example, if a transistor emitter is bypassed to ground with a 10-μF, 6-V capacitor, we can safely use, say, a 15-μF, 25-V unit, if that's all we have on hand. Similarly, if a transmitter circuit calls for a 100-pF ceramic coupling capacitor, we may substitute a 150-pF silver-mica unit without a significant change in performance. Or, if we happen to have only a 68-pF part on hand, we might use it as a substitute.

Depending on how they are constructed, some capacitors have an unwanted characteristic known as "stray inductance." What we are seeking in a capacitor is *pure capacitance*. We do not want the elements of resistance and inductance to be present, for they affect the quality of the capacitor — especially at the higher frequencies. Unfortunately, all capacitors have resistance and inductance associated with them. Some styles are much worse than others; therefore, we should always select the units we use in accordance with Table 1. This will help to minimize the effects of the resistance and inductance that is present.

A component I did not mention earlier is called a "chip capacitor." These specially manufactured small parts have no wire leads to cause unwanted inductance. They are square or rectangular in shape and have silver-plated electrodes. The dielectric is ceramic. You can actually solder a chip capacitor directly to the copper elements of a circuit board. This keeps the connecting leads of the circuit very short. Chip capacitors are used mainly at very-high frequencies (VHF) and above. Conventional fixed-value capacitors will not function as true capacitors in some VHF circuits. The main problem associated with chip capacitors is high cost and limited availability for ham use. As an example of what we are discussing here, a silver-mica capacitor may have a marked value of 56 pF. At 3.5 MHz it will function in accordance with that marking, since stray resistance and inductance will be too small to be significant at that low a frequency. But, at 146 MHz (VHF), it might appear as a 220-pF capacitor because of the combined effects of stray resistance and inductance. To minimize these effects, the leads of all capacitors used in a radio-frequency circuit should be cut as short as possible, still allowing ample lead length for soldering. In audio and power-supply circuits, this is not a requirement.

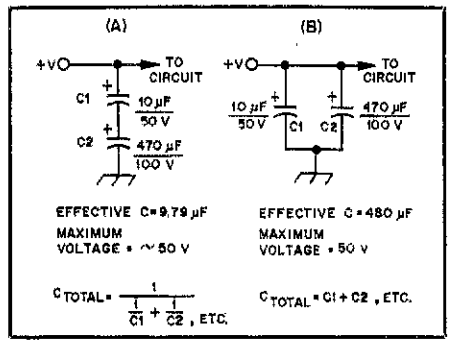


Fig. 4 — Capacitors in series are shown at A. The example at B shows capacitors in a parallel arrangement (see text).

### Combinations of Capacitors

When we use capacitors in series or in parallel, we get the opposite effect than is experienced with similar configurations of resistors (Fig. 4). That is, the net value of capacitance for two capacitors hooked in parallel is the capacitance of one plus that of the other. Conversely, when we use them in a series hookup, we end up with slightly less capacitance than the marked value of the smallest one. The voltage rating of parallel-connected capacitors is that of the unit having the *lowest* voltage rating. Series-connected capacitors divide the applied voltage according to the magnitude of their capacitance. The voltage across each capacitor is proportional to the total capacitance divided by that of the individual capacitor. It is best to use capacitors of the same voltage rating to avoid problems. We will often find equalizing resistors connected across the various capacitors in a series combination. This helps to ensure an equal division of operating voltage across each unit.

### Capacitors in an Actual Circuit

Fig. 5 shows a typical two-transistor circuit for use as an audio amplifier. Examples of bypass and coupling (blocking) capacitors are given. C1, C2 and C7 are coupling capacitors. Audio energy is able to pass through them, but dc voltage is blocked by the capacitors. This is just like a gate for the audio (ac) voltage, but it

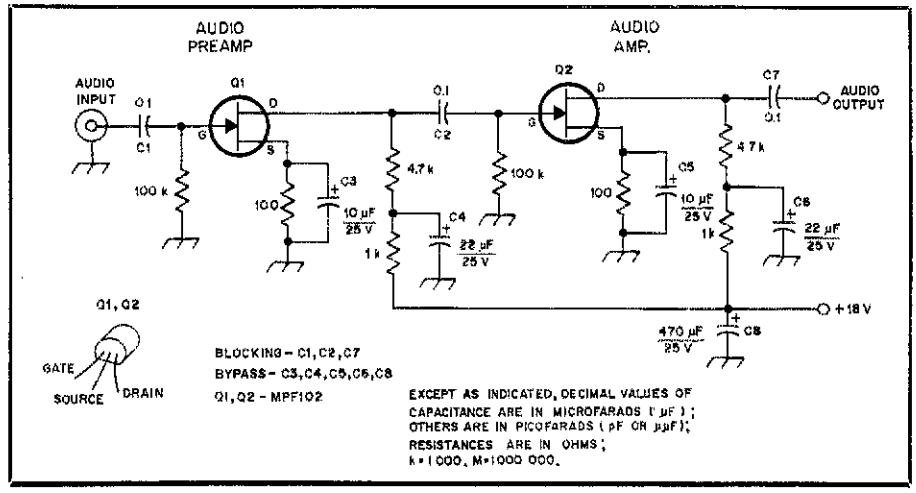


Fig. 5 — Illustration of a simple audio-amplifier circuit that uses coupling and bypass capacitors. Their functions are discussed in the text.

becomes a "brick wall" for the dc voltage. The ac voltage must pass through that branch of the circuit in order for us to have the benefits of audio amplification. But, if dc were permitted to pass through the same branch of our circuit, too much voltage would appear in the wrong places. The transistors could burn out, or amplification would not occur.

C3, C4, C5, C6 and C8, on the other hand, are bypass capacitors. We want the ac voltage to be directed to ground at these points. So, the capacitors permit this to happen while preventing dc voltage from going to ground. In other words, we are bypassing unwanted ac (audio) energy away from the circuit elements to which the capacitors are attached.

You will notice that C3, C4, C5, C6 and C8 have the polarity (+) indicated. Always be sure to hook the + sign to the plus-voltage line. The negative ends of those capacitors must go to ground. Otherwise, they could become hot, or even explode! I have had a few electrolytic and tantalum capacitors blow apart because I hooked them up backward. The sound is not unlike that of a gun going off! *Use caution.*

The polarized capacitors of Fig. 5 can be of the electrolytic, tantalum or computer-grade types with respect to satisfactory performance. The electrolytic units, preferred by most hams, will cost the least.

### Still Another Type of Capacitor

A number of semiconductor diodes are available for use as "electronic capacitors." Such a device is shown in Fig. 6, as D1, which is the designator for a diode. In this circuit, the diode functions as a variable capacitor to change the frequency of the tuned circuit that includes L1 and C1. As the operating voltage (dc) is varied at the diode terminal by means of R1, the internal capacitance of the diode changes. R1 would therefore become our panel-mounted tuning control. We could use it with a dial that showed the frequency versus the setting of R1. This type of tuning element has a number of trade names connected with it, such as Varicap® and Epicap®. It is known also as a *varactor* diode. Many FM and TV sets use these diodes for tuning in the stations.

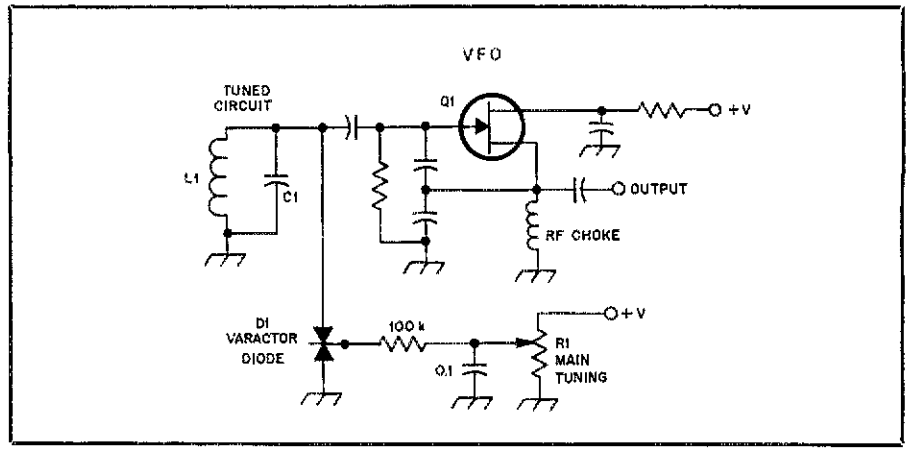


Fig. 6 — D1 in this circuit is an electronic capacitor. It is a semiconductor diode with two anodes and one cathode. You may learn how it works by reading the text.

**Glossary**

dielectric — an insulating medium. A nonconductor of direct current. Air, mica and ceramic are examples of dielectric materials.

electrode — a conductor that is used to establish an electrical connection to a nonmetallic part of a circuit. The plate cap on a vacuum tube is one example. A battery terminal is another.

electrolytic — an action caused by electrolysis. *Electrolyte* is the medium needed to make a device electrolytic. It is a nonmetallic conductor in which current is carried by the movement of ions. Such ionic conductors are found in wet batteries and electrolytic capacitors.

filtering — the electrical process of removing unwanted signals, ac frequencies or dc from incoming energy. Filters are used in receivers to permit the passage of desired signals while restricting the passage of unwanted, interfering signals. They are used also in transmitters to ensure purity of the output signal. Filters are used in power supplies to remove the ac ripple energy from the desired dc output voltage.

microfarad — a numerical expression for a portion of the farad, which is the basic unit of capacitance. Microfarad, expressed also as μF, is 0.000,001 farad, or $10^{-6}$ farad. For example, a 100-μF capacitor is 0.0001 farad.

padder — a variable capacitor, generally of small physical size and relatively low capacitance range, adjusted by means of a screwdriver or other small tool. Normally used to tune a particular circuit to a specific frequency. Sometimes padder capacitors are referred to as *trimmer* capacitors.

picofarad — abbreviated pF, a numerical part of the farad. It is 0.000,000,000,001 farad, or $10^{-12}$ farad.

stray inductance — unwanted inductance in a circuit. A piece of hookup wire or a printed-circuit board foil will introduce a certain amount of stray inductance. Too much stray inductance can spoil circuit performance. Becomes more pronounced as the operating frequency is raised.

tantalum — a substance used in the manufacture of certain types of capacitors. The size of the tantalum bead determines the capacitance of an individual unit. Tantalum capacitors can be made much smaller than electrolytic units of the same value.

varactor — variable-reactance diode. A semiconductor diode that functions as a voltage-variable capacitor. The capacitance of a varactor depends on applied voltage amplitude and polarity. These devices are used in place of mechanical tuning capacitors in many circuits.

very high frequency — known also as VHF. The band of frequencies that lies between 30 and 300 MHz. The 6- and 2-meter bands are examples of amateur VHF bands.

### What Have We Learned?

Although we have only covered the basics of capacitors, we have discovered that they are a "must" in most electronics circuits. They can be used for many purposes, and they come in many shapes, sizes, ratings and types. Their greatest use is for bypassing (filtering) and coupling in radio circuits.

We can summarize additionally by recalling that each capacitor has a particular maximum voltage rating that we must pay close attention to. We need also to observe the polarity marked on some types. Most small capacitors are not polarized, which means we can hook either end to a circuit point.

It is not mandatory that we use the exact capacitor called for in a construction project. For the most part, we can use a value that is reasonably close to the indicated one, and no problems should be experienced. We can also substitute some kinds of capacitors for others when the need arises, consistent with the data in Table 1.

We may obtain specific values of capacitance by using two or more capacitors in series or parallel. This is handy when we do not have a particular value available for a project. A happy amateur is usually one who is an inveterate experimenter. Parts substitution is part of the game. If your circuit calls for a 100-pF variable capacitor, don't be afraid to use a 150-pF unit. It will simply extend the effective tuning range of the circuit. Using more, rather than less, is a good rule of thumb, for too little capacitance in a variable unit will restrict the tuning range. Many hams pull the plates (vanes) from a too-large variable capacitor until the maximum-capacitance value is close to the prescribed one. I've done it many times.

# Artificial Radio Aurora: The Sequel

Based on previous experiments, the authors deduced, contacts should be possible via the RF energy produced from the massive competition to work the Space Shuttle *Columbia.* Despite early setbacks, their results exceeded their wildest expectations.

By Richard R. Farman,* K2QR, Donald A. Reschke,** WA2SZY and William A. Farman,*** WB9QBU

For many years now, radio amateurs have enjoyed working aurora on the 144-MHz band. Lately, however, there have not been as many openings as VHF DXers would like. Even the hypothesis of increased aurora after the peak of the sunspot cycle has not come true.[1] WA2SZY and I were convinced that artificially induced aurora would provide the long-sought band openings,[2,3] but how could we generate enough RF to heat the ionosphere?

The announcement of W5LFL's operation aboard the *Columbia,* STS-9, brought the obvious answer: *We* didn't have to generate the RF! Tens of thousands of amateurs would be transmitting simultaneously with a relatively high angle of radiation. Could we take advantage of this once-in-a-lifetime barrage of RF? Using preliminary STS-9 orbital data,[4] we used an 8080A S-100 computer and a modified OSCARLOCATOR to generate preliminary ground tracks. Amateur population data by states showed us where most of the RF might come from and, hence, which way to point our antennas.[5] (This derivation is left as an interesting exercise for the reader. Hint: The answer is *not* north!).

WA2SZY and K2QR are only 8 miles apart; we needed another station to make this idea work. WB9QBU, in Illinois, 600 air miles from Upstate New York, was the logical choice for the western end of the experiment. A short telephone call was all it took and Bill enthusiastically joined the team.

Our plan was to transmit CW on 144.040 MHz using meteor-scatter type sequencing with WB9QBU (8877, one 12-element Yagi) transmitting during the first half of each odd minute; WA2SZY (4CX250, 2 × 12-element Yagi) would take the second half. K2QR (two 4CX250, 4 × 13-element az-el) would monitor, use elevation to maximize any returns, and transmit only after coordinating with WA2SZY via a 6-meter AM link. (We expected the broader beamwidth antennas would give us the advantage of illuminating more sky.) After much discussion, we decided to make our transmissions coincide with everyone else's and ignore any time lag associated with the ionospheric heating process. Things would be busy enough without having to worry about when to transmit.

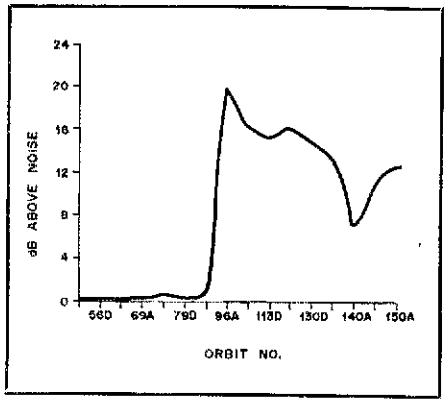


Fig. 1 — As this plot of signal strength (in decibels above noise) for various STS-9 orbits shows, the best success came during orbit number 96A. After the authors got the hang of artificial aurora operation, signal levels between K2QR and WA2SZY in Upstate New York and WB9QBU in Illinois improved markedly.

### At Last: Our Three-Way is Achieved

Our first attempt, during orbit 49A, was disappointing. All stations were operating, but a crucial error when converting from MET (mission elapsed time) to UTC had us transmitting when *Columbia* was over the Indian Ocean. Our next opportunity was orbit 96A, and our success was beyond our wildest dreams. Signals between Don, WA2SZY, and Bill, WB9QBU, were weak at 1331Z, but built up steadily to R5,S4 as *Columbia* and W5LFL moved within range of more and more amateurs who then joined the fray. The initial contact completed, K2QR called WB9QBU, whose signals peaked 19.83 dB above the noise. The three-way contact continued until LOS (loss of signal) reduced the onslaught of RF to below the ionization minimum.

Our activity continued throughout the STS-9 mission. Using off-work hours, judiciously chosen vacation days and the death of a great-grandmother, we managed to operate during 16 orbital passes. Even though W5LFL could not be on during all announced operating times (per WA3NAN and W1AW), we could still communicate because amateurs on the ground were still operating! Artificial-aurora-reflected signals between Illinois and New York averaged 8.6 dB below those orbits when Dr. Garriott was heard operating, however.

This raises an interesting possibility. An operational ham station does not have to be on board the Shuttle — all that is required is the *rumor* of space operation! We are looking forward to future STS amateur in-space operations, and challenge others to form teams and duplicate our experiments. Having found operation at VHF so easy, we will continue our experiments using Gunnplexers at 10 GHz during the next opportunity.

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**Star Rte. 1, Box 25a, Owego, NY 13827
***636 Valley Park Dr., Libertyville, IL 60048

**Notes**

[1]M. I. Skolnik, *Introduction to Radar Systems* (New York: McGraw-Hill, 1982).
[2]V. R. Frank, "Scattering Characteristics of Artificial Radio Aurora," *Ham Radio,* Nov. 1974, pp. 18-24.
[3]V. R. Frank, R. B. Fenwick and O. G. Villard Jr., "Communication at VHF via Artificial Radio Aurora," *QST,* Nov. 1974, pp. 27-31, 34.
[4]B. Glassmeyer, P. R. O'Dell and R. Neal, "Space Shuttle *Columbia* Calling All Radio Amateurs," *QST,* Aug. 1983, pp. 50-51.
[5]*Radio Amateur Callbook,* Vol. 58, No. 1, p. 10.

# Hints and Kinks

Conducted By Larry D. Wolfgang,* WA3VIL

## SAFE AC-POWER WIRING PRACTICES

☐ A serious ac-power wiring error appeared in the January 1984 *QST* article, "Getting into Amateur Radio Electronics." I am taking this opportunity to go over some important safety rules, and also to clarify *QST* style with regard to ac wiring. Some of our style for schematic diagrams has been revised as a result of the error.

Of primary concern are the pictorial and schematic diagrams of Fig. 2 on page 23 of the January article. Wired as shown, that power supply could be a killer! The ac-mains neutral wire should *never* be switched while the 117-V hot wire remains connected to the circuit. If transformer T1 had a defect that allowed the primary winding to contact the frame or chassis, the entire chassis would become hot (it would be at a potential of 117-V with respect to ground). The unsuspecting operator who touched a grounded object and the chassis could be electrocuted, even though the power supply was switched off.

A less disastrous scenario would develop if the power-supply chassis was properly grounded through the third wire of the ac power system. In that case, the defective transformer would cause the fuse to blow, disabling the supply.

The July 1981 issue of *Ham Radio* reported a similar situation.[1] Because his house wiring did not include the third wire safety ground, this ham wired an outlet box using grounded outlets and a two-wire power cord for use with his grounded equipment. A shorted transformer in his amplifier burned out even though the power switch on his outlet box was off. In this case, the switch turned out to be in the neutral wire when the plug was inserted one way, and in the hot wire if the plug was reversed. Since the amplifier had an RF-ground connection, the circuit was completed without the switched neutral wire. A fire could easily result from such a situation.

Fig. 1 shows the proper way to wire the power supply shown in the January article. The switch should always be in the hot lead, in series with the fuse and the transformer primary, but placed between the two. This will ensure that the supply is fused properly, and that no safety hazard is present. Standard wiring practice requires that the neutral line be uninterrupted back to the point of supply, which in this case would be the home distribution box.

The only time it is permissible to place a switch or circuit breaker in the neutral line is if it is mechanically connected to a switch or breaker in the hot wire. Fuses in both lines would not be acceptable because the neutral fuse could open first, leaving the entire circuit connected to the hot line. A primary function of the fuse or circuit breaker is to disconnect all parts of the circuit in the event a fault (overload or short circuit) occurs.

If your shack does not have properly wired grounded outlets, the best thing to do would be to hire a qualified electrician to install some for you.[2] But if you must use an outlet box as described earlier, then a double-pole switch would provide about the safest wiring. A polarized two-conductor plug could be used, in which case a fuse or circuit breaker could be added in the hot lead. Fig. 2 shows a wiring diagram. One way to check your external ground connection is to carefully measure the voltage between the hot and neutral wires and then measure the voltage between the hot wire and the ground wire. The voltages should be exactly the same.

Fig. 3 shows the schematic symbols used in *QST* and other League publications for ac-power wiring. Note that the wider blade or slot on the 117-V connectors goes to the neutral, or white, wire and the narrower one goes to the hot, or black, wire. The CEE-22 male chassis-mount connector does not have a wider blade, so if you use these connectors in your next project be sure

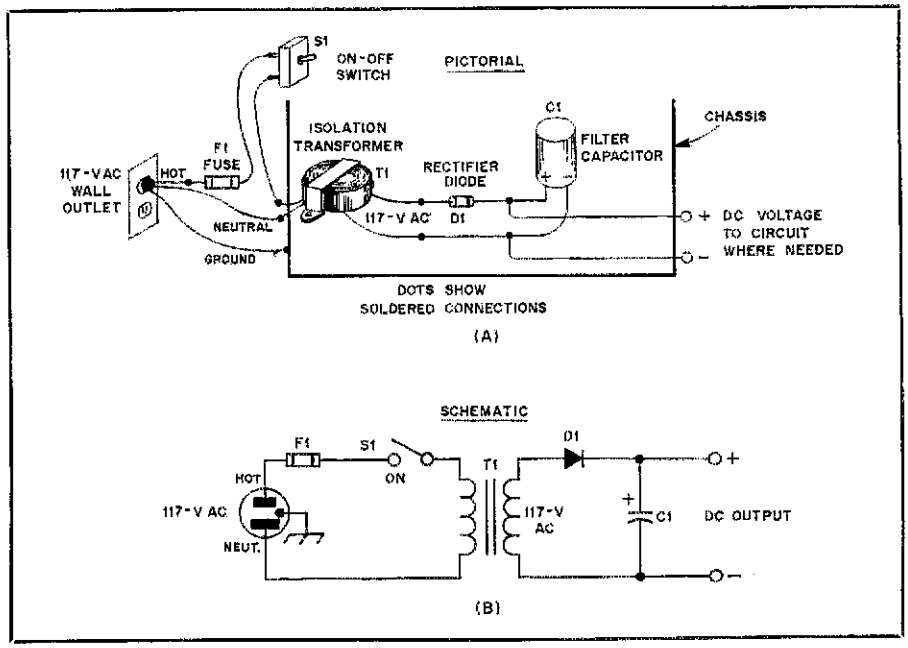



Fig. 1 — A corrected Fig. 2 for the January 1984 *QST* article, "Getting into Amateur Radio Electronics." A pictorial diagram of a dc power supply that is operated from a standard wall outlet (117-V ac) is shown at A. D1 changes the ac voltage to pulsating dc voltage, and capacitor C1 removes the small amount of ripple that remains after rectification. The same circuit is shown in schematic diagram form at B.

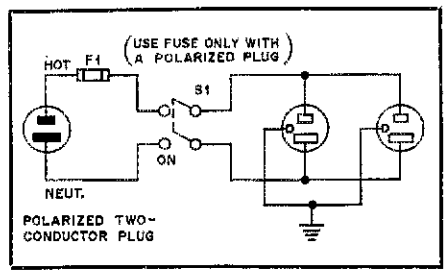



Fig. 2 — Schematic diagram of an adapter box, to allow the use of three-wire grounded equipment with old two-wire house wiring. If your receptacles will not accept a two-conductor polarized plug, do not include the fuse. Be certain the house wiring is fused properly, and do not overload the circuit! The ground pin on the receptacles must be connected to a good external ground.

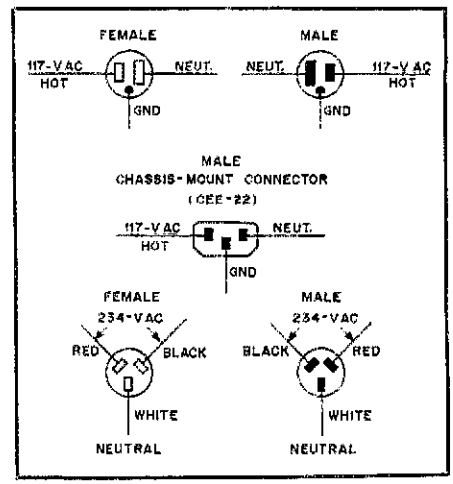



Fig. 3 — *QST* style for various ac power connectors. Note that all devices are shown as viewed from the back, or wiring side.

[1]The Ham Notebook, *Ham Radio*, July 1981, p. 69.

*Assistant Technical Editor

[2]Hints and Kinks, *QST*, June 1982, p. 45.

**Table 1**

**Effects of Electric Current Through the Body of an Average Person**

| *Current (1 Second Contact)* | *Effect* |
|---|---|
| 1 mA | Just perceptible. |
| 5 mA | Maximum harmless current. |
| 10-20 mA | Lower limit for sustained muscular contractions. |
| 50 mA | Pain, possible fainting. "Can't let go" current. |
| 100-300 mA | Normal heart rhythm disrupted. Electrocution if sustained current. |
| 6 A | Sustained heart contraction. Burns if current density is high. |

the connections are correct! As drawn in *QST*, all of these devices are shown as viewed from the wiring side, just as we would show a tube socket. If you look at some previous drawings in *QST*, you will notice that the positions of the hot and neutral terminals on the female connector have been reversed. This is because of our style change, to show the device from the wiring side.

Another change in style that you may notice on schematic diagrams is to show the pole piece on switches coming from the circuit side of the wiring, instead of from the power side. While this may not be important when a sealed switch mechanism is used, it is important in circuits that may use a knife-switch type device. Even battery-powered equipment can be lethal if allowed to force enough current through your body. The danger of contacting a hot switch blade can be eliminated by always connecting the blade to the circuit side of your project. Many hams use a knife-switch/fuse box in their shack to control ac power to the equipment. If your shack has such a device, be sure that the knife blades are on the station side of the circuit rather than on the power side.

Amateurs should be familiar with safe ac-power wiring procedures as outlined in the National Electrical Code.[3] Sooner or later, we will all be faced with the task of wiring some device for connection to the ac-power system. Remember: *Safety first!* A relatively small current flowing through your chest cavity can kill. Table 1 summarizes the effects of various amounts of electric current on an average person.[4]

When installing ac receptacles, the terminals of most devices are clearly marked as to where the white and black wires should be connected. The white wire goes to the silver-colored screw and the black wire goes to the brass screw. The terminal for the third wire safety ground usually has a green screw. This connection should not be omitted! I prefer to mount receptacles with the ground pin upward. The rationale for this is that if a metallic object were to fall across a partially inserted plug, the worst that could happen would be a momentary short circuit as the object slides off. If the ground pin is down, then an object could fall across the hot and neutral blades and stay there, producing a prolonged short-circuit condition.

After reading the copy for this article, Paul Pagel, N1FB, mentioned that he recently bought a new rig. The power supply came equipped with a CEE-22 male plug on the chassis, and a two-conductor power cord! He promptly purchased the proper three-conductor power cord for his rig. A quick look at the schematic diagrams of the power supplies from several amateur equipment manufacturers revealed that even those that supply a three-conductor cord often place the fuse in one lead and the power switch in the other! I would suggest that you check the schematic diagram and wiring in your rig.

I hope that by reading and following the suggestions presented here you will be able to safely wire your next power supply or other ac-operated project. In fact, perhaps a few readers will even be prompted to go back and rewire some past projects. If so, you could avert a potential disaster. — *Larry Wolfgang, WA3VIL, ARRL Hq.*

[3] *National Electrical Code* (Quincy, MA: National Fire Protection Association).

[4] S. Wolf, *Guide to Electronic Measurements and Laboratory Practice* (Englewood Cliffs, NJ: Prentice-Hall, 1973), p. 52.

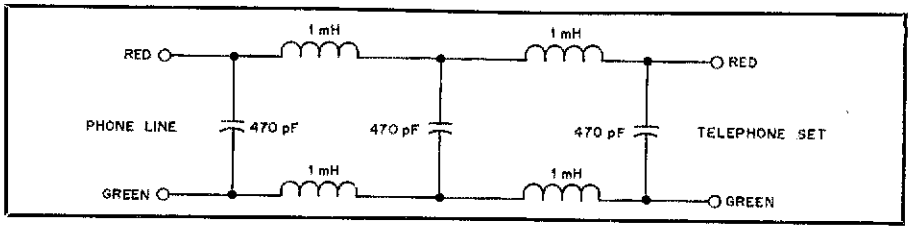



Fig. 4 — Schematic diagram of a filter used by WA6BSJ to cure a telephone interference problem.

## TELEPHONE RFI CURE

☐ I was experiencing telephone interference to the three phones in my house. I believed the interference to be caused by the telephone wires that run loosely around my attic, with no shielding. I contacted the phone company about the problem, and they installed an RFI filter between the house wiring and the outside line. This did not cure the problem, so I tried the suggestions presented in the 1983 *Radio Amateur's Handbook*. Again, the problem was still there.

Next, I made three filters, as shown in Fig. 4. Each filter takes four 1-mH chokes and three 470-pF capacitors. One filter is placed inside each telephone, and wired in series with the red and green leads from the wall jack. These filters have an attenuation of 85 dB or more at 14 MHz. This has cured my problem completely. Without the filters, I had interference when using my Kenwood TS-930 running 100 W. With the filters installed, there is no interference, even when I use my 1000-W amplifier. — *Mikio Maruya, WA6BSJ, Fountain Valley, California*

## HAND-HELD RADIO OPERATING TIP

☐ If you use your 2-meter hand-held rig often on an outside antenna and are bothered with the changing of antennas, try this: Hook a homemade quarter-wave antenna to the outside antenna and set it near where you use your hand-held rig. To talk, just hold the rubber duck antenna 6 to 8 inches from the quarter-wave antenna. You'll be pleased with the results, and it saves lots of wear and tear on the hand-held-radio antenna fitting. — *Robert H. VerSteeg, W7AZ, Richland, Washington*

## RECEIVING RTTY PICTURES BY COMPUTER

☐ While working on a computer program one evening, I found a new way to print RTTY pictures with my computer system. Previously, when I tried to copy such pictures with my printer, there would be spaces between each printed line, and only one character size could be printed. This new method provides a more condensed, higher resolution picture.

My RTTY station consists of a Yaesu FT-221R transceiver, a Flesher modem, an Apple® II+ computer and an NEC-8023A dot-matrix printer. Basically, I use software commands to place the printer into the condensed-print mode and to set the programmable line spacing to increment the line feed 15/144 inch at a time. This allows a picture that is 70 characters wide to fit into a 4-inch space. There is essentially no space between lines, so a line feed character will place the next row of characters directly under the previous one, with no white space. The quality of these pictures is superb. They are almost suitable for framing. Fig. 5 is an example of a picture I received.

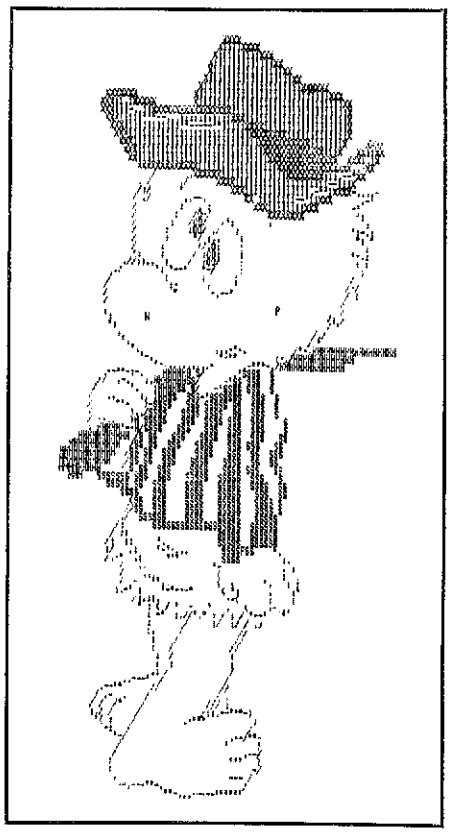


Fig. 5 — RTTY picture received by KB9GR using a condensed-print mode on his computer and printer.

**Table 2**
**Computer Printer Control Program**

```
ØØ1 PR#1
ØØ2 REM LINE ØØ3 SETS CONDENSED CHARACTER
ØØ3 PRINT CHR$(27);"Q";:PRINT CHR$(24);
ØØ4 REM LINE ØØ5 SETS LINE SPACING TO 15/144
ØØ5 PRINT CHR$(27);"T";"15";
ØØ6 REM TEST FOR CONDENSATION AND LINE FEED
ØØ7 FOR N = 1 TO 9
ØØ8 PRINT "TEST"
ØØ9 NEXT N
Ø1Ø END
```

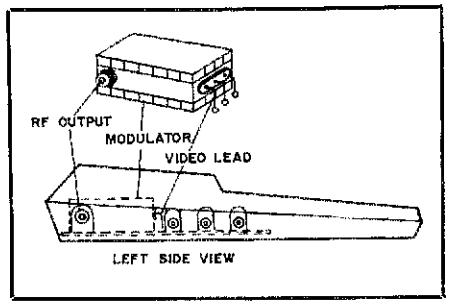



Fig. 6 — Side view of a Timex/Sinclair computer, with the video lead to the RF modulator shown. The video signal can be fed to a modulator for ATV, and the RF output can still be used for a TV display in your shack.

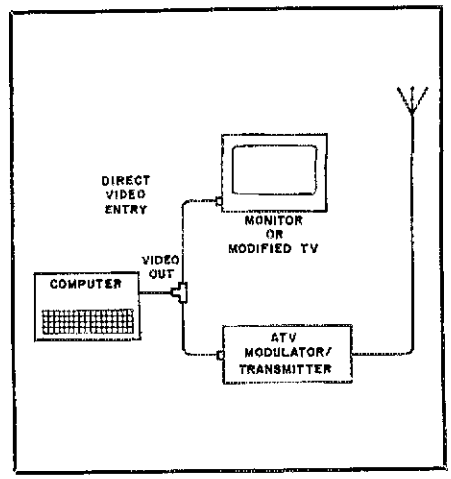



Fig. 7 — If the RF modulator is taken out of the computer, the video signal can be fed through a coaxial T fitting to a video monitor and the ATV modulator and transmitter.

I use the Kantronics "Hamsoft" program. Table 2 is a listing of the BASIC program that I use to set up my printer. Many other printers have capabilities similar to mine. You may have to change some of the control commands in the program, however. Check your manual. The printer-control program must be loaded prior to loading the RTTY program. The printer commands will remain in effect until you change them again, or until you turn off power to the printer. To go back to the standard print mode, simply turn the printer off and back on again. — *Gerald Lipski, KB9GR, Hammond, Indiana*

## COMPUTERIZED ATV

☐ Many amateurs may have thought about trying ATV, but are reluctant to make the large initial investment. Some have thought about the limited number of scenes or pictures they could transmit, and decided it wouldn't be worth the effort. I would like to suggest a more versatile system that invites experimenting with graphics and is quite inexpensive.

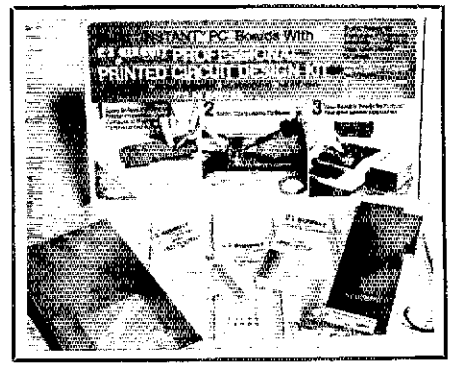
With the advent of the personal computer, much of the expense and complication have disappeared. There are a wide variety of inexpensive computers on the market. I chose a Timex/Sinclair computer because of the low price. The alphanumerics and graphics capabilities of these machines offer an endless repertoire of material to transmit.

All that is needed to adapt the computer to an ATV modulator and exciter is to tap the input signal to the computer's RF modulator. This signal can then be directed to the ATV modulator. One way to accomplish this is to use flea clips and a length of coaxial cable, as shown in Fig. 6. On the Timex/Sinclair computer, the lead closest to the case is the video input to the modulator. I would advise you to tack-solder a wire to the video lead, extending the wire through the case for attachment of a flea clip.

A better way to obtain the video signal might be to remove the modulator and substitute a bracket and appropriate coaxial fitting through the hole originally used for the RF jack. This would eliminate the RFI caused by this type of modulator, but would also necessitate a video monitor or modified TV set so you could view the picture being generated by your computer. Fig. 7 illustrates the connections.

Writing to the screen and transmitting the text or picture can be as simple as turning on the computer and typing. This is limited to simple short text or a calculator format. Fortunately, there are simple programs that can be typed in, loaded from cassette or plugged in as a detachable ROM pack. These programs range from simple graphics or sketch-pad systems to full word processors. — *John Shelley, WA1IAO, North Granby, Connecticut*

# New Products



## BISHOP GRAPHICS, INC. PC MATERIALS

☐ Many readers may already be aware of the Bishop Graphics product line. As a professional or hobbyist, if you build or repair equipment that uses PC boards, you should have a copy of their Printed Circuit Drafting Technical Manual and Catalog. (Good news — it's free!) In addition to describing their extensive product line, this catalog contains a wealth of information for PC-board designers. There are tables to aid you in selecting class-designation letters for electrical and electronic parts and graphic symbols for schematic diagrams. Amply illustrated pages lead you from initial PC-board design to the finished product. Artwork development is covered in detail: use of the grid system in laying out patterns, pattern scale, board size and number of layers; the "whys" of conductor width and spacing, component terminal areas (pads) and terminal holes, ground planes, component mounting, design techniques, drafting methods and much more.

In addition to the PC materials with which most of us are already familiar, Bishop Graphics offers some items that may be of particular interest to radio amateurs and computerists. These products are described in the Bishop Graphics EZ Circuit Technical Manual and Catalog (EZ3001), also available free of charge. One of the items is 5 × 6-inch adhesive-backed sheets of conductive copper (EZ7251).[1] These sheets can be used for EMI/RFI shielding applications.

Other products in the EZ line of PC patterns can be used for prototyping applications, one-of-a-kind assemblies, or the repair or modification of existing boards. There are also PC-board design kits geared specifically to computerists who wish to make their own plug-in cards. Separate kits for the Apple® computer, S-100 bus, Eurocard (Eurokit) and standard bus (22/44-pin connectors) can be purchased.

[1]mm = in × 25.4; g = oz. × 28.35

Should you err in your circuit layout when using EZ Circuit materials, the pattern(s) may be repositioned within a few minutes of initial installation. After a 48-hour curing period, the patterns may be removed if necessary, but should not be reused.

Connections between copper tape and/or component mounting pads are completed by soldering. When crossovers are required, an insulating tape is used between the copper traces. While the component mounting pads have a glass-epoxy substrate (which acts as a thermal barrier between the copper and adhesive backing) and may be soldered many times, the tape and donut pads do not have this advantage. Use caution to prevent the copper from lifting or sliding when soldering; the recommended procedure is to use a low-wattage iron (15-25 W) and hold it in a vertical position.

Virtually every type of component and connector pattern is available in the EZ Circuit line. Pattern holes are spaced at 0.1-inch intervals and a 1-ounce copper layer is used. Copper tape is offered in 10 different widths from 0.020 to 0.250 inch.

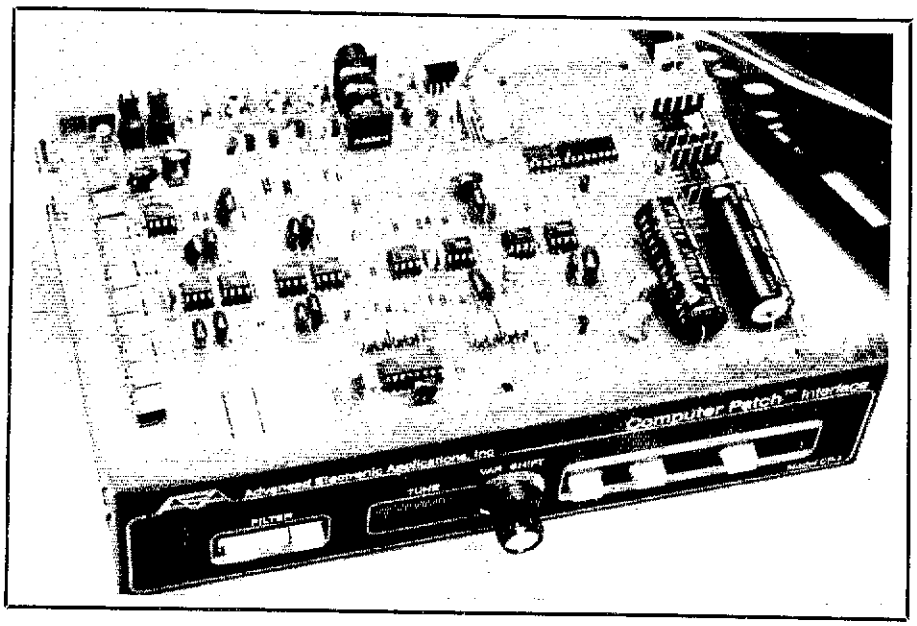
Further information may be obtained from Bishop Graphics, Inc., 5388 Sterling Center Dr., P.O. Box 5007, Westlake Village, CA 91359. Parts may be ordered from your local distributor or directly from Bishop Graphics: tel. 800-222-5808. — *Paul K. Pagel, N1FB*

# Product Review

Conducted By Paul K. Pagel,* N1FB

## AEA CP-1 Computer Patch™ Interface

The CP-1 is a modem designed to interface your personal computer with Amateur Radio equipment. With the appropriate software, Baudot and ASCII RTTY and CW signals can be received and transmitted using your computer as the I/O device. Many RTTY/CW software packages are available today, and AEA offers software for the Apple® II and //e, Commodore 64™ and VIC 20™ computers. The Apple package is a version of the software made popular by Dr. Chris Galfo, WB4JMD, and is supplied on disk. Plug-in ROM modules are used for the Commodore 64 and VIC 20 computers.




### Start at the Beginning

First, we should (but often don't) read the instruction manual. The CP-1 manual is well written and is supplied with a sufficient number of pictorials, a schematic diagram, block diagram and parts-placement guide. CP-1 operational procedures, some basic RTTY information, a troubleshooting guide, a parts list and circuit alignment procedures are included. There are also a number of helpful appendixes. These contain modification instructions for the CP-1 that allow for its use with mechanical teleprinters, negative-PTT-line keying, FSK output, 850-Hz shift on transmit and a host of mic connections for a number of popular transceivers. If you follow the instructions, you'll have your equipment off and running in a short time. If you've purchased the software package, you'll find the program and accompanying documentation friendly.

### On to the Hardware

Made of sturdy aluminum, the CP-1 enclosure is gray and black. As the interior photo shows, it contains a neatly assembled piece of gear — typical of AEA. All components are mounted on a single glass-epoxy, double-sided PC board. Alignment controls, should you need to use them, are easily accessible.

A minimum number of controls are on the front panel. At the left-hand side of the unit, the FILTER VAR/170/CW push buttons select the filter passband corresponding to the mode and/or shift you intend to use. For most amateur operation, the 170-Hz position will be selected, but the VAR position permits copying RTTY shifts of from 100 Hz to 1000 Hz. Selecting CW configures the space filter for a space frequency of between 800 to 950 Hz, depending on whether the unit is an early or late model CP-1; more on that later.

To the right of the filter switches is an LED bar-graph tuning indicator (TUNE) and the VARiable SHIFT knob. Signal tuning is adjusted to illuminate six to eight bar-graph segments with a minimum of display flicker.

STBY/PTT/MAN, NORM/REV and ON/OFF push-button switches occupy the right-hand side of the front panel. The first switch of the group selects manual or automatic T-R switching, while the second flips the mark/space filters to enable "upside-down" RTTY signals to be copied. I'll leave the determination of the use of the ON/OFF switch to your imagination!

All I/O connections are made on the rear panel. These include: PTT/AFSK/GND SHIELD, POWER, RS-232-C (optional)/TTL, DEMOD, KEY IN, KEY OUT +/-, SCOPE OUT MARK/SPACE and AUDIO IN/OUT. Additionally, a push-button switch selects the RS-232-C or TTL ports. Rear-panel holes provide access to the AFSK LEVEL and THRESHOLD potentiometers.

KEY IN accepts dry-contact or positive-level keying input from a key or keyer — you're keying the base of an NPN transistor at this point. KEY OUT +/- lines are diode protected, so incorrect cabling shouldn't harm the CP-1. DEMOD provides a TTL output that may be used to drive a current-loop circuit (with proper isolation, of course). The THRESHOLD adjustment sets the minimum signal level that will trigger the CP-1.

There is internal board space and a back-panel slot to accept the components required for the RS-232-C option. This low-cost kit of parts may be ordered from A.E.A. and added by those requiring such signal-levels. You may opt for the do-it-yourself method and buy the components from a parts supplier; the required materials are identified easily on the schematic diagram and in the parts list. The review CP-1 did not have the RS-232-C option installed.

### The Circuit in Brief

A number of dual bi-FET op amps are used in the demodulator section. Unlike some modems, the CP-1 decodes both RTTY tones — mark and space. The individual filter center frequencies are adjustable by means of potentiometers; alignment instructions are provided in the manual.

Early-model CP-1s have a CW filter center frequency (the space filter is used for CW reception) of 950 Hz. Those units have adjustment potentiometers that can be used to lower the filter frequency to about 800 Hz. Later-model CP-1s lack these potentiometers; the CW filter center frequency is fixed at approximately 800 Hz. Ideally, the CW filter center frequency should be closely matched to correspond with the transceiver offset during CW operation. This will provide the proper audio-output peak frequency for the demodulated CW signal when the incoming signal is properly centered in the IF filter passband. On most rigs, the offset frequency is about 800 Hz, although there are some transceivers (usually older models) that are designed for higher beat frequencies. If you have an early model CP-1 and wish to set the CW-filter center frequency to about 800 Hz, it is simple to do. Viewing the board from the trimmer potentiometer side (left side), adjust R14 and R36 to a fully conterclockwise position.

Positive and negative CW-keying lines are controlled with high-voltage NPN and PNP transistors. As supplied, the CP-1 keys positive-voltage PTT lines. For RTTY transmission, an Exar 2206 IC is used as the AFSK generator. Power for the CP-1 is supplied by an accompanying 16-V ac wall transformer.

### Other Paraphernalia

The Apple interfacing cable is an optional accessory (with or without the software), but the CP-1 comes supplied with two shielded phono plugs, a ¼-inch phone plug, one 3.5-mm plug, a four-pin female mic connector and a five-pin miniature female connector for the TTL output line connections.[1] The optional Apple computer

*Assistant Technical Editor

[1]mm = in × 25.4; m = ft × 0.3048.

interfacing cable has the five-pin CP-1 TTL connector at one end of a 3-foot length of cable with a 16-pin DIP plug on the other end for mating to the game I/O socket. I required a longer length of cable to reach from the CP-1 to my Apple //e, so I used a piece of five-wire ribbon cable, a DIP header and the five-pin connector supplied with the CP-1 to make my own.

The pins of the five-pin connector may be removed by using a pointed instrument to depress the locking tab on each pin. Before removing them, note their orientation so you may reinsert them correctly. Also pay attention to the pin numbers on the connector. The wires are then soldered to each pin, and the pins reinstalled in the connector body. Ensure you wire the connector so that the wires exit from the bottom of the connector. The required pin/DIP plug connections for the Apple are shown in Table 1. Note that pins 2 and 4 of the DIP plug have a common connection.

**Table 1**
**CP-1 Cable Pinouts**

| *CP-1* | *Apple II* | *Function* |
|---|---|---|
| 1 | 14 | AN1 |
| 2 | 15 | AN0 |
| 3 | 13 | AN2 |
| 4 | 8 | Gnd |
| 5 | 2, 4 | SW0/SW2 |

Note: SW0 is used for RTTY, and SW2 for CW operation.

### Comments

With my equipment setup, I find the use of AFSK less desirable than FSK. This is because with AFSK, the transceiver must be operated in the LSB mode. That means the IF filter selected will be that used for SSB — a wide-open door to interfering signals. My transceiver will operate FSK; in that mode, the 500-Hz CW filter is selected. This narrows the IF passband considerably, providing better copy under crowded band conditions. Consequently, the CP-1 was modified for FSK operation according to the instructions given in the manual. No PC board is used. The transistor and three resistors required for the modification are supported by their own leads and built around the DEMOD phono jack. All the necessary connections can be made within that area. One PC-board trace needs to be cut, that leading to the center conductor of the DEMOD jack. Should I decide to remove the modification later, it may be done quickly and the cut trace bridged with a piece of wire.

The CP-1 and AEA software make a nice combination. The software CW algorithm is quite good and has great latitude; it will copy speeds approximating one-third to three times the chosen CW sending/receiving speed. That requires less operator attention. The only time I change the CW speed is when I wish to transmit at a different speed. Usually, I "set it and forget it" at 25 wpm, and the program does the rest.

There are a number of software features — too many to detail here, but included among them are split-screen operation, type-ahead buffering, message retrieval from buffer or disk, saving messages on disk, error correction, a logging program, word or character mode transmission, fill character selection, automatic TR toggling at the end of transmission, automatic carriage return (CR), line feed (LF) and letters (LTRS) function insertion at the start of transmission or from within text, and a QSK buffer.

There is no provision for altering the weighting of the Morse characters. You can jump out of and back into the program easily and clear screen/buffer areas at will. The QSK buffer allows you to answer a query rapidly without disturbing the normal transmit buffer. There's a logging program and enough menus to keep you from getting lost.

The Control-C function initiates a CW ID on RTTY. Nowadays, we don't have to worry about the CW ID on RTTY, but the usefulness of the embedded Control-C function remains that of automatically toggling the equipment back to the receive mode at the end of a transmission.

You're cautioned to make a back-up copy of the master disk and to use that disk to configure your system. The Apple COPYA program will do the job since the program is not copy-protected in any way. Should you make a mistake and configure your system on the master disk and wish to change the configuration for some reason, you can restore the master to its original state by simply performing a couple of HELLO program RENAMES. If you LIST the HELLO program and read it, you'll see what I mean.

The operating simplicity and the flexibility of the software impress me. That, coupled with the few controls required to operate the CP-1, make for easy operating. CW copy is as good as I've seen with any automated unit, and I rank it high. Still, you can't beat the human ear/brain combination for digging the CW signals out of the QRM, QRN and QSB and, most of all, sorting out the information from poorly sent Morse code. When you listen to what the software is trying so desperately to decode, you begin to realize how crummy many of the fists are! With the worst of them, even the ear/brain combination surrenders! AEA has an engineering change for early model CP-1s. The change (replacing four resistors) decreases the CW-filter Q and broadens the filter bandwidth by about 20%.

Weak-signal RTTY copy is very good. It's surprising to see perfect or almost-perfect copy being displayed when the incoming signal is so weak it's almost indiscernible in the band noise. All things considered, the CP-1 and AEA software combination perform excellently. I think you'll like the package, too.

### Differences

The VIC 20/Commodore 64 HAMTEXT software have features not available with that for the Apple. These include the ability to transfer receive buffer data to the transmit buffer without involving transfer to disk, word-processor-like editing features for the message buffers, a simple keyboard overlay, a 24-hour time-of-day clock display and Farnsworth Morse operation below 15 WPM. With the latter, the Morse characters are sent at 15 WPM, but the character spacing is exaggerated such that the effective transmission rate is slower.

The CP-1 and mating software are available from Advanced Electronic Applications, Inc., P.O. Box C-2160, Lynnwood, WA 98036, tel. 206-775-7373. Price classes: CP-1, $200; RS-232-C option, $30; Apple interfacing cable, $20; Apple II and //e software (includes interfacing cable), $30; VIC 20/Commodore 64 software, $90; CP-1 and VIC 20 or Commodore 64 software package, $240. — *Paul K. Pagel, N1FB*

## HEATH HD-8999 ULTRA PRO® CW KEYBOARD

Since the beginning of my Amateur Radio career, I have enjoyed CW more than any other communications mode. For me, there is something special about a CW QSO that can't be rivaled by anything else in the ham world. Imagine my excitement when Heath announced plans to market a Morse keyboard!

The HD-8999 is a CW keyboard that affords both the Novice and the seasoned operator the opportunity to send perfect CW at speeds up to 99 WPM. A custom microprocessor is employed to provide many features not found in other keyboards.

### Features

The keypad has a quality "feel." Heath reports that the keytop legends are double-shot injection molded, so they shouldn't wear off. The keypad is prebuilt, and only requires wiring to the remaining circuitry.

- Ten memory buffers, allowing the storage of up to 495 characters of text, are included. The buffers are variable in length, so no memory space is wasted. A keyboard command prevents accidental erasure of information, even if the unit is unplugged!
- Operating parameters (speed, spacing and weighting) can be set from the keyboard. A crystal-controlled clock ensures timing accuracy.
- A 64-character type-ahead buffer and a three-color buffer-status indicator is also provided.
- A four-digit LED display indicates speed, spacing, QSO serial number (great for contests), weighting and memory space remaining. Decimal points in the display serve as prompts.
- Self-diagnostics are built in. If an IC fails, the microprocessor will diagnose the problem and indicate the number of the IC on the display. This function also serves the builder during the initial testing of the completed unit.
- The CMOS memory has a backup battery supply. This retains buffer contents and last-used operating parameters if power is interrupted.
- The HD-8999 is capable of keying most modern transceivers with positive- or negative-keyed lines. Two rear-panel jacks are provided for this purpose.

### Code Practice

The HD-8999 features three code practice modes. One of them is designed to improve typing speed! The built-in sidetone oscillator and speaker make this board perfect for personal or class instruction. For such instruction, the Farnsworth method (characters sent at approximately 16 WPM with large spaces between them) may be employed by setting the speed to 16 WPM, with 3-5 WPM spacing.

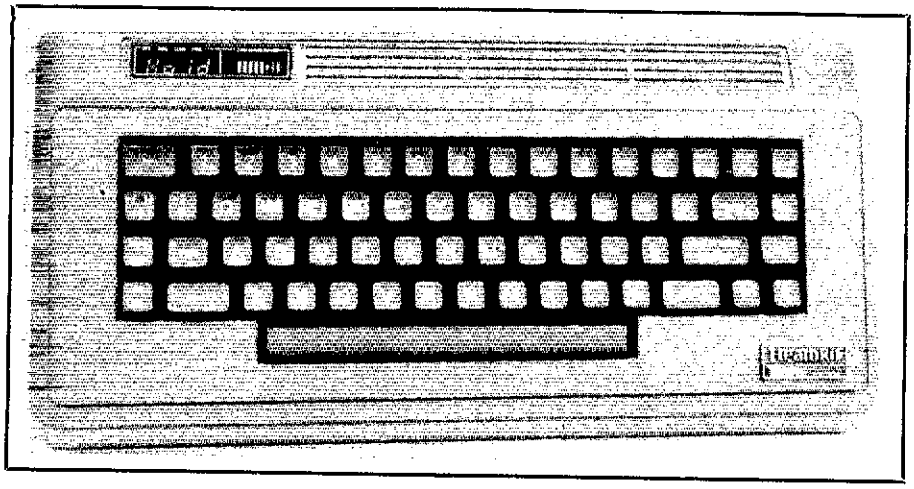
Random-length or five-character groups can be called for, with 3000 characters sent before the computer repeats the sequence. Heath supplies listings of the practice that is sent in each of the modes, to check progress.

A student may choose letters-only practice; letters and numbers; letters, numbers and common punctuation; or letters, numbers and *all* punctuation. Even seasoned operators will find the various modes useful for brushing up on unfamiliar characters.

In the unique COPY mode, the keyboard will generate a character and wait for the corresponding character to be keyed in. This function serves as a typing tutor. The student can elect to repeat a character with one key, or skip to another character by pressing another.

### Initial Inspection

When the kit arrived, I wasted no time in



opening the box and inspecting the instruction manual. The step-by-step assembly pages are outstanding, something Heathkit builders have come to appreciate. Every step is spelled out clearly, with numerous pictorials.

Minimal work space is required for construction, as Heath packs the components in three subpackages. Only the components associated with each of the assembly steps to be performed need be unpacked. I built the review kit on a small card table, and always had room to spare.

**Construction**

The majority of components mount on two PC boards. This greatly simplifies construction, since point-to-point wiring is kept to a minimum.

The smaller of the two boards, the display, is assembled first. Four eight-segment LEDs and associated circuitry mount on this board. Less than one hour was required to complete this portion of the keyboard.

The main circuit board, which contains the microprocessor, the memory and the remainder of the electronics, is built next. Working at a leisurely pace, I needed approximately six hours to finish it.

Mechanical chassis assembly and interboard wiring is completed last. Jacks, plugs and switches are mounted and wired to the assembled PC boards. Even with my large hands, no problems were experienced during this phase of assembly. There is plenty of room to spare in the HD-8999.

**Initial Testing**

A dc voltmeter is the only piece of equipment required for this phase. The keyboard is powered up (without ICs installed), and voltage is monitored at several points, to ensure that the discrete components were installed correctly. Possible causes for incorrect voltages at these points are listed after each checkpoint.

After verifying proper operating voltages, the ICs are installed and an operational check is performed. When power is applied, the microprocessor enters the self-diagnostic mode and, after about three seconds, a "20" appears on the display, indicating that all is well and that the keyboard is set to 20 WPM (the default value).

The output circuitry is checked for proper operation in the TUNE mode, the sidetone is turned on, and PITCH control is adjusted for a pleasing tone. A sidetone or electronic "click" can be used to verify key depression. These functions can also be turned off with a keyboard command.

**Operation**

I've been using the HD-8999 for several months now, and have enjoyed many ragchews with it. I'm only a fair touch-typist, so the unit has not been used extensively at speeds above 70 WPM. Several stations who have listened to the board at higher speeds noted that the weighting was slightly "heavy," making characters sound run-together. By resetting the weighting to a lighter value (10 are provided), I eliminated the problem. At slower speeds, below 60 WPM, the weighting is fine in the "normal" position.

The HOLD key allows typing to the type-ahead buffer without transmitting it, until it is pressed a second time. I found this handy, especially at higher speeds, in formulating responses (to questions, for instance) while receiving. By using this key to partially fill the buffer before beginning a transmission, I find it possible to stay ahead of what is being sent, resulting in perfect CW at speeds even greater than my typing speed.

**Comments**

No piece of equipment is perfect, and the HD-8999 is no exception. The prosign $\overline{AA}$, used for separating address lines while sending radiogram traffic, is missing. A choppy imitation can be used by typing two A's back-to-back. I find it hard to believe that an otherwise outstanding unit is hampered by this missing key, as several rarely sent characters (an exclamation point and parenthesis) are included.

Operation of the HD-8999 requires a low-voltage ac or dc power supply, or use of a wall-adapter, available from Heath. I would have preferred the inclusion of an internal 117-V ac supply, since there is plenty of room inside the package for one.

The HD-8999 is a pleasure to use, and would be a welcome addition to any ham shack. It is available from Heath Co., Benton Harbor, MI 49022. Price class: $250; ac power adapters, $16. — *Michael B. Kaczynski, W1OD*

## CES MODEL 510SA SMART PATCH

☐ Have you ever worked through a repeater autopatch to make a telephone call? The first time you do, it is a thrilling experience. All you need is a tone encoder on your transmitter and access to a repeater with autopatch facilities. (And if you don't have a tone encoder, almost any operator who has one will be glad to bring up the patch for you, if it is on an open repeater.) After you key the correct access code and a telephone number, the autopatch equipment at the repeater site makes a connection to the telephone line in response to your tone commands. The autopatch dials the number for you; if there is an answer, you can converse in an almost-normal telephone fashion. The difference is that you are using a radio link from your location to the repeater. When you've completed your call, another tone command causes the patch to disconnect.

Unless you have a separate receiver tuned to the repeater output frequency, you cannot talk and listen simultaneously, the way you can from a telephone instrument. When you are conversing via the autopatch, you naturally press the push-to-talk switch to transmit (talk on the telephone), and you release the switch to listen to the called party. Even if you have a separate receiver, you probably will hear only your own voice while you are transmitting, and not that of the called party. This is because the repeater equipment is set up for half-duplex operation. So, during the conversation, you and the repeater are alternately transmitting one way at a time. But all the while, you are actually using two radio frequencies: The repeater carrier is keyed continuously on one frequency, and your transmitter carrier occupies another.

**A Simplex Autopatch**

Because you can use an autopatch only one way at a time, it makes sense to use a simplex autopatch, one designed to work with equipment that uses the same frequency for both transmission and reception. The CES Smart Patch is just such a device. When connected between a transceiver (or a transmitter and receiver) and a telephone line, Smart Patch keys the transmitter so you can hear the called party talking, and it switches to receive so the called party can hear what you are saying. Just as in a direct or simplex radio contact, all operation takes place on the same frequency. Smart Patch controls the operation of the base station equipment, using received tone commands as well as received carrier information plus program logic. The patch is microprocessor controlled, and operation may be unattended in the sense that no one has to be physically "on-site."[1]

Should there be no operator at the base station, could an unlicensed operator gain and keep control of the base station transmitter? No. The transmitter is not controlled directly by a VOX circuit, so with Smart Patch it is not possible for an unlicensed operator to gain control.

How does Smart Patch handle the patching functions? Allow me to explain the sequence of placing a call and conversing. As with a repeater autopatch, you use a tone encoder to access the patch. If you merely key a carrier and talk or use the wrong access code, there is no response at all from the base station, nothing to indicate the presence of your patch equipment on the frequency. This is a helpful safeguard if there is a

[1][Editor's Note: The FCC Rules generally do not permit unattended operation of an amateur station unless it is in repeater or beacon operation. Therefore, if there is no control operator physically present at the base transmitter, the control functions must be accomplished via remote control. Remote control can be accomplished by either a wire or radio link. If the amateur is relying on a radio link to effect control, that operation must occur above 220.5 MHz (§97.61[d]). Operation of the simplex autopatch above 220.5 MHz would eliminate the need for a separate radio control link.]

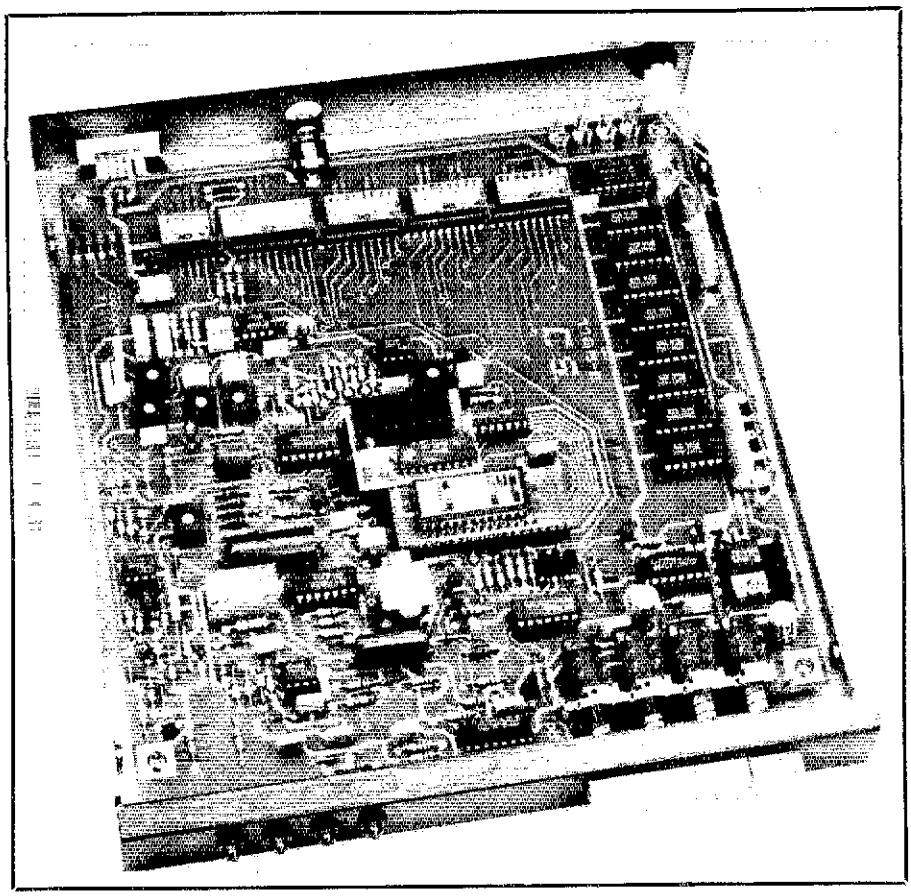


Fig. 1 — The CES 510SA Smart Patch with top cover removed. Five sets of DIP switches near the rear panel provide for selection of various user options. Power and other connections to the radio are made through the edge connector at the back, left. The instrument has a black enamel finish. When the top cover is in place, the unit looks rather plain. It is designed to be placed on a table or desk top, with a standard desk phone sitting on the top cover.

**Table 2**
**CES 510SA Smart Patch, Serial No. 510SA1076D**

*Specifications*

Size (HWD): 1¼ × 8¼ × 9¼ in.
Weight: 2 lb.
Connection to telephone line: Modular telephone plug.
DC power requirements: 12-V dc, 125 mA on standby, 140 mA with patch active.
Telephone line dialing: User selectable for tone or pulse (10 PPS).

*Programmable Options*

Patch access: *, or * followed by two selectable digits (compatible with 16-key pad).
Patch disconnect: #, or # followed by same two digits as for access.
Sample window duration: 6-260 ms in 15 steps.
Sample rate: 0.4-2 seconds in 15 steps. If audio is present on the telephone line, the sample rate is one-fourth the programmed value, controlled by a VOX circuit. (VOX sensitivity may be set to minimum for a constant sample rate.)
Patch timer: 0.5-15 minutes in 14 steps, or off. Warning beeps begin 30 seconds before timeout.
Activity timer: 20-90 seconds in 7 steps. Warning beeps begin 10 seconds before time-out.
Toll restrict: Based on 1st, or 1st and 2nd dialed digits, user option. (Many areas require a 0 or a 1 prefix for long-distance dialing, while no area codes begin with a 0 or a 1. Further, all area codes have a 0 or a 1 for the 2nd digit.) If the dialed number is rejected because of the toll restriction, the patch sends a series of dots and CW ID.

"Touch Tone Charlie" in your area. He must know the exact simplex frequency *and* the access code before he can get into Smart Patch.

When Smart Patch recognizes the correct access code, it uses audio tones to modulate the carrier, sending ON and identifying the base station. Then, it "picks up" the telephone, connects telephone audio to the mic input line, and keys the base-station transmitter. You hear the dial tone over the air. As you key in the phone number, Smart Patch dials for you. (Either pulse or tone dialing may be switch selected when you set up Smart Patch.) When someone answers, you engage in conversation.

From this, operation sounds similar to using a repeater autopatch, except that the base-station transmitter is *not keyed continuously* during the times you are listening. Instead, the carrier is interrupted very briefly at short intervals while the base-station receiver samples the simplex frequency for a received carrier. If a carrier is detected, Smart Patch will not key the transmitter again until the carrier has dropped. Thus, you can interrupt the called party in midsentence, if your carrier is present during the sample window. While you are listening, you repeatedly hear the carrier drop momentarily during the sampling period. This creates "chuh chuh chuh chuh" sounds over the air. Some operators may find this distracting at first, but with a very short sample period (in the order of milliseconds), no intelligence is lost, and one soon becomes accustomed to it.

There are differences in operating techniques between using Smart Patch and using a repeater autopatch, necessitated by this sampling technique. You cannot press your mic key and instantly start talking, if you expect everything you say to be heard. Unless you just happen to key your transmitter precisely during the sample window (a rare occurrence), the first syllable or even a couple of short words will often be cut off. Depending on your settings for the sample rate and sample duration, it pays to wait a second or so after keying the mic before you begin speaking. This allows time for your carrier to be detected in a sample window. Some operators may be able to adapt their PTT reflexes to the rhythmic sound of the channel noise during the sample windows, but I haven't yet mastered that technique. Perhaps this is because Smart Patch weights the time between sample windows, depending on whether audio is coming from the telephone line. This, of course, increases the intelligibility of what the called party is saying — sample windows occur less frequently when he or she is speaking, and more frequently when nothing is being said.

At the conclusion of the conversation, a command from your tone encoder will disconnect the telephone. Smart Patch sends OFF and again identifies the base station transmitter. Then, the equipment goes back into the standby mode. The call letters for ID are contained in a read-only memory chip that CES supplies, included in the purchase price of Smart Patch.

What happens if you're operating mobile and you drive out of range of the base station when a patch is in progress? Or (horrors) if your NiCd battery pack suddenly drops out on you during a patch (it happened to me!)? How can you terminate the remote transmitter if your control link fails? Never fear; the problem was solved in the design of Smart Patch. Two independent timers are running during the telephone conversation. The patch timer limits the duration of the phone call, and the activity timer controls the time the telephone connection is held without any carrier being received during a sample window. (Timer periods can be selected during setup of Smart Patch; see Table 2.) During operation of the patch, warning beeps are transmitted before time-out. Time-out of either timer will disconnect the telephone connection. The letters TO and the CW ID are transmitted upon time-out.

Although a dedicated telephone line for Smart Patch might be desirable for handling a lot of activity, this is not a requirement. During a part of the testing period for this review, connection was made to the telephone line at my home. Normal family telephone activity coexisted with a modest amount of phonepatch activity, with no problems. If I wanted to access the patch and the telephone line was already in use, Smart Patch would simply send a series of Morse code dots. In an emergency, a secret tone-encoder command can be used to connect Smart Patch to the telephone line, allowing you to break in on a landline conversation in progress.

### Installation and Technical Matters

One of the beauties of the simplex autopatch is that an ordinary transceiver may be used at the base station. No duplexer is required, which

is not true for most repeater sites. Thus, the operating frequency may be changed quickly and easily, if necessary. The audio quality with Smart Patch is excellent at both ends of the conversation. To the called party, there is no evidence at all of the sampling technique; he or she hears a quiet channel, depending on the signal-to-noise ratio of your transmissions. There is no received audio except when the radio-link transmitter is on the air, as the receiver is muted or else squelched off during sample windows.

Five interconnections must be made between Smart Patch and the radio equipment: ground, +12-V dc, PTT, discriminator audio and mic audio. The instruction booklet gives full information on how the connections are to be made. Typically, an installation can be done in less than an hour.

After the connections are completed, various level adjustments need to be made in Smart Patch. These are described fully in the instruction book. With use, you can experimentally determine the various patch settings you like best. See Table 2. The patch comes from the factory with all programmable options set for typical applications, and explicit instructions are included in the instructions for changing them. Complete schematic diagrams and an assembly drawing showing parts placement are also included in the instructions.

For the most satisfactory operation, the radio equipment should be able to switch very quickly from receive to transmit and then back to receive. The manufacturer of Smart Patch recommends solid-state rather than relay switching. With slower changeover capability in the radio equipment, the transmitter must necessarily be turned off longer during a sample window. Shorter interruptions will sound better over the air.

A miniature phone jack is provided on Smart Patch for auxiliary shut down. Thus, the patch may be controlled from a secondary link. This is particularly useful if the patch is used on the 2-meter band and you want to effect control via a radio link. Remember: Present FCC rules require that radio control links be above 220.5 MHz! [See §§97.3 (definition of auxiliary operation), 97.61(d) and 97.88 of the Amateur Rules.] User-option provisions are also included to lock out long-distance calls. If this option has been selected, a secret access code may be used to defeat it when you place a call.

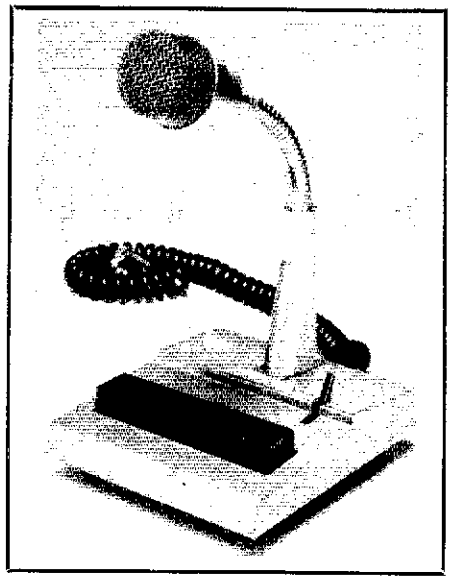
Connection to the telephone line is made with a standard modular telephone plug at the end of a 7½-ft cord permanently attached to Smart Patch.[3] An FCC type-accepted phone line coupler is available as an option.

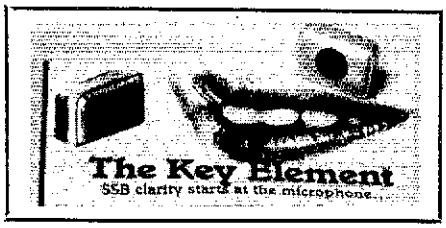
Smart Patch is not limited to use in simplex operation. With particular settings of the program switches, it may be put to use as a repeater autopatch, in normal half-duplex service. Operation is the same as described here, except that no sampling for a received carrier takes place. The CES Smart Patch is available from dealers and suppliers in a price class of $350. It is manufactured by CES Inc., P.O. Box 2930, Winter Park, FL 32790, tel. 305-645-0474. — *Jerry Hall, K1TD*

## HEIL SOUND, LTD. HM-5 MICROPHONE

☐ How do we select a suitable microphone for operating on SSB and FM? Do we use the stock

[3]mm = in × 25.4; m = ft × 0.3048; and kg = lb × 0.454.






mic provided by the manufacturer, or should we try to locate a unit that is designed for communications rather than wide-range voice reproduction? The answer lies in (1) the characteristics of the operator's voice and (2) how much we are willing to invest for audio effectiveness on the air. Heil Sound has chosen to address this matter with a direct approach — to provide a microphone that is engineered specifically for reproduction of those voice frequencies that are essential to punching through when conditions are difficult (QRM and QRN). I speak here of the Heil HM-5 desk mic and the mic element (HC-3), which can be purchased separately. Some of you may wish to buy just the element, then install it in an existing mic assembly, as a less-costly solution to your problem with unsatisfactory audio on your signal.

What is "unsatisfactory audio"? There is much latitude for debate. Some will maintain that "broadcast quality" is the only way to go when operating FM or SSB. To some extent, I may be inclined to agree, but for HF-band SSB, where QRM and QRN are an ever-constant threat to solid communications, I'll opt for clean audio with a restricted bandwidth — but with the peak response in the region of 2000 Hz. The Heil Sound mic elements provide the sought-after response, and for my voice they have spelled the difference between being copied rather than being dug out of the ambient crud level with just marginal copy.

### Microphone Characteristics

Wide-bandwidth signals have no place in our crowded SSB segments. The greater the audio bandwidth, depending on the characteristics of the speech system and filter in the rig, the greater the transmitted bandwidth. If you have been told that your signal is too broad, despite your signal being clean in terms of distortion, perhaps you are using a rig with wide audio response, along with a hi-fi type of mic. Narrowing the input audio response should greatly aid such a problem, provided you aren't using a speech processor or socking the overall transmitter with too much audio (a common misuse of equipment these days!).

The HC-3 and HM-5 audio units are engineered to provide a peak response at approximately 2400 Hz. A sharp rolloff occurs at 350 Hz on the low side, and again at 3100 Hz on the high side. This places maximum emphasis at the frequency of high articulation.

The Heil mic elements have a characteristic impedance of 2000 ohms, which makes them suitable for use with most of today's equipment. The midrange impedance seems to work well with all of my rigs, irrespective of the stated input impedance of the equipment: Some are rated at 500 ohms, one is 1000 ohms and another is 50,000 ohms. If your rig has a very high input impedance (such as a tube type of speech amplifier), a matching transformer is recommended to prevent the low-Z mic from loading the speech amplifier and lowering the gain.

The manufacturer states that the mic output level is slightly below that of most other microphones. I did not observe this condition when I connected the HM-5 to my FT-102 transceiver. Conversely, I had considerably more speech-amplifier gain with the HM-5, as compared to the stock hand-held Yaesu mic. Later, I installed an HC-3 element in the Yaesu mic, and the output level was identical to that of the HM-5.

PTT is provided by the HM-5 by means of a three-wire cable (white is for audio, black for control, and the shield braid for ground). There is a PTT bar on the base of the mic stand. A lever switch is provided also for lock-on operation.

### Personal Results

I have always had great difficulty with audio response when on SSB or during the old AM days. I have a very "bassy" voice, and have been asked more than once if my ancestors were part bullfrog! Voices like mine just don't punch through under adverse band conditions. My answer over the years has been the good old Astatic D-104. I have mated it to numerous rigs, and it has solved my audio-response problem. But, it is bulky and not necessarily convenient when operating portable or on DXpeditions. The HM-5, on the other hand, is compact and attractive as well. The D-104 has emphasis where I need it — at the higher end of the voice range.

I made a number of on-the-air tests with friends who know my natural voice characteristics. All of them reported a tremendous improvement over my stock mic (and over my natural voice response) when I switched to the HM-5 mic. Even the built-in speech-response adjustments of the Yaesu FT-102 did not solve my problem when using the Yaesu stock mic. I have had the same problems with Kenwood and ICOM gear as well. Persons with somewhat higher-pitched voices will often find run-of-the-mill or stock microphones to be entirely satisfactory. My comments are not meant as an indictment of the equipment designers.

In summary, I feel that Bob Heil, K9EID, is on the right track with his line of audio equipment for hams. It is time for someone to address the audio quality of transmitters and receivers! The HC-3 price class is $20, and the HM-5 cost is $55. The manufacturer is Heil Sound, Ltd., Marissa, IL 62257, tel. 618-295-3000. — *Doug DeMaw, W1FB*

# Technical Correspondence

Conducted By
Bob Schetgen,* KU7G



## ANOTHER USE FOR THE 40673

☐ Among dual-gate MOSFETs, the 40673 seems to be the "6C4" of the FET world, at least in terms of versatility. You can tie the gates together and use the device with no gate bias, as you would an MPF102 JFET. The 40673 is also useful, from AF through VHF, as an amplifier for meters and other projects.

Recently, during a design exercise for a 2-meter transmitter strip, I recalled an idea stated by former ARRL staff member Clarke Greene, K1JX. He suspected that a dual-gate MOSFET would serve well as a push-push doubler. (To the best of my recollection, he never pursued the matter.) My 2-meter circuit required some doubler stages, and a 40673 doubler seemed suitable. This circuit is less involved than using diode doublers followed by a straight-through amplifier to increase gain. (The push-push doubler is theoretically as efficient as a straight-through Class-C amplifier.) So, the 40673 was put to work as shown in Fig. 1.

The Q1 circuit is nothing of note. It is only shown to indicate how I coupled my oscillator to the 40673 doubler. Balanced coupling is provided by T1, a trifilar-wound broadband transformer. Self-resonance of the winding (including a stray circuit capacitance of roughly 15 pF) should be well below the frequency of Y1.

R1 provides a better load for T1; it also improves the drive balance to the gates of Q2. Class-C operation of Q2 improved slightly with a 100-ohm source resistor. (First tests were made with the source directly grounded.) C1, shown dotted in Fig. 1, can be added to the more responsive gate terminal (determined by experiment) to adjust circuit balance. This modification may be necessary to improve output-waveform purity from Q2, if the doubler input circuit is not symmetrical.

T2 is a tuned, 4:1 RF transformer. Powdered-iron core material is used at T2 to ensure a suitable Q at 36 MHz. The output winding of T2 is coupled to another 40673 push-push doubler (72 MHz) in my circuit.

At first, I observed some unwanted VHF energy at the output of Q2. The 15-ohm parasitic resistor (R2) cured the problem. This resistor may or may not be needed, depending on the circuit layout.

The performance of this circuit is quite satisfactory. I tested it while observing the output waveform on a Tektronix 453-A scope. (This scope has a stated bandwidth of 50 MHz, but it responds to frequencies approaching 200 MHz with good resolution, according to tests I made with a signal generator.) When there is proper balance at Q2 and the drain tuned circuit is peaked, the output waveform at 36 MHz closely approaches that of a pure sine wave. There is less than 10% asymmetry caused by fundamental energy (18 MHz) appearing at the output. A more elegant filter at the output of Q2 should virtually remove the 18-MHz component.

The output winding of T2 is terminated in 560 ohms to determine the output level of the doubler. I obtained 2 V P-P, as measured with the scope and a × 10 probe. Attempts to increase doubler output by increasing the drive from Q1 ended in disaster, at least with respect to purity of the Q2 output waveform. As drive to the 40673 increases, so does asymmetry of the 36-MHz waveform.

You may find the 40673 or similar dual-gate MOSFETs useful when you need doublers in converters or transmitters. I tend to prefer an active doubler to a passive one. It helps to minimize the circuit complexity. — *Doug DeMaw, W1FB/8, Luther, Michigan*

*Technical Editorial Assistant

## VIC-20 KEYERBOARD MODIFICATION

☐ Thanks to Dan Whipkey, N3DN, for the CW keyboard system (Jan. 1984 *QST*, p. 13). I keyed in Dan's program and it works well except for the 20-second RUN initialization required after each RUN-STOP. In order to eliminate this bothersome delay, I added in the following line:

90 IF PEEK (849) = 201 THEN GO TO 110

This has eliminated the delays after the first 20-second initialization for machine-language loading.[1] — *Michael Janis, VE5AGW, Regina, Saskatchewan*

☐ Response to Dan Whipkey's VIC 20™ CW-keyboard program has been very good. Many people however, have experienced problems after typing the program into their computer. These problems often result from the similarity between the number "8" and the letter "B" in the program listing. Also, the data in statements 390 through 460 is given in hexadecimal (base 16) notation. The only permissible characters in that notation are the numerals "0" through "9" and the letters "A" through "F." If you have had trouble getting the program running, check it again with careful attention to these areas. Full-size photocopies of the program listing are available from Technical Dept., ARRL Hq., 225 Main St., Newington, CT 06111, for an s.a.s.e. — *Bob Schetgen, KU7G, ARRL Hq.*

[1]This modification prevents the program from reloading the machine-language routine when memory location 849 contains the decimal value "201" (hexadecimal: C9). If you change the CW characters, or anything else in the data statements (lines 390 to 460), save the program, type: POKE 849,0 then press RETURN and continue with the instructions in the January article. — Ed.

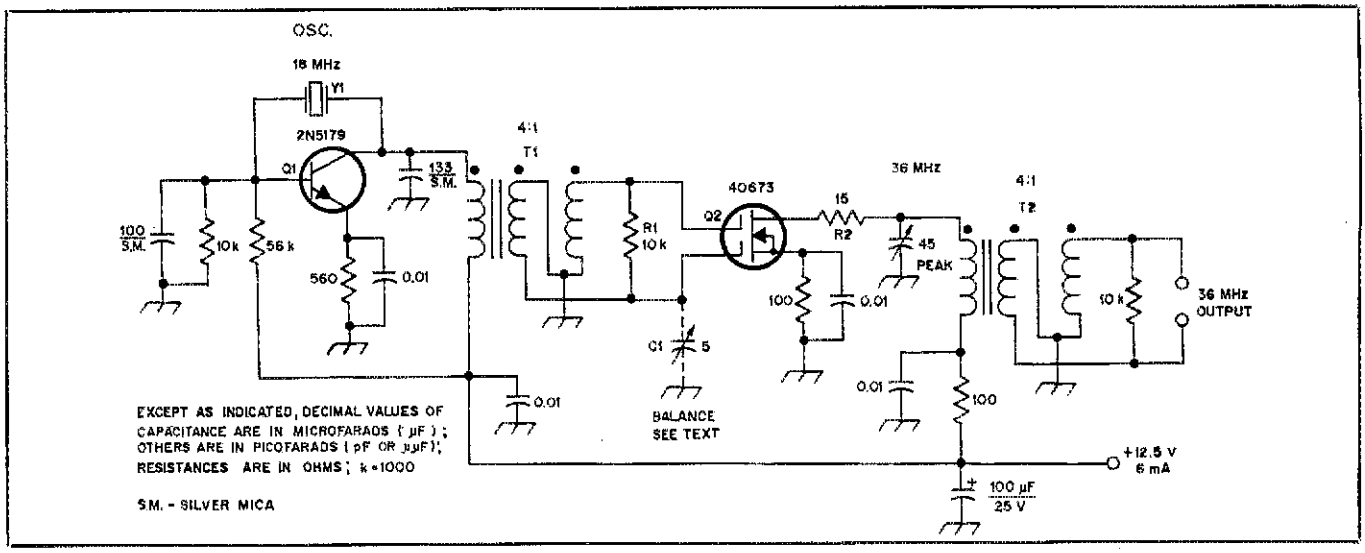



Fig. 1 — Circuit of the W1FB push-push MOSFET doubler. This circuit can be modified for higher and lower frequencies, but balance will be more difficult to obtain as operating frequency is increased into the VHF region. Y1 is a fundmental crystal. T1 consists of 12 turns of no. 26 enameled wire, trifilar wound, on an Amidon FT-50-61 core ($\mu_e$ = 125). T2 has a 0.65-µH trifilar winding, which consists of 13 turns of no. 26 enameled wire on an Amidon T50-6 core ($\mu_e$ = 8). Fixed-value capacitors are disc-ceramic unless otherwise noted.

## EQUATIONS FOR IMPEDANCE OF COUPLED ANTENNAS

☐ Alan Harbach's item (Oct. 1983 *QST*, p. 47) regarding the impedance of a dipole above ground provided an accurate explanation of a commonly observed and misunderstood phenomenon. However, some readers may mistakenly attempt to apply the equation and/or results to more general cases of phased antennas.

In the general case, the feed-point impedance of an element in an array is affected not only by the element self-impedance and the mutual impedance between it and the other array elements, but also by the magnitudes and phase angles of currents flowing in the other elements. For two elements, the general equations used to find feed-point impedance are:

$$R_1 = R_{11} + M_{12}(R_{12}\cos\mu_{12} - X_{12}\sin\mu_{12}) \quad \text{Eq. (1)}$$

$$X_1 = X_{11} + M_{12}(X_{12}\cos\mu_{12} + R_{12}\sin\mu_{12}) \quad \text{Eq. (2)}$$

$$R_2 = R_{22} + M_{21}(R_{21}\cos\mu_{21} - X_{21}\sin\mu_{21}) \quad \text{Eq. (3)}$$

$$X_2 + X_{22} + M_{21}(X_{21}\cos\mu_{21} + R_{21}\sin\mu_{21}) \quad \text{Eq. (4)}$$

where

$R_{11} + jX_{11}$ = the self-impedance of element 1

$R_{22} + jX_{22}$ = the self-impedance of element 2

$R_1 + jX_1$ = The feedpoint impedance of element 1

$R_2 + jX_2$ = The feedpoint impedance of element 2

$R_{12} + jX_{12}$ = The mutual impedance between elements 1 and 2[2]

$R_{21} + jX_{21}$ = The mutual impedance between elements 2 and 1

$M_{12} = \frac{1}{M_{21}}$ = Magnitude of current in element 2 relative to that in element 1

$\mu_{12} = -\mu_{21}$ = Phase angle of current in element 2 relative to that in element 1

These equations were derived from those found in the texts quoted by Harbach.

For the special case of an antenna parallel to a reflecting surface (ground), the currents are equal ($M_{12} = M_{21} = 1$) and of opposite phase ($\mu_{12} = \mu_{21} = 180°$). In this case, Eq. 1 through Eq. 4, above, reduce to Eq. 4 in Harbach's letter. Other combinations of current balance and phasing lead to quite different results. — *Roy W. Lewallen, W7EL, Beaverton, Oregon*

## TVI & VHF RIGS

☐ I read with interest the letter (Technical Correspondence, Dec. 1983 *QST*) from Robert Findlay, W6NZX, that describes his TVI problem and the RF susceptibility of his 2-meter radio. I am sure many others have also encountered a similar situation. After many hours of "TVI proofing" my SB-230 amplifier, so that it is "clean" when connected to a dummy load, I was dismayed to find that there was still severe TVI when an antenna was attached. This was

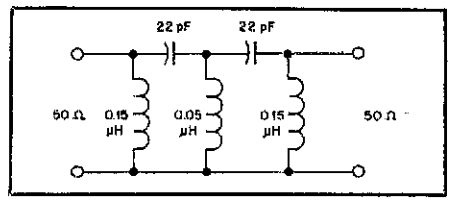



Fig. 2 — Schematic of a high-pass filter to reduce HF signals entering a 2-meter radio.

true despite a multisection low-pass filter installed at the amplifier output. In my case, the 2-meter antenna is approximately 15 ft below the HF antenna.[3] Even so, sufficient RF from the HF radio entered the VHF transceiver to cause interference to nearby television receivers.

Findlay suggests using a circulator on the VHF-radio input to eliminate the problem; most circulators I know of are devices of relatively narrow bandwidth, and their reverse isolation at HF isn't very good. Circulators are also fairly expensive devices. The normal TR functions of the VHF radio must be accounted for with such a solution and may require external, nontrivial, switching logic. Disconnection of the VHF antenna may not be possible if one wishes to simultaneously monitor VHF and HF.

Addition of a high-pass filter (Fig. 2) to the RF input of the VHF radio is a much more straightforward solution to the problem. The basic design is a 5-pole Butterworth high-pass filter with a cutoff (3-dB) frequency of 86 MHz. In my particular case, the TVI was eliminated when the filter was placed in the transmission line of the VHF rig. — *Bob Loving, Jr., K9JU, Streamwood, Illinois*

## FEEDING YOUR STATION

☐ DeMaw's article on feed lines, "Feeding Your Station" (Dec. 1983 *QST*), is one of the better articles for beginners that I have read in some time. However, I disagree with his last statement. Foam-dielectric coax cables and open-wire lines are not the answer to the average ham's feedline requirements.

As a supplier in the marine communications field, I find foam-dielectric coax cables totally unacceptable for commercial or private applications. If you have a spare piece of foam coax, a little experiment will make my point: Cut several small pieces from the sample. You will find that the center conductor is rarely in the exact center of the cable. I believe this condition is created at the time of cable manufacture and is worsened with each handling. This causes hot spots, which are irregularities in the cable impedance. At high power, I have seen these spots get hot to the touch and short out. At VHF, losses are greater than you would believe. Also, foam cables readily accept any moisture offered through poorly sealed connections. (This is a problem in both interior and exterior installations.)

Open-wire lines are indeed (in theory) low-loss feed lines. With today's automated equipment (from TVs to computers, and so on) in homes, however, a novice is foolish to use open-wire line without consideration of the RF radiation along its length — starting in the shack! The article said little about proper installation of the line, and did not show what measures are required to achieve this remarkable low-loss condition. [Installation details appear in Chapter 8 of *The ARRL Antenna Book* — Ed.] Personally, I love open-wire line — when there is no rain.

Good compromise feed lines for those who cannot afford (or justify) a hardline or Heliax™ are: RG-213/U, RG-214/U, 8237, 8213 or any good solid-dielectric RG-8/U with a noncontaminating cover and a minimum of 95% shield coverage. My years of wiring office buildings for limited coast station 1000-W HF systems (in an environment where RF is not considered in design of telephone or computer systems) has shown that 8237 cable (RG-2136) will generally keep RF where you want it. It also holds up well in that severe environment; if it works there, it will work anywhere. Also, don't buy cheap "bargain" coax. There is *no* bargain cable, unless you are fortunate enough to receive a good used section of Heliax or military large-diameter (1 inch or greater) coax.[4] Save your money for quality cable that will bring years of good service with little trouble.

I made believers recently of all the hams present at a local amateur's home. The large majority of TVI from his station was cured by elimination of foam-dielectric cables — this was an extreme case.

I hope *QST* publishes more articles of this quality. There are just as many "experienced" hams as beginners who can profit from such writing. — *Clifford R. Ward, WA5LVG, Spring, Texas*

[4]mm = in × 25.4

# Feedback

☐ Joseph Worrall, KL7T, informs us of an error in Table 1 (p. 22) of "Feeding Your Station" (Dec. 1983 *QST*). The capacitance of RG-11A/U is 20.5 pF/ft, not 0.5 pF/ft as shown.

☐ There are several errors in "Introducing the PS5 — A Dependable, 5-A Portable Power Supply" (June 1983 *QST*). R2 should be connected from pin 3 of U2 to the single ground point, not to the "+" output. Also, there should be a connection dot where the leads from the 2-µF capacitors cross the "common" lead (pin 4) of U2.

In the text on p. 20, under "Operation," the formula for dissipated power should read:

$$P_D = I_{load} \times (V_{in} - V_{out})$$

☐ The Hints and Kinks column in this issue contains a correction to a serious ac-power wiring error that appeared in the January *QST* article, "Getting into Amateur Radio Electronics."

☐ Here are a few corrections to the February 1984 Hints and Kinks article, "A Two-Transistor Transmitter for 30 Meters." The parts-placement diagram shows 300-pF capacitors in the output network, instead of the 330-pF values shown on the schematic diagram. Either value appears to work. If you use point-to-point wiring, as shown in Fig. 2, it may be necessary to reduce the value of the 130-pF silver-mica capacitor. The author used a value of 82 pF in his original design. The value of L1 is 0.8 µH, not 0.08 µH. The winding information given for this coil is correct.

[2]$R_{12} = R_{21}$ and $X_{12} = X_{21}$ only when the two elements are identical.

[3]m = ft × 0.3048

# QRP: More Than a State of Mind

## Looking for a new challenge? Try reducing power and adopting a few new operating habits.

By Bradley Wells,* KR7L

Low-power operation, or QRP, has enjoyed a surge in popularity in recent years. Why? Mostly it's the challenge of working stations the "hard way," be it during contests or everyday operation, and the great satisfaction that comes from making contacts that the "big guns" make. Most low-power ops will agree that the motivation for QRP is the same as for chasing DX — but the rewards are inversely proportional to the amount of power used.

In this article, we'll take a look at the exciting world of QRP, discuss some equipment that's available and talk about ways of improving your chances of success with low-power operation. One word of caution to the reader, though: QRP can be habit-forming.

The definition of QRP, recognized by most amateur organizations, is 10-W input, or 5-W measured output. Five watts may not sound like much to those who consider 200 W low power, but the difference is not as great as you may think. Under actual conditions, 5 W will have little effect on your ability to work DX. The difference between QRP and, say, 200 or 2000 W is only 3 or 5 S units. Also, QRP exemplifies the spirit of the Rules — specifically 97.67(b), which states that " . . . amateur stations shall use the minimum amount of transmitter power necessary to carry out the desired communications."

### Finding the Right Equipment

Entering the world of QRP, one does not find the often bewildering array of equipment that dominates high-power operation. A large percentage of rigs are homemade, and QRP remains one of the last bastions of those who roll their own. QRP rigs have the same requirements as their QRO counterparts with regard to selectivity, stability, harmonic suppression, etc. The ham who likes to build, not buy, will find many construction projects in back issues of *QST* and in other League publications (see accompanying box).

For the ham who prefers to buy, three commercial QRP rigs are currently available on the amateur market. The Heath HW-8 has the fewest features, but carries the lowest price tag. It is a four-band (80-15 meters), 3.5-W input, CW-only transceiver. It features a direct-conversion receiver, a semi-break-in with adjustable delay and an active audio filter with two stages of selectivity. Maximum current drain is 450 mA at 12 V, making it easily powered by lantern batteries. It is the smallest of the commercial rigs.

Ten-Tec's Argonaut has become the classic QRP transceiver. Their latest version, the Model 515, is over twice the cost of the HW-8, but has more than twice the features. It offers five-band operation (80-10 meters), a 4-pole 2.4-kHz crystal filter, both CW and SSB modes, a built-in SWR bridge and speaker. An audio CW/notch filter and crystal calibrator are available options. The Argonaut, as with all Ten-Tec rigs, comes equipped with full-break-in CW.

A step up, in price and features, from the Argonaut is the Ten-Tec Argosy. This transceiver has selectable power levels: 10-W or 100-W input at the flip of a switch. Both the receiver and transmitter are broadbanded. It covers six bands (80-10), and has a built-in power meter/SWR bridge, a tunable notch filter, an internal speaker and QSK on CW. Available options include an 8-pole 2.4-kHz SSB filter, an 8-pole 500-Hz CW filter, a dual bandwidth audio filter, a noise blanker and a crystal calibrator. For SSB, an outboard speech processor is available with both clipping level and audio passband fully adjustable.

There are other rigs that many consider QRP, but are found to be lacking in one or more features. Generally, and most importantly, they run more than 10-W input. Many have a limited selection of bands or no selection at all, will not work CW, or have channelized frequency selection.

### Choosing an Antenna

A major failing of both experienced and novice QRPers is the antenna system. Unfortunately, most hams think low power equates with poor antennas. Many QRP operators seem to delight in using their rig with a 50-foot piece of wire thrown out the nearest window.

The basic rule of QRP antennas is that nothing beats a beam; and nothing beats a beam on a tall tower. Put up the best beam/tower combination you can afford. A good 3-element beam and 40-foot tower will put you on a more-than-equal footing with those running 200 W to a vertical.

A good full-size dipole is the next best choice. On 20, 15 and 10 meters, a high dipole exhibits directivity, so place it broadside to the desired direction of radiation.

Related to the dipole, and almost as easy to construct, is the single-quad loop. This antenna is more directive, has wide bandwidth and can exhibit up to 2-dB gain over a dipole.

The poorest choice for the QRPer is the vertical antenna. The vertical suffers two defects when compared to a dipole. It is highly susceptible to man-made QRN, notably power-line noise. For a vertical to have the same radiation efficiency of a dipole, a good radial system is required. Amateurs lacking space for beams or dipoles might consider the Cushcraft R-3

*5052 37th Ave., S.W., Seattle, WA 98126

tuned vertical, which requires no radials and approaches the efficiency of a half-wave dipole.

Do not skimp on the coax. Use the best grade of RG-8 you can afford. We are not interested in power capability, but in achieving the lowest attenuation possible. The ham with an amplifier will not miss a couple of watts heating his coax as much as the QRPer running 5 W will. For portable operation, RG-8X may be used where its light weight and ease of handling offset the increase in attenuation. Make all connections clean and weatherproof. Strive for the highest possible efficiency in both feed line and the antenna.

### Operating Tips

One may wonder how a DX station can hear a 5-W signal when megawatts are coming at him. But hear it he does, and more often than not the experienced QRP operator will get through those pileups to snag the rare DX station. To do this, however, the operator requires some knowledge of tactics used by successful stations.

First, and most important, listen before using your key or mic. Is he working stations by call area or at random? Is he picking up tailenders? Is he listening high or low, and how wide is the split? All of these things can only be learned by listening. Spend five, even 10 minutes on your receiver before you begin to transmit.

Second, invest in a memory keyer. You're going to send your call a number of times, and it's much easier to do so by pushing a button instead of wearing out your wrist. Send your call at a slightly slower speed than the DX station is transmitting.

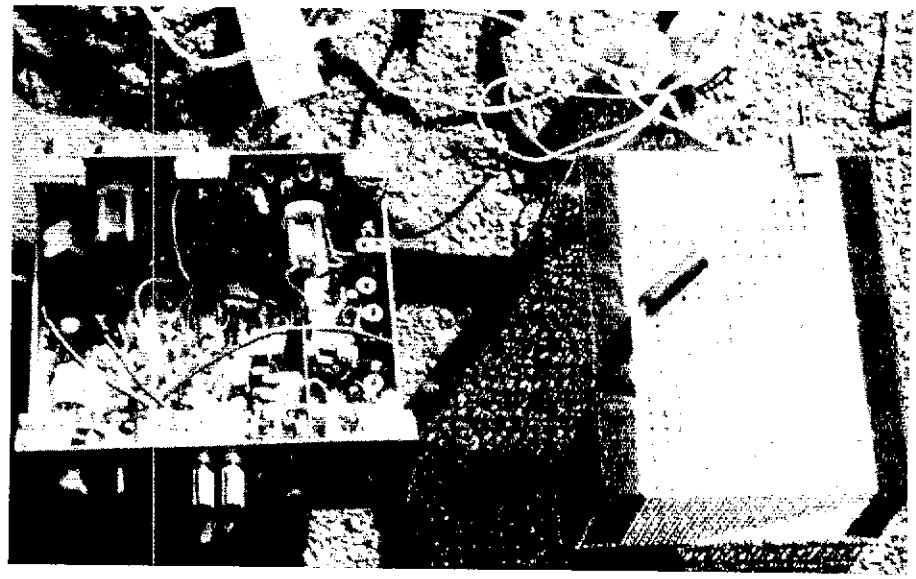
Third, on phone, use standard phonetics. The ham on the other end doesn't have time to figure out cute call signs, and will ignore you. In addition, use some form of speech processing to boost your average power, but don't overdo it. Too much is far worse than too little.

Fourth, time your calls. This is most important for QRP operators. Don't try to be first to hit the keyer or PTT switch. Normally, everyone will send their calls all at once, pause, then try again. When you hear that pause, slip your call in just once. That's all you have time for. Do this correctly, and you may get through on the third or fourth call.

Finally, know when to quit. Everyone has days when the propagation is wrong or Lady Luck is against you. Believe it or not, the world will not end if you fail to work the DX in that pileup.

### $R_x$ for Success

With only 5 W, there is no way you're going to blast an opening into a crowded band. You don't have an "afterburner" to kick in under heavy QRM conditions, or the power to make your own propagation.



Jim Ford, N6JF, of Costa Mesa, California, went the low-power route, and he's glad he did. Using the 8P6 "Hamcation Rig" (April 1983 *QST*) as a guide, Jim built his own QRP rig, which he operates with great success on 10 MHz.

So, you need a change in operating style.

The first habit you will break, and soon forget, is calling "CQ." In fact, "CQ" and "CQ DX" will just about disappear from your vocabulary and keyer. With full legal power, a "CQ" in any direction will get you contacts. QRP will never bring the same results. For those unwilling to change this operating habit, the kiss of death is on their QRP career.

There are several ways to increase your chances of success. First, have a good beam antenna. Second, sign your call with /QRP. This may cause stations to call you out of curiosity. The idea is to let everyone know, up front, why you're not 40 dB over S 9. However, most hams will not answer a weak "CQ" unless your call begins with something like S79, VKØ or T32.

The single-most-effective QRP operating technique is search-and-pounce. Search-and-pounce is simply tuning carefully through each band until you find a station to work. Most of the stations you work will be calling "CQ," or you will nail them as they finish a QSO.

Work the station with a moderate-to-loud signal. Since the sensitivity of most QRP receivers outstrips the effective range of their transmitter, a signal that is very weak may be impossible to work. Propagation is a reciprocal thing, and if the station on the other end is S 1 running a kilowatt, imagine what 5 W will sound like. Actually, there will be no sound at all — you simply will not be heard. This condition is more prevalent on 80 and 40 meters, where antennas and propagation tend to work against the QRPer.

If you become involved in a marginal contact, don't prolong it. The other operator did you a favor by coming back and will not get much enjoyment out of the QSO if you're only 3 3 9 at his end. The place to tell him all about your rig, antenna and the weather is on your QSL card.

A fact of QRP life, and one of its more frustrating aspects, is that you are going to get stomped on occasionally — whether it's deliberate bad manners, carelessness or simply that the station firing up on frequency can't hear you. Sometimes, you can operate through the QRM, but generally it's the end of the QSO.

For those of you who chase DX (and who doesn't?), listening on the local DX repeater is a good way to expand your search-and-pounce technique. If you do spot a bit of DX, work him first, then announce his frequency over the repeater. Do it the other way around and you may find yourself hip-deep in "big gun" stations.

Another prime requirement for being able to work DX (or anyone else) on a consistent basis is at least a working knowledge of propagation. All of the major amateur publications have monthly propagation charts. They use different formats, so different interpretive techniques are applicable to each. All of these charts are prepared several months in advance of publication; you should be able to update their information to make allowance for current conditions. There are two ways to do this. One is to monitor the WWV propagation forecast at 18 minutes after each hour. These recordings provide real-time information to update your monthly charts. A second method is to subscribe to one of the DX bulletins. Printed on a weekly or biweekly basis, all are excellent indicators of relatively current propagation conditions.

The three bands providing the bulk of activity for QRP are 20, 15 and 10 meters. When the 10-meter band is open, there is

little difference between 5 and 500 W. It can exhibit rapid shifts in propagation, however, which can be disconcerting to even experienced hams. Twenty meters is the most consistent band, providing openings to some part of the world day and night.

Forty and 80 meters are less consistent producers because of their more-seasonal nature and higher levels of QRN and QRM. Both tend to be winter bands, but can produce results any time of year. The best DX time is 30 minutes before and after local sunrise or sunset. Also, the 30-meter band is excellent for QRPers. Its propagation lies midway between 20 and 40 meters, and only limited-power (250 W) operation is permitted.

Most QRP CW operation is around 40-60 kHz up from the bottom edge of any band. Most phone operation tends to be in the Advanced and Extra Class subbands. Stay out of the Novice segments; beginners have enough problems without the added difficulty of having to copy less than S 9 signals.

### The QRP Contester

For many, contesting is just one interesting facet of Amateur Radio. For others, contests *are* Amateur Radio. Noncontesters and contesters alike may view operating a contest with a QRP rig as the ultimate insanity. Actually, the reverse is true. Most of us don't have the megabucks required to put together a top-drawer, big-gun, killer-type contest station. However, most hams can afford a first-class QRP station. Since QRP rigs are relatively inexpensive, you can afford to invest more in antennas — a deciding factor in contesting.

Many contests have a separate single-operator, all-band QRP category. Thus, you need only compete against other QRP operators. However, winning still requires maximum doses of perseverance and a large amount of skill.

**For More on QRP**

The following are suggested sources for more information on QRP operation:

- "The 'Ugly Weekender,' " R. Hayward and W. Hayward, Aug. 1981 *QST*, p. 18.
- "A QRP Transmitting Converter," J. Pitts, April 1981 *QST*, p. 35.
- "A Beginner's 3-Band VFO," D. DeMaw and R. Shriner, Jan. 1980 *QST*, p. 19.
- "Transmitting Fundamentals," D. DeMaw and R. Shriner, Dec. 1979 *QST*, p. 11.
- *Solid-State Design for the Radio Amateur*, W. Hayward and D. DeMaw (Newington: ARRL, 1977), p. 213.
- "CQ TR," E. L. Campbell, March 1956 *QST*, p. 11.

Contesting effectively with QRP requires the application of several important techniques. At the beginning of the contest, work the strongest stations. Then, work the progressively weaker stations. In addition, don't waste too much time calling any one station. If he hasn't come back to you by the fourth call, move on. You can work him later when the pileup is reduced. An exception to this would be near the end of the contest when that DX station represents a new multiplier.

Instead of tuning up and down the band, start at the high end and work stations as you go to the low end. When you hit the bottom edge, quickly tune up to the top and start down again. This will maximize your time on all portions of the band. Those proficient with a search-and-pounce technique will have a QSO rate almost equal to most stations calling "CQ." Also, new stations will appear and disappear with great rapidity, so don't worry about working the band dry.

Another rule for the QRPer is to work the MUF (maximum usable frequency). Work the highest frequency that is open in the area you want to cover, based on WWV or other propagation information. Operating at or close to the MUF reduces path loss and maximizes your 5-W signal.

In a DX contest, know the areas that are easiest to work, and concentrate on those at the start of the contest. Work the more difficult areas during the last 24 hours. For example: Generally, Japan, Oceania and Europe can be worked from the West Coast on 20 meters in the morning. For the QRPer, however, it is more productive to work Japan and Oceania Saturday morning and Europe Sunday morning. By the last day, Europeans will have worked out much of the Eastern seaboard and will respond more quickly to a call from the West Coast.

In any contest, but more particularly in a DX contest, establish some type of game plan. Spend some time consulting propagation charts, and write up a time-versus-frequency plan for your own use. Decide which areas you will cover at what times and the best band for each combination. This plan should be used as a guide for each hour of operation. The most productive directions will be based on your experience and an examination of previous contest scores.

Next to your log, the most important record to keep is the dupe sheet. Duplicating contacts means wasted effort, lost points and less-productive operating time. Since, as a QRP station, you will be operating 99% of the time in a search-and-pounce mode, your dupe sheet must be as current as your contest log. There are as many different dupe sheets as there are contests, so use one that fits your needs.

Finally, keep the proper perspective and attitude before, during and after the contest. Above all, don't worry about the big-gun station down the block. You're not competing against him, only against other QRPers.

## Strays

### IARU RADIOSPORT CORRECTION

☐ The table below is a corrected version of the Top World Scores CW box for the 1983 IARU Radiosport Championship (see February 1984 *QST*, page 80). Note that this change puts K8MFO/OHØ in the number-four position worldwide as well as makes him the top single-operator CW-only score from Europe.

**Top World Scores**

*CW*

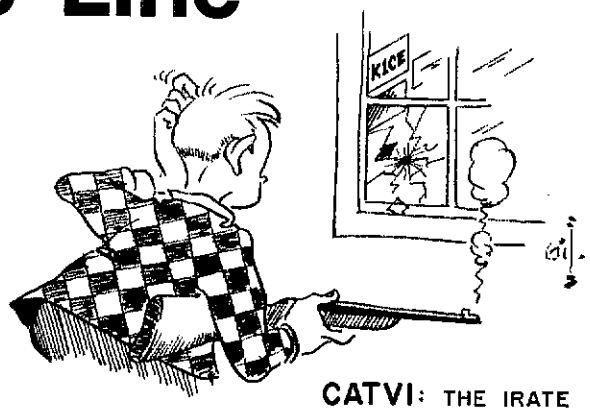
| | |
|---|---|
| LU8DQ | 1,676,010 |
| EL2AE (K2LE) | 1,432,800 |
| HZ1AB (K5KU) | 1,395,264 |
| K8MFO/OHØ | 1,201,122 |
| UA1DZ | 1,184,700 |
| WA8YVR | 1,044,956 |
| G3FXB | 1,042,705 |
| KRØY | 1,027,653 |
| OH8PF | 1,015,056 |
| HH2VP | 917,112 |

A complete loss of hearing in 1975 cut Larry Clements (ex-W4LDC), of Ludlow, Kentucky, off from the sounds of his world — including Amateur Radio, which he had enjoyed for more than 30 years. Now, with the aid of a hearing device called a Cochlear implant (shown above the ear), Larry's hearing has been partially restored and he's back on the air again, as N4FXU. *(photo by WA4VAG, Kentucky Post)*

# CATVI: An Inside Line

## Introducing the new joint ARRL/NCTA Committee for cable-television-interference cases: Some inside help for those thorny CATVI problems.

By Richard K. Palm,* K1CE




**CATVI:** THE IRATE NEIGHBOR SYNDROME

Are you the target of your neighbors' ire when they're trying to watch *Candlepins for Cash* but get a dazzling display of herringbones instead? Getting annoyed when they line up in front of your house armed with lawyers, guns and money?

Or, do you tire of trying to squeak out that weak moonbounce signal from some rare country only to have it wiped out by the Playboy Channel? Have you received your ARRL WAS (*W*orked *A*ll *S*ubscribers) certificate yet?

If the answer to any of these questions is yes, here's a new tack to try if you've tried the rest of the ways of getting a break from CATVI (cable-television interference). The League, in conjunction with the National Cable Television Association (NCTA), has formed a special joint committee of participants from both groups and the FCC. Its mission is to receive case files submitted to ARRL Hq., review them and initiate efforts with the affected cable operators and hams in order to reduce interference problems from the "inside." The intent is for the NCTA to exert peer pressure when necessary within industry boundaries to move an otherwise immovable cable operator toward action.

### Exhausting Alternatives

Before we present the nuts and bolts of the joint committee, let's examine some suggested procedures of dealing with CATVI that should be exhausted *prior to* reporting a case to the ARRL/NCTA Committee. Hams should give the cable operator a reasonable opportunity to fix trouble spots on his own before calling out the cavalry.

*Deputy Manager, Membership Services, ARRL

### What is CATVI?

What constitutes a legitimate CATVI complaint? This question has been the subject of some debate in recent times. We'll attempt to put the problem into perspective for cable operators and hams alike.

It is the ARRL position that if harmful interference is caused by the CATV system to the legitimate operations of an Amateur Radio station, it is the responsibility of the cable operator, under FCC Rules, to clean up that interference. If leakage from a CATV system merely breaks the squelch of a 2-meter receiver in the scanning mode, for example, a violation does not exist (unless the amateur is able to prove that the signal leakage level is in excess of FCC specifications; see below). Harmful interference clearly does exist if, for example, cable leakage interferes with a local repeater and users' communications or with a moonbounce enthusiast trying to dig out that weak signal. In these instances, the cable operator has the obligation to fix it, regardless of the leakage level.

If an amateur signal enters a CATV system and causes interference to subscribers' TV pictures, it is also the responsibility of the cable operator to correct the problem. Remember, FCC defines CATV services as "nonbroadcast facilities," closed to the outside RF environment. The cable operator is responsible for keeping his signals in, and other signals out, of the cable system.

### FCC Rules

Section 76.605(a)(12) contains the following leakage limits for CATV systems: up to 54 MHz — 15 μV/m at 100 ft from the cable; over 54 to 216 MHz — 20 μV/m at 10 ft; and over 216 MHz — 15 μV/m at 100 ft.

Section 76.613 regulates interference from cable-television systems. Paragraph (a) defines harmful interference as "any emission, radiation or induction which endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs or repeatedly interrupts a radiocommunication service operating in accordance with this chapter." Paragraph (b) states: "The operator of a cable television system that causes harmful interference shall promptly take appropriate measures to eliminate the harmful interference."

You should have these rules at your fingertips when dealing with a cable operator. This way he'll know he's been approached by an amateur who knows the FCC Rules. The cable operator should be aware that you represent the Amateur Radio Service and deserve proper consideration.

The League's RFI Task Group has approved the following step-by-step procedure as a general response to CATV leakage and an interference problem:

*Step 1*

*Contact the cable operator.* Telephone or write to the plant's Chief Technician, and describe the problem. If you elect to call in your complaint, always confirm the conversation in writing. For example:

> Dear Sir: This will confirm our [date] phone conversation. I have notified you of leakage from your cable plant at [location], which is causing harmful interference to the Amateur Radio Service near [frequency]. This operation is in violation of the harmful interference rules found in Section 76.613(b) of the FCC Rules, and may also be in excess of the leakage permitted by Section 76.605(a)(12).
>
> You agreed to have your staff investigate the leakage areas to eliminate the problem within 30 days. Thank you in advance for your cooperation.
>
> s/s _____

Inform your ARRL OO/RFI Coordinator of the problem. He or she may be able to provide technical support. Contact your Section Manager, whose name and phone number are listed in each issue of *QST* (p. 8), for the name and telephone number of your local OO/RFI Coordinator.

If you wish, you may assist the cable operator's staff — *if* they request your aid. However, you have no obligation to provide this assistance. The responsibility for egress and ingress of RF energy to or from a "nonbroadcast facility," which is defined as a closed off-the-air service, lies clearly with the cable operator. It is *you* who are doing him the favor!

Keep copies of all correspondence. This will serve as part of the record during possible follow-up actions. Also, please send copies of all related correspondence to the CATVI Desk at ARRL Hq. to enhance our data base and to keep the ARRL RFI Task Group informed.

If after 30 days there is no evidence of resolution, proceed to Step 2.

*Step 2*

*Send a second letter to the cable operator.* Inform the company that you have perceived little or no evidence of solution for the interference problems. For example:

> Dear Sir: This is to inform you that little or no reduction of the interference has occurred at [location] and [frequency]. See the enclosed copy of my [date] letter. My follow-up inspection of [date] showed that the problem persists despite your promise to fix the trouble within 30 days.
>
> I wish to reassert my original request that you eliminate the harmful interference in accordance with the requirements of Section 76.613(b) of the Commission's Rules. By copy of this letter, I am informing our town government, the local FCC District Office and the management of your company of our local problems.
>
> Please keep me informed of your efforts. Thank you.
>
> s/s _____

**Seeking Committee Action**

If you've reached the end of your rope with your local cable operator, consider the following course of action. Complete a reporting form (at right) available from ARRL, with information on the history and current status of your CATVI complaint. Return the completed form to Hq. for distribution to ARRL appointees, to the joint ARRL/NCTA CATVI Committee and to the designated NCTA liaison. NCTA has indicated that they will contact the cable operator about your complaint for the purpose of exerting some peer pressure. ARRL will monitor developments in your situation regularly to determine if problems are being solved. The ARRL/NCTA Committee will make every effort to resolve your complaint before formally referring it to the FCC for action.

Patience and perseverance are required in these matters. Some cases have resulted in FCC enforcement actions, but only after several months of inspections and reams of correspondence. Stick with it! Don't hesitate to contact the CATVI Desk at ARRL Hq. if we can be of any assistance. We're ready to help!

We will send copies of your reports to the FCC and your local Section OO/RFI Coordinator to keep these interested parties plugged into the loop. One of our objectives is to keep FCC policymakers informed of the nature and scope of the CATVI/ham problem. Your input will help us meet this goal.

I-D: Serial_____
State_____

Date:_____

Name of cable company_____

Address_____

Phone Number:_____

Name & Title of Person Contacted:_____

Areas Served by System:_____

_____

Nature of Interference:_____

_____

Method of Observation (List of equipment used):_____

_____

_____

Dates of Contact With:

A. Cable operator_____

B. FCC_____

C. Controller of franchise (town, county, etc.)_____

_____

Steps Taken by Cable Operator:

Does interference still exist?_____

_____

Your name:_____ Callsign:_____

Address:_____

Phone:_____

_____

FCC Involvement (if any):

_____

(For ARRL use only)

NCTA contact:

The CATVI Report Form, available from ARRL.

**For More Information**

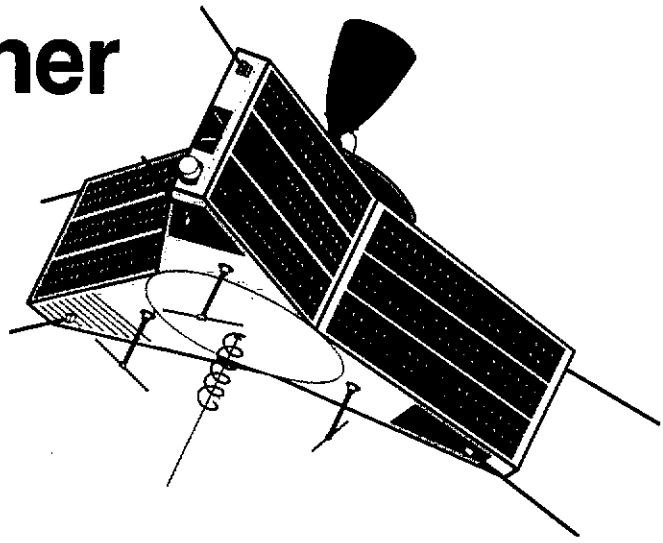
*Cable Television Interference: Working Materials For The Radio Amateur* contains a wealth of tools for use by hams in dealing with a local cable operator. This booklet contains copies of tutorial articles from both amateur and CATV publications, FCC documents of fines and actions, newspaper accounts, reference materials, sample CATVI complaint letters, and more. It contains sample language (approved by the ARRL Counsel) for contracts between towns and cable operators to head off potential CATVI problems. For your copy, send a 9- × 12-inch s.a.s.e. with $1.20 postage to ARRL CATVI Desk, 225 Main St., Newington, CT 06111. QST

## Strays

***QST* congratulates...**

☐ Dr. Francis "Drew" Gaffney, K5HKR, of Dallas, Texas, on being selected as a payload specialist for the NASA Space Lab 4 mission, scheduled for January 1986.

# The AMSAT-Stoner Challenge Cup



## An International Amateur Radio Satellite Competition

By Doug Loughmiller,* KO5I

Bill Orr, W6SAI, is one of Amateur Radio's best known and respected authors and experts. In a now-classic *QST* article ("Sixty Years of Radio Amateur Communication," Feb. 1962 *QST*), Bill recounted a bit of history: a pivotal moment in the genesis of amateur satellites.

> The radio amateur gazed thoughtfully for a moment at the white paper in his typewriter. Suddenly his fingers sprang into action and the keys flashed the fateful words, "Currently being tested is a solar powered six- to two-meter transistor repeater which could be ballooned over the Southwest. Can anyone come up with a spare rocket for orbiting purposes?"

The fingers were those of Don Stoner, W6TNS, writing his Semiconductors column for *CQ*. The "fateful words," as W6SAI later put it, appeared in the April 1959 edition of *CQ*. From that point on, a remarkable series of events captured the imaginations of countless radio amateurs worldwide, from the launch of OSCAR 1 in December 1961 through the recent launch of AMSAT-OSCAR 10, the most advanced of the proud lineage. Two-and-one-half decades ago the gauntlet was thrown down; today, 25 years later, a new challenge awaits.

AMSAT is commemorating the 25th anniversary of Don Stoner's challenge to "come up with a spare rocket" with a challenge of its own. The AMSAT-Stoner Challenge Cup for amateur satellite enthusiasts begins in April to simultaneously recall the lineage while fixing sights firmly on the future of Amateur Radio in space with OSCAR. The AMSAT-Stoner Challenge Cup will be awarded to the winner of an operating competition on AMSAT-OSCAR 10. The competition will run for three months and offers the winners in three categories substantial hardware (trophies, plaques) and software (certificates).

The competition is open to licensed amateurs and Amateur Radio satellite enthusiasts worldwide. The purpose of the competition is to promote satellite activity, to encourage AMSAT membership, and to stimulate refinement of ground station performance, with special emphasis on receive capabilities.

The competition shall be held in three sections:

1) AMSAT members
2) Non-AMSAT members
3) SWLs (both members and non-members).

The idea is to work as many stations in as many different grid squares as possible. Special emphasis (through the scoring method described below) is placed on low-power transmitting and superior receive capability.

Because of the sensitivity of AMSAT-OSCAR 10 to possible "desense" from excessively high power on the uplink, the rules will be enforced strictly. Disqualification of stations using excessive power may result. This being the first-ever competition of its type, AMSAT has resolved to approach this activity with cautious optimism. A disciplined, mature approach to the competition is thus required of all participants. Unlike HF competitions, in which sponsors can hardly turn off the ionosphere, this "ionosphere" *can* be turned off should things get out of hand.

The AMSAT-Stoner Challenge Cup is a benchmark for future, longer-term A-O 10 operating events and even for AMSAT's Technical Achievement Award for superior ground-station capability (especially receiver performance). Pick up the gauntlet. Take the challenge. Step up to the ultimate in space-age Amateur Radio events: the AMSAT-Stoner Challenge Cup.

*AMSAT Vice President, Operations

### Grid Squares Defined

Grid squares are a universal system of dividing the earth's surface into uniquely identifiable zones 2° long. × 1° lat. The grid-square system is described in Jan. 1983 *QST*, page 49. The article, by John Lindholm, W1XX, describes how to ascertain your own grid-square. For example, ARRL Hq. is at grid FN31. A more complete explanation, including the plan for locations outside the USA, appears in *The Lunar Letter*, April 1982, in an article entitled, "Worldwide QTH Locator System Proposed By Region 1," by Lance Collister, WA1JXN.

AMSAT will supply copies of these articles together with sample logs for this competition for $2 plus an s.a.s.e. or (overseas) for $2 plus an s.a.e. with 5 IRCs (send to AMSAT, P.O. Box 27, Washington, DC 20044). Complete rules are specified below.

### Official Rules

1) **Objective:** Two-way communication via A-O 10 Mode B or Mode L using the lowest uplink power possible. For SWLs, the objective is to report as many QSOs as possible, with special emphasis on those QSOs involving QRP stations.

2) **Competition Period:** Commencing 0000 UTC April 15, 1984 and running continuously through 2400 UTC July 14, 1984. No time limit on cumulative operating time.

3) **Entry Categories:**

A) *Challenger class* — AMSAT members only; two-way communication through A-O 10 required; affiliated AMSAT organizations are included, e.g., AMSAT UK, AMSAT DL, JAMSAT.

B) *Competitor class* — hams equipped for A-O 10 but who are future, not current, AMSAT members; 2-way communication through A-O 10 required.

C) *Observer class* — hams and non-hams alike, both current and future AMSAT members who will listen only as they are (1) not allowed to or (2) not equipped to transmit through A-O 10; SWLs.

4) **Exchange:** QSO serial number, uplink power code, grid square and AMSAT member number (if any). See below for power code.

5) **Scoring:** Scoring is based on three major elements.

A) *QSO points earned for each QSO completed.* Credit is given in inverse proportion to the uplink power employed. Basically, the lower the power, the more points you get for each QSO. Points per QSO will vary both with your uplink and the other station's uplink, and are computed on a QSO-by-QSO basis. See below.

B) *AMSAT member multiplier.* When an AMSAT member is worked, the point value for that QSO is doubled. Thus, working an AMSAT member gives you a member multiplier of two (for that QSO). For nonmember QSOs, the multiplier is one.

C) *Grid-square multiplier.* The multiplier is equal to one unit for each *distinct* grid square worked.

For observer class, simply report the power codes of each side of the QSO, but do not apply the member multiplier or the grid-square multiplier. Observer's score is then the sum of individual QSO power codes as described below.

### Scoring Details

- Uplink power code A is 200-W EIRP or less.
- Uplink power code B is 201 to 800-W EIRP.
- Uplink power greater than 800 W on Mode B is not permitted.
- Uplink power is not limited on Mode L, and each QSO is scored as if it were Mode B, code A.

| | | Your Uplink | |
|---|---|---|---|
| | | A | B |
| Other Station Uplink | A | 5 | 3 |
| | B | 3 | 1 |

From the matrix one can deduce the following: For QSO points, each QSO in which *both* stations use less than 200-W EIRP (code AA), the QSO points total 5. If either station uses less than 200 W (codes AB and BA), the QSO is worth 3 points. If both stations use between 200 and 800 W (code BB) the QSO earns 1 point.

**Sample Scoring calculations:**

You work an AMSAT member. He's running 500-W EIRP; you're running 125 W. The QSO points are 3 (code BA). Since he's a member, the member multiplier is 2. Thus, the total point value of the QSO is 3 × 2 = 6 points.

You work another station. She's not a member. Both of you are running 100-W EIRP. The QSO points are 5 (code AA). The member multiplier is 1 (she's not a member). The QSO total point value is 5 × 1 = 5 points.

After all individual QSO points are tallied, the subtotal is multiplied by the grid-square multiplier. Suppose your QSO subtotal is 1250 points and you worked 200 grid squares. Take the QSO points subtotal (1250) and multiply it by the number of different grid squares you worked (200). Thus: 1250 × 200 = 250,000 points — your grand total for the competition.

6) **Logs:** Log sheets may be obtained from AMSAT, as described elsewhere. Homemade logs are okay, too, as long as they follow the format shown below.

7) **Miscellaneous:** No repeater contacts; each station may be worked only once for credit. The QTH of your station is not a factor in this competition, and may be moved at any time to any other QTH. If you do change grid squares during the event, you must specify in your log which grid square you were operating from for each contact; note grid-square changes in the "Remarks" column of your log. CW and SSB are the only modes permitted in this initial event. Note the particular AMSAT organization affiliation of the member next to the member number using a convenient abbreviation with notes to indicate what it means (e.g., UK, DL, VE, ZL).

8) **Reporting:** Logs must be sent to AMSAT, P.O. Box 27, Washington, DC 20044, and must be postmarked no later than September 1, 1984. A summary sheet must be included to indicate grid-square total and QSO point subtotal. A signed statement attesting to the accuracy of the log must be enclosed, and the entrant must state that the maximum power used did not exceed 800-W EIRP on Mode B (no limit on Mode L).

9) **Awards:**

A) *Challenger class.* First place will be honored with a silver loving cup engraved with "AMSAT-Stoner Challenge Cup, 1984. FIRST PLACE (your call sign)" The next four finishers will receive plaques. The next five finishers will receive special certificates. All entrants in the Challenger Class will receive certificates.

B) *Competitor class.* First place will receive an engraved plaque with the winner's call sign and a one-year AMSAT membership. The next four finishers will receive special certificates.

C) *Observer class.* The top five Observers will receive certificates.

10) **Costs:** A nominal entry fee is required to offset the costs of administration. AMSAT member's fee is $2; nonmembers, $3.

11) **Disqualification:** An entrant may be disqualified for

A) more than 2% log dupes (call signs or grid squares claimed).

B) consistently exceeding the Mode B General Beacon (145.810 MHz) by 6 dB or more; about 1 S unit.

C) behavior incongruous with good Amateur Radio practice.

| *Date Time* | *Call Sign* | *QSO Serial Number* | *Uplink Power Code His* | *Yours* | *Grid Square*[1] | *Member Number* | *QSO Points* | *Remarks* |
|---|---|---|---|---|---|---|---|---|
| April 17 | | | | | | | | |
| 2200 | W6SP | 523 | A | A | CM96 | 132 | 10 | |
| 2201 | VE2VQ | 524 | B | A | FA32 | 543 | 6 | |
| 2202 | XE1TH | 525 | B | B | CH86 | — | 1 | |
| 2203 | G3IOR | 526 | A | A | EU9O | 12 | 10 | |
| 2204 | PY2LK | 527 | A | A | KY76 | — | 5 | |
| | | | | | Total grids = 200 | | Total QSO points = 1250 | |

Grand total: 1250 × 200 = 250,000 points.

[1]Be sure to count only total different grid squares worked.

# Strays

## CODE DOES THE TALKING

☐ How do you communicate when your mouth is swollen, your jaw is wired closed and you're too weak to write on a pad? You use CW, of course!

The staff at Fox Chase Cancer Center in Philadelphia were taken aback when Hugo Scheuerman, WB2IGD, checked in carrying a code-practice oscillator. His wife Jan, WB2JCE, not only converses with Hugo via code, she is also able to convey his needs and requests to hospital personnel caring for him following extensive facial surgery and a complete reconstruction of his lower jaw.

This is a "first" for these dedicated people who deal daily with patients unable to speak. They all agree that WB2IDG's means of communication is playing an important role in his recuperation. "You can't imagine the frustration of one day being able to communicate normally and the next day complete silence," says 'IGD in CW.

Hugo says he never considered CW his favorite mode of operation on the air, but is now convinced that it should definitely be a required portion of the test. Until he regains his ability to speak, Hugo expects to use CW daily. And who knows, maybe there will be some new Novice licensees from Fox Chase in the near future. — *Jan Scheuerman, WB2JCE, Linwood, New Jersey*

First Ham in Space Owen Garriott, W5LFL (standing) enjoys a post-flight homecoming with the members of the Enid (Oklahoma) ARC at a luncheon in his honor. The club station, W5HTK, was one of Owen's many contacts during his historic Amateur Radio operation from the Space Shuttle *Columbia* last December.

# New FCC Study Guide For Exam Preparation

## Think you're ready for your new or upgrade license test? Check out the FCC's new exam topics list to be sure!

The FCC has released a February 1984 edition of its study syllabi for Amateur Radio operator license examinations. These syllabi should be used as the primary guides for all test preparation efforts, as the questions on each exam follow them closely. For copies of actual Novice or Technician/General test questions, send an s.a.s.e. to ARRL Hq. Please specify the license class exam questions you need. The Advanced and Extra Class questions are currently being compiled, and so are not available as of this writing. Please also note that the Novice questions are now in effect for all Novice exams. The Technician/General class questions will be used in the upcoming Volunteer Examiner Program; some are currently in use at FCC exam points.

The new syllabi reproduced here reflect the numerous rule changes that occurred during the rulemaking blitz of 1983. Changes from the previous syllabi appear in **boldface** print. — *Richard K. Palm, K1CE*

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**STUDY GUIDE FOR FCC AMATEUR RADIO OPERATOR LICENSE EXAMINATIONS**

*WHY AMATEUR RADIO OPERATOR EXAMINATIONS ARE REQUIRED*

The examinations determine if you are qualified for the privileges conveyed by an amateur radio license. Those privileges are many and diverse. As an amateur radio operator, you are allowed to build, repair, and modify your radio transmitters. You alone are responsible for the technical quality of your station's transmissions. You are allowed to communicate with amateur radio operators in other countries around the world and, in some cases, send messages for friends. As you upgrade to the higher operator license classes, you are allowed to communicate using not only telegraphy and voice, but also teleprinting, facsimile, and several forms of television. For such a flexible radio service to be practical, you and every other amateur radio operator must thoroughly understand your responsibilities and develop the skills needed to operate your amateur radio station properly.

*SUBJECTS COVERED IN AMATEUR RADIO EXAMINATIONS*

The written examinations cover the rules, practices, procedures, and technical material that you need to know in order to operate your amateur radio station properly. Each examination element is composed of questions which determine whether you have an adequate understanding of the topics listed in the corresponding syllabus. For example, all Element 3 examination questions are derived from the Element 3 syllabus, which appears in this Bulletin. To prepare properly for an examination, you should become knowledgeable about all topics in the syllabus for the element you will be taking. Every examination covers nine general subjects:

- Rules and Regulations
- Electrical Principles
- Signals and Emissions
- Antennas and Feedlines
- Amateur Radio Practice
- Circuit Components
- Practical Circuits
- Operating Procedures
- Radio Wave Propagation

These syllabi are updated as necessary to reflect current technology and amateur radio practices. Comments on the study guide contents are welcome. Mail them to the Personal Radio Branch, Federal Communications Commission, Washington, D.C. 20554.

*OBTAINING STUDY MATERIALS*

A study manual can be helpful in preparing for an examination. Several publishers offer manuals or courses based upon the material in this Bulletin. These may be found in many public libraries and radio stores. The FCC does not offer such manuals, nor recommend any specific publisher. However, you will find two FCC publications, *Part 97* and *How to Identify and Resolve Radio-TV Interference Problems*, useful when preparing for the amateur radio examinations. Copies are sold by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Specify stock number 004-000-00424-8 for Part 97 and stock number 004-000-00345-4 for the interference booklet.

*QUESTIONS USED IN AN EXAMINATION*

The questions used in the examinations are taken from those listed in PR Bulletins 1035A (Element 2); 1035B (Element 3); 1035C (Element 4A); and 1035D (Element 4B). The FCC compiles these lists from proposed questions submitted by interested amateur radio operators.

*SUBMITTING QUESTIONS FOR EXAMINATIONS*

If you are an amateur radio operator, you are invited to submit questions for use in the examinations. Such questions must be suitable for various types of answer formats: single-answer, multiple choice or essay type. All proposed amateur operator license examination questions must be directed to the Personal Radio Branch, Federal Communications Commission, Washington, D.C. 20554. The following table shows which element questions may be submitted by each class of amateur operator:

| | *Elements* | | | |
|---|---|---|---|---|
| *Operator Class* | *2* | *3* | *4A* | *4B* |
| Amateur Extra | Yes | Yes | Yes | Yes |
| Advanced | Yes | Yes | No | No |
| General | Yes | No | No | No |
| Technician | Yes | No | No | No |
| Novice | No | No | No | No |

Each proposed question must be submitted on a single 8½" × 11" sheet of paper showing the following:

1) The test element (2, 3, 4A or 4B) for which the question is proposed.

2) The study guide topic upon which the questions is based. (Example: B(2) Radio Teleprinting Operating Procedures.)

3) The question and the answer.

4) One or more reference sources which confirm the correct answer. (Examples: FCC rule number; textbook name and page number.)

5) Submittor's name, address, operator class and amateur radio station call sign.

FCC approval of a submitted question may require modification or change to any portion thereof. All questions submitted become the property of the FCC.

**ELEMENT 2 SYLLABUS**

A. RULES AND REGULATIONS

Definition:

(1) Amateur Radio Service 97.3(a)
(2) Amateur radio operator 97.3(c)
(3) Amateur radio station 97.3(e)
(4) Amateur radio communications 97.3(b)
(5) Operator license 97.3(d)
(6) Station license 97.3(d)
(7) Control operator 97.3(o)
(8) Third-party traffic 97.3(v)

Novice class operator privileges:

(9) Authorized frequency band 97.7(e)
(10) Authorized A1 emission 97.7(e)

Prohibited practices:

(11) Unidentified communications 97.123
(12) Intentional interference 97.125
(13) False signals 97.121
(14) Communications for hire 97.112(a)

Basis and purpose of the Amateur Radio Service rules:

(15) To recognize and enhance the value of the Amateur Radio Service to the public as a voluntary, non-commercial communication service,

particularly with respect to providing emergency communications. 97.1(a)
(16) To continue and extend the amateur radio operators' proven ability to contribute to the advancement of the radio art. 97.1(b)
(17) To encourage and improve the Amateur Radio Service by providing for advancing skills in both the communication and technical phases. 97.1(c)
(18) To expand the existing reservoir within the Amateur Radio Service of trained operators, technicians, and electronics experts. 97.1(d)
(19) To continue and extend the radio amateurs' unique ability to enhance international good will. 97.1(e)

Operating rules:
(20) U.S. amateur radio station call signs 2.302 and FCC Public Notice
(21) Permissible points of communications 97.89(a)(1)
**(22) Station identification 97.84(a)**
**[The logging requirements have been eliminated, thus reference in this syllabus has been removed — Ed.]**
(23) Novice band transmitter power limitation 97.67, (d)
(24) Necessary procedure in response to an official notice of violation 97.137
(25) Control operator requirements 97.79(a), (b)

B. OPERATING PROCEDURES
(1) R-S-T signal reporting system
(2) Choice of telegraphy speed
(3) Zero-beating received signal
(4) Transmitter tune-up procedure
(5) Use of common and internationally recognized telegraphy abbreviations, including: CQ, DE, K, SK, R, AR, 73, QRS, QRZ, QTH, QSL, QRM, QRN

C. RADIO WAVE PROPAGATION
(1) Sky wave; "skip"
(2) Ground wave

D. AMATEUR RADIO PRACTICE
(1) Measures to prevent use of amateur radio station equipment by unauthorized persons

Safety precautions:
(2) Lightning protection for antenna system
(3) Ground system
(4) Antenna installation safety procedures

Electromagnetic compatibility — identify and suggest cure:
(5) Overload of consumer electronic products by strong radio frequency fields
(6) Interference to consumer electronic products caused by radiated harmonics

Interpretation of SWR readings as related to faults in antenna system:
(7) Acceptable readings
(8) Possible causes of unacceptable readings

E. ELECTRICAL PRINCIPLES
Concepts:
(1) Voltage
(2) Alternating current, direct current
(3) Conductor, insulator
(4) Open circuit, short circuit
(5) Energy, power
(6) Frequency, wavelength
(7) Radio frequency
(8) Audio frequency

Electrical units:
(9) Volt
(10) Ampere
(11) Watt
(12) Hertz
(13) Metric prefixes: mega, kilo, centi, milli, micro, pico

F. CIRCUIT COMPONENTS
Physical appearance, applications, and schematic symbols of:
(1) Quartz crystals
(2) Meters (D'Arsonval movement)
(3) Vacuum tubes
(4) Fuses

G. PRACTICAL CIRCUITS
Block diagrams:
(1) The stages in a simple telegraphy (A1) transmitter
(2) The stages in a simple receiver capable of telegraphy (A1) reception
(3) The functional layout of Novice station equipment, including transmitter, receiver, antenna switching, antenna feedline, antenna, and telegraph key

H. SIGNALS AND EMISSIONS
(1) Emission type A1

Cause and cure:
(2) Backwave
(3) Key clicks
(4) Chirp
(5) Superimposed hum
(6) Undesirable harmonic emissions
(7) Spurious emissions

I. ANTENNAS AND FEEDLINES
Necessary physical dimensions of these high frequency antennas for resonance on amateur radio frequencies:
(1) A half-wave dipole
(2) A quarter-wave vertical

Common types of feedlines used at amateur radio stations:
(3) Coaxial cable
(4) Parallel conductor line

## ELEMENT 3 SYLLABUS

(Technician, General, Advanced and Amateur Extra classes)

A. RULES AND REGULATIONS
(1) Control point 97.3(p)
(2) Emergency communications 97.3(w); 97.107
(3) Amateur radio transmitter power limitations 97.67
(4) Station identification requirement 97.84(b), (f), (g); 97.79(c)
(5) Third-party participation in amateur radio communications 97.79(d)
(6) Domestic and international third party traffic 97.114; Appendix 2, Art. 41, Sec. 2
(7) Permissible one-way transmissions 97.91
(8) Frequency bands available to the Technician class 97.7(d)
(9) Frequency bands available to the General class 97.7(b)
(10) Limitations on use of amateur radio frequencies 97.61
(11) Selection and use of frequencies 97.63
(12) Radio controlled model crafts and vehicles 97.65(a); 97.99
(13) Digital communications 97.69

Prohibited practices:
(14) Broadcasting 97.113
(15) Music 97.115
(16) Codes and ciphers 97.117
(17) Obscenity, indecency, profanity 97.119

B. OPERATING PROCEDURES
(1) Radiotelephony
(2) Radioteleprinting
(3) Use of repeaters
(4) Vox transmitter control
(5) Full break-in telegraphy
(6) Operating courtesy
(7) Antenna orientation
(8) International communication
(9) Emergency preparedness drills

C. RADIO WAVE PROPAGATION
(1) Ionospheric layers; D, E, F1, F2
(2) Absorption
(3) Maximum usable frequency
(4) Regular daily variations
(5) Sudden ionospheric disturbance
(6) Scatter
(7) Sunspot cycle
(8) Line-of-sight
(9) Ducting, tropospheric bending

D. AMATEUR RADIO PRACTICE
Safety precautions:
(1) Household ac supply and electrical wiring safety
(2) Dangerous voltages in equipment made inaccessible to accidental contact

Transmitter performance:
(3) Two-tone test
(4) Neutralizing final amplifier
(5) Power measurement

Use of test equipment:
(6) Oscilloscope
(7) Multimeter
(8) Signal generators
(9) Signal tracer

Electromagnetic compatibility; identify and suggest cure:
(10) Disturbance in consumer electronic products caused by audio rectification

Proper use of station accessories:
(11) Reflectometer (VSWR meter)
(12) Speech processor — rf and af
(13) Electronic t-r Switch
(14) Antenna tuning unit; matching network
(15) Monitoring oscilloscope
(16) Non-radiating load; "dummy antenna"
(17) Field strength meter; S-meter
(18) Wattmeter

E. ELECTRICAL PRINCIPLES
Concepts:
(1) Impedance
(2) Resistance
(3) Reactance
(4) Inductance
(5) Capacitance
(6) Impedance matching

Electrical units:
(7) Ohm
(8) Microfarad, picofarad
(9) Henry, millihenry, microhenry
(10) Decibel

Mathematical relationships:
(11) Ohm's Law
(12) Current and voltage dividers
(13) Electrical power calculations
(14) Series and parallel combinations; of resistors, of capacitors, of inductors
(15) Turns ratio; voltage, current, and impedance transformation
(16) Root-mean-square value of a sine wave alternating current

F. CIRCUIT COMPONENTS
Physical appearance, types, characteristics, applications, and schematic symbols for:
(1) Resistors
(2) Capacitors

(3) Inductors
(4) Transformers
(5) Power supply type diode rectifiers

G. PRACTICAL CIRCUITS
(1) Power supplies
(2) High-pass, low-pass, and band-pass filters
(3) Block diagrams showing the stages in complete AM, SSB, and FM transmitters and receivers

H. SIGNALS AND EMISSIONS
(1) Emission Types AØ, A3, F1, F2, F3
(2) Signal, information
(3) Amplitude modulation
(4) Double sideband
(5) Single sideband
(6) Frequency modulation
(7) Phase modulation
(8) Carrier
(9) Sidebands
(10) Bandwidth
(11) Envelope
(12) Deviation
(13) Overmodulation
(14) Splatter
(15) Frequency translation; mixing, multiplication
(16) Radioteleprinting; audio-frequency shift keying, mark, space, shift

I. ANTENNAS AND FEEDLINES
Popular amateur radio antennas and their characteristics:
(1) Yagi antenna
(2) Quad antenna
(3) Physical dimensions
(4) Vertical and horizontal polarization
(5) Feedpoint impedance of half-wave dipole, quarter-wave vertical
(6) Radiation patterns; directivity, major lobes
Characteristics of popular amateur radio antenna feedlines; related concepts:
(7) Characteristic impedance
(8) Standing waves
(9) Significance of standing wave ratio
(10) Balanced, unbalanced
(11) Attenuation
(12) Antenna-feedline mismatch

## ELEMENT 4A SYLLABUS

(Advanced and Amateur Extra classes)

A. RULES AND REGULATIONS
(1) Frequency bands available to the Advanced class amateur radio operator and limitations on use 97.7(a); 97.61
(2) Automatic retransmission of amateur radio signals and signals from other radio services 97.3(x); 97.113; 97.126
(3) Amateur radio stations in repeater operation 97.3(1); 97.85; 97.61(c)
(4) Amateur radio stations in auxiliary operation 97.3(1); 97.86; 97.61(d)
(5) Remote control of amateur radio stations 97.3(m)(2); 97.88
(6) Automatic control of amateur radio stations 97.3(m)(3)
(7) Control link 97.3(n)
(8) System network diagram 97.3(u)
(9) Station identification 97.84(c), (d), (e)
**[Former logging requirement reference deleted — Ed.]**
**(10) Antenna height limitations 97.45**
**(11) Antenna height above average terrain 97.67(c); Appendix 5**

**Prohibited practices:**
**(12) Business communications 97.110**
**(13) International communications 97.111**
**(14) Remuneration for use of station 97.112**

**Novice operator class examinations:**
**(15) Element 1(A) examination preparation 97.27(a)**
**(16) Element 2 examination preparation 97.27(c), (e)**
**(17) Examination administration 97.28(b), (c), (d), (f), (g)**
**(18) Examination grading 97.29**
**(19) Volunteer examiner requirements 97.31(a), (b), (c), (e)**
**(20) Volunteer examiner conduct 97.33**

B. OPERATING PROCEDURES
(1) Facsimile transmission
(2) Slow-scan television transmission

C. RADIO WAVE PROPAGATION
(1) Sporadic-E
(2) Selective fading
(3) Auroral propagation
(4) Radio-path horizon

D. AMATEUR RADIO PRACTICE
Use of test equipment:
(1) Frequency measurement devices
**(2) Dip meter**
(3) Performance limitations of oscilloscopes, meters, frequency counters; accuracy, frequency response, stability
Electromagnetic compatibility:
(4) Intermodulation interference
(5) Receiver desensitizing
(6) Cross-modulation interference
(7) Capture effect

E. ELECTRICAL PRINCIPLES
Concepts:
(1) Reactive power
(2) Series and parallel resonance
(3) Skin effect
(4) Fields, energy storage, electrostatic, electromagnetic
Mathematical relationships:
(5) Resonant frequency, bandwidth, and "Q" of R-L-C circuits, given component values
(6) Phase angle between voltage and current, given resistance and reactance
(7) Power factor, given phase angle
(8) Effective radiated power, given system gains and losses
(9) Replacement of voltage source and resistive voltage divider with equivalent circuit consisting of a voltage source and one resistor (an application of Thevenin's Theorem, used to predict the current supplied by a voltage divider to a known load)

F. CIRCUIT COMPONENTS
Physical appearance, types, characteristics, applications, and schematic symbols for the following:
(1) Diodes; zener, tunnel, varactor, hot-carrier, junction, point contact, pin
(2) Transistors; npn, pnp, junction, unijunction, power, germanium, silicon
(3) Silicon controlled rectifier, triac
(4) Light emitting diode, neon lamp
(5) Crystal lattice ssb filters

G. PRACTICAL CIRCUITS
(1) Voltage-regulator circuits; discrete and integrated
(2) Amplifers; Class A, AB, B, C; characteristics of each type
(3) Impedance-matching networks; Pi, L, Pi-L
(4) Filters; constant K, M-derived, band-stop, notch, Modern-network-theory, Pi-section, T-section, L-section (not necessary to memorize design equations; know general description, characteristics, responses, and applications of these filters)
(5) Oscillators; various types and their applications; stability
Transmitter and receiver circuits — purpose of each and how it functions:
(6) Modulators; am, fm, balanced
(7) Transmitter final amplifiers
(8) Detectors, mixer stages
(9) RF and IF amplifier stages
Circulation of voltages, currents, and power in common amateur radio circuits:
(10) Common emitter class A transistor amplifier; bias network, signal gain, input and output impedances
(11) Common collector class A transistor amplifier; bias network, signal gain, input and output impedances
Circuit design selection of circuit component values:
(12) Voltage regulator with pass transistor and zener diode to produce given output voltage
(13) Select coil and capacitor to resonate at given frequency

H. SIGNALS AND EMISSIONS
(1) Emission types A4, A5, F4, F5
(2) Modulation methods
(3) Deviation ratio
(4) Modulation index
(5) Electromagnetic radiation
(6) Wave polarization
(7) Sine, square, sawtooth waveforms
(8) Root-mean-square value
(9) Peak-envelope-power relative to average
(10) Signal-to-noise ratio

I. ANTENNAS AND FEEDLINES
(1) Antenna gain, beamwidth
(2) Trap antennas
(3) Parasitic elements
(4) Radiation resistance
(5) Driven elements
(6) Efficiency of antenna
(7) Folded, multiple wire dipoles
(8) Velocity factor
(9) Electrical length of a feedline
(10) Voltage and current nodes
(11) Mobile antennas
(12) Loading coil; base, center, top

## ELEMENT 4B SYLLABUS

(Amateur Extra class)

A. RULES AND REGULATIONS
(1) Frequency bands available to U.S. amateur radio operators and limitations on their use including variations for Regions 1 & 3 97.61; 97.95
**(2) Amateur-Satellite Service Subpart H**
(3) Purity of emissions 97.73
(4) Mobile operation aboard ships or aircraft 97.101
**(5) RACES Subpart F**
(6) Points of communications 97.89
**(7) Alien operators, reciprocal agreements Subpart G**
**(8) Volunteer-Examiner Coordinators Subpart I**

**Volunteer examiner teams:**
**(9) Examination elements 97.21**
**(10) Examination requirements 97.23**
**(11) Examination credit 97.25**
**(12) Examination procedure 97.26**

(continued on page 64)

# Happenings

Conducted By Richard K. Palm,* K1CE

- *160-Meter RTTY Request*
- *160-Meter Power Limits Should Go — ARRL*
- *ARRL Bids For Reconsideration In 2310-2390 MHz Loss*
- *Goldwater and FAR Scholarships*

## ARRL Asks For 160-Meter RTTY

In a *Petition For Rule Making* filed with the FCC on February 2, 1984, ARRL requested that the agency amend Part 97 of its Rules to allow F1 emissions in the entire 160-meter band, 1800-2000 kHz. F1 is the Commission's designator for frequency-shift keying (FSK), a common mode used for digital communications. Presently only A1 (on-off keying) and A3 (amplitude-modulated voice) modes are permitted on "top band."

In support of its request, ARRL offered a brief history of rule making in the band, and noted the Commission's past reluctance to allow any modes other than A1 and A3 because of an international mandate concerning protection for Loran A operations. Loran is a radiodetermination service for aiding navigation. "However, with respect to the 1800-1900 kHz portion of the band, now exclusively allocated to Amateur Radio, there is no Loran A to be protected," ARRL stated. At 1900-2000 kHz, the League noted that the international mandate for Loran A protection, which calls for A1 and A3 types only, is now moot because of the cessation of Loran A operations in this segment in ITU Region 2 (North and South America). The League said it was precisely this abandonment of U.S. Loran A operation and the reduction in Canadian operation that, in 1981, led to the elimination of the special geographic power limitations by the Commission at 1800-1900 kHz. Now, with Canadian Loran A operations terminated, there is no longer any need for U.S. 160-meter mode limitations, ARRL indicated. "... it is now appropriate to permit more flexibility for amateur operation in that band," the League concluded.

Concerning the need for 160-meter F1 privileges, the League cited two factors: First, there has been a rapid growth of RTTY activity because of the availability of inexpensive personal computers that readily adapt to this mode. "There is thus a need for additional RTTY channels in the HF bands as the RTTY portions of the other HF bands become more crowded," ARRL stated. Second, with the continuing decline of sunspot numbers and the corresponding changes in skywave communications, the 160-meter band is becoming more essential at night for certain paths.

Because of the need for flexibility in amateurs' own band planning and coordination efforts, the League stated its desire that the FCC *not* create a particular subband for F1 operations.

### ARRL REQUESTS END TO 160-METER SPECIAL POWER LIMITS

In a separate move concerning the 160-meter band, ARRL has requested that the FCC terminate the special geographic power limitations that currently exist at the 1900-2000 kHz portion. The League filed a *Petition For Issuance Of Order Relieving Operating Restrictions* with the Commission Secretary on February 2, 1984 to remove the special restrictions contained in the domestic frequency table for 1900-2000 kHz and in Section 97.61(b)(1) and (2) of the Amateur Radio Rules. These special power restrictions, expressed in peak envelope power output by state, were put in place originally to protect Loran A radionavigation operations in the Northeastern U.S. and Canada.

The League said these special limits are no longer required, as Loran A operations at 1900-2000 kHz are nonexistent in ITU Region 2 (North and South America).

ARRL stated its belief that the Commission has the authority simply to issue an *Order* amending the rules per its petition, thus foregoing the notice and comment stages of rulemaking procedures, based on the following language of §97.61(b)(1): "The use of frequencies in this band is on a shared basis with the Loran A radionavigation system and is subject to cancellation or revision, in whole or in part, *by order of the Commission, without hearing,* whenever the Commission shall determine such action necessary in view of the priority of the Loran A radionavigation system ..." (emphasis added). ARRL also cited the fact that FCC lifted the old 1800-1900 kHz power restrictions by *Order* upon a U.S. Coast Guard statement that its Loran A operations were ceasing.

The League concluded its request by stating, "The relief of unnecessary operating restrictions is appropriate and will further the public interest in that it will permit increased opportunities for experimentation and enhance amateur communication in this unique frequency band."

### 2310-2390 MHz — THINK AGAIN, FCC

ARRL has asked FCC to reverse its decision to remove amateur access to the 2310-2390 MHz segment of the 2300-2450 MHz band. This decision, reported in the *Second Report and Order* of the WARC-79 implementation proceeding (General Docket 80-739), was made to protect new aeronautical flight test telemetry operations from interference. These operations are a mobile service for relaying electrical and other data by telemetry, and for telecommand operation, for flight testing of manned and unmanned aircraft and missiles. WARC-79 agreements provide for a secondary amateur allocation, and primary fixed, mobile and radiolocation allocations at the 2300-2450 MHz portion of the spectrum.

In comments filed in the *Third Notice of Inquiry* in the WARC proceeding, ARRL requested that the amateur allocation be retained, and that FCC investigate the possibility of geographical sharing between amateurs and aeronautical telemetering. The League supported the need for safety, particularly for the general public, in flight test areas, but quickly pointed out that these operations would exist on a very limited and specifically defined geographic basis. Thus, the door seems open to amateur/flight test sharing on this geographic basis.

FCC turned down ARRL's requests, saying "there is little evidence to support the ARRL proposal ... and no new information was filed in response to the [later released] NPRM [Notice of Proposed Rule Making] to support such sharing" (Paragraph 53 of the Second Report and Order).

In a February 21, 1984 *Petition for Reconsideration*, the League took issue with the Commission, stating that no technical analysis has ever been provided to establish the presumed interference between primary aeronautical telemetering and Amateur Radio use of the band. Nor has there been significant opportunity to establish such data on a national basis, ARRL said. Because of the Commission's stated intent that it did not wish to revisit the matters addressed in the extensive WARC-79 preparations, ARRL did not have the full opportunity to rebut the agency's thinking with respect to the 2310-2390 MHz segment. To wit, the *Report and Order* in the WARC preparations proceeding (Docket 20271) positively states that Amateur Radio occupancy of the band would continue. The League and the amateur community fully expected continued access to the band.

It was not until the *Third Notice of Inquiry* in the WARC implementation proceeding that any indication arose that FCC intended to abandon its own ground rules and exclude amateurs from the 80-MHz-wide segment of the band, contrary to its pre-WARC position. The short period between the release of the third notice and

*Deputy Manager, Membership Services, ARRL

the comment deadline in the *Notice of Proposed Rule Making* was inadequate for a thorough consideration of the technical issues.

In other arguments, the League pointed to the lack of any request for aeronautical flight testing *exclusivity* at the segment in a petition for rule making filed by the Aerospace and Flight Test Radio Coordinating Council. The petition, RM-4077, looking for flight-test access to the segment, has not yet been acted upon by the Commission. ARRL suggested that this rule-making proceeding may be the appropriate vehicle for addressing the League's geographical-sharing proposal.

ARRL summed up its bid for reconsideration by reminding the Commission of its duty under the Communications Act of 1934 to foster the widest use of radio service. "For the Commission to preclude all amateur secondary use of that band would be the most arbitrary of frequency allocation actions," ARRL concluded. The League urged continued amateur access to the segment until the technical parameters of both the primary use of aeronautical flight-test telemetry and secondary geographical sharing by amateurs are explored in further rule-making proceedings such as RM-4077.

## ANTENNA-CONTEST LICENSE SOUGHT

On February 14, ARRL filed an application for an experimental license under Part 5 of the FCC Rules. The application seeks authority for participants in ARRL's Antenna Design contest (see March 1984 *QST*, p. 56) to do one-way tests on 18.073, 18.163, 24.895 and 24.985 MHz with 250-W peak power. (The frequencies were chosen arbitrarily 5 kHz in from each band edge of the 18- and 24-MHz WARC bands so that contestants can check the flatness of their antennas across the band; they are subject to adjustment to accommodate government users of the frequencies.) Only A0 emission will be used, except for ID by A3J or A1 (new J3E and A1A, respectively) emissions every 15 minutes. The identification has not yet been worked out, but it will include the normal amateur call sign of the participants, shown on an appendix ARRL will furnish later.

## FCC LICENSE FIGURES

As of January 31, statistics for the Amateur Service by license class look like this:

| | |
|---|---|
| Extra Class | 34,674 |
| Advanced | 95,782 |
| General | 118,023 |
| Technician | 77,518 |
| Novice | 85,482 |
| Individual Operators | 411,479 |
| Club Stations | 2413 |
| Mil. Recreation | 191 |
| Secondary Stns. | 252 |
| RACES | 479 |
| Total Stns. | 414,814 |

## FIRST GOLDWATER SCHOLARSHIP TO BE OFFERED

The ARRL Foundation plans to award the first Goldwater Scholarship for the academic year 1984-1985 this fall. With the fund-raising campaign for the Goldwater Scholarship Endowment Fund well underway (see elsewhere in this column), it is anticipated that the Endowment will be sufficient to make the first award this fall, potentially in the amount of $5000.

Applicants must have been accepted for enrollment in at least a baccalaureate degree program in a regionally accredited institution of higher education, must be a licensed radio amateur and must intend to study full-time in a communications-related field. Among the factors to be considered in selecting a scholarship recipient will be academic merit and financial need. Applications are available from the ARRL Foundation, Inc., 225 Main St., Newington, CT 06111. The deadline for applications for the 1984-1985 academic year is June 1, 1984.

This scholarship is administered by the ARRL Foundation, and is separate and distinct from the scholarships offered by the Washington, DC-based Foundation for Amateur Radio discussed elsewhere in this column.

### 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: Taizo Arakawa, N2ATT/JA3AER; Robert Aldrich, WØJVM; Albany ARA; Raymond Brown, W2STF; Richard Badgett, KA5SRV; John Brant, W8WAB; Howard Bullock, W4LBM; Charles Campbell, W9UEM; Hugh Crouch, W1HEZ; Ted Clifton, W9TC; Daniel Cetin, N2DMT; Robert Carter, W7INP; Ian Elliott, W7JMX; Dale Diehl, K5WUF; Anthony DeCaro, K2OCU; Sandy Donahue, WA4ABY; E. R. Durham; Milton Durham, KC7RX; Irvin Emig, W6GC; Byron Gifford, WA4YPQ; Jan Garner, W8IQV; W. P. Gearhiser, W5EPW; I. Goldwasser, W4RD; David Hyde, KA2MJI; Vaughn Herrick, K6EXJ; A. E. Hirsch, Jr., K2SKV; Ed Jones, WB2DVL; Clarence Jeffers, KA1IH; Dale Jones, K5MM; R. S. Kingsbury, K8WOX; John Libby, W2SWA; Louis Lyell, WA5YMK; Lowell Lux, K6SRD; Charles Mason, N5GNE; Nellie Meyers, KA9DVY; Massillon ARC; Charles Mathias, W8KGD; Don Meserve, WØHG; Harold Masden, AF6B; Roy Ozawa, W6FOJ; Stanley Niedermeier, W8YIQ; Aaron Powers, W6NUM; Willard Prentice, W3VBM; Willis Richardson, W8SLE; Rock Creek ARA; Clyde Stanfield, WA6HEG; ARRL President Carl L. Smith, WØBWJ; and Terriann Smith; Leland Smith, W5KL; Charles Stone, KØOSN; J. M. Scovill, W7GSZ; Andrew Stefanek, N1CLO; Ethel Smith, K4LMB; The Rev. Anthony Tamulis, W9PQS; John Tiernan, KA6LNC; Charles Taksony, W8FJK; L. Phil Wicker, W4ACY; Raymond Wilson, W7BMM; Stanley Wauchope, W6MIO/VK6AIO; Donald Weber, N4DC; Raymond Yakesh, KL7WL; Richard Yeager, WB6YKV; Frank Zayac, W2FYY.

## 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.

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, that 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 elections were conducted for a two-year term of office beginning April 1, 1984:

*Balloting Results:* In the North Carolina Section, Rae Everhart, K4SWN, received 579 votes and Ian C. Black, WD4CNR, received 323 votes. Mr. Everhart was declared elected.

In the Pacific Section, James F. Wakefield, AH6CO, received 174 votes and Army Curtis, AH6P, received 124 votes. Mr. Wakefield was declared elected.

In the Virginia Section, Claude E. Feigley, W3ATQ, received 828 votes and A. Ray Massie, K3RZR, received 502 votes. Mr. Feigley was declared elected.

## FAR SCHOLARSHIPS

The Foundation for Amateur Radio, Inc., a nonprofit organization with headquarters in Washington, DC, plans to award 15 scholarships for the academic year 1984-85. The Foundation, composed of 50 local area Amateur Radio clubs, fully funds two of these scholarships from the proceeds of its annual hamfest. It administers, without cost to the donors, three scholarships for the Quarter Century Wireless Association, two for the Dade (Florida) RC and one each for the Radio Club of America, the Richard G. Chichester Memorial, the Young Ladies' Radio League, the Edmund B. Redington Memorial, the Amateur Radio News Service, the Columbia (Maryland) ARA, the Baltimore (Maryland) ARC and the Lewis G. Wilkinson Memorial.

Licensed radio amateurs may compete for one or more of these awards if they plan to pursue a full-time course of studies beyond high school and are enrolled or have been accepted for enrollment in an accredited university, college or technical school. Most of the scholarships require the applicant to hold at least an FCC General class license or equivalent. The scholarship awards range from $350 to $900, with preference given in some cases to residents of specified geographical areas or for the pursuit of certain study programs.

The Foundation is devoted exclusively to promoting the interests of Amateur Radio and to those scientific, literary and educational pursuits that advance the purposes of the Amateur Radio Service.

Additional information and an application form can be requested by letter or QSL/postcard postmarked prior to May 31, 1984 from: FAR Scholarships, 6903 Rhode Island Ave., College Park, MD 20740.

(continued from page 61)

**(13) Examination preparation 97.27(b), (d), (e)**
**(14) Examination administration 97.28(a), (e), (h), (i), (j)**
**(15) Volunteer examiner requirements 97.31(d)**
**(16) Temporary operating authority 97.35**

B. OPERATING PROCEDURES
(1) Use of amateur radio satellite
(2) Amateur fast-scan television

C. RADIO WAVE PROPAGATION
(1) Eme; "moonbounce"
(2) Meteor burst
(3) Trans-equatorial

D. AMATEUR RADIO PRACTICE
Use of test equipment:
(1) Spectrum analyzer; interpret display; display of transmitter output spectrum, such as commonly found in new product review articles in amateur radio magazines
(2) Logic probe; indication of high or low state, pulsing state
Electromagnetic compatibility:
(3) Vehicle noise suppression; ignition noise, alternator whine, static
(4) Direction finding techniques; methods for location of source of radio signals

E. ELECTRICAL PRINCIPLES
Concepts:
(1) Photoconductive effect
(2) Exponential charge/discharge
Mathematical relationships; calculations:
(3) Time constant for R-C and R-L circuits (including circuits with more than one resistor, capacitor or inductor)
(4) Impedance diagrams; basic principles of Smith chart
(5) Impedance of R-L-C networks at a specified frequency
(6) Algebraic operations using complex numbers; real, imaginary, magnitude, angle

F. CIRCUIT COMPONENTS
Physical appearance, types, characteristics, applications, and schematic symbols for:
(1) Field-effect transistors; enhancement, depletion, MOS, CMOS, n-Channel, p-Channel
(2) Operational amplifier and phase-locked loop integrated circuits
(3) 7400 Series TTL digital integrated circuits
(4) 4000 Series CMOS digital integrated circuits
(5) Vidicon; cathode ray tube

G. PRACTICAL CIRCUITS
(1) Digital logic circuits; flip-flop, multivibrator, AND/OR/NAND/NOR/ gates
(2) Digital frequency divider circuits; crystal marker, counters
(3) Active audio filters using integrated operational amplifiers
High performance receiver characteristics
(4) Noise figure, sensitivity
(5) Selectivity
(6) Dynamic range
Calculation of voltages, currents, and power in common amateur radio oriented circuits:
(7) Integrated operational amplifier; voltage gain, frequency response
(8) F.E.T. common-source amplifier; input impedance
Circuit design; selection of circuit component values:
(9) LC preselector with fixed and variable capacitors to tune a given frequency range
(10) Single stage amplifier to have desired frequency response by proper selection of bypass and coupling capacitors

H. SIGNALS AND EMISSIONS
(1) Pulse modulation; position, width
(2) Digital signals
(3) Modulation amplitude compandored single-sideband
(4) Information rate vs. bandwidth
(5) Peak amplitude of a signal
(6) Peak-to-peak values of a signal

I. ANTENNAS AND FEEDLINES
(1) Antennas for space radio communications; gain, beamwidth, tracking
(2) Isotropic radiator; use as a standard of comparison
(3) Phased vertical antennas; resultant patterns, spacing in wavelengths
(4) Rhombic antennas; advantages, disadvantages
(5) Matching antenna to feedline; delta, gamma, stub
(6) Properties of 1/8, 1/4, 3/8 and 1/2 wavelength sections of feedlines; shorted, open

# East Coast 220-MHz EME DXpedition

By Ed Gray,* WØSD, Barry Arneson,** WBØPJB and Marc Thorson,*** WBØTEM

After nearly 100 QSOs and about 4000 miles, the East Coast 220-MHz EME DXpedition is a matter of record. We left WBØTEM's QTH on December 14, in a raging snowstorm, and returned, under similar circumstances, on Christmas Eve. Operating from the borders of WV/VA, MD/DE and NY/VT and from W1UHE (RI) and W1AW (CT), we netted a total of 75 220-MHz EME QSOs. These states were needed by nearly every 220 operator. Top honors go to W5FF, K5FF, WB5LUA, WØSD and WBØTEM, who made QSOs at every stop (see Fig. 1). Also, WA3GOO reached us via tropo from VA, WV, MD, DE, RI and CT, and W1JR from VA, WV, NY, VT and RI. Other stations worked on tropo were W3GPY, W2WW, W1GCI, W2EIF, K4LHB and N2BJ.

Special thanks to WBØTEM, who designed the equipment used and maintained regular skeds with us during the DXpedition. Thanks also to W1UHE, W1JR, WA3GOO, W3GPY, WB3LJK and K3EUG for liaison and backup while we were out East, and to K1ZZ, W1XX and others at ARRL Hq. for making our stay in Newington a successful and enjoyable one. Here are a few highlights of our journey East.

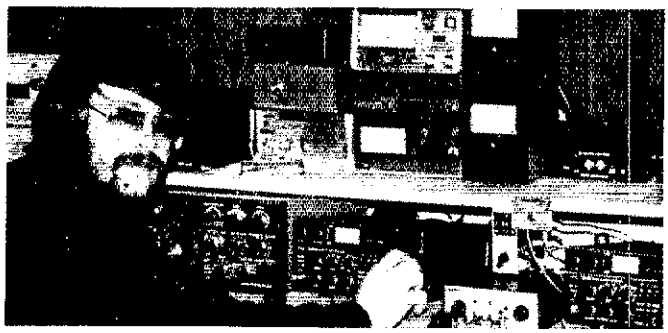
*Rte. 2, Box 151, Salem, SD 57058, **5300 W. 52nd, Sioux Falls, SD 57106, ***331 Dakota, Akron, IA 51001

| | WV | VA | MD | DE | NY | VT | RI | CT |
|---|---|---|---|---|---|---|---|---|
| W5FF | X | X | X | X | X | X | X | X |
| K5FF | X | X | X | X | X | X | X | X |
| WB5LUA | X | X | X | X | X | X | X | X |
| WØSD | X | X | X | X | X | X | X | X |
| WBØTEM | X | X | X | X | X | X | X | X |
| KD6R | X | X | X | X | X | X | X | — |
| KAØY | — | — | X | X | X | X | X | X |
| W4WD | — | — | X | X | X | X | X | X |
| VE3EMS | X | X | X | X | — | — | X | — |
| K9XY | X | X | X | X | — | — | — | — |
| K9KFR | — | — | X | X | — | — | X | — |
| K9HMB | — | — | X | X | — | — | — | — |
| WDØFOY | — | — | — | — | — | — | — | X |
| WBØPJB | — | — | — | — | — | — | — | X |

Fig. 1 — The East Coast DXpedition netted a total of 75 220-MHz EME QSOs. Here is the breakdown of those contacts by state.

Having quickly worked the band dry at our first stop, the WV/VA border, we moved on to MD/DE, where we had great success working everyone we heard. Our noise level was virtually zero, and conditions were good. The HF rig on the steering wheel was used primarily for keeping in regular contact with WBØTEM and for liaison along the route. The 220-MHz equipment is on the seat, beside WØSD, with the rest of the 220 gear on a shelf behind the seat.

After NY/VT, we headed for the Tiverton, Rhode Island, QTH of Norm Patenaude, W1UHE, arriving the afternoon of December 19. Shortly after moonrise, WØSD was able to work a couple of stations, before the moon went behind the house. Later, we worked some tropo, as it was a 220 activity night. W1UHE also did a good deal of operating, including K5FF and W5FF among the contacts. The second night at W1UHE, we managed to work K9KFR and VE3EMS, but were unable to make two-ways with K9HMB and K9XY despite five hours of trying. It was our coldest teardown, at 6° F.



At the last stop on our East Coast swing, WBØTEM took some time out to operate from the visitor's console at W1AW. Aside from some power-line problems, the Newington operation went smoothly, netting us nine contacts on EME and WA3GOO on tropo. We also worked quite a few stations on 75 meters using the rhombic and kW.

Teardown at W1AW was done in 8 inches of freshly fallen snow. Our generator is at the left, secured to the trailer; the 220 array, above the car roof, awaits dismantling. W1AW's 432 EME array is barely discernible behind the 220. After a farewell visit with the ARRL Communications Department, we were on our way, making it home barely in time for Christmas.

# Correspondence

Conducted By Peter R. O'Dell,* KB1N



## WHAT'S NEW?

☐ I have been a member of ARRL for several years, but sometimes I don't even unwrap the QST issues — but in a few months generally give them away to hams who are project builders, etc. I wasn't going to renew my subscription again this year, but I just happened to open the January issue, because I believe I heard the space Shuttle answer my call and I heard there was a partial list in *QST* of those he had heard.

I was so surprised to see *QST* had been revamped with interesting articles and especially cartoons like those in "Build that Kit" and "Getting Into Amateur Electronics." Previously, it seemed to me there was not a great deal for "appliance operators" and those with a sketchy knowledge of what goes on inside our black boxes. Years ago in the tube era, I did considerable work repairing home and auto radios. Keep the interesting "down to earth where most of us live" articles and illustrations coming. — *Clyde B. Stanfield, WA6HEG, Upland, California*

## WORLDWIDE BEACON FREQUENCY

☐ Based on the number of signals that zero in on 14.1 MHz, one must conclude that there are many amateurs who are unfamiliar with the worldwide beacon net (June 1983 *QST*, p. 27). What could be more conclusive than when a VE3 called ZS6DN after one of that beacon's transmissions.

As the *QST* article pointed out, one "can get a quick general appraisal of the various 14-MHz paths that may or may not be open around the world, and the direction and quality of the opening" in only a few minutes. With so much QRM, however, it is often impossible to take advantage of the beacon system.

It would really be helpful to those who monitor the beacons regularly to check on immediate openings and to those who are collecting data for a propagation study if the users/tuners would move off at least 0.5 kHz. — *J. W. Dreher, W2TKG, Baldwinsville, New York*

## NIHILUM ANTE UNUS[1]

☐ I loudly applaud Bill Wilson's observations (Jan. 1984 *QST*, p. 55) on DX operating today. What is so discouraging is that it is so true. One of the problems is that the worst violators of good operating practice are Extra Class operators, and many of them are the well-known Honor Roll types.

I strongly recommend that the League focus more directly on this issue in general, making it a primary goal to improve amateur DX operations worldwide during 1984. We *must* redevelop operating courtesy before chaos rules the ham bands. Listening to some pileups sounds like children crying for candy.

"Listen carefully before putting mouth into gear!" The list of rules can go on and on from there. — *Richard B. Wilborg, W1FJH, Hudson, New Hampshire*

## LEGISLATING DECENCY

☐ I agree wholeheartedly with the sentiments expressed in "Freedom of Speech, on the Air" (Jan. 1984 *QST*, p. 78). The appeal to common decency is not only ethical, but it is the only logical alternative, since arguments based on legal premises are, as we have found, unstable. Common decency cannot be legislated, anymore than "good amateur practices." It devolves upon each one of us to live up to our responsibility inherent in that FCC license. Congratulations on a "sermon" none of us are above heeding. — *Ted Applegate, KB4ERV, Southport, North Carolina*

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## METERS ÜBER ALLES

☐ I wish to strongly suggest that all measurements given in *QST* be in the common system: metric. For most of the history of radio, wavelengths, bands and whatever else has been expressed in meters or portions thereof. It seems archaic to read measurements in the "old" English system, let alone the headaches achieved by converting to metric. Think about it; even the handy talkies are in metric. — *Merrill J. Mirman, D.O., KC3JY, Springfield, Pennsylvania*

## WHY NOVICES QUIT

☐ I think I can give you some reasons for so many of the new licensees dropping out and not reaching for the better grade. I just received my Novice ticket in December and was anxious to try it out. The first contact I made, the ham on the other end sent me a string of ?????????? The next one continued to show me how fast he could send code — not much fun in that. So I tried to make more contacts. About the time I got ready to answer their CQ, some good ham started to tune his transmitter. Next was someone calling CQ, CQ, again covering up a beautiful signal. I haven't become discouraged yet, as I will be taking my Tech or General in May, Lord willing. — *Henry O. Little, KA3LWE, Hamburg, Pennsylvania*

## THANKS FOR NO NO-CODE

☐ The article "No Code Buried" *The ARRL Letter*, (Dec. 20, 1983, p. 1) was discussed at our monthly club meeting (Susquehanna County ARC). We, the members of the club, felt that a letter of thanks should be sent to you. The requirement of code in order to receive a ham radio license is still necessary, and we strongly feel that ham radio would not be what it is without it. Again, thank you to you and the FCC. — *Pam Koeb, KA3HKL, Montrose, Pennsylvania*

☐ I find it interesting that the biggest voices for keeping the code are the ones who seldom, if ever, use it on the air. In addition, they are poorly technically inclined, hardly knowing a resistor from a hole in the ground, and running around saying such nonsense as "tubes forever."

Times change, ideas change and people change. The no-code idea will keep coming back until it goes through, one way or another. It is just a matter of time.

Why *QST* wasted so much space to pat the egos of the "code forever" group, I'll never know. I've always said, and will continue to say, that we don't need people who can rattle off 20 WPM, but more technically competent and knowledgeable people to better the hobby. — *Gordon Woroshelo, VE3EYW, Manitouwadge, Ontario*

## CONGRATULATIONS!

☐ Today has been for me very pleasant and successful. Besides that I became 75 years of age and the FCC sent me my Amateur Extra Class license.

To study for the theory part of the FCC exam, I used only the ARRL *License Manual* and *Handbook*. For the CW part, I listened daily to W1AW. It was quite a task at times to copy through the deliberate CQs, tune-ups and malicious interference, but I made it. Right now, I am an avid fan of the daily CW bulletins from ARRL. Thanks, ARRL, for all the help and services. — *Harry K. Wolf, W6NKT, Sun City Center, Florida*

## A SLOW SCANDAL?

☐ I am a slow scanner. Those words connote division, both in and out of context. It seems that most slow scanners have an Edwardian sense about their frequency of operation, 14.230 MHz. They, like some net operators, think their corner of the band is most sacrosanct. To trespass: unholy! They protect their rectory with a fever not known to common man.

On the other hand, we have the quiet, usually unassuming amateurs who feel any part of the subband is okay to operate in. They're right. No one really owns a frequency — the FCC has seen to that. But, nonetheless, sooner or later they come head to head with the slow scanners (or a net). Chaos erupts! In slow-scanner retort: "Get the ---- off our frequency! This is the international slow scan calling frequency, dummy. Whatsthemadder (pun intended) with you?" The usually unassuming amateur gets the word and quickly realizes that he has found the *national tune-up frequency!*

This parody is all too true. The answer is obvious. I believe the definition of amateur and gentleman are synonymous. Please, fellow slow scanners, don't change my mind. — *Alan Applegate, KØBG, Lakewood, Colorado*

[1]Loose translation: Zeros are always last. — Ed.]

*Public Information Coordinator, ARRL

# How's DX?

Conducted By Ellen White,* W1YL/4

## The Complete DXer

*Some weeks back, your DX editor had the good fortune to peruse galley proofs of W9KNI's new book, which is sure to increase the competition for DX on our bands! The book reads as if Bob was sitting at your side as you tune the band, conversationally telling you how to use those tricks that are the hallmark of the seasoned DXer. In addition to his realistic hands-on approach, his sidelights all through the book seem to catch both his personal style and the intangible allure of our world of DX. Here are some tidbits reprinted with permission, to whet your appetite.*

"I came across a station using the Cyrillic Morse letters, probably a Russian. Yes, he turns it over. It is UK9CBB with a UW3. A night like this is pure joy to listen to, with many parts of the world coming through. My receiver dial is a magic carpet gone mad, with never an idea of what lies on the next kilohertz, only the knowledge that whoever I will hear there will likely be far away, in a strange land. Even if I don't find a new country, and I rarely do, listening to an open band is always exciting, and every kilohertz I cross is an opportunity to find a new one.

"The art of listening is also learning to let nothing get by you as you tune a band, a 6th sense about what band to be listening on, and knowing what heading to turn your antenna (if you have a rotary array). It is being able to discern a pirate from the real thing, or knowing when a pileup on a station is a lost cause and it's time to move on. Listening is finding out about schedules with rare ones being traded by other stations who would just as soon you not be listening. It is checking into inter-Pacific traffic nets at 3 A.M. so you can nail that elusive KC6 after the net is over. It is knowing when to listen, and when not to waste your time, especially when you have other obligations which must be met. Again, it is digging calls out of fierce QRM, or reading extremely weak signals. These, too, are skills that improve considerably with simple practice. It is the joy of taking the pulse of an open band, and hearing the world talk to itself. Listen to every signal, strong and weak, and try to identify the country it comes from, and who the QSO is with. Try to let nothing get past you. Dig deep for the weak signals. The experienced and skilled listener will unearth country after country as he tunes across the band, digging rare ones out, exploring, probing; while the casual amateur, spending the same amount of time and with the same objective, will hear little or none of what is going on.

"Context of a QSO can be very helpful. If you hear someone saying that the temperature was 32 degrees Celsius, and it is the dead of winter out of your window, you'd best hang around to see where it's so hot. There are other tricks of the trade as well. One is the day and date. Consider, for example, that in the Moslem Middle East countries Friday has the same status as Sunday in those countries where Christianity is the dominant religion. So, even though some of the stations of the Middle East are operated by westerners, Friday is the day off, and the most likely time that some of those stations will be active. Remember, Friday morning for them is Thursday evening in the states.

"Local time at the other end is always an important factor to consider. For example, Middle East stations operate more during the morning and evening hours, since the heat of the day can make for very uncomfortable operating conditions. Again, except for the dead of winter, conditions on any DX band are poor around noon local time for any particular station. Rare DX stations don't generally respond the same way to clocks that determined DX hunters do. They go to bed at night, and sleep. If it's 3 A.M. in Kuwait, the odds of finding a 9K2 on the air are rather slim. If a 9K2 is the last one you need that is on, you'd best take a look at a time conversion table. Your best shot would be on a Friday morning, on ten meter short path, or twenty meter long path. But, if it is a World Cup Soccer weekend, forget Kuwait — they are rabid soccer fans, and have a fine national team as well. No Kuwaiti amateur in his right mind would risk TVI (and his life!) during one of those games.

"An old hunter's saying is that to hunt for a tiger you have to think like a tiger. There is a natural corollary for the would-be DXer; if you want to work rare DX, you must think like rare DX. While this is somewhat the essence of pileup strategy, it has other ramifications as well. Let's consider for a moment that we are a rare DX station. One of the reasons we are considered rare is that we have little interest in working and confirming contacts with five thousand W stations just for the joy of exchanging reports and cards. We already know very well that our signal is capable of reaching any part of the world, and meaningless contacts to prove it are of no interest.

"Yet, as a rare DX station we continue to be operational because we do enjoy ham radio. The question becomes how do we stay active without always raising huge pileups? There are several tricks. For one, we operate (when possible) at the times that the W operators are mostly in bed, or when propagation is not favorable for W stations. For another, we use a directional antenna, and try to minimize our signals to those areas where we will encounter pileups. We never call CQ, preferring to only answer those of the stations that we want to QSO. When we run schedules with our pals, we do it on funny frequencies, like 14110, or 21188. We use call signs only at the bare minimum. Now, having thought out the DX stations's position, and being aware that only a few are going to make it through, a pileup is guaranteed to end as a failure and a frustration for the bulk of the people in it. Pileups tend to be very fluid, dynamic situations, where the rules keep changing, as determined by the arbiter (the DX station). And never forget, he has two penalties that he can impose: one individual, one collective. He can refuse to work you if you annoy him with your tactics, or he can turn off the rig if too many people offend him. If he is not interested in pileups, we start searching the byways as well as the highways. Above all, we are patient, waiting, watching, listening. We are DXers.

"The purpose of the first part of the book (Chapters 1-11) is to teach the fundamental skills that the successful DXer should possess. Section 2 is based on the belief that the reader is pretty well in command of those skills and has worked something over 200 countries. Finding the new ones gets harder and harder, and the time between DXpeditions longer and longer. Now, we start the hunt for the elusive ones that are on the air, but rarely or never found out in the open dealing with pileups. Other aspects of DXing besides operating are discussed — QSLing, towers and tower ordinances, the equipment philosophy of the DXer, bulletins, buddy systems, etc. And, there is a very important though brief chapter on DXing mortality. Section 3 contains advice for the 300+ country DXer, the operator who has worked everything on the air and is waiting for the DXpeditions he needs to make it to the Honor Roll — the goal of the true DXer.

"The fast reader will be able to easily read this book in an evening or two. Please, don't. The material in this book has been learned, mostly the hard way, over many years. There are a lot of different ideas and techniques presented. They will be rather ineffective at best unless they are understood by the user. This really is not a book so much as it is a course, a course in becoming a successful DXer. Read it a chapter or two, at most, at a time. It will be more meaningful to you.

"DXing is a wonderful hobby. Be responsible. Help make it better, not worse. If you get angry at what is happening in a pileup, don't say what you think on the air. Observe the terms of your license. Support your national amateur organization, and be involved in it."

Way to go, Bob! *The Complete DX'er,* by Bob Locher, W9KNI, is available from the Idiom Press, Box 583, Deerfield, IL 60015 ($10.95 plus $2 postage and handling).

### BALEARIC ISLANDS AWARDS PROGRAMS

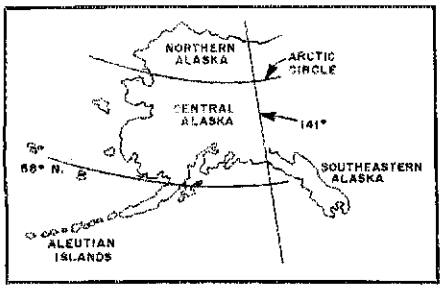
*CWEA6:* may be claimed for having worked (heard) and received a card from six amateur stations located in the Balearic Islands (EA or EC6).

*3 Islands:* This award requires confirmations from five stations located on Mallorca Island, one on Menorca Island and one on Ibiza or Formentera Island. Modes are SSB, CW, RTTY.

*Balearic Islands:* requires 15 stations on two bands, or 20 stations on three or more bands. Modes are SSB, CW, RTTY.

Each claim must be accompanied by a QSL-card list containing calls, dates, bands, modes. The list must be accompanied by a statement from the applicant's national society, or from any two amateurs other than the applicant, that the cards do indeed represent the contacts listed. A fee of 10 IRCs is required. Correspondence should be addressed to URE, Delegación Regional, Box 34, Palma Mallorca, Balearic Islands, Spain.

*19620 SW 234 St., Homestead, FL 33031




Alaska DX Certificate (see text)

## ALASKA DX CERTIFICATE

This interesting award is offered by the Anchorage Amateur Radio Club, KL7AA, Box 101987, Anchorage, AK 99510-1987, for contacts made since January 1, 1955 with 10 Alaskan amateurs, one from at least each of the following areas: (1) Southeastern — that part east of 141° West latitude, (2) Northern — that part above the Arctic Circle, (3) Aleutian Islands, including Kodiak Island and the Alaska Peninsula south of 58° North longitude, and (4) Central Alaska, which includes Anchorage and Fairbanks. Of these 10 contacts, four must be with club members. Any band/modes may be used (except for the WARC bands). Send cards or a certified list (by three licensed amateurs or an official of a national level organization/club) and include return postage. See map herein for the boundaries.

## WEST KENT AMATEUR RADIO SOCIETY AWARD

Sponsored by the club, in Royal Tunbridge Wells, Kent, England, it is available to both hams and SWLs (on a heard basis) for confirmation of contacts with club members and other stations within a 20-km radius of Tunbridge Wells.

This area includes the towns of Borough Green, Brasted, Brenchley, Burted, Burwash, Chartwell, Cranbrook, Crowborough, Dormansland, East Grinstead, East Peckham, Edenbridge, Frant, Goudhurst, Hadlow, Hadlow Down, Hartfield, Hawkhurst, Heathfield, Hever, Hildenborough, Hurst Green, Hutley, Ide Hill, Igthan, Kemsing, Lamberhurst, Lingfield, Linton, Marden, Maresfield, Mayfield, Morsmoden, Motherfield, Paddock Wood, Penshurst, Plaxtol, Royal Tunbridge Wells, Sevenoaks, Shipbourne, Speldhurst, Staplehurst, Ticehurst, Tonbridge, Wadhurst, Wateringbury, Westerham, West Malling, Wrotham and Yalding.

To qualify, 10 points are required (of non-UK amateurs) as follows: Contact with past/present members equals 3 points; with the club station G3WKS, 5 points; with other stations within the radius, 1 point. The award is available for all CW, phone or mixed mode on HF (or VHF, 70 MHz up). Send contact list with usual data and one IRC to Alex Korda, G4FDC, 5 Windmill Ct., North St., Tunbridge Wells, Kent TN2 4SU, England.

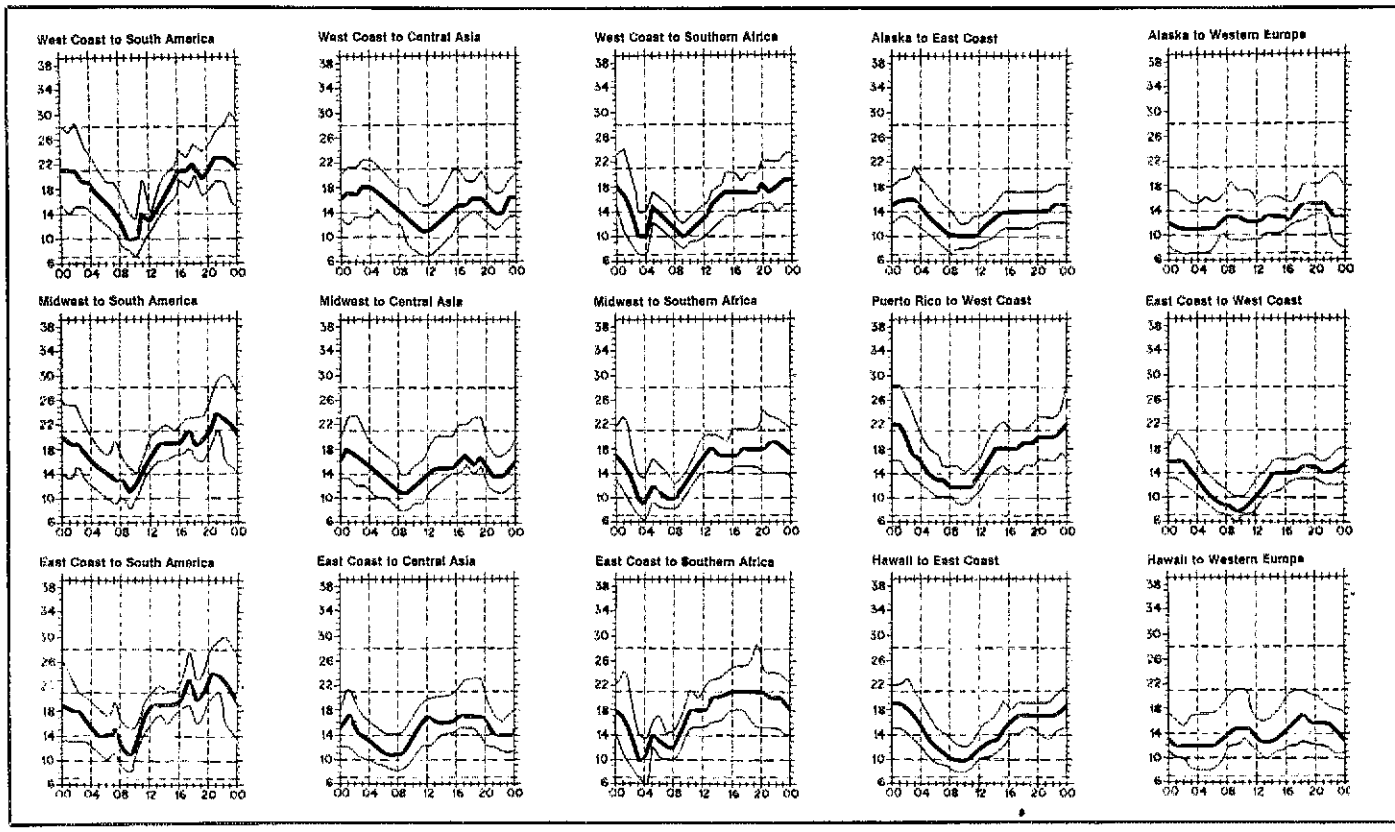
One of our honored old-timers, Ivan Pastre. On the left is Ivan when he was FF8AG in Bamako (now Mali) in 1952, 1953 and 1956. A recent photo of F3AT appears on the right. Other DX calls held include FQ3AT (Chad) and FE8AB from the Cameroons.

## SOLOMON ISLANDS POSTAGE STAMPS

A postage stamp featuring Amateur Radio has been issued by the Solomon Islands as part of their World Communications Year set released on December 19, 1983. The stamp, featuring Solomon Islands Radio Society amateur station H44SI, is available on a special commemorative cover ($1 U.S., 5 IRCs or equivalent, including postage). The complete WCY set of three covers, featuring a total of six stamps, is also available for $6 U.S. (or equivalent) including postage. Orders go to the Solomon Islands Radio Society, Box 81, Honiara, Solomon Islands.

## FATHER MORAN

9N1MM is coming to the United States early September. This will be his 60th year as a Jesuit missionary. His trip coordinator is looking for DX clubs in the larger cities who would like to have him for a




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

guest for 2-3 days. Send your inquiries to Edward F. Konop, W3WGS, 125 Wetzel Rd., Pittsburgh, PA 15209.

## THE CIRCUIT

☐ Berlenga Island: Several weeks ago, CT4NH and CT4UW were expected to be QRV on 10-80 meters using CTØBI. This is a "first" for this lighthouse location, and is available for the Islands on the Air Award. Word has it that the island is a seagull and rabbit paradise.

☐ TN8EE: Documentation has been received and approved, and credit is available. Resubmit with your next endorsement application.

☐ K9MK/VP2: Mike notes that he recently received a number of cards via the bureau for 1978 and 1981 operation. He has held that call since 1976, but was off the air until 1982 and never has operated as a VP2.

☐ CP1FW: For 12 years, as CP1FW, "Meddy" tried to get some particular Russian confirmations, without success. Now, thanks to Joanie, KA6V, and Joe, W3HNK, he has confirmed 289 out of 290. He particularly wants to thank these fine managers for their efforts, and hopefully is looking for a top for a card from no. 290, 9U5FR (op. "Tony") worked on Oct. 28, 1972. Meddy recently changed calls from KA1JOC to KB1LL.

☐ YB2ARH: Effective last November 1, K2ROR is managing cards for Ray. Please QSL with appropriate IRCs or s.a.s.e., instead of through the W2 Bureau. A word to the wise: Alan, K2ROR, is a stamp collector. He also manages cards for FK8CE.

☐ Help!: W8RV pleads for advice on VR4KS (July 1977) and H44ES (July 1982). KK9Y is on the lookout for tips on KX6OB, PJ2FR, EL2CQ and HH2WW.

☐ AD1S/KH5: Cards are on the way now — quite a job what with 16,800 QSOs to confirm (for 88 hours of operation!).

☐ Kwajalein: K4TO/KX6DS has been on since early December, active mainly on CW around 3505, 7005, 14,025 and 21,025. Cards via the North Alabama DX Club, Box 4563, Huntsville, AL 35815-4563. S.a.s.e. or s.a.e./IRC required. Cards received without postage (or equivalent) will be returned via the outgoing bureau route. Skeds for any band will be gladly met if you drop Dave a note at Box 1179, APO San Francisco, CA 96555. (Note: The hours of 1800-0000Z and 0000-0600Z are his normal working hours and are not available for skeds except for weekends. Sunday 2100Z-0030Z is unavailable, likewise. Sorry, 160-meter operation is not allowed on KX6.)

☐ Turkey: TA1UA, Dr. Unal Akbal, operates high-speed CW only each Saturday between 1000-1400Z, except for contests. Look for him around 21,020. If you get lucky, confirm via Dr. Unal Akbal, TA1UA, Box 787, Istanbul, Turkey.

☐ ATØA: Update that special prefix list in the February issue! VU2IF, Secretary of the Amateur Radio Association of New Delhi, India, is a member of the 3rd Indian Antarctic Expedition. This is the first time that Amateur Radio has received this level of sponsorship from the government. Dr. Singh uses a TR-4 "barefoot" and dipole on 20, and should be concluding his base camp operation at about the time you receive this issue.

☐ IT84: Sicilian amateurs have been granted permission to use this prefix during April, in celebration of the IARU Conference in Cefalu. An award is available for contacts made from 2300Z March 31 to 2300Z April 30. European amateurs are required to make 40 contacts; all others, 25. From April 8 to 13, IP9IARU will be on from Cefalu. QSOs with this station count as 5. See if your total will qualify by sending your list of IT84 contacts no later than July 31 with $5 U.S. to IT9TGO, Gioacchino Tramuto, via P.P. Vasta 19-I-90144 Palermo, Italy. The decisions of the ARI Regional Committee of Sicily will be considered final.

☐ Calendar: Upcoming DX doings worth pursuing — Visalia DX Convention, April 13-15; the Dayton Extravaganza, April 27-29; DXPO 84, Oct. 13-14 (Northern Virginia; information via W2GHK).

☐ FOØ: On February 6, the O'Briens mailed over 1100 cards for their Nov./Dec. 1983 operation from French Polynesia as FOØJO/OJ. This is a reminder that a sample of their *W6GO/K6HHD List* can be obtained by sending a large s.a.s.e. with U.S. postage for one ounce to Box 700, Rio Linda, CA 95673.

☐ Northern Cooks: Congratulations to ZK1CG and wife Marsha on their new baby girl, Heather. Victor notes that the mid-Feb./March N. Cooks operation by ZK1MA and ZK1XL gets confirmed via ZK1CG, direct.

# 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.

CT1BWY (WD4HRO)
CT2YJ (WA7GXD)
C53AL (KA2CDE)
FGØHJ/FS7 (VE2EWS)
FM7WD (W3HNK)
HC1OT (W2KF)
HC1SK/8 (SM6DYK)
JW1UW (LA1UW)
J37AJ (W2KF)
J37XC (W2BJI)
OE3FAC (WB2LCH)
OE3YHU (WB2LCH)
TF5TP (DL7MQ)
TG9NX (N4FKZ)
TJ1AF (WA4VDE)
TU2NA (K2IBW)
VP2EAG (KJØD)
VP2KBZ (VE3KZ)
VY1AB (VE3AZJ)
V2AAW (NØDH)
V2AJI (W2BJI)
3D2FR (NE4S)
5B4LP (KA3FIB)
5W1EU (VE3XJ)
8Q7BX (I4ALU)

### Corrections

☐ K6MLW is not manager for VY1CW
☐ WB8SSR is not manager for YI1BGD

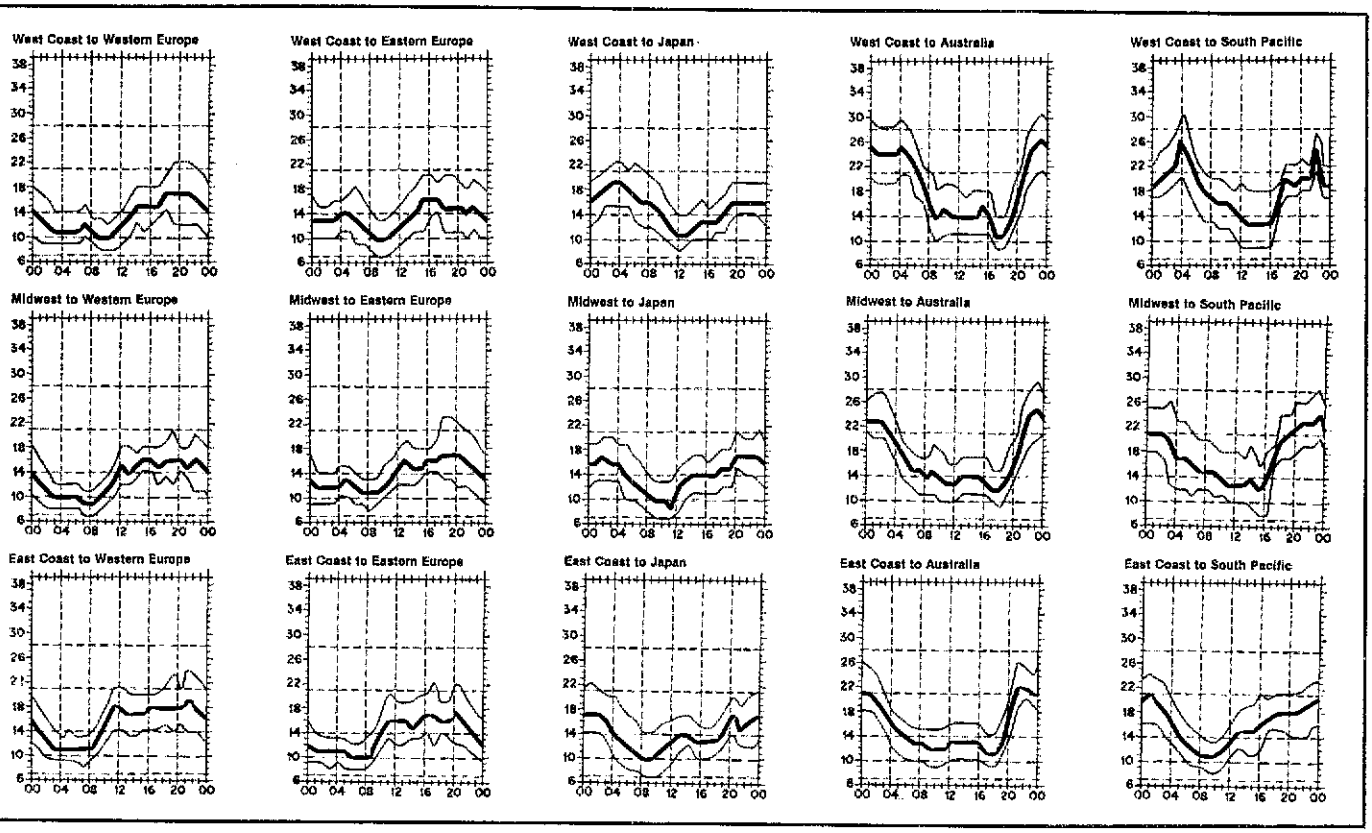
### QSL Manager Volunteers

NU6L WA2OIZ KA2SGD

### Special Notes

☐ The American ARC of Korea has QSL cards dating back to 1969. They have not been claimed because some members have moved on to new assignments around the world. If you wish to claim your cards, please send an s.a.s.e. to American Amateur Radio Club of Korea, Dependent Mail Section, APO San Francisco, CA 96301. All cards not claimed before July 31, 1984 will be destroyed. Please spread the word.

☐ December 1983 QSL Corner contains information and addresses for the Incoming Bureaus. March 1984 QSL Corner contains information on the operation of the ARRL-Membership Outgoing Overseas QSL Service. 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 April 15 to May 15, 1984 assume a sunspot number of 43, which corresponds to a 2800-MHz solar flux of 95.

# 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 January 1, 1984 through January 31, 1984. An s.a.s.e. will bring you the full rules for participation in the DXCC, the DXCC list and application forms.

## New Members

**Mixed**

DK7SL/137
EA4CU/155
I2AOX/253
I3TZP/273
I8TOH/107
I8UZF/105
I8ZUT/170
IK8AZG/181
JM1MGP/113
JN1GQK/158
JI3MZY/114
JR6PGB/184
LZ1KOZ/190
LZ2PT/107
ON6HC/109
PY2XX/223
YS1SC/290
YU4WBM/238
YV6ABM/100
ZB2G/100
ZD8RH/163
AJ1T/100
KA1ILA/104
KM1I/104
WA1UCY/106
KU2W/103
KA2IIA/101
N2EDF/110
N2GU/100
W2ELH/258
WA2SPL/104
WA2YXC/100
KO3W/156
N3CYC/102
W3HHG/117
WA3EYL/105
N4DBJ/104
N4HBD/110
NT4L/108
NY4X/224
WA4MOM/100
WA4QHI/100
K5MC/103
K5RPC/226
W5VVX/111
WB5TFM/104
K6CFV/100
K6SMF/311
KG6AM/103
KX6C/108
N6ALS/100
W6AMQ/100
W6ZQK/105
K7JF/102
W7KKR/142
K8KUH/100
K8OQB/104
K8XE/102
KD8HX/106
KC8UR/100
KW8M/109
N8DPL/108
N8EBA/101
W8UMH/102
KE9Y/134
KQ9R/100
KS9K/280
WD9EME/102
AAØV/102
KAØEGE/114
KGØC/284
KSØT/114
KVØD/100
WØMCY/110

**Radiotelephone**

CO2HQ/144
CT3BM/265
DF7DQ/135
DJ4NY/108
DJ9MH/244
DK1RV/262
DK7NO/148
DK9KX/309
DL3ZQ/124
EA1BCL/110
FØOV/FC/109
G3XEP/100
G5BSW/115
I2AOX/251
I3TZP/270
I8TOH/107
IT9MAB/152
IKØAZG/178
JI3MZY/114
JM1IFB/101
JM1MGP/102
JN1GQK/132
JR6PGB/179
JH7XGN/110
LZ1KOZ/109
LU8AEJ/102
PY2XX/200
SV2QI/108
Y21QH/105
YBØBZZ/108
YS1SC/290
ZD8RH/132
ZS4AE/128
7X2HM/100
KA1TY/101
WB1FAK/107
K2TQC/316
NA2G/116
W2ELH/232
K4LR/293
NA4J/119
W4WWZ/104
W4YV/279
KC5UB/101
KR5D/107
K6TEH/101
W6WCA/100
WA6VWJ/100
KC8TZ/102
KCBUZ/100
KE9Y/120
KR9F/131
KV9V/107
W9FSZ/100
KØAZB/100
KDØBO/105

**CW**

DF3ZE/106
DF5DR/120
DF6CY/205
DK1RV/103
DL0GZ/113
HA5OR/108
HB9CSA/108
I2MOV/108
IØZUT/142
JH1EBU/106
JJ1OSP/128
JH5AUE/132
LZ1KOZ/158
PY2VW/107
PP2WV/101
SM4EMO/161
ZS2U/104
W2ELH/106
W2HN/200
AI3K/101
K4HTY/126
N4EM/101
WM4Z/100
KC5M/111
N7RU/170
N8AFV/101
KR9F/107
W9FU/182
W9MYG/174
WD9JKZ/103
KFØT/106
WØMCY/103

**RTTY**

KA5CQJ
HB9AAG
DK1RV

**160 Meters**

WA2SPL
W4ZR
K4UEE

**5BDXCC**

W2TK
KJ3Q
KD9E
AE3Y
AI3E
DK1RV
K3SWZ
WØIZ
KGØC
W9AMM
KM1H
KS9K

## Endorsements

**Mixed**

CT2AK/333
DF4FO/254
DFØAFZ/202
DJ5JH/332
DF6JC/233
DJ7OB/169
DJ8DT/169
DK1RV/269
DK5JI/260
DL1DA/313
DL1FBQ/209
DL3ZI/345
DL4FL/293
EA2LY/199
EA6BH/301
EI7CC/274
EL2AM/185
F8DYG/282
HB9AAH/200
HB9CCL/207
HB9CSA/201
HB9HT/309
HB9NU/291
I2MOV/269
I8SCV/260
I8WY/274
JA1EOD/332
JA1MCU/337
JF1VST/245
JP1BJR/154
JA2AIR/326
JA2APA/312
JA2GCW/165
JR3LGB/179
JR3RRY/230
JA5CKD/200
JH5AUE/213
JA7BJS/314
JA7HMZ/294
JH7LMZ/282
JA9FPI/291
JY5ZM/248
KH6BZF/293
LA7JO/316
LZ1YE/277
OE7HHW/153
OH2BAD/330
OH2BLD/301
OH3SG/250
OH5OZ/251
OK1KRS/284
OZ6MI/334
OZ9PP/317
PAØTAU/338
PAØWRS/291
PY4OD/343
SM3DXC/310
SM3EVR/316
SM4DHF/324
SM4EMO/303
SM6BGG/276
SM6DUA/187
SM7EXE/330
SP6AEG/292
VE1KG/331
VE2DPJ/256
VE3BHZ/304
VE3ILE/128
VE3LDT/284
VE3XK/316
VE4ADV/255
VE7DX/303
VE7AAQ/348
XE1MDX/276
YU1GTU/281
YU1OHI/253
YU2RTW/315
ZS2U/243
4X4JO/223
4Z4DX/318
AK1E/215
K1ZSI/322
KM1R/175
W1AIM/154
W1AXA/356
W1BWS/289
W1DQH/324
W1GVZ/283
W1OQP/250
W1OHA/335
W1PEA/298
W1YY/318
WB1CFP/149
WB1FDY/124
K2BXG/308
K2EUH/200
K2HWY/130
KA2HMJ/181
KB2CV/295
KB2RZ/291
KB2VP/251
KE2B/139
KM2P/324
KU2A/132
N2DL/310
N2WS/263
W2YD/326
W2ZZ/332
WA2AHP/174
WA2CWP/199
WA2JBV/325
WA2UZB/173
AF3T/296
K3HBP/263
KA3IEA/126
KA3R/290
KF3C/226
N3GB/303
W3BWU/126
W3FAE/227
W3XX/311
WA3HUP/333
WB3LHY/125
AA4QZ/210
AA4S/330
K4BVQ/342
K4CEB/335
K4HTY/270
K4JW/300
K4NYV/300
K4SV/285
K4XG/332
KB4HU/292
KB4SA/285
KC4U/291
N4AJZ/290
N4IB/281
N4IR/290
N4SA/328
NA4J/210
NN4R/260
W4FHI/226
W4MGN/349
W4OMQ/322
W4UKA/331
WA4SKE/296
WA4VCC/290
WB4SYP/212
WD4NBX/291
WD4HLK/289
WM4Z/154
K5HX/132
W5NF/202
K5YCP/311
KC5TW/129
KR5D/244
KU5L/224
N5AX/304
N5RR/333
N5UD/319
W5DL/332
W5RO/329
W5UFI/258
W5YM/153
WA5EZQ/306
WA5IPS/203
WB5LBJ/DU/297
WD5GJB/292
AK6T/187
K6CBL/316
K6RF/349
K6TMB/270
K6XN/300
K6XT/325
K6ZOR/274
KA6NOR/126
N6EBD/186
N6QR/322
NA6F/238
NE6I/203
W6AE/330
W6BYH/336
W6LOI/270
W6KPC/334
W6OAT/315
W6PLK/338
W6PKB/202
W6QL/338
W6TFO/309
W6TMD/300
KA7V/149
KC7V/232
KQ7H/178
N7RU/292
NB7R/250
W7BGH/346
W7BUN/227
W7CUS/181
W7EDA/321
W7HRD/270
W7HS/199
W7ID/272
W7IUV/310
W7OM/332
W7QZI/150
K8AC/250
K8MPF/305
K8RWL/328
KA8GAG/133
KD8V/262
KM8E/156
KN8M/276
N8AFV/179
N8BC/231
N8DE/301
N8TN/320
NE8R/260
W8BCE/153
W8FN/202
W8HSW/341
WA8MOA/289
WB8HIW/164
WB8JEY/308
WB8VKL/271
K9GPN/178
K9GX/305
K9RR/252
KA9CFD/127
KC9TA/273
KC9XF/175
KR9F/176
KS9Y/150
KW9K/307
N9AIB/260
N9UN/181
W9AMM/323
W9DH/335
W9FID/337
W9FU/316
W9QWM/286
W9UO/272
W9WY/331
WD9IIC/300
WD9IIX/303
KØCVD/275
KMØQ/175
NØAT/300
WØHBH/311
WØIZ/326
WØJF/270
WØLSD/278
WØNB/307
WØWDW/155
WAØDCQ/299
WAØIJO/150
WBØMWJ/151

**Radiotelephone**

CP1FW/286
CT1FL/330
DF4FO/201
DJ3HJ/256
DJ6FN/311
DK3PZ/292
DK8II/180
DL7FP/314
EA1QF/305
EA2LY/178
EA4CU/155
EA4DO/333
EA5AYD/129
EA8AKN/209
EI7CC/271
EL2AM/184
HB9CSA/160
HB9NU/291
I2MOV/267
I2PQW/250
I7SCA/335
JA1EOD/331
JA1MCU/323
JF1VST/241
JH1MQC/155
JA2APA/312
JA2MTM/285
JR3RRY/230
JH5AUE/194
JA7BJS/309
JA7HMZ/271
JA9FPI/275
KH6BZF/290
KH6OR/344
LZ1YE/252
OA4OS/330
OH2BAD/322
OH3SR/332
OK2DB/272
ON7TN/216
OZ1ACB/134
OZ3PZ/324
OZ4ZT/144
OZ5EV/316
SP6ECA/269
SM3DXC/281
SM5BDV/184
SM6BGG/276
SV8JE/251
VE2DPJ/227
VE7AAQ/328
VE7DX/292
VE7WJ/322
XE1MDX/275
YS9RVE/305
ZL3NS/339
4Z4DX/310
8P6OV/178
9Y4RD/SU/135
9Y4RD/4X/125
AK1E/204
K1ZSI/308
KA1BRD/249
KA1ERN/129
KA1ND/290
KM1R/145
N1ADF/175
W1AIM/152
W1BWS/273
W1CRL/260
W1PEA/294
KA2HMJ/125
KB2CV/290
KB2RZ/291
KM2P/321
W2EOE/250
W2YTO/290
WB2EZU/271
AF3T/292
KA3BTH/212
KF3C/225
N3GB/275
W3AMQ/127
W3FAE/212
WA3ZTE/175
AA4S/296
K4BVQ/331
K4HTY/252
K4JC/342
K4JDJ/175
K4JW/300
K4WMB/265
KB4HU/292
KC4U/264
N4AJZ/252
N4BCV/291
W4JGO/271
W4MGN/338
W4OMY/270
WA4VCC/290
WB4SYP/210
K5RPC/225
K5YCP/304
N5UD/306
W5IJE/229
W5JWM/351
W5RO/329
W5SZ/338
W5UAW/333
W5UFI/258
WA5EZQ/297
WB5LBJ/DU/296
WB5NTI/209
K6BKU/184
K6JCK/156
K6JR/327
K6RF/329
K6SMF/310
K6TMB/262
K6XN/269
KF6AW/161
N6EBD/183
N6EVZ/125
N6NA/341
N6QR/276
NE6I/139
W6BWG/295
W6CN/301
W6FW/343
W6KPC/333
W6SN/300
W6TFO/292
W6VBI/201
WA6SGQ/200
WD6BSD/300
WD6GFF/202
W7EDA/245
K7GNC/149
KB7HB/261
KC7V/204
KQ7H/176
N7RU/250
NB7R/242
W7LXR/251
W7OM/319
WA7OYL/270
WB7VHA/240
AE8N/131
K8MID/180
K8ZZU/283
KB8DB/301
KC8KE/176
KD8V/242
KN8M/234
N8AFV/170
N8BSB/160
N8DE/250
NE8R/260
W8BCE/152
W8JTD/333
WA8KMK/149
WA8MOA/272
WB8VKL/267
K9GX/304
KC7V/131
W7EDA/268
W7IUV/290
KD8V/204
KN8M/148
KR8Y/151
N8DE/233
KC9TA/273
KR9R/202
KS9K/279
W9HUW/175
W9NTU/152
W9TEI/290
WA9IVU/249
WA9WGJ/269
WD9EWT/196
WD9IIC/264
KØEPE/331
KØXD/190
KUØY/174
NØAT/298
WØBX/163
WØIZ/299
WØJF/233
WØNB/282
WØWFB/188
WBØMWJ/151
W8FN/175
W8RSW/303
WB8JEY/291
WD9IIC/280
KØCVD/261
WØJF/176
WØNB/252

# The World Above 50 MHz

Conducted By
Bill Tynan,* W3XO

## A Call for Experiments

The operation of Owen Garriott, W5LFL, from aboard *Columbia* captured the imagination of many thousands of amateurs throughout the world, and gained for our hobby a great deal of favorable exposure in the mass media. Less than a year from now, another licensed radio amateur is scheduled to fly on a Shuttle mission. The mission designation is 51-F (in NASA's new numbering scheme), and among the crew will be Dr. Anthony W. England, WØORE. Like Owen, Tony hopes to be able to take amateur equipment along with him. I hasten to point out that official permission for such activity has yet to be granted. However, as was done for W5LFL's operation on the STS-9 mission, ARRL and AMSAT are in the process of drafting a joint proposal to be submitted to NASA Headquarters requesting approval to include Amateur Radio operation on 51-F. Talks between Tony and some of those amateurs who were instrumental in integrating the equipment used on STS-9 into the Shuttle, such as Dick Fenner, W5AVI, of the Johnson Space Center ARC, have bought out WØORE's desire to conduct meaningful experiments utilizing amateur gear aboard the Shuttle in conjunction with the vast pool of amateur stations available throughout the world. One of the experiments he has in mind is investigation of the occurrence of antipodal propagation. Such propagation occurs when a space-borne transmitter is located on the opposite side of the earth from the receiving station. It has been observed in the high HF portion of the spectrum — for example, the 20-MHz Sputnik frequency as well as the OSCAR 6 10-meter downlink. How high in frequency this effect persists is not known, and thus represents a very interesting question. Another possible experiment involves the use of amateur-supplied equipment on the Shuttle being used as a store-and-forward packet repeater. Such an experiment might be a good precursor to the launch of the PACSAT satellite planned by AMSAT a few years hence.

A third potential experiment was recently suggested to this conductor by Paul Shuch, N6TX, of San Jose City College. He is interested in the idea of trying amplitude companded single sideband with a pilot tone for communication between the Shuttle and the ground. Paul contends that the use of ACSSB should provide acceptable signal-to-noise ratios even with very-low power, and he believes that the use of the pilot tone (small amount of carrier) should enable lock-on of the locally inserted carrier in the presence of the roughly ±3 kHz of Doppler shift present on 2-meter signals from low-earth orbit.

These are just a few ideas. Some of them obviously involve the use of specialized equipment, not included on the STS-9 mission. With the lead time between now and the launch of 51-F only about 11 months, this poses quite a challenge. Under these circumstances, the equipment available for use by WØORE may have to be the same as that employed on W5LFL's mission. This consisted of a 5-W output FM hand-held transceiver and interface box, both specially constructed for use on the Shuttle by the members of the Motorola Amateur Radio Club in Ft. Lauderdale, Florida. Obviously, anyone seriously proposing an experiment that would involve other equipment must be in a position to provide the necessary gear in time for checkout by NASA to be certain that it meets the rigorous standards applied to anything going along on manned space missions.

One item that will probably have to be changed is the unique antenna, designed and built by the Johnson Space Center ARC, which fit against the upper-deck compartment window. Because more-crowded conditions are expected to prevail in that area of the ship during this flight, other arrangements may have to be made. Therefore, the same group that came up with the STS-9 radiator is looking into the possibility of providing an antenna in another location, possibly the cargo bay.

Despite the short lead time and its impact on the availability of different equipment, there is some possibility that an FM unit similar to that used on STS-9, except for 70 cm, might be able to be accommodated. The use of this band would pose some interesting challenges, not the least of which would be Doppler three times that present on 2 meters. To conform to the WARC-imposed allocations for the Amateur Satellite Service, frequencies between 435 and 438 MHz would undoubtedly have to be used.

With these considerations in mind, the amateur community is being asked to suggest further potential experiments that might be performed on Shuttle mission 51-F. Some would certainly involve the active participation of WØORE, while others might be able to be performed using an automatic, unattended mode of operation. If the only equipment that can be readied in time is that used by W5LFL, we are again dealing with 2-meter FM as the mode of operation. This would at first appear to rule out experiments that depend for their success on detection of weak signals. This need not necessarily be true, however. Using CW-type detection, with a BFO, the presence or absence of FM carriers can be determined very readily, even at extremely low signal levels.

What experiments would you like to see performed if amateur operation is allowed on Mission 51-F? Your comments on the use of the 70-cm band, under the conditions outlined above, are particularly sought. WØORE has expressed a great interest in receiving ideas from the amateur community. I will collect any proposals turned in by readers of this column and pass them along to Tony and others performing the evaluation. Send your suggestions to the address noted below.

Your ideas may be used on the 51-F Mission. Whether or not these ideas are used, a good response from amateurs could be instrumental in demonstrating to NASA officials that we are seriously interested in participating in space science research, and thus may help secure the go-ahead for another Amateur Radio operation from the Shuttle.

### THE CONFERENCE SEASON

To many, the various VHF conferences held around the country over the next few months represent some of the most memorable happenings in the world above 50 MHz. First up is the get-together at the Dayton Hamvention being planned by WA8ONQ. A number of papers by well-known VHFers plus antenna-gain and noise-figure events are scheduled, along with all-around, good fellowship.

The West Coast Conference is to be held May 4-6 at the Paso Robles Inn, Paso Robles, California. Information can be obtained from Mike Goshay, K6HXW, P.O. Box 493, Arroyo Grande, CA 93420.

Sharing the same weekend as the West Coast Conference, the Eastern VHF/UHF Conference is tentatively set for the Sheraton in Nashua, New Hampshire. The appropriate contact for further details is Tom Kirby, W1EJ, RFD 4, Meadow Knoll, Pelham, NH 03076.

The Central States VHF Society's annual conference will be held this year at Cedar Rapids, Iowa, the weekend of July 27-29 at the Sheraton Inn, near the airport. The technical program is under the stewardship of Barry Buelow, WAØRJT, 4110 Emerson, N.E., Cedar Rapids, IA 52402. Those who might be interested in presenting a talk should contact him. Of course, there will be the usual antenna-gain and noise-figure events, the former of which will be organized by WBØTEM. Two new twists are planned this year. One is an indoor VHF flea market, and the other is the intent to publish Conference papers. Additional information can be obtained from Society Secretary Ed Fitch, WØOHU, 1628 Northern Heights Dr., Rochester, MN 55904.

The Mid Atlantic VHF Conference sponsored by the Pack Rats is normally held the first weekend in October at Warrenton, Pennsylvania. I'll have more details on this one as the date approaches.

All of these affairs are well worth attending for anyone more than casually interested in work on the VHF and UHF bands.

### ON THE BANDS

**6 Meters** — Reports of 6-meter DX are scarce this month. Those that do arrive are mainly from overseas. That at least tells us there are people out there just waiting for the right conditions. One such report comes from FK8EB on New Caledonia. Henri says that during December and the first part of January, he worked all VK call areas except VKØ but including VK9 Norfolk Island, ZLs 1 through 4, A35, P29, H44 and a number of JAs. See the 2-meter section for more of FK8EB's exploits. JA2DDN is another reporter from afar noting far better conditions than we are experiencing. Hideo sends along a very impressive list of calls heard and worked from August through the end of January — such exotic calls as XU1SS; P29ZFD; YB1HR; YC3FU; DU1s GF, CK and MZ; FK8s AX, RU, EB and EM; and numerous VKs, ZLs and other Pacific Basin Stations. Listings as recent as late January include tidbits like YJ8RG along with VKs and ZLs.

Back in this part of the world, KC2TX/1 near Limestone, Maine, writes that he got off to a good start from his new QTH during the early January $E_s$ opening. Spence finds himself the only VHF station in FN66. He should be quite popular come next summer. For those who may need his mailing address, it's Spencer F. Ritch, 186 Andrews Ct., Loring AFB, ME 04751. Just prior to his departure from San Antonio in mid-October, Spence hooked up with YS1ECB for a new country. Incidentally, he says that his brother-in-law CT2EE is returning to the U.S. John should be signing WB6UDL/7 in Arizona by June. Those cross-band $E_s$ QSOs with CT2EE, experienced over the past few summers, will be missed. Let's hope someone steps into that breach.

The issue of calling frequencies keeps coming up. Now, as another $E_s$ season draws near, appears to be a good time to revisit the question. WA5UFH Slidell, Louisiana, makes the case for 50.110 MHz as the universal frequency. Randy contends that people wan

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

to monitor only one frequency whether it be for DX or local contacts. Since 110 has been the spot used for years, he asks, why not stick to it rather than diluting the effort by some U.S. stations using another frequency?

The opposing view is voiced by K2LNS Raritan, New Jersey. Herb cites the overcrowding that took place here in the East during the January VHF Sweepstakes as a prime example of the problems created when everyone concentrates on a single frequency or a small portion of the band. He notes that the area around 50.110 was dominated by high-power, relatively local stations much of the time — preventing the weaker stations, be they low-power or those at a greater distance, from being heard. However, since everyone has fallen into the habit of tuning only a few kilohertz from 110, it was fruitless to make calls much above 50.130. Thus, we are depriving ourselves of the use of the ample space we have. Particularly in these days of scanning receivers, it seems foolish to stick to a single "channel."

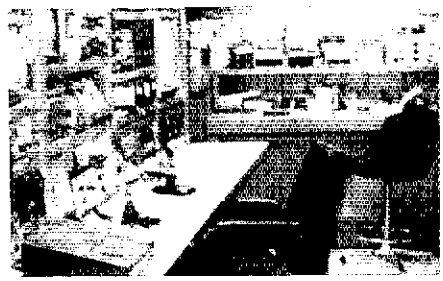
It may be one thing when the band is dead and there is a virtual certainty that no DX is possible, but one of the features about 6 meters that attracts most of us is its propensity for surprise. We can never be absolutely certain that the band cannot open and, if it does, we should be ready to spread out immediately. The trouble is, few of us do. Instead, we have a tendency to stay where we are and begin to make contacts. "Let the guy just getting on find another frequency — I was here first" seems to be the prevailing attitude. With this approach, others as well as ourselves are prevented from hearing the weak signals should they appear. Even during a major $E_s$ opening, when several out-of-country DX stations are being heard, many continue ragchewing or responding to calls from S9-plus U.S. stations around 110. If they are not interested in chasing the DX, this is certainly their business and they have every right to enjoy the band in their own way. The question that arises, however, is does that right include doing so in a manner that prevents others from using the band the way they choose?

The fact is, most out-of-country stations do, and will continue to, operate near 50.110. Getting them to change is much more difficult, because of communication and language barriers, than it is for us. There is ample room for both "local" ragchewing and DX operation. That's why the Central States VHF Society voted several years ago to urge the use of 50.2 as the domestic calling frequency, with 50.110 and environs tagged for DX work. That is why this conductor has supported this recommendation and will continue to do so. I try to carry out most of my domestic QSOs at 50.130 or higher, and to call "CQ" during openings around 50.2. If I am heard at 50.110, it's because I have run into an old friend whom I feel I simply must talk to, or because I am trying to work DX. I also have a tendency to answer CQs around 50.2 more frequently than those I hear around 50.110.

Apparently, a growing number of others, like K2LNS, agree, as I note an increasing amount of activity higher in the band every season. It is still not yet enough, however, to reduce the QRM just above 50.1 significantly. Maybe the coming season will be better.

GW3LDH writes proposing a system of 50-MHz beacons specifically designed to collect data on transatlantic $E_s$. He suggests a transmitter power of about 25 W and two or more directive antennas switched on a timed basis. This proposal was published in full in the March issue of *QEX*, the League's newsletter for experimenters.

**2 Meters** — One of the things that keeps life interesting on VHF is the continuous influx of new people joining the ranks of the world above 50 MHz. One of these new converts is N9KC Round Lake Park, Illinois. Lou says that he was not active in Amateur Radio for a number of years, but got back into it about a year ago with 2-meter SSB and CW. Before the end of 1983, he had 34 states using a 160-W solid-state amplifier and a single 14-element KLM at 60 feet. He credits the VUCC program with stimulating his interest, which certainly helped make life interesting during his first year of operation. Current plans include the construction of a 4CX250 amplifier for 70-cm, so N9KC can be expected to be heard on that band before long.



The extensive layout of W5DFU Tulsa, Oklahoma. Warren is active on 70 cm, 23 cm and ATV

At the 1983 New Hampshire Hoss Traders Fleamarket (l-r): W1QXX, K1RAP, J6LOV and K1MNS.

Another who is enjoying life on VHF is WB4KNF Antioch, Tennessee. Randy finds the winter m.s. showers quite productive. During the Quadrantids in early January, he worked W5UWB Texas and W1AIM Vermont to up his total to 27. Randy is also working toward VUCC and is up to 47 grids.

What must be characterized as the slower part of the year for most of us in frozen reaches of our part of the world is quite the contrary for inhabitants of the Southern Hemisphere. FK8EB writes from New Caledonia of his recent experiences on 2 and 6 meters. On the higher band, Henri reports a very fine $E_s$ opening to VK2 January 10. Worked with ease, including from his car, was VK2DDG near Sydney. Signals were, at times, well over S9.

Take heart Ws and VEs. Those days will return for us before too many more weeks.

As this is being written, K6MYC is to begin his EME DXpedition to Hawaii. It is understood that Mike plans to operate both 2 meters and 70 cm. I hope to have a full report of results by next month.

**1¼ Meters** — As if they had not inflicted enough punishment on themselves on their late-December sortie to the East Coast, WØSD and WBØPJB were at it again January 22. Joined by WBØTEM, and aided by NØLL, they braved 0° to −20° temperatures on a trip to the Kansas/Nebraska border. There, they completed tropo two-ways with AAØL, KXØO, WDØFOY, WØSD, WBØTEM and WB5LUA. They went on to work K9KFR, K5FF, W5FF, WA3GOO, W3GPY, VE3EMS, W4WD/7 and WB5LUA (again) via moonbounce. Heard, but unfortunately not worked, were W1JR and K1WHS.

Faraday rotation was a constant problem in hearing and being heard at the same time. WØSD says they are now convinced of the advantage of polarization control for this band and 70 cm where Faraday often does not change for hours at a time. They also make a good case for their method of operation in which they attempted to work whatever stations they could hear at a particular time rather than adhering to fixed schedules. Their overall rate, about one contact every 40 minutes for all of the trips, would seem to indicate that they are on the right track.

The drive to and from the operating location wasn't spent listening to the BC set in the car. Many unpopulated grid squares were put on 2 and 1¼ meters, much to the delight of VUCC hunters on both bands.

VE3EMS is one of many who is very grateful for the efforts of WØSD, WBØPJB, WBØTEM and WØVB over the past few months. Thanks to their "Have 220 EME, Will Travel" credo, his state total has surged ahead. Add to their efforts a 20-second S9 burst during last summer's Perseids, enabling a 1233-mile contact with W7SF Washington. Peter now needs only South Carolina, Louisiana and Florida to complete WAS. Another beneficiary of these DXpeditions is that longtime booster of the band, K5FF. Lee now needs only South Carolina for her 50th state.

**The Higher Bands** — Texas is one part of the country where tropo doesn't necessarily take a winter vacation. N5BBO San Antonio writes that the morning of January 24 produced extremely strong 23-cm signals over the approximately 260-mile path between him and the Dallas/Fort Worth area. Worked were W5GG, W5HN and W5HPT. The first two were S9 plus 40 dB for over two hours, while W5HPT was S9. Houston area stations W5LDV and WB5SDR, about 200 miles away, were workable also with signals running S3 to S7.

During the evening of the same day, N5BBO reports that W5VDS Wimberley, in the Texas Hill Country between San Antonio and Austin, worked W5RCI Mississippi as well as WA4VWR and WB4EPG, both of Jackson, Tennessee, and WA4LIT Huntsville, Alabama, on 70 cm. W5VDS attempted to work WB4EPG on 23 cm, but could not complete a two-way, although his 125 W was heard by the Tennessee station. However, the 1 W on the other end was not enough to make the grade. Stations in San Antonio, Austin and Dallas were able to hear only W5RCI. This report is especially interesting to this conductor as I have plans to retire to a hilltop location only a few miles from Wimberly. It looks like it will be a super VHF/UHF location, and I am looking forward to trying it out one of these days.

KB7Q Montana notes that OSCAR 10 has materially increased the number of people capable of getting on 70 cm in his part of the country. Gene says that five stations are now active in his state as a direct result of the satellite. He asks that the rest of the country look for them during periods of good propagation, such as an aurora. I wonder if other areas are also experiencing an upsurge of 70-cm activity as a result of those acquiring OSCAR 10 gear.

## 23-CM Standings

Listings are call, state, number of states worked, number of call areas worked, number of grids worked and best DX in statute miles for farthest terrestrial contact. Call areas are the 10 continental U.S. call areas plus KL7 and KH6, each VE and XE call area, DXCC countries not located within the borders of the above. Compiled February 12, 1984. Deadline for next update is August 1.

| | | | | | |
|---|---|---|---|---|---|
| K1PXE | CT | 13 | 5 | — | 448 |
| K1FO | CT | 11 | 4 | — | 405 |
| W1JR | MA | 10 | 4 | — | 475 |
| WA1JOF | MA | 9 | 4 | 10 | — |
| W1XP | MA | 7 | 5 | — | 300 |
| KA1GT | MA | 7 | 4 | — | 360 |
| W1QXX | MA | 6 | 3 | — | 260 |
| K2UYH* | NJ | 20 | 9 | — | 770 |
| WA2LTM* | NJ | 17 | 6 | — | 770 |
| W2VC | NJ | 15 | 5 | — | 537 |
| W2DWJ | NJ | 15 | 5 | — | — |
| K2YCO | NY | 11 | 6 | — | 670 |
| K2EVJ | NY | 10 | 6 | — | 426 |
| K2JNG | NJ | 10 | 4 | — | 305 |
| W2PGC | NY | 5 | 5 | — | 473 |
| WA2FUZ | NY | 5 | 3 | — | 125 |
| WA2EUS | NY | 4 | 5 | — | 320 |
| K2OVS | NY | 3 | 2 | — | 135 |
| WA3NZL | MD | 11 | 7 | — | 780 |
| W3HMU | PA | 11 | 5 | — | 300 |
| K3IUV | PA | 9 | 4 | — | 290 |
| W3IP | MD | 8 | 5 | 9 | 369 |
| WA3JUF | PA | 7 | 4 | — | 300 |
| K4QIF | VA | 15 | 6 | — | 790 |
| W3IY/4 | VA | 7 | 5 | — | 274 |
| K4NTD | FL | 3 | 2 | — | 847 |
| W4VHH | GA | 2 | 1 | — | 350 |
| K4KJP | FL | 2 | 2 | — | 670 |
| WB5LUA* | TX | 14 | 17 | — | 839 |
| W5HN | TX | 7 | 3 | — | 625 |
| W5DFU | OK | 5 | 3 | — | 500 |
| K5MWH | AR | 4 | 2 | — | 280 |
| KR5F | TX | 3 | 2 | — | 750 |
| W5UWB | TX | 3 | 2 | — | 720 |
| N4JS/5 | MS | 3 | 2 | — | 467 |
| WB5LBT | LA | 3 | 2 | — | — |
| K5LLL | TX | 2 | 2 | — | 847 |
| W5LDV | TX | 2 | 2 | — | 847 |
| N5BBO | TX | 2 | 2 | — | 734 |
| W5UKQ | LA | 1 | 1 | — | 365 |
| W5HPT | TX | 1 | 1 | — | 571 |
| WA5TBE | TX | 1 | 1 | — | 372 |
| W5GVE | TX | 1 | 1 | — | 366 |
| K5PUF | TX | 1 | 1 | — | 290 |
| WA5HNK | TX | 1 | 1 | — | 250 |
| K6ZMW | | 4 | 3 | — | 402 |
| N6CA | | 3 | 2 | — | 338 |
| W6XJ | | 2 | 3 | — | 250 |
| W6OQQ | | 2 | 2 | — | 200 |
| WB6NMT | | 1 | 1 | — | 296 |
| KC6A/6 | | 1 | 1 | — | 295 |
| N6TX | | 1 | 1 | — | 112 |
| K7GNV/7 | AZ | 5 | 3 | 6 | 426 |
| N6NB/7 | UT | 4 | 2 | — | 295 |
| WB5TCO/7 | AZ | 2 | 2 | 2 | 403 |
| WA7JUO | NV | 2 | 1 | — | — |
| W7LUX | AZ | 1 | 1 | — | 130 |
| W8YIO | MI | 14 | 7 | — | 551 |
| WB8BKC | MI | 14 | 7 | — | 650 |
| WA8TXT | OH | 12 | 8 | — | 550 |
| K8WW | OH | 12 | 7 | — | 448 |
| WB8PAT | OH | 3 | 3 | — | 405 |
| W9ZIH | IL | 19 | 9 | — | 790 |
| WB9SNR | IL | 8 | 5 | — | 760 |
| W9UD | IL | 5 | 4 | — | 760 |
| W9JIY | IN | 5 | 3 | — | 300 |
| W9WCD | IL | 3 | 3 | — | 770 |
| W9AAG | IL | 2 | 2 | — | 350 |
| WØOHU | MN | 7 | 4 | — | 575 |
| WØRAP | IA | 7 | 3 | 6 | — |
| WØYZS | MO | 4 | 2 | — | 425 |
| WØPW | CO | 3 | 2 | 3 | 97 |
| WØZJY | KS | 3 | 1 | — | 170 |
| WØMDL | MN | 2 | 2 | — | 340 |
| WØVB | MN | 2 | 2 | — | 290 |
| XE2BC | | 1 | 1 | — | 370 |

*Indicates that some contacts were made via EME

# The New Frontier

*The World Above 1 Gig*

Conducted By Bob Atkins,* KA1GT

## Coaxial Cable for Microwave Use

Not all commonly available types of coax are suitable for microwave use. A number of factors affect the microwave (and to a lesser extent the lower-frequency) performance of coax. They are (1) physical size, (2) dielectric material, and (3) shield and center conductor material.

In general, the larger a coax cable is, the lower its loss will be at any given frequency. As the size goes up and the cable is used at shorter wavelengths, however, there comes a point at which the wavelength in use approaches the physical dimensions of the coax. At a frequency known as the cutoff frequency, the cable becomes capable of propagating RF energy in modes other than the normal TEM mode. In many cases, the cable can be used above its cutoff frequency without ill effects, but this is not a recommended mode of operation. The formula relating cutoff to cable dimensions is

$$\text{Cutoff frequency (GHz)} = 7.5/\sqrt{E}(D + d) \quad \text{(Eq. 1)}$$

where

E = dielectric constant of the cable dielectric
D = the ID of the outer conductor (in)
d = the OD of the inner conductor (in)

The dielectric material used in the cable affects cable losses. As far as loss is concerned, air dielectric gives lowest losses (Heliax cable), followed by Teflon, foam polyethylene and solid polyethylene. This can be modified severely in the presence of moisture, however. Both Heliax and foam dielectric cables can show increased loss in the presence of water vapor. The solid dielectric cables tend not to show a large effect since water cannot permeate the space between the inner and outer conductors. Foam dielectric cables with solid outer metal jackets ("hardline") show less moisture degradation than foam dielectric cables with braided copper shield, since the solid jacket acts as a barrier to moisture penetration.

A second way in which dielectric losses may increase is by contamination from the outer jacket. So-called Type I PVC jackets have contaminating plasticizers that can degrade cable performance. RG-8/U has a type I PVC jacket, and so should be avoided. RG-213/U is the same size as RG-8/U, but has a type IIA noncontaminating jacket and is therefore preferred.

The cables with the best microwave performance either have solid, outer conductors or silver-plated copper-stranded shielding. Cables with tin-plated shielding should be avoided, as should cables with bare copper shielding. The tin-plated shielding gives rise to higher losses, whereas the bare copper shielding (which may initially have lower loss) tends to age rapidly. The silver-plated shielding shows the lowest initial loss, and is much more resistant to aging. Double-shielded cables show much lower RF leakage (~30 dB better) than single shielded cables. Solid aluminum or copper shielding is best, but it is, of course, not flexible.

It should be noted that repeated bending, particularly over a tight bend radius, can considerably increase the loss of a coax cable. Loss increase can be on the order of 50-100%. If a cable is to be used in service where repeated flexing is required, a cable with a stranded center conductor and silver-plated, braided shielding should be chosen. The minimum bend radius should be at least 20 times the cable diameter. A suitable cable might be RG-214/U, with a minimum bend radius of about 1 foot.

The following cables are among those recommended for microwave use:

*RG-141/U* — similar in physical dimensions to RG-58/U, but with a Teflon dielectric, silver-plated shielding and center conductors, and a noncontaminating jacket.

*RG-214/U* — similar in physical dimensions to RG-8/U, but with silver-plated conductors, a double shield and a noncontaminating outer jacket.

*RG-402/U* — sometimes called UT141. A small semirigid cable 0.141 in outer diameter with a solid copper jacket, Teflon dielectric and silver-plated center conductor. Very useful in point-to-point connections with SMA connectors because of its small size.

*RG-231/U, RG-331* — 1/2-in-OD aluminum-jacketed-foam dielectric cable. Often called 1/2-in hardline.

*RG-360/U* — 3/4-in aluminum-jacketed-foam dielectric cable, 3/4-in hardline.

*RG-332/U* — 7/8-in aluminum-jacketed-foam dielectric cable, 7/8-in hardline.

*RG-236/U, RG-237/U* — 1/2-in aluminum-jacketed Heliax.

*RG-183/U* — 3/4-in aluminum-jacketed Heliax.

*RG-232/U* — 7/8-in aluminum-jacketed Heliax.

**Table 1**
**Coaxial Cable Attenuation Characteristics (dB/100 ft)**

| Cable | Frequency (MHz) | | | | |
|---|---|---|---|---|---|
| RG- | 1296 | 2304 | 3456 | 5670 | 10,368 |
| 58B | (21) | (31.5) | — | — | — |
| 141 | 15.3 | 22.0 | 28.4 | 39.7 | 63.7 |
| 8/213 | (10.7) | (15.9) | (21.2) | (30.8) | (48.3) |
| 9/214 | 10.7 | 15.9 | 21.2 | 30.8 | 48.3 |
| 331 | 3.7 | 5.4 | 7.1 | 9.9 | 15.4 |
| 360 | 3.0 | 4.4 | 5.8 | 8.2 | CU |
| 332 | 2.5 | 3.9 | 5.1 | 7.0 | CU |
| 236 | 3.3 | 4.6 | 5.7 | 7.8 | — |
| 183 | 2.2 | 3.2 | 4.0 | 5.4 | CU |
| 232 | 1.9 | 2.6 | 3.4 | 4.5 | CU |
| 402 | 13 | 18 | 22 | 30 | 42 |
| FM8 | (6.3) | (8.4) | — | — | — |

RG-331/U is 1/2-in hardline. RG-236/U is 1/2-in Heliax. RG-360/U is 3/4-in hardline. RG-183/U is 3/4-in Heliax. RG-332/U is 7/8-in hardline. RG-232/U is 7/8-in Heliax. Values in parentheses indicate use is not recommended. CU indicates frequency is above the cable cutoff.

### MORE ON WAVEGUIDE-TO-COAX TRANSITIONS

Following the December 1983 column, which dealt with a waveguide-to-coax transition, I have received two letters on the subject. The first, from Bill Mumford, W2CU, brought to my attention a paper that Bill authored many years ago. It is titled "Optimum Piston Position for Wide-Band Coaxial-to-Waveguide Transducers," and appeared in the Proceedings of the IRE, Vol. 41, p. 256, 1953. It is interesting and informative reading on this subject.

The second letter points out an error in Table 1 of the December column. The cutoff wavelength, $\lambda_c$, in WR42 is given as 1.239 cm. This is the free-space wavelength at 24,192 MHz. The correct cutoff wavelength should be 2.133 cm. Thanks to Mac, JK1RJQ, for bringing the error to my attention.

A different type of transition is described in the January 1984 edition of *Microwaves and RF* magazine. The article is titled "Waveguide-to-Microstrip Transition Uses Evanescent Mode," by S. S. Bharj and S. Mak. As may be deduced from the title, the article describes a transition between microstrip and waveguide.

### COMPONENT NEWS

Acrian, Inc. (10060 Bubb Rd., Cupertino, CA 95014), has announced a 1-W transistor, the 80143, suitable for use at 2.3 GHz. The device is designed for Class A operation, and has a power gain of 9 dB at 2.3 GHz. The large-quantity price is $27.

Trim-Tronics, Inc. (67 Albany St., Cazenovia, NY 13035), produces a line of air-variable capacitors with a self-resonant frequency >5 GHz. These capacitors have a Q factor of >5000 at a frequency of 200 MHz. Price is around $1.85.

### RSGB MICROWAVE AWARDS

Following the award for the first 10-GHz amateur contact over 1000 km, which went to IØSNY and IW4ADT, the RSGB has announced that awards will be given for the first contacts using amateur-owned equipment over the following distances: 10 GHz — 2000 km; 24 GHz — 250 km; 47 GHz — 50 km.

Thanks to WD4FAB for bringing these awards to my attention.

### 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 | QSL Bureaus Incoming | Dec. 1983, p. 74 |
| Board Standing Committees (Minute 42) | June 1983, p. 55 | Outgoing | March 1984, p. 65 |
| Call Sign Assignment System | June 1983, p. 61 | *QST* Abbreviations List | Jan. 1984, p. 53 |
| FCC Exam Schedule | Jan. 1984, p. 59 | Reciprocal-Operating Countries | Nov. 1983, p. 71 |
| License Renewal Information | Jan. 1984, p. 51 | Section Emergency Coordinators | Oct. 1983, p. 95 |
| Major ARRL Operating Events and Conventions — 1984 | Jan. 1984, p. 52 | Third-Party-Traffic Countries | This issue, p. 87 |
| Pending Dockets | Feb. 1984, p. 65 | U.S. Amateur Frequency and Mode Allocations | Jan. 1984, p. 51 |

*103 Division Ave., Millington, NJ 07946

# IARU News

Conducted By Richard L. Baldwin,* W1RU



## New Member Societies of IARU Proposed

Two more Amateur Radio societies, representing the interests of amateurs in their respective countries, have applied for membership in IARU. One is the Vanuatu Amateur Radio Society, Republic of Vanuatu, in the western Pacific. VARS, which has 20 members (18 of them licensed amateurs), was formed in May 1980, a couple of months before Vanuatu (formerly the New Hebrides) became independent.

The other prospective member of the IARU is the Chinese Radio Sports Association, representing the interests of radio amateurs in the People's Republic of China. Because of the intense interest that has been evidenced the past two or three years about the development of Amateur Radio in China, we present herewith a brief history, as prepared by the CRSA.

Amateur Radio activities first appeared in China in the '20s. In the '30s, a number of Amateur Radio organizations were formed, and in 1940 several of these jointly formed the Chinese Amateur Radio League and began publishing an official journal named *Radio World.* In 1947, CARL was accepted as a member-society of IARU. Later, after the founding of the People's Republic of China, Amateur Radio began to develop among the people, especially the youth. In October 1958, an Amateur Radio organization named the Chinese People Radio Club was established. Then, clubs were formed one after the other in many cities, provinces and autonomous regions.

The Chinese Radio Sports Association was formed in 1964 as a new entity under the jurisdiction of the All-China Sports Federation. It is now the sole national organization authorized to represent radio amateurs in China.

Amateur Radio activities in China have varied forms. The most popular aspects include Amateur Radio Communication and Amateur Radio Direction Finding. The development of Amateur Radio has enabled youth to acquire more knowledge about radio techniques, and it has provided the opportunity for Chinese amateurs to exchange experiences and strengthen ties with other amateurs all over the world.

At present, active Amateur Radio stations are being operated in Beijing (BY1PK), Shanghai (BY4AA) and Chengdu (BY8AA). Radio communications and radio direction-finding activities are conducted in 17 provinces and autonomous regions and, competitions for Amateur Radio communications and direction finding are held on a regular basis every year. Radio techniques clinics, electronics summer clinics and exhibitions of radio equipment made by amateurs are attracting thousands of new amateurs.

In the radio receiving competitions held in 1956 and 1958, young Chinese radio amateurs won the team champion title. Representatives of the Chinese Radio Sports Association visited Japan in 1980, and in 1983 representatives of CRSA attended the World Amateur Radio International Conference held in Tokyo. In July 1983, the Chinese Radio Direction Finding Team participated in the 27th International Radio Direction Finding Competition held in Yugoslavia. With the support of their government, Amateur Radio activities are developing rapidly in the People's Republic of China.

We look forward with enthusiasm to the renewed participation in international Amateur Radio activities by our friends in China.

### HF BC WARC

The first session of the high-frequency broadcasting WARC ended on February 11, only one day later than the original schedule. It was a difficult conference for the participants, for there were many conflicting needs. There were a number of countries that were satisfied with the status quo, and didn't want that disrupted. Other countries felt that existing procedures did not take care of their needs, and wanted different methods of planning the use of the bands allocated to broadcasting. There were still other countries that do not yet have an HF broadcasting service and wanted some assurance that their future needs would be taken care of.

The second session of this conference, to take place in 1986, will plan the actual use of the HF BC bands based on the principles developed at this first session. The proof of the pudding will be in the eating, and it is far too early to state positively whether the conference as a whole will be successful. The first session took no actions that were harmful to the Amateur Radio Service. In fact, it passed a couple of resolutions having to do with out-of-band operation and harmful interference which, if heeded by the HF broadcasters, would be to Amateur Radio's advantage.

The IARU was represented at this conference by G5CO, SP5FM and W1RU, who have made a more detailed report available to the IARU's Administrative Council.

*President, IARU

# In Training

### REDISCOVER THAT TEACHING GROOVE

You may need a little encouragement or friendly persuasion from your Amateur Radio friends, but you know that you're willing to get back into training if given the chance. Maybe that chance has not been clearly in view because of previous or current commitments, but club members and potential Amateur Radio students see *you* as that someone to fill the important instructor's role and provide needed guidance. Give it some thought. Test procedures are changing, and the course material is no longer "the same old stuff." So reinvest your interest in training radio amateurs — it's a most worthwhile activity.

Given the changes that have already occurred and those that will happen soon, how should an instructor just returning to the classroom prepare accordingly? Catch up on the news! The Training Branch at Headquarters has received numerous inquiries over the past several months about the new Novice test procedures, and we are glad to provide the FCC-approved question pool to new and veteran instructors who are boning up on the changes (see September 1983 *QST*, p. 56).

The ARRL Novice Question and Answer Supplement contains a multiple-choice version of the 200 Novice questions based on PR Bulletin 1035A. Now, the FCC rules allow greater flexibility in exam format. This helps you choose the best method for your teaching style and student needs. Let the ARRL Training Program material help you design your course of instruction for an effective use of time and talent.

As an experienced instructor looking at the new test questions, you may have some comments or suggestions for future improvement. Instructors please note: The FCC invites Amateur Radio operators to submit questions for all Amateur Radio exams. This is how the FCC compiled PR Bulletins 1035A and 1035B (Elements 2 and 3). The opportunity for input in this matter is new and should be taken to improve exams. Details on how to submit questions for possible use are described in PR Bulletin 1035 (February 1984).

The new Volunteer Examiner Program will certainly open opportunities for your involvement as an active instructor or Volunteer Examiner, or both. Your support will especially be appreciated at the local level, where your participation can make a difference. See March 1984 *QST*, p. 48, for the latest details on Volunteer Examining.

Now that you begin to see the overall shape of a revitalized amateur testing program, you can apply your teaching skills anew. After accepting a commitment to teach a training class or to instruct an individual, ask for assistance from another amateur or a local club if you need it. No need to go it alone just because the host club knows that you have had previous teaching experience. A training program can be stronger and more effective if additional help is accessible.

Here's an idea that should be welcomed both by you and the host club: Since you agreed to lead the course, have an "instructor trainee" or two assist, to learn the teaching ropes. Having another radio amateur in class to confer with during the class discussion or to help in other ways may take the pressure off you while you find your reliable teaching groove. Therein is a benefit at work for you, your students and the new training instructor.

Think of ways to apply your experiences in Amateur Radio to a teaching situation. Because you have a personal grasp on the subject matter, it will be easier to reestablish confidence in front of the class. At the same time, the students may explore and participate in many aspects of Amateur Radio. Invite the students to your radio shack for a demonstration, or to a club activity.

What activities are coming up? Don't forget Field Day or an area hamfest. These events are natural extensions of a training class, and your students will profit from the exposure. A creative and positive response to the chance to help someone into Amateur Radio is always encouraging to the individuals involved. Remember: You don't have to go far to share your interest, and sharing an interest is what teaching is all about. — *Steve Ewald, WA4CMS, Training Assistant*

# YL News and Views

Conducted By Jean Peacor,* K1IJV

## No TVI Here

The island of New Britain, part of the Bismarck Archipelago, lies east of the big island of New Guinea. There is a large cocoa/coconut plantation on this island located 80 km from the town of Rabaul and up in the mountains. For 21 years, the Freymadls have managed this plantation. Born in Bavaria/Germany, they first went to Australia, where they lived for more than a year before moving on to New Guinea. They were a young couple with a young daughter, Karin, born in Melbourne, Australia. Their son, Hans, born in 1964, is a New Guinean.

Tremendous changes have occurred during their 21 years on the island, including the New Guineans obtaining independence in 1975, which is when the island of New Britain became part of the country of Papua New Guinea. Airplane is the most popular form of transport, and in many areas the only means of travel. The road system is very primitive in some areas. In fact, the Freymadls' plantation area relied solely on sea transportation up until two years ago, when the first road was established. Limited funds allowed for road construction, but the five rivers that must be crossed going to and from Rabaul must be forded — no bridges were built. In times of rain, being stranded or stuck in the river is accepted as all part of a day's work.

Siegi Freymadl and Karin started taking CW and theory classes together in 1977. Siegi anticipated the need for communicating — the day would come for her children to continue their education off island. Siegi and Karin had great fun practicing Morse code together. Their instructor marveled at how much alike their fists became. They passed the CW exam with no problem.

Work on the theory continued. Arrangements

Siegi Freymadl, P29NSF

were made for Karin to leave the plantation to attend school in Brisbane, Australia. An amateur friend also arranged for Karin to go to the Redcliffe Radio Club's theory classes in VK4-land. Prior to becoming licensed, Siegi was able to enjoy weekly skeds with Karin via Amateur Radio as a second operator at the stations of either P29LA or P29TL. Karin operated as second operator to VK4AMB. Eventually, they both passed their Novice exams and received call signs within a few weeks of each other in 1980. Karin became VK4VER, and Siegi P29NSF. Weekly skeds became a highlight of their lives.

The remoteness of the plantation allows Siegi to set up as many antennas and towers as high as she wishes. There is no TVI problem simply because there is no television in Papua New Guinea. Siegi and her OM do have video and enjoy the latest shows from Australia. Her OM is an engineer and Siegi's technical advisor. Electricity is generated from a small diesel engine driving a 4 KVA alternator. It is sufficient for lights, refrigerator, freezer, washing machine, water pump, video and, most important, the rig — as long as all aren't in use at the same time. Breakdowns in the system only seem to occur when it's most inconvenient: The generator seems to have an aversion to contests. The ALARA contest brought on a breakdown, as did Australia's Remembrance Day contest.

Siegi's Novice class license limits her operating to 30-W output. Most of the time she uses between 10 and 15 W. Despite the limitations, she has managed to work 179 confirmed countries, and is very proud of her DXCC and WAS awards. She has 71 confirmed QSOs toward DXCC YL. Most contacts have been made on 10 meters or on 15 meters between 21.125 and 21.200 MHz. Upgrading is high on her priority list.

In Rabaul, there are three Amateur Radio operators (not extremely active) plus Siegi living in the outskirts — a grand total of four operators on New Britain Island. Siegi mentioned how difficult it can be at times to get verification from two fellow amateurs for award applications, and she is an avid award hunter.

Plans have been underway for some time for the Freymadls to pack up and move to Queensland, Australia. They were negotiating the sale of the plantation when Siegi last wrote. She is all set to operate in Australia with the call VK4VSF, and may be doing just that as you read this. It has been exciting for her to be New Britain Island's only YL operator, and she and her OM will miss New Guinea. But, there's excitement for them awaiting in Australia: a new, big country to explore, new people to meet and, best of all, to being near their children once more.

### NEW SANTA CRUZ COUNTY EMERGENCY COORDINATOR

Susan Tracy, WA6OCV, has been appointed ARRL Emergency Coordinator for Santa Cruz County, California. She is a very active member of the Santa Cruz County Amateur Radio Club, and has been a ham since 1977. She has contributed many hours of her time organizing and participating in communications assistance for local community activities. Under her leadership, Amateur Radio communications were provided for the recent Horseman's Association Endurance Trail Ride, The Monterey Triathlon and the Race Through the Redwoods. Susan also played an important part as an Amateur Radio Emergency Service (ARES) team member in the storm disaster in Santa Cruz in January 1982.

One of Susan's first acts after becoming the EC was to conduct a training program for all members of her ARES team. In a series of training meetings, team members were briefed on traffic handling and emergency communication procedures. Many new members, including Novices, benefited from the training. All team members were given communications packets containing net directories, communication plans and sample emergency mobilization plans received from other areas. They were given ARES and Sheriff's Department identification cards to facilitate their movements in future, actual disaster areas.

Shortly after team training was completed, the ARRL National Simulated Emergency Test (SET) was conducted. For this test, Susan and her team wrote up an earthquake disaster scenario. The test was highly successful, and 23 local team members participated. Net control was established by Susan, KH6PP and K6BDK in the County Emergency Center. Three repeaters were used. This was necessary because of the elongated geographic and mountainous layout of the county terrain. Vital assistance was provided by additional hams, particularly K7CRS in Carmel, who relayed messages over the Monterey repeater throughout the exercise.

As part of the SET, approximately 30 test messages were passed through the National Traffic System by Cynthia DeLauney, W6PHT, ARRL Section Traffic Manager. All messages (one as far away as Maine) were delivered, and receipts acknowledged.

Susan Tracy, WA6OCV

Susan was pleased with her first emergency exercise: "It gave us a chance to test our equipment, especially our antennas which are permanently mounted on top of the County Building. We also wanted to get team members out into the extreme parts of the country — from Davenport to Watsonville — to see if we could reach each other."

One of the major problems with a disaster in Santa Cruz County is that the county is nearly isolated if State Highway 17 is closed. In that event, emergency supplies to Santa Cruz would be diverted through long and circuitous routes. Another problem is that the Santa Cruz mountains limit 2-meter communication. The October test proved that in-county repeaters were ineffective for use throughout the full length of the county. In the 1982 storm disaster, it was found that entire mountain communities were cut off from contact with emergency officials.

At the exercise debriefing, Susan said, "Everyone really pitched in to help. We had few problems with message traffic passing, but did decide to pass them directly to outlying areas rather than through net control. For this purpose, we ran two nets." She added, "We learned a lot, and it was a good experience for all of us."

Susan is no stranger to leadership roles. She was chairman for the well-attended and highly successful ARRL Pacific Division Convention in Santa Cruz in October 1982. She has been elected vice president of the Santa Cruz County Amateur Radio Club for 1984, and currently serves as president of the San Lorenzo Valley Repeater Club. While working full-time, Susan found time to help her 13-year-old daughter Amy obtain her Novice license. Amy, like her mother, is proud of her recently received call, KB6AWR. — *Arthur R. Lee, N6FAD*

*Country Club Dr., Monson, MA 01057

# Silent Keys

It is with deep regret that we record the passing of these amateurs:

W1AKZ, Andrew Hurnanen, Templeton, MA
K1AWQ, Paul R. Goudreau, Sr., Old Orchard Beach, ME
K1BAY, George W. Fullerton, South Portland, ME
W1CNJ, Arthur "Bill" Gormley, Warwick, RI
AJ1I, Everett S. Hudson, Billerica, MA
KA1JBK, Gilbert A. Gerridge, Easton, MA
W1PJD, Harley S. Wood, New London, CT
W1QVZ, Thomas D. O'Connor, Manchester, NH
W1ST, Robert D. Stimpson, Boothbay, ME
K1SYN, Thomas W. Grieco, Sr., Torrington, CT
WB2BSS, Lester E. Ehlen, Zellwood, FL
WA2DWH, Laurence M. Connaughton, Philmont, NY
K2EGH, Roy W. Foxhill, Homosassa, FL
WB2HCB, Edwin R. Deans, Pulaski, NY
W2HJL, George A. Savonis, Mystic Island, NJ
K2JAQ, Bertram G. Marshall, Rahway, NJ
W2JYB, Edward L. Long, Chatham, NY
WA2ODR, Ralph R. Paul, Holland, NY
W2OO, Joseph H. Ehrler, Queens Village, NY
W3AX, Samuel E. Fraim, West Palm Beach, FL
N3CFU, LeRoy L. Wiseman, Sr., Laurel, MD
KA3DHO, Joseph E. McKernon, Archbald, PA
W3GVG, Malcolm L. Wiseman, Washington, DC
W3IFN, David Yurow, Washington, DC
W3LEZ, Phil D. Boardman, Scotland, PA
W3NSU, Alfred N. Myers, Westminster, MD
W3QB, Jay O. Achenbach, Philadelphia, PA
*W4ERA, Carl A. Goldner, Floral City, FL
K4ETV, Charles S. Bell, Nashville, TN
K4FDB, William D. McGraw, Nashville, TN
WD4FTX, A. L. Cataline, Davison, MI
*WA4HDU, Willis J. Howard, Gadsden, AL
K4HGP, Louis B. Palmer, Sr., Kinston, NC
W4HKU, James B. Cobb, Sr., Kingsport, TN
K4PNA, Arthur M. Jester, Danville, KY
WA4RAV, Joseph T. Maddox, Irwinton, GA
W4WLX, Chalmers S. Stromberg, Orlando, FL
W5AIP, Ford Michael, Norman, OK
W5CEE, Ivan R. Davis, Fort Worth, TX
W5GOS, Norman P. Walker, Midland, TX
KA5JRC, Charles A. Rose, Fort Worth, TX
KA5JWI, Edmund H. Gilmore, Sr., Metairie, LA
K5JYC, Felix E. Redwine, Tahoka, TX
*K5MRK, Charles A. Stiles, Jr., Ft. Worth, TX
WB5MRS, Perfecto M. Gomez, Gulfport, MS
K5OUU, Lewis M. Nolen, Sr., Whitney, TX
W5REZ, Louis M. Dezettel, Albuquerque, NM
W5TQR, Durward L. Nichols, San Antonio, TX
W5WMT, Eugene L. Silvia, Jr., Rayne, LA
N6AVQ, Marcus J. Couts, Desert Hot Springs, CA
WB6CAF, Jack Y. Levy, Los Angeles, CA
W6DNB, Edward B. Pringle, San Francisco, CA
K6EJ, Leon A. Moore, Fresno, CA
WD6GGB, Donald A. Howard, Paradise, CA
W6KRT, Sidney Wald, Canoga Park, CA
WA6KXO, Stanley T. Radenz, San Diego, CA
WB6LJD, James A. Troutman, Bakersfield, CA
W6NTY, Robert S. Edwards, Palmdale, CA
W6PAX, Donald G. Burgar, La Jolla, CA
W6PLK, William C. Martin, Fullerton, CA
KA6POT, Arthur H. Collbran, San Rafael, CA
K6QLY, David R. Cate, San Diego, CA
W6TBU, John F. Mullen, Jr., Los Altos Hills, CA
W6VPV, Wilbur Osler, San Jose, CA
WA6WCE, William W. Alston, Madera, CA
KA7AGJ, Albert E. Smith, Tacoma, WA
W7APJ, Edward A. Pruitt, Jr., Eugene, OR
W7BA, Bertram A. Gooch, Apache Junction, AZ
W7COB, Edward H. Hart, Portland, OR
W7DSB, Lynn J. Schuck, Mercer Island, WA
W7GAT, Stephen C. Mergler, Mount Vernon, WA
W7HIF, Robert B. Smith, Corvallis, OR
W7MCZ, John S. Hollenbeck, Prineville, OR
W7MDO, William H. Coats, Green Valley, AZ
WA7NXW, Louis E. Jorquera, Coos Bay, OR
W7OXF, Elmer L. Bayles, Portland, OR
K7OZA, William A. Fuller, Seattle, WA
*K7PH, Carl Lindberg, Las Vegas, NV
W7SVV, Clinton J. Crandall, Tacoma, WA
WA8BBT, Guy N. Kelton, Royal Oak, MI
W8DFL, Victor R. Bambeck, Parma, OH
W8EEE, Harry F. Randolph, Euclid, OH
W8EIR, Alvine "Kate" Eastman, Lansing, MI
KA8HCD, Donald R. Carnes, Clinton, OH
W8LVD, Allen P. Dudley, Findlay, OH
*WB8MWH, Paul E. Bass, Cleveland, OH
WB8TBS, Hubert W. Eiben, Lodi, OH
W8TLW, Wilfred Leemon, St. Petersburg, FL
*K8WNX, Ira A. Leach, Weirton, WV
N9DVL, Harold J. Sandwick, Wheaton, IL
KA9PWJ, John F. Kellerstrass, Peoria, IL
WB9VFJ, Paul R. De Vos, North Liberty, IN
WØBGY, Sidney L. Markusen, Esko, MN
WØCV, Joseph E. Deines, Junction City, KS
WDØFTQ, Adrian F. Lunceford, Jr., Richmond, MO
WØGEQ, Wayne T. Moore, Ogallala, NE
WØKDI, Ralph A. Bryan, Milford, IA
KØLUN, Floyd C. Cross, Des Moines, IA
KAØNJU, Oiva K. Pauhu, Pengilly, MN
KØPKW, Glen Witzenburg, Lincoln, NE
WØRTE, Mathew A. Simonich, Minneapolis, MN
WØUHD, Lucien G. Metzger, Aurora, CO
VE2ERV, Gilbert Varden, Port Charlotte, FL
VE3AIB J. Leslie Weir, Toronto, ON
VE3KGG, Everett M. Marsh, Brigden, ON
VE3YI, Lawrence R. Young, Collingwood, ON
VE3ZU, Roland A. White, Belleville, ON
VE7ABW, William A. Wasyluk, Richmond, BC
ON4QJ, Raoul Billen, Antwerp, Belgium
OZ3SL, Svend Lauth, Viborg, Denmark
VK4PR, W. J. "Jim" Ratter, Alderly, Brisbane, Australia

*Life Member, ARRL

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

**April 1934**

☐ President Hiram Percy Maxim addresses a message to all members, reminiscing on the April 6, 1914 Hartford-to-Springfield relay incident that sparked in his mind the concept of a national amateur association — and marked the beginnings of the League. Hamdom is invited to send a reply message on April 7 this year to the grand old man of Amateur Radio.

☐ Responding to numerous requests in queries to the Technical Information Service, W1SZ has designed a converter, using the new pentagrid 2A7, to feed a broadcast receiver and effectively provide all-wave reception with bandspread for amateur use. A separate beat oscillator is required for telegraphy, however.

☐ W8RD and W8KIR have long been interested in and concerned about the quality of modulation emanating from many of our voice stations. Extensive 'scope monitoring since the December *QST* article on overmodulation, however, shows a considerable change for the better.

☐ On the same theme, W1HRX and W1BZR provide us with details for a cathode-ray tube presentation of trapezoidal patterns of received stations, with info on interpretation of the various shapes.

☐ Lest we forget, we are reminded of the League's QSL Bureau system, operated by volunteers, and urged to provide our district manager with a return envelope for those coveted cards.

☐ During extensive floods in California as well as the Northwestern states, amateurs provided essential emergency communication to help save lives and property. Heroic personal rescues were made through Canadian ham communication as well.

☐ The Federal Radio Commission's expanded monitoring activity to ensure regulations compliance is not a witch-hunt, we are assured. "Discrepancy" reports require only a simple response; however, repeated violations will bring stronger disciplinary measures.

☐ The relatively new League appointment of Official Phone Station has so far garnered a meager total of only 91 enrollees.

☐ George Grammer's '59 tri-tet oscillator last month was just the beginning of a complete transmitter design. This issue brings details of an intermediate amplifier, to provide necessary higher drive on 10 and 20 meters. An '841 is chosen because of its high-mu and freedom from grid-emission troubles.

☐ The Editor expresses fears that the 11-year sunspot cycle peaks every second time around, so we may have to wait another 13 years or so for dream DX.

# 25 Years Ago

**April 1959**

☐ W6VX offers a number of ideas on achieving variable selectivity with fixed filters, still with a good noise figure and image rejection.

☐ Which coax to use? W1GKX of Times Wire & Cable sorts out the various "75-ohm" types and tabulates their characteristics, including attenuation figures.

☐ Two half-wave dipoles at right angles constitute W1CUT's 2-meter "turnstile" mobile antenna, providing horizontal polarization and omnidirectional pattern.

☐ K2KGJ won the Edison Award offered by General Electric, mostly for outstanding message relaying and phonepatch work with Antarctica.

☐ An audio filter can provide increased c.w. selectivity, especially for a Novice. W1ICP presents a version adapted from a W3FQB design.

☐ Standing-wave "bridges" are becoming popular, in all sizes and shapes. WØTTK of Collins Radio takes us straight to the fundamentals and then expounds on the good and bad points of various coupler and wattmeter designs.

☐ The Editor reminds us that the new frequencies made available for the Radio Amateur Civil Emergency Service are not an "invasion" of our bands as some have suggested, but rather a tool that can be used — though hopefully never — for vital civilian communication in the event of war.

☐ W3HTF finds voice bands too crowded for successful mobile work, and so has turned to telegraphy. He devised a c.w. monitor that uses a couple of neon bulbs and a transistor.

☐ Modifying popular commercial rigs can improve performance. W8NJH revamped his Viking Ranger to function additionally on 6 meters. W2HUG didn't like the keying (who did?) on the DX-100, and so installed a time-sequence circuit.

☐ The Los Angeles Council of Radio Clubs is sponsoring an elaborate installation of ham gear at W6USA, as a "show" station to acquaint foreign telecommunications delegates with our hobby during their attendance at a world technical radio conference.

☐ W6MUR feeds the center of a full-wave antenna and grounds both ends; the installation works on harmonic bands as well.

☐ The Amateur Radio Emergency Corps, civil defense and the Red Cross all cooperated to make the 1958 Simulated Emergency Test a great success.

☐ A description of a new "QS-59" receiver reads like a real breakthrough — saturable-reactor tuning, continuously variable selectivity, triple (3-band) panoramic presentation, scanner to search for DX signals less than S7 ... Oops, almost forgot this is the *April* issue! — *W1RW*

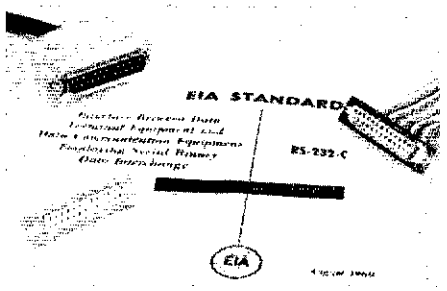
# On Line

Conducted By Stan Horzepa,* WA1LOU

# RS-232-C: The Amateur Radio Connection

Most personal computers (PCs) have the capability of interfacing with modems for the purpose of data communications. Usually, this computer-to-modem interfacing is accomplished by means of RS-232-C, which is the name of an Electronic Industries Association (EIA) standard that is "applicable to the interconnection of data terminal equipment (DTE) and data communications equipment (DCE) employing serial binary data interchange." RS-232-C defines the data, timing and control signals that are exchanged by means of the interface.

RS-232-C is of interest to us because it also provides a means of interfacing our PCs with our Amateur Radio transmitting and receiving equipment for ASCII radio communications. The following signals are applicable to Amateur Radio utilization.




### Ham Signals

Transmitted Data (TXD), on pin 2 of the interface connector, consists of data that is transmitted, while Received Data (RXD), pin 3, is data that is received.

Data Terminal Ready (DTR), pin 20, is a control signal that informs the DCE to prepare for data communications by connecting to a communications channel. In response, the DCE sends Data Set Ready (DSR), pin 6, to inform the DTE when the DCE is connected to a communications channel.

Request to Send (RTS), pin 4, is a control signal that informs the DCE that the DTE has data to transmit. In response to RTS, the DCE sends Clear to Send (CTS), pin 5, to inform the DTE when the DCE is ready to transmit data.

Received Line Signal Detector, also known as Carrier Detect (CD), pin 8, is a control signal that informs the DTE that the DCE is receiving a signal (a carrier) over the communications channel.

Signal Ground (SG), pin 7, provides a ground reference for the other signals.

### Spaces and Marks

Data signals are defined as spaces when they are greater than +5 V and as marks when less than −5 V. Control signals are defined as "on" when they are greater than +5 V and as "off" when less than -5 V. Depending on the software and hardware you are using, you may ignore some signals, while attending to others. Your Amateur Radio TTY modulator and demodulator (that is, your Amateur Radio modem) probably does not require the control signals; all you need be concerned with is that your modem is compatible with the greater than + 5-V spaces and less than −5-V marks that make up the data. The other end of the connection, the computer end, may require more attention. This depends upon the software you intend to use.

If you write your own software, write it to ignore the control signals; however, if you are using commercial data communications software that emulates a DTE (a "terminal" program), it may look for DSR, CTS and/or CD before it will send data.

### April's Fool

The simplest way to get over this hurdle is to connect DTR to DSR (pin 20 to pin 6) and RTS to CTS, and CD (pin 4 to pins 5 and 8) at the computer side of the interface. The control signals that the DTE sends to the DCE are looped back to the DTE as responding signals; thus, the computer is fooled into thinking that all systems are go and it will start sending data.

For example, when the DTE sends RTS on pin 4, that signal is looped back to pin 5 by means of the connection between pins 4 and 5. When RTS is looped onto pin 5, all the computer sees is +5 V (or more) on that pin, which indicates to it that it has received CTS from the DCE. (Computers are not as smart as you thought!)

Once you have satisfied all of the signal requirements at the computer end of the RS-232-C connection, you are ready to send data. Select your operating parameters (baud rate, parity, character length, etc.) and call CQ.

## COMPUTER NET DIRECTORY

An upcoming installment of this column will list all known computer-oriented Amateur Radio nets. If I don't know about your net, I won't be able to include it in the list, so please send me the name of your net, its meeting day, time and frequency, its geographical coverage area and net manager. (By the way, I submit all computer net data that I have to the editor of the *ARRL Net Directory* for inclusion in each edition of that directory, so if you send me your net's information you can kill two birds with one stone.) Also, those of you who send me your net's newsletter need not send me the net information if it is already included in the newsletter.

## ATTENUATOR IN A CAN

RFI Conductive Coating is a new product that is intended to absorb RFI/EMI over a broad frequency range. The coating is contained in a 16-ounce aerosol can and is applied in a 2-mil layer on plastic or metal surfaces. According to the product's specifications, attenuation is greater than 78 dB at 1 MHz, greater than 49 dB at 10 MHz and greater than 21 dB at 100 MHz.

The product sounded ideal for eliminating the RF generated by my computer, RF that was being detected by my Amateur Radio receiver. So, I obtained some samples from the manufacturer (Miller-Stephenson Chemical Co. Inc.) to test with my TRS-80® Model I computer.

Before I applied the coating, I took S meter readings of the TRS-80 signals that I could detect in the Amateur Radio frequency spectrum. Next, I carefully disassembled the enclosures of the computer/keyboard and the expansion interface. (Be very careful when disassembling any computer. Some of the devices used in computer circuitry are very sensitive. An electrostatic discharge from your body is enough to destroy some devices.) After disassembly, I applied the coating to the inside of each enclosure according to the manufacturer's directions (I used approximately one and one-half cans to do the job).

After the coating dried (in approximately 15 minutes), I assembled the enclosures and rechecked the ham bands for computer RF. I was pleasantly surprised! All of the computer's signals were either attenuated appreciably or were erased completely. (The accompanying table compares the S meter readings before and after the application of coating.)

In the past, I have tried various tricks (with limited success) to try to eliminate the noise emitting from my TRS-80. The RFI Conductive Coating is the only thing that really does the job, and I recommend it to anyone trying to contend with computer RF. The coating is available in black or beige (according to the product's specifications, the black is the better attenuator) from the Miller-Stephenson Chemical Co., Inc., George Washington Hwy., Danbury, CT 06810.

*75 Kreger Dr., Wolcott, CT 06716

### PX: Universal Contest Program and More MINIMUF

Mike Kravitz, K2MK, wrote the Universal Contest Program for the Commodore 64 computer. It is actually three programs that can be used for logging, duping and reporting ham radio contests. It is a big package, so please include 54 cents postage with your s.a.s.e. and request PX program number 37.

The original MINIMUF program, written by K6GKU (Dec. 1982 *QST*), is still very popular, and now PX has some new conversions to offer: Frank Goodwin, WA8ELQ, converted MINIMUF for the Atari 400/800/1200. It is now available as PX program number 38. (PX hereby acknowledges and thanks K3EQ, KA4ATK, and K7VBY who also submitted Atari MINIMUFs.)

PX program number 39 is a Commodore 64 conversion of MINIMUF by Alan Memley, KE6UY.

Program number 40 is a Heath H-89 MINIMUF conversion by Richard E. Levin, W3RWU. It runs under HDOS with MBASIC.

Number 41 is a TRS-80 Color Computer (Extended BASIC) version of MINIMUF by Dean C. Cole, W7JUC.

Walt Gesell, WD9DYR, submitted a MINIMUF conversion for the Epson QX-10. It is program number 42.

An improved VIC-20 version of MINIMUF was submitted by Larry K. List, KC8KD. It is program number 43.

A listing of my TRS-80 Model I conversion of MINIMUF, as described in the Aug. 1983 installment of On Line, is available as program number 44. (Other versions of MINIMUF, an Apple II+ version (number 20), a Sinclair/Timex version (number 21), and another VIC-20 version (number 22), which were originally offered in the August installment of PX, are still available.)

To obtain a listing of any of these programs, send an s.a.s.e. (preferably no. 10, business-size) with 37 cents postage (54 cents for program number 37) to ARRL, Dept. PX, 225 Main St., Newington, CT 06111. Use a separate s.a.s.e. for each program request and write the catalog number of the desired program at the lower left-hand corner of the envelope. Please do not send correspondence other than PX program requests to Dept. PX at ARRL Hq.

### S Meter Readings Before and After Application of RFI Conductive Coating

| *Freq.* | *S-Meter Readings* | |
|---|---|---|
| *MHz* | *Before* | *After* |
| 7.1 | 9 | inaudible |
| 7.3 | 7 | inaudible |
| 14.187 | 9 | 6 |
| 14.2 | 2 | inaudible |
| 14.3 | 3 | inaudible |
| 28.373 | 5 | 4 |
| 144.006 | 3 | 0 |
| 144.047 | 3 | inaudible |
| 144.536 | 1 | 0 |

# Operating News

Conducted By John F. Lindholm,* W1XX

## Straight Key Night — SKN XIVic

### Straight Key Tribute

*A tribute to a friend so dear,*
*He reached the highest mark.*
*Tho' he is gone, the echo's clear —*
*Vic Clark . . . Vic Clark . . . Vic Clark.*
— W5JOV

We, as hams in general, are an interesting collection of people, but it seems like those of us who operate SKN are a most intriguing mix of individuality. Amateurs from all over the States and Canada set aside the glitter and parties of New Year's Eve to dig out their straight keys and reverse the calendar to that nostalgic time when good sending took practice and effort, and was a sought-after skill with each individual fist reflecting its owner's personality. This year saw many operators, from 13-year-old KA9OBP (Ole Brass Pounder) to several in their seventies, united in a common interest, retreating from the rat race to relax in a comfortable shack with the glow of warm equipment and the unmistakable rhythm of the straight key.

Exactly 550 Brasspounders put a few more miles on the old key by operating SKN 1983/84. Of those, 90 sent in their reports of a relaxing, unpressured fun evening.

There were 73 operators nominated for Best Fist. Top honors go to K5MM and W9PCF, who tied for best with a grand total of three votes each. Tied for second with two votes each are W2MYA, W4CDA, K5PKA, W5KL, W5LXS, W7BMI, W9TG, WØAWP and NØCWW. Congratulations to the other 62 nominees who came in third with one vote each.

The "most interesting QSO" honor goes to W9MYY, who runs two keys — one for his right hand and one for his left. (He doesn't get as tired that way!) W9MYY's first homebrew key was made from a strip of tin and a knob from an old coffee pot. Tied for first runners up (keyers up) are N2IT, N4EE, W4YE, WB4SPB, W5KL, WA5PTV, KA6REL and KL7PG. All in all, there were 50 operators nominated for most interesting QSO.

Though it was interesting and fun, there was a note of bittersweetness about this year's SKN. How symbolic it was to say a final farewell to Vic Clark, W4KFC, a friend and familiar fist in each of the past SKNs, on the eve of the New Year.

-.../.-.-./.-../.-../.-.-
— *Edith Holsopple, N1CZC*

### KEY KLIX — VIC

This year, SKN was more poignant than ever, as I knew I would not hear the familiar call of W4KFC coming through my headphones. I did send my final farewell to Vic by ending with vic (W4RHZ). I looked up an old QSL card from Vic, confirming QSO on Dec. 4, 1954, a QSO on LO Party (W4CDA). So glad to hear the turnout to honor W4KFC (W4YE). It was most appropriate that we remember our longtime friend Vic Clark, W4KFC, by signing vic at the end of each contact. I have been in almost every SKN since it started. In the past, almost invariably I would QSO Vic Clark, W4KFC (W5KL). We chatted for more than an hour . . . and in the particular about Vic Clark. Both W4YE and I share a long-standing personal relationship with Vic . . . Bud lived near him for 30 years, and Vic is my Grand Elmer. The QSO-ending vic was just super. Almost everyone used it (K5MM). As a personal friend of Vic Clark, it was a pleasure to exchange reminiscences with several other of his friends this farewell SKN. I had worked W4KFC four times on SKN. It had become a tradition. (WA7NXL). Something was missing, and I can't help thinking that this year we wouldn't be hearing the beautiful fist of W4KFC. Vic loved SKN, and I hope there can be something tied into SKN every year to remind us all of him. I think he would have liked that (W9PCF). My best QSO was with W4YE, who knew Vic Clark well and was greatly honored to speak at his memorial service (KT1Q). I was very pleased to hear all the fine comments honoring Vic . . . Wish he could have been with us on the air. I know he was listening (K4LMB).


*Communications Manager, ARRL

### W1AW Schedule

**April 29 — October 28, 1984** **MTWThFSSn = Days of Week** **Dy = Daily**
**W1AW code practice and bulletin transmissions are sent on the following schedule:**

| | | |
|---|---|---|
| UTC | Slow Code Practice | MWF: 0200, 1300; 2300; TTh: 2000; Sn: 0200 |
| | Fast Code Practice | MWF: 2000, TTh: 0200, 1300; TThSSn: 2300, S: 0200 |
| | CW Bulletins | Dy: 0000, 0300; MTWThF: 1400, 2100 |
| | Teleprinter Bulletins | Dy: 0100, 0400, 2200; MTWThF: 1500 |
| | Voice Bulletins | Dy: 0130, 0430 |
| EDT | Slow Code Practice | MWF: 9 A.M., 7 P.M.; TTh: 4 P.M.; 10 P.M.; SSn: 10 P.M. |
| | Fast Code Practice | MWF: 4 P.M., 10 P.M.; TTh: 9 A.M.; TThSSn: 7 P.M. |
| | CW Bulletins | Dy: 8 P.M., 11 P.M.; MTWThF: 10 A.M., 5 P.M. |
| | Teleprinter Bulletins | Dy: 6 P.M., 9 P.M., 12 P.M.; MTWThF: 11 A.M. |
| | Voice Bulletins | Dy: 9:30 P.M., 12:30 A.M. |
| CDT | Slow Code Practice | MWF: 8 A.M., 6 P.M.; TTh: 3 P.M.; 9 P.M.; SSn: 9 P.M. |
| | Fast Code Practice | MWF: 3 P.M., 9 P.M.; TTh: 8 A.M.; TThSSn: 6 P.M. |
| | CW Bulletins | Dy: 7 P.M., 10 P.M.; MTWThF: 9 A.M.; 4 P.M. |
| | Teleprinter Bulletins | Dy: 5 P.M., 8 P.M., 11 P.M.; MTWThF: 10 A.M. |
| | Voice Bulletins | Dy: 8:30 P.M., 11:30 P.M. |
| PDT | Slow Code Practice | MWF: 6 A.M., 4 P.M.; TTh: 1 P.M.; 7 P.M.; SSn: 7 P.M. |
| | Fast Code Practice | MWF: 1 P.M., 7 P.M.; TTh: 6 A.M.; TThSSn: 4 P.M. |
| | CW Bulletins | Dy: 5 P.M., 8 P.M.; MTWThF: 7 A.M.; 2 P.M. |
| | Teleprinter Bulletins | Dy: 3 P.M., 6 P.M., 9 P.M.; MTWThF: 8 A.M. |
| | Voice Bulletins | Dy: 6:30 P.M., 9:30 P.M. |

Code practice, Qualifying Run and CW bulletin frequencies: 1.818, 3.58, 7.08, 14.07, 21.08, 28.08, 50.08, 147.555 MHz.

Teleprinter bulletin frequencies: 3.625, 7.095, 14.095, 21.095, 28.095, 147.555 MHz.
Voice bulletin frequencies: 1.89, 3.99, 7.29, 14.29, 21.39, 28.59, 50.19, 147.555 MHz.

Slow code practice is at 5, 7½, 10, 13 and 15 WPM.
Fast code practice is at 35, 30, 25, 20, 15, 13 and 10 WPM.

On Monday, Wednesday and Friday, 1300 through 2100 UTC, transmissions are beamed to Europe on 14, 21 and 28 MHz; on Wednesday at 2300 UTC they are beamed south.

Code practice texts are from *QST*, and the source of each practice is given at the beginning of each practice and at the beginning of alternate speeds. For example, "Text is from February 1984 *QST*, pages 9 and 84" indicates that the main text is from the article on page 9 and the mixed number/letter groups at the end of each speed are from the contest scores on page 84.

On Fridays, UTC, a DX bulletin replaces the regular bulletin transmissions.

On Wednesdays at 2230 UTC, an IARU Region 2 bulletin in English and Spanish on 45.45-baud Baudot is sent on the regular teleprinter frequencies, beamed to Central and South America.

W1AW CW and voice bulletins are sent on OSCAR 10, Mode B, when the satellite is within range. Look for CW on 145.840 MHz and SSB on 145.972 MHz.

Teleprinter bulletins are 45.45-baud Baudot, 110-baud ASCII and 100-baud AMTOR, FEC mode. Baudot, ASCII and AMTOR (in that order) are sent during all 1500 UTC transmissions, and 2200 UTC on TThFSSn. During other transmission times, AMTOR is sent only as time permits.

CW bulletins are sent at 18 WPM.

W1AW is open for visitors Monday through Friday from 8:30 A.M. to 1 A.M. EDT and on Saturday and Sunday from 5:30 P.M. to 1 A.M. EDT. If you desire to operate W1AW, be sure to bring a copy of your license with you. W1AW is available for operation by visitors between 1 and 4 P.M. Monday through Friday.

In a communications emergency, monitor W1AW for special bulletins as follows: voice on the hour, teleprinter at 15 minutes past the hour, and CW on the half hour.

W1AW will be closed on May 28, July 4 and September 3.

Station staff: Chief Operator/Asst. Communications Mgr. C. R. Bender, W1WPR; Charles Chadwick, K8AXL, Bruce Hale, KA9OLS.

# Canadian NewsFronts

Conducted By Harry MacLean,* VE3GRO



## Clubs

We often receive letters from clubs that seem to need a bit of help. Sometimes, the letters are from clubs just starting out. Sometimes they're from established clubs where the old-timers have decided to sit back and let the newer members take over. Sometimes, they're from clubs that have been successful in the past, but aren't now. The membership is drifting away.

Clubs seem to be most successful when their leaders use a bit of imagination, work hard and plan lots of activities. When we're asked, we usually offer these suggestions:

1) If your club has a newsletter, send it to all amateurs in your area at least once a year. Announce a really special program for the next meeting. They'll come!

2) Let your executives make as many decisions as possible without reference to the membership. After all, you elected them for their good judgement, didn't you? This helps to keep the business portions of the meetings short.

3) After a short business meeting, have a good, long coffee break. Then have the program. Always make sure the program is about Amateur Radio, not someone's slides of their trip to Spain, or the like. (You might be allowed one program like this a year, hi.) Your programs could be about modes: RTTY, SSTV, OSCAR, repeaters, computer communications; operating activities: contesting or handling traffic, or how to really work DX; homebrewing: Everybody brings a project for show-and-tell (even a demonstration of some new store-bought equipment would be of interest here); the good old days: Call it Old-Timers' Night, and get someone to reminisce about Amateur Radio in the '20s and '30s and display old gear (in Canada this is an excellent program for September just before the "snowbirds" head for W4-land); CRRL: Any CRRL Director will be glad to visit your club and bring a film or a videotape or a slide show and give you the lowdown on current issues, the latest developments in DOC and what's new with the League.

All this should help to stress the importance of the monthly meeting. When the meeting is good, the rest seems to fall into place. Most successful clubs try to have activities between their meetings. Field Day, a fox hunt, an emergency drill, a mall display, a Jamboree-on-the-Air station at Scout Headquarters, club participation in a contest — all are excellent. Here in Canada, summer is a great time for a road rally. You follow a map, keep in touch on 2 metres and meet for a picnic or a corn roast at the end. These affairs go a long way toward making Amateur Radio more acceptable to the non-amateurs in your life. Sometimes, it's fun to designate a different ham shack as open house every Saturday morning. You serve coffee, and hope that all 100 club members don't show up at once!

We also receive letters from clubs that want to affiliate with CRRL. Unfortunately, at this time, there is no mechanism for doing this directly. If you read last month's Canadian NewsFronts column, you'll know that this should change this year. In the meantime, your club can support CRRL by affiliating with ARRL. The requirements are simple: 51% of your members must belong to ARRL-CRRL, and your club secretary must complete and forward a two-page report form once a year. There is no cost. In fact, it's quite the other way around. Your club gets to keep the equivalent of $2 U.S. (about $2.40 Canadian) for every ARRL-CRRL membership processed through your club membership secretary. This is the League's way of supporting your club. Your club also receives a charter of affiliation and a quarterly publication called *Radio Club News*, and gets first shot at many League materials and services.

If all this sounds interesting, drop a note to CRRL Headquarters and ask for a club-affiliation package. Of course, you might prefer to wait until the CRRL affiliated-club program is in place. A committee headed by Western Director Bill Kremer, VE7CSD, will soon be examining the rules for the different categories of affiliation and the benefits those categories will offer. One category will definitely dovetail with the ARRL affiliated-club program, and will have similar rules and benefits.

### CRRL NEWS

☐ We are sorry to report that Les Weir, VE3AIB, a fine amateur and a valued member of the ARRL VHF-UHF Advisory Committee, recently passed away.

☐ Want to promote Amateur Radio? CRRL's public relations man, John Gowron, VE4ADS, has 50 reel-to-reel tapes of 15- to 60-second radio spots for use on your local broadcast station. They're free for the asking. Contact John at 229 Kisel Bay, Winnipeg, MB R2K 3E7.

☐ CRRL Ontario Director Ray Perrin, VE3FN, did represent amateurs at a recent meeting of CRTPB, now called RABC, the Radio Advisory Board of Canada. Electromagnetic interference from digital equipment and cordless telephones was high on the agenda.

☐ The Electromagnetic Interference Committee of RABC is meeting in Toronto on April 4. Bill Loucks, VE3AR, will represent CRRL.

### INTRUDER WATCH

CRRL is looking for new people to take part in the IARU Intruder Watch. Intruder watchers look for broadcast and commercial stations that operate illegally in our amateur bands. Reports of such stations are sent to the IARU Region 2 Intruder Watch Co-ordinator for verification by intruder watchers in other countries. IARU member-societies, such as CRRL, then contact their licensing authorities and ask them to make formal complaint to the countries in which the intruders are located. If all goes well, the intruders move or disappear.

Intruder Watch isn't for everyone. It takes good equipment and a willingness to spend hours scanning the bands. Intruders can be very elusive. Still, it's interesting and rewarding work. It's also important work, helping to ensure that amateur bands remain in the hands of amateurs. Interested? Contact CRRL President Tom Atkins, VE3CDM, at 55 Havenbrook Blvd., Willowdale, ON M2J 1A7.

### ARES CANADA NET

The ARES Canada Net is now meeting every Sunday at 2000 UTC on 14.13 MHz. Hugh Clark, VE3WM, is acting net manager. Representatives from all emergency groups across Canada are invited to check in. General check-ins are also welcomed. In any large-scale emergency, plan to monitor 14.13 MHz. There may be traffic for your area.

Start saving your travel fare now. SORT, the Southern Ontario Repeater Team, will host the 17th annual Radio Society of Ontario Convention combined with the first CRRL National Convention, to be held in London, Ontario, September 27-29, 1985. From left to right are VE3AVY (RSO), VE3ZK (SORT Convention Chairman), VE3CSK (SORT), VE3GRO (CRRL), VE3HAH (RSO President) and VE3CDM (CRRL President) at a recent planning meeting held in Kitchener, Ontario. *(VE3BLJ photo)*

### NOTES FROM ALL OVER

☐ There certainly was confusion over those special call signs for Sable and Saint Paul's Islands. For a while, it looked as if both would have a CYØ prefix. After more discussions with DOC, the original prefixes were confirmed. The call signs are CY9SAB for Sable and CYØSPI for Saint Paul's.

☐ Loran A stations disappeared from the 160-metre band sometime during the week of January 15. A quick check with Ottawa indicated they were ceasing operation, but no official notification was available at the time. Once this becomes official, DOC is expected to lift restrictions on the 160-metre band very quickly.

☐ Amateurs in Vancouver recently testified before CRTC, the Canadian Radio and Television Commission, with regard to Channel E cable television interference in the 2-metre band. Commissioners complimented the amateurs on the thoroughness of their presentations. Early indications are that they will rule in favour of the amateurs and force a Vancouver cable company to tighten up its system or vacate Channel E.

☐ Finally, some public service notes. Amateurs in Toronto, in co-operation with local broadcast stations, used two-way radio to collect over $6000 in pledges for their United Way campaign. During the holiday season, amateurs in Thunder Bay, Ontario, visited senior citizens' homes, gathering messages to be relayed to families and friends. In Liverpool, Nova Scotia, amateurs have acquired a bus. It's shared with local police and fire department and will serve as a mobile base for any search-and-rescue operations in their area.

*163 Meridene Crescent West, London, ON N5X 1G3, Tel. 519-433-1198

# Coming Conventions

**April 7-8**
**Arkansas State, North Little Rock**

**April 7-8**
**Missouri State, Kansas City**

**April 14-15**
**Mississippi State, Jackson**

**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**
**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**

### MISSISSIPPI STATE CONVENTION
**April 14-15, Jackson**

The 1984 ARRL Mississippi State Convention/Capital City Hamfest again will be hosted by the Jackson Amateur Radio Club. This year's convention will be held at the Communications Workers of America Building (I-220 at Country Club Dr.), 9-5 Saturday and 8-1:30 Sunday.

Top attractions include commercial dealer exhibits, a large indoor flea market, concessions and abundant free parking. Overnight accommodations will be available for self-contained RV's.

An ARRL forum is planned, featuring League Counsel Christopher D. Imlay, N3AKD; Delta Division Director Clyde Hurlbert, W5CH; and Mississippi Section Manager Tom Hammack, W4WLF. Mississippi Sideband Net, MARS and VHF/UHF forums are also scheduled.

Admission is free. Flea-market tables will be available at $5 each. Motel reservations may be made through the Holiday Inn Southwest; specify you are a hamfest participant for special rates. Talk-in on 146.16/76 MHz.

For further information, contact Carol Kemp, NA5Y, 3581 Beaumont Dr., Pearl, MS 39208, tel. 601-939-7612.

# 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.]

**Arizona (St. David) — May 4-6:** This year, the Cochise ARA, Inc., will upgrade from a swapmeet to a full hamfest, to be held in St. David on May 4-6. Tours are planned to Tombstone, the Bisbee Lavender Pit and other places of interest. A flea market is planned, and all tailgaters are welcome. CARA has now acquired a 40-acre parcel, which we plan to turn into an antenna testing range and other facilities for the amateurs. We need your help. For more details, contact CARA, P.O. Box 1855, Sierra Vista, AZ 85636, Attn: KB7HB. Talk-in on 16/76 and 52 simplex.

**California (Paso Robles) — May 4-6:** The 29th annual West Coast VHF/UHF Conference will be held at the Paso Robles Inn, Paso Robles, on May 4-6. May 4, hospitality; May 5, starting 8 A.M.; Sunday, starting 9 A.M. Seminars, NF measurements, antenna gain. Talk-in on 144.200 MHz and 52. Advance registration is $6, at the door, $10. For information and reservations, contact Mike Goshay, K6HXW, P.O. Box 493, Arroyo Grande, CA 93420, tel. 805-489-8891.

**Colorado (Colorado Springs) — April 15:** The annual Pikes Peak ARC Swapfest will be held at the International Polka Club, 2422 Bush St., Colorado Springs, from 9 A.M. to 5 P.M. Tables are $5 each. Talk-in on 146.52. For more information, contact Al Vrooman, N0CMW, 1341 Diana La., Colorado Springs, CO 80909.

†**Connecticut (East Hartford) — April 29:** The 7th annual Pioneer Valley Radio Assn. (PVRA) Flea Market will be held on Sunday, April 29, from 10 A.M. to 4 P.M., at Penney High School, Forbes St., East Hartford. Talk-in on 19/79. For info and reservations, contact Jon Patz, KA1FYL, 34 Whiting La., West Hartford, CT 06119, tel. 203-232-8772.

**Georgia (Hartwell) — April 28-29:** The Anderson, Hartwell and Toccoa ARCs will hold the 6th annual Lake Hartwell Hamfest on April 28-29 at the Lake Hartwell Group Camp, located on Hwy. 29, four miles north of Hartwell. Features include free admission, free camping and free flea-market space. Activities include a left-footed CW contest, horseshoes and many other activities for the whole family. Campgrounds open at 6 P.M. on Friday. Talk-in on 19/79, 93/33 and 895/295. For further information, contact Ray Pettit, WB4ZLG, Rte. 1, Dooley Dr., Toccoa, GA 30577.

†**Georgia (Albany) — May 5-6:** The Albany ARC, Inc., hamfest will be held at the Hasan Temple, 1822 Palmyra Rd., Albany, on Saturday, May 5, from 8 A.M. to 5 P.M., and Sunday, May 6, from 9 A.M. to 2 P.M. All activities held indoors. Possibility of FCC exams. Room reservations should be made directly with the Cricket Inn, 2588 N. Slappey Blvd., tel. 912-435-6859. Inn is located one-half mile from hamfest site. Room rates are $28.50 for single and $31.15 for double. For further information, contact Albany ARC, Inc., W4MM, P.O. Box 1205, Albany, GA 31702.

**Illinois (Chicago) — May 2:** The Chicago ARC Evening Mini-Hamfest will be held Wednesday, May 2, 6-10 P.M., at the Edgebrook Golf Course Field House, 6100 N. Central, between Elston and Devon. Admission is $1. Card table spaces are $3. Talk-in on 52. For info/tickets/space reservations, send s.a.s.e. to CARC, 5631 W. Irving Park Rd., Chicago, IL 60634, tel. 312-545-3622.

†**Illinois (Centralia) — May 6:** The Centralia Wireless Assn., Inc., will hold its annual hamfest at the Kaskaskia College Gymnasium, three miles northwest of Centralia, on Sunday, May 6, from 8 A.M. to 2 P.M. Doors will open at 7 A.M. for set up of flea market and exhibit displays. No charge for flea market and exhibit space. Limited number of tables provided on first-come, first-served basis. Plenty of parking and refreshments available. Tickets are $1 each, or 6 for $5, and may be purchased in advance or at the door. Mail ticket orders with an s.a.s.e. to Centralia Wireless Assn., Inc., Hamfest Tickets, P.O. Box 1166, Centralia, IL 62801. Talk-in on 27/87 or 52. For further information, contact Bud King, WB9QEG, at 618-532-6606; Lou Hodges, W9IL, at 618-533-4724; or write to CWA, Inc., at above address.

†**Illinois (Kankakee) — May 6:** The annual Kankakee Hamfest will be held at the Kankakee County Fairgrounds on May 6. A large flea market with indoor and outdoor facilities. There will be an FCC booth to serve you. Refreshments available. Shuttle service available from adjacent Greater Kankakee Airport (all standard aviation and jet fuels available). For motel reservations, call 815-939-4551. Talk-in on 34/94. Gates open at 8 A.M. Advance tickets for $2.50; $3 at the gate. For further information, call Don Kerouac before 5 P.M. at 815-937-2750, or write to KARS Hamfest, 1377 Circle Dr., N.W., Kankakee, IL 60901.

**Illinois (Sandwich) — May 6:** The Kishwaukee RC of DeKalb will hold their annual hamfest on Sunday, May 6, at the Sandwich Fairgrounds, Sandwich. Overnight camping available — no hookups. Advance tickets are $2.50; at the door, $3. Tables available at $5 each. For more information, contact Howard Newquist, WA9TXW, P.O. Box 349, Sycamore, IL 60178.

**Illinois (Sullivan) — May 6:** The MARK Hamfest will be held at the 4H Fairgrounds. Talk-in on 655/055 and 52 simplex 7 A.M. to 3 P.M. Covered facilities, free swappers row, lunch served. Contact WA9WOB, tel. 217-268-3139 (evenings).

†**Kansas (Pittsburg) — May 20:** The Pittsburg Repeater Organization will hold its annual hamfest on May 20, from 10 A.M. to 5 P.M., at Lincoln center, Lincoln Park, Pittsburg. Covered dish dinner, flea market. Admission is $2 for ham's family and $1 for children; includes chicken — bring a covered dish. For more information, write to Pittsburg Repeater Organization, c/o Steve Cooper, 1405 N. Elm, Pittsburg, KS 66762.

**Massachusetts (Wellesley) — April 14:** The Wellesley ARS is conducting its annual auction on Saturday, April 14, at the First Congregational Church of Wellesley Hills, 207 Washington St., at the intersection of Rtes. 9 and 16, Wellesley. Doors open at 10 A.M.; auction begins at 11 A.M. Talk-in on 63/03, 04/64 and 52. Contact: Kevin P. Kelly, WA1YHV, 7 Lawnwood Pl., Charlestown, MA 02129.

**Massachusetts (Braintree) — April 29:** Celebrating its 53rd year in Amateur Radio, the South Shore ARC of Braintree will hold an indoor flea market on Sunday, April 29, at the Viking Club, 410 Quincy Ave., from 11 A.M. to 4 P.M. Tables (8 ft) available for $10 each (includes *one* free admission per table), and paid for in advance by sending the appropriate amount to Ed Doherty, W1MPT, 236 Wildwood Ave., Braintree, MA 02184. Checks should be made payable to the South Shore Amateur Radio Club. Confirmation of check

†ARRL Hamfest

*Convention/Travel Coordinator, ARRL

receipt will be sent. *No* cancellation refund after April 25. Doors open to vendors at 9:30 A.M. and to public at 11 A.M., with an entrance fee of $1. Plenty of parking. Tables sold out last year — first come, first-served. Questions? Call 617-843-4431 (Ed, W1MPT) (evenings).

†**Michigan (Muskegon) — April 14:** The Muskegon Area ARC will hold its annual hamfest and swap and shop on Saturday, April 14, at the L. C. Walker Sports Arena in downtown Muskegon. Ham Hospitality on Friday, April 13, at 7 P.M., at Ramada Inn. Food service, net meetings, free parking and programs. Tickets are $3 at the door; tables are $3 per 4 ft, $6 per 8 ft. Talk-in on 146.94 and 82. For further information, write to MAARC, P.O. Box 691, Muskegon, MI 49443, or call Don Wilson, WB8ZOS, at 616-722-2077.

†**Minnesota (Bemidji) — April 28:** The Bemidji ARC is again having its huge spring hamfest on April 28, from 9 A.M. to 3 P.M., at the Middle School. Admission is $2.50. Swapfest, movies, speaker and food available. Talk-in on 13/73. For further information, contact Jerry Pottratz, WBØMSH, Box 524, Bemidji, MN 56601, tel. 218-751-7502 (after 6 P.M. Central).

†**Missouri (Columbia) — May 5-6:** The Central Missouri Radio Assn. is pleased to announce Columbia Hamfest '84, to be held May 5-6 at the Hilton Inn of Columbia, I-70 and Stadium Blvd. A wide variety of forum topics for hams and nonhams, hospitality room, hard-surfaced flea market, display tables, and shuttle bus service to parking areas and shopping centers. Saturday night banquet tickets, dealer tables, reserved flea-market spaces, advance tickets and hotel reservations available on request. Talk-in on 16/76 or 222.42/224.02. For information and reservations, contact Ben Smith, KØPCK, Rte. 1, Prairie Home, MO 65068, tel. 816-427-5319.

**New Hampshire (Nashua) — May 4-6:** The 10th Annual Eastern VHF/UHF Conference will be held on May 4-6 at the Sheraton Tara, Exit 1 of U.S. 3, Nashua. Program features a Friday night hospitality room, technical talks by well-known VHFers, "rap sessions" for the various VHF/UHF bands, noise-figure and antenna measurements, and other activities. To preregister, send $14.50 to Rick Como, K1LOG, 3 Pryor Rd., Natick, MA 01760, before April 29. Registration at the door is $20. Saturday night banquet is $15, also payable before April 29. Room reservations should be made directly with the hotel. Be sure to mention "Eastern VHF/UHF Conference" when making reservations. Room rate is $69 single/$81 double per night. "Merry Weekend" package provides two night's lodging plus several meals for $159.95; rates are exclusive of 7% New Hampshire room tax. Address inquiries to Lewis D. Collins, W1GXT, 10 Marshall Terr., Wayland, MA 01778, tel. 617-358-2854 (before 10 P.M.).

**New Jersey (Trenton) — April 14-15:** The 9th Trenton Computer Festival will be held at Trenton State College on Saturday and Sunday, April 14-15, from 10 A.M. to 5 P.M. TCF-84 is oriented toward computers and will be of interest to hams who are also interested in computing and digital electronics. This year, an ARRL-sponsored Packet Radio Conference will be held at TCF; also, the usual commercial exhibits, electronics flea market, many technical sessions and user-group meetings of interest to the ham, and free short courses. Admission to all activities is $5 ($3/students). For further information, write to TCF-84, Trenton State College, Hillwood Lakes CN550, Trenton, NJ 08625, or call 609-771-2487.

†**New Jersey (Paramus) — May 6:** The Bergen ARA is holding a Ham Swap-n-Sell on May 6, 8 A.M. to 4 P.M., at Bergen Community College, 400 Paramus Rd. Tailgating only. Bring your own tables. Sellers $4; buyers free. Thousands of spaces. Talk-in on 79/19 and 52. For more info, contact Jim Greer, KK2U, 444 Berkshire Rd., Ridgewood, NJ 07450, tel. 201-445-2855.

†**New York (Melville) — May 6:** The Suffolk County RC Indoor and Outdoor Flea Market will be held Sunday, May 6, 8 A.M. to 3 P.M., at Republic Lodge No. 1987, 585 Broadhollow Rd. (Rte. 110), Melville. Refreshments on the premises, and plenty of free parking. General admission is $2 (women and children under 12 free). Indoor sellers' tables are $7; outdoor space is $5 and includes one admission. Talk-in on 144.61/145.21 and 52. For additional information, contact Richard Tygar, AC2P, tel. 516-643-5956 (evenings).

†**North Carolina (Raleigh) — April 15:** The Raleigh ARS will hold its 12th annual hamfest and flea market on Sunday, April 15, at the Crabtree Valley Shopping Mall, located at the intersection of U.S. 70 West and U.S. 1 & 64. Action starts at 8 A.M. Admission is $4 at the gate; no extra charge for tailgaters. Tables available for rent. Everything covered; WX no problem. Special-interest meetings, CW contest and homebrew contest. Lots of hotels nearby. Talk-in on 04/64 and 28/88. For more information, contact Pete Thacher, N4HQZ, tel. 919-876-4073, or Jim Bradley, WA4AOO, tel. 919-851-2437 (6-8 P.M., weekdays or weekends), or write to RARS, P.O. Box 19127, Raleigh, NC 27609.

**Ohio (Dayton) — April 27:** The Dayton-Cincinnati Chapter of the QCWA will hold its annual banquet during the Dayton Hamvention on Friday, April 27, at Neil's Heritage House Restaurant, 2189 S. Dixie Dr., Dayton. The c.o.d. bar opens at 6:30 P.M.; dinner is at 7:30 P.M. An illustrated presentation will be given by Dr. Jerrold Petrofsky, NØAQM/8, who has gained worldwide recognition as the developer of computerized equipment that enables paraplegics to walk. Tickets are $12.50; contact Doug Horner, W8PH, for details, or call 513-859-3210.

**Ohio (Dayton) — April 27:** The 15th Annual B*A*S*H will be held on the Friday night of the Dayton Hamvention, April 27, at the Convention Center, Main and Fifth Sts. Parking in adjacent City Garage. Admission is free to all. Sandwiches, snacks and c.o.d. bar available. Live entertainment for a super social evening. Don't miss it — two exciting top awards, and many, many others. For further information, contact the Miami Valley F.M. Assn., P.O. Box 263, Dayton, OH 45401.

**Ohio (Dayton) — April 27-29:** The annual Dayton Hamvention will be held at Hara Arena and Exhibition Center on April 27-29. ARRL and FCC forums, technical forums and giant three-day flea market, starting at noon Friday. New products and exhibits, electrical-safety forum, special group meetings, many special awards, alternative activities, and much more. Admission in advance is $7.50; at door, $10 — valid all three days. Banquet $14 advance, $16 at door. Flea market space $15 in advance — valid all three days. Checks for advance registration to Dayton HAMVENTION, Box 2205, Dayton, OH 45401. All other inquiries, write to Box 44, Dayton, OH 45401.

**Oklahoma (Wagoner) — May 18-20:** The Broken Arrow ARC and the Tulsa ARC will sponsor the Greencountry Hamfest and Swapmeet, to be held at Western Hills Lodge, 6 miles east of Wagoner, at Sequoyah State Park, on May 18-20. Preregistration is $2.50; $3 at the door. Programs for entire family.

**Ontario (Ajax) — April 14:** South Pickering ARC will host the Durham Amateur Radio Flea Market, from 8 A.M. to 2 P.M., Saturday, April 14, at Pickering Secondary School, Ajax. Vendors will be admitted at 6 A.M. Tables: $4 each. General admission: $2. Talk-in on 52 simplex, 12/72 and 975/375. For more information, contact Phil Washburn, VE3HAA, 34 Albany Crescent, Ajax, ON L1S 2Y3, tel. 416-683-3368.

**Pennsylvania (Downingtown) — April 14:** The Downingtown High ARC (DHARC) will hold its second annual hamfest and electronics flea market on April 14 at the Downingtown Senior High School, Manor Ave., just a short drive from Penn. Tpke., Exit 23. Indoor tables $4; outdoor spaces $3. Admission is $2; women and children free. Doors open at 8 A.M. for sellers, 9 A.M. for all others. For more information or reservations, call Bill Worthington, N3CQU, at 215-269-6374, or Jeff Knickerbocker, N3CCP, at 215-269-0267, or write to Bill Worthington, 325 Horseshoe La., Downingtown, PA 19335. Talk-in on 146.985/7.585 and 52 simplex.

†**South Carolina (Greenville) — May 5-6:** The Greenville Hamfest sponsored by the Blue Ridge ARS will be held at the American Legion Fairgrounds, White Horse Rd., ½ mile north of I-85 in Greenville, Saturday, May 5, and Sunday, May 6. Admission is $4; in advance, $3. Talk-in on 01/61. For further information, write to Hamfest Chairman Phil Mullins, WD4KTG, P.O. Box 99, Simpsonville, SC 29681. For advance sales, write to Mrs. Sue Chism, N4ENX, Rte. 6, 203 Lanewood Dr., Greenville, SC 29607.

**Texas (Kerrville) — April 27-29:** The annual 7290 Traffic Net Picnic will be held on April 27-29 at the Kerrville State Recreation Area. Members of the Texas Traffic Net, Texas Slow Speed Net and Fifth Region Daytime Net will join with us and participate in the many activities. Registration in advance required for Saturday evening barbecue supper. Several motels and hotels in the area; advance reservations recommended. Overnight camping, shelters and RV hookups are available; reservations obtained by writing to the Kerrville State Recreation Area, 2385 Bandera Hwy., Kerrville, TX 78028, or by calling 512-257-5392. Talk-in on 7290 kHz, 37/97 and 52. For more information, write to the 7290 Traffic Net, P.O. Box 126, New Braunfels, TX 78130.

**Texas (Flatonia) — May 4-6:** Come to the South Texas Emergency Net, 5 P.M. Friday to 3 P.M. Sunday, with ARRL program, transmitter hunt, women's activities, barbecue and banquet. For information, send an s.a.s.e. to Jerry N. Connaway, W5KLV, 110 Rosemont Dr., San Antonio, TX 78228.

†**Washington (Bryant) — April 21:** The 32nd annual Skagit Hamfest will be held on April 21 at the Bryant Grange Hall (near Arlington). Activities start at 9 A.M., with vendor exhibits, Jim Creek Tour, banquet and programs planned. Tickets are $8, and may be obtained from Jack Carlson, W7GHO, 121-15th Ave., Kirkland, WA 98033, tel. 206-821-7604.

**Washington (Spokane) — April 28:** The fifth annual Inland Empire Swap Fest will be held April 28 at the Spokane Interstate Fairgrounds. The swapfest is sponsored by the Amateur Radio Clubs of the Inland Empire. Commercial and noncommercial displays, swap tables, contests, auctions, public-service displays, collectors displays, working amateur stations, slow-scan TV, snack bar, and much more. $2 admittance fee. For further information, contact Jan Thiemann, KA7DDU, Inland Empire Swap Fest, 2201 N. Craig Rd., Spokane, WA, tel. 509-244-5212.

**Wisconsin (Cedarburg) — May 5:** The Ozaukee RC will sponsor its 6th Annual Swapfest on Saturday, May 5, from 8 A.M. to 1 P.M., at the Circle B Recreation Center, Hwy. 60, Cedarburg (located 20 miles north of Milwaukee). Admission is $2 in advance, $3 at the door. Six-foot tables are $2; eight-foot tables are $3. Food and refreshments. Sellers admitted at 7 A.M. for table set up. For tickets, tables, maps or more information, send a business-size s.a.s.e. to 1984 Ozaukee Radio Club Swapfest, P.O. Box 13, Port Washington, WI 53074.

**Wisconsin (Jackson) — May 5:** Milwaukee RAC Annual Spring Dinner Party will be held on Saturday, May 5, at noon, at Heidel's Restaurant near Jackson. Advance reservations required. For more detailed information, send an s.a.s.e. to MRAC, N50 W16328 Pin Oak Ct., Menomonee Falls, WI 53051. All interested persons are invited.

**Wisconsin (Wauwatosa) — May 10:** The Milwaukee RAC annual auction of equipment and parts is Thursday, May 20, at 7:20 P.M., at the Wauwatosa Savings and Loan Bldg., 7500 West State St., Wauwatosa. Open to all hams and proteges. Free admission; no sales charges. No flea-market dealers. Please tag all gear to be sold with seller's name and minimum opening bid. Our auctioneer is the inimitable Travis Baird, W9VQD. For further information, write to Milwaukee RAC, N5O W16328 Pin Oak Ct., Menomonee Falls, WI 53051.

*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

## *QST* congratulates...

☐ the following radio amateurs on 50 years as ARRL members:

- Herman Bielefeld, W9SFK, of Waterford, Wisconsin
- Rudolph Veverka, WØFBB, of Omaha, Nebraska
- William Conant, W1BPY, of East Hartford, Connecticut
- Elmer Barber, K1ZFP, of Jensen Beach, Florida
- Caleb F. Enix, W8EN, of White Pigeon, Michigan
- Marion R. Longworth, W8CSG, of Chelsea, Michigan
- Corwin L. Miller, W8RZG, of Grove City, Ohio
- William A. Morian, W8WWU, of Mount Vernon, Ohio
- Jose de Caluwe, ON4LX, of Oost Vlaanderen, Belgium

☐ Ronald Wysong, K8AY, of Centerville, Ohio, on his promotion to President of R. L. Drake.

☐ Mary Lou Shontz, N2CLX, of Hainesport, New Jersey, on being named 1983 Ham of the Year by the West Jersey Radio Amateurs.

☐ Ann Leveridge, K5VZB, of East Bernard, Texas, on being elected President of the National PTA.

☐ Joseph J. Dombroski, KM2Y, of Middlesex, New Jersey, on attaining the rank of Eagle Scout.

# Club Corner

Conducted By Sally O'Dell,* KB1O

## AN OPEN LETTER

A year is over for the Special Service Club program, and there are 100 clubs in the ranks. These special clubs go the extra mile to get involved in their communities. Curtis Carter, K4KKQ, a member of the Central Georgia ARC (a Special Service Club) offers the following challenge to all clubs.

"The League can look back in retrospect with pride at 1983 and its many achievements during the year. So can the Central Georgia Amateur Radio Club. Over the years, the Central Georgia bunch, like some other amateur clubs, had become a ship without a rudder — dead in the water. It needed that certain magic, drive and vitality to get moving, achieve a goal, become an integral part of the hobby and be worthy of the public's trust.

"Our club got its zing six years ago on the day that the Georgia Special Olympics came to town. We were asked to provide communications for a two-day event, and seven bedraggled Amateur Radio operators arrived to assist the local Special Olympics committee. While the club's efforts were handled professionally and were appreciated, we were quick to recognize our deficiencies.

"As the years wore on, we continued to support the Special Olympics, and even assisted at other public-service events. The club's dedication and professionalism in providing the necessary communications for the Special Olympics was the prime reason that the City of Warner Robins has been awarded these games for as long as the city and its citizens want them.

"But most importantly, our club had found its wheels and was up and running — a club with purpose and goals. In 1983, we shifted into high gear. Here is a quick look at our achievements in '83.

"We began early in the year by planning for the first Middle Georgia Computer Expo. We had the idea that we would indoctrinate the public and our fellow hams on the many and varied uses of the computer and how it would affect their lives in the years to come. At the same time, we would raise funds for the local Area 8 Special Olympic Committee. With the support of the Chamber of Commerce and a grant of $300, we set out to lure the big companies to our event.

"While we were busy working on the Computer Expo, we had other responsibilities. We were responsible for providing communications at the annual Volksmarch held at Robins AFB. Immediately after the Volksmarch, we assisted the March of Dimes with their Walk-A-Thon. When we finished the Walk-A-Thon, the Computer Expo began.

"We brought in some of the big manufacturers of the computer world, and our success was beyond our greatest expectations. We took the proceeds and bought a computer with two disk drives and a printer to aid the Area 8 Special Olympics Committee. When trying to establish scheduling for 7000 persons in a multitude of events and to keep track of medications and where everyone is staying in the area, a computer is a definite asset.

"The Olympic games were in late May, and while we were getting our breath we found ourselves setting up for Field Day. We truly enjoy showing off to the public, so we went about doing just that. We not only invited the local media, we asked the public to join us. While the crowds were not as large as we had wanted, the general public did come to observe.

"We held our hamfest in the sweltering days of September, but thousands of hams came anyway. Publicizing the launch of the *Columbia* STS-9 mission and Dr. Garriott's planned operation from space helped. We had a continuous crowd around the TV reviewing the Garriott videotape.

"In October, we were asked to provide communications for the Houston County Hospital's Exercise for the Health of It program, which included foot races, bicycle races and long walks. By now, almost everyone in Houston County was well aware of the Central Georgia ARC.

"Although we were well into the planning of the Space Shuttle event, we found time in November to handle the coordination for the City's annual Christmas parade. We were commended on our skill in getting the parade underway and to its successful completion.

"The STS-9 Shuttle launch and the subsequent Amateur Radio operation in space has to be the hobby's most controversial subject since the shutdown of the amateur stations at the onset of World War II — and certainly its biggest shot in the arm! We were quick to recognize the potential of such an event, and went all out to publicize it. We pushed this event, on behalf of the hobby, to the limit. We were able to resurrect some of the old dyed-in-the-wool anti-2-meter hobbyists, and got them excited.

"But the year was far from over. While publicizing the STS-9 mission, and boasting of our support of the public, we were approached by the Warner Robins Police Department to assist them during the Christmas holidays. Our members responded immediately; our services were used and warmly received.

"We do these projects because we are good at what we do and we enjoy doing something for the public. We, the club as a whole, feel we owe something to the public for the privilege of being licensed and operating our stations. But doing our thing is only one aspect; bringing it to the public is something else.

"We like to boast that our biggest fan in the middle Georgia area is the media — TV, radio and newspapers. Once they became aware of what we could do, they were anxious to see us in action. Our personnel appeared on local television seven times to promote the hobby. A total of 39 articles appeared in nine newspapers and technical publications. During the year, the city of Warner Robins issued three proclamations, and the Governor of Georgia issued one to recognize the Amateur Radio Service.

"By now, you probably have said to yourself that our club has been quite active — and you would be right, but only partially. To promote amateur participation in the STS-9 mission, we appeared before high school classes, Boy Scout groups and other ham clubs. Portions of the videotapes were shown on two local TV stations. These two tapes were shown to more than 600 students and Boy Scouts, and to thousands of hams. In addition, we encouraged three local TV stations to show the ARRL public service announcement in an appropriate time slot.

"Quite a year for a club with a membership of 110 hams, right? Well that's not all we have accomplished. Probably the greatest thrill a ham can expect is when he or she is able to pass the hobby on to others. In 1983, we conducted two Novice classes and licensed 15 new hams. One of the classes was conducted at a local junior high school. It was such a great success that Amateur Radio will be offered to the students next year as a science elective. We are extremely proud of this achievement.

"So, with all this behind us, what can we do for an encore? It's barely yearend and already we are planning on the March of Dimes Walk-A-Thon, Novice classes, the 2nd annual Middle Georgia Computer Expo (with proceeds going to charity), the Annual Georgia Special Olympic Games, Field Day and our Hamfest. Plus, we have been asked for repeat performances at the other functions. We'll probably find a surprise out there if we just keep out eyes and ears open."

Theirs is a mighty hard act to follow. Is your club up to the challenge?

*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 Club of Savannah, Inc.***
c/o P.O. Box 13342
Savannah, GA 31406
Club membership — 34

***Blue River Valley Amateur Radio Society***
c/o RR 3, Box 310
Shelbyville, IN 46176
Club membership — 31

***Blue Valley Amateur Radio Club, Inc.***
c/o RFD 1, Box 86
Beaver Crossing, NE 68313
Club membership — 36

***Conejo Valley Amateur Radio Club, Inc.***
c/o P.O. Box 2051
Thousand Oaks, CA 91360
Club membership — 71

***Four Lakes Amateur Radio Club***
c/o 3713 Rebel Dr.
De Forest, WI 53532
Club membership — 123

***Great South Bay Amateur Radio Club***
c/o P.O. Box 491
Babylon, NY 11702
Club membership — 50

***Knickerbocker Amateur Radio Club***
c/o 433 Main St.
Port Washington, NY 11050
Club membership — 16

***Prairie Dog Amateur Radio Club***
c/o Box 485
Childress, TX 79201
Club membership — 15

***Robbinsdale Amateur Radio Club***
c/o P.O. Box 22613
Robbinsdale, MN 55422
Club membership — 42

***Wantagh Amateur Radio Club***
c/o 2444 Seebode Ct.
Bellmore, NY 11710
Club membership — 42

***Warminster Amateur Radio Club, Inc.***
c/o P.O. Box 113
Warminster, PA 18974
Club membership — 102

With WD4NCP at the head of a junior high school science class, eight new hams were brought into the fold. Because of its success in the classroom, Amateur Radio will be offered as an elective in the fall. *(KF4FQ photo)*

## 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 New Frontier, Vol. 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.

# Amateur Satellite Program News

Conducted By
Bernie Glassmeyer,*
W9KDR

## OSCARLOCATOR SECOND REVISION

The second revision of the OSCARLOCATOR package is at the printers. The package should be available from your favorite radio store book dealer or from AMSAT later this spring. Watch for an announcement of availability in *QST*. You may also order direct from ARRL.

The new, redesigned package contains map plotters for AMSAT-OSCAR 10, UoSAT-OSCAR 9 and the Soviet RADIO satellites. Also included is information about AMSAT, how to choose equipment for OSCAR 10 operation and how to get started using Phase II satellites (2 meters, uplink; 10 meters, downlink).

The plotter for OSCAR 10 is a simple device that determines your station antenna azimuth heading. It uses a polar-projection map, range circle centered over your location and a ground-track cursor. By plotting the sub satellite point (that point on earth directly under the satellite), you will be able to find the satellite's location and read the antenna heading from the range circle.

The ground-track cursor will have to be updated every two or three months. Starting this month, a full-size ground track will be provided (see Fig. 1). Instructions for making use of this drawing are in the OSCARLOCATOR package.

### The Satellite Experimenter's Handbook

This new ARRL publication, hot off the press, is the finest Amateur Radio satellite book available. Price is $10 postpaid in the U.S. and $11 in Canada and elsewhere direct from ARRL Hq. It is also available in many radio stores and from AMSAT.

Included in the book is a proof-of-purchase coupon that entitles ARRL members to a $1 credit on the next renewal or purchase of goods or services from Headquarters. This is an innovation for ARRL publications.

### Call for Experiments

AMSAT and ARRL are looking for ideas for Space Shuttle experiments. If you have any ideas for future flights, please contact Bill Tynan, W3XO, or ARRL Hq. See World Above 50 MHz, this issue, for more details.

*Satellite Program Manager, ARRL

### AMSAT Forum At Dayton Hamvention

The tentative schedule for the three-day event is:

*Friday, April 27:* One hour in the afternoon. Speakers will be N2CF, WA2LQQ and W8GQW. The topics will be (1) AMSAT, its Purpose and Operation, (2) Amateur Satellites: Today's Capabilities; Tomorrow's Challenges and (3) AMSAT Information Net Operations.

*Saturday, April 28:* 1½ to 2 hours in the afternoon. Panel of speakers: W3IWI, WA2LQQ, ZS6AKV, W3GEY and KA9Q, with moderator K8OCL. Topics: (1) AMSAT-OSCAR 10 and UoSAT-B Satellites — Design, Development and Operation, (2) Earth-Station Requirements, (3) AMSAT Software Exchange and (4) Computer Applications.

*Sunday, April 29:* One hour in the morning. Speakers are W3GEY, K8OCL and W3IWI. Topics: (1) AMSAT in the Future, (2) Satellite Activity — Phase IIIC, (3) World Space Foundation and (4) Solar Sail Project. *(tnx K8OCL)*

## THE AMSAT-STONER CHALLENGE CUP

AMSAT Vice President for Operations Doug Loughmiller, KO5I, has announced a new satellite operating award AMSAT-OSCAR 10 will be used for the competition beginning April 15. More details on this event can be found on page 57.

## AMSAT GENERAL MANAGER ASKS YOUR SUPPORT

"The successful operation of OSCAR 10 brings with it many new challenges and opportunities. Perhaps the largest challenge facing AMSAT today is the need to expand its membership. Ideally, this is best achieved by providing information and assistance to those amateurs who are just now becoming satellite enthusiasts. This vast group of potential members holds the key to our future as an organization. Their active participation and financial support will propel us into a more exciting future. Without them, we may face a future of unfulfilled dreams.

"Take the lead in bringing the AMSAT message to the amateurs in your area. A proven method of meeting this objective is through hamfest participation. I ask that you plan to represent AMSAT at your area hamfests.

"The set-up of a booth is a simple task. You might also consider leading a demonstration or a forum talk, if such an opportunity exists.

"Please tequest a hamfest support kit from the AMSAT office. The kit includes free handouts and our many promotional items. We also have some excellent audio visual programs that are well-suited to hamfest activities. These include VHS videotapes, slides, tapes and photographs.

"Your participation in hamfests will be an important step toward a brighter future for AMSAT. Moreover, you will find it a personally rewarding experience.

"For more information, please write to or call AMSAT Hq., 850 Sligo Ave., Silver Spring, MD 20910, tel. 301-589-6062." — *Bill Lazzaro, N2CF, General Manager, AMSAT*

### 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.

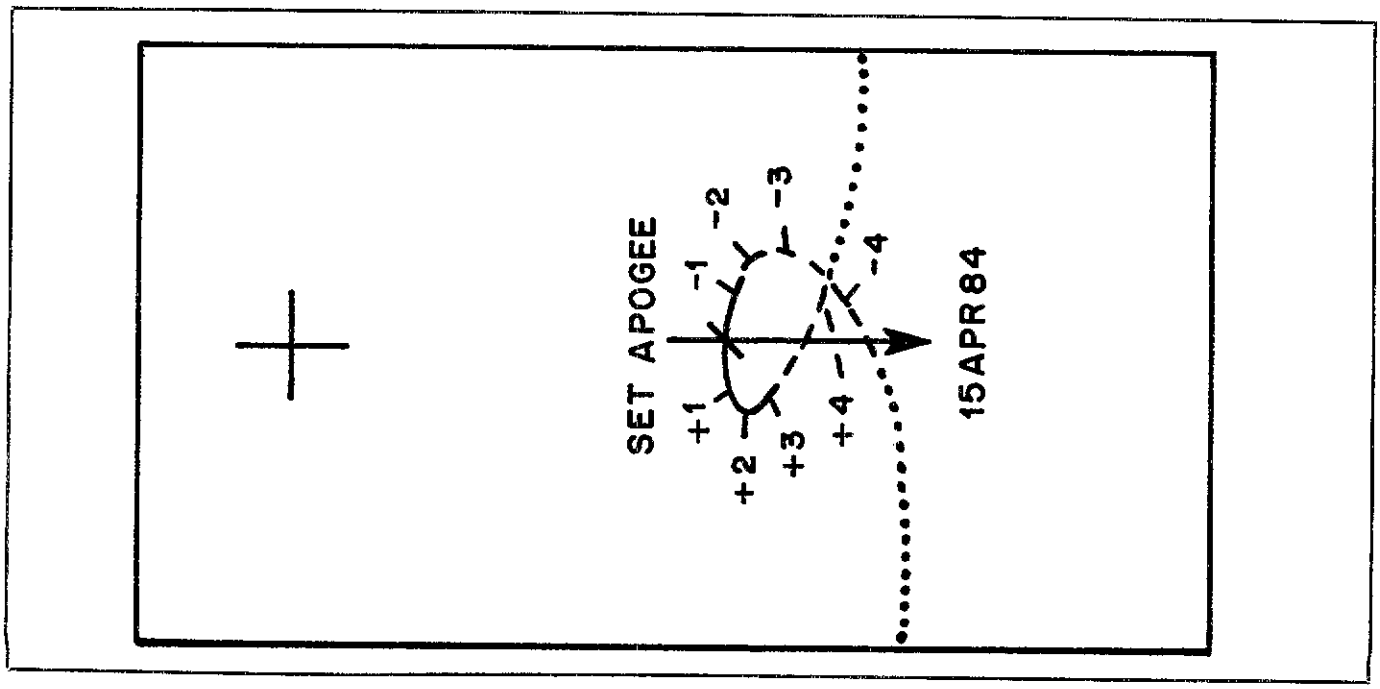



Fig. 1 — AMSAT-OSCAR 10 ground-track cursor.

# Results, 14th Annual ARRL 160-Meter Contest

This was no replay of the 1982 contest when the scoresheet read "QRN — 1 and 160-meter contesters — 0." The weekend of the 1983 contest, December 2-4, brought adequate band conditions, while Top Band buffs from around the world provided the effort and incentive to make for an interesting contest weekend.

With the likes of KU8E and his 1500-foot Beverage antenna at VP2EEW working all comers, and N8AG on station at ZF2AG handing out the Cayman Islands multiplier to nearly 150 stations, the whole tone of the contest was set. There was enough DX to excite those looking to fatten their 160-meter DXCC totals and there were many of the "rarer" states on the air to help those looking to complete the requirements for 160-meter Worked All States.

There were enough stations on to pad the QSO totals for those operators able and willing to dig them out. Top single operator, Jon, AA1K (and there has to be a few "dB" advantage when Jon hands out his Delaware Section) found 807 different stations to work in his 36 hours of contest operation and had a rate of 75+ stations per hour for several hours. The multiplier distribution ran true to the old story line: East Coast stations worked Europeans for a few multipliers, West Coast stations worked JAs, thanks to some FB propagation conditions; everyone added to their multiplier totals with stations from South America and the Caribbean.

By comparison, 9 of the 10 single-operator Top Ten scores from the 1982 contest would not have made the listings in this contest. Last year's top single op, AD8I, added 13 kilopoints to his 1982 score in 1983 and wound up in sixth place in the single op. standings. AA1K led the single-op pack with the third highest QSO total of all contestants (the two stations who beat Jon were multiop stations and only bested him by 13 QSOs) and had (at 86) the second-highest multiplier count of all stations reporting activity in 1983. The rest of the single-operator Top Ten is filled out with, among others, four stations who held Top Ten slots in past 160-meter contests. They are N7DF, K1ZM, AD8I and WØEJ.

In the race for the top multioperator slot, it came right down to the last multiplier. N9MM and KS8S each had 820 QSOs, but the 84 multipliers of 'MM was one better than KS8S could find, assuring the crew at N9MM the top slot. Whew!

Four of the '83 Top Ten multiop stations are "repeaters" that held Top Ten positions in 1982. They are WØAIH, W8LT (last year's top multiop station), KK5I and W9AZ.

The next ARRL 160-Meter Contest is scheduled for the weekend of December 1-2, 1984.

Good Luck! — *N1CZC and K1WJ*

## Top Ten

| *Single Operator* | | *Multioperator* | |
|---|---|---|---|
| AA1K | 143,190 | N9MM | 141,708 |
| K5NA | 136,510 | KS8S | 139,357 |
| N7DF | 134,904 | WØAIH | 132,435 |
| K4VX (KM9P) | 134,396 | W8LT | 131,774 |
| K1ZM | 130,872 | WA9EYY | 122,720 |
| AD8I | 129,397 | KK5I | 114,744 |
| K4FU | 124,000 | KE9A | 106,880 |
| K4XU | 122,426 | AC8W | 95,985 |
| WØEJ | 117,117 | W9AZ | 93,936 |
| W1CF (N1EE) | 112,392 | NA5B | 93,398 |

## Antennas Used By Top Stations

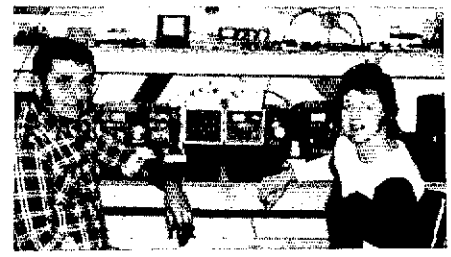
| *Single Op* | *Antenna(s)* |
|---|---|
| AA1K | 113-ft shunt-fed vertical/Beverages |
| K5NA | Slopers (E.& W.)/Inverted V |
| N7DF | Collins Discage |
| K4VX (KM9P) | Half Sloper/Beverages |
| K1ZM | Wire/Beverages |

| *Multiop* | *Antenna(s)* |
|---|---|
| N9MM | 105-ft vertical/Beverages |
| KS8S | Vertical/Inverted V @ 180-feet |
| WØAIH | Vertical/sloper/Zepp |
| W8LT | 40-ft vertical/6 Beverages (600-1000 ft long) |
| WA9EYY | Inverted L & Inverted V |

## Division Leaders

| *Single Op* | | *Division* | *Multiop* | |
|---|---|---|---|---|
| *Call* | *Score* | | *Call* | *Score* |
| AA1K | 143,190 | Atlantic | K2XR | 90,942 |
| KF9D | 79,156 | Central | N9MM | 141,708 |
| WØHW | 93,000 | Dakota | --- | --- |
| W5KL | 38,052 | Delta | --- | --- |
| AD8I | 129,397 | Great Lakes | KS8S | 139,357 |
| K5NA | 136,510 | Hudson | --- | --- |
| N7DF | 134,904 | Midwest | NØSM | 77,748 |
| W1CF (N1EE) | 112,392 | New England | N1RI | 66,780 |
| N7EIJ | 77,440 | Northwestern | W7RM | 92,016 |
| K6HIH | 53,476 | Pacific | WB6EGE | 12,892 |
| K4XU | 122,426 | Roanoke | --- | --- |
| KØUK | 23,142 | Rocky Mountain | WØKEA | 91,134 |
| AI8H/4 | 56,872 | Southeastern | — | --- |
| K6SE | 86,240 | Southwestern | --- | --- |
| N5JB | 101,598 | West Gulf | KK5I | 114,744 |
| VE3ABG | 71,221 | Canadian | VE7QRP | 196 |
| VP2EEW (KU8E) | 25,092 | DX | JA7YFB | 1482 |

R. B. Frey, K4XU, operating from North Carolina, came in 8th in the single-op category.



KI7W and N7CYZ spent some time on Top Band from Wyoming.

## SOAPBOX

I put the wire up one week before the contest. Why do it in August when it's so nice in December? (VE2MJ). When it's 3 A.M., the rate's down to 15 QSOs/hr and the coffee's all gone, nothing wakes you up like a cathode-to-grid short on a 3-500Z (KK5I).

## SCORES

Scores list call sign, final score, total QSOs, total multipliers and hours operated. Example: CX8DT's score is 40 points, with 4 QSOs, and 2 multipliers. He operated for one hour.

**DX**

**URUGUAY**
CX8DT 40- 4- 2- 1

**SPAIN**
EA3VY 700- 25- 14

**IRELAND**
EI8J 160- 8- 4-

**HAITI**
HH2VP 21,730-205-53- 8

**COLOMBIA**
HK1AMW 4400- 40-22-

**JAPAN**
JA7NI 1983- 46-21-
JA1GTF 1482- 40-19-
JA7YCQ (JHØCZQ,opr.) 1080- 27-20- 7
JA5DQH 756- 27-14- 10
JA9BOH 480- 20-12-
JE1SPY 324- 19- 9- 15
JH1APK 128- 9- 7- 2
JA3YKC (JH4RHF,opr.) 60- 6- 5-
JA7YWD (JE7XEH,opr.) 18- 3- 3- 1
JR6LJO 12- 3- 2- 1
JA1YCL (JL1QOC,opr.) 8- 2- 2- 1
JA1AAT 2- 1- 1- 1
JA7YFB (JE7s HLZ,MLJ,JH7,MXO, JJ1s, GXY,MVV,JR7s,JLU,JVO, LCI,oprs.) 1482- 39-19-
JA2YKA (JA9SSY,JG1GIF,oprs.) 1056- 33-16- 10

**ANGUILLA**
VP2EEW (KU8E, opr.) 25,092-246-51-

**MONTSERRAT ISLAND**
VP2MFL (K5BDX, opr.) 384- 16-12- 8

**MEXICO**
XE1MD 2800- 52-10- 21

**VENEZUELA**
YV1OB 10,164-121-42- 12

**CAYMAN ISLANDS**
ZF2AG (NBAG,opr.) 12,496-142-44- 14

W/VE

1

CONNECTICUT

W1XX 36,403-301-59- 9
W1WEF 24,970-223-55-
N1CC 16,302-210-38- 17
W1WY 16,170-156-49- 12
K1DW 14,945-272-35- 13
N1JW 13,480-167-40- 6
AA2Z 2300- 50-23- 1
W1QV 390- 15-13-1

EASTERN MASSACHUSETTS

W1CF (N1EE,opr.)
112,392-642-84- 30
W1YN 44,330-326-88- 16
K1MEM 40,040-288-85- 11
K1NA 39,487-310-61- 15
W1WAI 38,280-321-58- 13
W1AQE 17,986-194-46-
KQ1F 16,848-156-52-
W1FT 3861- 70-27-
K1XM 3090- 50-30-
W1TUM 1190- 70-17- 2
KR1B 960- 32-15-6

MAINE

W1HRQ 24,048-249-48-
KS1G 12,400-155-40-
W1GKJ 4928- 88-28-
K1PV 3562- 67-26-
W1HHV 2852- 62-23-

NEW HAMPSHIRE

WA1TZV 73,071-522-69-
K1DL 16,512-171-43- 16
N1ACH 15,552-159-48- 6
AQ1C 7560-112-36- 5
K1TR 1600- 40-20-

RHODE ISLAND

KA1SR 10,660-130-41- 27
N1RI ( + KA1AJR,KA1EHR,N1BVY,
N1OM,N1XW,WB1DXQ)
66,780-453-70-
W1OP (K1HGC,KA1s DUV,HAP,
N1s AKO,BBM,W1GS,WB1FOY,
oprs.) 29,200-292-50-21

VERMONT

K1IK 87,075-558-75- 23
WB1GQR 69,300-516-68- 25
K1LPS 16,954-170-49-

WESTERN MASSACHUSETTS

K1KNQ 26,136-233-54- 11
WA1ZAM 10,626-125-42- 8
WB1HIH 8192-128-32- 13
W1JP 4300- 86-25-3

2

EASTERN NEW YORK

K5NA 136,510-779-85- 36
K1ZM 130,872-749-84- 38
WA2SPL 75,336-482-73-
K2EK 52,780-394-65- 15
K2XA 35,343-270-63- 9
W2KHO 23,766-227-51- 21
WA8MAZ 17,020-185-46-
K2GBH 13,365-147-45- 4
KN2Q 13,020-152-42- 10
KR2V 12,120-150-40- 16
W2DW 9630-130-36- 4
K2MN 6039- 90-33- 5
WB2PUH 4424- 79-28- 7
N2JJ 784- 28-14-1

N.Y.C. & LONG ISLAND

W2GKZ 21,338-224-47- 15
W2GP 10,434-141-37- 7
WB2DLA 4872-100-24- 18
K2SHL 4750- 95-25- 7
W2JGQ 4681- 73-31-5

NORTHERN NEW JERSEY

KR2Q 53,144-467-56- 24
W2RQ 2600- 50-26- 1
N2IN 1720- 43-20-

SOUTHERN NEW JERSEY

W2ZY 10,626-122-42-

WESTERN NEW YORK

W2ONP 20,064-206-48- 25
KW2A 13,112-149-44-
NA2Q 12,363-157-39- 18
W2CJQ 7800-100-39- 9
W2QIP 7008-108-32-
KK2B 5673- 90-31- 10
W2GJ 4844- 85-28-
NA2A 1764- 42-21- 7
K2XR (KD2I,KT2B,W2HWG,
WA2VUN,WB2s EGI,TSY,WIK,
oprs.) 90,942-647-69

3

DELAWARE

AA1K 143,190-807-86- 36

N8NA 7105-100-35-2

EASTERN PENNSYLVANIA

W3GM 107,152-709-74-
W3TS 57,865-815-71- 19
W3BUR 40,064-304-64- 17
W3BGN 31,428-280-54-
N3CXB 25,488-264-48- 13
WB3CAC 24,850-236-50- 10
KR3G 21,730-205-53- 13
WB3FAA 20,889-509-41- 16
W3CNS 20,790-188-54- 8
W3AJS 19,834-208-47-
WA3YON 19,366-209-46- 13
K4JLD 18,524-209-44-
W3ADE 7490-107-35- 6
W3NZ 6570-107-30-
W3ARK 6200-100-31-
K3SWZ 4292- 74-29-
W3AP 1640- 41-20-1

MARYLAND-D.C.

K3ZZ 89,100-579-75- 29
W3GG 44,958-378-58-
WB3JRU 36,720-300-60-
N3CO 26,264-265-49-
N3II 20,502-260-51- 11
W3GN 18,000-200-45-
W3ICM 11,973-152-39- 5
W3PEV 3024- 56-27-6

WESTERN PENNSYLVANIA

K3MO 81,548-520-76- 27
W3QM 36,464-340-53- 25
W3HDH 28,938-270-53- 13
AF3V 1320- 66-20- 2
W3FSB 8- 2- 2- 2
K3UA ( + W3FSB)
18,945-206-45- 7

4

ALABAMA

N4AID 7474-101-37- 5

GEORGIA

AI8H/4 55,872-379-72- 36
K4UEE 45,764-326-68- 9
W5VUX 27,995-250-55- 11
K4BAI 13,478-145-46- 8
WI4R 7308-100-36-
WB4ABY 6732- 92-36- 5
N4UZ 6480- 90-36-
KA4KMH 3444- 60-28-
AA4EI 1080- 27-20-

KENTUCKY

K4FU 124,000-760-80- 31
W4YOK 42,084-331-63- 10
W4XT 7276-214-34- 8
WA4EBN 7272-101-36- 10
N4XM ( + KD4U,KK4Q,NO4R)
90,972-588-76- 28

NORTH CAROLINA

K4XU 122,426-730-82- 24
N4SF 101,574-603-81-
W4TMR 59,865-474-65- 29
K4PB 11,280-141-40-
K4HF 6422- 83-38-
WF4I 4176- 72-29- 5

NORTHERN FLORIDA

W4HBK 37,654-272-67-
AA4EH 8775-225-39- 16
W8IM 154- 11- 7- 1

SOUTH CAROLINA

K4CNW 40,716-332-58- 11
N4EE 6188- 91-34- 7
K4ADI 5115- 76-33-

SOUTHERN FLORIDA

N4IN 45,288-292-72- 19
W4OO 39,530-274-67- 20
W4OWJ 17,545-146-65-
K4KUZ 13,770-120-54- 8
K4RD 2889- 52-27-

TENNESSEE

K4PJ 30,780-257-57-
WM4Z 13,158-150-43- 9
K4ON 10,530-135-39-
W4VOS 7452-102-36- 10

VIRGINIA

KG4W 80,227-533-73- 33
AA4AT 24,288-250-48- 6
K4VHH 18,450-183-50-
K4OD 18,135-200-45- 9
KX4V 16,684-194-43-
W4KMS 9331-107-43-
W4YE 7200-100-36- 3
N4RA 3726- 69-27- 2
N4MM 2820- 47-30- 1
KA9X 2530- 55-23-

5

ARKANSAS

W5KL 38,052-302-63-

LOUISIANA

K5KLA 13,959-144-47-

MISSISSIPPI

KK5K 12,013-142-41- 14
N5XA 10,992-113-48-
W5GWD 6708- 86-39- 10
WA5MUE 720- 24-15-

NORTHERN TEXAS

N5JB 101,598-576-82- 27
N5TP 59,213-363-77- 13
KC5DX 58,765-392-73- 15
N5AU 35,577-252-67- 7
KB5UL 24,998-211-58- 17
N5UA 14,076-132-51- 12
W5FIX 13,156-143-46- 19
KD5RO 9600-103-40- 9
W5QF 6142- 83-37- 5
K5MR ( + N5RZ,W1AEL,WD5BIK)
59,349-399-73- 15

OKLAHOMA

KM5H 86,751-504-81- 25
N5AEV 10,160-127-40- 13
KK5I ( + K7CW,N5CG,W5KI)
114,744-653-84- 32
NA5B ( + K5SM,KA5KGO,W5s
LFS,VHP,W7FG,WD5DWT)
93,398-547-82- 31
N0N/5 ( + W3AS)
83,960-521-76- 15

SOUTHERN TEXAS

K5LZO 58,682-359-74- 11
K5DL 5504- 86-32- 16
W5NTJ ( + WA5IEX)
26,220-218-57-
WA4EWV ( + N5EM)
7210-103-35-

6

EAST BAY

K6HIR 53,476-236-58-
K6TS 10,168-121-41- 9
AD6D 7344-102-36- 7
AD6X 3080- 55-28- 4

LOS ANGELES

K6SE 86,240-452-80- 26
N6NW 6586- 89-37-
W6PFE 5320- 70-38- 10
WA6MEM 2160- 45-24- 4

ORANGE

N7AZ 39,000-273-65- 28
N6PE 23,760-202-54- 20
N4ARO/6 3432- 66-26- 7
KC7SF 440- 20-11- 3

SANTA BARBARA

N6VR 18,502-158-58- 8
K6MXO 6279- 79-39-
W6JEO 2000- 50-20- 6

SANTA CLARA VALLEY

K6RU 27,170-229-55- 18
KD6PY 25,960-209-55- 20
W6OKK 8960-119-36- 7
N6HR 3380- 65-26-
KK6C 7056- 95-36-

SAN DIEGO

N6ND 54,648-339-69- 14
K6QM 10,080-112-45- 11
AA6EE 1364- 31-22- 1

SAN FRANCISCO

W6SDY 14,310-159-45- 19
WB6EGE (KA6AHK,KB6HT,N6MQ
N6QP,WB6WPO,WB7DEG,oprs.)
12,892-293-44- 17

SAN JOAQUIN VALLEY

K6MO 25,056-211-54- 15
W6BYH 1800- 36-25-
W6SX 1156- 34-17-
WA6BAI (KJ6P,W6MUV,WB6vGL,
WD6CNV,WD6DET,oprs.)
12,838-131-49-10

SACRAMENTO VALLEY

AI6V 68,184-418-72- 30
WA6EUZ 39,232-250-64- 30
WA6BRV 750- 25-15-2

PACIFIC

KH6IJ 1406- 37-19-
AH6P ( + AH6J)
9288-108-43-8

7

ARIZONA

K7OX 74,000-467-74-
K6LL 56,032-358-68-
AK7Y 36,090-287-65- 20
W7YS 3844- 62-31-
WA7KLK 690- 23-15-

IDAHO

N7SU 37,950-280-66- 19

MONTANA

N7EIJ 77,440-460-80- 31
K0PP/7 56,240-361-76- 21
KS7T 15,900-159-50-
WB7CFL 3132- 54-29- 7

NEVADA

KA7BRE 18,868-178-53-22

OREGON

W7DCR 23,408-209-56- 24
N7DB 12,408-132-47- 24
W7TC 8840-130-34- 16
AD7T 6878- 89-38-
KA7FEF 1280- 40-16-

UTAH

KC7PA 4216- 68-31-10

WASHINGTON

KG7D 42,478-275-67- 30
N7CKD 39,534-280-66- 28
W7IEU 13,462-127-53- 20
W7KQU 12,314-131-47- 25
KT7G 9321-118-39-
W7BYK 7392- 76-42- 6
K7UU 7144- 94-38- 10
AK7F 280- 14-10- 4
W7RM (KB7G,W7WA,oprs.)
92,016-490-81- 26
W7TJ ( + W7XR)
37,848-240-76- 30

WYOMING

WA8MAM 16,512-172-48- 9
W7HLA 1440- 36-20- 6
KI7W ( + N7CYZ)
5040- 70-36- 6

8

MICHIGAN

N8EA 60,789-430-69- 14
N8AKY 39,707-332-59-
K8OOK 14,720-160-46-
K8SIA 13,772-155-44- 6
N8BJ 11,620-166-35- 9
N8CKH 6060-101-30-
W8WVU 2160- 45-24- 4
AC8W ( + K8DD,KZ8K,N8ERV)
95,985-588-79- 23
K8AQM ( + KC8KQ)
69,880-517-67- 23

OHIO

AD8I 128,397-754-83- 29
W8FN 104,166-625-81- 29
WB8JBM (WD8IJP,opr.)
101,088-612-78- 22
K8CCV 80,500-566-70- 31
K8MN 64,828-413-76-
W8ILG 41,832-283-72- 14
N8BJQ 27,075-230-57-
KC8JH 15,000-150-50- 5
W8EX 6882- 90-37-
W8IDM 5592-103-32- 4
W8PCS 4588- 74-31- 4
K8HF 2990- 55-26- 2
K8MR 2250- 42-25-
KS8S ( + AD8P)
139,357-820-83- 40
W8LT (K1LT,K3JT,K8LT,K8ND,
WB8PHI,WD8IXE,WD8LXX, oprs.)
131,774-784-82- 41
W8SDL ( + AC8M,W8VSA,
WD8MGL) 44,395-337-65-22

WEST VIRGINIA

K8OQL 33,420-271-60- 20
KB8FJ 13,570-143-46- 3
W8JWX 12,814-149-43-

9

ILLINOIS

KF9D 79,156-502-77- 24
K9AB 69,423-468-73- 20
K9BG 65,262-438-73- 19
KS9O 58,435-448-65- 30
W9YYG 42,570-312-66- 16
N9CW 34,465-281-61- 13
K9JU 32,400-270-60- 15
WB9GYJ 32,306-274-58- 25
W90A 29,522-253-58-
KB8AC/9 19,396-182-52- 17
KG9D 15,840-180-44-
WD9DBC 14,872-169-44-
W8QWM 14,536-155-46- 10
W9LNQ 6688- 76-44-
W9FSD 644- 23-14- 4
WA9EYY ( + K9GL,WB9TIY)
122,720-755-80- 30
W9AZ (AK9F,K9IFO,K9NR,
W9HPR,WB9HAD,WD9CSA,oprs.)
93,936-609-76-42

INDIANA

KE9I 68,109-454-73- 16
W9RE 30,392-259-58- 4
KA9OKH 20,492-218-47- 17
WB9CIF 19,080-180-53- 18

W9JQO 16,848-174-48- 9
W9TG 14,852-158-47-
WB9WQV 11,592-126-46- 16
W9WM 8588-113-38-
KK9G 2912- 56-26-
KC9FC 2632- 47-26-
N9MM ( + KM9D,W9ZRX,WB9POH)
141,708-820-84- 30
K9ZUH ( + WB9PXR)
63,888-472-66-21

WISCONSIN

WA1UJU 35,496-306-58- 15
WA9TZE 26,760-220-60-
W9WQ 19,928-212-47-
K9GM 11,750-122-47- 5
W0AIH ( + K0FVF,W0UC)
132,435-798-81- 41
KE9A ( + KO9O, WB8YXY)
106,880-650-80-27

0

COLORADO

K0UK 23,142-198-58-
KG7Z 21,384-198-54- 17
KA0CDN 21,122-176-59- 15
KI0G 10,164-116-42-
N0ZA 6786- 87-39- 8
K0RZ 3570- 51-35- 3
W0KEA ( + ND0E)
91,134-483-83- 35

IOWA

W0EJ 117,117-747-77- 25
N0BB 25,920-216-60- 17
WB9IOG/0 25,842-216-59- 14
K0LUZ 23,868-228-52-
K0SRL 12,735-140-45- 11
W0YBV 6720- 84-40-
W0ANZ 4402- 71-31-
WD0GVY 4200- 70-30-
N0SM ( + K0JGH,WB0VYV)
77,748-501-76- 30
K0GVB ( + KA0HLG)
25,870-184-65-

KANSAS

N7DF 134,904-766-84-
WA0QMU 106,800-654-80-
WA0TKJ 61,712-397-76- 20
W0AWP 6020- 86-35-
WO0F'EN (WB0TOM,WD0CXN
oprs.) 9030-129-35- 20

MINNESOTA

W0HW 93,000-609-75- 23
K0PK 83,658-570-73- 21
KK0C 28,560-476-60- 17
WB0BJP 27,660-229-60- 26
W0RXL 8880-120-37- 12
KN0V 6272- 98-33- 10

MISSOURI

K4VX (KM9P,opr.)
134,390-730-89-35

NEBRASKA

K0HA 106,848-632-82- 25

NORTH DAKOTA

KF0A 9996-119-42- 4
KI0E 2000- 50-20-

SOUTH DAKOTA

W0JX 88,388-574-76- 26

VE

MARITIME-NEWFOUNDLAND

VE1AXT 26,061-245-51- 17
VE1YX 25,308-207-57-14

QUEBEC

VE2MJ 17,028-198-43- 17
VE2QQ 3696- 66-28-

ONTARIO

VE3ABG 71,221-527-67-
VE3INQ 69,768-477-72- 33
VE3MFA 67,760-470-70-
VE3JKZ 9828-117-42-

ALBERTA

VE6AQI 4900- 70-35- 17

BRITISH COLUMBIA

VE7CRU 42,704-314-68- 27
VE7BS 14,886-117-55-
VE7IQ 3976- 71-28-
VE7FPT 1848- 44-21- 5
VE7QRP (VE7s FPT,FDX,oprs.)
196- 14- 7- 3

CHECKLOGS

VE3BAJ,KE6VL

# Public Service

Conducted By Robert J. Halprin,* K1XA

## RACES, Repeaters and Rock 'n' Roll

For years, a vexing dilemma has been facing amateur groups interested in putting a 2-meter Radio Amateur Civil Emergency Service (RACES) repeater on the air in their communities. That is, FCC-designated frequencies for 2-meter RACES operation were not in harmony with standard amateur repeater pairs. This had an inhibiting effect on the growth of RACES repeaters (funding for which can sometimes be obtained from local government).

While all amateur frequencies are available to RACES on a shared basis during normal times, in the event of a presidentially declared war emergency, the only permissible amateur operations would be by a RACES group, and only on those oddball frequencies. Why put a repeater on the air when it will be unusable when it's needed the most? This has not been a very workable situation, particularly since 2-meter repeaters play a crucial role in most emergencies. The realization that standard repeater frequencies should be available to RACES took a substantial amount of time to filter through the maze of government agencies concerned.

Admittedly, the wheels of government move slowly. Luckily for amateurs, the climate of the FCC continues in the deregulatory mode. Through the efforts of ARRL and other agencies, the FCC has announced that, effective March 26, 1984, all 2-meter repeater frequencies are available to RACES (see Happenings, March 1984 *QST*). This will bring more repeaters into RACES operation, expand the potential for the use of RACES stations in the future, and will eliminate the uneasiness of trying to figure out a reasonable way of complying with the nonstandard 2-meter RACES segments in the event of a national emergency.

Further, this will have a very beneficial effect on cooperation between RACES groups and the League-sponsored Amateur Radio Emergency Service (ARES). RACES and ARES can now work together on the same frequencies to meet the needs of any local or state emergency. While RACES and ARES are separate entities, the League strongly recommends dual membership and cooperation between both groups whenever and wherever possible. Using the same operators on the same frequencies, as ARES group also enrolled as RACES can "switch hats" from ARES to RACES or RACES to ARES to meet the requirement of a developing situation. For example: During a nondeclared emergency, the group can operate as ARES; but when an emergency or disaster is officially declared by a state or federal authority, the operation can become RACES with no change in personnel or frequencies.

RACES is sponsored by Uncle Sam, specifically the Federal Emergency Management Agency (FEMA). It is a part of the Amateur Radio Service providing radio communications for civil preparedness purposes only, during periods of emergencies. These emergencies are not limited to war-related activities, of course, and include natural disasters. As defined in the FCC Rules, RACES is conducted by volunteer radio amateurs and designed to provide emergency communications to local or state civil preparedness agencies. RACES is administered by local or state civil preparedness officials.

Amateurs operating in a local RACES organization must be officially enrolled in that local civil preparedness group. RACES is conducted by amateurs using their own primary station licenses and operator privileges.

While operating in a RACES capacity, RACES stations and amateurs registered in the local RACES organization may not communicate with amateurs who are not members of RACES. Only civil preparedness communications can be transmitted, and tests/drills are limited to a maximum of one hour per week. (ARES is not subject to any of these restrictions.)

The beauty of ARES/RACES togetherness is that RACES has official government recognition (and resources), while the League's ARES has a skilled Emergency Coordinator at the helm, the backing of ARRL Field Organization personpower, and freedom from the above-indicated operating restraints. Public service 2-meter repeaters can now be operated under joint ARES/RACES coordination, and it is completely unnecessary for anyone to even contemplate altering repeater frequencies to operate on RACES frequencies during a declared emergency. ARES can shift to RACES, or vice versa, without a shift in frequency.

In areas where there is currently no RACES organization, it would be a relatively simple matter for an ARES group to enroll in that capacity. The first step is for the ARRL Emergency Coordinator or District Emergency Coordinator to make a sophisticated presentation to local civil preparedness authorities. Perhaps the logical long-range goal is for ARES and RACES to merge into one vigorous organization. Now that the all-important 2-meter frequencies have been reconciled, the concept of a unified public service force is something worth striving for.

By the way, "Rock 'n' Roll" was included in the title was just to get your attention!

### THIRTY SECONDS OR LESS — AN EMERGENCY AUTOPATCH PRIMER

Let's face it: Nobody is ever fully prepared to make an emergency call, and it's normal to stumble a bit. Since we cannot practice on the air the way we do for traffic handling or for communications backup service, the best we can do is to refresh our memory of the steps to take and the information needed, and hope for the best.

*Step 1:* Stay calm, which is not very easy if you've just seen a sports car climb under a semi-tractor truck to get out of the sun. Try to stay cool, anyway; you can't help anyone if you panic.

*Step 2:* Stop and think. Move to a position where you are not in danger and take stock of the situation. You should be able to get the information needed for the authorities in 30 seconds or less. Try it sometime when there is no emergency; it'll be good practice.

*Step 3:* Call for help. If you have called 911, your call was probably "screened" by a police agency, such as the county sheriff. Give them a *brief* description (see below) of the incident and the location so they can transfer your call to the proper agency. Give this agency all the details they need, and follow whatever instructions they give. Do not get involved in any emergency unless you know thoroughly what you are doing. You could get into serious trouble and then need help yourself.

**Information to be Given in an Emergency**

1) What is the nature of the incident (i.e., car accident, crime, fire, stalled vehicle, etc.)?

2) Is there immediate danger to life and property? Are there injuries, leaking gas, downed power lines?

3) Is it happening right now?

4) Where is/was the incident? Be as exact with location description(s) as possible: what road, direction of travel, distance and direction from highway exit or mile marker, any landmarks.

5) Number and descriptions of person(s)/vehicle(s) involved. Describe the person(s) involved: sex, age, race, height, weight, etc. Describe the vehicle(s): make and model of the vehicle(s), license number, any noticeable characteristics such as dents, body rot or other damage.

While this seems to be a great deal of information to get into a very short time, remember that some situations will need much more than what and where the incident is. The investigating officers can get the rest of the details at the scene.

The average emergency call should take no more than 30 seconds from the time the autopatch is accessed until it is terminated. Adding the 30 seconds that it should take to get yourself and your information organized brings the total time invested to one minute.

Got a minute? Do it right and make it count! — *E. J. Schwarzmann, WB4IOL, Pompano Beach, Florida*

### INFORMATION ON JOINING MARS

The Military Affiliate Radio System (MARS) is a three-pronged network organized primarily for handling messages to and from American service personnel stationed overseas. Because of third-party-traffic restrictions in many countries, MARS provides a service that is usually not permitted on the amateur frequencies. Thousands of amateurs participate in MARS (a separate license and authorization is required) on numerous nets, all of which are outside the amateur bands on military frequencies.

Many amateur messages find their way into MARS circuits, and MARS messages find their way into amateur (usually National Traffic System) nets, as a result of those amateurs who provide liaison between the two circuits. Traffic for points overseas where U.S. military personnel are stationed can be introduced into NTS and ultimately handled via MARS, provided a

*Deputy Communications Manager, ARRL

complete *military address* is given. Third-party traffic coming from the MARS network into NTS nets for delivery by Amateur Radio is converted from MARS to amateur message format and handled as any other message. When the traffic originates overseas, the name of the country from which it originates, followed by "via MARS," appears as the place of origin in the message preamble.

Information concerning MARS can be obtained directly from the individual branches at these addresses:

| Air Force MARS | Navy-Marine Corps MARS | Army MARS |
|---|---|---|
| Chief, Air Force | Chief, Navy-Marine Corps MARS | Director, CONUS Army MARS |
| AFCC/XOP | NAVTELCOM | C COM 7th SIG Command |
| Scott AFB, 62225 | Washington, DC 20390 | Ft. Ritchie, MD 21719 |

## NTS SECTION-NET EXPANSION

Last year, I wrote an article (April 1983 *QST*, p. 81) on the conception of the New York State CW Morning Net (NYS/M). As the manager of this Cycle 1 section net, I thought it was a good idea to share and explain its success. The purpose was to also show the section net managers in the National Traffic System that a net of this kind just might fit the bill in their sections as well.

To stress my point, here is some pertinent information to show why a Cycle 1 section net is not only feasible but much needed in NTS. Here are some statistics:

| | | |
|---|---|---|
| Sessions reported | 356 (1983) | 295 (1982) |
| Check-ins | 4027 | 1789 |
| Traffic passed | 2567 | 1012 |

Please keep in mind that the net has been in operation only two years and it is still growing. The numbers above show that CW lives on.

I find that the traffic comes from the following places:

1) left over from the previous evening's session (Cycle 4).

2) Early-morning independent nets.

3) Originated by net members that morning.

4) TCC reps. The net gives them a place to pass traffic they picked up on their skeds.

Three more things to consider:

1) During SET weekend, an established Section Net is already there to handle the traffic.

2) The same goes for the "Christmas rush" and, in some cases, for the college "Valentine's Day Message Blitz."

3) Last, but not least, it is there for emergency or disaster purposes.

It is advisable to keep the net's CW speed down, therefore enticing the newcomer to join the net. Our net also provides a training course to help these newcomers over the "cold sweats" when trying to learn about net procedures, message formats, QN signals and traffic handling in general.

These are all things to consider when starting a new net like this. It is advisable that *all* section net managers give some serious thought to this. If you think it might work in your section, give it a trial run. You won't regret it.

If you need any further information, I will be happy to answer any correspondence. Good luck and 73. — *Mark Rappaport, WB2EAG, NM NYS/M, RR 2, Box 215, Holmes, NY 12531*

## PUBLIC SERVICE DIARY

☐ Baltimore, Maryland — January 20. While driving on the Baltimore Beltway, KC3JX spotted a vehicle that was weaving from lane to lane and greatly varying its traveling speed. With W3GXK's help, KC3JX used the W3DID/R autopatch to notify the Maryland State Police of the problem, and continued driving behind the erratically driven vehicle until a state police patrol car arrived. (W3GXK)

☐ Orange County, California — January 26-28. The notorious Santa Ana winds, hitting gusts of up to 80 mi/h, caused a small brush fire to burn out of control in the Modjeska Canyon. For nearly 36 hours, 25 amateurs used the W6CNL repeater to conduct communications for the 500 fire crewmembers and the two Red Cross shelters that had been set up for the workers (W6RE)

## AMATEUR RADIO EMERGENCY SERVICE REPORTS

☐ York, Pennsylvania — January 19. A natural gas explosion caused a raging fire in the center of York. Since the possibility of further explosions remained, it was necessary to evacuate about 4000 people in a nine-square-block area around the site. Assistant RACES director N3BQB was notified of the incident on the 146.79 repeater (N3AIA/R). He and DEC N3AIA proceeded to the York Emergency Operations Center (EOC). W3AQN called up an emergency net on the repeater, and several stations checked in to volunteer their assistance. Evacuation centers were established at the William Penn High School and St. John's Church, and amateurs were dispatched to these points to provide communications among County Control, Red Cross headquarters in York and the evacuation centers. Three hours after the amateurs were notified, the emergency was under control and the hams were released from their assignments. (N3AIA, DEC District 10)

### Third-Party Traffic Agreements

Here is the latest list of countries (by prefix) with which U.S. amateurs may legally handle third-party-message traffic.

| | | | | | |
|---|---|---|---|---|---|
| C5 | The Gambia | J6 | St. Lucia | XE | Mexico |
| CE | Chile | J8 | St. Vincent | YN | Nicaragua |
| CO | Chile | JY | Jordan | YS | El Salvador |
| CP | Bolivia | LU | Argentina | YV | Venezuela |
| CX | Uruguay | OA | Peru | ZP | Paraguay |
| EL | Liberia | PY | Brazil | 3D6 | Swaziland |
| HC | Ecuador | TG | Guatemala | 4U1ITU | ITU, Geneva |
| HH | Haiti | TI | Costa Rica | 4X | Israel |
| HI | Dominican Republic | V2 | Antigua and Barbuda | 6Y | Jamaica |
| HK | Colombia | VE | Canada | 8R | Guyana |
| HP | Panama | VK | Australia | 9G | Ghana |
| HR | Honduras | VR6 | Pitcairn Island† | 9Y | Trinidad and Tobago |
| J3 | Grenada | | | | |

†Informal agreement. See League Lines, Oct. 1981 *QST*, for details

## COMMUNICATIONS SERVICE OF THE MONTH

**1984 Save a Life Net**

On Saturday, December 31, 1983, at 2000 PST, the WB6HUL repeater (145.22 MHz), located on Santiago Peak in Orange County, California, was activated to coordinate net activities for a special ARES program in Orange, Los Angeles, San Bernardino and Riverside Counties.

Seventy-four Southern California Amateur Radio operators, with both mobile and base capacities, initiated operations over 14 repeaters and several simplex frequencies to provide information to the California Highway Patrol and local police agencies relative to unsafe highway conditions, traffic accidents, stalled vehicles, and erratic and reckless drivers. Hundreds of additional hams were aware of the program. For those who were mobile, it provided them base station and telephone support for any emergency or routine traffic that required handling during the course of the night.

The net ended at 0400 PST New Year's Day with over 50 pieces of message traffic handled. This traffic included disabled vehicle assistance, road hazards, vehicular accidents (some with injury) and incidents involving erratic or reckless drivers where direct contact with police agencies was continually maintained until their units arrived to determine if violations of the California Vehicle Code were, in fact, being committed. This action resulted in a number of potentially dangerous drivers being removed from Southern California highways.

Additionally, there were a number of residual benefits as a result of this program. The stranded motorists who received assistance will long remember the support from ham radio operators. The California Highway Patrol, which for years has shunned the use of volunteer assistance, was so impressed with the professional manner in which traffic was handled that ARES is being considered for possible communications support for that agency during the 1984 Summer Olympics. Local ARES officials gained valuable information regarding multiple frequency usage, net management personnel, inter-county coordination and better understanding of liaison requirements with city, county and state agencies. All of the hams involved learned improved techniques in network interaction and expeditious traffic handling.

A critique of the program is currently under way and will be completed soon. Anybody wishing a copy of the critique or additional information regarding the program is invited to send their request along with an s.a.s.e. to Dick McKeever, N6BAW, 4854 Maychelle Dr., Anaheim, CA 92807.

The following systems were either used in direct support of the program or were monitored during the net in order to provide assistance to the many hams on the highways who were not directly associated with the Save a Life Net: WB6HUL/R (145.22 MHz), W6JBT/R (146.85), KC6K/R (146.79), WB6KRW/R (146.895), KJ6B/R (146.91), WD6DPY/R (147.975), W6TZ/R (146.88), N6DFQ/R (145.24), N6BAE/R (145.42), W6FXN/R (145.46), AA6DP (147.09), W6CNL/R (145.14), WB6RSD/R (146.985) and W6LOR/R (224.50). — *Ralph G. Swanson, WB6JBI, Anaheim, California*

## ARRL SECTION EMERGENCY COORDINATOR REPORTS

☐ At deadline, SEC reports received for 1983 totaled 517. Reports for the year decreased slightly from 1982 (529), and the number of different Sections reporting during the year was reduced by one (57). Twenty-five SECs reported every month, a decrease of 17% from last year (30). Including late reports, the following Sections had 100% reporting (the number in parentheses shows how many consecutive years of complete reporting have occurred): AB (6), AZ (2), IL (4), ME (3), MI (3), MN (2), MO (1), NE (1), NLI (3), NC (1), NFL (2), OH (6), ON (2), PAC (1), SDG (13), SJV (6), SD (1), SFL (32), TN (2), VA (2), WV (8), WMA (4), WNY (2) and WPA (2). The SFL Section added one more to its longstanding record, which now stands at 32 straight years.

Nonreporters numbered 16, one more than 1982. These sections were: BC, EBAY, GA, ID, LAX, MB, MR/NF, MDC, NM, ND, NNJ, PQ, SBAR, SK, SNJ and VT.

For January, 33 SEC reports were received, denoting a total ARES membership of 17,531. Sections reporting were: AB, AZ, CT, DE, EMA, ENY, GA, IN, ME, MI, MN, MO, NC, NE, NH, NFL, OH, OK, ORG, PAC, SV, SDG, SJV, SC, SD, SFL, TN, VA, WA, WV, WMA, WNY and WI.

## NATIONAL TRAFFIC SYSTEM

### January Reports

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| **Cycle Two** | | | | | | |
| **Area Nets** | | | | | | |
| EAN | 31 | 901 | 29.1 | .722 | 96.8 | |
| CAN | 31 | 680 | 21.9 | .449 | 100.0 | |
| PAN* | 62 | 657 | 10.6 | .378 | 100.0 | |
| **Region Nets** | | | | | | |
| 1RN | 60 | 459 | 7.6 | .367 | 93.1 | 100.0 |
| 2RN | 62 | 408 | 6.6 | .342 | 83.9 | 100.0 |
| 3RN | 31 | 226 | 7.3 | .416 | 93.5 | 100.0 |
| 4RN | 62 | 524 | 8.5 | .399 | 76.7 | 100.0 |
| RN5 | 62 | 511 | 8.2 | .364 | 98.4 | 100.0 |
| RN6 | 62 | 467 | 7.5 | .338 | 96.8 | 100.0 |
| RN7 | 93 | 926 | 10.0 | .617 | 97.1 | 100.0 |
| 8RN | 62 | 233 | 3.8 | .307 | 100.0 | 100.0 |
| 9RN | 62 | 302 | 4.9 | .262 | 99.2 | 100.0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| TEN | 62 | 434 | 7.0 | .345 | 80.3 | 100.0 |
| ECN | | | | | | 80.6 |
| TWN | 62 | 188 | 3.0 | .182 | 89.0 | 100.0 |
| **TCC** | | | | | | |
| TCC Eastern | 92[1] | 434 | | | | |
| TCC Central | 86[1] | 295 | | | | |
| TCC Pacific | | | | | | |
| **Cycle Four** | | | | | | |
| **Area Nets** | | | | | | |
| EAN | 31 | 1681 | 54.2 | 1.347 | 96.8 | |
| CAN | 31 | 775 | 25.0 | .839 | 100.0 | |
| PAN | 31 | 984 | 31.7 | .992 | 96.2 | |
| **Region Nets** | | | | | | |
| 1RN | 60 | 717 | 11.9 | .485 | 94.3 | 96.8 |
| 2RN | 89 | 687 | 7.7 | .510 | 96.0 | 90.3 |
| 3RN | 62 | 336 | 5.4 | .565 | 96.8 | 100.0 |
| 4RN | | | | | | 100.0 |
| RN5 | 62 | 491 | 7.9 | .524 | 95.8 | 100.0 |
| RN6 | 62 | 594 | 9.6 | .532 | 96.2 | 100.0 |
| RN7 | 62 | 529 | 8.5 | .513 | 94.9 | 100.0 |
| 8RN | 62 | 288 | 4.6 | .315 | 98.0 | 100.0 |
| 9RN | 62 | 390 | 6.3 | .362 | 96.0 | 100.0 |
| TEN | 61 | 331 | 5.4 | .368 | 84.4 | 100.0 |
| ECN | | | | | | 93.6 |
| TWN | 55 | 340 | 6.2 | .370 | 81.0 | 88.7 |
| **TCC** | | | | | | |
| TCC Eastern | 127[1] | 602 | | | | |
| TCC Central | 60[1] | 296 | | | | |
| TCC Pacific | 118[1] | 635 | | | | |
| Sections[2] | 7802 | 31,573 | 4.0 | | | |
| Summary | 9245 | 46,165 | 5.0 | | | |
| Record | 8347 | 50,754 | 19.1 | | | |

*PAN operates both cycles one and two.
[1]TCC functions not counted as net sessions.
[2]Section and local nets reporting (272): APSN ATN (AB), MG (AK), AENB AEND AENK AENR AENX AENY AENZ ATNM ECAN WAEN (AL), ACN ATEN HARC (AZ), BCEN (BC), NCN RTTY/V SCN/1 SCN/2 SCN/V SVTN/1 SVTN/2 (CA), CN CPN NVTN RSN WCN (CT), MDD (DE/MD), BEN DEN ENMC FAST FMSN FMTN FPON FPTN GCVTN GN LCEN LSTTN NFPN PBTN PEN PRVAN QFN SEFTN SPARC SVTN SWFTN TPTN (FL), CGVHF CSCN GCN GSBN GSN GTN NWGN (GA), 175MN ICN (IA), ILN ISN ITN (IL), ITN QIN (IN), CSTN KMWN KPN KSBN KWN QKS QKS-SS (KS), 3ARES 4ARES 5ARES 7ARES 11ARES BARES CARN KEN KNTN KSN KTN KYPON MKPN NKARC TSTMN WTEN (KY), LTN (LA), CITN EM2MN EMRI EMRIPN EMRISS HHTN NEEPN RIEM2MTN WMEN WMFN WMN WMTN (MA/RI), MEPN MMN MTN WRIN (MB) AEN CMEN MPSN OXRACES PTN SGN (ME), MACS MITN MNN QMN UPN (MI), MNAMWXNT MSN MSPN MSSN PAW (MN), CCARN CMEN HBN IFN JCARES LOACW LOAFM MEOW MON MOSSB MTTN RRARN SARN STARES (MO), MTN (MS), BSN MTN (MT) CN CSN (NC/SC), BVARES CC2MN EN2MN MARES MNARES NCHN NCN NE4O NE75 NE160 NENN NMPN NSN PV2MN SBARES TCARES WNN (NE) GSFM GSPN NHN (NH) HCATEN JSARS MCN NJM NJN NJPN NJSN NJVN OBTTN SJVN TCETN TCETN (NJ), NSN (NV), CDN CNYTN EPN HVN NCVHFTN NLI NLIPN NYPON NYS NYS/M OCTEN SCVHFTN SDN STAR WDN (NY), ALERT BN BNR BRTN BSSN HCARES LCNWOARES LCTN MCTN O6MN OSN OSSN (OH), CARA NWOSN NWOTN OLZ ONON OPEN OTN OTN OTWN QCWA-63 STN (OK), BSN LBLARES MPARES OHNN ORARES OSN PDXARES PTTN SOFM THN (OR), NWPA2MTN WPA WPA2MTN WPAPTN (PA), PTN (PAC), QSN (PQ), A2MN GPD2MN LG2MN SCNTN SCSSBN (SC), SDEEN SDTN WCEN (SD), TNCN TNPN TNVN TSRN (TN), DFW NET TEX TSN TTN TTN (TX), BUN UCN (UT) VTN (VT), EWTN NTN NWSSBN PSTS WARTS WSN (WA), BEN BWN NWTN WCWTN WIN WNN WSBN WSSN (WI), WINS (WIN), WVARN WVFN WVMDN WVN (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 | 124 | 74.2 | 862 | 434 |
| TCC Central | 93 | 92.5 | 611 | 295 |
| TCC Pacific | | | | |
| Summary | 217 | 89.3 | 1473 | 729 |
| **Cycle Four** | | | | |
| TCC Eastern | 148 | 85.8 | 1209 | 602 |
| TCC Central | 62 | 96.8 | 597 | 296 |
| TCC Pacific | 125 | 94.4 | 1247 | 635 |
| Summary | 335 | 92.3 | 3053 | 1533 |

1 — AREA
2 — FUNCTIONS
3 — % SUCCESSFUL
4 — TRAFFIC
5 — OUT-OF-NET TRAFFIC

### TCC Roster

The TCC Roster (January) *Cycle Two* — Eastern Area (AF8V, 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 K9AZS WA5BHF N5BT W5CTZ N5DFO W0FRC WD0FWB K5FW NG5G KW9J W4JL WA4JTE W9JUJ K5KJN W5KLV KD5KQ WB9NVN KB5UL K5UPN WF4X WB5YDD. Pacific Area (W0HXB, Director) — KT6A WA7CBN VE6CHK N7CSP N0CXI KU6D WD5ESV KD7EY KB7FE W7GHT W0HXB KM6I W5JOV KR7L KB0MB K0OVK K6OWA WA0OYI KF7R ND5T W7TGU K6UYK WB7WOW K6YBV KM7Z. *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
## January 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.

252
WB7WOW
212
K7VW
146
KA3DLY
136
KA1GBS
130
KB0Z
K4KDJ
126
WF4Y
123
K4SCL
122
KC9CJ
121
WA4QXT
WX4J
119
WB1GXZ
WF4X
118
WB2EAG
KA1EXJ
KX7W
116
KD7ME
W9YCV
115
AL7W
114
WB3GZU
113
KM9B
KB2HM
112
W7VSE
KK3F
111
WA4PFK
110
K4ZK
WB4RUJ
109
W9JUJ
N4GHI
108
WD8LRT
107
W2MTA
W3YVQ
VE7BNI
106
WB4WYG
KA1KML
W4ANK
N2XJ
105
W1KK
KA9IKR
N2AKZ
W8UE
W2VY
104
WX4I
KK1E
KC2TF
NI6A
103
WB1HIH
VE3BDM
WA4CCK
K4JST
WB0ZEN
N5AMK
102
KC3LY
WA4EIC
WD8MIO
WB2MCO
WD8RHU
101
WA7MEL
WB2OWO
WA4JDH
KB4OZ
100
N5BT
KC5NN
KB7FA
WA6ZUD
WB2KLF
99
WA2FJJ
WD4ALY
KT9I
WA0TFC
98
AK1W
KC2QQ
WB2ZCM
KB0MB
97
N5DKW
NG4J
WD4CNQ
K2ZVI
96
W1RWG
KJ3T
KA4SAA
W0OYH
KA0ARP
K8KQJ
K3JL
W6VOM
95
W1PUO
KA9ARP
W9DM
K2VX
94
KT6A
WB6QBZ
K7GXZ
KA5HDT
W1TN
WB4YQP
AG9G
93
W1EOF
W4CKS
VE2GFH
KR4V
KA0EPY
92
K6UYK
N6AWH
KA2BHR
K8TI
VE3GT
VE3WM
KA8GJV
KI1M
N4PL
K4VWK
WB2GHN
91
W3VA
KA1T
WB0TED
VE3KK
WA2ARC
KB4WT
90
WB1ABQ
VE3DPO
K2ZM
KA8CPS
89
N3COY
NW4R
WA4LXP
KC3Y
KA0BWM
W5CTZ
88
WB1GLH
KA4GUS
WB4WII
N1CPX
N9BDL
AA4AT
87
WA1YNZ
KB5UL
KT6D
WB2RBA
WB5NCM
K4IWW
AA2H
W2BIW
WB2OHR
WB2VUK
86
KA3GJT
KA1EPO
KA6BNW
KA1BHT
KF8J
W0IKT
85
KJ3E
KA4BCM
KA4MTX
84
KD5FR
KA2DQA
W0KK
KU4W
KS5V
N8EVC
N0CFS
W8QHB
KY2P
83
K1JHC
WA4YPQ
WB2UVB
WB8MTD
82
WA4GYR
N1ER
81
KY4U
N1BGW
W2AET
W7LG
KA0BCB
WA4EYU
KA8NCR
WA3DUM
80
KL7IJG
WA3WIY
N6GIW
W2PKY
79
KQ3T
WB5YDD
N0EEH
78
W9NXG
AD7G
WA2NKC
KV7F
N5TC
N2EOV
77
N8CW
WB2IDS
76
WA2KOJ
AI6E
KA8PQH
75
K1CB
N7BGW
KG9B
K0SI
WD5GKH
K6AGD
74
WA3UNX
WD4OCW
WD8OUO
73
ND2S
K8ND
KB4LB
WB4TZR
WD4HBP
KT5Y
AK2E
72
N1BJW
WB5MMI
K4ZN
71
KD9K
N1AJJ
KA2QIK
WD4BSC
KD0JM
W2XD
70
WB9IHH
W6INH
W2ZOJ
69
W2GJ
KV8Q
K4WJR
68
KB3UD
WB4AID
WA1FCD
KO7V
W5KLV
67
N3DKC
66
KF7R
W7LNE
WD4PBF
WB4HRR
WB8WKQ
WD2AFI
65
VE2FMQ
KX7T
WB3KJT
WA6QCA
WA4JTE
KA4SKV
VE3GOL
WB8SYA
64
K7LCA
KX2T
K3NNI
W4HON
W0OUD
WA8DHB
W4FMZ
63
W1JRA
WD4KBW
VE2EDO
AI0O
N2EKS
62
W2FR
KR7F
WD8KBW
KZ9V
KD2BE
61
KC3DW
VE3HTL
WB4DQZ
KC0OO
K0PCK
NV6T
60
KA5AZK
K2GXT
K7OVK
KA7AID
WA0SCP
KA1GWE
W8MVA
KB4OG
57
KA1BBU/T
WB8NHV/T
52
KA2OVL/T
N5EZM/T
51
KA6HJK/T
50
KA2OPG/T
48
WB2ANK/T
47
KA1HPO/T
45
WA2MGV/T
42
KA2COX/T
N1CLV/T
N0DGM/T

## Brass Pounders League
## January 1984

BPL Medallions (see April 1979 *QST*, page 77) have been awarded to the following amateurs since last month's listing: KA1T K2GXT.

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 | 807 | 989 | 1571 | 89 | 3456 |
| N0BQP | 38 | 1367 | 168 | 758 | 2329 |
| KA9CPA | 39 | 1243 | 112 | 836 | 2230 |
| WA0HJZ | 6 | 951 | 31 | 549 | 1537 |
| KA1GBS | 5 | 452 | 499 | 40 | 996 |
| W1EOF | 1 | 304 | 554 | 9 | 868 |
| W9JUJ | 4 | 400 | 435 | 8 | 847 |
| W3VR | 281 | 193 | 269 | 19 | 762 |
| WA4JDH | 0 | 388 | 328 | 0 | 716 |
| WB7WOW | 26 | 291 | 231 | 86 | 634 |
| K0JAN | 0 | 367 | 31 | 231 | 629 |
| KA1KML | 5 | 279 | 303 | 31 | 618 |
| W7VSE | 1 | 327 | 266 | 11 | 605 |
| WF4X | 5 | 271 | 263 | 23 | 562 |
| KT6A | 3 | 313 | 206 | 9 | 531 |
| WD8MIO | 32 | 318 | 158 | 23 | 531 |
| AA4AT | 28 | 232 | 259 | 4 | 523 |

BPL for 100 or more originations plus deliveries:

| | | | |
|---|---|---|---|
| WD4IIO | 168 | WA1YZN | 109 |
| KB0MB | 165 | W0HZU | 109 |
| KH6B | 134 | WD4GUZ (Dec.) | 104 |

Multioperator stations:

| | |
|---|---|
| K2GXT | 258 |
| K4KDJ | 111 |

1 — CALL
2 — ORIG.
3 — RCVD.
4 — SENT
5 — DLVD.
6 — TOTAL

## Independent Nets (January 1984)

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| Amateur Radio Telegraph Society | 31 | 606 | 372 |
| Central Gulf Coast Hurricane | 31 | 242 | 3382 |
| Clearing House | 31 | 149 | 401 |
| Early Bird | 31 | 1037 | 455 |
| Golden Bear | 31 | 99 | 2148 |
| IMRA | 26 | 729 | 1656 |
| Mission Trail | 31 | 276 | 1019 |
| New England Novice | 31 | 238 | 359 |
| North American SSB Traffic | 26 | 57 | 270 |
| West Coast Slow Speed | 32 | 73 | 413 |
| 20-Meter ISSB | 26 | 823 | 433 |
| 75-Meter ISSB | 31 | 227 | 1180 |
| 7290 Traffic | 48 | 465 | 3800 |

1 — NET NAME
2 — SESSIONS
3 — TRAFFIC
4 — CHECK-INS

# Contest Corral

## A Roundup of Upcoming Operating Events

Conducted By
Edith Holsopple,* N1CZC

### MARCH 31-APRIL 1

**Connecticut QSO Party,** March *QST,* page 92.

### APRIL

3

**West Coast Qualifying Run,** 10-40 WPM, at 0500Z April 4 (9 A.M. PST April 3). W6OWP prime, W6ZRJ alternate. Frequencies are approximately 3.590/7.090 MHz. Underline one minute of the highest speed you copied, certify that your copy was made without aid and send to ARRL for grading. Please include your full name, call sign (if any) and complete mailing address. A large s.a.s.e. will help expedite your award/endorsement.

7-8

**The SP-DX Contest,** phone, March *QST,* page 92.

**DX-YL to NA-YL Contest,** CW, sponsored by YLRL for women licensees (phone is April 14-15) from 1800Z April 7 until 1800Z April 8. Net, repeater and OM contacts do not count. Exchange call sign, QSO no., RS(T) and state or country. Logs must include time, band, date and power. Phone and CW contests are separate. DX YLs (including HI and AK) work the 48 contiguous states and Canada. North American YLs contact DX. Count 1 point for each contact per band. Multipliers are the DX states and provinces or countries worked. Count each multiplier once. Low-power stations (CW — 150 W or less, phone — 300 W or less) multiply total score by 1.25. Suggested frequencies are: CW — 3.540-3.570, 7.040-7.070, 14.040-14.070, 21.180-21.210, 28.180-28.210; phone — 3.940-3.970, 7.240-7.270, 14.280-14.310, 21.280-21.310, 28.580-28.610. Awards and certificates. Send original logs by April 29 (none will be returned) to YLRL VP Marty Silver, NY4H, 3118 Eton Rd., Raleigh, NC 27608.

12

**W1AW Qualifying Run,** 10-35 WPM, at 0300Z April 13 (10 P.M. EST April 12). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 147.555 MHz. See April 3 listing for more details.

14-15

**DX-YL to NA-YL,** phone. See April 7-8 listing for more details.

15

**Gagarin Cup Competition,** sponsored by the Radiosport Federation of the USSR on behalf of the IARU (Region 1) from 0001Z until 2400Z April 15. CW only. Exchange RST and ITU Zone. Contest QSOs only in the following band segments: 1.85-1.95, 3.505-3.600, 7.005-7.040, 14.010-14.100, 21.010-21.150 and 28.010-28.200 MHz. Call "CQ-GC." Entry classes are: single operator — all bands, single op-single bands, or multioperator-single transmitter-all bands. Score 1 point for each QSO within own continent, 3 points for QSOs with other continents. Multipliers are sum of different ITU Zones worked on each band. Send complete log (separate log for each band) and summary sheet postmarked by June 1 to GC DX Contest Committee, POB 88, Moscow, U.S.S.R.

### APRIL 15-JULY 14

**AMSAT-Stoner Challenge Cup,** see page 57 this issue for details.

16

**ARRL VHF/UHF Spring Sprint,** 144 MHz. Note: The Sprint times printed in the March issue are incorrect. The Sprints will be held 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. Only these recognized simplex frequencies may be used: 144.90 to 145.10; 146.49 .55 and .58; and 147.42 .45 .48 .51, .54 and .57 MHz. This restriction 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. Use of the national calling frequency, 146.52 MHz, is prohibited. 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.

21-22

**QRP QSO Party,** sponsored by the QRP ARC International, from 1200Z April 21 until 2400Z April 22. CW only. Operate a maximum of 24 hours. Power level must not exceed 5-W output. Exchange for members is RST, state/province/county and QRP ARCI membership no. Nonmembers exchange RST, state/province/country and power output. Work each station once per band for multiplier credit. Each member-contact counts 5 points; each nonmember U.S. or Canadian contact, 2 points. Each nonmember contact other than W/VE counts 4 points. QSO points (total all bands) times total no. of states/provinces/countries (an s/p/c may be worked on more than one band) times power-multiplier times bonus-multiplier equals claimed score. Multipliers are 4-5 W output ×2, 3-4 W output ×4, 2-3 W output ×6, 1-2 W output ×8, less than 1-W output ×10. Bonus multipliers: If 100% natural power with no storage, ×2. If 100% battery power, × 1.5. Suggested frequencies are 1.810 3.560 7.040 14.060 28.060 50.360 MHz; Novices and Technicians — 10 kHz from the bottom of each band. Certificates. Logs must be received by May 21. Send to QRP ARCI Contest Chairman Eugene C. Smith, Jr. KA5NLY, 16 Fairmont Dr., Little Rock, AR 72204.

24

**ARRL Spring Sprint,** 220 MHz. See April 16 listing for more details.

28-29

**County Hunters SSB Contest,** from 0001Z to 0800Z April 28, 1200Z April 28 to 0800Z April 29 and 1200Z to 2400Z April 29. Work fixed stations once only. Work mobiles again as they change bands or counties. Mobiles on a county line count as one contact and two multipliers. Mobile teams count as two contacts if both participate in the exchange. No net QSOs. Exchange signal report, county and state (country for DX stations). Suggested frequencies: 3.920-3.940 7.220-7.240 14.275-14.295 21.375-21.395 28.625-28.650. Avoid "mobile windows" from 3.925 to 3.935, 7.225-7.235 and 14.280-14.290. Count 1 point per QSO with fixed W/VE stations, 5 points for DX QSO, 15 points for QSOs with mobiles, and 30 points for mobile team QSOs. Multiply QSO points by total U.S. counties plus Canadian stations worked for final scores. Awards. Entries must be received by June 1. Mail to John W. Ferguson, WØQWS, 3820 Stonewall Ct., Independence, MO 64055.

**Massachusetts QSO Party,** sponsored by the Pilgrim Amateur Wireless Assn., from 1600Z April 28 until 2400Z April 29. Work each station once per band. (Phone and CW count as separate bands.) No crossband or repeater contacts permitted. MA stations send RS(T) and county; all others send RS(T) and state or province. Count 2 points for phone QSOs and 4 points for CW QSOs. MA stations multiply by MA counties, states and provinces worked; others multiply by MA counties worked and PAWA club members. Count mobiles again as they change county. Certificates. Suggested frequencies for Phone and CW: 20 kHz from the bottom of the General portion of the band, and in Novice bands on CW. Logs must include date, time, band, mode, call sign and exchange. Include a summary sheet. Use a dupe sheet if more than 100 QSOs. Mail by May 31 to Ed Peters, K1KJT, 29 Greenbrier Dr., New Bedford, MA 02745.

**Helvetia Contest,** sponsored by the USKA (Switzerland), from 1300Z April 28 until 1300Z April 29. CW and phone, 160-10 meters (no WARC band operation). Work stations once per band, regardless of mode. Exchange RS(T) and 3-digit serial no. Swiss stations will also send one of the following abbreviations to indicate their canton: BL ZH BE LU UR SZ OW NW GL ZG FR SO BS SH AR AI SG GR AG TG TI VD VS NE GE JU. Count 3 points per QSO with Swiss (HB) stations. HB stations also work each other. Multiply by number of Swiss cantons worked (max. 26 per band). Awards. Separate QSOs by band on logs. Mail entry by May 28 to Gody Stalder, HB9ZY, Tellenhof, C-6045 Meggen, Switzerland.

### MAY

1

**CW QRP Party,** sponsored by the DL Activity Group CW, from 1300Z to 1900Z May 1. CW only, 80 and 40 meters. Categories: A — max. 5-W input/2.5-W output; B — max. 25-W input/12.5 W output. Work stations once per band. Exchange signal report, serial number and category. Count 1 point for QSOs in your own country, 2 points for DX. QSOs with category A stations count double points. DXCC countries count as multipliers. Score each band separately, then add band totals for final score. Mail logs by May 31 (include s.a.e. and IRC for results) to Werner Henning, DF5DD, Mastholter Strasse 16, D-4780 Lippstadt, Fed. Rep. of Germany.

2

**ARRL Spring Sprint,** 432 MHz. See April 16 listing for more details.

**West Coast Qualifying Run,** 10-35 WPM, at 0500 May 3 (9 A.M. PST May 2). See April 3 listing for more information.

5

**World Telecommunications Day Contest,** phone, sponsored by LABRE, from 0000Z to 2400Z May 5. No rules have been received this year.

5-6

**Late Spring QRP SSB Activity Weekend,** sponsored by the G-QRP club. Times (UTC)/frequencies: 0900-1000/14.285; 1000-1100/21.385, 28.885; 1100-1200/7.090; 1200-1300/3.690; 1300-1400/14.285; 1400-1500/3.690; 1500-1730/21.385, 28.885; 1730-2000/14.285; 2000-2100/7.090; 2100-2200/3.560; 2200-2300/14.285. For further details, contact Christopher J. Page, G4BUE, "Alamosa," The Paddocks, Upper Beeding, Steyning, West Sussex BN4 3JW, England.

**Florida QSO Party,** sponsored by *Florida Skip Magazine,* from 1400Z to 1900Z May 5 and 0001Z-0500Z and 1500Z-2300Z May 6. 160-2 meters. Suggested frequencies: CW — 3.555 7.055 14.055 21.055 28.055 MHz; for phone — 3.945 7.279 14.279 21.379 28.579. Phone and CW are separate contests. Use separate logs. Work each station once per band and mode. No crossband, crossmode or repeater contacts. FL classes are: A — those operating portable on emergency power and running 100 W or less output inside FL but outside their home counties; Class B — all other stations operating in FL. Indicate single-op or multi-op. For exchange, FL stations send signal report and county. Others send signal report and state, province or country. FL stations count 1 point per QSO. Multiplier is the total states (49 max.), provinces (12 max.) and DX countries (27 max.). All others count 2 points for each FL QSO. Multiply by total of FL counties worked (67 max.). FL Class A stations multiply final score by 1.5. Certificates and plaques. Include a summary sheet with logs and a dupe sheet if more than 200 contacts. Entries must be postmarked

*Communications Assistant, ARRL

by June 3. Mail to Florida Skip Contest Committee, c/o North Florida ARS, P.O. Box 9673, Jacksonville, FL 32208

**10**

**ARRL Spring Sprint,** 1296 MHz. See April 16 listing for more information.

**11**

**W1AW Qualifying Run,** 10-35 WPM, at 0300Z May 12 (10 P.M. EST May 11). See April 3 and 12 listings for more information

**World Telecommunication Day Contest,** CW.

**12-13**

**A. Volta RTTY DX Contest,** sponsored by the SSB and RTTY Club of Como and the ARI, from 1200Z May 12 until 1200Z May 13. 80-10 meters. Classes are: A1 — single op/all bands; A2 — single op/single band; B — multiop, single transmitter (list names and calls of all operators); C — SWL. Work each station once per band. Two-way RTTY contacts with stations outside one's own continent on 3.5 or 28 MHz count double. Contacts within one's own country do not count. Count one multiplier for each DX QSO per band. Add an additional multiplier for each intercontinental country worked on four or more bands. All two-way RTTY contacts will count points in accordance with the Exchange Points Table, available from the sponsor. For the score: the total exchange points × the total number of multipliers × the total number of QSOs. Use the ARRL countries list plus U.S., Canadian and Australian call areas as multipliers. Exchange RST, QSO no. and ITU Zone no. Use one log per band. Send logs before July 16 to Francesco Di Michele, 12DMI, P.O. Box 55, 22063 CANTU, Italy.

**CQ-M Contest** (Peace to the World), sponsored by the Krenkel Central Radio Club of the USSR, from 2100Z May 12 until 2100Z May 13. CW and Phone, 3.5 through 28 MHz. Amateur satellites count as a separate band if a 144- to 28-MHz mode is used. Work stations once per band, regardless of mode. No crossmode QSOs. Categories: single op, single band; single op, all band; multioperator, single transmitter (all bands); SWL. Non-USSR stations send RS(T) and 3-digit serial number. USSR stations send signal report and oblast number. Avoid lower 5 kHz of 80/40 meters and lower 10 kHz of 20/15 meters. Count one point per QSO within your continent, 3 points for other continents. QSOs with your own country count for multiplier credit, but have no point value. Multiply total QSO points by the sum of different countries (R-150-S country list) worked per band. Serious competitors should review the R-150 list. Awards. Mail logs by July 1 to CQ-M Contest Committee, P.O. Box 88, Moscow, USSR.

**19**

**ARRL Spring Sprint,** 50 MHz.

**Armed Forces Day**

**19-20**

**Georgia QSO Party**

**20-21**

**Michigan QSO Party**

**22**

**W1AW Qualifying Run**

# Special Events

Conducted By Edith Holsopple,* N1CZC

**Xenia, Ohio:** Xenia Weather AR Net will operate WB8QZZ 1500-0300Z *March 31* and 1500-2300 *April 1* to commemorate the contributions of Amateur Radio and XWARN, which was started as a result of the killer tornadoes that destroyed half the town 10 years ago. Suggested frequencies are: phone — 7.275 14.275 21.375 146.52 simplex and the XWARN repeater, 147.165/765. QSL via N8CYS.

**Benton, Kentucky:** The Marshall County ARA will operate from 1800Z *April 1* until 2400Z *April 2* to commemorate the 141st Tater Day Celebration. CW — 7.120 MHz; phone — 20 kHz up from lower 40-15 meter General band edges and 146.55 simplex. Certificate via WG4U.

**Bech, Luxembourg:** Sixteen members of the Dordtse Electronica Club will operate from Luxembourg from 1800Z *April 5* until 2400Z *April 8* on all bands (including WARC and 160 meters). All members will sign /LX. QSL via bureau.

**Shreveport, Louisiana:** Shreveport operators are sponsoring the Holiday-in-Dixie QSO Party celebrating the Louisiana Purchase. Operation will be on 40, 20 and 15 meters from 1800Z to 2300Z and 10 meters from 1800Z to 1900Z *April 7*. CW — 60 kHz up from the lower band edges; phone — 7.240 14.280 21.370 28.570. Novices — 7.125 and 21.125.

**Wichita Falls, Texas:** This event commemorates "Terrible Tuesday," April 10, 1979, when a tornado devastated the city. Operation will be from 1400 to 2400Z *April 7-8* on 80-10 meters, 25 kHz up from lower band edges. Certificate via ND5X or WD5BNY.

**Wilmington, North Carolina:** The Wilmington Azalea Coast ARC will operate WD4HMA from 1400Z to 2200Z on *April 7-8* from the battleship *USS North Carolina*. Frequencies will be approx. 20 kHz up from the lower edges of the General class phone bands, 10-40 meters.

**Lolo Pass, Idaho:** The Hellgate ARC of Missoula, Montana will operate WB7SFL at Lolo Pass, commemorating the Lewis and Clark expedition's crossing of the Bitterroot Mountains. Operation will be on *April 7-8* in the lower 50 kHz of the General portion of 10, 15 and 20 meters, from 1700Z to 2400Z each day.

**Philadelphia, Pennsylvania:** Olympia ARC will operate from *USS Becuna*, a historic submarine. Frequencies are: phone — 7.235 14.285 21.360 28.600 146-MHz-FM; CW — 7.050 14.050 21.090 28.150 plus Novice bands.

**Camdenton, Missouri:** The Lake of the Ozarks ARC will operate station WØNA on *April 14* starting at 1500Z, in conjunction with the annual Dogwood Festival. Operating frequencies: Novice — 7.125; phone — 7.250 and 14.255.

**Brackettville, Texas:** Border ARS and Uvalde RC will operate W5LFG from their third Annual Alamo Village DX-Pedition on *April 14-15*, on all bands.

**Oxfordshire, England:** Vale of White Horse ARS will operate GB4GWR in a former Great Western Railway saloon coach at Didcot Railway Centre. Activity will be from *April 15-23* on HF and VHF bands.

**Waverly, Ohio:** Pike County ARC will operate from 1600Z-2100Z on *April 21-22*. Operation will be 10 kHz up from the lower edge of the 40-meter General phone band. QSL via WD8BGN.

**Nebraska City, Nebraska:** Nebraska City ARC will operate KØTIK from the State Arbor Lodge, former home of J. Sterling Morton (founder of Arbor) during the annual Arbor Day celebration. Times will be from 2400Z *April 27* to 0600Z *April 29* in the General portion of the phone and CW bands on 80-10 meters. Certificate via KAØOKI.

**Bryan, Texas:** Bryan ARC will operate W5RAS from the Crockett National Forest to commemorate the contributions of Davy Crockett to the fight for Texas independence. Times will be from 1800Z to 0600Z *April 28* on 80-2 meters in the phone bands. Certificate via KA5OIT.

**Columbus, Mississippi:** The Lowndes County ARC will operate KA5MMK from the Mississippi Sheriffs Boys Ranch (Lowndes County Unit) on *April 28* from 1500 to 2300Z. Frequencies will be 10 kHz from lower end of General class bands (40-10 meters). Certificate via KA5MMK.

**Wyandotte, Michigan:** Motor City RC members will operate throughout 1984 in celebration of its 52nd year as a radio club and 50 years of holding the call W8MRM. Certificate available via W8MRM.

**Note:** The deadline for 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 April 15 to make the June issue.

*Communications Assistant, ARRL

## Strays

When Robert Cardarelli, KA1GFY (center), of New Britain, Connecticut, visited his native Italy recently, he was the guest of honor of the radio group of Roseto degli Abruzzi, who were celebrating their entry into the Regional Institute of Gastronomy. With KA1GFY are (l-r) IØNC, club President I6AEN and I6TEM (foreground).

# 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. Minor Hockey Week kept the NARC busy transmitting scores to a Hqs. Regret to report two Silent Keys, Namely VE6BHA and VE6ABN. The AARCS Net has experienced such poor signals in the evening so is now meeting at 0830 A.M. local time Sunday on 3750 kHz — all are welcome. Traffic: VE6CHK 166, VE6BLY 66, VE6ABC 38, VE6YW 4, VE6QN 4.

**BRITISH COLUMBIA:** SM, K. Ernie Savage, VE7FB — British Columbia Emergency Net CW 3650 kHz Asst. Net Manager VE7BNI is monitoring BCEN frequency from noon till net time at 0300Z. With such poor conditions at net time has has been able to handle a fair amount of traffic before net. BC Public Service net 3757 kHz, reports for the month is total check-ins 535 with a high of 242 and low 102. Net Manager VE7QC has had several trips to hospital. VE7PB had a successful opening of the new store Dollards Radio West, with several hundred amateurs milling about drooling at the goodies. With VE7FKZ carried away the handheld. Oh yes, the SM has a new rig Icom-730. Traffic: VE7BNI 277, VE7CDF 93, VE7ZK 79, VE7CCJ 26, VE7FB 18.

**MANITOBA:** SM, Peter Guenther, VE4PG — SM: AEJ. STM: OO. SEC: HK. NMs: VJ TE NM IX. We are happy to report that VE4PA is back from the hospital. VE4AJE drove him to the Winnipeg Hospital. Checkins on all nets are up, and we are glad to see the CW net QNI is increasing as well. MTN QNI 210, QTC 46, sess. 28, WRIN QNI 337, QTC 1, sess. 9. MMN QNI 573, QTC 35, sess. 31. MEPN QNI 1359, QTC 33, sess. 31. Traffic: VE4AJE 84, VE4IX 44, VE4RO 44, VE4PG 38, VE4TE 33, VE4AAD 19, VE4HK 13, VE4AED 12, VE4AMO 12, VE4ADS 9, VE4JA 9, VE4DT 8, VE4FK 8, VE4CR 5, VE4HA 2, VE4JF 2, VE4NE 2, VE4NM 2, VE4AEZ 1, VE4JK 1.

**ONTARIO:** SM, Larry Thivierge, VE3GT — BM: VE3IBV. PGL: VE3AR. SEC: VE3GV. STM: VE3HTL. TC: VE3EGO. The Transprovincial Net (TPN) operating daily 0900 to 1700 on 7.055 MHz USB recently provided assistance for a serious traffic accident at Burk's Falls. Their quick action saved at least one life. The call for assistance came from VE3KLK/M who came upon the accident. Members of the TPN who assisted were NCS VE3OED VE3CU and VE3LZI. This net is similar to EASTCARS, and is managed by VE3LZI. VE3AIB, member of the VHF/UHF Advisory Committee, VE3CEA, long time prominent KW area amateur and member of the famous Coffee Club, and VE3YI have become Silent Keys. New appts: VE3LSU, EC for St. Thomas; Elgin Co. OBS: VE3MZH for the North Bay area. 1984 marks the 50th year as a radio amateur for VE3JFN who was first licensed in '34 as VE3XV. Argyle Mall was host to the London ARC's successful Amateur Radio display. SSB, CW, RTTY and fastscan TV were featured. Those helping out were VE3s MGU NRJ GAM BBI NMD NMG MBP MGF NMT MGY DSK. In the WCY RTTY contest sponsored by the Australian National Amateur Radio Teleprinter Society, VE3UR VE3JHC and VE3JPC placed first in the multiop category, receiving both a plaque and certificate. Congrats to VE3AJN who has been appointed assistant net manager for the International Assistance and Traffic Net (IATN) on 20 meters. VE3CM has started a mail box on 3.630 MHz. A 2-metre link system is in the works for VE3TTT. At the Welland Co. ARC monthly meeting, VE3IFY of Ontario Hydro Research Department discussed the phenomenon of lightning as it affects Amateur Radio installations. VE3JPC is attempting to create some interest in starting a 2-metre RTTY net in the Ottawa area. Traffic: VE3CYR 209, VE3GT 207, VE3KK 203, VE3HTL 133, VE3HGJ 130, VE3AWE 124, VE3GOL 121, VE3KXB 100, VE3DPO 82, VE3AJN 71, VE3KCZ 59, VE3BCZ 57, VE3WM 46, VE3GFN 45, VE3BDM 41, VE3FGU 37, VE3WG 37, VE3MPF 23, VE3EWD 13, VE3WV 13, VE3EHL 9, VE3BAJ 6. (Dec.) VE3AWE 273.

**QUEBEC:** SM, Harold Moreau, VE2BP — STM: VE2EDO. BM: VE2ALE. PIC: VE2YW. TC: VE2ED. NMs: VE2EDO VE2FSA. The Air Canada Montreal ARG have their own repeater, VE2RBI, output 147.975 MHz and input 147.375 MHz. It is the first "ham" repeater to be situated on a Federal Airport in Canada. Snowbirds that have gone south are VE2s DHR DVX EDN and EDO. VE2FJR est le directeur du reseau VE2MO (146.67). Felicitations a VE2ED pour la traduction et emission des bulletins en RTTY, le lundi et vendredi a 2130 hrs sur 3640 MHz. Traffic: VE2GFH 102, VE2EDO 80, VE2CU 80, VE2EC 42, VE2BP 38, VE2EKC 22.

**SASKATCHEWAN:** SM, W.C. Munday, VE5WM — STM: VE5HG. SEC: VE5RP. TC: VE5GF. NMs: VE5NJ VE5BAF VE5HG VE5OI VE5EX. An Amateur Radio static display has been set up in the Regina Plains Historical Museum. The MJARC mobile project is continuing with assistance provided by VE5s IL AFU AV AQ and ham to be Jocko. The SWARC announce the new antenna for the Tompkins repeater is now ready. Repeater frequency is 147.07/147.67 MHz. The SARC auto-patch repeater will be operating soon from the EMO building on a frequency of 146.37/146.97 MHz. Congrats to VE5HG who replaces VE5BEX as SARC director. Traffic: VE5BAF 26, VE5AFQ 20, VE5HG 15, VE5AAT 14, VE5UX 14, VE5WM 5, VE5AEJ 2.

### ATLANTIC DIVISION

**DELAWARE:** SM, John Hartman, WA3ZBI — STM: W3DKX. SEC: W3PQ. PIC: N3DIP. PHSR: K3JL WA3DUM WA3WIY W3DKX. The Millsboro repeater now has an autopatch, and the SARA members are pleased with its performance. As new SM, I hope I will do as well as my predecessors. DTN: QNI 454, QTC 41 in 22 sessions. DEPN: QNI 77, QTC 9 in 4 sessions. SEN: QNI 54, QTC 8 in 5 sessions. Traffic: W3PQ 133, WB3DUG 44, WA3WIY 39, W3QQ 36, WA3DUM 28, W3DKX 24, K3JL 19, W3FEG 14, N3AXH 8, K3ZXP 8, KC3JM 7, WA3ZBI 5, W3WD 4.

**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 | 526 | 153 | 31 |
| EPA | 7/10 P.M. Dy | 3610 | 409 | 187 | 62 |
| PTTN | 6:30 P.M. Dy | 3610 | 265 | 109 | 30 |
| PFN | 5 P.M. Dy | 3958 | 175 | 117 | 31 |

Local and VHF nets reports (QNI/QTC sess): D3ARES 164/18/5; D5ESN 58/3/5; D6ARES 36/2/4; ATN 36/5/8; CCARES 38/1/4; CSVARES 40/1/4; LCARES 71/8/9, KC3LY new NM for Anthracite Traffic Net (ATN). OBS reports: KC3LY W3CL W3VA. PSHR: K3NTD KA3DLY KA3GJT KB3UD KC3LY N2BSK/3 N3COY N3DKC W3GOA W3VA WA3JRL WB3FKP. EPA welcomes N3DKC. PTTN welcomes N2BSK/3. W3AMQ doing FB job as new PIO for EPA. W3CL reports Pack-Rats made a tremendous score in recent VHF SS contest. New officers for Tamaqua ARA: W3VA, pres.; K3BWE, v.p.; WA3OFD, secy.; W3EEK, treas. Keystone ARC: W2DGZ, pres.; W3UQJ, 1st v.p.; W3SST, 2nd v.p.; K3DJC, secy.; W3FLD, asst. secy.; K3GDI, treas.; W3IQF, trustee. Congrats to Warminster ARC now SSC. KA3EJG now KC3LY. WB3FYT enjoying new TS930. Congrats to KA3A on making 5BDXCC, N3DKC sends last report, is going to school in W. Mass and op W1JRA. WA3AQN reports all gear now equipped for emergency operation. DLARC Novice classes began with 30 prospective Novices. Nice to hear W3HK back in nets again. N3AAU has been appointed by the Holmsburg ARC to organize a revival of the Delaware Valley Council of Amateur Radio Clubs which was in existence a number of years. Recent upgrades: Extra — KA3IFG KA3JFB KA3JFE KB3OM WB3AMG; Advanced — KA3IDD KA3JFA N3CUB N3DCF WB3FUR; General — K3BLD KA3FJC. Congrats to all. The PWA, DLARC & Murgas ARC finished 2nd, 3rd & 4th respectively in recent PA QSO Party. N3DAY was top single op in same Party. Traffic: KA3DLY 325, N3COY 214, W3IPX 201, KB3UD 152, N3AIW 126, WB9KPE 82, KA3IME 79, AA3B 75, KC3LY 73, N3CD 66, N3DKC 65, W3VA 58, WA3WQP 54, KA3GJT 49, WA3QN 37, W3SD 20, W3CL 15, W3TWV 15, K3NTD 12, WA3CKA 12, N2BSK 11, W3ADE 11, K3QXC 8, WB3FKP 7, N3CMC 6, N3BFL 3, W3HK 3.

**MARYLAND — DISTRICT OF COLUMBIA:** SM, Karl R. Medrow, W3FA — After two major operations, K3CN is well on the road to recovery. His highlight talking to the AARC Installation Dinner gang from the hospital via 2 meters. KC3D can't wait for winter to end and to get back on the tower. KB3WL puzzles over the funny WX in Garrett Co. KJ3E has become a netter! W3CDQ found SKN special as did many. New Goddard ARC Extras are N3DTO N3CJN and KA3FOX. Congrats! EC WA5UNR/3 cites K3HKI W2WLS KB3FS KA3GLF KJ3E N3AGJ W3NET W3EYP WD6BAA W3ZQD WA4CYR and KA3ICG for a RACES/ARES drill; well done. SEC WA3TAI is happy with results too. ACC KA3DRO says NCDXA and Potomac Area VHF Society are 100% ARRL. The CBARA has KC3IQ, pres.; WB3ISS, v.p./treas.; KB3B, secy.; KA3DRO, director. W3FA enjoyed visiting them at the annual dinner. WB3KJT reflects on all the good things about Amateur Radio. KA3R is finding key clicks this month. KC3EK named quietly holds his end down. WA3KCY has been named OO/RFI Coordinator for the section. Congrats. KC3AV has KC3Y as Traffic Director and N3DE as Training Director of the MSN. WB3BFK reports WR PON activities. W3OYY is coming along nicely after surgery. KB3NL is eyeing computers. W3DQI travels cross country. Find KA3EWV on MDD and MSN. KJ3T is a source of good info. W3UT is pleased with his homebrew W7ZOI superhet. K3NNI is busy as usual. W3FZV is spending some time in NJ. N3QA is on the Eastern Shore side of the Bay Bridge. W3UYVQ had a good month. WA2ERT/3 is new in Rockville. N3IT is our early bird. WB3GZU reserves weekends for ham radio. K3TEZ has his tribander right where he wants it — at the top of the tower! N4DR will dabble in high power. With the nets (net/manager sessions/QTC/QNI avg.) WR PON/WB3BFK 26/31/15.5; WC 2-mtr/KC3DW 5/3/16.6; MSN/KC3AV 31/108/11.4; MDD/W3PQ 62/276/11.9; MEPN/WB3GZU 31/161/30. 100% W3LDD. Brass W3FA, KJ3E and W3QQ. Three or less W3BRZ WA3IHW K3ONU and KC3Y. W0EWN Laurel ARC earned his certificate for worked all counties — congrats. Tnx for Feedback, FAR, GARC, CARA, MARC, CBARA, SMARC and AARC for newsletters and bulletins. Traffic: WB3GZU 413, KJ3E 154, W3FA 140, KC3DW 120, KC3Y 101, K3NNI 97, W3YVQ 90, W3UT 88, KA3EWV 88, WB3KJT 77, KC3AV 72, KK3F 72, KB3WL 67, KJ3T 66, N3QA 37, WB3BFK 23, W3FZV 14, W3LDD 22, W3DQI 16, N3IT 8, KB3NL 8, N4DR 7, KC3D 5, WA2ERT/3 4, K3TEZ 4. (Dec.) K3TEZ 16, KC3D 8.

**SOUTHERN NEW JERSEY:** SM, Richard Baier, WA2HEB — SEC: K2NE. STM: WA2HEB. ACC: K2IXE. BM: WB2UVB. SGL: W2XQ. TC: W2IJX. PIO: WB2RVE. Congrats to N2CLX on being made WJRA's first "Ham of the Year." As far as I've been able to determine, W2PAU of Riverton is the only Ham in the section to have a confirmed two-way with W5LFL. (If anyone else in SNJ worked W5LFL, please let me know). Rather than just congratulate him, I'll let him tell you his story. "I am not sure when W5LFL heard my call, but I heard him acknowledge, 'W2 Papa Alfa. . .' on what I believe was orbit 128A. He should have been out near Chicago at that time." W2PAU was using a TS-700A with a pre-amp and a 4CX250 amp running about 300 watts out, which he felt was "definite overkill." For the successful contact, he was using an antenna array of four 5-element yagis horizontally polorized at 55 feet. FB job! SGL W2XQ reports that State Senator Saxton will reintroduce the "Scanner/Ham Exemption" Bill into the legislature shortly. The Senator thinks that the bill will not make it out of committee because of the strong opposition of the state police. Write your representatives! Traffic: WB2UVB 149, WA2HEB 90, AA2H 62, WA2CUW 43, KC2PO 28, WA2MGV 26, WA2GYF 12, W2IU 11, N2AEP 10, KA2CQX 9, KC2PB 4, KA2ANJ 3.

**WESTERN NEW YORK:** SM, William W. Thompson, W2MTA — SEC: W2BCH. SGL: KO2X. STM: W2ZOJ. TC: K2QR. ACC: N2EH. BM: W2GLH. OO/RFI: W2AET. PIO: WA2PU. Appts: PIA — N2AGF Cortland; N2BHJ Rochester; K2KWK Rochester; K2DTQ Owego; K2KLV Utica; WA2QDV Medina; WA2RXO Ogdensburg. HAMFESTS: Owego/STARC May 5, Rochester State/Division May 18-19, Rome June 2, Cortland June 16, Batavia July 8, NYC July 20-22, Trumansburg Aug. 25, Hamburg Sept., Elmira Sept. 29, Syracuse Oct. 13. Thanks for club newsletters.

| | | | |
|---|---|---|---|
| NYS/1* | 3677 | 1000/Dy | 452-261-31 |
| Mike Farad | 3925 | 1300/M-S | 183-065-25 |
| NYPON* | 3913 | 1700/Dy | 798-346-31 |
| NYSPTEN | 3925 | 1800/Dy | 670-058-31 |
| ESS | 3590 | 1800/Dy | -31 |
| OCTEN* | 34/94 | 1830/Dy | 668-081-31 |
| Q Net | 31/91 | 1830/Dy | 374-003-31 |
| WDN/E* | 04/64 | 1830/Dy | 638-167-31 |
| Blue Line | 93/33 | 1900/Dy | 310-014-31 |
| NYS/4* | 3677 | 1900/Dy | 517-258-31 |
| JCARCN | 10/70 | 2000/Dy | -31 |
| OARC Net | 25/85 | 2000/Wed | 054-001-04 |
| Black Rvr | 055/655 | 2100/Dy | -31 |
| CNYTN* | 90/30+ | 2115/Dy | 472-092-31 |
| OCTEN* | 28/88 | 2130/Dy | 194-070-21 |
| STAR* | 99/39 | 2130/Dy | |
| WDN/L* | 04/64 | 2130/Dy | 591-150-31 |
| NYS/5* | 3677 | 2200/Dy | 404-249-31 |

*NTS Net. ARES: WNYEN W2BCH 3955 third Sunday 8 P.M.; Lewis Co. WA2OEP 146.415/147.015 Sundays 6 P.M.; St. Lawrence Co. KA2FSP 31/91 Sundays 7:30 P.M.; WNYEN WB2PID 31/91 Sundays 12 P.M. and 7 P.M. — 3915 at 1230 P.M.; Central District KA2BHR 40/00 third Sunday 8:30 P.M.; Oneida Co. KB2DP 34/94 Tuesdays 7:30 P.M.; Onondaga Co. WA2PUU 90/30 Tuesdays 7:30 P.M.; Chemung Co. WA2OVT 10/70 and 93/33 Sundays 9 P.M.; West Catskill W2TFL 3540 Mondays 6:30 P.M. Traffic Handlers Info Net WA2KOJ 3913 Sundays 4 P.M.; VHF THIN KC2QQ and WB2PID 04/64 Tuesdays 8 P.M. BPL: K2GXT. PSHR: W2AET WD2AFI KA2BHR KA2DQA WA2FJJ VE2FMQ W2FR W2GJ K2GXT WB2IDS WA2KOJ W2MTA WA2NKC KA2OVL WB2QWO KA2QIK KC2QQ WB2RBA ND2S KX2T W2ZOJ. CONGRATS: Two ways with W5LFL by WA2SEF (Blue Mountain Bouncer!), K2TTI and WA2WVL. 135 Scouts at Cherry Valley winter camporee — WB2PEE/PEF. WB2PID and WB2QZL plugging ARES/ARC at clubs. Utica ARC affiliated 50 years. K2NY Atlantic Division on ARRL DX Advisory Committee. Traffic: K2GXT 394, WB2OWO 312, WB2IDS 306, WA2FJJ 289, W2MTA 282, W2AET 189, VE2FMQ 180, KC2QQ 175, WA2NKC 141, W2FR 134, WB2QIX 128, W2GJ 127, ND2S 124, KA2BHR 123, W2ZOJ 123, KG2D 107, WD2AFI 94, WA2KOJ 92, KA2DBD 88, KA2DQA 83, W2UYE 73, KX2T 62, WB2RBA 56, KA2OVL 44, KB3RG 42, AF2K 40, WB2PID 22, KA2QIK 21, N2ARD 19, WA2OEP 15, WA2RXO 15, KA2HRS 14, K2QR 14, WB3CUF 10, WA2SDY 8, K2RN 6, WA2SMZ 6, WA2FGW 5, WB2NAO 5, K2IUT 4, KC2SJ 4, W2PHQ 2, K2VR 2. (Dec.) VE2FMQ 231, K2QR 64, AF2K 54, WA2SDY 41, KC2XD 29.

**WESTERN PENNSYLVANIA:** SM, Otto L. Schuler, K3SMB — SEC: AB3Q. STM: AC3N. ACC: N3EE. OO/RFI: KN3B. PIO: WB3IZJ. TC: W3FE. BM: WN3VAW.

| Net | QNI | QTC | Sess. | kHz | T/D |
|---|---|---|---|---|---|
| WPACW | 422 | 189 | 31 | 3585 | 7 P/D |
| WPAPTN | 601 | 125 | 31 | 3983 | 6 P/D |
| WPA2MTN | 459 | 88 | 31 | 146.28/88 | 8 P/D |
| NWPA2MTN | 175 | 117 | 31 | 145.13/53 | 1400 UTC/D |

I regret to announce four Silent Keys: W3HDU W3LEZ K3JCR and WB3LVB who had just retired and moved to Florida. Our sympathies to their families. Upgrades to Tech KA3LOB & KA3LKG. New officers for 1984 Foothills ARC. WB3AMR, pres.; WA3HOL, v.p.; KA3EGE, secy.; KA3DFK, treas.; KA3HZS, mbr at large. W3OKN has resigned as SGL and K3HWL has volunteered to take the appointment after he has recovered from surgery in February. On Dec. 12, 1983, the SCARC sponsored a Boy Scout Booth at the David Lawrence Center in Pgh. They received a blue ribbon for their display. The BVARA sponsored Explorer Scout Post at the Center also. Our net operators are doing a fine job handling traffic with KQ3T KN3B WA3UNX KN3B AC3N usually on the PSHR. W3EGK made BPL last month and is very active. We need more operators in the traffic nets. Also ECs get in touch with the STM AC3N and the SEC AB3Q for info. The sections in the state are quite large with some sparse areas and if you live in one with only one or two amateurs we need your help both WPA & EPA. Remember if you can give up a couple of hours a week to check into one of our nets you will be welcome and the rewards are great PR for your hobby. Traffic: AC3N 219, W3EGK 218, K3CR 140, KQ3T 126, N3FM 102, WA3UNX 95, K3SMB 86, KQ3M 83, KA3JGN 68, WA3QNT 60, K3NPW 55, KA3COX 54, W3VC 53, W3RUL 51, W3NGO 37, WD8PUH 36, WN3VAW 34, N3CYV 29, W3KMZ 29, W3KUN 25, W3MML 23, K3LTV 16, WB3EUM 15, KF3V 14, WB3DBW 12, KB3NV 9, KB3L 8, WA3GMF 5, W3LOD 5, KC3JQ 4, N3KB 4, W3SN 3.

### 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 | 3990 | 0030/0400 Dy | 636 | 185 | 61 |
| ITN | 3705 | 0100 Dy | 296 | 70 | 31 |
| ILPN | 3915 | 2230 Dy (X Sn) | 713 | 217 | 31 |
| NCPN | 3915 | 1300 Dy (X Sn) | 474 | 76 | --- |
| NCPN | 7270 | 1815 Dy (X Sn) | 231 | 78 | --- |
| IEN | 3940 | 1500 Sn | 133 | 3 | 5 |
| IARES | 3915 | 2230 1 + 3 Sn | 43 | --- | 2 |
| ISN | 3905 | 0000 Dy | 364 | 81 | 31 |

Illinois was represented 98% to 9RN by stations K9AZS K9BVE K9GMZ K9OEW K9SW W9INZ W9NXG W9VY KA9FEZ WB9NVN KZ9I KW9J KD9K KW9P N9TN and KB9X. Illinois was represented 100% to D9RN by stations KA9FEZ W9HOT W9NXG W9HLX W9OBU W9KPI K9AZS K9BVE WB9NVN KW9J and WA9EXB. D9RN was represented 100% to CAND. Illinois stations were WB9NVN W9HOT KW9J and K9AZS. The traffic gang got a chance for an eyeball at the Illinois ARES forum held at the WCRA hamfest. The forum was well attended by amateurs from all aspects of the ARRL field organization. The forum hosted by SEC W9QBH and featured short reports by SM WD9EBQ, STM KB9X, BM K9ZDN, ACC WB9SFT, and of course W9QBH himself. By the time this issue goes to print, we will be well into the 1984 tornado season. Let's make a special effort this year to coordinate ARES spotter activities with ESDA and the NWS SKYWARN program. KV9L, EC for Williamson Co., continues to chair the quarterly meetings of the southern region ECs group which last met in January at the Mt. Vernon High School, courtesy of Jefferson Co. EC WD9GHG. While coordination on this scale is in its infancy in Illinois, the meetings have been well run, and very in-

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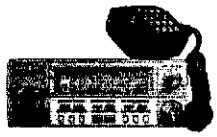

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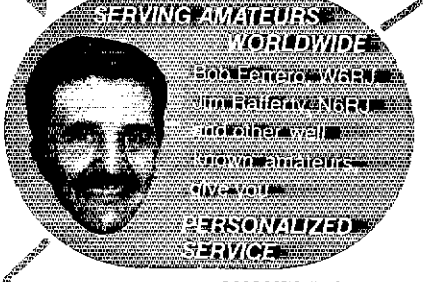


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formative to those participating. We look for this to be a sort of continuing task force on ARES problems and solutions for the area. NTS in Illinois is at its best ever, thanks to the continuing efforts of STM KB9X, and NMs KW9J K9AZS and K9QEW. I have had a few folks that I've been trying to get more involved try the ITN and come back a few weeks later and say "Hey, this traffic stuff is really FUN!" Give it a try, you may find yourself hooked as well! PIO WD9EED is still looking for contacts in each of the Illinois clubs. If your club has someone that usually takes care of local media contacts, *have them get with WD9EED* for a PIA appointment so that we have a better coordinated effort throughout the state. From time to time I get letters from clubs and or individuals wanting to know why I never saw anything about this group or that in the column. The answer is usually that if I don't have the news I can't include it. Don't hesitate to send a note along with your monthly report if you have an item of general interest. Traffic: KW9J 247, K9ZDN 214, WB9UEA 166, W9JU 156, W9NXG 141, W9HLX 97, WB9NVN 97, W9HOT 96, KA9FEZ 96, K9BVE 89, K9AZS 78, KB9X 71, K9QEW 67, WA9SHE 61, KD9K 36, WD9DBO 31, W9TCO 29, KN9BAM 25, WD9EED 13, WD9HQW 12, W9VEY/M 11, W9OBU 10, KW9L 10, K9CMO 9, KZ9I 9, W9LNO 8, WA9RUM 8, WD9IBH 4, KA9NBH 4, WD9JLS 2, WB9WGD 2, KB9QX 2.

**INDIANA:** SM, Bruce Woodward, W9UMH — SEC: WB9ZQE. STM: W9JUJ. OO/RFI Coord.: SGL: WA9VQO. 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-W9PMT; IWN-KA9ERC.

| Net | Freq. | Time/UTC/Daily | QNI | QTC | QTR | Sess. |
|---|---|---|---|---|---|---|
| ITN | 3910 | 1330/2130/2300 | 3176 | 303 | 2174 | 93 |
| OIN | 3656 | 1430/0100/0400 | 677 | 331 | 1852 | 93 |
| ICN | 3708 | 0015 | 85 | 30 | 600 | 31 |
| IRN | 3629 | 0000 | 252 | 16 | 794 | 31 |
| IWN | 3910 | 1310 | 1775 | 15 | 498 | 31 |
| IWN VHF | Kokomo | | 942 | 7 | 269 | 31 |
| IWN VHF | Bloomington | | 1108 | — | 331 | 31 |

Hoosier VHF nets: QNI 8230; QTC 249; QTR 8168; bulletins 52 for 25 nets. D9RN was active during January. CAND reports 680 messages in 31 sessions. D9RN 100% IN stn W9JUJ. 9RN QNI 391, QTC 390. QTC 1077 in 62 sessions. IN 100% with stns N9AEI W9EI N9HZ KJ9J W9JUJ WA9QCF W9QLW WB9UYU K9WWJ W9XD. Silent Key: WD9HDV Muncie. Appts: OBS N9DOK Milan, KQ9K New Castle, and W9PRD Westport. ECs KA9OBR for Wayne Co., KA9ORN for Adams Co.; DEC N9CQD; ORS KK9N. Add Ripley County RA to your list of clubs. Pres. is KA9DZM. The Air Force MARS director for Indiana is N9CZD. The Navy MARS director for Indiana is W9BAD. The Army MARS director for Indiana is K9VEJ. It appears that the way the VEC (Volunteer Examiner Coordinator) program is going some Amateur Radio club in Indiana with enough financial resources and membership to get the job done needs to apply. The ARRL Executive Board approved Hoosierland Amateur Mobile Systems, Inc. pres K9LSB and Indianapolis RA (pres. W9VMT) for ARRL affiliation. Congrats to both clubs. K9AJC and W9ZIB who both received call sign belt buckles and citations from Pres. W9EY for long service to the Michigan ARC of South Bend. Congrats to the Blue River Valley ARS of Shelby Co. on their becoming a Special Service Club. A special thanks to K9CDB and K9SEW. Congrats to the Henry Co. ARC for its re-activation as an ARRL affiliated club. KA9EIV was the winner of the 1983 McCutchan Award given by the Tri-State ARS. Presented first by VP2KC to his friend and Elmer John E. McCutchen. Traffic: W9JUJ 847, KJ9J 209, KM9B 145, W9QYY 124, N9EI 113, WA9QCF 76, K9WWJ 69, W9CNE 63, KB9HH 57, N9AEI 51, N9HZ 48, W9UMH 45, W9PRD 43, W9URQ 41, W9QLW 34, KA9FFO 25, W9JZV 22, W9PMT 20, W9RTH 20, WB9AWI 16, K9DCX 16, AB9A 16, KK9N 14, KA9LAU 12, K9OUP 11, N9CQS 9, N9DHX 9, W9ZGC 9, WB9OZZ 7, W9BUQ 7, WD9HII 7, WB9OZZ 7, WA9OKK 6, K9DIY 5, W9IOH 5, W9XD 4, WB9AJY 3, WD9EXI 3, W9BDP 3, W9UPI 3, KW9C 1, K9SBW 1.

**WISCONSIN:** SM, Roy A. Pedersen, K9FHI — SEC: W9OAK. STM: K9UTQ. BWN 3984 1200Z QNI 1343, QTC 1430 WD9IID. BEN 3985 1800Z QNI 759, QTC 221 WB9ESM. WSBN 3985 2330Z QNI 950, QTC 293 K9ANV. WNN 3723 0000Z QNI 209, QTC 34 KA9OBP. WSSN 3645 0030Z QNI 214, QTC 52 KC9CJ. WIN-E 3662 0100Z QNI 417, QTC 155 W9YCV. WIN-L 3862 0400Z QNI 245, QTC 66 K9LGU. XPO 3925 1831Z QNI 295, QTC 35 K9AKG. (Dec. QNI 284, QTC 24) NWTN 3491.94 0030Z QNI 432, QTC 47 N9BDL. WCWTN 3191.91 0030Z QNI 460, QTC 29 N9AUG. KA9OBP worked K9ZZ on CW. (Glad you're back on the air.) Onalaska ARC officers 1984 N9CEY, pres.; KA9FOZ, v.p.; N9CDT, secy/treas. Waukesha swapfest was well attended. Don't forget to mark your calendars Sept. 15 for WNA picnic at North Wood County Park, good facilities, camping, etc. Sorry to report WN9KHL & WB9SZO as Silent Keys. Eau Claire hamfest Saturday July 14; mark your calendars; details later. W9SO was in hospital and was missed by the nets. KA9HPQ is now KZ9V. New officers for OARC KD9BC, pres.; N9AKG, v.p.; N9CRD, secy.; WB9VKD, treas. BPL to KA9CPA. K9BIL has 5-band WAC. FLARC officers KC9GO, pres.; KF9U, v.p.; WB9HRO, secy.; KA9HCJ, treas.; KC9XH KA9OTQ KC9XF, BOD. Traffic: KA9CPA 2230, KC9CJ 252, W9CBE 179, W9CXY 164, WD9IID 163, WA9WYS 147, K9GDF 135, KA9BHL 126, KC9KQ 118, W9UCL 118, W9YCV 117, K9FHI 117, KA9OBP 104, WB9ICH 98, K9UTQ 95, K9AKG 91, KG9B 90, N9BDL 84, WB9ESM 55, N9AUG 52, K9LGU 50, AG9G 49, WB9JSW 46, N9BCX 39, KA9IKR 37, WB9PKL 36, K9JPS 34, W9FDY 35, N9BGE 32, K9BED 29, WA9ZTY 27, W9LDO 24, KN9P 22, KZ9V 22, W9IHW 20, WB8RGE 20, W9UW 17, N9DCF 16, KA9BHK 13, KY9P 10. (Dec.) K9JPS 45, WA9ZTY 29.

### DAKOTA DIVISION

**MINNESOTA:** SM, Helen Haynes, WBØHOX — SEC: KAØARP. STM: KDØCI. Hello again! First of all, congrats to NØCXC WØPHD & WØPN. They are among the contacts made with W5LFL during the space flight. KCØT has confirmed his intentions to seek the Section Manager post in the coming election, which will be late this summer. Nobody else has announced their candidacy up to this time. WAØPPY is the new pres of the Brainerd Area ARC. Call sign change: NØEYR now NEØD. Upgrade: General to Advanced WØKYG. New Novices: KAØRZW and KAØRZX. Net news: The MSSN has changed its time from 7 P.M. to 6 P.M. local time. I hope this change will increase activity on the net, as well as reduce the QRM problem. Novices are especially encouraged to check in and learn the art of CW operation. KCØUJ was forced to resign as mgr of MSPN/E owing to his work schedule. The new net mgr is WDØBGS, who is a regular NCS on the net and is well qualified. He will do a fine job. For some time now,

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MSPN/E has been preceded by a 15- to 30-minute "gab session," so to speak. A change is taking place, spearheaded by KCØT, to make these sessions both educational and informative. WAØLMK and WAØLUT are reading bulletins, and KYØX is passing along satellite info during these sessions. Later, a series of traffic handling seminars, CW net procedures and sessions on radio theory will be held during these "pre-nets." If anyone else has any suggestions for this, or would like to help, let KCØT, WDØBGS or myself (KDØCI) know. Hamfest info: KAØAJF informs me that the Bemidji Hamfest will be Sat., April 28th at the Middle School. Look for details in the Hamfest Calendar of *QST* or listen to MSPN. The St. Paul ARC newsletter informs me that WØOYC is a Silent Key. Our sympathies to his family and friends. Finally, my thanks to KØJUH who loaned me his typewriter so I could type up this month's news. My typewriter has been overworked and is recovering in a repair shop. Net Mgrs: MSN/1 WØEHI; MSN/2 KAØEPY; MSSN WBØWXU; MSPN/N KAØJUX; MSPN/E WDØBGS; MNAMWXNT WDØBAC; PICONET WØHZU.

| Net | Freq. | Time | QNI | QTC | Sess. |
|---|---|---|---|---|---|
| MSN/1 | 3685 | 6:30 P | 316 | 120 | 31 |
| MSN/2 | 3685 | 10:00 P | 256 | 50 | 31 |
| MSSN | 3710 | 6:00 P | 99 | 24 | 26 |
| MSPN/N | 3945 | 12:05 P | 701 | 104 | 31 |
| MSPN/E | 3929 | 5:30 P | 1306 | 237 | 31 |
| MNAMWXNT | 3929 | 6:15 P | 697 | 526 | 31 |
| PICONET | 3925 | Daily | 3833 | 194 | 26 |

Traffic: KBØMB 430, WAØTFC 383, KT9I 371, WDHZU 221, KAØJUX 192, WØEHI 172, KDØCI 145, KAØCIR 142, NØCLS 140, KAØARP 120, KAØEPY 118, WDØHDD 114, WDØCGM 86, WØMFW 68, KØCSE 61, KTØR 59, W9DM 53, NØJP 49, NØEXP 38, KCØT 37, WBØUKI 34, WDØBGS 33, KZØH 33, KAØAJF 24, KZØR 18, KØOGI 16, WØKYG 14, WBØJUL 12, NEØD 7, KDØKK 6, KAØPER 6, WAØAIN 5, KØIKU 3, KXØV 3.

**NORTH DAKOTA:** SM, Ron Roche, KØALL — Condolences to the family of WBØYKA, as he is reported to be a Silent Key. Theodore Roosevelt ARC new officers are: WDØDAJ, prez.; WDØEMY, v.p.; WDØDAW, secy/treas. New Novice classes this winter are MARA in Minot, Ramsey Co. ARC and Trinity Jr. High ARC in Dickinson. Trinity Jr. High new club with 29 members. KNØA produced a nice video on the W6LFL space program. It was shown at PPTV state wide. NØBXQ is putting on a fine propagation column in the *Grand Forks Feedline*. Clubs: send your Ham of the Year nominations for the Stateside candidate of your choice to VE4XN by July 1. WAØQBN and KQØC will all accompany the Olympic Torch providing communications. Goose River Net 97 QNI, 2 QTC. Traffic: WØCDO 54.

**SOUTH DAKOTA:** SM, Fredric Stephan, KCØOO — SEC: WØYMB. SGL: NBØD. BM: NØCFS. STM: WØKJZ. TC: KØAS. ACC: WBØPWA. OO/RFI: KCØOO. We all look forward to hearing WØKJZ back again on the familiar frequencies. ARRL BM from Britton, NØCFS, deserves our thanks for such fine handling of the official bulletins. The OBSs sent the bulletins a grand total of 56 times. Dakota Division Convention 1985 will be in Rapid City near the beautiful Black Hills of South Dakota during the first week of July. Sponsors will be the Black Hills ARC. Make your plans now. We need more Emergency Coordinators. Contact SEC WØYMB. NTS TEN and DTEN liaison stations were WBØKWX WBØSUM WBØLTV KCØAF KCØOO. PSHR: NØCFS KCØOO NØEEH. Traffic: NØCFS 56, KCØAF 40, KCØOO 29, WBØKWX 23, WBØLTV 17, NØEEH 12, WØYMB 10, NBØD 9, WAØBZD 8, KAØKXG 6, WBØYDG 2, WBØSUM 1. (Dec.) KCØAF 416. Informal and miscellaneous messages: KCØAF 149, W7UDB 26, WØYMU 25, WBØYDG 24, WAØCIP 23, WAØBZD 20, NBØD 9, KCØOO 8, WBØSUM 2, WBØLTV 1.

## DELTA DIVISION

**ARKANSAS:** SM, Joel Harrison, WB5IGF — STM: AE5L. SEC: N5BPU. ACC: AD5M. TC: W5FD. SGL: W5LCI. The Northwest Arkansas Hamfest at Rogers will be held May 12. Grand prize will be a Kenwood TS-430 and PS. Contact Roy Milliren, AF5W, for details. Big thanks to K5BIL for all the assistance he has given me the past few months. Activity on the bands has been excellent his past month. Our section traffic handlers did an excellent job during the past holiday season by handling over 2000 pieces of traffic. Ark nets: Razorback 6:30 P.M. 3995 kHz Dy, phone 6 A.M. 3937 kHz Dy, Mockingbird 4:30 P.M. 3928 kHz M-F, OZK CW 7 P.M. 3760 kHz Dy, Ark EC 3995 kHz 5:30 P.M. Sunday. Traffic: W5TUM 303, WD5FCE 109, W4AZJ 108, W5UAU 32, WB5IGF 24, W9DK 20, W5KL 8, KA5DFT 4, K5MEA 2.

**LOUISIANA:** SM, John Meyer, N5JM — SEC: WA4MUW. PIO: KO5R. ACC: K5DPG. SGL: KD5SL. This month I am pleased to "welcome aboard" your new SM, K5KR. "Wondy" is retired Navy Captain and has been on since 1940. With 300+ countries plus contest activities, he should be easy to catch on any band. I hope that each of you will drop him a line on items of interest for this column as they occur. The success of a SM is dependent on the section working together as a team. I have been fortunate to have had help from many good people, and I thank you all for the opportunity to have served you. A Leage appointment is a rewarding experience; contact K5KR on how to apply. Thibodaux ARC's 1984 Officers are: KC5PL, prexy; WA5PRI, v.p.; K5CRF, treas.; KD5KS, secy.; WB5CWI, activities. Ditto for the JARC with KA5CSI, prexy; N5GFK, v.p.; KB5VC, secy.; KB5GQ, treas.; K5EF, trustee; WB5RNM NE5O KA5MSD AG5I board. A station at the World's Fair is getting near.

| 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. M | KA5PFB |
| CCTN | 146.01/61 | 6:45 P.M. M-F | GNOARC |

Traffic: KA5HDT 81, W5TVW 78, W5GHP 76, K5TL 65, WB5NCM 28, WB5LBR 23.

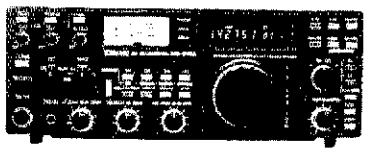
**MISSISSIPPI:** SM, Tom Hammack, W4WLF — Our deepest sympathy to W5CH, our Division Director, on the tragic loss of his son in a traffic accident. MSN activity is up this month. Thanks to all who are helping. Mississippi was 100% again in DRN5, RN5 and CAN. Great work N5AMK KB5W KT5Z W5LSG WB5SXK W5HKW WB5GNR N5DDY and KE5EC. Whom did I miss? Congrats to N5AXV who at age 72, received his Extra Class license on 2-6-84.

| Net | Sess. | QNI | QTC | Freq. | Time (loc) |
|---|---|---|---|---|---|
| MMN | 31 | 497 | 18 | 3935 | 0630 |
| MSN | 22 | 115 | 22 | 3733 | 1900 M-F |
| MTN | 31 | 127 | 38 | 3665 | 1845 |
| RACES-ARES | 4 | 90 | 1 | 3987.5 | |

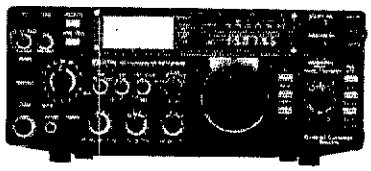
Traffic: N5AMK 376, K5OAF 170, KT5Z 77, W5LSG 29, W5WZ 26.

**TENNESSEE:** SM, John C. Brown, NO4Q — ACC: WA4GLS. OO/RFI: W9FZW. PIO: WK4V. SEC: WA4GZQ. SGL: WA4GZZ. STM: NG4J. TCC: W4HHK. By this time

ALSO: AEA, DAIWA, HUSTLER, HY-GAIN, LARSEN, MICROLOG, MFJ, & TEN-TEC



IC-751



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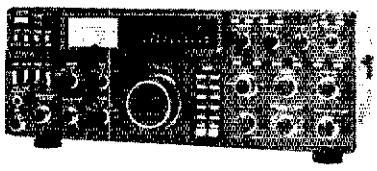

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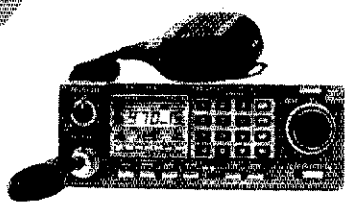

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the 1984 hamfest season is well underway. Your Section Manager and the Tenessee staff would like to have firm dates for all the events of the section so that we might make plans to come and visit during these activities and hear what you have to say about the management of your section affairs. So be sure to drop a line or send ND4Q a message and let him know. That includes swap fests, picnics and the like. We would like to make them all if possible. Had a problem last year in that there was activity in both the Kingsport and Memphis areas the same day and that was a big stretch to say the least. By the way, if any of you are in the Savannah area, *you might* drop by the home of QTH of WA4HGN and see his big 28-foot dish antenna. He holds frequent QSOs and just conducts tests, etc on 2 meter (SSB), 220, 432, and 1296 MHz. They are not all on the big dish, but it is used in the EME work and SWL testing. What would some of the anti-antenna people think of that structure? Section traffic activity is about par. LF sessions 91, QNI 3974, QTC 301; CW nets sessions 26, QNI 131, QTC 25; VHF sessions 64, QNI 1911, QTC 544. TSN Honor Roll NG4J WV4E W4DDK K9IMI and KA4BSG. Wish you gals and fellows would suggest that the new hams get on the slow net and get some real fine training. I am talking about fun-type training, not the stiff boring stuff. Good show on traffic, but I am sure that there are many stations with much activity. Send in a report so we can include the work. Traffic: NG4J 290, W9FZW 155, W4WSH 111, W4DDK 104, K4WWQ 60, KA4BSG 58, WV4E 44, WD4GYT 33, KE4LS 29, W4MRD 23, WB4YPO 22, K4WOP 21, WD4SIG 21, W4PFP 16, W4ZJY 15, NN4S 14, W4PMP 11, W4PSN 8, W4TYV 6, WM4V 5, NM4W 3, KA4UVR 2. (Dec.) W4WXH 207. (Nov.) W4WXH 182.

## GREAT LAKES DIVISION

**KENTUCKY:** SM, Ann Jackson, KA4GFU — SEC: WA4JAV. STM: KA4BCM. OO/RFI: N4GD. BM: WA4AGH. PIO: K4TAJ. ACC: W4OYI.

| | | | | | |
|---|---|---|---|---|---|
| MKPN | 3959 | 1330Z | KA4SAA | 1298 | 110 |
| KTN | 3959 | 0000Z | KA4SKV | 1241 | 104 |
| KNTN | 3727 | 0000Z | KB4OZ | 352 | 60 |
| KYN | 3600 | 0100Z | WD4IYI | 198 | 86 |
| K8N | 3600 | 0330Z | KZ8Q | 183 | 52 |

KYPON-78,5; BARES-106,10; CARN-104,15; NKARC-93,1; TSTMN-564,62; WTEN-37,5. ARES 3-29, 1; 4-62,6; 5-61,3; 7-36,1; 11-77, 10. Congrats to KA4GFU and K4TAJ who were married Feb. 6. KA4GFU's new address is 2917 Adams, Paducah 42001. Kentuckiana ARC of Louisville: K4DMU, pres.; WA4UMR v.p.; WD4CPQ, secy.; WB4RLA, treas.; KA4LSQ KA4OBP, exec. board. Owensboro ARC: KA4YBL, prs.; WD4IYH, v.p.; NW4A, secy.; N4IVQ, treas. O'boro Bar-B-Q Festival special event station May 18-19. Listen for K4HY, 40M; SASE for certificate. Traffic: KA4SAA 184, WA4JTE 161, WD4IYI 86, WD4RWU 62, KB4OZ 61, KA4BCM 56, WD4BSC 48, KA4SKV 45, KA4GFU 37, WA4EBN 30, K4HOE 27, KA4MTX 27, K4MHL 23, WK4D 18, WD4PBF 16, WA4YPQ 16, WA4JAV 15, N4GD 13, WA4AVV 11, KA4YIV 11, WD4CJQ 9, N4HZT 9, WA4NOG 9, WA4AGH 8, W4PKX 6, KA4GBZ 5, W4WQV 5.

**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. |
|---|---|---|---|---|---|
| QMN* | 3663 | 1800 Dy** | 1185 | 225 | 93 |
| MACS* | 3953 | 1100 Dy** | 646 | 220 | 31 |
| MITN* | 3953 | 1900 Dy | 730 | 193 | 31 |
| UPN* | 3922 | 1700 Dy | 860 | 71 | 36 |
| GLETN | 3932 | 2100 Dy | 583 | 63 | 28 |
| MNN* | 3722 | 1730 Dy* | 257 | 58 | 57 |
| WSSBN | 3935 | 1900 Dy | 783 | 37 | 31 |
| TASYL | 3922 | 1900 M | 6 | 1 | 1 |
| VHF 10 reports | | | 945 | 32 | 60 |

*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. As of Feb. 1, WD8EIB is MITN manager. Many thanks to K8KQJ for 16 months of excellent leadership in that post. The new asst. mgr. is K8UPE. New ORS: WB8SIW. New EC: WB8MFG (Kent). New club officers — Chelsea RCC: KA8FPM, dir.; KA8JVK, aecy/treas.; KA8EKO, act. mgr. Monroe Co. RCA; KD8KA, pres.; KB8RT, v.p.; KD8SW, secy/treas.; KA8NCR KA8MBK, trustees. The dates for the ARRL State Convention (which missed last month's column) are June 29 & 30, at Schoolcraft College in Livonia. See you there? The U.P. Hamfest this year will be hosted by the Copper Country ARA, July 28, on the campus of Michigan Tech in Houghton. For those who might have missed it elsewhere, as of March 1 the Detroit office of the FCC has a new address: 24897 Hathaway, Farmington Hills 48018. The phone numbers remain the same. Club newsletter editors/mailers please note: Check my name and address on pg. 8 of this magazine. I am not William, or Donald. It's Clinton Rd., not Clifton. It's Springport, not Jackson. Etc. I love getting the bulletins. I might get even more, and/or more on time, were they all properly addressed! The following clubs DO have SSC applications in process, any rumors to the contrary notwithstanding: AuSable Valley and MCRC. Two more "golden ones" have appeared. Congrats to W8ZMN and W8ZMQ for 50 years continuously licensed. Traffic: W8OHB 335, KA8CPS 273, W8UE 157, WB8MTD 111, WD8LRT 109, WD8RHU 99, K8EQO 96, WA8DHB 90, K8GXV 82, N8BNC 75, WB8WKQ 58, KA8NCR 57, WD8EIB 56, K8OCP 54, W8CUP 51, WD8MJB 51, WB8SIW 51, K8ZJU 48, K8KQJ 45, WD8OUO 44, AF8V 36, W8SCW 34, WB8YDZ 33, K8UPE 31, W8IXH 28, KA8PQH 25, KA8KAK 24, W8YIQ 24, WB8SYA 23, WB8TTA 19, KV8U 19, KI8Q 18, W8YZ 18, W8VIZ 16, KD8FF 13, KA8JCL 11, W8LDS 11, KT8G 10, W8URM 10, WB8YWA 8, WB8YRY 7, N8CQA 5, N8EBN 4, W8TBP 3, KB8TD 3, WB8HSN 1.

**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 | 368 | 168 | 62 | 6:45/10:00 P.M. | 3.577 |
| BNR | 411 | 100 | 31 | 6:00 P.M. | 3.577 |
| BSSN | 384 | 153 | 59 | 9:45 A.M./7:15 P.M. | 3.927 |
| ONN | 130 | 21 | 27 | 6:30 P.M. | 3.708 |
| OSN | 251 | 89 | 31 | 6:10 P.M. | 3.577 |
| OSSBN | 2554 | 589 | 93 | 10:30 A.M. 4:15 & 6:45 P.M. | 3.9725 |
| OSSN | 127 | 48 | 28 | 6:45 A.M. | 3.577 |
| O6MN | 330 | 16 | 31 | 9:00 P.M. | 50.160 |

Congrats to one of this section's real stalwarts — traffic, club support, etc. W8PMJ, who is approaching his 50th year of League membership. News from this month's newsletters. The first item is a downer: WA3ZBU is resigning as editor of the *Carascope*, diluting my future reading pleasure. Since good clubs have no problem finding capable persons, I'll bet her replacement will also produce an interesting newsletter. And thank you, Donna! The

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YAGI ANTENNAS
QUAD ANTENNAS
POLARIZATION
FEEDPOINT IMPEDANCE
HALF-WAVE DIPOLE
QUARTER-WAVE VERTICAL
RADIATION PATTERNS
DIRECTIVITY
MAJOR LOBES
CHARACTERISTIC IMPEDANCE
STANDING WAVES
ATTENUATION
ANTENNA-FEEDING MISMATCH
STATION ID
CALL SIGNS
LOGGING REQUIREMENTS
POWER LIMITATION
CONTROL OP REQUIREMENTS
R-S-T REPORTING SYSTEM
TELEGRAPHY SPEED
ZERO-BEATING SIGNAL
TRANSMITTER TUNE-UP
TELEGRAPHY ABBREVIATIONS
RADIO WAVE PROPAGATION
SKY WAVE AND SKIP
GROUND WAVE
HARMONIC INTERFERENCE
SWR READINGS
SIGNALS AND EMISSIONS
BACKWAVE
KEY CLICKS-CHIRPS
SUPERIMPOSED HUM
SPURIOUS EMISSIONS
COMPUTERS
OSCAR
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OPERATING COURTESY
RULES AND REGULATIONS
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RADIO WAVE PROPAGATION
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CIRCUIT COMPONENTS
PRACTICAL CIRCUITS
SIGNALS AND EMISSIONS
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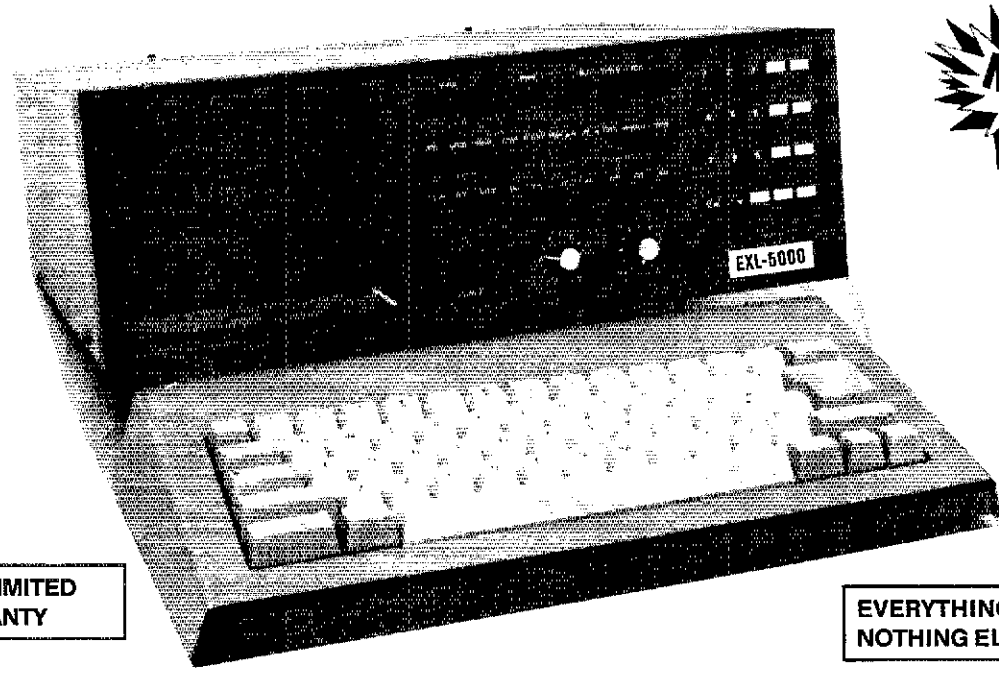


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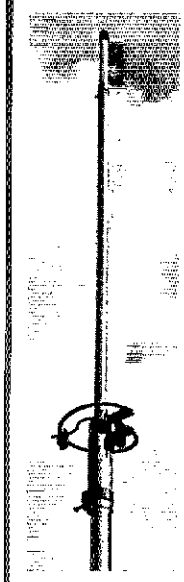

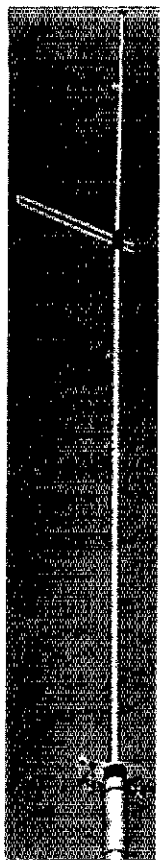

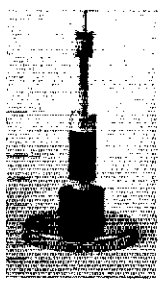

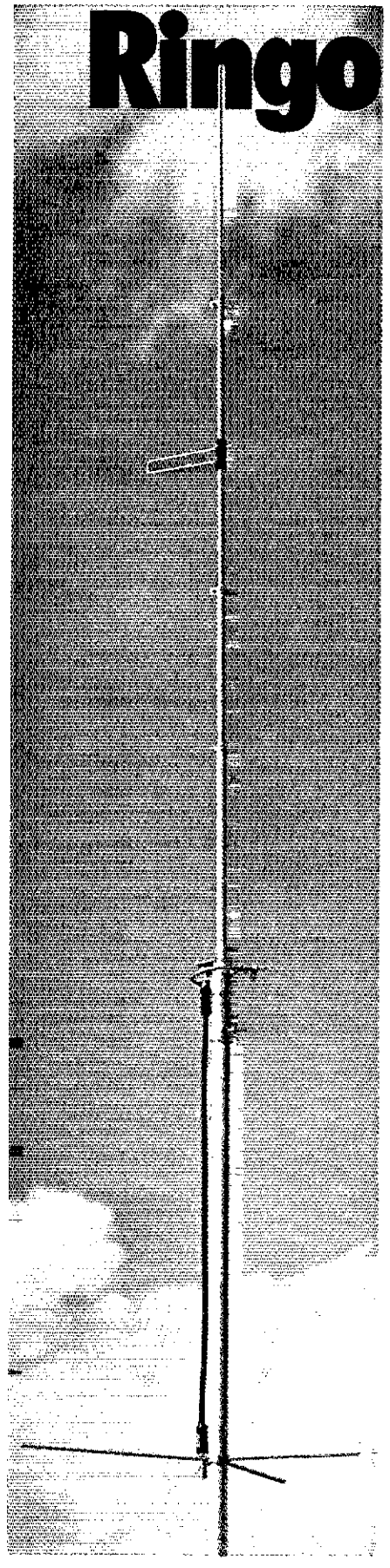

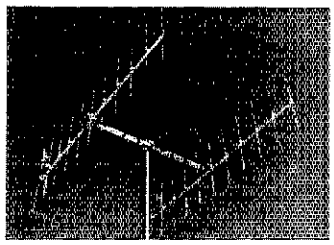

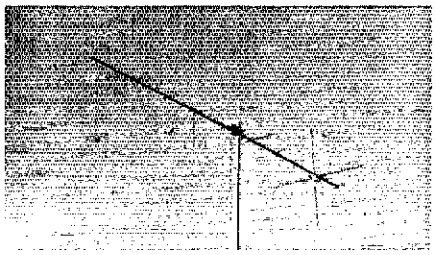

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| | |
|---|---|
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|---|---|
| AR-6 | 50-54 MHz |
| AR-2 | 135-175 MHz |
| AR-10 | 28-29.7 MHz |
| AR-220 | 220-225 MHz |
| AR-450 | 440-460 MHz |

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| TS-147 | 144-148 MHz | Trunk Lip Mount |
| MS-220 | 220-225 MHz | Magnetic Mount |
| TS-220 | 220-225 MHz | Trunk Lip Mount |

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| | | |
|---|---|---|
| A147-4 | 145.5-148 MHz | 4 Element |
| A147-11 | 145.5-148 MHz | 11 Element |
| A147-22 | 145.5-148 MHz | 22 Element |
| 214-FB | 145.5-148 MHz | 14 Element |
| A220-7 | 220-225 MHz | 7 Element |
| A449-6 | 440-450 MHz | 6 Element |
| A449-11 | 440-450 MHz | 11 Element |

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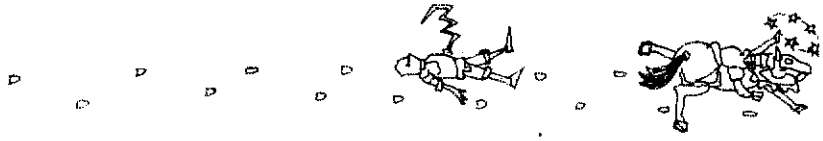
| | | |
|---|---|---|
| A147-20T | 144-146 MHz | Horizontal |
| | 145.5-148 MHz | Vertical |



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Order of the Golden Computer for the most news-packed newsletter this month goes to WB8ZDW, editor of *The Beacon*, published by the Hamilton Co. ARPSC and Committe for Amateur Radio. Twelve pages of condensed type, featuring columns, guest editorials, national news, local news and, very often, constructive criticism. Just another thing those folks in Cincinnati do with excellence. Of course, the usual blockbuster came in from TSRAC and the talented typewriter and/or computer of K8AN. (As I've said before, whereever does he find the time?) Many mentions of successful Novice classes (and here a kudo to OH-KY-IN ARS-their entire Novice class passed both elements of the novice test). Interest in the Special Service Club concept seems to be snowballing. We are lucky to have one of this section's most experienced club idea persons at the helm, K8US, as Affiliated Club Coordinator. He fervently hopes we will maintain the original form of qualification and not dilute it. Every club officer I've discussed this with (those who represent clubs which would qualify and those whose clubs may never qualify) concur. Let's keep it something special! Club elections: NOARS: N8DSG, pres.; KB8MU, v.p.; K8KR, secy.; WB8LFO, treas. Upgrades: to Extra K8NIO NG8N. Appt.: KA8SBO to EC Fairfield Co. Congrats all!

| Local Nets | QNI | QTC | Sess. |
|---|---|---|---|
| ALERT | 55 | 3 | 4 |
| BRTN | 272 | 135 | 31 |
| COARES | 70 | 7 | 3 |
| MASER | 124 | 5 | 4 |
| Medina Co. | 246 | 42 | 31 |
| NCTW | 14 | 4 | 12 |
| RARA | 41 | 2 | 4 |
| TSRAC | 1015 | 120 | 38 |
| VWCEN | 50 | 1 | 5 |

Traffic: WD8MIO 531, W8BO 222, WD8KFN 204, AB8P 168, W8QZK 158, K8OZ 147, W8EK 136, N8EES 119, K8JDI 116, WB8KWD 115, KF8J 113, W8SKP 109, WA8GMT 98, N8AKS 80, K8AN 79, N8AUH 73, WD8KBW 69, WB8MRL 67, N8EVC 59, KA8GJV 57, W8MVE 56, WB8UBR 55, N8FCQ 54, WA8SSI 51, WB8HHZ 48, WB8MEK 45, WB8JGW 43, KA8CGF 39, WB8SIQ 39, K8ND 38, NE8X 37, WB8YTD 35, K8VQY 33, KV8Q 32, N8DGY 30, K8JE 29, WD8RGP 28, WA8HED 25, WD8IKC 25, WB8QHV 21, W8CXM 20, KA8IAF 20, KA8ICB 19, WD8OYK 18, W8UPD 18, W8BHL 17, WA8DYX 16, WA8HGH 16, K8NJQ 16, N8AEH 14, KA8GMF 14.

## HUDSON DIVISION

**EASTERN NEW YORK:** SM, Paul S. Vydareny, WB2VUK — SEC: AK2E. STM: WB2MCO. ACC & TC. N2BFG. BM: WB2EAG. SGL: KB2HQ. NMs: KC2TF W2WSS WB2ZCM N2BDW K2ZVI KV2U WA2KOJ. Net Reports: AETN QNI 88, QTC 8, sess. 4. CDN: QNI 795, QTC 80, sess. 31; EPN QNI 202, QTC 110, sess. 31; ESS QNI 451, QTC 66, sess. 31; NYPON QNI 798, QTC 348, sess. 31; NYS/E QNI 517, QTC 258, sess. 31; NYS/L QNI 404, QTC 249, sess. 31; NYS/M QNI 452, QTC 261, sess. 31; Sch. ARES QNI 41, QTC 3, sess. 5; SCN 75, QNI 40, QTC 30-sess. 5; SDN QNI 327, QTC 72, sess. 31; Ulster RACES QNI 49, QTC 2. CLUB NEWS: AARA contributed to scholarship fund under ARRL Foundation under name of K7UGA and to mem. fund in memory of W4KFC. They are starting new Novice class. They also report N2EKJ to Extra, W2UU's son, WB2CQK, passed Novice, SARA reports Silent Key WA2IET. WECA reports upgrades WA2BLX to Extra, KA2TLV to Tech. They have new Novice class started. We are still in need of volunteers to fill a number of positions on ENY staff. Please contact me if you are interested. Don't forget National Convention in NYC. Make your reservations early! Remember W5LFL will be banquet speaker! Still looking for voluntary help for printing ENY newsletter. PSHR: WB2EAG KC2TF WB2MCO WB2ZCM K2ZVI K2ZM W2BIW WB2OHR WB2VUK W2PKY AK2E N2EKS KA2OPG. Traffic: KC2TF 337, WB2EAG 293, K2ZM 239, N2EKS 191, WB2MCO 137, W2PKY 109, W2BIW 102, WB2VUK 98, K2ZVI 89, WA2JBO 76, AK2E 57, WA8MAZ 57, WB2ZCM 54, W2SWA 38, WB2OHR 34, KA2OPG 32, N2AWI 28, K2HNW 23, WB2HQK 14, N2BFG 12, WB2SON 10.

**NEW YORK CITY — LONG ISLAND:** SM, John H. Smale, K2IZ — SEC: WA2SUB. STM: K2GCE. ACC: WB2IAP. OO/RFI Coord.: NB2T. TC: W2JUP. PIO: W2IYX.

| | | | |
|---|---|---|---|
| NLI CW* | 3630 | 1900/2200 | N2AKZ |
| NLIPN* | 3928 | 1815 | KS2G |
| NCVHF | 6.145/745 | 1930 M-F | K2MT |
| SCVHF | 4.77/5.37 | 2030 M-F | WA2ARC |
| BAVHF | 6.07/67 | 2000 M-F | N2BQD |
| 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 will be the guest speaker at the banquet. See the advertisements in *QST* for ticket information. NLIPN high QNI for 1983 were AH2M 305, KA2FFC 271, WA2ARC 257. New members of Larkfield ARC who are also graduates of the clubs fall Novice class are: KA2TYB KA2TXZ KA2TYA KA2TXY KA2TXX KA2TXW and KA2TYC who has already upgraded to Tech. Other new members are WA2BIA N2EPW KA2SEH and WA2EOF. KA2RGI is now the AEC for the town of Babylon. Radio Central ARC says thanks to N2AWM N2CRW N2DQJ and K2RPZ for their help in making 1983 "Operation Santa" at St. Charles Hospital a success. W2GZA W2HAF KK2P and K2VL all contributed to get the new Radio Central 450 MHz repeater going. N2DXJ upgraded from Tech to Advanced. Wantagh, Gt. South Bay, Kickerbocker and LIMARC have all filed with the ARRL for Special Services Club status. New members of Grumman ARC are KA2RGB WA4CTY and WA2IXH. Please note, the 745 machine is up and working fine; K2CNF and K2DOD have devised and built an "anti-kerchunk" circuit. When the repeater has not been in use for more than a minute the circuit requires a full uninterrupted 3 sec. of carrier to have the xmtr turn on. Suffolk Co. RC can be found in the Yellow Pages under Hobbies and Sports. The club also had W2HD as the guest speaker at the Jan. meeting. Officers for TARCOM: K2EEL pres.; N2CLR, v.p.; W2FPF, treas.; KC2WM, secy.; W2DJS, ed. Traffic: N2AKZ 252, W2GKZ 72, W2DBQ 64, K2MT 38, K2GCE 20, KS2G 19. (Dec.) WA2ARC 173.

## MIDWEST DIVISION

**IOWA:** SM, Bob McCaffrey, KØCY — SEC: WA4VWV. STM: KAØX. PIO: KBØZP. BM: KØIIR. ACC: WBØQAM. TC: KØDAS. SGL: AKØQ. Do not forget to send me nominations for "Iowa ARRL Ham of the Year." New Novice calls are KAØRVK and KAØRFI; congrats. New officers at HARK are KØGP WDØRKO WDØBBE WDØBPO. New officers at CVARC are WBØOET KBØKW NØLS and WBØOAV. Ft Dodge rptr now on the CATV tower for better coverage.

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★ *10 day Trial (pay only Shipping Charges)*
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MBA-RO Reader $129 w
MBA-RC Reader/conv 269 v
**AMP SUPPLY**
AT-1200 600w tuner $119 f
**CLIFFORD**
XXXR 30A power supply $ 79 v
**COLLINS**
75S-1 Ham Rcvr $179 f
75S-3 Ham Rcvr 269 f
32S-3 Transmitter 329 wf
30L-1 Linear 499 f
312B-4 Station control 189 m
KWM-2 Xcvr 439 t
KWM-2 Xcvr/Waters rej 449 m
312B-5 PTO console 289 m
516F-2* AC supply 149 mwf
*Not sold separately
PM-2 AC supply 119 m
**DAIWA**
AF-306 Active audio filter $ 29 w
RF-660 Speech proc 59 w
CNA-1001 Auto tuner 229 m
**DENTRON**
MT—3000A Ant tuner $229 m
MLA-2500B Linear 589 m
Clipperton L Linear 459 f
W-2 Wattmeter 69 v
SWR-1A SWR/pwr meter 19 m
**DRAKE**
2C Ham Rcvr $119 w
R-4A Ham Rcvr 149 f
R-4C Ham Rcvr 269 mv
MS-4* Speaker 19 cv
*Sold with Rcvrs only
4NB Noise blanker 49 m
FL-250 250 Hz filter 35 m
FL-500 500 Hz filter 35 m
FL-6000 6 KHz filter 35 m
SC-6 6m rcv conv 59 f
R-7 SW Receiver 869 fc
R-7A SW Receiver 1099 e
T-4XC Transmitter 269 f
TR-4 Xcvr 229 f
TR-4/NB Xcvr/blanker 249 c
34PNB Blanker 49 w
AC-3* AC supply 59 m
AC-4* AC supply 89 mwfc
*Not sold separately
TR-5 Xcvr 489 w
TR-7 Xcvr 699 mf
TR-7/6 KHz filter/fan 739 w
TR-7/300/500 Hz 749 m
TR-7/500 Hz/6 KHz 749 w
TR-7/NB/fan 769 w
TR-7/300 Hz/1.8/6 KHz 775 m
TR-7/500 Hz/1.8/6/aux 799 m
TR-7/500 Hz/1.8/6/NB 825 m
TR-7/500/1.8/6/NB/fan 849 m
TR-7/300/500/6/NB/aux 849 m
TR-7/300/500/1.8/nb/aux 849 e
PS-7* Power supply 199 mwfe
*Not sold separately
PS-75 Power supply 99 m
RV-7 Remote VFO 99 m
SL-4000 4 KHz filter 45 m
LA-7 Line amp 29 m
L-7 Linear 869 w
MN-7 Ant tuner 119 e
7000E Terminal 369 m
UV-3 3-band Xcvr/TTP 599 v
ESR-24 TVRO receiver 499 m
ESR-224 TVRO receiver 299 m
**HAL**
RVD-1002 Video conv $119 m
RKB-1 RTTY keyboard 59 m
ST-5000 Demodulator 149 m
KB-2100 Keyboard 99 m
DS-2000KSR Terminal 229 m
DS-3000KSR Term vers 2 469 m
DS-3000KSR Term vers 3 569 e
CWR-670 Rcv Telereader 249 m
CWR-670D Rcv Telereader 269 mv
**HENRY**
1KD-5 Linear $459 mc
**IRL**
FSK-1000 Demod w/keyer $299 f
**ICOM**
IC-701PS AC ps only $ 89 c
IC-720A Xcvr 689 mfe
IC-720A/FL-32 CW filter 729 e
PS-15 Power supply 99 fe
PS-20 20A switching ps 159 f
IC-740 w/internal ps 729 m
IC-740/FM/FL-44/FL-45 769 f
IC-730/EX-202 LDA 499 m
FL-30 SSB filter 39 w
FL-53A 250 Hz CW filt 69 w
AH-1 Mobile ant/tuner 189 m
IC-502A 6m SSB port 149 m
IC-22S 2m FM Xcvr 109 m
IC-25A 2m FM Xcvr 249 e
IC-202 2m SSB port 139 w
IC-215/batts 2m SSB port 109 m
IC-255A 2m FM Xcvr 189 c
IC-260A 2m Xcvr 269 w
IC-451A 430-440 Xcvr 569 m
AG-1 UHF preamp 49 m
SM-5 Desk mic 25 v
HM-12 Hand mic 25 m
**KDK**
FM-2030 2m FM Xcvr $199 c
**KLM**
PA15-40BL 2m amp $ 69 m
Echo 70 430 SSB Xcvr 249 f
**KANTRONICS**
Field Day II Reader $119 m
Interface for computer 89 mwe
Hamsoft for VIC-20 29 w
Hamtext for VIC-20 69 w
**KENWOOD**
TS-130SE Xcvr $469 f
TS-130V 25w PEP Xcvr 399 m
PS-20 4.5A ps for 130V 39 mw
DFC-230 Dig freq control 119 m
DFC-230 (new close-out) 169.95 all
TS-180S/DFC Xcvr 499 mwf
TS-180S/DFC/CW filter 529 mf
VFO-180 Remote VFO 89 w
AT-250 Auto ant tuner 239 w
TS-520 Xcvr 399 mcv
TS-520/CW filter 429 v
TS-520S Xcvr 429 mfc
TS-520S/CW filter 459 f
TS-520SE Xcvr 449 f
TS-530S Xcvr 489 w
TS-820/DG-1 Dig Xcvr 529 e
TS-820S Xcvr 549 wf
TS-820S/CW filter 579 m
VFO-820 Remote VFO 129 e
TS-830S Xcvr 659 m
SM-220 Monitor scope 269 e
SM-220/BS-8 Scope/pan 319 e
R-300 SW receiver 169 m
R-600 SW receiver 259 m
R-820 Rcvr/2 CW filts 549 m
TV-502 2m transverter 169 e
TS-700A 2m Xcvr 369 mwc
TM-201A 2m FM Xcvr 239 mc
TR-7600 2m FM Xcvr 129 c
TR-8400 440 FM Xcvr 269 mw
KPS-7 6A power supply 59 w
MC-60A Desk mic 59 m
**MFJ**
496 Super Keyboard II $199 m
496/clock/loop module 229 m
624 Phone patch 45 c
752B Dual filter 49 w
940 Ant tuner 49 v
943 Ant tuner 45 c
1040 Rcv preselector 59 e
1224 Computer interface 59 m
**MACROTRONICS**
TA-650 Interface/Apple $119 m
CA-650 Interface/Apple 119 m
**METRON (Magnus)**
MA-1000B Mobile linear $629 e
**MICROLOG**
ACT-1 Terminal $469 mw
**MIDLAND**
13-510 2m FM Xcvr $169 m
**RCA**
TC-1110 9" B/W monitor $ 79 m
**REGENCY**
HRT-2 2m FM HT $ 59 mw
**ROBOT**
400 SSTV conv $329 m
800 Terminal 349 m
800H/800CH kit Term 429 c
**SPECTRONICS**
DFD-K Dig disp; Kenwood $ 69 f
DFD-I Dig disp; Tempo 69 f
**SWAN/CUBIC**
Astro 150 Xcvr $399 m
Astro 102BX Xcvr 469 e
Astro 102BXA Xcvr 499 v
Astro 103 Xcvr 599 m
PSU-6 AC supply 119 e
PSU-6A AC supply 119 mv
FP-4 Phone patch 59 w
**TEMPO**
Tempo One Xcvr $249 m
AC/One AC supply 89 m
2020 Xcvr 369 w
8010 Remote VFO 89 w
8120 Speaker 19 w
S-4T/16 440 FM HT/TTP 189 m
**TEN-TEC**
505 Argonaut Xcvr $199 m
509 Argonaut Xcvr 249 m
210 1A power supply 19 f
570 Century/21 Xcvr 239 mf
574 Century/21 digital 289 m
525 Argosy Xcvr 349 wfc
525D Argosy fl/3 filt/nb 429 m
225 Power supply 89 mtc
Triton II Xcvr 299 m
283 Remote VFO 119 w
546C Omni D series C 599 w
255 Power supply 129 w
260 Power supply 139 m
262G Power supply 89 m
207 Ammeter 9 mw
215PC Desk mic 25 m
216 Desk mic 15 m
645 Keyer 39 w
**TRAC**
TE-464 Keyer/CW proc $ 69 m
**WILSON**
YM-1000 Sat Rcvr $399 m
T-1405 2m FM HT 69 m
**YAESU**
FT-101 Xcvr $389 w
FT-101B Xcvr 399 mw
FT-101E Xcvr 469 mc
FT-101E/CW filter 499 mf
FT-101EE Xcvr 449 f
FT-101EE/CW filt 479 f
FT-101EX Xcvr 429 m
FT-101EX/CW filt 459 f
FT-101Z/CW filt Xcvr 499 m
FT-101ZD Dig Xcvr 499 wf
FT-101ZD Mk II Xcvr 569 v
FT-101ZD/Mk III Xcvr 569 m
FV-101Z Remote VFO 89 mfv
SP-101 Speaker 19 f
SP-101B Speaker 19 c
FP-301 AC supply 89 m
ERB Ext relay box 19 w
FT-77 Xcvr 399 f
FP-70D Power supply 99 c
FT-901DM Xcvr 629 m
SP-901P Spkr/patch 49 m
FV-901DM Remote VFO 169 mv
YR-901/YK-901 rd/kbd 349 m
FTV-901R Xvtr w/2m 249 f
FT-102 Xcvr 589 e
FAS-1-4R Remote ant sw 29 m
FT-107M/DMS Xcvr 499 c
FT-107M/DMS/warc/ps 599 f
FP-107E External ps 89 c
SP-107 Speaker 19 c
FV-107 Remote VFO 89 c
FTV-107R Xvtr w/430 249 f
FV-707DM Dig VFO 169 c
FTV-707 Xvtr (no mod) 79 w
FTV-707 w/2m mod 159 m
FT-ONE Xcvr 1199 v
FT-ONE/4 filts/RAM/FM 1389 m
FRG-7000 SW Rcvr 269 f
FRG-7700 SW Rcvr 329 m
FRA-7700 Active ant 29 m
FRV-7700F Rcv VHF conv 89 f
FT-620B 6m Xcvr 289 mw
FT-625RD 6m Xcvr 449 mw
FT-627RA 6m FM Xcvr 239 m
FT-221R 2m Xcvr 299 mw
FT-225RD 2m Xcvr 489 m
FT-230R 2m FM Xcvr 199 m
S-72/E-72L Box/cable 69 m
FP-80 4.5A ps 69 w
FP-12 12A ps 89 f
FT-208R/TS-32 2m HT 229 m
NC-1A Desk charger 39 v

**2-24-84**

(1) This list was prepared from an inventory taken on the date shown. The letters after the prices indicate in which store the equipment was located at that time. The quantities vary. In some cases there are several of an item; others, only one. Due to the lead and distribution time of this publication, some of the items may have already been sold by the time you see this ad. However, due to the number of trades we are involved in each day, some items are in stock that are not listed. (2) We reserve the right to sell certain power supplies and accessories only with matching transmitters or transceivers, depending on our stock situation. (3) Sometimes used gear is serviced **after** we receive your order. Please allow for a few days delay in shipping your order. (4) No trades on used gear. (5) Used gear policies do not apply to New Equipment special, Closeouts, etc.

## USED AES SHOP TEST EQUIPMENT

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8640B .5-1024Mhz sig gen w/options 002/003 5895

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OAM-1 AM module for FM-10C 395

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| w = **Wickliffe, OH** 44092; 28940 Euclid Ave..... | (216) 585-7388 | 1-800-321-3594 | 1-800-362-0290 |
| f = **Orlando, FL** 32803; 621 Commonwealth Ave ..... | (305) 894-3238 | 1-800-327-1917 | 1-800-432-9424 |
| c = **Clearwater, FL** 33515; 1898 Drew Street..... | (813) 461-4267 | | |
| v = **Las Vegas, NV** 89106; 1072 N. Rancho Drive..... | (702) 647-3114 | 1-800-634-6227 | |
| e = **Chicago, IL** Erickson Communications (Associate)... | (312) 631-5181 | | |

MasterCard VISA

Mt. Pleasant will have autopatch on 7.165. WB0BHT was elected pres of Ia-Ill ARC and KA0PFC is new pres at U of IA. N0EFD has checked into the 3900 Novice net more than 260 consecutive times. That's over 5 years!! Can anyone beat that for support of a net.

| Net | Freq. | UTC | Days | QNI | QTC | Sess. |
|---|---|---|---|---|---|---|
| 75M Phone | 3970 | 1830/2330 | M-S | 2095 | 106 | 52 |
| TLCN | 3560 | 0030/0400 | Dy | 398 | 153 | 62 |
| ICN | 3713 | 0100 | T-S | 148 | 60 | 22 |
| ITEN | 3970 | 2230 | Sn | 97 | 10 | 5 |

Excellent representation to region nets from both CW and fone. ICN doing well at 5 nights a week, keep up the support. Schedule your WX program now. Severe weather is not that far away. Contact the *SEC for info.* Watch for more on Tech. Seminar and Amateur Radio Week. Field day planning should be firming up by now. How about you? I need your report. Did you forget me this month. Traffic: WD0FWB 202, K0GP 152, W0YLS 90, W0SS 71, NC0R 61, WB0AVW 52, K0ZQ 50, K0CY 41, KB0OZ 32, KA0X/AE0R 28, KC0XL 25, W0BW 24, W4JL 22, KA0ADF 20, W0HTP 18, KC0SC 12, KB0BG 12, W0LFF 6, WD0GVY 4.

**KANSAS:** SM, Robert M. Summers, K0BXF. SEC: W0KL. STM: W0OYH. SGL: N0BLD. TC: K0EZ. ACC: K0BXF. BM: K0JDD. PIO: KD0JM. Newly elected officers for the Hiawatha ARC are W0PB, pres.; N0DJW, v.p.; WA0KDC, secy/treas.; WA0SRR, act. mgr. Congrats to W0HI for his countless number of hours in the traffic system. Someone kept track though: He has been active in TCC "E" continuously for 14 years effective Oct. 1983. Traffic net totals: KSBN QNI 1417, QTC 146. KPN QNI 476' QTC nl. KWN QNI 1031, QTC 783. KMWN 664/562. CSTN 2258/87. QKS 412/105. QKS-SS 52/14. Newly appointed Public Information Officer is Tim Lilley, KD0JM, 125 N. Chambery, Olathe 66061. I am sure he would like to hear from each club in the state as to your choice for Public Information Asst. as related to your club. An application for Special Service Club appt. has been processed for the Pilot Knob ARC in Leavenworth. Who is next? New officers for BEARS (Boeing Employees), Wichita: WB0DUX, pres.; N7PM, v.p.; KA0QWX, secy.; AE0A, treas.; WA0TAH, editor. New Officers for TEC-NI-CHAT ARC Wichita are: WA0SFI, pres.; WD0GZB, v.p./secy.; K0KCH, treas. New officers will be continued next month. Traffic: W0FRC 239, WB0ZEN 143, W0FIR 200, WA0LBB 132, W0HI 91, W0OYH 69, W0FDJ 66, K0BXF 63, KD0JM 23, W0MYM 15, W0CHJ 12, W0QMT 9, W0PB 8, W0RBO 7, KA0E 3.

**MISSOURI:** SM, Ben Smith, K0PCK — SEC: WB0KUW. STM: K0SI. ACC & PIO: KT5Y. SGL: KA0CSJ. BM: N0BKH. OO/RFI Coord.: WB0RHK. TC: K4CHS. I have listed all of the section Leadership Officials to remind everyone who holds these positions and that any of us would be glad to help clubs with programs or any other service to the amateurs of Missouri. Congrats to the Northwest Amateur & Electronics Assn. of Ferguson on becoming our newest Affiliated Club in the section. K0DSQ received Field Appointment ORS in January. 1984 club officers for the C. M. RA. are: K4CHS, pres.; KA0OGO, v.p.; WD0AFE, corres. secy.; N0CVH, rec. secy.; AI0O, treas. Newly elected officials of the OARS are: KC0QV, pres.; WB0PJS, v.p.; KA0ELU, secy/treas. With the arrival of spring comes the tornado season and a time when amateurs can be a great help to their communities by assisting in storm watches. Whenever a storm watch is issued for your area and your local 2-meter net is activated, always check in so the NCS will know who is around. From then on only transmit when you have information that the NCS is asking for. Amateurs are an important part of severe weather spotting and reporting, but we must be caretul to keep our reports as accurate as possible. During the storm season check 3.963 kHz for the MEOW Net which can be called up for storm duty. Spring also brings hamfests. If your club is holding a hamfest offer your help to the committee. It takes a lot workers to put on a hamfest. Everyone should try to attend as many hamfests as possible. In a way, hamfests are a service to amateurs, so the clubs holding them need our support. Novices, don't forget the slow speed net. The MTTN meets Monday-Saturday 3.730 kHz at 7:30 P.M. A 2-meter repeater is now on the air in Sullivan, on the frequency of 145.15 —. Nets reporting for January:

| Net | Sess. | Time | Day | Freq. | QNI | QTC |
|---|---|---|---|---|---|---|
| MON | 62 | 7/9:45 P.M. | Dy | 3583 | 235 | 168 |
| MOSSN | 31 | 6 P.M. | Dy | 3963 | 1158 | 93 |
| MEOW | 31 | 5:45 P.M. | Dy | 3963 | 668 | 30 |
| MTTN | 17 | 7:30 P.M. | M-S | 3730 | 82 | 17 |
| HBN | 22 | 12:05 P.M. | M-F | 7260 | 467 | 10 |
| RRARN | 28 | 8 P.M. | Dy | 146.79 | 401 | 2 |
| STAN | 4 | 8 P.M. | M | 146.91 | 211 | 2 |
| LOAFM | 5 | 9 P.M. | F | 146.73 | 46 | 1 |
| LOACW | 5 | 8 P.M. | Th | 28.1047 | 33 | 1 |
| CMEN | 4 | 9 P.M. | W | 146.76 | 62 | 0 |
| SARN | 5 | 9 P.M. | Tu | 147.03 | 60 | 0 |
| JCARES | 4 | 6 P.M. | W | 147.00 | 44 | 0 |
| IFN | 4 | 8 P.M. | M | 147.24 | 38 | 0 |
| CCARN | 4 | 8 P.M. | W | 146.46 | 30 | 0 |

Traffic: W0BMA 378, W0QAU 230, K0GI 168, AI0O 120, KT5Y 103, K0PCK 90, KC0AS 53, K0DSQ 40, N0DDZ 36, W0OUD 35, K2ONP 25, WA0YJX 22, NE0N 21, KG0L 11, ND0N 11, W0NUB 10, KY0U 8, WB0HOP 4.

**NEBRASKA:** SM, Reynolds Davis, K0GND — More 1984 affiliated club officers: AKSARBEN ARC — N0CLW; Grand Island ARS — WB0MST; Hastings ARC — KB0XK; Pine Ridge ARC — WB0TEX; West NE ARC — WD0BPC. Congrats! Lincoln Communications Society has affiliated with ARRL. KC0QR is pres.; welcome aboard! Blue Valley ARC has been designated as a Special Service Club; WB0SIP is pres. KA0BOC is new net mgr for NE 40 Phone, stepping in for the founder W0HTA. Other appts: WD0EGK & KA0NXK as ORS and WB0QOB as net mgr. The NE CW net held an on-the-air 1st anniversary party & STM KA0BCB wore a new dress for the event! There will be a meeting for all NE section appointees at the Midwest Conv in Kearney. See you there. Traffic: K0DKM 119, W0KK 114, WB0TED 104, KA0BCB 70, K0GND 41, KA0BWM 33, K0IXY 33, WA0SCP 32, WD0EGK 29, WB0GMQ 19, WA0BOK 16, W0NIK 14, KA0ELI 9, WB0GWR 6, N0DGM 5, KA0IOM 5, WA0DXY 5, W0WZR 4, K0ODF 4, K0TUH 2, WB0TEX 1.

## NEW ENGLAND DIVISION

**CONNECTICUT:** SM, Pete Kemp, KA1KD — STM: K1EIC. SEC: K1WGO. BM: K3ZJJ. ACC: N1AZF. TC: W1HAD. PIO: WB8TDA. SGL: K1AH. OO/RFI: KA1ML.

| Net | Freq. | Local Time | QTC | QNI | NM |
|---|---|---|---|---|---|
| CN | 3640 | 1900/2000 | 186 | 287 | K1EIR |
| CPN | 3965 | 1800/1000 Sn | 92 | 346 | KA1BHT |
| NVTN | 28/88 | 2130 | 58 | 229 | WA1EMI |
| WCN | 78/18 | 2030 | 424 | 106 | WB1GXZ |
| RTN | 13/73 | 2100 | 54 | 293 | K1OQE |

Welcome aboard to WB8TDA, our new PIO, and to K3ZJJ, our new BM for the section. Upgrades: Adv. KB1KU K1YRF K1IWY/KP4 N1CDV; Gen. KA1JQM; Tech: KA1KEX

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*Contest: Send us suggestions for our ad headlines. Entries must be submitted on a postcard or QSL card postmarked by May 1, 1984. Receive an AEA-HR1 ½-wave antenna if your idea is selected. A maximum of 12 headlines will be chosen for the July 1984-June 1985 ads. In case of duplicates, the earliest postmark will receive an antenna. No purchase required.*

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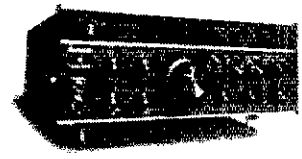

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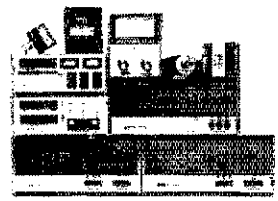

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See our Antenna/Tower ad in this issue.

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D1010N UHF Amp/N connectors . 279.95
B215 2m Amp: 2 in, 150 out . . . . . 245.95
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**AMERITRON HF AMPLIFIERS**
AL80 1200 watt . . . . . 589.95

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202 Noise Bridge . . . . . 48.95
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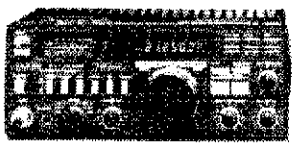
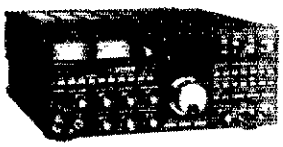
FT One Transceiver . . . . . CALL
All-mode, General coverage RCVR



NEW FT 757 HF XCVR . . . . . 739.95
with General Coverage RCVR
includes CW keyer, AM/FM, CW filter

FT 77 . . . . . SPECIAL 499.95
Compact HF XCVR



FT 980 CAT System . . . SPECIAL 1289.95
AC Power Supply, Full Break-in CW,
SSB/AM/FM/FSK, RF Speech Processor

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2m Handheld with VOX
Introductory
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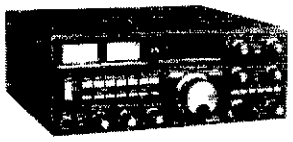
FT 708 440 MHz HT . . . . . Special 269.95
All accessories in stock including:
speaker mike, leather case, extra battery
pack, base charger, & mobile charger

## VHF/UHF



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(Optional modules for 6m, 430,440 MHz)
Great for Satellite Work

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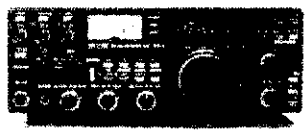

New IC 751
HF XCVR/Gen Cov RCVR . . . . . 1179.00

IC 730
8-band Transceiver with Mic . . . . . 589.95

## VHF TRANSCEIVERS

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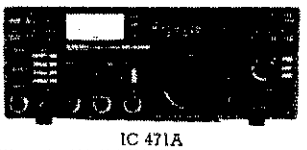
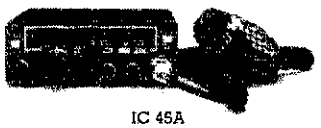
All-mode 2m Transceiver . . . . . 599.00
IC 271H New 100-watt 2m XCVR . . . CALL

IC 25A 25-watt 2m FM Transceiver . 309.95
IC 25H 45-watt 2m FM Transceiver . 339.95
IC 27A New 2m compact mobile . . 329.95
IC 290H 25-watt all-mode 2m XCVR 479.95

## UHF TRANSCEIVERS



IC 471A
All-mode 430-450 XCVR . . . . . 689.95



IC 45A
440 FM 10-watt Transceiver Special 319.95
IC 490A all-mode 430-40 XCVR . . . . 575.95

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10 Memories
Battery backup
Scanning; LCD readout
Offset in memory
Keyboard select PL tones
Uses 2AT accessories

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IC 3AT 220 MHz HT/Touchtone . . . 229.95
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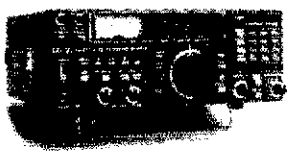
## SWL RECEIVERS



NEW R71
100KHz-30MHz . . . . . Introductory 649.95

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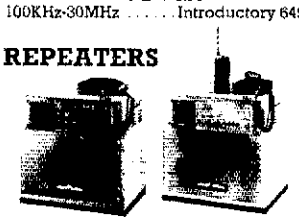

RP 310 440 MHz . . . . . 899.00
RP 1210 1.2 GHz . . . . . CALL
Call for repeater-mobile unit
special packages.

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M12 12-channel Programmable HT 229.00
M2 76-channel Synthesized HT . . . . 299.00
M80 25-watt all-channel Scanner . . . 429.00
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PS 15 12V for HF . . . . . 145.00
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PS 30 System Power Supply . . . . . 229.95

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Complete line of accessories in stock.
Call for our prices.

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AEA Micropatch for VIC-20/C-64 . . 119.95
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MFJ 1224 for VIC 20/C-64 . . . . . 114.95
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## SOFTWARE

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Apple . . . . . 119.95

**AEA MBA Text**
VIC-20 or C-64 . . . . . 79.95

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HAM DATA

***Amateur Software for the VIC-20, Commodore 64, TI99/4A, & Atari***

**Revisions 3.1 now available!**

*Super Logs* now have 7-way search including mode and ITU zone, improved screen displays, and optional memory check.

*Contest Log* now has fourth program: a Dupe Check routine checks more than 2000 contacts and provides a print out.

*Propagation Chart* is based on the Mini-MUF Model 3.5 developed by Navy Sea Systems Labs. It displays results in miles or kilometers and creates an MUF chart for multiple days.

Soon to be available: Net Controller, Antenna Design, and Computer Morse. Software for the TI99/4A and Atari 400-1200 available in April 1984.

Programs are compatible with most printers. Some computers need memory expansion for certain programs. Check before ordering.

**Super Log I** Auto date. Auto/manual time. 7 search categories (name, call, QTH, date, band, mode, ITU zone). FWD/REV scan. All standard log entries. Change any entry and update QSL info! Save on paper, cassette or floppy disk. VIC-20 log size about 300 with 16K . . . . . 12.95

**Super Log II** All the above *plus* single screen WAS summary with worked/needed/confirmed status. Comm-64 log size over 500. VIC-20 log over 230 with 16K . . . . . 16.95

**Super Log III** Same as above but with DXCC summary! Comm-64 log over 450. VIC-20 over 170 with 16K . . . . . 18.95

**Super Log IV** *Disk only* program includes both WAS and DXCC summary and uses less memory! Largest file size with least memory. Specify Comm-64 or VIC-20 . . . . . 23.95

**Contest Log** 4 in 1: FD, SS, universal, and dupe check. Auto time/date/dupe. Dupe check not affected by log size! Clock display and QSL print capability. Comm-64 offers over 1000 entries. VIC-20 with 16K over 350. . . . . 18.95

**Propagation Chart** 24-hour MUF chart, beam heading and distance to any QTH. Comm 64 or VIC-20 . . . . . 18.95

***On some computers these programs require memory expansion. Check before ordering. Send stamp for a flyer with descriptions.***

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KA1KPT. New OBS: KA1XG KA1XZ K1VKO W1GDZ. Call changes: KA1JAO/N1CWX; KA1GXN/N1CUP. WB8PBC and the gang provided communications for the annual Boy Scout Klondike Derby. WA1EMI is the new NM for Nutmeg. New SARA officers: KG1M, pres.; N1AWJ, v.p.; N1AZF, treas.; KK1J, secy.; KA1FOT, trustee. New ICRC officers: K1GZU, pres.; KM1T, v.p.; WB1ASH, tech. v.p.; KA1JKN, secy.; K1DFS, trustee! The 147.15 repeater now has a 6-meter link. The annual Connecticut Traffic Handlers Dinner will be held April 14th at Valle's Steak House in Hartford. Silent Key: K1AF. K1IWY recently became only the 2nd 1-lander to receive the German "DIG" Award. A new RTTY repeater is now on the air on 147.255. It operates 74 baud BAUDOT and 110 baud ASCII with the call WA1IUF. The Civil Air Patrol and the Connecticut section of the ARES recently signed an Agreement of Understanding. This marks the first time that such an association has been officially sanctioned. Both parent organizations are considering a national agreement. Congrats to SEC K1WGO and to CAP/EC W2FJT for their efforts on a job well done. The 147.12 Newtown machine is moving to atop the Danbury Hospital. New ECARA officers: KS1F, pres.; KR1V, v.p.; K1APE, secy.; WB1DXZ, treas.; K1SYI, trustee. KB1BJ has put the CARA Capers on cassette tape for visually impaired members. N1BOG recently had a QSO with K7UGA, WB1ELA & KS1F have moved out of the section; their contributions will be missed. Traffic: WB1GXZ 435, W1EFW 274, WB9IHH 113, KA1JAN 100, KA1GWE 78, WA1HFE 75, KA1EGE 73, KA1BHT 72, W1BDN 39, K1AQE 33, WB1ESJ 25, KA1KD 25, KA1JJX 19, WA1WQG 10, N1CLV 6.

**EASTERN MASSACHUSETTS:** SM, Rick Beebe, K1PAD — STM: KA1GBS. PIO: 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 | 452 | 433 |
| EMRIPN | N1BGW | 3.959 | 1730/Dy | 301 | 220 |
| EM2MN | N1BNI | 23/63 | 2000/Dy | 349 | 121 |
| NEEPN | K1BZD | 3.945 | 0830/Sn | 85 | 22 |
| HHTN | KA1MI | 04/64 | 2230/Dy | 506 | 324 |
| EMRISS | N1BHH | 3.715 | 2030/Dy | 175 | 92 |
| CI2MN | N1BYS | 045/645 | 1930/Dy | 230 | 65 |

As I write this, the Mass Maritime ship has sailed and the traffic is starting to come in. It's hoped that the large volume or traffic will be handled efficiently and some good PR gained as well. Congrats to W1PSG and anyone else who made it to W5LFL. If your club needs a speaker contact ACC K1AZE who is keeping a list. Don't forget your section-level officials are listed at the top of this column. They'll be glad to talk to your club about emergency communications, traffic, Special Service Club status, etc. If you get real desperate you can even invite me. There are over 20 stns north of Boston on Packet Radio. Want a demo/talk? Contact KA1MI. WB1FOK gave a Packet demo to the Greater Lawrence club. Quannapowitt RA member W1AQV has honored with a bronze life membership plaque from the Society of Radio Operators of New England; congrats. Waltham ARA member (also means Heavy Hitter) W1MJ working on special project which is called "Repeathius Quadrophenius." This means that he has plans to finish the control systems on all four repeaters. Middlesex club had 40 club members at a pizza party. Southern NE DX Assn. officers are: KT1N (formerly K1GSK), pres.; KC1R; v.p/secy.; N1AZL treas.; K1MEM, act chmn. The new DXCC List, including room for checking off countries on each band, is now available from ARRL Hq. Massasoit club has new emblems for its members to wear on their jackets. Sturdy Memorial Hosp club members KA1MY KG1K KA1NJ K1ZZJ and others gave up their Xmas Eve to bring Santa to the children in the pediatrics ward who had to be in the hospital. Radio personality Bill Connell gave a talk at the MMRA. Wellesley club (SSC) finished third in Sept. ARRL VHF QSO Party. Framingham club had a talk on Civil Air Patrol. KJ1G gave talk at Cape Ann club on a home brew power supply. K1OJH gave talk at Billerica club on DXpedition to St. Paul. Traffic: KA1GBS 996, KA1EPO 241, KA1EXJ 219, N1BGW 193, N1ER 173, N1AJJ 158, N1BHH 148, N1BQG 119, K1CB 99, WA1FCD 76, WA1DXT 68, N1BYS 50, K1BZD 48, KA1BBU 42, K1GN 41, K1ABO 39, WA1FNM 29, KA1AMR 26, K9HI 26, KI1I 26, WB3FOC 24, W1QLL 21, K1LCO 7, W1ZHC 7, KT1K 6, K1OGF 5. (Dec.) KO1O 230, KT1K 149, N1ER 84.

**MAINE:** SM, Cliff Laverty, W1RWG — ACC: KB1JF. BM: W1JTH. OO/RFI: W1KX. PIO: KA1TJ. SEC: KL7IJG. SGL: K1NIT. STM: AK1W. TC: KQ1L. Congrats to K1NIT & KA1KAP upgrading to Extra. New officers PAWA include KA1ZX, pres.; KA1FI, v.p.; K1ME, secy.; KA1UT, treas. AEARU installed WB1DPK, pres.; N1CQS, v.p.; KA1KAP, treas.; N1CIQ, secy. The mid-winter hamfest at Poland by Andy club was a success. PAWA, Sunday River, Skowhegan, Aroostook clubs all conducting Novice or Gen classes. PSHR: N1BJW KL7IJG WA1YNZ WB1GLH W1RWG AK1W.

| Net | Sess. | Checkins | Traffic | Mgr. |
|---|---|---|---|---|
| SGN | 26 | 1059 | 206 | K1GUP |
| PTN (early) | 31 | 379 | 163 | AC1G |
| PTN (late) | 21 | 121 | 31 | WA1YNZ |
| CMEN | 9 | 267 | 23 | W1WCI |
| MPSN | 5 | 93 | 3 | KL7IJG |
| AEN | 5 | 78 | 1 | WA1YNZ |
| RACES | 5 | 61 | 2 | W1RWG |

Traffic: AK1W 256, WB1BYR 110, W1RWG 108, WB1CBP 105, WB1GLH 104, W1ISO 102, N1BLZ 91, W1BMX 76, W1KX 71, KA1KFC 55, KA1TJ 51, KL7IJG 50, N1BJW 49, W1JTH 41, W1EZH 40, WA1YNZ 30, W1CTR 27, W1AHM 24, W1WCI 17, W1VEH 10, KA1FTL 9, N1BME 8, W1OTQ 6, K1UMZ 5, KA1ENL 4, KA1ENM 3, WA2ERT 3.

**NEW HAMPSHIRE:** SM, Robert C. Mitchell, W1NH — STM: W1TN. NMs: N1NH KI1M KK1E. Get ready for Greay Bay club's Springfest '84 on April 7 at VFW Post in Rochester (Gonic). KM1H & W1NH worked K6ELX/YU4 at Sarajevo on 80 cw. EC reports received from N1ACB W1FYR & K1OIQ. KA1JOA now Tech. Sad to report N1AQN now a Silent Key. New Hampshire ARA board: KI1M, pres.; WB1DXN, v.p./treas.; N1BAO, secy. Amherst club was given a Swan 120 by K0UNJ & a Ranger by AC1J. Welcome to KA1LDS KA1LDF & KA1LDP. Traffic: KK1E 307, WA1YZN 212, W1TN 210, KI1M 174, N1CPX 148, W1FYR 128, N1NH 109, AK1E 105, K1PQV 94, N1AKS 75, W1MHX 52, W1ALE 44, W1CUE 39, WB1CFP 37, KA1HKB 31, N1ALM 22, KA1HPO 19, W1VTP 15, K6UXO 14, KA1GOZ 12, KU1D 9, KA1IIP 9, N1BVI 4, K1OIQ 4, N1CXK 3, KT1A.

**RHODE ISLAND:** SM, Gordon F. Fox, W1YNE — SEC: KA1EHR. STM: W1EOF. TD: AB1D. NM: WA1OSL (RIEM2MTN). ACC: N1BEE. SGL: K1DA. RIEM2MTN sessions 22, QNI 170, QTC 27. Club election results: Newport Co. RC W1LO, pres.; N1DB, v.p.; WA1OSL, treas. K1PTV, rec. secy.; W1JFF, corr. secy. Assoc Radio Amateurs of

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### About the authors

**Wayne Overbeck:**

- ❑ Named 1980 Radio Amateur of the Year by the Dayton Hamvention, world's largest amateur radio convention.
- ❑ Won Technical Excellence award of the American Radio Relay League for designing the "quagi" antenna.

**James Steffen:**

- ❑ Life member of the American Radio Relay League
- ❑ Regional scoring leader in several ARRL UHF-VHF operating contests

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   _____
4. Date of Birth:_____
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   Use this listing to describe all radio equipment in your possession.

| Description (Including Manufacturer's Name, Model and Serial Numbers or Other Identification) | Replacement Cost (Value at today's prices) $ |
|---|---|
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7. To figure your premium complete the following:
   - Total amount of Replacement Insurance $_____
   - Total amount of Miscellaneous Items (valued under $50.00 each) $_____
   - Total amount of Insurance $_____
   - Annual Premium (based on the rate of $1 per $100 of insurance. Minimum premium $10.00) $_____
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## ENROLLMENT PERIOD ENDS: MAY 1, 1984

So NE (W1AQ) K1AGA, pres.; K1AMG, v.p.; WA1LAD, secy.; KM1X, treas. Providence RA WB1FDY, pres.; K1HGC, v.p.; WA1RKL, secy.; N1BBM, treas.; W1EYH W1KKR W1GS, directors. Ocean State AR Group (OSARG) K1DA, pres.; KA1LA, v.p.; K1VOB, secy/treas.; WA1RBT W1YNE N1BWG W1XJ, directors. ARES/Wx Svc RTTY link has been approved and is in the construction phase. Should be fully operational as you read this column. Check 70 repeater whenever Wx Svc issues a storm warning. Traffic: W1EOF 868, KA1KML 618, WA1CRY 61, KA1EHR 22, KA1FPP 16, WA1CSO 14.

**VERMONT:** SM, Reed Garfield, WB1ABQ — STM: N1ARI. SEC: W1RNA. BM: AE1T. SGL: W1KRV. ACC: KA1AKI. Wow! Lots of new hams in VT. Hearty welcome and congrats to KA1s LEH LEM LEJ LEI LDJ LDK LDL LDM LFA LFB KUN KVJ KBO KBX KPP KRX. Told you there were a lot! Hope all the ops had fun with VT QSO Party. It sounded like good condx. Lots of interest in computers on the air lately. Hope it continues. Hope the snow will be gone by the time you read this! Nets: VTN (NTS) 31/209/97, VSBN 31/580/144, VFMTN 31/436/89, GMN 26/411/27, VPN 5/82/6, RFD 5/88/11. Carrier 26/649/26, CVFMN 5/39/5, RFD (Dec.) 4/53/10. Traffic: N1COB 95, W1JLZ 83, W1KRV 77, AE1T 51, WB1ABQ 51, W1OAK 49, K1IK 2.

**WESTERN MASSACHUSETTS:** SM, Don Haney, KA1T — TC: KA1JJM. OO/RFI: N1CM. SEC: WB1HIH. STM: W1UD. Glad to have new PIO WB1CJH aboard. Also welcome W1JRA as both an Affiliated Club and ORS. Could use some volunteer examiners in western part of Section. Look for volunteer exams to start in fall. Plan to upgrade? Register by April 15 for May FCC exams. W1ZPB very QRL but still makes 2M FM from office at school. Regret to note WB1EYM is Silent Key. Congrats to WB1FVS for VUCC on 6 meters. Hampden Co. flea market coming April 29. Good to meet the NoBARC crew in January. Stay tuned for a possible hamfest. Pleased to recognize WMTN/c3 as NTS net daily at 4 P.M. on KA1JJM/R 147.105. PSHR: W1KK WB1HIH W1PUO KA1T K1JHC W1JRA. Traffic: W1PUO 179, W1JRA 172, W1UD 153, KA1T 147, W1KK 75, WB1HIH 53, K1PUG 52, K1JHC 50, WA1YYW 40, WA1OPN 38, W1JP 31, K1IJV 26, KR1R 19, WB1FSV 13, W1SJV 12, KB1W 10, WB1HKN 9, KA1EKQ 8, W1ZPB 4.

## NORTHWESTERN DIVISION

**ALASKA:** SM, David W. Stevens, KL7EB — STM: KL7T. SEC: KL7QS. PIO: NL7CP. SGL: KL7LO. The TCA is working again; thanks goes to KL7VY KL7LA KL7T and WB7WOW. TCA meets daily on 14.292 at 1720Z and 2100Z. Please help pass traffic if you can. Congrats goes to WA4TNV/KL7 for talking to the space shuttle Columbia. The new Public Information Officer is Joe Kile, NL7CP. Please send black and white photos or stories of Alaskan hams in action to Joe Kile, POB 103421, Anchorage 99510. Thanks KL7BW for the new 146.22/82 repeater at mile 156 Parks Hwy. Snipers 3920 0400Z; Seasaw 3900 0500Z; Motley Group 3933 0700Z. Traffic: KL7LA 120, KL7VY 86, AL7FJ 43.

**MONTANA:** SM, Les Selyea, N7AIK — The Northwestern Division convention will be held June 1-3 in Seaside, OR. Club officers for the Lower Yellowstone ARC are KC7AA, pres.; WB7QZU, v.p.; N7DYE, secy.; KC7UC, treas. WB7NFK has set up a RTTY mailbox system for Montana amateurs on 3618 kHz, 60 wpm baudot code, 170 Hz shift, evenings with NFKNZH access code. KK7Y KB7BJ and KD7PZ of Bozeman operate their stations using solar panel systems. W7LR has developed a regulator and PC board for these. New ECs: for Flathead Co. is KA7LLI; for Treasure Co. is W7LZY. Rumor has it that WA7CAC was attempting to put Goosebay International Airport (of which he is the manager) on the map. At least he was calling "WA7CAC, Goosebay International Airport" on one of the space shuttle passes. PSHR: KF7R.

| Net | Sess. | QNI | QTC | Mgr. |
|---|---|---|---|---|
| MTN | 31 | 1614 | 232 | KB7SE |
| IMN | 22 | 204 | 106 | OPEN |
| BSN | 14 | 220 | 21 | WB7UTJ |
| MSN | 3 | 29 | 0 | K0PP |

Traffic: KF7R 106, KD7EG 68, WB7TNH 38, N7AIK 30, W7JMX 8.

**OREGON:** SM, William Shrader, W7QMU — STM: W7VSE. SEC: N7CPA. PIO: KC7YN. SGL: KA7KSK. ACC: WB7WTD. RFI: AK7T. OO: N7SC. Upgrades: N6JMB KA7RFD KA7QWJ KA7RFD KA7RUL KA7RKK Tech; KA7MLW Gen; KA7AGH KD7SC Adv. KQ7Q promoted to Sergeant on Medord PD. KC7WO finally joined DXCC ranks. KM7Z now has 101 countries confirmed on CW. KD7HS was named Portland ARC "Ham of the Year." W7OPH was installed as officer in Bandon Masonic Lodge. Rusty Key Night (OTVARC) in October was Co-won by KD7B and NB7W. Novice high score was held by KA7NPN. ND7T was awarded "Most Congenial Operator" in the contest. Congrats to the whole bunch. Hoodview ARC meets for breakfast at Heidi's in Gresham every Saturday at 7:30 A.M. If you are in the area be sure and stop in. W7AGQ got a new Icom 751 for Christmas; Boy, you talk about a pipeline to Santa, he must have a good one. Big news of the month is that Oregon State Convention at Seaside in June will now take on the status of ARRL Northwest Division Convention also. A new net has started up in the section. The "High Noon Net" meets at 11:45 A.M. daily on 3898 kHz. The purpose of the net is traffic handling and any questions about it should be directed by AL7W. Support your club in the Volunteer Examination Program, get your name on the list to help. OSN net toals: QNI 559, QTC 479. Traffic: W7VSE 605, KN7B 371, KX7W 330, AL7W 194, KX7T 97, K7QVK 82, KI7Y 66, KV7F 61, KM7Z 61, WB7OEX 61, KA7AID 39, N7BGW 26, W7LNE 16, W7LT 3. (Dec.) KI7Y 60.

**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 | 2886 | 162 | 31 |
| WSN | 3590 | 0245/0545 | 508 | 219 | 62 |
| PSTS | 145.33 | 0130/0630 | 184 | 139 | 62 |
| NTN | 3970 | 2000 | 1235 | 63 | 31 |
| EWTN | 146.04 | 0130/0630 | 188 | 88 | 62 |
| NWSSB | 3945 | 0230 | 444 | 38 | 31 |

Hamfair Season is upon us! Skagit Apr. 21st, Yakima May 12th & 13th, Vancouver May 19th & 20th Northwestern Division Conv. June 2nd & 3rd, Tacoma Aug. 11th & 12th, Walla Walla Sept. 22nd & 23rd. I'll see you there! Radio Ams/Skagit Co. '84 officers KF7F, pres.; N7AXJ, v.p.; KA7ACY, secy/treas.; WB7OPZ, rptr trustee. Inland Empire VHF WB7QVH pres.; N7AGL, v.p.; KA7DDU, secy.; KA7LNI, treas.; Spokane Swapfest Apr. 28th WA7LNC rpts 28 chk-in to successful Nat'l Wx. Serv drill in Spokane area. Western Wash. Amateur Relay Assn. W7FHZ, chrm WA7FUS, v. chmn.; K7CR, secy/treas. New opr. of 442.825 rptr in Longview is W7KNM. Peninsula ARC W7ZLJ has

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new rptr on 145.35. WA7NAN & W7FHZ put up new DATA rptr. on Cougar Mt. Out 145.25 for RTTY, ASCII, PACKET, etc. baud rate to abt 1200. Hi-tec is on the move! Rad. Club/Tac's. W7KKN may have passes a milestone Dec. 19th when he and W7FEN in Duvall made 1st Pug. Sd. Packet Radio QSO using the Tucson Board. Bravo! KC7EQ is running 5 Novice classes per week. WOW! RCT participates in Tac. Mall hobby show winning 2nd prize for its active booth. Tri-Cities ARS '84 ofcrs: WB7VCD, pres.; WB7VCC, v.p.; WB7PHP, treas.; AB7Z, secy. Mt Baker ARC ofcrs N7PF, pres.; K7VNI, v.p.; K7IWX, secy.; W7GVO, treas. Fourteen mbrs spend 65 hrs working on Nooksack River flooding Jan 4 & 5. W7IEU in Marysville started 160 Mtr Tfc Handling Net during poor condx on 75 & 40 mtrs. Worked quite well! Boeing EARS KD7QR, formerly N7BKM, gave interesting program describing their sophisticated rptr on 145.33. The Volunteer Exam Program to be successful will need many amateurs to give some time administering exams. Let's get behind this program. (See Dec. *QST*) You can volunteer by writing ARRL, Curt Holsopple, K9CH, Vol. Exam. Prog. Mgr. The future of Ham Radio depends on us! WWDXC's W7NG presented great DX prgm "The Isle of Man" to the W. Sea. ARC. Your SM enjoyed giving a prgm on the ARRL organization to the WSARC. I also enjoyed mtg. with the Peninsula ARC. Reminder! When using simplex use 144.91 to 145.09; 146.42 to 146.56; 147.55. Please AVOID RPTR. INPUTS Clallam Co ARC ofcrs N7DHY, pres.; KA7PXL, v.p.; Mary Tate, secy.; N7BOE, treas. Traffic: WB7WOW 634, W7DZX 484, KD7ME 337, K7GXZ 182, KR7F 137, W7LG 133, N7ANE 128, K5TI 114, W7GB 74, WA7BDD 61, W7IEU 61, N7DDP 58, K7CTP 40, KD7G 23, K7AJT 22, W7LUP 19, KA7INX 13, K7OXL 6, W7APS 3, WA7RWK 3, W7AIB 2. (June) KD7ME 188.

## PACIFIC DIVISION

**EAST BAY:** SM, Bob Vallio, W6RGG — ASMs: W6ZF N6DHN. SEC: W6LKE. STM: NI6A. NI6A and W6LKE spoke at the Alameda Red Cross and the Benicia ARC about public sevice. EBARC welcomes another new member, WA6DOO. Their membership at the close of the year was 76. MDARC member DJ8QN (ex-WA8GSN) is the proud father of a 2nd harmonic! N6DRT, sitting in for SEC W6LKE, showed a video tape called "At Any Moment" at an Alameda Co. RACES meeting. Thanks to the climbing skills of WB6OOL, the NCCC/RACES UHF repeater W6RGG/R (444.200) now has its new antenna atop the tower. I am happy to report that WB6DOB has been released from the hospital and is active again. KD6KV has joined the action on the 220 MHz band. Traffic: NI6A 251, K6AGD 145, W6VOM 143, NV6T 105, WB6UZX 29, K6APW 29.

**NEVADA:** SM, L. M. Norman, W7PBV — SEC: WB5VDV/7. STM: W7BS. W7THH in Washoe Medical Center; get well soon. A group of about thirty radio amateurs meet in Las Vegas to coordinate ways and means of providing emergency communications for the community. W7MRN wintering with a reported 450K other snowbirds in the Quartzsite area. WA7UEC now NF7P; WB7SUY now NF7K. KA7RTX and KA7RWZ new Novices in Reno area. W7DIK out of hospital recouping tending his bee's. SNARS board members: WB7UXO K7WYC NC7K KC7LX W7AAA KF7E and WA7HVY. Traffic: W7BX 58, W7BQE 20, W7PBV 4.

**PACIFIC:** SM: Amy Curtis, AH6P — STM: KH6HIJ. SEC: KH6B. ACC: KH6BZF. BM: KH6W. PIO: KH6IJ. Aloha and hafa adai to all of the Pacific. Had a wonderful visit to Oahu and met many of the good folks there in HARC and EARC. Thanks to all for being so nice. NH6N is teaching a General license class in Kona. WH6AVE just upgraded from Novice to General. Congrats! Was saddened to hear of the passing of KH6DZB. He was a wonderful human being and will be missed. Kauai ARC members active in support of the recent Triathelon. Nice work! Hawaii Afternoon Net reports QNI of 300 for January, a new record! Check them out every afternoon at 0200Z on 7290 kHz. Traffic: KH6B 268, KH6XO 101, KH6S 47, KH6HIJ 40, KH6RQ 15.

**SACRAMENTO VALLEY:** SM, Ron Menet, N6AUB — STM: KY6Q. SEC: WA6ZUD. OO/RFI: WB6TNC. SGL: WB6WFG. Welcome to the Yolo Co. ARS, the latest addition to the section's family of affiliated clubs. Congrats to the Dunsmuir ARC for 100% ARRL membership. Next Sacramento Valley section meeting is in Red Bluff in June or July. New officers: EDARC-WA6JQN, pres.; N6DPP, v.p.; ROC-KI6O, pres.; KF6A, v.p. Congrats to all the upgrades of whom we know: Novice-KB6APW KB6DCI; Tech.-KA6WKZ KA6WGQ N6JYQ KB6NVV; General WA6ZGS KA6WJY N6JSL; Extra-K6EE. You can always tell an active club: It is made up of active members! SM N6AUB has taken on the additional responsibility of chairman, Emergency Communications Advisory Committee. SM travels: Sierra Foothills A.R.C. and Yolo Co. ARC Section officers are available to speak at your club meetings with advance notice. Contact SM. Traffic: WA6WJZ 58, N6CVF 36, WB6SRQ 23, WA6ZUD 22, N6AUB 13, N6EPG 6, KY6Q 6.

**SAN FRANCISCO:** SM, Bob Smith, NA6T — The Winter San Francisco section meeting was held in Santa Rosa. Main topic of discussion was the development of the Area/RACES communications plan for the section. Forty two representatives from all the clubs within the section attended with good input to the discussion on emergency communications. Please support your local DEC or EC with the help he/she needs. Field Day plans are progressing within the section, contact K9AT. K6ANP completed 5BDXCC, congrats. Two 70 foot towers in AE6H's back yard? New EC in Humboldt Co. is KA6SFX. New SEC is KE6LF from Eureka. WA8LLY es Nancy are 2 for 2 — Erik and Alexei on 12-6-83. New Rptr. in northern CA on Anthony Peak (7000') in Mendocino Co. on 147.81/21. There is a need for traffic handlers within the ARES groups in the section. If you are interested in traffic handling with AREA or NTS, please write NA6T or W6IPL at *Callbook* address. See you next month. The V30AA slide show is almost ready. Let met know if your club would like to see it.

**SAN JOAQUIN VALLEY:** SM, Chales McConnell, W6DPD. SEC: WA6YAB. STM: N6AWH. TC: WA6EXV. New ofcers of the Kern Co. ARC are WD6BUK, pres.; WB6KLL, v.p.; KB6BSD, secy.; WA6BED, treas. The club meets the 4th Friday in Bakersfield. The officers of the Stanislaus ARA were reelected for another year. They are W6AFS, pres.; NV6S, v.p.; WA6MIZ, secy.; N6EKV, treas. The club meets the 3rd Thursday in Modesto. The Kings Co. Chapter of 10-X meets Wednesdays at 8 P.M. on 28.702. K6GHT is a Silent Key. WD6DET is Extra. N6JTA is General. KB6CYK KB6CCK and KA6VMJ are Techs. KB6DGD KB6DGE KB6DGF KB6DGG KB6AMT and KB6DKT are Novices. AA6S and N6QP are in the log of W5LFL/STS-9. K6OZL has a TS930 and operated from both North and South Cook Islands. W6JBL and WB6QDN have TS430s. WB6UKB has a TR2500. W6XP has a 2M HT amp and an Ameco pre-amp. N6HPP has both an IC2AT and an IC3AT.

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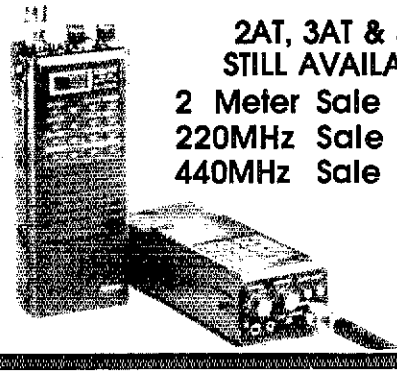

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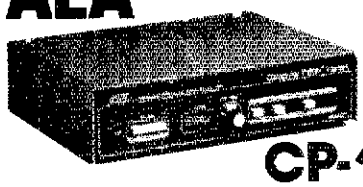

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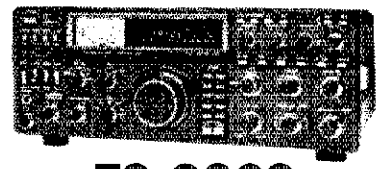

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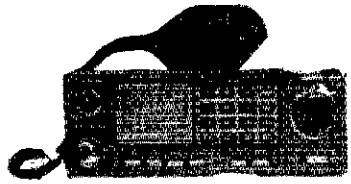

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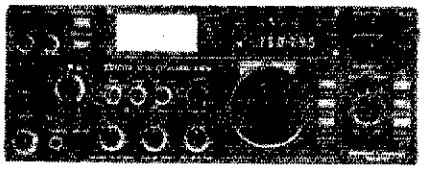

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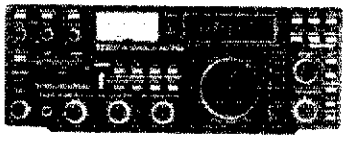

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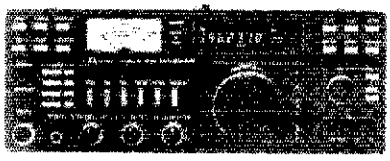

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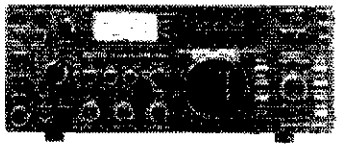

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The 1984 Fresno Hamfest is May 18-20 at the Tropicana Inn in Fresno. Bring your excess gear for the swap meet. Traffic: N6AWH 107, WA6YAB 14, W6SX 12, W6DPD 10, WD6FRS 6, K9YBM 5, K6PMG 3.

**SANTA CLARA VALLEY:** SM, Rod Stafford, KB6ZV — SEC: KA6R. STM: W6PHT. PIO: WB6BPU. ACC: W6MKM. It has been a very busy period for SCV section activities lately. As SM, I held two section-wide meetings, one in Watsonville for the people in the southern part of the section, and one in San Mateo for the northern part of the section. These were well attended and were preludes to the Pacific Division "Cabinet Meeting" in Livermore sponsored by Pac. Div. Director W6ZM. These meetings will always take place in the spring and fall just before the ARRL Bd. of Directors' meetings. Remember, these are opportunities for you to have some direct input into the policies and the directions of the ARRL. Your comments are always welcome at any time, but these meetings are for the specific purpose of hearing your views on ARRL policies. Let your voice be heard! While visiting the various clubs in this section I am regularly asked how clubs can increase their membership and their attendance at meetings. Good speakers and a good newsletter really pull the clubs together. We are lucky to be in a section where we have an excellent selection of knowledgable speakers in varied technical and non-technical areas. All it takes is a little imagination and time to come up with really good programs. Newsletters are more difficult and time consuming to produce. There are two newsletters in the section that deserve mention because of their high quality: *Pearagraphs* (Palo Alto ARA) and the *Pacifica Communicator* (Coastside ARC). WA6OML has spent considerable time and effort in reactivating the Silicon Valley Emerg. Comm. Group. WA6ADZ/R (146.715) is being used by the SVECG for their weekly net on Tues. night at 8 P.M. (local). If you want to become involved in emergency communications, check into the following VHF nets:

| Net | Freq. | Day | Time |
|---|---|---|---|
| SVECG | 146.715 | Tue | 8 P.M. |
| SPECS | 145.27 | Mon | 8 P.M. |
| SCV/ARES | 145.45 | Wed | 7 P.M. |

A local electronics firm donated over $2,000 to Santa Clara Valley RS to help defray costs of the WB6OQS repeater site rental. Someone in that company knows the value of Amateur Radio. Recently elected officers for the Varian ARC: WA6RCX, pres.; K6OYN, v.p.; W6ZYH, secy.; KA6RDQ, treas. Coastside ARC officers for 1984: KY6I, pres.; WB6BMD, v.p.; WD6FYJ, secy.; KB6VT, treas. K6SZ gave a very interesting talk to the San Mateo ARC about maritime radio operation from the early days to the present. He is a merchant marine radio operator. Did you know CQD was the distress call that ships used to send? W6XN & W6SP talked about OSCAR 10 to the NCDXC. N6TX has a lot of information about satellite communications and shared some with the West Valley ARA and WB6OQS, NM6J gave a practical talk about inexpensive antenna fabrication at a Palo Alto ARA meeting. How about a $5 mobile mag 5/8 antenna for 2 meters? Flea markets each 2nd Sat. from March to October at Foothill College. Stop by the ARRL booth and say hello. Traffic: W6KZJ 108, WA6HAD 14, W6PHT 11, W6ZRJ 4.

## ROANOKE DIVISION

**NORTH CAROLINA:** SM, Ian C. Black, WD4CNR — STM: W4EAT. SEC: KU4W.

| Net | Freq. | Time | QNI | QTC | NM |
|---|---|---|---|---|---|
| CMN | 3927 | 745 | 491 | 190 | WD4CNQ |
| JFKN | 3923 | 630 | 720 | 57 | WB4WII |
| THEN | 3923 | 730 | 500 | 42 | WD4LRG |
| CEN | 3902 | 630 | 560 | 120 | K4NLK |
| CN | 3574 | 7/10 | 557 | 254 | K4WJR |
| CNCTN | | | 1092 | 95 | 30 |
| PCTN | | | 477 | 105 | 27 |
| PETN | | | 172 | 58 | 22 |

Those of you who are not members of WCARS missed the almost orgasmic pleasure of seeing our friend, Lew Trexler, looking out from the pages of *Smoke Test*. WA4UTY was chosen V.I.P. of the month, and all sorts of personal info was included. That makes two clubs I know of that feature a ham each month. I think this is a great idea. Suggestion from S.C. club for Div-wide award for Ham of the Year. A memorial to W4KFC, this may be implemented as soon as 1985. NC has turned in one request for Special Service Club. The Triangle ARC should be hearing from Hq. soon. Other clubs wanting info on this designation, please get in touch. Heard some good advice from WA4PID. He says when bothered by those carriers and "tuner-uppers," silence is golden and always does more good than the ranting and raving we feel like doing. And the same advice is good for those times when stations start QSOs on or near net frequencies. If it's a case of them legitimately finding and using a clear frequency for conversation, their right to do that is protected by law. If they are doing it to annoy, they succeed only when they are recognized. Traffic: K4NLK 376, WD4CNQ 309, WD4CNR 282, WD4LRG 260, WA4OBR 196, NJ4L 151, W4GRO 87, WB4WII 83, WA4MNR 68, WB4N 61, K4IWW 60, WB4HRR 60, KA4KJI 52, KU4W 51, NT4K 40, KC4AM 32, K4DDY 32, NE4J 32, WA4YTG 31, N4JRE 27, WB4CYN 23, W4EHF 16, N4UE 13, W4TWD 10, KA4ATK 7, KB4BXA 7.

**SOUTH CAROLINA:** SM, Jimmy Walker, WD4HLZ — I am proud to announce that W4DRF was selected by the ARRL as an ARRL Interference Reporting System (AIRS) station. Eligibility for AIRS is based on maturity and experience in Amateur Radio, availability of the necessary equipment, and technical knowledge of monitoring and related matters. He became a "charter" AIRS member based on his excellent qualifications and active participation in the Intruder Watch (IW) program. Functions of AIRS stations are to document non-amateur encroaching on the amateur bands and to report each case to ARRL Hq. Severe cases will be forwarded on to the FCC for further action. In addition, the ARRL will share these reports with the three IARU regions. These records may be called upon to defend the rights of amateurs to operate freely in their allocated bands. W4DRF supplied similar reports through the IW program which were used at WARC-79. As a result, new frequencies were allocated to amateurs. THANKS W4DRF. Traffic: K4WJR 237, K4ZN 233, W4ANK 163, W4NTO 108, W4FMZ 102, WØIKT 64, KA4LRM 48, K4FRX 42, WB4UDK 36, K4ZB 36, WD4FJP 22, WA4JWS 12, W4DRF 6, KA4AUR 5.

**VIRGINIA:** SM, Phil Sager, WB4FDT. Our newly elected Section Manager is W3ATQ. Congrats to him and to K3RZR for a fine election. W3ATQ takes office April 1, and all March reports should go to him. My December report, scheduled to appear in March *QST* was lost in the mail and was never received at ARRL Hq. Fortunately, our Section Traffic Manager's report was received, so stations

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| | | |
|---|---|---|
| 416-TB | 435MHz | $54.95 |
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| A144-20T | 145.9MHz | 68.95 |
| A14T-MB | Mounting boom | 27.95 |

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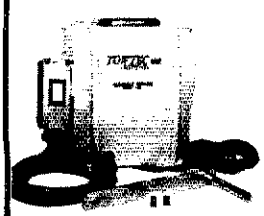

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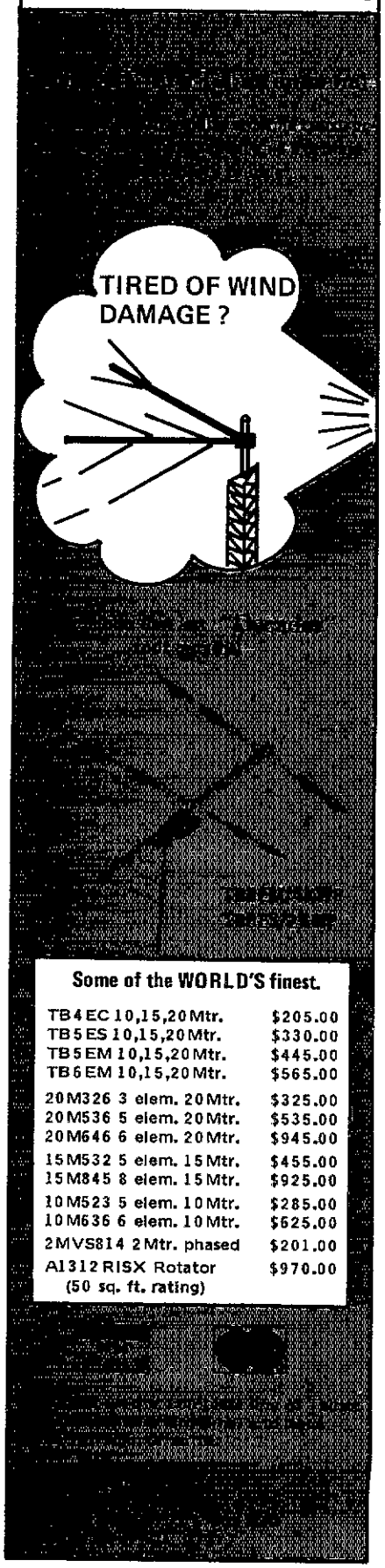


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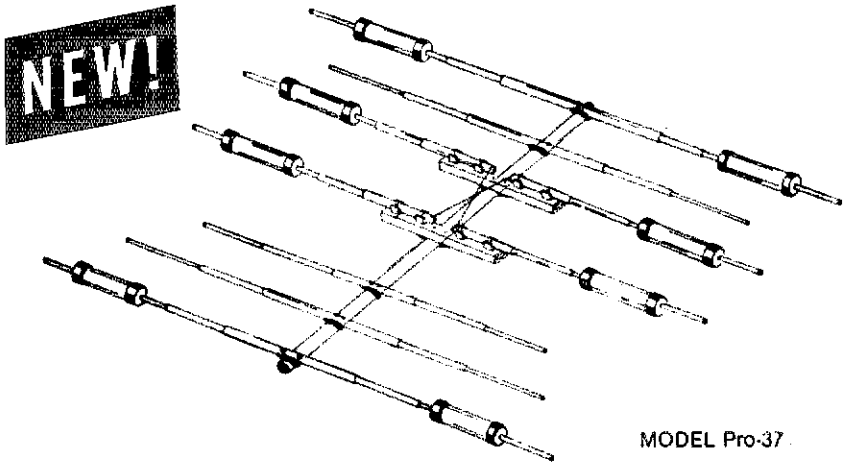


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| FRONT-TO-BACK RATIO | | |
| POWER RATING | CW | 2.5 kW Avg. |
| | SSB | 5.0 kWPEP |
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| VSWR (1.5/1 or better) | | 1.5/1 |
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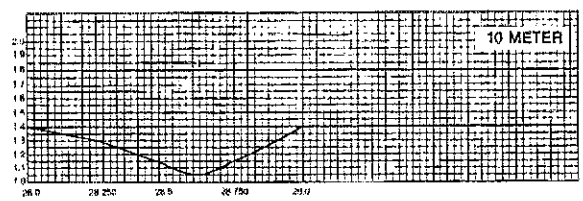
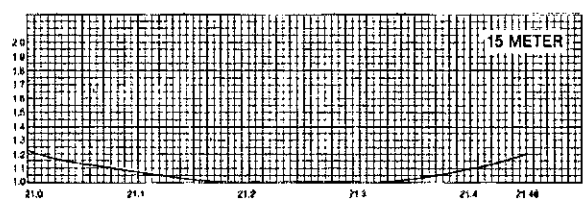
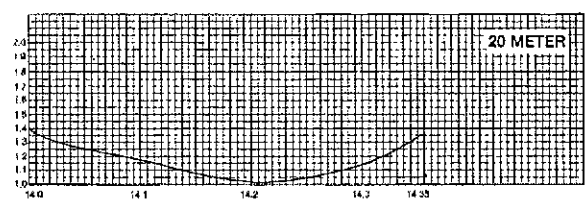
| RECOMMENDED MAST SIZE | | 2" |
| TURNING RADIUS | | 19'8" |
| WIND SURFACE AREA (in sq. ft.) | | 13.1 sq. ft. |
| WIND LOAD (EIA STD. 80 MPH) | | 250 lbs. |
| ASSEMBLED WEIGHT (approx.) | | 81 lbs. |
| SHIPPING WEIGHT (approx.) | | 86 lbs. |

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were properly listed for BPL and PSHR. I regret to announce the following Silent Keys, K4ROH K4DC (ex-W4SZT), and WA4JJF. K4DC was an active member of the CW nets during the 1960s. WA4JJF was one of the most active stations on the VSBN prior to his move to Waco, Texas, in 1973. Did you notice K4JST's QSL card in the bottom left corner on the cover of March QST? K4RHQ celebrates 11 yers of NCSing the early Saturing VSBN. N4GHI is everywhere. *The Virginia Ham* is being published every other month. To get on the mailing list contact K4KDJ or K4VWK. Former PAM W4JMA is once again living in Israel and is licensed as 4X6LL. W4SQQ back in Virginia. Former PAM WA9NEW now living in North Carolina and is president of the Raleigh ARC. WB4FDT is looking for copies of the *Virginia Ham* or the Virginia Section Newsletter issued between 1954-1960. Nice to hear K4GR and K4LMB back on the CW nets. KB4PW active in ARRL QSO Party. All club bulletins should put W3ATQ on their mailing list. I have appreciated receiving all club bulletins over the past two years. Traffic: AA4AT 523, W3ATQ 316, N4GHI 290, WA4CCK 254, K4KDJ 252, WD4FTK 241, WD4ALY 214, K4JM 150, WD4OCW 147, WB4FLT 144, WB4PNY 125, KR4V 114, WA4LJI 104, W3BBN 85, W4JLS 85, KB4QG 82, K4VWK 81, KA3DTE 69, K4JST 58, KB4WT 57, K4GR 44, KB4PW 43, NT4S 43, WB4DQZ 34, WB4EDB 27, K3RZR 27, WB4FDT 26, KA4JXZ 26, WB4KIT 26, K4MLC 22, KA4ZTB 19, WB4ZNB 17, W3BBQ 14, WB4UHC 14, N4FNT 11, NN4I 11, N4TE 11, NW4O 10, KC4HN 9, WB4RDV 8, WA1VRL 8, W4YE 8, WB2OMZ 7, WA4TVS 6, W4PVA 5, W4TZC 5, WD4KQJ 3, K4LMB 3, N3RC 3, W4KX 2.

## ROCKY MOUNTAIN DIVISION

**COLORADO:** SM, Bill Sheffield, KQ0J — SEC: WB0FQB. STM: WD0AIT. OO/RFI: NC0F. ACC: WB0DUV. PIO: WD0HNQ. TC: KO0P. SGL: WD0GQL. BM: W0MDT. We have a new SGL, Bill Davis, WD0GQL, a very knowledgeable & dedicated amateur. Two new appts made on the W. Slope. N0ACW moves up to the SEC's staff as Asst of Operations, KC0WR has assumed the duties of DEC on the W. Slope. Good luck to all three in your new positions. Colo repeaters are constantly improving coverage & with the spring run-off expected to be high, they will be of great help. In Glenwood, 448.65/443.65 has linking into Utah with 449.200 in Grand Mesa & coverage from the "tunnel." The RMRL 34/94 is linking with the Lamar 144.59/145.19 for excellent coverage into southeast. the ARA Conifer site now has a digital repeater on 145.70 for packet radio enthusiasts. Sorry to hear that W0CJK is now a Silent Key. He was very active on many nets & on RACES. Statewide efforts going well for the '84 Health Fair. To help contact WA0HJZ, state coord. or K0WOP Metro area. The dates April 7-15. The Pikes Peak Swapfest is set for April 15th at the Internat'l Polka Club in the Springs. It's always a good one. Rocky Mt. Div. Conv. is going great. Many dealers, good forums & lots of prizes. Get registered for the big one on May 25-27th. Congrats to name droppers WA0HJZ K0WOP KC0WR. 73, KQ0J. Nets: Colb QNI 940, QTC 37, inf 145, time 844, 26 sess.; CWN QNI 151, QTC 95, time 568, 30 sess.; CWXN QNI 2685, QTC 2078, time 2790, 31 sess.; HNN QNI 2055, QTC 93, inf 435, time 1600, 34 sess. Traffic: N0BQP 2329, WA0HJZ 1537, K0JAN 629, W0ACH 452, K0RXK 362, WD0AUN 252, N0CXI 192, WD0AIT 178, KB0Z 144, W0EJD 99, K0BN 68, W5HRS 31, WB0NHA 18, W0LQ 17, N0EBM 40, N0CYR 5.

**NEW MEXICO:** SM, Joe T. Knight, W5PDY — DEC: KB5XD. STM: KV5U. NMs: WA5UNO K6LL W5VFQ. TC: W8GY. ACC: W5HD. Southwest Net (SWN) meets daily on 3583 at 1930 local and handled 250 msgs with 232 stations in. New Mexico Roadrunner Net (NMRRN) meets daily on 3.939 at 0100 UTC and handled 51 msgs with 1195 stations in. New Mexico Breakfast Club meets daily on 3.939 at 0630 local and handled 60 msgs with 1163 checkins. Yucca 2-Mtr Net 78/18 & 93/33 handled 13 msgs with 417 checkins. Caravan Club 2-Mtr Net 66/06 handled 13 msgs with 163 checkins. Everyone looking forward to the "Bean Feed" in Las Cruces April 28/29th and to the Rocky Mt. Div. Convention in Denver May 25-27th. Good newsletter from N5EPA & Northern NM ARC. They will receive their ARRL Charter Feb 17th. Traffic: W5UH 316, ND5T 185, W5JOV 118.

**UTAH:** SM, Ron Todd, K3FR — STM: W7OCX. SEC: NA7G. BM: WA7MEL. OO/RFI: KD7FL. ACC: KB7XO. PIO: N7BHC. TC: K7RJ. Congrats to N7BHC. N7ARE as KI7L who wrked W5LFL; seems CW idea may have started in Utah. New Adv is KD7SL. WA7UZO and N7BHC now on packet radio 147.54 in SL area. About 5 others expected on by May. N7BHC has new TRS-80 model II and will be splitting time between packet bulletin board and underdense MS experiments. Upgrade concious car. Catch K7HLR code practice on following schedule: 1030 A.M. 7098 kHz, 146.58 MHz 5 P.M. 146.58 MHz; 8 P.M. 3698 kHz. Section tfc. nets are: Behive Utah Net 7272 kHz 1230 local time daily; Utah Code Net 3710 kHz 1930 local time daily. Traffic: K7HLR 196, WA7KHE 99, WA7MEL 71, KD7SL 20, W7OCX 14, KO7H 9, K3FR 9.

**WYOMING:** SM, Dick Wunder, WA7WFC — SEC: W7TVK. STM: W0OGH. PIO & ACC: KC7QJ. The Wyo. Hamfest will be July 14 & 15 at Meadow Lark Lake with the Sweetwater ARC hosting the event this year. I would like to see a representative from every club and/or repeater group in the state attend this year so we can resurrect the Wyoming Council of Amateur Radio Clubs (WCARC). Also, the position of Frequency Coordinator needs to be filled on a permanent basis. I have the following vacancies in the Leadership Organization: Bulletin Mgr, Technical Coord, OO/RFI Coord. ARRL Rocky Mt. Division Convention is May 25-27 in Aurora, Co. WCN — 22 sessions with 838 QNI & 34 QTC. WJN — 26 sessions with 845 QNI. Traffic: WB7NHR 307, W7HLA 80.

## SOUTHEASTERN DIVISION

**ALABAMA:** SM, Joseph E. Smith, WA4RNP — SEC: N4DMA. STM: N4JAW. SGL: KA4WVU. PIO: WO4W. BM: KF4VV. The new Haylarc club officers are: KD4JD, pres.; KA4SHI, v.p.; WD4DDJ, secy.; WA4DJW, treas. 84 club officers of the WAARS are: KE4TN, pres.; KB4AZS, v.p.; N4HII, secy/treas. MARC officers are: K4BTP, pres.; WB4RGX, v.p.; KE4FO, secy.; KA4WZI, treas. SCARC new officers are: N4IVI, pres.; KF4DN, v.p.; N4FCO, secy/treas. The North Ala DX Club, the Selma ARC, and the Limestone ARC have 100% ARRL membership. I hope to see all of you at the ARRL Ala State Convention next month, May 18th and 19th which will be at the Birminghamfest this year. Let's all atend the "ARES" and "ARRL" forums and get together to discuss some section activities. I want to know what you think. Nets: Jan GAND with 680 messages in 31 sessions: rep 100% by W4CKS and WX4I. DRN5 with 511 messages in 62 sessions rep 98% by WX4I NW4X WB4IXA WA4JDH KC4GS W4IBU W4CKS W4WJF W4GUY

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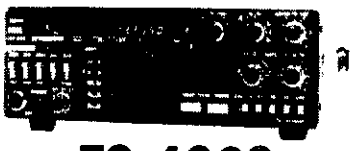

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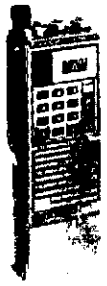

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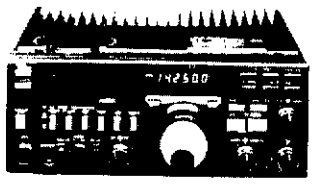

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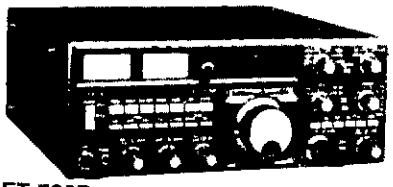

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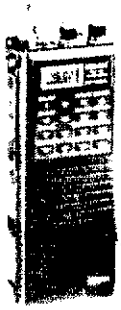

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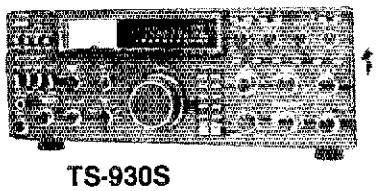

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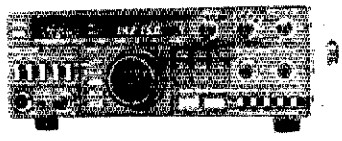

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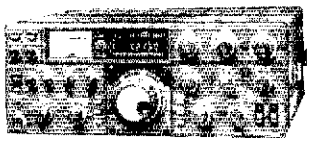

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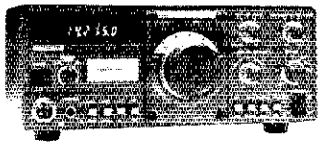

**TS-130SE Compact 80-10 Meter Transceiver**

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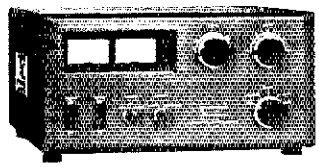

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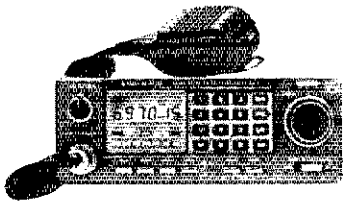

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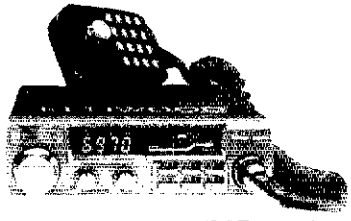

**TM-201A/TM-401A 2m/70cm FM Transceiver**

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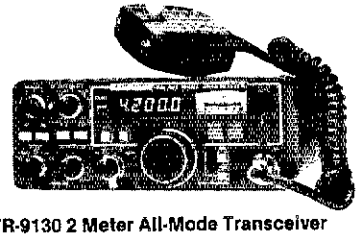

**TR-9130 2 Meter All-Mode Transceiver**

- 25W Output—All Modes
- Six Memories—with Battery Back-up
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- High Performance Noise Blanker

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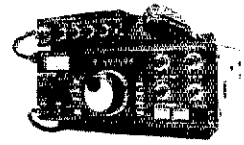

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- 5 Memories
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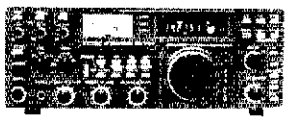

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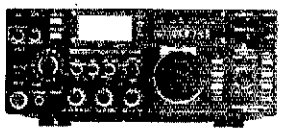

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TR-2500 2.5W/300 mW
(Switchable) 2 Meter
Handheld Transceiver
Small Size— Small Price—
Big Performance!
- LCD Readout
- Ten Memories w/Lithium Back-up
- Band and Memory Scan
- Built-In Sub-tone Encoder
- Built-In 16 Key Autopatch Encoder
- Slide Lock Battery Pack

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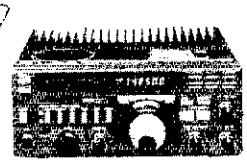

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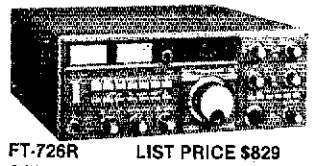

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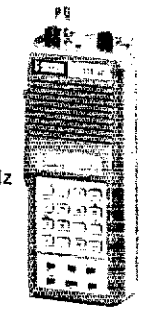

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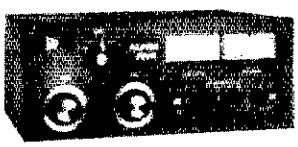
ST442μP . . . . . CALL!

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

## ALPHA SALE!

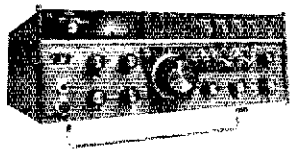


76PA $1899!

| 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!



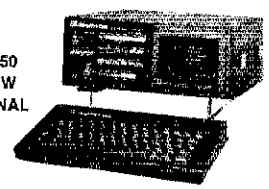
CORSAIR List $1169
Deluxe AC Supply List $199
Both Items—Yours for $1169!
All Ten-Tec Accessories in Stock
for Fast Shipment!

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

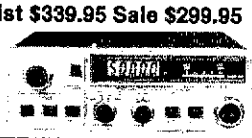
| | | | |
|---|---|---|---|
| CWR6700 | $439.95 | DS3100ASR | $1699.95 |
| CWR6750 | $629.95 | MPT3100 | $2199.95 |
| CT2100/KB2100 | $749.95 | RS2100 | $269.95 |
| CT2200/KB2100 | $949.95 | ST5000 | $219.95 |
| DSK3100 | $1049.95 | ST8000 | $649.95 |
| ARQ1000 | $649.95 | KG-12 | $169.95 |

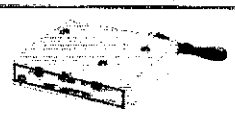
## TOKYO HY-POWER LABS

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-20U . . $99.95 | HC-2000 $289.95 |

## KDK FM2033
List $339.95 Sale $299.95





JANEL QSA5 PREAMP $39.95!

| | | | |
|---|---|---|---|
| QSA-5 | $41 | 432PL | $59 |
| PB-30 | $25 | PB144 | $25 |
| PB-50 | $25 | PB220 | $25 |

## MIRAGE AMPLIFIER SALE!

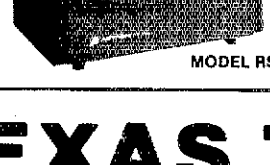
B1016
$249

| Model | Band | Pre-amp | Input | Output | DC Pwr | Sale Price |
|---|---|---|---|---|---|---|
| A1015 | 6M | Yes | 10W | 150W | 20A | $249 |
| B23 | 2M | No | 2W | 30W | 5A | $ 79 |
| B215 | 2M | Yes | 2W | 150W | 20A | $259 |
| B108 | 2M | Yes | 10W | 80W | 10A | $159 |
| B1016 | 2M | Yes | 10W | 160W | 20A | $249 |
| B3016 | 2M | Yes | 30W | 160W | 17A | $199 |
| C22 | 220 | No | 2W | 20W | 5A | $ 79 |
| C106 | 220 | Yes | 10W | 50W | 10A | $179 |
| C1012 | 220 | Yes | 10W | 140W | 20A | $259 |
| D24 | 440 | No | 2W | 40W | 8A | $179 |
| D1010N | 440 | No | 10W | 100W | 20A | $269 |

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 | $ 69 |
| RS7A | 5 | 7 | 79 |
| RS12A | 9 | 12 | 99 |
| RS20A | 16 | 20 | 159 |
| RS20M | 16 | 20 | 169 |
| RS35A | 25 | 35 | 199 |
| RS35M | 25 | 35 | 149 |
| RS50A | 37 | 50 | 199 |
| RS50M | 37 | 50 | 229 |

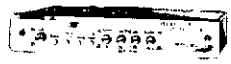


MODEL RS-50A

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 |

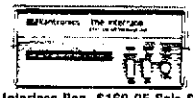
All AEA Keyers, Antennas & Accessories
In Stock!



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 | 49 |
| Vic-20 Amtor Soft | 89 | Hamtext VIC-20 | 99 |
| Model 64 Amtor Soft | 89 | Hamtext Model 64 | 99 |
| Apple Hamsoft | 29 | Alan Hamsoft | 49 |
| | | TRS-80C Hamsoft | 59 |

METRON
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

# TEXAS TOWERS

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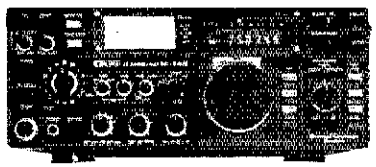
Monday-Friday 9 AM - 5 PM Saturday 9 AM - 1 PM

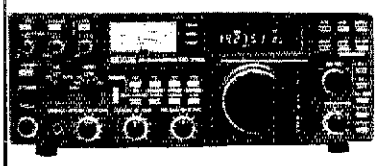
# ICOM SALE! SALE! SALE!



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

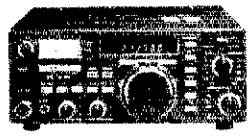
- All Solid State
- High Dynamic Range
- Full QSK Operation
- Receives .1 - 30MHz
- Dual VFO w/16 Memories
- 12VDC Operation or Optional Internal AC Supply
- 100% Duty Cycle
- Speech Compressor
- Lithium Memory Backup
- Adjustable Noise Blanker
- IF Shift/Passband Tuning

**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

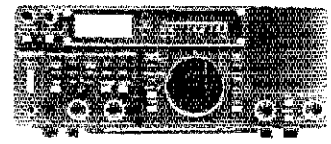
**LIST PRICE $1795—CALL FOR SPECIAL SALE PRICE!**



**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

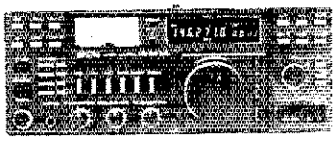
**LIST PRICE $829—CALL FOR SPECIAL SALE PRICE!**



**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

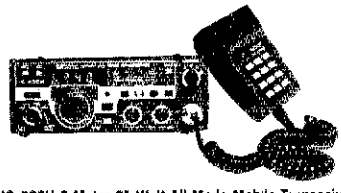
**LIST PRICE $749—CALL FOR SPECIAL SALE PRICE!**



**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

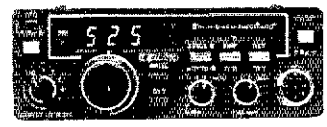
**IC-271A List $699 IC-471A List $799**
**PLEASE CALL FOR YOUR SPECIAL PRICE!**



**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**

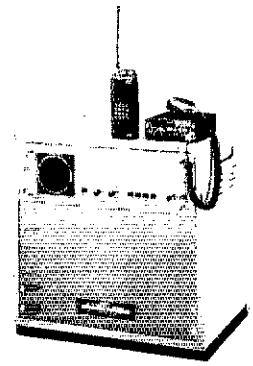
- Digital LCD Readout
- Scanning
- Programmable PL Tones
- Optional 5W Battery
- S-meter Function
- 10 Memories
- Offset Storage
- Lithium Memory Backup
- 13.8VDC Operation!
- Sealed Case

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 $$$!!**

VISA
MasterCard

# TEXAS TOWERS

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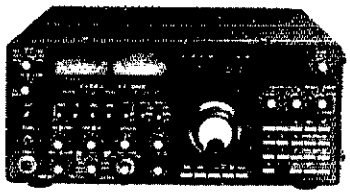
# YAESU SALE!

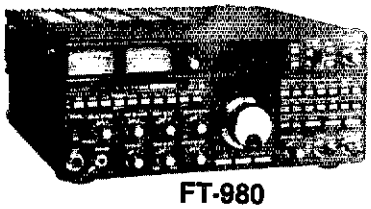


## FT-ONE

**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

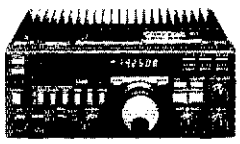
List Price $3074. CALL FOR YOUR SPECIAL PRICE!
Quantities Limited — Hurry!



## 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

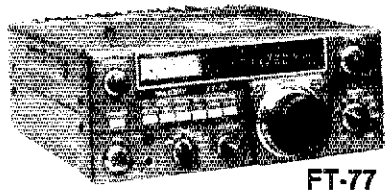
Computer Interface now in development—Own Tomorrow's HF Transceiver—Today!!
Manufacturer's Suggested List Price $1499
Call For Your Special Price Today!!



## FT-757 GX

**Compact General-Coverage Transceiver**
- General-Coverage Receiver
- USB/LSB/CW/AM/FM
- Dual VFOs
- 8 Memories with Lithium Backup
- IF Shift/IF Width Controls
- Memory/Band Scan
- Speech Processor
- CW Filter and CW Keyer Included
- 100 Watt Output/100% Duty Cycle
- Many, Many Other Features

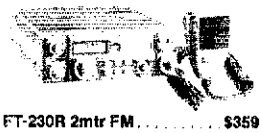
**List Price $829. Call for Special Low Texas Towers Discount Price and Save $$$**



## FT-77

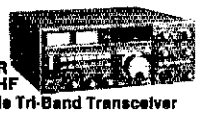
**New 80-10mtr Compact HF Transceiver**
- Digital Readout
- Adj Noise Blanker
- CW/SSB/FM Modes
- CW Wide/Narrow
- Optional AC Supply, CW Filter, FM Unit External VFO, Antenna Tuner Available

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!

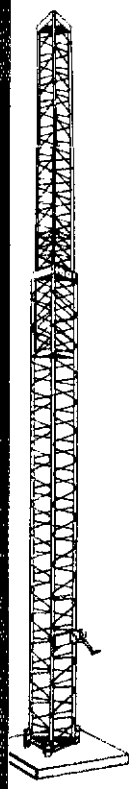
Manufacturer's List $499—Call today for Your Special Discount Price!!

**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

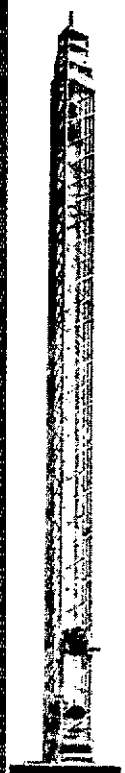
## CRANKUP SALE!

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!

# TEXAS TOWERS

**Div. of Texas RF Distributors Inc.**
**1108 Summit Ave., Suite 4 • Plano, Texas 75074**

**Telephone (214) 422-7306**

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W4CUE KB4VI WD4DAG WD4MTK. PSHR: WX4I W4CKS WA4LXP WA4JDH WA4RNP. BPL: WA4JDH. Thanks to all of you for the good work. You keep your section looking good. 73, Joe. Traffic: WA4JDH 716, WX4I 93, WB4IXA 69, W4CKS 55, NW4X 54, WA4LXP 50, K4AOZ 48, WA4RNP 26, W4DGH 10.

**GEORGIA:** SM, Eddy Kosobucki, K4JNL — SEC: WB4ABY. STM: K4VHC. ACC: WA4ABY. BM: W4BIA. OO/RFI: K4VHC. PIO: WA4PNY. SGL: W4BTZ. TC: K4UDR. NWS: WA4PZD. Congrats to all of you who have been elected to the leadership of UR respective clubs. Hope that U have a gud year. Dalton ARC officers: KE4UJ, pres.; K4FLG, v.p.; W4KAU, secy/treas. BGMRC at Newnan elected: W4IGE, pres.; WD4RAD, v.p.; WS4N, s/t; N4HIC, act.; N4DSG, fin. ARRL VP W4RA gathered a huge crowd when he spoke to the Albany ARC. Their newly installed officers are: WA4GKI, pres.; NT4E, v.p.; KA4YBA, secy.; K4XA, treas. Central Ga ARC elected: K4KKQ, pres.; WD4NGF, v.p.; KC4WU, s/t; N4BHB, prog. dir. Augusta ARC: NA4I, pres.; K4FRM, v.p.; KF4LM, s/t. Lanierland ARC is now in its 21st year. They elected N4FCL, pres.; N4DMZ, v.p.; WA4YWK, secy.; N4BYX, treas.; N4DMZ, act. Gwinnett Co. ARS: K4KAZ, pres.; WA4IOB, v.p.; KA4BNG, secy.; NG4I, treas.; WB4DDN, act.; WA4BXA, editor. W5LFL made honorary member of the Atlanta ARC. W4BIW keeps Atlanta area hams informed on all OSCAR 10 activities. Keep it up. QCWA net meets on Sat at 9 EST on 3832. U are cordially invited to meet the gang. Colquitt Co. HRS installed WD4A, pres.; KB4DAY, v.p.; AA4P, s/t. Stone Mt 146.16/76 machine being replaced with all new equipment and will have new controller & natural gas generator. It cud be possible that UR new Ga Ham tag will have Amateur Radio replacing Peach State. As of this writing a bill is before the State Senate thx to the efforts of WB4UVW & W4BTZ. Augusta ARC, Central Ga ARC & Savannah ARC are the three Special Service Clubs in the section. Won't U get with UR club members & see if U can be the next one. Remember the Albany ARC Hamfest coming up on May 5 & 6. They promise a FB time. Traffic: WB4RUJ 126, W4WXA 108, W4PIM 99, K4NM 83, N4BIM 39, WB4NTW 34, K4VHC 32, K4EV 26, W4BIA 23, N4UZ 13, KA4ATM 12, K4BAI 10, W4HON 9, K4JNL 4.

**NORTHERN FLORIDA:** SM, Billy Williams, N4UF — The Gulf Coast VHF Traffic Net continues to be very active. N4EZU is NM and the net meets at 2000 local. Officers of the Crestview ARC are KD5M, pres.; K4FGI, V.P.; KA4VDK, treas.; W4ZGS, secy.; KA4KMP, act. mgr. KØBWN is system operator for a RTTY mailbox on the 147.33 rptr in FWB. Those interested are invited to participate. N7SD has new ham classes underway in Daytona Beach. OPARC is ordering a new duplexer for the 07/67 rptr. LMARS committee chmn are KF4WM W3SOB AB6I WD4BMN W6RAO N4ADI KB4LB AJ4L K4AHO KW4V and NE4I. KF4LG KF4EF & W1BEL gave program on packet radio to LMARS. WB4TPG reports HCARA hams assisted with comm. for Flatlanders Run. KB9LT headed up comm. for Spring Hill Run also. Both very successful. KA4DBZ is heading up a feasibility study concerning a Tallahassee hamfest. KC4N and KA4YLU gave ham radio demo to Boy Scouts in Tallahassee. K4AQQ very active on 160 with over 60 countries. KB4JB active with RTTY mailbox. New EC for Bay Co. is K4GVV. The 1984 Fla. QSO Party is May 5-6. The goal is to activate many of Florida's 67 counties during the weekend. Clubs and groups are invited to operate mobile during the three segments. The record is 21 counties in a weekend established by WA4SGF. Those interested should contact N4UF (QTH on page 8 of *QST*). NOFARS was presented with the *Florida Skip* FD trophy for the second consecutive year. NOFARS also has a new Directed Independent Study program for novice aspirants consisting of four modules. Traffic: WF4X 562, WD4IIO 352, N4PL 352, WA4QXT 309, WF4Y 312, WX4J 208, WA4EYU 179, KB9LT 170, WB4ADL 138, WD4HBP 134, KB4LB 121, AA4FG 102, W4MGO 78, KF4U 68, WD4MLQ 60, KD4KK 57, WB4TZR 51, N4ADI 45, W4KIX 40, W4GUJ 39, WD4HUZ 37, WD4EQB 35, NF4O 32, NQ4P 26, WA4STZ 25, KD4QZ 22, KB8GT 21, N4UF 20, NS4C 20, WB4YQP 19, WD4RIQ 17, AH2AO 15, WC4D 13, KA4RBY 13, W4DTV 12, N4HJB 11, N4JHI 11, NA4F 10, W4LUW 9, W8IM 8, WB4AWG 8, KF4GY 7, N4IIP 7, KI4CQ 5, W1HXK 5, KW4V 4. (Dec.) WD4MLQ 278, WD4GUZ 227, KF4U 103.

**SOUTHERN FLORIDA:** SM, Richard D. Hill, WA4PFK — SEC: W4SS. STM: K4ZK. TC: KI4T. BM: WA4EIC. ACC: AA4WJ. PIO: W4WYR. SGL: KC4N. OO/RFI: W4SS. Congrats to W4SS who is now doing double duty as both SEC and OO/RFI Coord. Bulletin Manager WA4EIC reports 24 bulletins received and 50 sent by WA4EIC 12, N4IMI 6, W4DL 21, AA4BN 4, NW4R 15, K4IEK 6, KA4AMC 4 and WD4KBW 6. KE4O said he is giving up his 4RN and EAN liaisons. He said that after 20 years of traffic handling he wanted to try something new and is getting set up for RTTY operation. He will still continue to QNI to QFN. W4LLA handled 40 phone patches during January. The America RC of Hialeah has been approved as an affiliated club. K4ZK reported that a dry run for a simulated nuclear disaster was held in January. The full fledged test involving the evacuation of 10,000 people will be held in March. The practice was cut short, however, when a bottle labeled nitroglycerine was found near the reactor. Fortunately, it was just sick humor and not the real thing. KA4RWV did a FB job of coordinating the Fort Myers ARC booth at the Southwest Florida Fair. WB2OUK reports that ARES is establishing a new station at the Red Cross Hq. in Ft. Myers. K4VOC WA4PIL and WD4CHO all worked at the Boy Scouts Order of the Arrow training session at the camp in Charlotte Co. W4JM writes that he wishes more guys would work the ARRL QSO parties. He has trouble every time trying to work Sothern Florida. When you have a news item be sure to include it with your SAR; just send by radiogram, and even if you are not a traffic handler I still would like a short radiogram giving some item of interest relative to your station. 73 de WA4PFK. Traffic: W3CUL 3456, W3VR 762, WA4PFK 384, K4SCL 268, WA4EIC 264, K4ZK 218, WB4AID 181, KE4O 133, KY4U 133, WB4WYG 127, KA4GUS 117, K4EUK 113, W1NJM 110, W4YCL 105, K4IA 104, WA4HXU 95, W4NFK 93, K4JI 77, WB2NVJ 70, WA4GYR 67, W4PKP 67, NW4R 59, KF4RL 57, W4LLA 56, W4DL 53, WD4CHO 52, WD4KBW 45, KA4KSQ 44, VE3BSY 43, KA4FZI 42, NJ4O 42, WB4GCK 39, K4JLL 38, WD4AWN 32, K5IHH 32, KA4YHS 32, W4DVO 25, KA4NXF 23, W3TLV 22, WA4TWD 22, K4FQS 20, KA4TTS 20, K4FQU 19, AA4BN 18, KM4Y 17, K4EUD 16, W1DLP 15, KA4RWV 14, K9EHP 14, KF4JA 13, WB2OUK 12, KA9AKY 12, WD9AEP 10, K4IRT 10, K3NMR 10, AF3S 10, K7LCA 9, N4CMW 9, K8BXT 8, KB8GV 8, WD8JPF 8, N4AKA 7, WK4F 7, W3IJR 7, KA4SIH 7, K4VSN 7, N4HAS 6, WV4F 5, KA2IXV 5, KA4KDD 5, W4OUU 5, KY9T 5, NX4X 5, WD4HYB 4, W4JM 4, WB4LPX 4, WD4MCC 4, W4MPV 4, W4UIO 4, KB4AXD 3, W4MFD 3, VE3SI 3, WB8SNT 2, KA4CXQ 1, KA4GDU 1, W3IJC 1, WD4PPA 1. (Dec.) K8BXT 32.

**WEST INDIES:** SM, Gregorio Nieves, KP4EW — West In-

# Attention Moonbouncers

## *and Satellite Communications Enthusiasts*

### Introducing New Ultra High Performance Antennas from KLM Electronics, Inc.

KLM Electronics is fueling the Moonbounce and Oscar 10 revolution with Antenna Equipment that delivers truely Out-of-This-World performance.

For the Moonbouncer, our New 2M-16LBX is designed to be the highest gain 2 meter antenna available on the market today by more than a full db, making the 2M-16LBX an outstanding performer as a single antenna or in Moonbounce (EME) arrays.

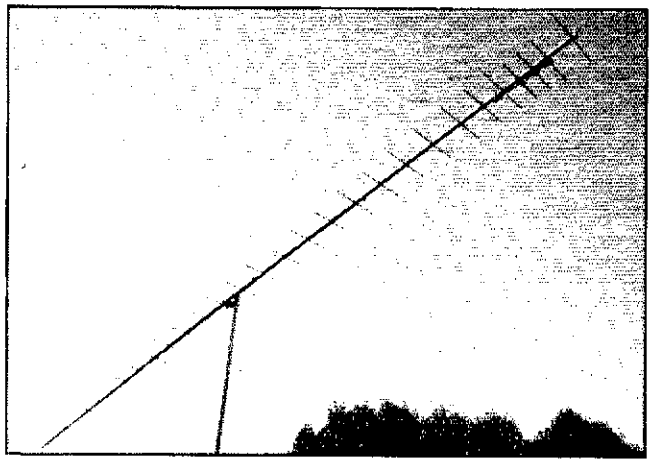
The New 432-30LBX follows the same pattern as the 2M-16LBX, and soon will become the industry's standard of comparison.

Featuring straight forward construction, and an innovative tapered boom that greatly reduces windload and adds strength and durability. Virtually unbreakable, insulated, 3/16" rod parasitic elements are anchored through the boom to insure years of trouble-free performance.

For the satellite enthusiasts, the 2M-22C high gain 2 meter, circular polarized antenna, features the same rugged construction and total flexibility as our very popular 2M-14C with a 2db increase in gain.

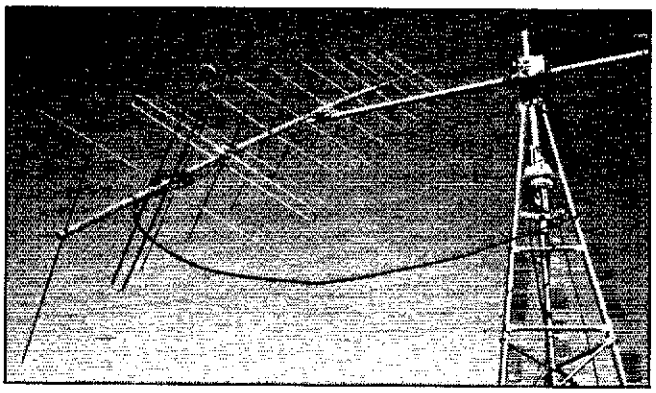
Four or more 2M-22Cs make an excellent array for Moonbounce (EME) by elminating Faraday fading.

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.



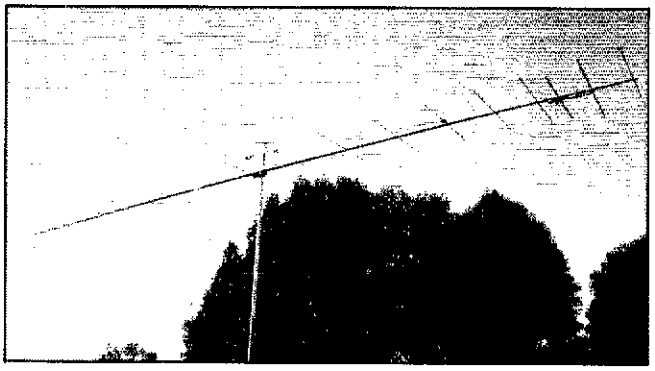
**432-30LBX**

| | |
|---|---|
| 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 | 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. |



**2M-16LBX**

| | |
|---|---|
| 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. |

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P.O. Box 816
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dies Net Slow (WINS) daily 7 P.M. (2300 UTC) on 3.710 MHz. West Indies Net Central (WINC) daily 6:30 P.M. (2330 UTC). The Puerto Rico ARC will celebrate a transmitter hunt activity on Sunday, Feb. 26. The transmitting site and transmissions will be the charge of KP4AOC, president of the club. The prize for the first person or group arriving at the site will be of $100. Good luck to all of you. A new radio amateur's club was organized on the western side of the Island. The new organization is led by KP4ANG. The name of this club is "Federacion de Radioaficionados de Puerto Rico." Congrats to all of you and hope your goals will be reached soon. KP4DJ reports the following totals for WINS: QND 539, QNI 186, QTC 71, 31 sessons. Traffic: KP4DJ 112, NP4FQ 54, NP4D 40.

## SOUTHWESTERN DIVISION

**ARIZONA:** SM, Erich J. Holzer, N7EH — STM: W7EP. NM's: WA7KQE WA7FDN. The month of January has flown by at this QTH. The Coconino ARC reports the following officers: N7CXF, pres.; WA7LTH, v.p.; KA7PZL, secy./treas. ARA reports the following participated in providing comm. for the Thunderbird Invitational Balloon race: WB7OZR KD7FA WA7ZCZ WB7BVS WB7CHQ KA7FQO KJ7J KD7DR N7FHA N7EJJ N7DFH KA7PAE K7TPW KD7BD N4BNL KA7RFF N7ERM N7AIY KC7OE KA7DTT K8AKH KA7DRV KA7NEM WB7BYK N7BYA WA7ZZT WB9VMP KA7MPD. The OPRC reports the following officers: WA8NNC, pres.; WB8KSW, v.p.; KA7QEH, secy.; N7BUP, treas.; AF7M KB7KZ N7DZN KA7NUM N7BXX, board members. The TRA reports its 1984 officers: K7KYW, pres.; N7EOJ, v.p.; KB8IW secy.; N7EH, treas.; KA7O W0YOY, board members. EARS reports that a number of amateurs helped provide comm. for the Rex Allen Days parade in Wilcox. W7KAX reports that the Hualapai ARC officers are: WA7OPQ, pres.; W6TAZ, v.p.; KA7EVK, secy./treas. The Superstition ARC officers are: WD8HCD, pres.; WA7JZL, v.p.; KA7AKK, secy.; WB7FAJ, treas.; WB7FDF WA7IVA WB7QZB W7JPJ WB7CRK, board mbrs. PSHR: KB7FE KO7V. ATEN: QNI 1157, QTC 70. AZ Cactus Net: QNI 832, QTC 87. The new ARRL Field Organization is one-year old and there are still positions you can fill. Don't hesitate to contact me for that appointment before they're all gone. Traffic: KB7FE 247, KO7V 96, W7LVB 91, W7KXE 44, KA7JNU 24, WA7KQE 20, K7POF 12, N7CQY 9, N7EH 9, K7NMQ 7, WB3LQQ 6, WA7NXL 6.

**LOS ANGELES:** SM, Stan Brokl, N2YQ — SEC: N6UK. STM: W6INH. ACC: NF6D. ARES In Subarea-4 had a successful sobriety shuttle on New Year's eve. KA6HWV, KA6NRH and KA6JDT operated until 4:30 A.M. with 25 pickups and 50 riders. The San Fernando Valey ARC honor two outstanding amateurs in their club this year. WB6THM received the W6IN Award and WA6LAU received the Silver Dollar Award for his work in ARES. In addition to my other duties and work I have become Bulletin Editor for the Southern Calif. DX Club. Hope to CU at the TRW swap meets. 73 Stan N2YQ.

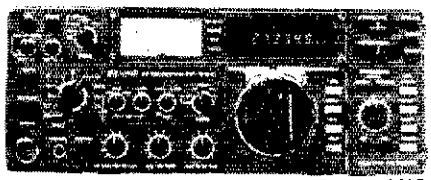
**ORANGE:** SM, Sandra Heyn, WA6WZN — SEC: W6UBQ. STM: WA6QCA. ACC: KA6NLY. BM: W6DXL. OO/RFI Coord.: N6PE. PIO: NS6W. SGL: N6HIQ. TC: AA6DD. It is with deep regret that we must announce K6GGS's resignation as DEC (and RACES R.O.) for San Bernardino Co. after almost 30 years of service. His position will be filled by his asst WA6IKH. Also, WB6YZY has had to resign as DEC for Inyo Co. and his replacement is KA6HII, who is currently pres of Bishop ARC. DEC W6LKN announced the creation of RACES dist #9-formerly part of dist #4-covering Sun City/Paris area. It will be headed up by EC KZ6D. Congrats to KZ6E on OO appointment. New 1984 officers: So Cal DX Club (SCDXC) K5KT, pres.; WA6WZO, v.p.; KB6HW, treas.; N6CGB, secy. Western Public Service System (3952 kHz) KB6ZO, pres.; WB6BNA, v.p.; WA6FOU, treas.; NJ6M, secy. Fullerton RC K6OGD, pres.; WA7AHY, v.p.; K6GMY, treas.; N6IYV, secy.; Beach Cities Wireless Society KA6NMS, pres.; KE6RG, v.p.; WB6GGF, treas.; W6FQX, secy. 220 SMA N6BVU pres.; WB6MOB, v.p.; WB6YIZ, treas.; K6KH, secy. Tri County ARA WA6CZZ, pres.; WB6UFX, v.p.; NQ6G, treas.; G6KIR, secy. Citrus Belt ARC has started new classes taught by N6ZN and N6IIE. Rio Hondo ARC pres. WA6GEV started new classes at Rio Hondo College. In Orange Co. WB6NOA is starting a variety of classes. Coachella Valley ARC is sponsoring classes taught by WB6VMR and KA6IYS. Pres W6IF announced Morongo Basin ARC is starting Novice classes. NI6W is the Orange Co. area coord. for the So Ca Contest Club which has a net Wed 7:30 P.M. 3815 kHz. N6TK conducts an Antique Radio round table the last Fri of each month at 8 P.M. 146.40/147.435. EC W6RE announced Modjeska Canyon fire amateur radio support, which was headed by AEC K6LJA (net control of Wed noon ARES net): WB6GDZ WA6VZO KE6VI K6VD WA6TLE KF6SW W6RE KA6NNU K6LJA WB6LAR KB6BST WA6GUC WA6ACB W7EII KB6CYD KA6SAT KA6YGW KA6OIN WD6CZE KD6DA KB6CTR W6CEB KB6CTT WD6AWP KA6HWV. PSHR: WB6QBZ KA6BNW N6GIW AI6E WA6QCA KA6HJK/T.

| Net | Freq. | Time | QNI | QTC | NM |
|---|---|---|---|---|---|
| SCN/1(20+) | 3598 | 7PM | 336 | 282 | AI6E |
| SCN/2(13−) | 3598 | 8:15 | 212 | 60 | AI6E |
| SCN/V(FM) | 146.645 | 9PM | 519 | 332 | WA6QCA |
| RTTY/VHF | 145.12 | 10AM | 480 | 107 | KA6HJK |

Traffic: N6GIW 208, WA6QCA 156, KA6BNW 133, AI6E 128, WB6QBZ 124, KA6HJK 118, K6GGS 61, W6RE 57, N6GOT 48, W6TKV 46, N6FRW 22, W6PNS 13, KA6HMS 3, WA6WZO 2.

**SAN DIEGO:** SM, Arthur R. Smith, W6INI — BM: WA6HJJ. STM: N6GW. SEC: W6INI. PIO: WA6CUP. ACC: WA6COE. TC: N6NR. ARRL Affiliated Clubs are encouraged to apply for Special Service Club status. Refer to Dec. 1982 QST, page 62, or contact ACC WA6COE (484-1744). Club officers for 1984: North Shores ARC N6ART, pres.; KW6V, v.p.; KA6FAC, secy.; KA6UCD, treas. Palomar ARC N6GZI, pres.; N6GSS, v.p.; WB6TBQ, secy.; W6OLQ, treas. ARC of El Cajon KB6WB, pres.; KA6VBH, v.p.; WD6GGJ, secy.; KE6UI, treas. 1983 traffic totals for regular tfc handlers are: KT6A 7537, KM6I 3436, KU6D 1903, W6HUJ 1392, KB6AI 1144, N6AT 535, N6GW 212, WA6IIK 165. Nice going! Comm for the Calif. Special Olympics Floor Hockey Championship were provided by WA6BCC N6CQW WD6GGJ WD6GIW KR6K W6NFG N6NR WA6RVB KA6VBH. 220 and 450 simplex nets were used, coordinated by KM6S. The North County Tfc Net held 29 sessions and handled 64 msgs in Jan. South Bay ARS presented "Ham of the Year" award to KB6EP. Commodore computer users have weekly net on 145.53 MHz at 2000 hrs. N6DPX is NCS. Traffic: KT6A 531, W6HUJ 135, KU6D 121, KB6AI 81, N6AT 27, N6GW 15, KF6TF 15, WA6IIK 14, KM6I 2.

**SANTA BARBARA:** SM, Ernest L. Kapphahn, WB6HJW — KA6Q is new DEC for NSBAR ARES. New ECs are W6FLL for Santa Maria and WA6QPO for Lompoc. KC7WN and KD7LI have new Extra calls, NE8C and NF7U respective-



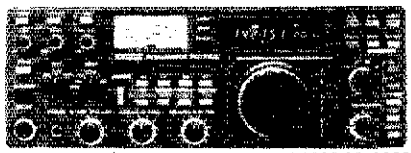
*HF Equipment* — Regular — SALE

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 5.2 kHz AM filter | 49.50 | |
| SM-5 8-pin electret desk microphone | 39.00 | |
| MB-5 Mobile mount | 19.50 | |
| IC-745 9-band xcvr w/.1-30 Mhz rcvr | $999.00 | **899.95** |
| PS-35 Internal power supply | 160.00 | **144.95** |
| CF5-455K5 2.8 kHz wide SSB filter | TBA | |
| 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

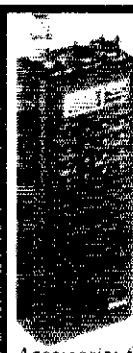
| *Options - continued* | Regular | SALE |
|---|---|---|
| CC-1 Adapt. cable; HF radio/PS-20 | 10.00 | |
| CF-1 Cooling fan for PS-20 | 45.00 | |
| EX-310 Voice synth; 745, 751 | 39.50 | |
| SP-3 External base station speaker | 49.50 | |
| Speaker/Phone patch - specify radio | 139.00 | **129.95** |
| 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.**

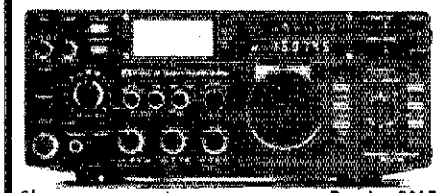
| | | |
|---|---|---|
| IC-27A 25w 2m mobile transceiver | 369.00 | **329.95** |
| EX-388 Voice synthesizer | TBA | |
| IC-45A 10w 440 FM xcvr, TTP mic | 399.00 | **359.95** |
| AG-1 15 db 440 Mhz preamplifier | 89.00 | **79.95** |
| EX-270 CTCSS encoder | 39.00 | |
| BU-1 Memory back-up | 38.50 | |
| 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 BP-35 | 67.50 |
| BP-8 800mah/8.4V Nicad Pak - use BP-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 |
| BC-25U Extra wall charger for BP2 | $ 10.00 |
| BC-30 Drop in Charger - BP2/BP3/BP4/BP5 | 69.00 |
| BP-2 425mah/7.2V Nicad Pak - use BC30 | 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 Cigarette lighter plug/cord - BP3 | 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/HS10SB Boom mic headset/switchbox | 39.00 |
| HP-10SA Vox unit for HS-10 | TBA |
| 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 |
| *Marine model* | |
| 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** |
| 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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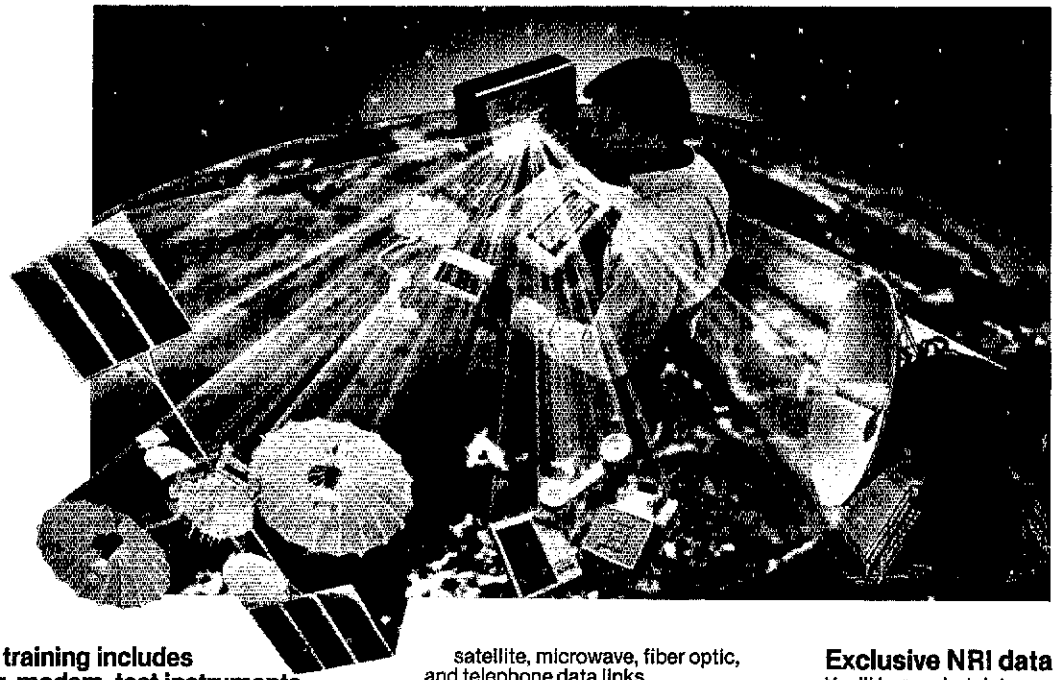
# NEW! DATA COMMUNICATIONS TRAINING FROM NRI



### Practical training includes computer, modem, test instruments, and access to exclusive NRI communications network.

Satellites . . . microwave . . . fiber optics . . . dedicated land lines. Suddenly the world is communicating in a new and different way, via digital data systems. People talking to computers . . . computers to computers . . . information is stored, retrieved, and relayed in nanoseconds.

### Industry, opportunities to triple

Data and telecommunications is already a $150 billion industry and is expected to triple over the next five years. One typical company has grown from $85 million to $650 million . . . a 765% growth since 1978 alone. The need for qualified technicians to install, maintain, and service this enormous investment in high-tech equipment is tremendous even now. Opportunities and salaries can go nowhere but up and up.

### NRI will train you at home

You can learn at home in your spare time to become a data communications technician with NRI at-home training. NRI will start you with the basics, build upon your knowledge with easy-to-follow, bite size lessons to take you into the world of digital data communications. You'll learn what it takes to work on satellite, microwave, fiber optic, and telephone data links.

And you'll learn at your own comfortable pace, without classroom pressures or evenings away from your family. Over the past 70 years, NRI has taught the latest high-tech skills to almost 2 million students to become the world's largest and most successful school of its kind.

### Hands-on training includes computer, modem, breakout box and much more

NRI takes you far beyond "book learning." As part of your course, you receive plenty of practical hands-on training that gives you real-world skills. You get the Radio Shack Color Computer, with 16K memory to teach you the systems and language of data communications plus you get an operating modem to let you tie in with world-wide communications networks.

You build your own RS-232C interface breakout box, an indispensable installation and trouble-shooting instrument you'll use throughout your career. You receive a professional digital multimeter and the NRI Discovery Lab, where you construct solid-state circuits and demonstrate practical applications of the theory you've learned.

### Exclusive NRI data network

You'll learn what data communications is all about by actually becoming part of an operating network. You'll go on line to "talk" to your instructor, take your final exam by computer link, communicate with other NRI students and leave messages on the NRI "bulletin board."

As part of your course, you'll also receive membership in THE SOURCE℠, a regular $100 value. A phone call ties you into computers loaded with instant news, stock quotes, electronic mail, educational programs, games, even discount shopping and travel reservations.

### Move into the future, send for Free Catalog

You can't find training like this anywhere else . . . only NRI trains you at home for an exciting and rewarding career in the brilliant new world of Data Communications. Mail the coupon right now for our big catalog of high-tech electronic careers showing all the equipment you get, detailed lesson descriptions, and career opportunities. Look it over and decide where you want your future to grow. Act now. There's a real need for trained data communications technicians.

Training includes all this equipment you keep . . . 16K computer, modem, breakout box, digital multimeter and the exclusive NRI Discovery Lab.

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ly. The West Coast VHF Conference will be held May 4-6 at the Paso Robles Inn. Inquiries should be directed to K6HXW, 680 Camino Del Rey, Arroyo Grande 93420. K6HXW says that you must pre-register for the banquet. Satellite ARC is putting the Tricars Field Day trophy up for grabs this yr. Details will be forthcoming to area clubs. Traffic: K6YD 50.

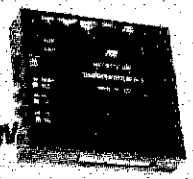
### WEST GULF DIVISION

**NORTHERN TEXAS:** SM, Phil Clements, K5PC — SM/ACC: NI5V. SEC: W5GPO. STM: W5VMP. PIO: N5FDL. OO/RFI: WB5JBP. TC: WB5IIR. BM: W5QXK. SGL: W5UXP. New officers for the Sabine Valley ARC of Greenville are: WB5IZL, pres.; WA5TMY, v.p.; WB5PWL, secy.; WD5FMP, treas. EC/RO K2SCU reports 20 ARES members and 15 RACES members active in Hunt Co. New officers for the Panhandle ARC of Amarillo are: WB5MDJ, pres.; KA5MTE, v.p.; KA5OLK, secy.; KD5IA, treas.; N5SM, W5VGX KA5OXP, trustees. Congrats to the Childress ARC, which has been designated a Special Service Club by ARRL Hq. Tornado season is upon us. The portable and emergency equipment should be all checked out and ready for immediate deployment. Let's plan to get into a disaster area fast, and get set up so each situation can be sized up ASAP. All ARES members should monitor 7290 kHz (day) and 3961 kHz (night) when an operation is in progress for possible communications assistance and traffic relay. PSHR: N5BT KC5NN N5DKW KA5AZK KB5UL N5EZM KD5FR. Hope to see you all at the Midland Swaptest on March 17 & 18! Traffic: N5BT 214, KB5UL 130, KA5AZK 104, W9OYL 45, KD5FR 41, KC5NN 40, WB4HML 32, NI5V 32, N5GRZ 31, AE5I 26, WB5NFS 19, KA5SPT 19, W5CUE 12, W5PBN 11, N5GKF 4, K5HGX 4, K5PC 4, N5EZM 3.

**SOUTHERN TEXAS:** SM, Arthur R. Ross, W5KR — SEC: WA5RVT. ASM: N5TC. TM: K5QEW. Houston ARC operates an Amateur Radio station at the Houston Museum of Natural Sciences on Saturday and Sunday afternoons; response from public has been excellent. ORS WD5GKH says his call has been "mis-spelled" as WB5GHK in some traffic and PSHR lists; he wants all to know he didn't miss. ORS K5RG working on a QSK scheme for his SB-200. Brazosport ARC reports N5GMM upgraded to General. GREAT! Brenham ARC reports KA5RNC upgraded to Tech. Also GREAT! DRN5 Manager WB5YDD reports Southern Texas represented 100% by WB5EPA WB5FQU W5KLV N5DFO W5CTZ W5URN KB5V KC5CB WB5ATP N5CRU N5AMH WB5YDD. ORS N5AF has new SB-220, Nye Viking 3kW tuner and extended double Zepp fed with 450-ohm open line. Computer OBS WB5FCO having excellent results with ARRL bulletins on Armadillo BBS. CAND manager W5KLV reports Southern Texas represented 100% in January by N5DFO KD5KQ W5TFB N5CRU W5KLV WB5YDD. OO K5VRF received RTTY bulletins on STS-9 and broadcast them to surrounding communities via 2 meters as an aid to local amateurs; also taped some STS-9 activities via TVRO. Traffic: WB5YDD 460, N5DFO 365, W5CTZ 335, W5KLV 231, W5TFB 219, WB5MMI 122, KS6V 79, N5TC 74, K5OWK 34, W5KR 33, WB5BGE 29, K5RG 22, N5CRU 14, K5HZR 14, WD5GKH 12, KK8L 8.

# MFJ RTTY / ASCII / AMTOR / CW
# COMPUTER INTERFACES

## RTTY/ACSII/AMTOR/CW INTERFACE CARTRIDGE FOR VIC-20/C-64



NEW

MFJ-1228
$69.95

**Most versatile RTTY/ASCII/AMTOR/CW interface cartridge** available for VIC-20 and Commodore 64. Gives you more features, more performance, more value for your money than any other interface cartridge available.

**Same interface cartridge** works for both VIC-20 and Commodore 64. Plugs into user's port.

**Choose from wide variety** of RTTY/ASCII/CW, even AMTOR software. You are not married to one on-board software package. Use MFJ, Kantronics, AEA plus most other software cartridge, tape or disk.

**850 Hz and 170 Hz** shifts on receive **and** transmit.

**Has mark and space outputs** for scope tuning.

**Normal/Reverse switch** eliminates retuning.

**True dual channel mark and space active filters** and automatic threshold correction gives good copy when one tone is obliterated by QRM or selective fading.

**Easy, positive tuning** with twin LED indicators.

**Narrow 800 Hz** active CW filter. Automatic PTT.

**Exar 2206** sine generator for AFSK output.

**Shielded XCVR AFSK/PTT interface cable** provided. Plus or minus CW keyed output. FSK out.

**Powered by computer** (few mA.), no power adapter to buy or extra wire to dangle or pick up/radiate RFI.

**Glass epoxy PCB.** Aluminum enclosure. 4½x4½x1".

## MFJ INTERFACE plus MFJ SOFTWARE CARTRIDGE

**for VIC-20 or Commodore 64. MFJ-1228 PLUS MFJ-1250 or MFJ-1251 for one low price**

$99.95
Save $20.00

## SOFTWARE CARTRIDGE FOR VIC-20/C-64

MFJ-1250/MFJ-1251
$49.95

**Powerful MFJ software** cartridge for VIC-20 (MFJ-1250, $49.95) and Commodore 64 (MFJ-1251, $49.95). Plugs into expansion port. Developed by MFJ.

**Features RTTY/ASCII/CW** send and receive, split screen display, type ahead buffer, message ports, status display, automatic CW speed tracking, parallel printer compatibility plus much more.

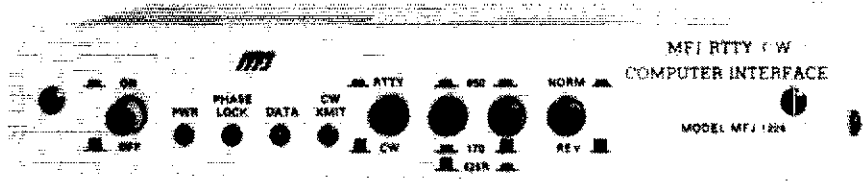
## SUPER RTTY FILTER

MFJ-725
$39.95 NEW

**Super RTTY filter** greatly improves copy under crowded, fading and weak signal conditions. Improves **any** RTTY receiving system. 8 pole bandpass active filter for 170 Hz shift (2125/2295 Hz mark/space). 200 or 400 Hz bandwidths. Automatic noise limiter. Audio in, speaker out jacks. On/off/bypass switch. "ON" LED. 12 VDC or 110 VAC with optional AC adapter, MFJ-1312, $9.95. 3x4x1 inch aluminum cabinet.

## GENERAL PURPOSE RTTY/ASCII/AMTOR/CW COMPUTER INTERFACE

**Lets you send and receive computerized RTTY/ASCII/AMTOR/CW. Copies all shifts and all speeds. Copies on both mark and space. Sharp 8 pole active filter for 170 Hz shift and CW. Plugs between your rig and VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64 or most other personal computers. Uses MFJ, Kantronics software and most other RTTY/CW software.**




**MFJ Software plus MFJ Interface for VIC-20/C-64**
Software cartridge alone, $49.95. Order MFJ-1250/MFJ-1224 for VIC-20, MFJ-1251/MFJ-1224 for Commodore 64. Includes cable to interface MFJ-1224 to VIC-20 or C-64.
$129.95

MFJ-1224
$99.95

**New MFJ-1224 RTTY/ASCII/AMTOR/CW Computer Interface** lets you use your personal computer as a computerized full featured RTTY/ASCII/AMTOR/CW station for sending and receiving. Plugs between rig and VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64 and most others.

**Use MFJ (see MFJ-1250/1251 below)** software for VIC-20, Commodore 64 and Kantronics for Apple, TRS-80C, Atari, TI-99 and most other software for RTTY/ASCII/AMTOR/CW.

**Easy, positive tuning** with twin LED indicators.

**Copy any shift** (170,425,850 Hz and all other shifts) and any speed (5-100 WPM RTTY/CW and up to 300 baud ASCII).

**Copies on both mark and space,** not mark only or space only, to improve copy under adverse conditions.

**Sharp 8 pole 170 Hz shift/CW active filter** gives good copy under crowded, fading and weak signal conditions. Automatic noise limiter suppress static crashes for better copy.

**Normal/Reverse switch** eliminates retuning. +250 VDC loop output drives RTTY machine. Speaker jack.

**Automatic tracking** copies drifting signal.

**Exar 2206 sine generator** gives phase continuous AFSK tones. Standard 2125 Hz mark and 2295/2975 Hz space. Microphone line: AFSK out, AFSK ground, PTT out and PTT ground.

**FSK keying output.** Plus and minus CW keying. CW transmit LED. External CW key jack.

**Kantronics compatible socket.**

**Exclusive general purpose socket** allows interfacing to nearly any personal computer with most appropriate software. Available TTL lines: RTTY demod out, CW demod out. CW-ID input, +5 VDC, ground. All signal lines are buffered and can be inverted using an internal DIP switch.

**Use Galfo software with Apple,** RAK with VIC-20, Clay Abrams with TRS-80C, N4EU with TRS-80 III, IV. Some computers with some software may require some external components.

**Metal cabinet.** Brushed alum. front. 8x11¼x6 in. 12-15 VDC or 110 VAC with adapter, MFJ-1312, $9.95.

**MFJ-1223, $29.95, RS-232 adapter for MFJ-1224.**

## CW INTERFACE CARTRIDGE FOR VIC-20/C-64

NEW

MFJ-1226
$39.95

**High performance CW interface** cartridge. Gives excellent performance under weak, crowded, noisy conditions. Works for both VIC-20 and Commodore 64. Plugs into user's port.

**4 pole 100 Hz bandwidth active filter.** 800 Hz center frequency. 3 pole active lowpass post detection filter. Exclusive automatic tracking comparator.

**Plus and minus CW keying.** Audio in, speaker out jacks. Powered by computer.

**Includes Basic listing** of CW transmit/receive program. Available on cassette tape, MFJ-1252 (VIC-20) or MFJ-1253 (C-64), $4.95 and on software cartridge, MFJ-1254 (VIC-20) or MFJ-1255 (C-64), $19.95.

**You can also use MFJ-1250** (VIC-20) or MFJ-1251 (C-64), $49.95 each, RTTY/ASCII/CW software cartridge. Or use Kantronics, AEA and others.

**Also copy RTTY** with single tone detection.

## UNIVERSAL SWL RECEIVE ONLY COMPUTER INTERFACE FOR RTTY/ASCII/AMTOR/CW

MFJ-1225
$69.95

**Use your personal computer** and communications receiver to receive commercial, military and amateur RTTY/ASCII/AMTOR/CW traffic.

**MFJ-1225 plus MFJ-1250 or MFJ-1251 $99.95.**

**Plugs between receiver and VIC-20,** Apple, TRS-80C, Atari, TI-99, Commodore 64 and most other personal computers. Requires appropriate software.

**Use MFJ (see this ad),** Kantronics, AEA and most other RTTY/ASCII/AMTOR/CW software.

**Copies all shifts and all speeds.** Twin LED indicators makes tuning easy, positive. Normal/Reverse switch eliminates tuning for inverted RTTY. Speaker out jack. Includes cable to interface MFJ-1224 to VIC-20 or Commodore 64. 4½x1¼x4¼ inches. 12-15 VDC or 110 VAC with optional adapter, MFJ-1312, $9.95.

**ORDER ANY PRODUCT FROM MFJ AND TRY IT-NO OBLIGATION. IF NOT DELIGHTED, RETURN WITHIN 30 DAYS FOR PROMPT REFUND (LESS SHIPPING).**

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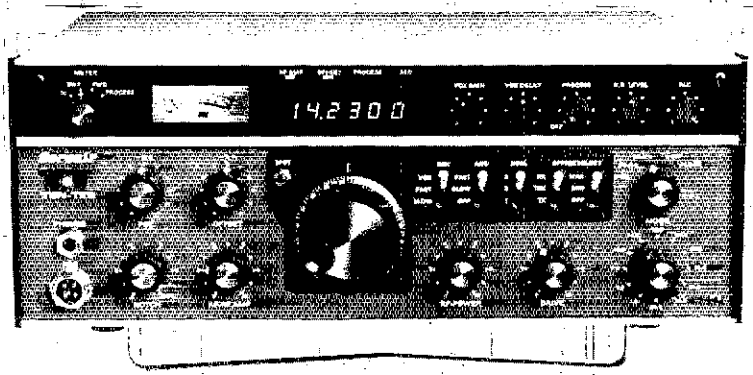
# What's special about Corsair?



# PERFORMANCE!

Superlative circuit design provides easy operation, outstanding performance. Low-noise receiver lets you hear signals often lost in the noise in other transceivers. Corsair owners often receive "great audio" reports . . . more evidence of superior performance. And Corsair is backed by the best warranty in amateur radio.

**Compare these features:**
• Low-noise front end •.25uV sensitivity, all bands • Low phase noise • 90db dynamic range • Triple conversion receiver • Switchable pre-amp • Variable band width tuning • 3-position AGC • Notch filter • Noise blanker • Dual range, triple mode offset • All solid state • Instant band change • 200 watts input, all bands • 100% duty cycle • AMTOR compatible • Variable threshold ALC • Speech processor • 5 function meter • Full and semi break-in • Adjustable sidetone • CW spot tone • Comfortable control spacing • 1-year warranty • Made in U.S.A.

*See your Ten-Tec dealer or write for full details.*

**TEN-TEC, INC.**
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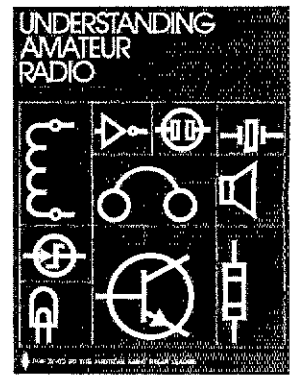


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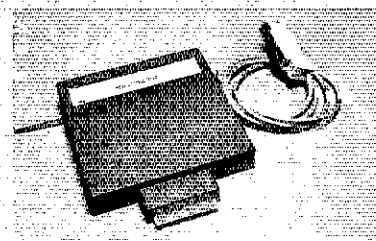

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**MP-20 or MP-64**

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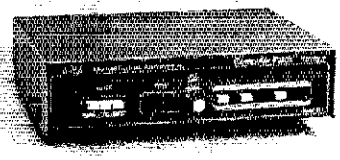

**COMPUTER PATCH™** is the name of our most advanced computer interface equipment for Morse, Baudot, ASCII, or AMTOR operation. The CP-1 will allow you to patch most of the popular personal computers to your transceiver when used with the appropriate AEASOFT™ TU software such as AEA MBATEXT, AMTOR TEXT™, or the MBATEXT RESIDENT ON THE MICROPATCH units. AEA also offers a full feature software package for the Apple II, II plus and IIE; TRS-80 Models I, III and IV; and the IBM-PC. The CP-1 will also work with certain other computers using commonly available software packages.

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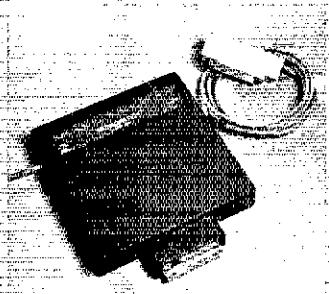
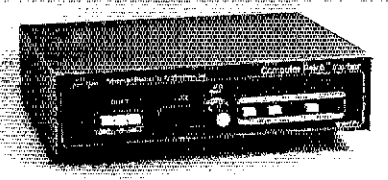


The **MICROPATCH™** computer interface is our latest example of engineering excellence bringing you superb value at a low, low price. The MICROPATCH is a COMPLETE RTTY/CW/ASCII PLUG-IN HARDWARE/SOFTWARE PACKAGE for either the Commodore 64 (model MP-64) or VIC-20 computer (model MP-20). The MICROPATCH 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.



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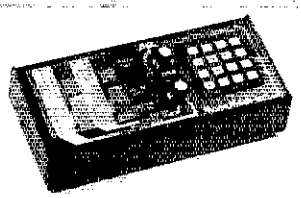

AEA has developed the most sophisticated line of automatic microcomputerized Morse keyers and trainers in the world. AEA keyers and trainers are the standard against which all others have been judged and have fallen short. Two of our trainers (Model BT-1 and KT-3) are designed for people who have never 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).

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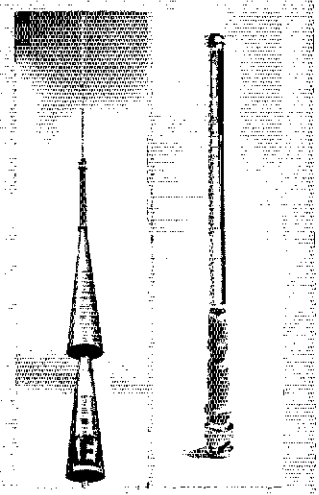

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IMRA-International Mission Radio Association Helps missionaries by supplying equipment and running a net for them daily except Sunday, 14.280 MHz, 1900-2000 GMT. Br. Bernard Frey, 1 Pryer Manor Rd., Larchmont, NY 10538.

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MISSOURI STATE ARRL Convention April 7-8 1984. Details see March QST Ham Conventions.

ANNUAL FLEMINGTON, NJ Hamfest by Cherryville Repeater Association will be held Saturday April 7 at Hunterdon Central High School Field House on Route 31. Doors open at 8 AM, but breakfast will be served on site from 6:30 AM. Talk-In on 147.375, 147.015, 146.52, 224.12, 444.85. For further info or table reservations, call 201-788-4080 or write Bill Inkrote, K2NJ, RD10 Box 294, Quakertown-Croton Rd., Flemington, NJ 08822.

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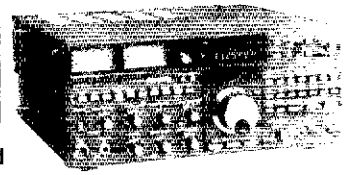

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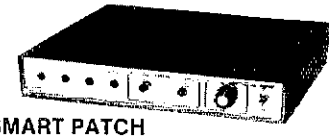
IC-R71A, IC-751, IC-720A, IC-745, IC-27A, IC-37A
IC-47A, IC-271A/H, IC-2KL, IC-471A, IC-290H,

YAESU
FT-ONE, FT-980, FT-102, FT-77, FT-230R FT-757GX
FT-726R, FT-720RU, FT-290R, FRG-7700, FT-203R



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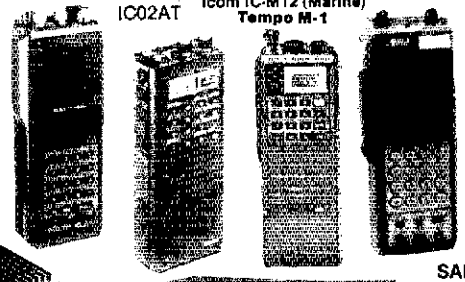
| | | Tempo M-1 |



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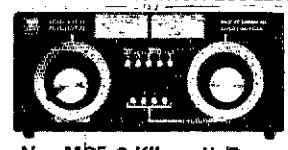

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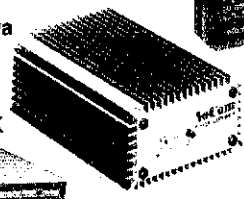

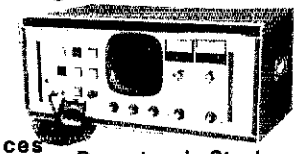

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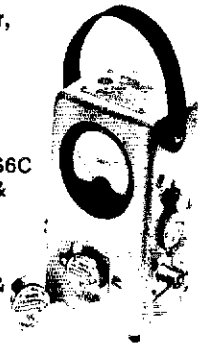

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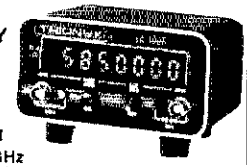

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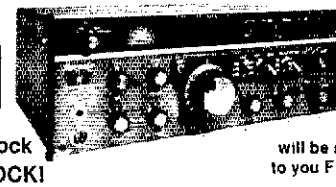

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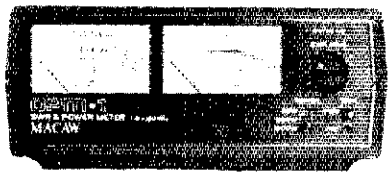

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- 0-20, 200, 1000 watt scale
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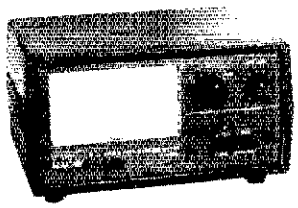

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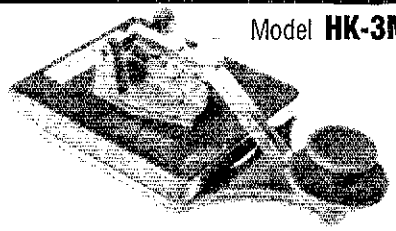
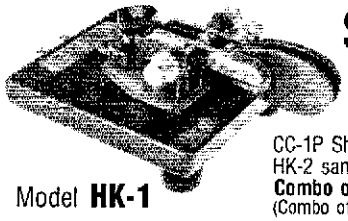


- Deluxe straight key
- Heavy base, no need to attach to desk
- Navy type knob

CC-3P Shielded cable & plug for HK-3M **$1.50**

**$21.95** Add $2.00 shipping Cont. U.S.A.



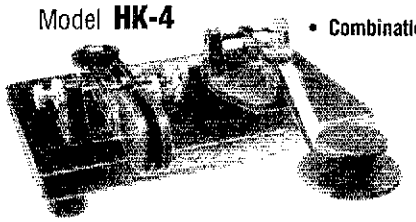
Model **HK-1**

**$29.95** Add $2.00 shipping Cont. U.S.A.

- Dual lever squeeze paddle
- For use with all electronic keyers

CC-1P Shielded cable & plug for HK-1 **$2.00**
HK-2 same as above less base **$18.95**
**Combo offer HK-1/HK-5A & CC-1P $84.95**
(Combo offer) Prepaid shipping Cont. U.S.A.

Model **HK-4**



- Combination HK-1/HK-3 on same base

CC-1/3P shielded cable & plugs for HK-4 **$3.50**

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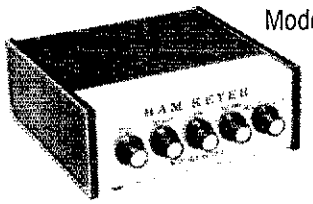
Model **HK-5A** Electronic Keyer

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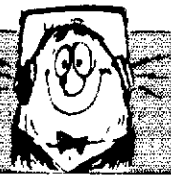

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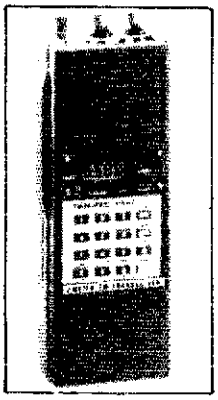
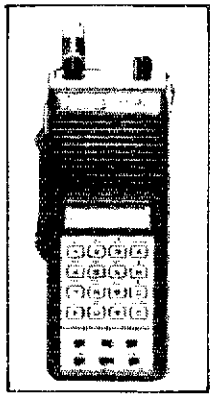


**TEN-TEC 2591**



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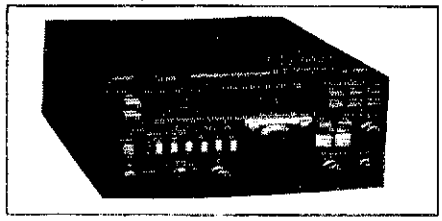

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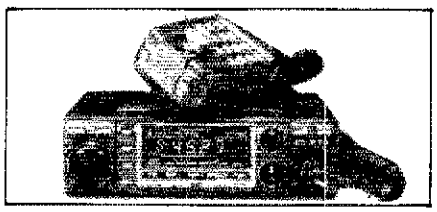

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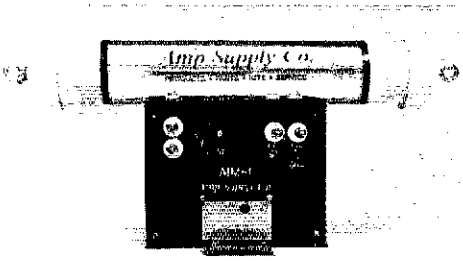
The LA-1000A is a portable kilowatt now covering 160-15 meters. Typical drive requirement is 100 watts PEP yielding 1200 watts PEP SSB 700 watts CW. The compact linear uses four 6MJ6 tubes, has a tuned input and QSK built in and comes in an attractive gray-on-gray finish.

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***

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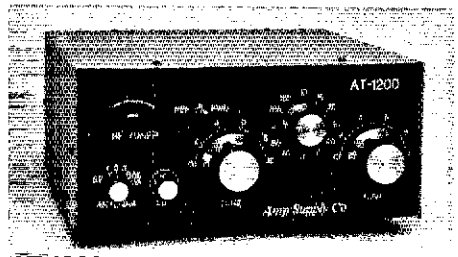
*Major Antenna break through!*

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.

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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.

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**Sloper Matching Network** ..... **$49.50***
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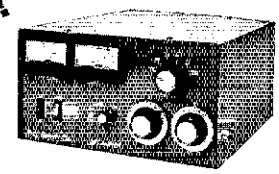
NEW! NEW!



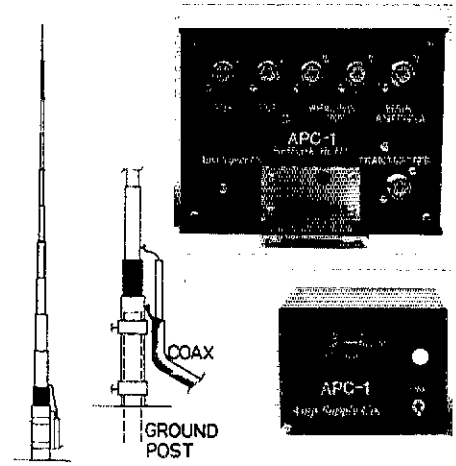
## LK500ZA 2.5 KW AMPLIFIER

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 Elmac 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***

*POSTPAID CONTINENTAL USA.

****Statement from K8KXK**

**As founder and President of Amp Supply Co., I guarantee you'll be satisfied with our products. If you are not, write to me and I'll refund your money or replace your order.**

*Amp Supply Co.*

2071 MIDWAY DRIVE
P.O. BOX 421
TWINSBURG, OHIO 44087
**216—425-2010 TLX 980131 WDMR**

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.

FREE QRP info kit. Large S.A.S.E. w/37¢ postage to QRP-ARCI, Box 12072, Austin, TX 78711.

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.

16TH ANNUAL Wabash County Hamfest. May 20th, 1984. 4-H Fairgrounds Wabash, IN. 6:00 A.M. to 4:00 P.M. Contact Don Spangler, W9HNO, 235 Southwood Dr., Wabash, IN 46992, 219-563-5564.

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.

**QSL Cards/Rubber Stamps/Engraving**

TRAVEL-PAK QSL Kit — Converts Post Cards, Photos to QSLs. Stamp brings circular. Samco, Box 203, Wynantskill, NY 12198.

DON'T buy QSL cards until you see my free samples — or draw your own design. I specialize in custom cards. Send black and white sketch: wil give quote. Little Print Shop, Box 9848, Austin, TX 78766.

DISTINCTIVE QSL's — Largest selection, lowest prices, top quality photo and completely customized cards. Make your QSL's truly unique at the same cost as a standard card, and get a better return rate! Free samples, catalogue. Stamps appreciated. Stu, K2RPZ, Box 412, Rocky Point, NY 11778 516-744-6260.

FREE samples — stamp appreciated. Conner, 522 Notre Dame Ave., Chattanooga, TN 37412.

QSLs & rubber stamps. Top quality. QSL samples and stamp information 50c. Ebbert Graphics D-3, Box 70, Westerville, OH 43081.

QSL samples — 25¢ Samcards - 48 Monte Carlo Dr., Pittsburgh, PA 15239.

EMBROIDERED emblems, custom designed club pins, medallions, trophies, ribbons. Highest quality, fastest delivery, lowest prices anywhere. Free info: NDI, Box 6665 M, Marietta, GA 30065.

CADILLAC of QSLs — Completely different! Samples $1. (refundable) Mac's Shack, P.O. Box No. 43175, Seven Points, TX 75143.

QSLs — KØAAB collection, railroad employees and railfan's specials, front report styles. State your sample wants. 37¢ self addressed business size envelope required. Marv WØMGI, 2095 Prosperity Ave., St. Paul, MN 55109.

QSLs Samples 30c (stamps OK) Fred Leyden, W1NZJ, 454 Proctor Ave., Revere, MA 02151.

INTRODUCING: Beautiful natural full color photo QSL cards, made from your color negative or slide. From $285. for 3,000 cards minimum. Free samples, stamps appreciated. K2RPZ, Box 412, Dept. NC, Rocky Point, NY 11778 516-744-6260.

QSLS, Quality and fast service for 24 years. Include call for decal. Samples 50c. Ray, K7HLR, Box 331, Clearfield, UT 84015.

QSLs by W6BA "customized" $19.75 per 1000. Star Route 2, Box 241, 29 Palms, CA 92277.

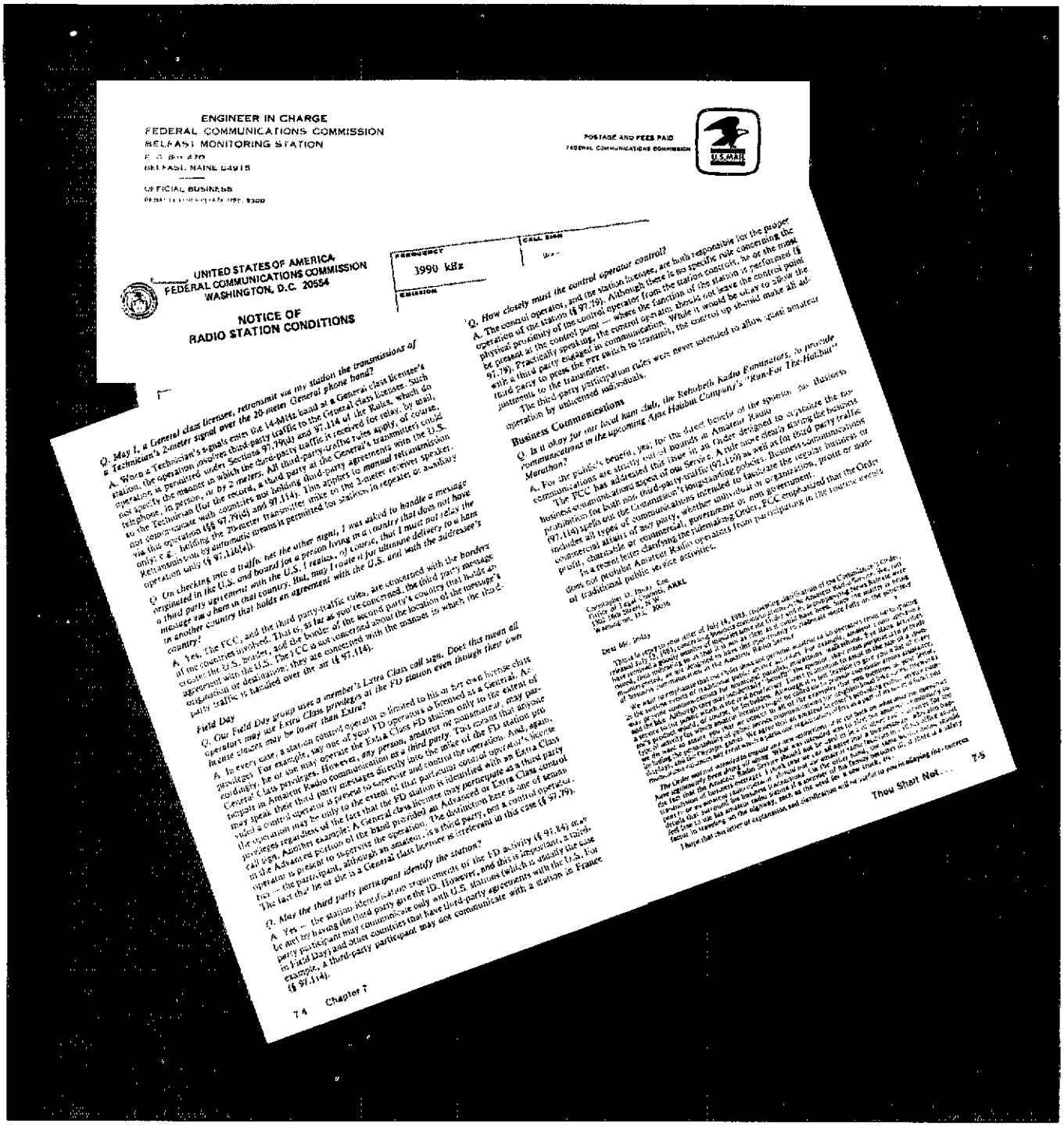
NEW KID on block — for QSL free samples write Kings Grove Press, Box 9, Ellerslie, MD 21529. Also custom printing and SWL's. Stamp appreciated.

RUBBER Stamps custom made to your satisfaction. Free literature. J. Glass, WB6ZTI, 14316 Cerecita Drive, East Whittier, CA 90604.

CLUB Call pins: 3 lines 1-1/4 × 3-1/4 $1.55 each. Call, first name and club, colors: blue black or red with white letters. Catalog — Arnold Linzner, WA2ZHA, 2041 Linden, Ridgewood, NY 11385.

QSL's by W4TG: Prices from $16 per 1000. Send SASE to PO Box F, Gray, GA 31032.

# 20-20 HINDSIGHT?




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

BE SURPRISED - get a variety of cards - 100 for $8 or 200 for $13. Samples $1 refundable. All three colors, fast service, satisfaction guaranteed. Constantine, 1219 Ellington, Myrtle Beach, SC 29577.

FINEST custom QSLs, large cut catalog and samples $1 refundable on first order. Ritz Print Shop P.O. Box 45018, Westlake, OH 44145.

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.

QSL CARDS: Don't buy QSL cards until you see the NEW catalog from Mail Order Express. We start from scratch and create a special QSL just for you. Top quality, low prices and service that you need. Free catalog. Mail Order Express, P.O. Box 703Q, Lexington, NC 27292.

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.

COLORFUL QSL's — thirteen card colors, ten inks, Samples 50¢. Specialty Printing Box 361, Duquesne, PA 15110.

RUBBER STAMPS: Name, Call and Address. $3.75 postpaid U.S. Floyd Durand, W5YZC, P.O. Box 67, Westwego, LA 70094.

NEW STYLE QSL's, personalized or standard design on colored stock — 1 & 2 color also YL cards. S.A.S.E. for samples. Jim's Printing Service, 2155 Young Ave., Memphis, TN 38104.

W4MPY is "busting buttons" cause his partner of 30 years recently took on the FCC and passed the General theory test to upgrade. Her reward is another trip to Las Vegas in April. This one may be expensive so keep those orders rolling in. You get a great QSL . . . Lola stays happy . . . We both come out winners! Send for free samples. QSLs By W4MPY, 705 Audubon Circle, Belvedere, SC 29841.

RUBBER Stamps custom made to your satisfaction. Free literature. J. Glass, WB6ZTI, 14316 Cerecita Drive, East Whittier, CA 90604.

CLUB Call pins: 3 lines 1-1/4 × 3-1/4 $1.55 each. Call, first name and club, colors: blue black or red with white letters. Catalog — Arnold Linzner, WA2ZHA, 2041 Linden, Ridgewood, NY 11385.

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HOSS-TRADER, Ed Says, Shop Around for the best price then telephone the Hoss last, for the best deal. New Display Kenwood 530-S, $569. New Drake R-7A receiver, regular $1649, cash $1095. Mint Collins 30L-1 linear $449. New Display Icom IC-2AT $199. Display Azden PCS-4000 $259. Display Icom-730 regular $829, cash $549. New Icom 25-A $279. New Drake L-7 linear $875. New KDK model-2033 $275. New Display Icom-751 $1149. New Display Icom-745 $795. Mint Collins KWM-2 $450. New Icom 02-AT with scan regular $349, cash $295. Display Ham-4 rotor $185. HyGain TH5MK2 beam regular $499.95, cash $319. VISA accepted. Moory Electronics Company, P.O. Box 506, DeWitt, AR 72042, 501-946-2820.

WANTED — old microphones for my mic. museum. Also mic-related items. Write Bob Paquette, 107 E. National Ave., Milw. WI 53204.

# ORDER FORM

THE 1984 RADIO AMATEUR'S HANDBOOK

☐ SOFT COVER $12.00 U.S. $13.00 Canada $14.50 Elsewhere

☐ CLOTH BOUND $17.75 U.S. $20.00 Elsewhere

☐ ARRL Amateur Radio Call Directory, U.S. listings $15.75 U.S., $19.75 in Canada and Elsewhere.

☐ TUNE IN THE WORLD WITH HAM RADIO. $8.50

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☐ SOFT COVER $8.00 U.S. $8.50 Elsewhere

☐ CLOTHBOUND $12.50 U.S. $13.50 Elsewhere

☐ ARRL CODE KIT $8.00

☐ THE FCC RULE BOOK A guide to the regulations. $3.00 U.S., $3.50 Elsewhere

☐ FIFTY YEARS OF ARRL $4.00

☐ FM AND REPEATERS FOR THE RADIO AMATEUR $5.00 U.S., $5.50 Elsewhere

☐ HINTS AND KINKS Vol XI The best from QST. $4.00 U.S., $4.50 Elsewhere

☐ LICENSE MANUAL $4.00 U.S., $4.50 Elsewhere

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☐ THE SATELLITE EXPERIMENTER'S HANDBOOK, $10 U.S., $11 Elsewhere

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☐ UNDERSTANDING AMATEUR RADIO $5.00 U.S., $5.50 Elsewhere

☐ WEEKEND PROJECTS FOR THE RADIO AMATEUR Easy to build projects from QST. $3.00 U.S., $3.50 Elsewhere

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☐ RSGB RADIO COMMUNICATIONS HANDBOOK 5th Ed. in one paperback volume, 778 pages $22.00

☐ VHF-UHF MANUAL $17.50

☐ AMATEUR RADIO TECHNIQUES $12.50

☐ TELEPRINTER HANDBOOK Covers mechanical teleprinters, demodulators, test equipment $21.00

☐ TEST EQUIPMENT $11.00

☐ HF ANTENNAS $12.00

☐ AMATEUR RADIO OPERATING MANUAL $10.00

THE ARRL FLAG

☐ 3' x 5' cloth flag $21.00

☐ Pin $2.50

☐ License Plate $5.00

☐ Cloth Patch $5.00

BINDERS

☐ 6½ x 9½ (U.S and Canada only) $6.00

☐ 8½ x 11 (U.S. and Canada only) $7.00

☐ L/C/F CALCULATOR Slide-rule type for problems on inductance, capacitance and frequency $3.00

BUMPER STICKERS $2.00 each

☐ "Amateur Radio - A National Resource"

☐ "Amateur Radio - One World, One Language"

CODE PRACTICE TAPES each $5.00

☐ 30 minutes of 5 wpm and 30 minutes of 7.5 wpm on one standard cassette.*

☐ 30 minutes of 10 wpm and 30 minutes of 13 wpm on one standard cassette.*

☐ 30 minutes of 15 wpm and 30 minutes of 20 wpm on one standard cassette.

*Same as the tapes provided in the CODE KIT.

LOG BOOKS

☐ 8½ x 11 Spiral $1.75 U.S., $2.50 Elsewhere

☐ Mini Log 4 x 6 $1.00 U.S., $1.50 Elsewhere

☐ 3-hole Loose Leaf 96 8½ x 11 sheets $3.00

DECALS

☐ Amateur Radio Emergency Service Color _____ 2/$0.50

☐ Amateur Radio Emergency Service Color 5/$1.00

☐ Member or Life Member, each 2/$0.50

CLOTH PATCHES (washable)

☐ Amateur Radio Emergency Service $2.50

☐ 3" League Diamond $1.00

☐ 5" League Diamond $2.00

☐ Life Membership for 3" League Diamond Patch $1.00

☐ Life Membership for 5" League Diamond Patch $1.25

☐ Rubber Stamp $2.00

MEMBERSHIP PINS

☐ Membership $2.50

☐ League Official _____ $2.50
Title

LEAGUE EMBLEM CHARM

☐ Membership $2.50

☐ League Official _____ $2.50
Title

☐ 14" x 16" LEAGUE EMBLEM BANNER $7.50

☐ DXCC LIST $1.00

MAPS

☐ U.S. Call Area: $3.00

☐ World Map $4.50

☐ Grid Locator $1.00

☐ Polar (for OSCAR) $1.00

☐ 1984 REPEATER DIRECTORY (Available late April) $2.00

## AMATEUR RADIO IN SPACE:

☐ Shuttle Mug $5.00

☐ 3" Cloth Patch $3.00

☐ 3" Stickers 2 for $1.00

Video Tape: "Amateur Radio's Newest Frontier"

☐ VHS format $25.00

☐ U-matic $35.00

Audio Cassettes of Amateur Radio in Space

☐ Highlights $3.00

☐ Complete $5.00

## ☐ YES!

Sign me up for membership $25 per year in the U.S., $30 in Canada, $33 elsewhere. If your are under age 18 or over 65 and provide **proof of age** $20 U.S., $25 Canada, $28 elsewhere. Family membership $2.00—a member of the immediate family of a regular member. 50% of dues for QST, balance for membership. Cannot be separated.

PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE.
ALLOW 3-4 WEEKS FOR DELIVERY.

**PAYMENT MUST BE IN U.S. FUNDS**
**$1.00 PER TITLE FOR POSTAGE AND HANDLING ON ORDERS UNDER $10.00.**

( ) Payment enclosed Charge to my: (MasterCard) ( ) VISA ( ) American Express

Acct. # _____ Good from _____ Good to _____

Mastercard bank # _____

Date _____ Signature (charge orders only) _____

Name _____ (Callsign) _____

Address _____

City _____ State/Prov _____ Zip/PC _____

Have you fully completed your order form? Is your check (which must be drawn on a U.S. bank) signed or charge number indicated?

**THE AMERICAN RADIO RELAY LEAGUE**
225 MAIN ST., NEWINGTON, CT 06111

# ICOM KENWOOD YAESU

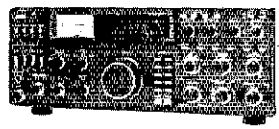
| | | Regular | SALE |
|---|---|---|---|
| IC-751 | 9-band Xcvr/.1-30 MHz Rcvr | $1399.00 | Call |
| PS-35 | Internal power supply | 160.00 | 144.95 |
| FL-52A | 500 Hz CW filter | 96.50 | 89.95 |
| FL-53A | 250 Hz CW filter | 96.50 | 89.95 |
| FL-33 | AM filter | 31.50 | |
| RC-10 | External frequency 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 | 10w430-450 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, grn 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 | 10w440 FM Xcvr, TTP mic | 399.00 | 359.95 |
| EX-270 | CTCSS encoder | 39.00 | |
| BU-1 | Memory back-up | 38.50 | |
| RP-3010 | 10w440 MHz FM repeater | 999.00 | 899.95 |

*Hand-held tranceivers:*

| | | | |
|---|---|---|---|
| **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 | |
| **Standard models** | | | |
| 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 |

*New*
IC-R71A Short wave receiver ..... Call

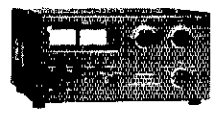


| | Regular | SALE |
|---|---|---|
| TS-930S/AT | 1799.00 | Call |
| TS-930S | 1599.00 | Call |

**COMPANY SPECIAL SALE**

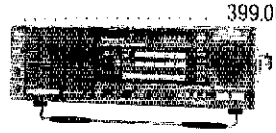
| | | |
|---|---|---|
| TM-201 | 369.00 | Call |
| TR-2500/PB25H | | Call |
| TR-3500/PB25H | | Call |
| TS-830S (choice CW filter 500 c/s or SP-230) | | Call |

| | | |
|---|---|---|
| TS-530SP | 749.00 | Call |
| VFO-230 | 169.95 | 152.95 |
| AT-230 | 194.95 | 174.95 |
| AT-130 | 144.95 | 129.00 |
| TS-430 | 895.95 | Call |
| PS-430 | 149.95 | 134.95 |
| AT-250 | 399.95 | 295.00 |
| TS-130SE | 629.95 | Call |
| TS-660(GM) | 699.95 | Call |



| | | |
|---|---|---|
| TL-922A 2K AMP | $1229.95 | Call |
| SM-220 | 359.95 | 324.00 |

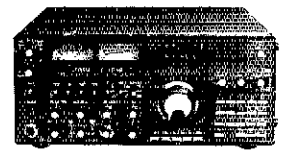
| | | |
|---|---|---|
| TW-4000A | 599.95 | Call |
| VS-1 | | 39.95 |
| TR-9130 | 529.95 | Call |
| TS-780 | 995.00 | Call |
| TR-7950 | 399.00 | 359.00 |
| TM-401 | 399.00 | 359.00 |



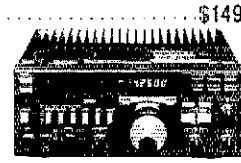
R-2000 Short wave receiver ..... Call

**HAL COMMUNICATIONS CORP.**

CALL US FOR PRICE!!



| | | 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 |
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WE Buy Electron tubes, diodes, transistors, integrated circuits, semiconductors. Astral Electronics, 321 Pennsylvania Ave., Linden, NJ 07036. 201-486-3365.

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TRS-80 Model I/III/IV Radio Amateur Software. Super-Log & Super-Duper $19.95; Compu-Log $16.95; Antenna Anatomy $14.95; Custom Beam Headings $19.95; Code Trainer II $16.95; General, Advanced or Extra Theory (specify) $19.95 each; more. Add $3 S/H. Specify Model, Tape or Disk? MICRO-80, 2665 Busby Quarter, Oak Harbor, WA 98277.

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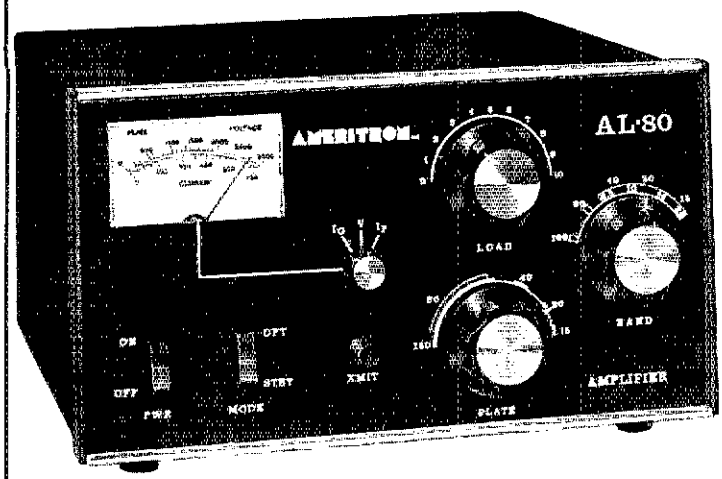
# AL-80 Compact QSK CW and SSB Kilowatt Amplifier




At the suggested retail price of $699.50, the Ameritron AL-80 is one of the lowest priced kilowatt amplifiers available.

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- The AL-80 incorporates the rugged 3-500Z tube.
- Compact size: 12"W x 6.6"H x 11.8"D. Weight: 43 lbs.

**Frequency Coverage:** 1.8-21.5 MHz amateur bands. Export model includes 10 meter amateur band.

**Power Input:** 1500W PEP SSB, 1000W CW and RTTY.

**Drive Required:** typically 65W PEP on SSB and 55W on CW.

**Intermodulation distortion Products:** In excess of — 33 dB below PEP.

**Power required:** 120 volts 50/60 Hz 15 amperes or 240 volts 50/60 Hz 7.5 amperes.

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The **Ameritron ATR-8** is a compact antenna tuner designed to match almost any antenna to any transceiver.

**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.

The **SWR bridge** provides an accurate and sensitive method of matching solid state output transmitters to any antenna, insuring maximum output.

**Model ATR-8B** has a built in balun to provide maximum power into balanced feeders of either twin lead or open wire type. The balun provides a ground isolated balanced current source that is superior to conventional center tapped voltage source baluns.


**Power Input:** 300 watts, 10 through 80 meters
175 watts, 160 meters

**Input Impedance:** 50 ohms at match

**Size:** 6-1/2 x 6 x 2"

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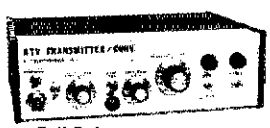

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*That full measure of performance goes into our product integrity too. With a no nonsense warranty that won't slow you down.*

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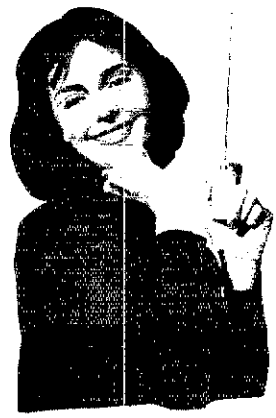

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*IN USA: Larsen Electronics, Inc.*
*11611 N.E. 50th Avenue P.O. Box 1799 Vancouver, WA 98668 Phone: 206-573-2722*

*IN CANADA: Canadian Larsen Electronics, Ltd.*
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WANTED: KENWOOD MARS-7000 adapter and SP-70 speakers. C.T. Huth; 130 Hunter St., Tiffin, OH 44883.

IBM-PC Ham Radio Software. Micro Electronic Systems, 19 Annette Park Drive, Bozeman, MT 59715.

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AMATEUR RADIO Servicing: General Radiotelephone license. Repairs, calibrations, modifications. George Gooder, KC7FI, POB 116, Summerville, Oregon 97876. 503-534-6981.

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## Digital Readout, Scanning, Memories and...

**ICOM introduces the new top-of-the-line IC-02A and IC-02AT to compliment its existing line of popular handheld transceivers and accessories. The new direct entry microprocessor controlled IC-02A is a full-featured 2-meter handheld.**

Some of the features standard on the IC-02A are: programmable scanning, 10 memories, duplex offset storage in memory, odd offsets, 32 keyboard selectable PL tones which store in memory, and internal lithium battery backup.

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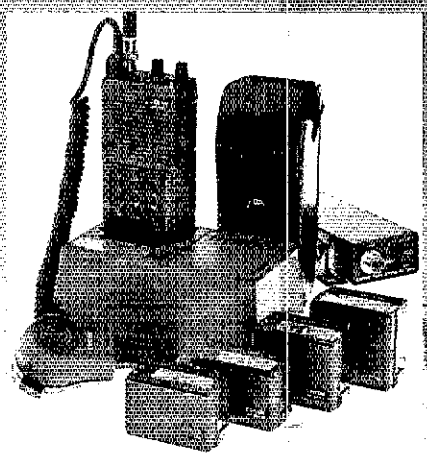
**The new IC-02A** has a battery lock, frequency lock, and lamp on/off switch. An aluminum case back is provided for superheterodyne shielding. The IC-02A is rich at the standard 3 watt level or 5 watts (optional battery pack).

Five packs are available for the IC-02A and IC-02AT including the new long-life 6.4 volt IC-BP8 and 13.2 volt IC-BP7. The IC-BP7 and BP8 may be charged from a top panel connector for 13.8 volts which will also power transceiver operation.



**ICOM's IC-2A(T)** continues to be available...and its complete line of accessories work with the new IC-02A.

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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.

For specifications and a full catalog of Encomm, Inc. products send us a QSL. Specifications subject to change without notice or obligation. Information in this ad does not constitute warranty.


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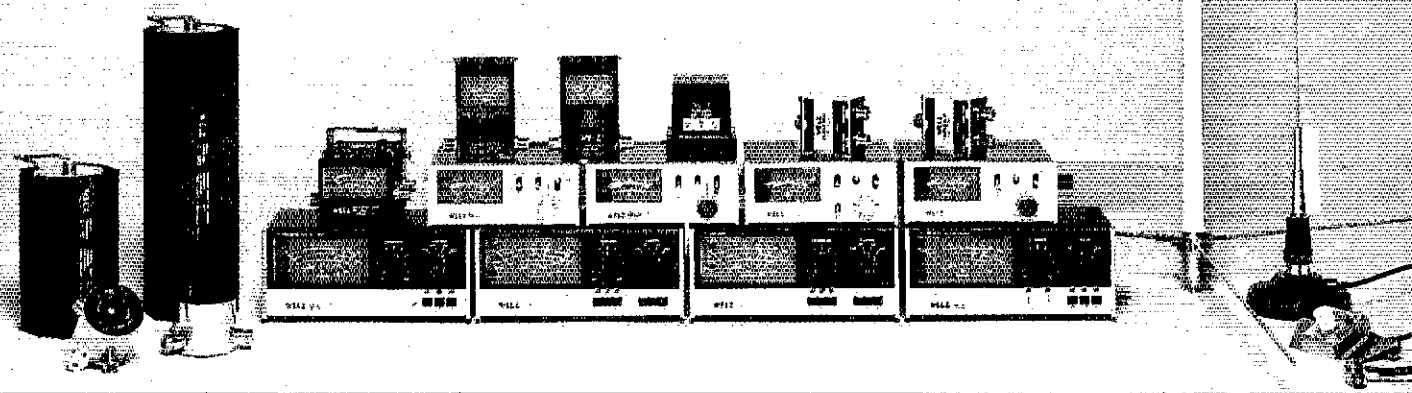

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# KDK

## FM MOBILE TRANSCEIVERS

## 2m 25W Mobile Maxpack

- Liquid Crystal Display with soft orange lighting for direct sunlight viewing plus night viewing.
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- Memories with valid data scanned, blanks are skipped.
- Repeater reverse switch for monitoring repeater's input frequency.

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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

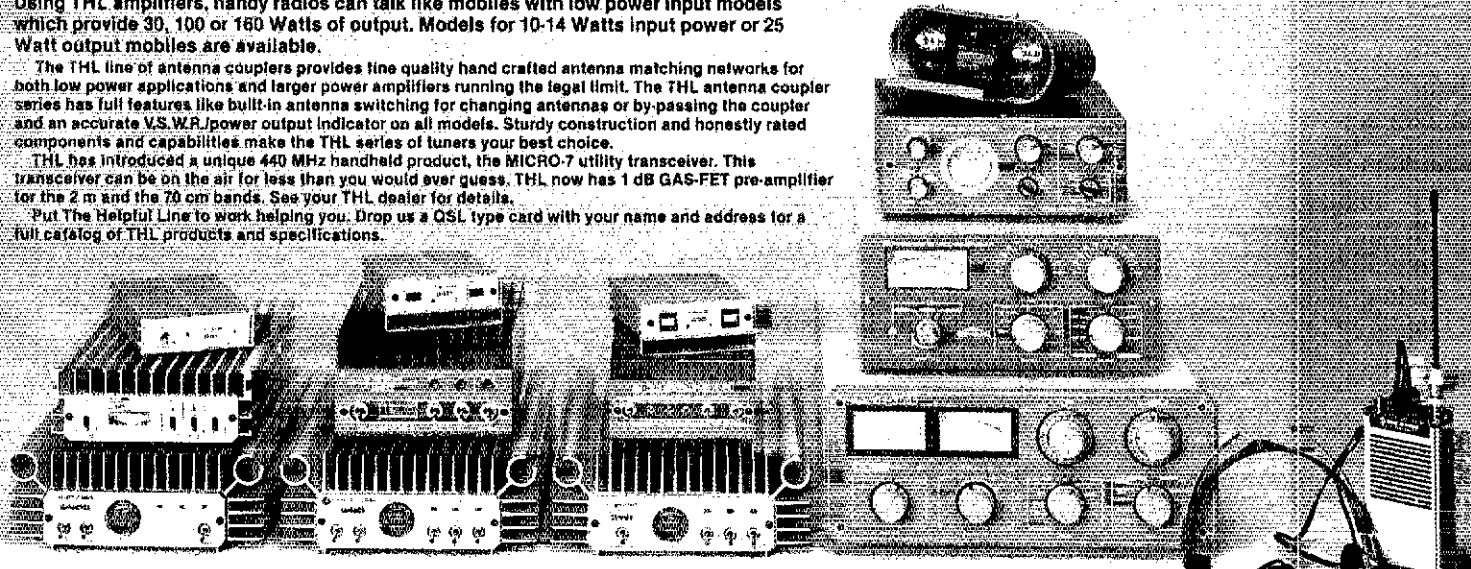
## The helpful line of handsome products.

**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.

Put The Helpful Line to work helping you. Drop us a QSL type card with your name and address for a full catalog of THL products and specifications.



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.

xas 75074
ENCOMM DAL
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2000 Avenue G, Suite 800, Plano, Texas 75074
Phone (214) 423-0024 TLX 79-4783 ENCOMM DAL
ENCOMM

# hy-gain®

# "Heavy Duty" is Relative!


In our lineup of rotators, the CD45 II is rated as medium duty. Some of our worthy competitors offer similar rotators which they rate as "heavy duty" and, within their product line, they are. But if you compare all rotators, it's a different picture. Here is a comparison of our CD45 II, our HAM IV and the Alliance HD73 (Specifications as stated by the manufacturer).

| | HD73 | CD45 II | HAM IV |
|---|---|---|---|
| Output Torque | 400 in. lbs. | 600 in. lbs. | 800 in. lbs. |
| Gears | Plastic and Steel | All Steel | All Steel |
| Control Box Weight | 3.8 lbs. | 6.8 lbs. | 6.8 lbs. |
| Rotor Unit Weight | 6.5 lbs. | 8.5 lbs. | 10.5 lbs. |
| Direction Indicator Potentiometer | Carbon | Precision wire wound | Precision wire wound |
| Rotation Limiter | Mechanical stop only | Limit switches with mechanical stop | Limit switches with mechanical stop |
| Braking Power | 1600 in. lbs. "Windmilling" | 800 in. lbs. "Holding" | 5000 in. lbs. "Holding" |
| Antenna Size Rating | 10.7 sq. ft. | 8.5 sq. ft. | 15 sq. ft. |

Wind load rating is an important specification too. Unfortunately, there is no standard method of measurement. For example, a long boom antenna with an unbalanced wind load is a much tougher problem than the calculated square area of the antenna would suggest. So we take a conservative "worst case" approach and rate the CD45 II at 8.5 square feet. Yet, the HD73, a lighter unit, is rated at 10.7 square feet. You be the judge.

Here is a complete listing of Hy-Gain rotators and the typical antenna systems that each will comfortably and reliably manage.

**AR40**—Primarily used for small to medium size VHF and UHF beams. Can also be used with a 10 or 15 meter, 3 element Yagi.

**CD45 II**—Recommended for a 3 element tribander such as our Explorer 14. Will also manage a medium sized VHF stack and is a good choice for the Azimuth rotator on a good sized satellite system.

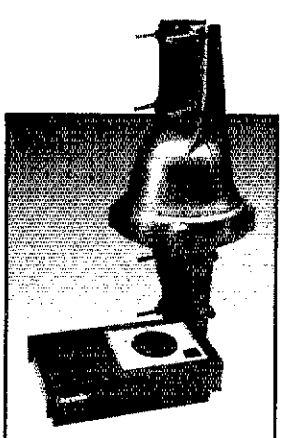
**HAM IV**—A favorite for long boom tribanders such as our TH7DX. Would also be a good choice for an Explorer 14 stacked with a VHF DX antenna or a satellite system.

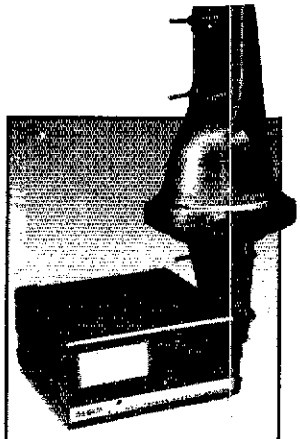
**HAM SP**—A modified Ham IV with a special control unit for a blind operator. Single knob directional control system includes a compass rose with braille markings. An audible beep indicates rotator start and stop.

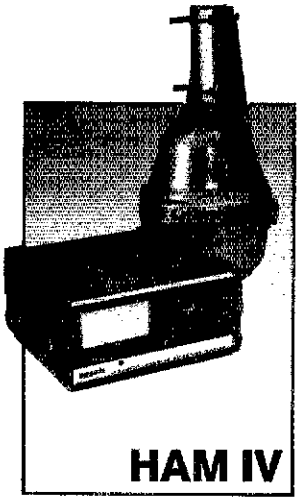
**T2X**—The well-known Tail Twister manages combinations such as a TH7DX stacked with a small 2 element 40 meter beam. Also a great choice for a substantial VHF "weak signal" array. Of course, the ever popular stack of 3 or 4 element 10, 15, and 20 meter monobanders is a safe match for the T2X.

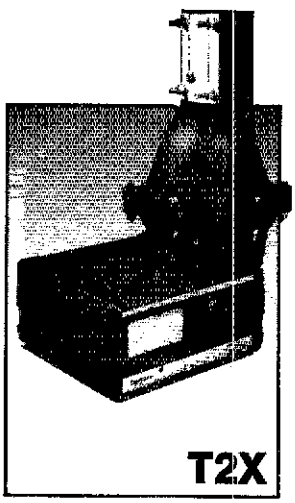
**HDR300**—This 5000 inch pound torquer is our idea of heavy duty. This is the choice for stacked HF "Long Johns" or the full sized 3 element 40 meter monsters. A favorite too for the giant VHF "weak signal" systems where the 1° rotator control and indicator accuracy is a must.

CHOOSING THE RIGHT MODEL—The mistake most commonly made is selecting a rotator for the antenna being installed at the time and not looking forward to the antenna system that you ultimately plan. A rotator that is not over-loaded will deliver many years of reliable service. So, when you choose yours, plan ahead and buy the model that will handle the ultimate load. If in doubt, drop us a note. We will share our experience with you. Long term, you will save money.




TELEX® hy-gain®

TELEX COMMUNICATIONS, INC.
9600 Aldrich Ave. So., Minneapolis, MN 55420 U.S.A.
Europe: Le Bonaparte—Office 711, Centre Affaires Paris-Nord, II
93153 Le Blanc-Mesnil, France.

COAX: Low-Loss 50Ω (1/2, 3/4, 7/8, 1 5/8, 3 1/8) inches. Specifications S.A.S.E. Link, 1081 Aron St., Cocoa, FL 32922.

OST 1966 to 1983 in ARRL binders, $150, pick-up only, K2AM, 201-687-3518.

N6TR DUPING Service 1.5¢/QSO 805-526-3372.

JOHNSON VIKING 275 watt matchbox, missing a knob, $90. Yaesu FT1018, mobile mic, $400. Cushcraft A3 tribander, you pickup, $100. Heathkit SB100, power supply, Ameco receiver pre-amp, $285. Redi-Kilowatt contest memory keyer, $75. KM3G Lane Zeitler 7273 Rupert Drive, Fairview, PA 16415.

TI99/4A learn CW. Tape $3, Listing $1. WA3UQR.

SELL: Henry 2KD Classic. New November 83. 5 hours use. 10 meters. $800. Chuck, AKØT, 701-258-8651.

WANTED: Cheap 2M handheld, Wilson type or TR-2400. Looking for Yaesu FV301 VFO, FP30, PS, and a Yaesu antenna tuner for 301AD series. Also want Yaesu FT-221 2M and FT620B 6M. Also want a 2M, 6M, and 440 mobile and 440 HT xtal-type okay, and a 2M Amp and 10 Amp or better supply. Any above should be reasonable, and not-working units are okay. Gary, WD4IPL, 1025 Meadowlark, Merritt Island, FL 32953.

ROBOT 400, RCA camera $450. Sanyo mon, $100. Mint, no mods. K6GLJ, 805-832-5500, 805-398-2111.

HEWLETT PACKARD counter 5381 with small signal pickup attenuator, Simpson model 184 digital multimeter absolute mint offers, IC215 two meter grabber $130, mint, Commodore 64, disc drive 1541, joystick, Rat Race, used about two hours, never-used MFJ 1224 interface, Hamtext, word and name machine, bonus pak $675. Three six-volt eight-Amp gel cells charged $8 each SASE, freight extra. KD7FE 5085 Highland Drive, Post Falls, ID 83854.

WANTED: 833-A and mounting assembly - W2ABE.

COLLINS 32V-3 transmitter, like new, with 32V-1 junker for spare parts, two spare 4D32 finals, spare modulators, manual. Pick-up, or will ship via bus. Best offer. Lee Christie, 31427 Mound Road, Warren, MI 48092 313-759-6438.

ICOM SP-3 speaker. New, $36. Ten-Tec 252G power supply, $35. WB7VOO, 602-298-4820.

WANTED: Old Keys for my telegraph and radiotelegraph key collection. Need pre-1950 bugs. All models of Vibroplex, Martin, Boulter, Abernathy, McElroy, etc. Also need spark keys, Boston keys, large or unusual radiotelegraph keys, sideswipers, cootles, homebrew and foreign keys. K5RW, Neal McEwen, 1128 Midway, Richardson, TX 75081.

WANTED: Heath HW-12A with manual. KØHQW, 65 Dellbrook Ct., O'Fallon, MO 63366.

HEATHKIT SB-604, SB-614, SB-634, un-used, meticulously assembled by a perfectionist kit-builder, best offers on all or part. Lee Christie, 31427 Mound Road, Warren, MI 48092 313-759-6438.

WANTED: Manual Precision 10-40 tube tester. N1CCL, 292 S. Prospect, Burlington, VT 05401.

2 TEK mobile/portable VHF FM 25W radios. Works but no transmit xtals. Freq. 169.+ one Hallicrafters Porta-Command PC-230 30W mobile radio used only as base station, works? Freq. 163.81. Best offer all or part. P.O. Box 465, Newark, CA 94560. Mark Lawrence.

KWM-2 $475. 399C-1 external VFO, $125. PM-2 ac supply, $95. CC-2 suitcase, $65. Very clean with manuals, $595 takes all. Swan 240, matching spkr/supply, $165. W1HUX, 802-649-1006.

BATTERY PACKS - rechargeable - 12 V - 2.5 AH-D cells - 7¾ "X 2-¾" X1½" $39.95 includes shipping - Alkman Engineering, Box J, Kingston, MA 02364 617-934-6456.

WANTED: Collins 455 kHz mechanical filter. #526-9522-001. Reasonable. J. Szomolyai, 15418 Collins, Romulus, MI 48174.

SWAN 700CX with ps and D104. $400. Heathkit SB104A with p.s. and mike. $400. 503-759-3338 Donald Bibbey, 640 Tiara, Lakeside, OR 97449.

DRAKE 2-C excellent condition with manual $100; Standard SR-C806M 2-meter FM xcvr used little, good condition $90; 3-500Z and SK-410 socket in original boxes never used $55; K3ZQI Ernie; 4314 McKee Drive, Pittsburgh, PA 15236 or 412-884-7697.

SELL: Superb KWM-2A/312B-5/516F-2. All RE w/man'ls $1000. Hal ST-5000 (newest version w/TTL). Excellent w/man'l $175. Prices firm and include shipping. N4EDX 205-836-0187.

WANTED: Hallicrafters HT-33B linear to match my HT-32B/SX115. Must be mint condx. Robert Brown, KA5HWH, 201 Laurel Street, Lake Jackson, TX 77566.

CENTURY-21 with keyer and calibrator $260 713-797-1036, KA5DXZ, David Sarkozi, 2111 Holly Hall 2165, Houston, TX 77054.

WANTED: TS130 SE Kenwood with D. C. power supply. Call 406-328-8347 or write P.O. Box 68, Absarokee, MT 59001, KA7GBO.

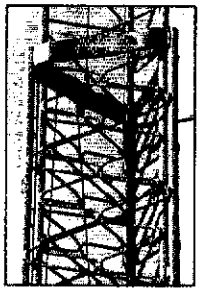
BC 221AK frequency meter, MV strip chart recorders, L + N volt potentiometer. Swap for Duck Stamps, QRP equipment. KA2JNV, 914-356-5495.

FOR SALE: Heath HW202 loaded with crystals, but needs work. Make offer. Charlie, WA9RRB, Route One, Walnut, IL 61376. 815-379-2094.

COLLINS 75S-3-32S-1-516F-1 - spkr-D104 mike. All in mint condition. Load of boxed tubes. $600 F.O.B. 305-722-0408. Lou Retzkin-8260 S.W. 24 St., No. Lauderdale, FL 33068.

# hy-gain®

# TOWER OF STRENGTH



Rugged Hy-Gain antenna crank-up towers are made as no others. All steel construction and galvanizing after welding meets ASTM material standards. Giant welding fixtures assure straight and true alignment of tower sections for close tolerance crank-up guide systems. Diamond web bracing, 2.5 times the strength of ordinary "W" bracing, adds strength where tower sections meet. Open-end tubular steel legs are galvanized inside and out and permit unrestricted moisture drainage. It all adds up to long lasting, massive tower strength for antenna loads of up to 16 sq. ft. at 60 mph.

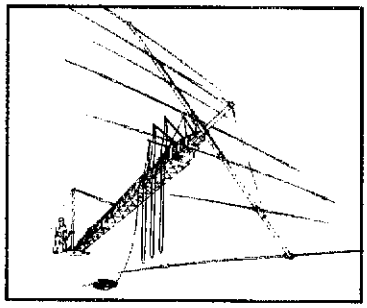
| | Tower Sections | Height Extended | Height Retracted | Width at Base | Antenna Windload Limit | Weight |
|---|---|---|---|---|---|---|
| HG-52SS | 3 | 52 ft.<br>15.8 m | 21 ft.<br>6.4 m | 16.44 in.<br>417.6 mm | 9.5 sq. ft.-50 mph<br>.88 sq. m-80 km/h | 455 lbs.<br>206 kg |
| HG-37SS | 2 | 37 ft.<br>11.3 m | 20.5 ft.<br>6.2 m | 13.75 in.<br>349.3 mm | 9.5 sq. ft.-50 mph<br>.88 sq. m-80 km/h | 265 lbs.<br>120 kg |
| HG-54HD | 3 | 54 ft.<br>16.5 m | 21.5 ft.<br>6.6 m | 19.53 in.<br>496.1 mm | 16 sq. ft.-60 mph<br>1.5 sq. m-96 km/h | 575 lbs.<br>261 kg |
| HG-70HD | 4 | 70 ft.<br>21.3 m | 21.5 ft.<br>6.6 m | 22.63 in.<br>574.7 mm | 16 sq. ft.-60 mph<br>1.5 sq. m-96 km/h | 1100 lbs.<br>499 kg |

Hy-Gain crank-up towers come complete with hinged base, installation steelwork, pre-drilled rotator plate and a manual winch.

Hy-Gain crank-up towers require no guying and conform to EIA, to the Uniform Building Code, and are approved by Los Angeles (license 1095). UBC documents for building permits are available on request (specify tower model) **before** you buy the tower.

## OPTIONAL TOWER ACCESSORIES

Electric winch/Remote control • Mast • Thrust bearing • Coax arms • Rotators • Tower Gin Pole



An accessory tilt-over gin pole allows one person to tilt the tower over to ground level.

## FREE FREIGHT

Order any Hy-Gain tower from your dealer for factory shipment direct to you. Hy-Gain will pay the freight on the tower and any of our antennas, rotators and accessories ordered for shipment at the same time. This offer is limited to within the 48 contiguous United States.

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TELEX COMMUNICATIONS, INC.

9600 Aldrich Ave. So., Minneapolis, MN 55420 U.S.A.
Europe: Le Bonaparte–Office 711, Centre Affaires Paris-Nord, 93153 Le Blanc-Mesnil, France.

HW-101, PS, 400 Hz filter, purchased from Heath this year. Still in cartons. Invoice price. HW-104, PS, external speaker, remote VFO, noise blanker, currently in use, $450. B. Knoll, 517-784-6777 nites. KA8TIO.

UT-4, rack mounted. Fully operational. Will ship, best offer. John J. O'Neill, Jr. KØVW 612-432-7817.

RTTY: Teletype ASR-28, excellent condition, with Flesher TU-170K terminal unit and all manuals. $350 plus freight. First check takes. Ed Groves, K7WG, 801-673-5868.

SELL: Rare collection of QST, most 1916s (individual) and all 1917-1974 (bound by year). Sell as a set for $3000 or by year. Call 301-589-6062 days or write to N2CF, 4424 Highboro Dr., Mount Airy, MD 21771.

MANAGERS/Chief Engineers: Hewlett-Packard 201C Oscillator and 330D Distortion Analyzer pair like new; used very little since purchase mid-1959 for KCVL. Held in clean dry storage. Complete with instruction books; misc. cordage and adaptors. Reasonably priced. Merle B. Peterson, W7LLS, Route 3, Box 273, Kettle Falls, WA 99141, 509-738-6540.

EXPERT SERVICE by W2YJ: All type amateur gear from newest handhelds to older tube rigs repaired. 20 years experience. G. Krickovich, 47 Wren Ave., Lancaster, NY 14086. 716-684-3562 after 5 PM.

FOR SALE: Collins 75A4, spkr, three filters; Collins KWM2 and p/s; Central Electronics 100V; other items, send for list. No shipping, local pick up only. George A. Diehl, W2IHA, 30 Wilson Avenue, Chatham, NJ 07928.

HAM COMPUTER Software Catalog. Send SASE. Electronic Put-Ons, 7805 N.E. 147th Ave., Vancouver, WA 98662.

SWAN 350D, digital, transceiver $350. N5FWG 501-322-8121.

HRO-500/LF-10: Original owner selling National Radio Co. 5 kHz - 30 MHz solid state receiver/LF preselector with cables, technical manuals and factory rack mounts, all in excellent condition: $950. Contact Robert G. Carter, POB 127, Hollywood, MD 20636 301-373-5183.

VHFers: Grid Square Program for the Entire World!! VIC-20, C-64, Apple II+ computers. No expansion necessary for VIC-20. Calculates six-character grid locator or LAT/LONG, and great-circle bearing and distance (MI/KM/NM) to that location. Specify computer: Tape - $5.95, Disk - $6.95. Apple - disk only. Info - SASE. ANADIT, Inc., 5791 Scotland Rd., Pensacola, FL 32506.

WANTED: Collins Transmitter KWS-1 in perfect operational condition. K2LQ, 62 Upper Prospect Road, Atlantic Highlands, NJ 07716.

YAESU: FT901DM transceiver, with Curtis Keyer, CW filter, nice and clean. N1VC, Vinnie Coppola, 12 Charles St., Plantsville, CT 06479. 203-621-5954.

CW STATION: Ten-Tec 'Century 21' (Model 570 analog) in excellent condition with Heath HD-1410 keyer, $250. Internal p.s., 500 Hz filter, speaker. I'll pay UPS shipping, COD. Jim, WAØTUS, 129 Compass Lane, Lexington, SC 29072.

MUST SELL - Dentron 3000A antenna tuner, 2 kW PEP, mint - $200. Dick Clancey, KA1SM, 25 Rolling Lane, Dover, MA 02030.

SELL: F.D.K. Multi-800D 25 watt P.L.L. digital 2-meter FM transceiver, mic, and manual immaculate condition, $200. Wanted: VFO for Heath HW16. K7GFL, 209-924-8566.

AMATEUR'S SHANGRI-LA: 5 acres, two 70' towers with TH6DXX-205BA ready to go. Five more towers in back of lot. Includes secluded 4/bedroom, 3/bath, 2700 square foot brick home. Country living at its best. $118,000. Call Ben, WA5VGD, 405-275-7692. Leona 405-356-4256. Dan 405-275-4400, 405-275-6624.

COLLINS S-Line for sale: 75S-3B, 32S-3, 516F-2, 312B-4, SM-2, Spectronics Digital Frequency Display plus some extras. All equipment in mint condition with manuals and cables $1250 or best offer. WB2HMU, 609-586-9652 after 6:00 P.M.

BEAM HEADINGS, computer calculated for your QTH, $6. Huff, Box 1112, Springfield, IL 62705.

11½ A. Hilltop homesite, Southbury, Conn.: excellent VHF/DX LOCATION. Possible subdivision. $52,900, will partial finance or swap for land in New Hampshire. KM1H, 54 Hobbs Rd., Pelham, NH 03076. 603-635-3048.

DRAKE TR-7 transceiver, power supply, speaker, fan, WARC, CW, AM filters, microphone, WH-7 wattmeter. Mint condition. $850. W1ZHW 617-263-0661.

KENWOOD TS-520 with 500 Hz CW filter, SP-520 and audio filter. Mint condition $450. Rosemary Wood, 1271 BeeBee Circle, Akron, OH 44305, 216-784-3506.

SURPLUS NEEDED: Mount & dynamotor for ARC-38 Steve Rohrer, 303 Melrose Ave., Decatur, GA 30030 404-378-1366.

SELL SB-200/linear, excellent. Prefer pick up, $200. W3GVR.

KENWOOD TS820S, CW filter, VFO-820, SP-820. Excellent condition. All manuals. $595. Jim, K6TL, 415-933-7696. 1257 Laurel Lane, Lafayette, CA 94549.

RME-9, Comet Pro and other pre-1940 ham gear wanted. AD1E, Box 73, Kennebunk, ME 04043. 207-985-7243.

WANTED - Collins KWS-1 Screen Power Transformer, T504 on schematic, 980 VCT, no fil. W2JZQ, 212-896-1678.

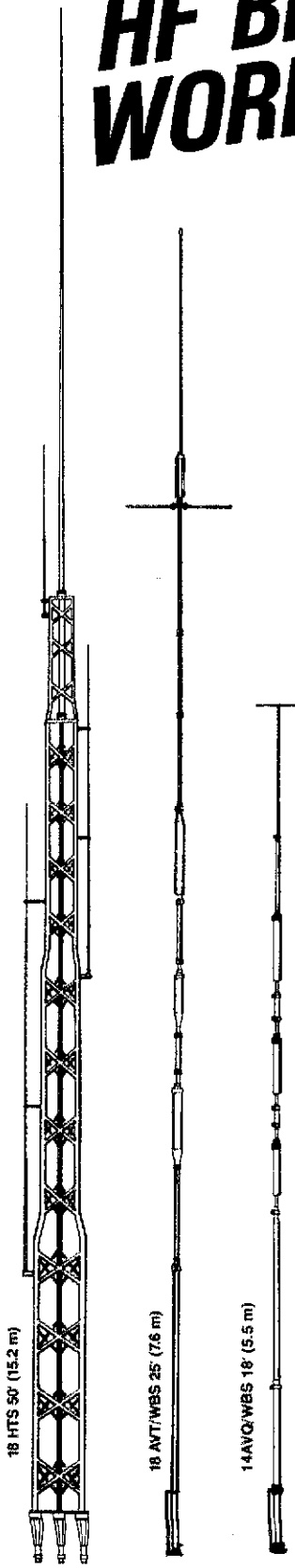
SIGNAL/ONE CX7A w/10 MHz - $750. Eimac 4CX3000A, new - $595. Hewlett-Packard 606A - $245. A. Emerald, 8956 Swallow, Fountain Valley, CA 92708.

WANTED: B&W 3852 roller coil for Collins KWS-1. K6WZ, 13638 Sproule, Sylmar, CA 91342.

# hy-gain®

# HF BROADBAND VERTICALS WORK THE WORLD

**Hy-Gain broadband vertical antennas load the new auto-tune solid state rigs, require minimal space and provide low angle radiation without the expense or the problems of support structures.**

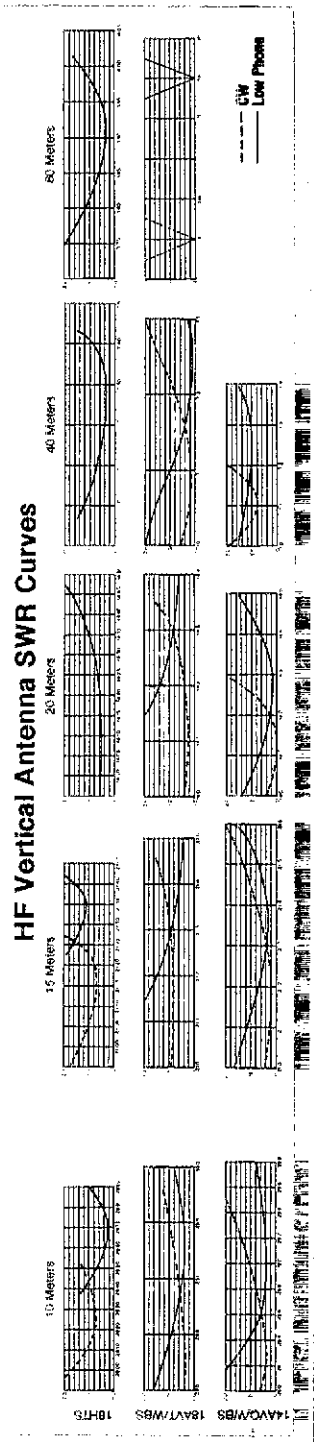



**18AVT/WBS** (80-10 meters) The most successful vertical antenna of all and for good reasons. Broadband performance covers the 40, 20, 15 and 10 meter bands in their entirety. Automatic 5 band switching is accomplished by mechanically superior, highly efficient factory tuned Hy-Q traps with large coils for consistent performance at 2:1 or lower VSWR on 40-10 meter band edges; bandwidth on 80 meters is approximately 40 kHz with VSWR below 2:1. A factory tuned matching network for 50 ohms impedance is dc grounded for lightning protection and reduced precipitation static. The mechanical integrity of this antenna is so stable that performance does not change with the weather. The 18AVT withstands winds to 80 mph (128 km/h) without guying. All stainless steel hardware is included.

**14AVQ/WBS** (40-10 meters) Offers very similar construction and the same excellent broadband performance as 18AVT over the entire 40, 20, 15 and 10 meter bands; automatic band switching with mechanically superior large-coil Hy-Q traps and very low angle radiation pattern. The smaller, low visibility size also makes the 14AVQ very suitable for roof mounting. The optional 14RMQ roof mounting kit includes base plate, mast and radial/guy wires. All antenna hardware is stainless steel.

**18 HTS** (80-10 meters. 160 meters with optional loading coil) The superb reliability of the 18 HTS is manifest in installations now over 20 years old. And, with the improvements we made over the years, the 18HTS is now better than ever. Automatic band selection is achieved through a unique stub decoupling system which effectively isolates various sections of the antenna so that an electrical ¼ wavelength (or odd multiple ¼ wavelength) exists on all bands. For example, outstanding broadband performance on 20, 15 and 10 meters is achieved with an extended ¾ wave collinear. On 80 meters bandwidth is approximately 250 kHz at 2:1 VSWR. With the optional base loading coil exceptional performance is also provided at 160 meters. The galvanized tower requires no guying and withstands winds to 100 mph (160 km/h). A special hinged base allows complete assembly at ground level and permits easy raising and lowering. Includes stainless steel hardware. WARC kits to be available.

Other Hy-Gain vertical multiband antennas are available though not shown here. The 12AVQS (20, 15, 10 meter) is similar to 18AVT above but with VSWR of 1.5:1 or less on all bands. The 18VS (80-10 meter) comes with a base loading coil and may be installed on a short mast driven into the ground. All include stainless steel hardware.




**PHASE FOR GAIN**

Any two identical Hy-Gain verticals can be phased for excellent gain and directivity. A great system for beam performance on 40, 80 and 160 meters or for 10, 15 and 20 meters where space is limited. Send for our free technical report "Phased Verticals".

**Hy-Gain Verticals that work the world at better Amateur Dealers.**

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TELEX COMMUNICATIONS, INC.

9600 Aldrich Ave. So., Minneapolis, MN 55420 U.S.A.
Europe: Le Bonaparte—Office 711, Centre Affaires Paris-Nord, 93153 Le Blanc-Mesnil, France.

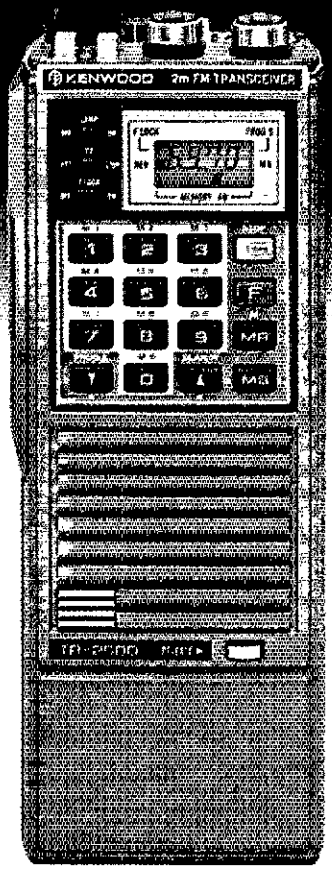
# TR-2500

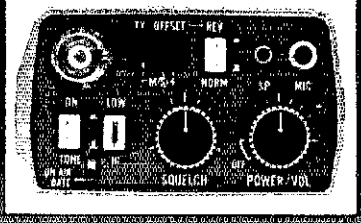
## Big performance, small size, smaller price!

**The TR-2500 is a compact 2 meter FM handheld transceiver with every conceivable operating feature.**

TR-2500 FEATURES:

- Weighs 540 g, (1.2 lbs). 66 (2-5/8) W x 168 (6-5/8) H x 40 (1-5/8) D, mm (inches).
- LCD digital frequency readout.
- Ten memories includes "MO" for non-standard split repeaters.
- Lithium battery memory back-up, built-in. (est. 5 year life).
- Memory scan.
- Programmable automatic band scan, and upper/lower scan limits; 5-kHz steps or larger.
- Repeater reverse operation.
- 2.5 W or 300 mW RF output. (HI/LOW power switch).
- Built-in tunable (with variable resistor) sub-tone encoder.
- Built-in 16-key autopatch encoder.
- Slide-lock battery pack.
- Keyboard frequency selection.
- Covers 143.900 to 148.995 MHz.




- Optional MS-1 mobile stand/ SC charger/supply for operation while charging.
- Battery status indicator.
- Complete with flexible antenna, 400 mAH Ni-Cd battery, and AC charger.

**Optional accessories:**

- ST-2 Base station power supply/ charger (approx. 1 hr.)
- MS-1 13.8 VDC mobile stand/ charger/power supply.
- VB-2530 2-M 25 W RF power amps., (TR-2500 only).
- TU-1 Programmable CTCSS encoder (TR-2500 only).
- TU-35B Programmable CTCSS encoder (mounts inside TR-3500 only).
- PB-25H Heavy-duty 490 mAH Ni-Cd battery pack.
- DC-25 13.8 VDC adapter.
- BT-1 Battery case for AA manganese/alkaline cells.
- SMC-25 Speaker microphone.
- LH-2 Deluxe leather case.

# TR-3500

## 70 CM FM Handheld

- Covers 440-449.995 MHz in 5-kHz steps.
- HI-1.5 W, Low-300 mW.
- TX OFFSET switch, ±5 kHz to ±9.995 MHz programmable.
- Auto/manual squelch control.
- Tone switch for opt. TU-35B
- Other outstanding features similar to TR-2500.

- BH-2A Belt hook.
- RA-3 2 m 3/8 λ telescoping antenna (for TR-2500).
- WS-1 Wrist strap.
- EP-1 Earphone.

# TR-7950/7930

## Big LCD, Big 45 W, Big 21 memories, Compact.

**Outstanding features providing maximum ease of operation include a large, easy-to-read LCD display, 21 multi-function memories, a choice of 45 watts (TR-7950) or 25 watts (TR-7930), and the use of microprocessor technology throughout.**

TR-7950/TR-7930 FEATURES:

- New, large, easy-to-read LCD digital display. Easy to read in direct sunlight or dark (back-lighted). Displays TX/RX frequencies, memory channel, repeater offset, sub-tone number, scan, and memory scan lock-out.
- 21 new multi-function memory channels. Stores frequency, repeater offset, and optional sub-tone channels. Memory pairs for non-standard splits. "A" and "B" set band scan limits. Lighted memory selector knob. Audible "beep" indicates channel 1 position.
- Lithium battery memory back-up. (Est. 5 yr. life.)
- 45 watts or 25 watts output. HI/LOW power switch for reduction to 5 watts.
- Automatic offset. Pre-programmed for simplex or ±600 kHz offset, in accordance with the 2 meter band plan. "OS" key for manual change in offset.
- Programmable priority alert. May be programmed in any memory.
- Programmable memory scan lock-out. Skips selected memory channels during scan.
- Programmable band scan width.
- Center stop circuit for band scan, with indicator.
- Scan resume selectable. Selectable automatic time resume-scan, or carrier operated resume-scan.
- Scan start/stop from up/down microphone.
- Programmable three sub-tone channels with optional TU-79 unit (encoder).
- Built-in 16-key autopatch encod with monitor (Audible tones).
- Front panel keyboard control.
- Covers 142.000-148.995 MHz in 5-kHz steps.
- Repeater reverse switch. (Locking)
- "Beeper" amplified through speaker.
- Compact lightweight design.

**Optional accessories:**

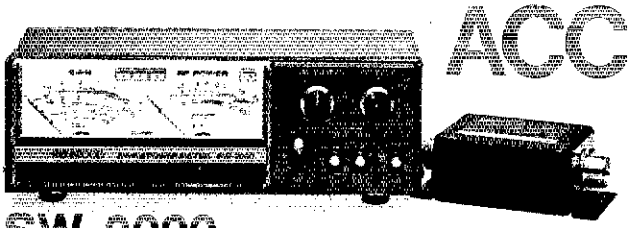
- TU-79 three frequency tone unit
- KPS-12 fixed-station power supply for TR-7950.
- KPS-7A fixed-station power supply for TR-7930.
- SP-40 compact mobile speaker.


# KENWOOD

**TRIO-KENWOOD COMMUNICATIONS**

1111 West Walnut, Compton, California 90220

# ACCESSORIES



## SW-2000

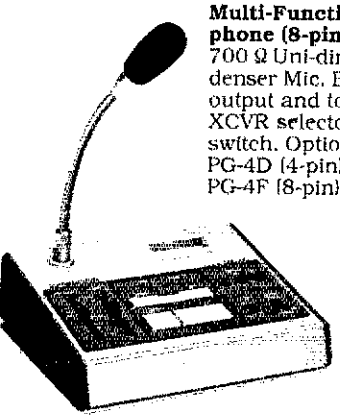
**160~6-m 2 KW SWR/PEP-POWER Meter**

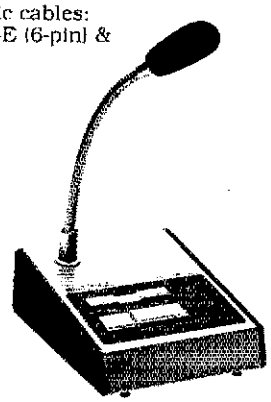
Up to 3 separate directional couplers may be connected. (One SWC 3 is supplied.) Optional couplers: SWC-2 (2-m/70-cm, 200 W) & SWC-3 (160~6-m, 2 KW).

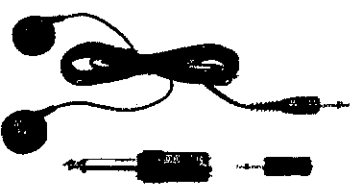
## MC-85

**Multi-Function Desk Top Microphone (8-pin)**

700 Ω Uni-directional Electret Condenser Mic. Built-in mic-amp with output and tone control, meter, XCVR selector and UP/DOWN switch. Optional mic cables: PG-4D (4-pin), PG-4E (6-pin) & PG-4F (8-pin).







## MC-80

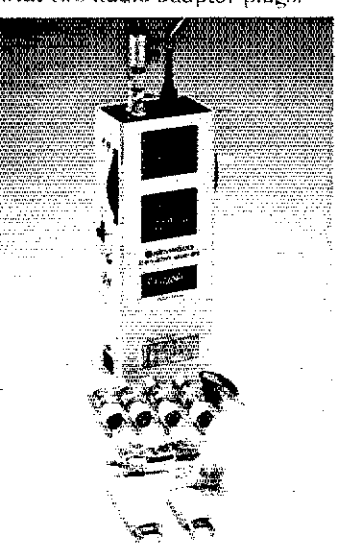
**Desk Top UP/DOWN Microphone (8-pin)**

700 Ω Uni-directional Electret Condenser Mic. with "FLEX" type boom. Built-in mic-amp and UP/DOWN switch. Optional mic plug adaptors: MJ-84 (8p-4p) & MJ-86 (8p-6p).

## HS-7

**Micro Headphones (16 Ω)**

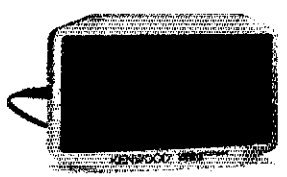
Ultra light weight and portable ear-fitting headphones supplied with two audio adaptor plugs.



## DM-81

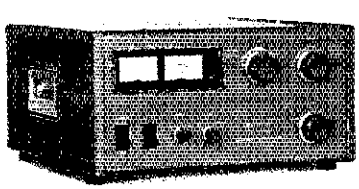
**700 kHz-250 MHz Dip Meter**

All solid-state and built-in battery.



## SP-50

**High Quality External Mobile Speaker**



## TL-922A

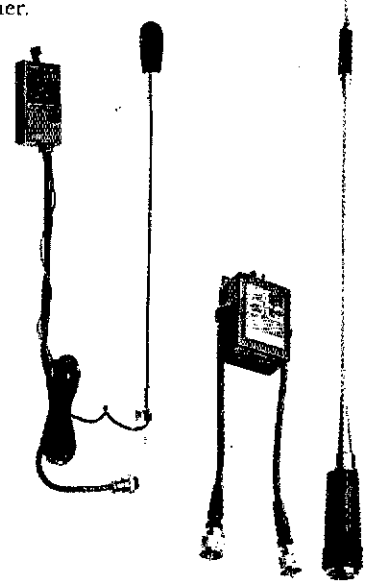
**160~15-m 2 KW PEP/1 KW DC Input Linear Amplifier**

Pair of EIMAC 3-500Z tubes and excellent IMD characteristics. Perfect safety protection with blower turn-off delay circuit.

## MC-55 (8P/6P)

**Mobile Microphone (8-pin or 6-pin)**

700 Ω Electret Condenser Mic. with flexible boom, and separate STAND-BY box built-in UP/DOWN switch and 5 minute Time-Out-Timer.





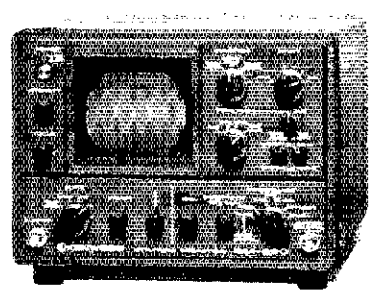
## MA-4000

**2-m/70-cm Dual Band Mobile Antenna**

5/8 λ for 2-m and stacked 5/8 λ for 70-cm. Duplexer is supplied.

## PC-1A

**Phone Patch** (FCC Part 68 registered)



## SM-220

**Station Monitor/High-Performance Oscilloscope**

Pan-display capability with optional BS-8 (for TS-830S/820S/180S) or BS-5 (for TS-520 series). Transmitted waveforms and/or receiving signal waveform monitor. Built-in 2-tone generator.

## SW-100A/B

**A: 160-m ~ 2-m. B: 2-m ~ 70-cm. 150 W SWR/POWER/VOLT Meter**

Compact design with separate coupler, ideal for mobile use. Built-in 0-20 V voltmeter.

**MICROPHONES:**

- **MC-60A** Deluxe desk top microphone with UP/DOWN switch. (8-pin) Pre-amplifier, 500/900 Ω
- **MC-60N4** Deluxe desk top microphone (pre-amp. not included). (4-pin) 50 k/500 Ω
- **MC-50** Desk top microphone, 50 k/500 Ω (4-pin)
- **MC-48** 16-key autopatch UP/DOWN microphone. (8-pin)
- **MC-46** 16-key autopatch UP/DOWN microphone. (6-pin)
- **MC-42S** Hand microphone with UP/DOWN switch. (8-pin)
- **MC-35S** Noise-cancelling hand microphone, 50 k Ω (4-pin)
- **MC-30S** Noise-cancelling hand microphone, 500 Ω (4-pin)

**MICROPHONE CABLES:**

- **PG-4A/4B/4C** For MC-60A/60N4. PG-4A(4-pin)/4B(6-pin)/4C(8-pin)
- **PG-4D/4E/4F** For MC-85. PG-4D (4-pin)/4E(6-pin)/4F(8-pin)

**MICROPHONE PLUG ADAPTORS:**

- **MJ-48** (4-pin mic to 8-pin XCVR)
- **MJ-84** (8-pin to 4-pin)
- **MJ-86** (8-pin to 6-pin)

**HEADPHONES:**

- **HS-6** Lightweight headphones
- **HS-5** Deluxe headphones
- **HS-4** Standard headphones

**GENERAL PURPOSE AC POWER SUPPLIES:**

- **KPS-7A** 13.8 VDC, 7.5A intermittent
- **KPS-12** 13.8 VDC, 12A intermittent
- **KPS-21** 13.8 VDC, 21A intermittent

**ANTENNAS:**

- **RA-3** 2-m 3/8 λ Telescoping antenna with BNC connector
- **RA-5** 2-m 1/4 λ /70-cm 5/8 λ Telescoping dual-band antenna with BNC connector

**Other accessories:**

- **RD-20** Dummy load, 50 Ω, DC-500 MHz, 50 W intermittent
- **SP-40** Compact external mobile speaker
- **AL-2** Lightning & static protector, 50 Ω 1 KW output
- **PG-3A** DC line noise filter for mobile

**SERVICE MANUALS:**

- Available for most transceivers, receivers, and major accessories.

**NOTE:** Prices and specifications of all Trio-Kenwood products are subject to change without prior notice or obligation.

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# 4000 SERIES
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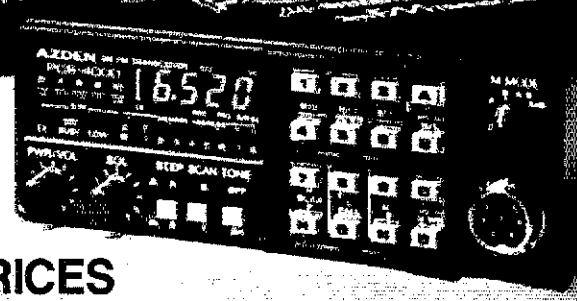

PCS-4000
2-m FM Transceiver

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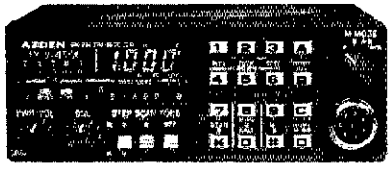
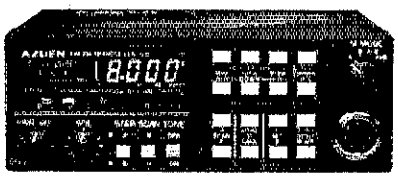
**THE 4000 SERIES**

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**
**FM Transceiver**
**142-149.995 MHz**

- **WIDE FREQUENCY COVERAGE:** PCS-4000 covers 142.000-149.995 MHz in selectable steps of 5 or 10 kHz. PCS-4200 covers 220.000-224.995 MHz in selectable steps of 5 or 20 kHz. PCS-4300 covers 440.000-449.995 MHz in selectable steps of 5 or 25 kHz. PCS-4500 covers 50.000-53.995 MHz in selectable steps of 5 or 10 kHz. PCS-4800 covers 28.000-29.990 MHz in selectable steps of 10 or 20 kHz.
- **CAP/MARS BUILT IN:** PCS-4000 includes coverage of CAP and MARS frequencies.
- **TINY SIZE:** Only 2"H × 5.5"W × 6.8"D. COMPARE!
- **MICROCOMPUTER CONTROL:** At the forefront of technology!
- **UP TO 8 NONSTANDARD SPLITS:** Ultimate versatility. COMPARE!
- **16-CHANNEL MEMORY IN TWO 8-CHANNEL BANKS:** Retains frequency and standard simplex or plus/minus offsets. Standard offsets are 600 kHz for PCS-4000, 1.6 MHz for PCS-4200, 5 MHz for PCS-4300, 1 MHz for PCS-4500, and 100 KHz for PCS-4800.
- **DUAL MEMORY SCAN:** Scan memory banks either separately or together. COMPARE!
- **TWO RANGES OF PROGRAMMABLE BAND SCANNING:** Limits are quickly reset. Scan the two segments either separately or together. COMPARE!
- **FREE AND VACANT SCAN MODES:** Free scanning stops 5 seconds on a busy channel; auto-resume can be overridden if desired. Vacant scanning stops on unoccupied frequencies.
- **DISCRIMINATOR SCAN CENTERING (AZDEN EXCLUSIVE PATENT):** Always stops on frequency.
- **TWO PRIORITY MEMORIES:** Either may be instantly recalled at any time. COMPARE!
- **NICAD MEMORY BACKUP:** Never lose the programmed channels!
- **FREQUENCY REVERSE:** The touch of a single button inverts the transmit and receive frequencies, no matter what the offset.
- **ILLUMINATED KEYBOARD WITH ACQUISITION TONE:** Unparalleled ease of operation.
- **BRIGHT GREEN LED FREQUENCY DISPLAY:** Easily visible, even in direct sunlight.
- **DIGITAL S/RF METER:** Shows incoming signal strength and relative power output.
- **BUSY-CHANNEL AND TRANSMIT INDICATORS:** Bright LEDs show when a channel is busy and when you are transmitting.
- **FULL 16-KEY TOUCHTONE® PAD:** Keyboard functions as autopatch when transmitting (except in PCS-4800).
- **PL TONE:** Optional PL tone unit allows access to private-line repeaters. Deviation and tone frequency are fully adjustable.
- **TRUE FM:** Not phase modulation. Unsurpassed intelligibility and audio fidelity.
- **HIGH/LOW POWER OUTPUT:** 25 or 5 watts selectable in PCS-4000; 10 or 1 watt selectable in PCS-4200, PCS-4300, PCS-4500, and PCS-4800. Transmitter power is fully adjustable.
- **SUPERIOR RECEIVER:** Sensitivity is 0.2 uV or better for 20-dB quieting. Circuits are designed and manufactured to rigorous specifications for exceptional performance, second to none. COMPARE!
- **REMOTE-CONTROL MICROPHONE:** Memory A-1 call, up/down manual scan, and memory address functions may be performed without touching the front panel! COMPARE!
- **OTHER FEATURES:** Dynamic microphone, rugged built-in speaker, mobile mounting bracket, remote speaker jack, and all cords, plugs, fuses, and hardware are included.
- **ACCESSORIES:** CS-7R 7-amp ac power supply, CS-4.5R 4.5-amp ac power supply, CS-AS remote speaker, and Communications Specialists SS-32 PL tone module.
- **ONE YEAR LIMITED WARRANTY!**

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## Introducing our new microprocessor-based HD-8999 *UltraPro* CW Keyboard... Better features and technology, for the build-it-yourself operator.

A major advance – the newest generation of "intelligent" CW Keyboards is now here! The *UltraPro* sends letter-perfect code, was 'human engineered' for maximum convenience, style and comfort – with specialized functions to improve your QSO productivity, typing skill and copy speed! It's the most versatile concept in CW history! Assemble one yourself for real satisfaction – *and savings.*

### EXCLUSIVE FEATURES

*UltraPro* combines the look of professional design with the sound and feel of a Morse computer. It's the only CW Keyboard with conveniences of the finest word/data processing terminals, like component-level diagnostics and 2-key rollover. A custom microprocessor makes setup fast, with all operations programmed by a few keystrokes. Send at 1-99 wpm, with ten weight and space settings, and enjoy automatic serial number generation, too! Up to ten variable-length message memories will hold a total of 495 characters, and can be selectively protected against erasure. CMOS RAM with battery backup and AC/DC power compatibility means you can use it anywhere.

### MORE USER-FLEXIBILITY

A large four-digit LED display and three-color bargraph panel provide complete status update by indicating parameter values as they are set and change, input error, space remaining in the message memory and fullness of the 64-character type-ahead buffer. The *UltraPro* has twelve different code practice modes to increase your copy speed, including one that can improve your typing skill! Yet it's so easy to use, a 9-year-old Novice can sound like a pro in minutes. *UltraPro* CW. There's no better name for it. Or the feeling you get from using it.

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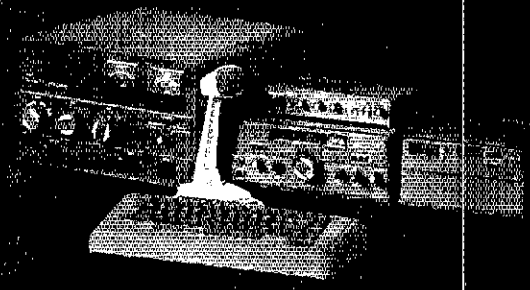

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AM-438

COLLINS C.W. Filter wanted to fit 75 S 3 B: F455 Q 200, W5EZ, 406 Bayou View Dr., Seabrook, TX 77586.

LIKE NEW! Drake R4C, T4XC, MN2000, Hallicrafters 2kW transceiver SR2000, Robot 400 & Color Boards, Must sell - make offer. WA9EUN, Callbook or 312-964-8198.

ICOM IC-730 xcvr w/mic, FL-30 and FL-45 filters, HM-10 Scanning Microphone. Excellent condition. Complete w/manuals and original packaging. $539. Glen, KA7IWL 801-375-4074.

FOR SALE - Tempo-One transceiver with power supply $300. KQ3K Schneider, 9528 Wandering Way, Columbia, MD 21045.

RADIO/ASTRONOMY site par excellence. 5-acre mountain top, 5 miles from McDonald Observatory at 6200 feet. Excellent site for radio/astronomy/solar/wind experimentation and scenic homesite. Commercial power on site, telephone available. Otherwise a quiet, remote spot. $15,000. K5CN, Box 426, Ft. Davis, TX 79734.

WANTED: Yaesu FT-127RA 220 MHz, TTP preferred, WB1ATX.

SURPLUS military equipment schematics, SASE, N1CCL.

TI-99/4A Send/Receive CW code practice, TI-Basic or Extended Basic; MINIMUF propagation in TI-Basic. Cassettes $12, Diskettes $15, Listings $5. Ham Software Co., A. C. Buxton, W8NX; 2225 Woodpark, Akron, OH 44313.

KENWOOD TS-520/VFO-520 $435; TR-7800, 11-ele beam, 5/8 Larsen $200. Original boxes: Teletype 33KSR $75; Drake 2-B $75. WB2HYO, 201-852-8054. RD1, Andover, NJ 07821.

WANTED: Pre-1932 one- or two-tube transmitter, no replicas. Jim Miller, 34 Garretson Road, White Plains, NY 10604. 914-949-5787.

SELL: Kenwood TR-2400 2M HT with case, $125: Kenwood TR-7200A 2M FM transceiver, $100; both like new. HT-220, $100. Dick Yerian, KE4YC, 1525 LaRochelle, Charlotte, NC 28226, 704-366-3127.

SALE OR TRADE: Heath SB-102, ps, spkr, mic, 400 Hz CW xtal, all manuals, nice rig - Heath assembled as demo. $250 or trade for clean, late model synthesized 2 mtr rig w/encoder. Call Bob N3DRW 301-644-0451 after 7 E.S.T.

WANTED: Yaesu FL-2100 Z linear, premium price for premium linear. W2MSV, W. G. Schenk, Jr., 462 Grider St., Buffalo, NY 14215.

FOR SALE: HAMMARLUND HQ-150 and Globe Champion 350. 4009 Snyder, Cheyenne, WY 82001. KA7DNI.

WANTED - Original or copy of pre-WWII QSL for ZU1T. Contact W6IRN.

PORTABLE COMPUTER - Hewlett Packard HP-75C w/24KB mem., modem, 80 col video I/F, VISICALC, DATACOMM, text formatter, never used, list over $2000, sell for $1195, K8II. Call 513-891-9870.

COLLINS WANTED: 399B-4 or 399B-5 Novice Adapters for the 32S-3 transmitter and KWM-2. Also F455FA series CW and AM bandpass filters. Contact George Hawrysko, K2AWA, P.O. Box 568, Boro Hall, Jamaica, NY 11424.

HAL DS2050 complete RTTY terminal and keyboard, mint. $275 or best. KC9AO, 312-352-1557.

HEATH 610 monitor scope; KLM 16C antenna; 10-meter beam; Kenwood VFO-230; Teknik 12/24 hr. clock; Kenwood PC-1 phonepatch; Yaesu F221 2-meter base all-mode; Yaesu YC-221 digital display; Azden PCS-2800 10-meter transceiver; Drake CS-7 remote ant. switcher for 5 antennas, brand new in closed box; Icom IC-30L UHF linear. WB7AWA.

COMPUTER - Hewlett Packard HP-85A w/32KB mem., modem, IEEE-488 I/F, all ROM's, lots of software, dual 3 ½" microfloppy, list $6400, sell for $2395, K8II. Call 513-683-0940.

WANTED, military surplus radios, we need Collins 618T, ARC-72, ARC-94, ARC-102, RT-712/ARC-105, ARC-114, ARC-115, ARC-116, RT-823/ARC-131, or FM-622, RT-857/ARC-134 or Wilcox 807A, ARC-159, RT-1167 or RT-1168/ARC-164, RT-1299/ARC-186, RT-859/APX-72, APX-76, ARN-82, ARN-84, ARN-89, APN-153, APN-155, APN-171, MRC-95, 718F-1/2, HF-105. Collins antenna couplers 490T-1, 490T-2, 490T-9, CU-1658A/ARC, CU-1669/GRC, 490B-1, CU-1239/ARC-105, 490D-1, Top dollar paid or trade for new Amateur Gear, write or phone Bill Slep, 704-524-7519. Slep Electronics Company, Highway 441, Otto, NC 28763.

KDK-2015R $150. Regency P110, ps $35. Terminal RTTY interface for Apple $400. Phone 208-286-7750 or write W7FOF, Rt. #1, Box 139, Star, ID 83669.

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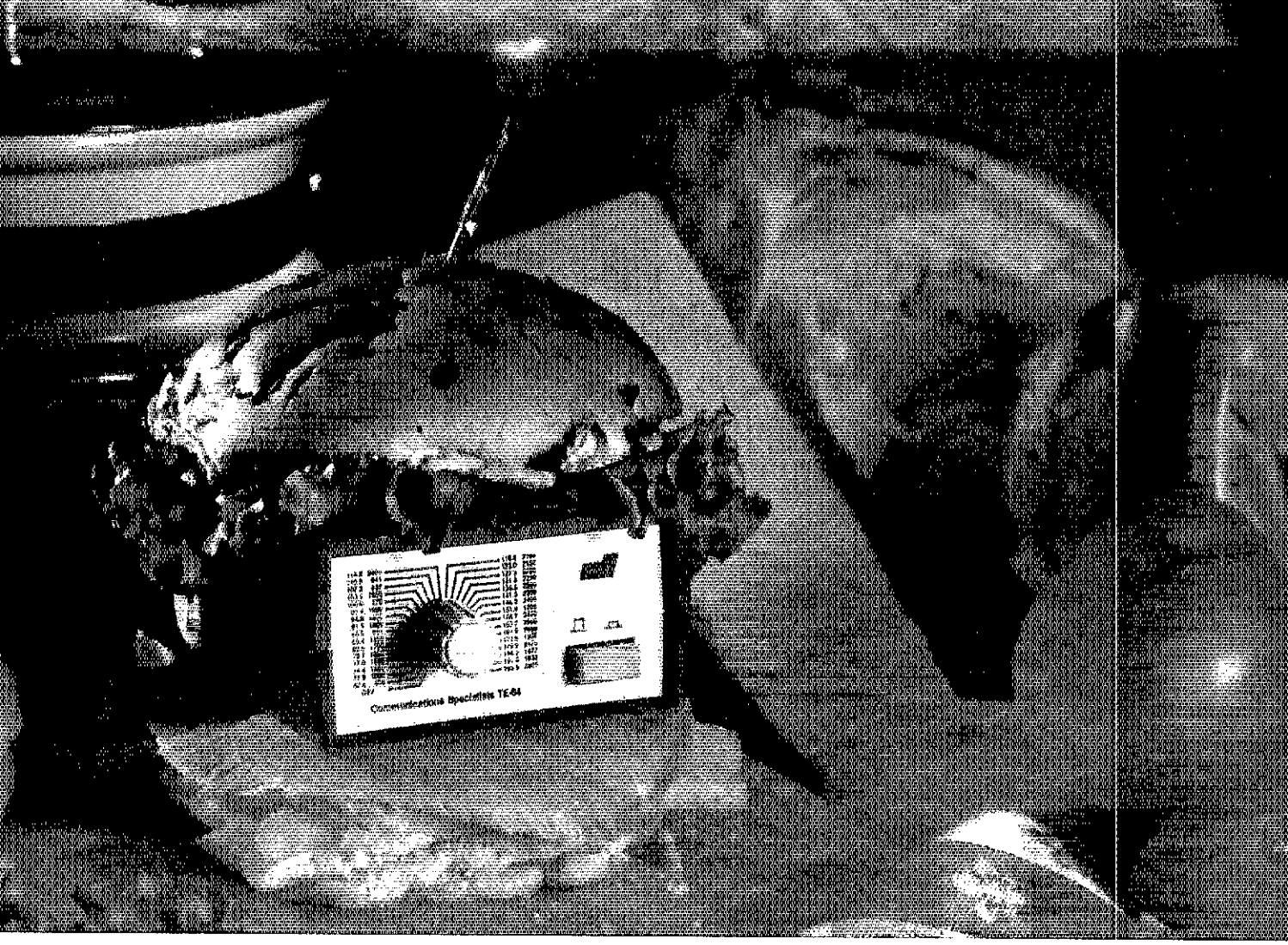
ARIZONA QTH bound? 61 ft Wilson crank up/down tilt over tower with rotating base installed at 3741 West St. John Road, Glendale, Arizona 85308. Tower is negotiable with sale of this DXCC QTH. This deluxe 5½ year old home in best Northwest Phoenix neighborhood. Your XYL will love this home! Priced below market at $79K. SASE or phone 602-938-2077 no collect calls accepted. S. Bert Davidson, W2GOB.



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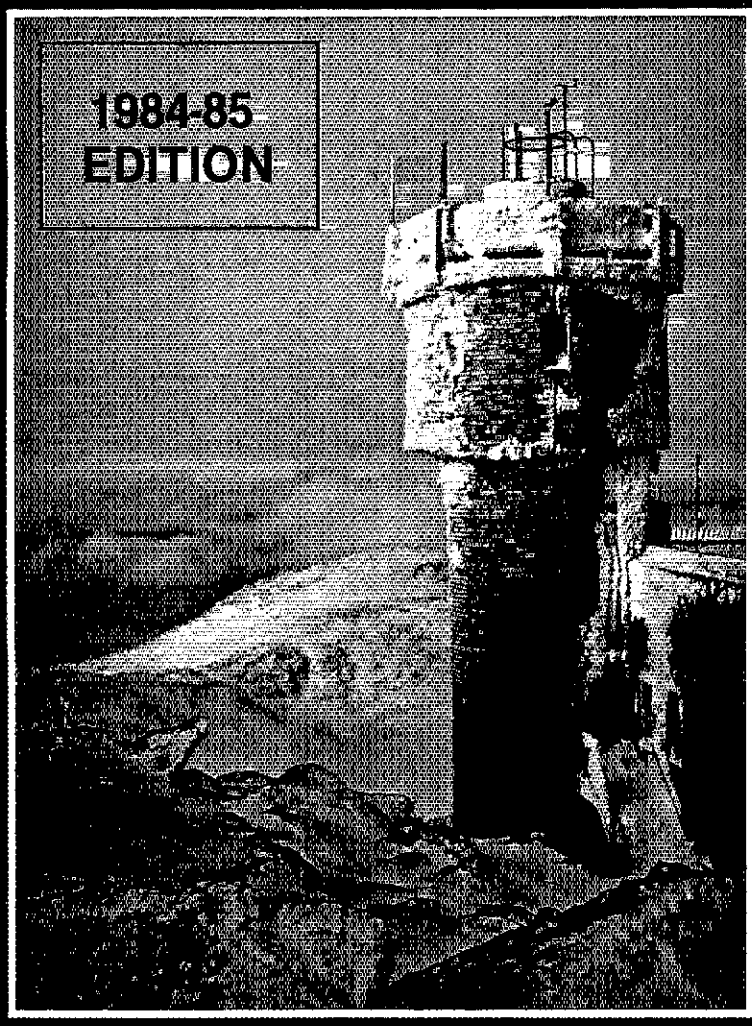


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WANTED: Ten-Tec 515 Argonaut. Write to: WB3AAL, 1030 Windsor St., Reading, PA 19604.

DIGITAL DISPLAYS for FT-101's, TS-520's, Collins, Drake, Swan and others. Write for information. Grand Systems, P.O. Box 3377, Blaine WA 98230. 604-530-4551.

COLLECTOR QUALITY - mint to fine. Heath HW-100 + PS23 $225. SB200 $225. HW19 "Tener" $30. Test sets: LG-1 $25, IG-42 $35, IG-82 $50, TS-4A $50, PS3 $30, IP32 $35. Scopes: O-11 $35, IO-12 $80. Gonset Comm. II $40. Small Viking matchbox $55. SX71 $80. Ranger $80. Looking for Johnson 500. Make offer. Jim W4QO, 404-993-9500 (7-9:30 EST) Atlanta.

MADISON RTTY Goodies: MFJ 1228 RTTY, CW, AMTOR $59.95 with 1251 software - Comm 64 $99.95 complete; Kantronics Interface $119; Interface 2 $219.95; AEA CP1 $179.95; CP1/MBA Text COMM 64 or VIC 20 $209.95 each; AEA, Kantronics software - 10%; MFJ 1224 $79.95; 1250/1251 $40 ea; Prices FOB Houston, all guaranteed, subject prior sale. Madison Electronics, 1508 McKinney, Houston, TX 77010. 1-713-658-0268-Texas; 1-800-231-3057-orders; 1-800-231-1064 5-10 PMCT MWF; 1-713-331-2235-nite Texas. Mastercard/Visa.

JST 100, Mint Condition, Desk Microphone CHG 43, Power Supply NBD 500G. KA1YD 212-758-2860.

SB-301 with SSB/CW filter, matching speaker, SB-401 with crystal package, cables, manuals, dust covers, excellent $400. N9CW 498 Thunderbird Trail, Carol Stream, IL 60188 312-668-3905.

YAESU FT-901 DM with C.W. filter, excellent, K2CYT, R. DuPont-10 Fleming Ct-Long Valley, NJ 07853. 201-876-4444.

**Jobs for Hams**

COUNSELORS ... Maine Boys' Camp. Ham radio, Electronics, Code, General License, may bring own equipment. Write: Richard Krasker, 95 Woodchester Dr., Chestnut Hill, MA 02167.

WANTED for summer of 1984: Instructors in electronics, ham radio, and computers. Small boys' science camp in Pennsylvania. Apply: Donald Wacker, P.O. Box 356, Paupack, PA 18451.

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.

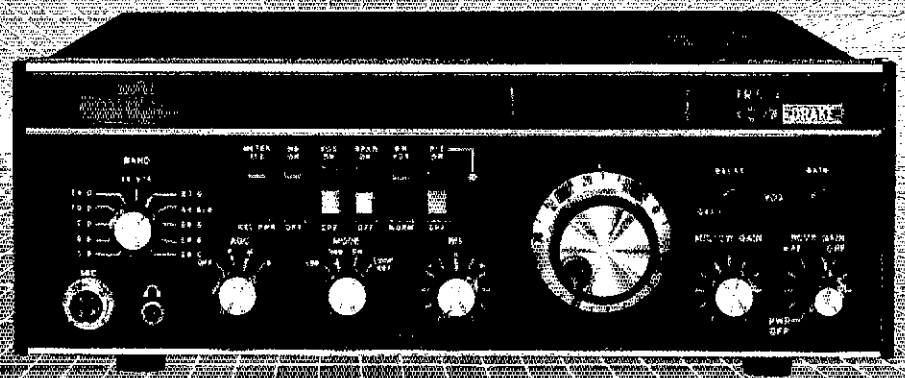
COUNSELOR — Ham Radio, cabin living, varied activities, 6/24-8/22, Northeastern Pennsylvania. Write: Camp Wayne, 570 Broadway, Lynbrook, NY 11563. 516-599-4562.

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.

HAMS FOR World Goodwill. Outstanding opportunity for training in international youth community. Practicum in intercultural relations, communications, youth work, preparation for international careers. Seeking flexible, enthusiastic operators (licensed) capable of preparing youths (ages 9-18) for Novice, Technicians, General and above class licenses. Help youths create an international amateur radio and satellite computer communications network. Full station setup: 2-meters, low band, RTTY, computer. Cost: $875 includes training, room, board. June 20-August 18. College credit available at extra cost. Ask about financial assistance. LEGACY 1141 N. Glebe Rd., Arlington, VA 22201.

# 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**

DRAKE

540 Richard St., Miamisburg, Ohio 45342. USA
Phone: (513) 866-2421 • Telex: 288-017

**ADVERTISING DEPARTMENT STAFF**

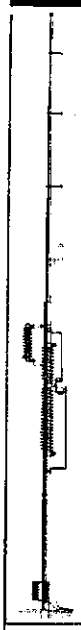
Lee Aurick, W1SE, Advertising Manager
Sandy Gerli, AC1Y, Deputy Adv. Mgr.
Karen L. Holden, Advertising Assistant

203-667-2494 is a direct line, and will be answered only by Advertising Department personnel


## Index of Advertisers

# ANTENNA/TOWER SALE!

## BUTTERNUT ELECTRONICS CO.

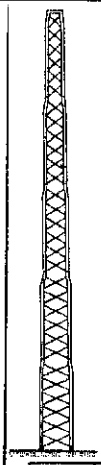


- Designed to operate on all Amateur Bands at "FULL" Legal Power Input.
- Automatic Band Switching (80/10 meters).
- Automatic Band Switching (160/10 meters) with optional model TBR-160 HD.
- IN STOCK for IMMEDIATE DELIVERY & LOOK at very SPECIAL PRICES . . .
- New Model HF6V $129.00
- New Model TBR-160HD (High Power 160 meter Base Resonator) $49.00.

Model RMK-11 (roof mount kit with multiband radial kit $39.00. Model STR-2 (Stub Tuned Radial Kit) $29.00.

Delivery Anywhere In The Continental USA At No Additional Cost. (Free Shipping On Butternut Accessories Also When Purchased With Antenna.)

## UNARCO-ROHN Self Supporting Towers — On Sale!

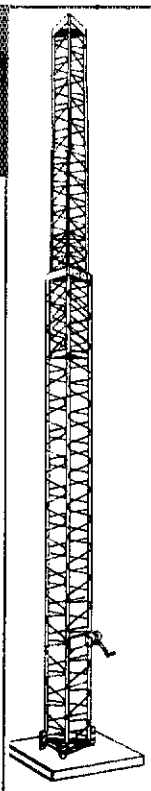


### Freight Prepaid

**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!**

**And — Save even more — include antenna and rotor of your choice with the order and we will ship them along freight prepaid also! How's that for good old fashioned savings?**

| 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 |
| HDBX40 | 40 ft | 18 sq ft | 281 | BXB7 | 339 | 26 | 365 |
| HDBX48 | 48 ft | 18 sq ft | 363 | BXB8 | 429 | 30 | 459 |



## 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

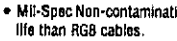
| Model | Height | Load | Sale Price |
|---|---|---|---|
| HG37SS | 37 ft. | 9 sq. ft., | $ 679 |
| HG52SS | 52 ft. | 9 sq. ft., | $ 959 |
| HG54HD | 54 ft. | 16 sq. ft., | $1499 |
| HG70HD | 70 ft. | 16 sq. ft., | $2399 |

Masts—Thrust Bearings—Other Accessories Available —Call! Prices Shown Are Your Total Delivered Price In Continental U.S.A.!

### RG-213U — $.29/ft $279/1000 ft Up to 600 ft via UPS

- RG-213/U—95% Bare Copper Shield
- Mil-Spec Non-contaminating Jacket for longer life than RG8 cables.
- Our RG-213/U uses virgin materials.
- Guaranteed Highest Quality!

### RG-8X — $.19/ft $179/1000 ft



- RG8X—95% Bare Copper Shield
- Low Loss Foam Dielectric
- Non-contaminating Vinyl Jacket

**Coaxial Cable Loss Characteristics (DB/100 ft)**

| Cable Type | Impad. | 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 |

### HARDLINE/HELIAX™

Lowest Loss for VHF/UHF!

½" Alum. w/poly Jacket . . . . . $.79/ft
½" LDF4-50 Andrew Heliax ™ . . . . . $1.69/ft
⅞" LDF5-50 Andrew Heliax ™ . . . . . $3.99/ft
select connectors below.

**HARDLINE & HELIAX™ CONNECTORS**

| Cable Type | UHF FML | UHF MALE | N FML | N MALE |
|---|---|---|---|---|
| ½" Alum | $19 | $19 | $19 | $25 |
| ½" Heliax ™ | $22 | $22 | $22 | $22 |
| ⅞" Heliax ™ | $49 | $49 | $49 | $49 |

**AMPHENOL CONNECTORS**

Silver PL259 . . . $1.25 Nickle PL259 . . . $.90
UG21B N Male . . $2.95 UG23D N Female . $2.95

### ANTENNA WIRE & ACCESSORIES

12 Ga. Copperweld . $.12/ft 14 Ga. Copperweld . $.10/ft
14 Ga. Stranded . . $.10/ft 18 Ga. Copperweld ¼mi $30
450 Ohm H.D. Line . $.16/ft H.D. End Insulators . $2/ea
Van Gorden 1:1 Balun . . . . . $11
Van Gorden Center Insulator . . . . . $6

### HUSTLER — 6BTV 80-10 mtr Vert $129

4BTV 40-10 mtr Vert $89 5BTV 80-10 mtr Vert $109
G6-144B 2-mtr Base $89 G7-144 2-mtr Base . $119

| Mobile Resonators | 10m | 15m | 20m | 40m | 75m |
|---|---|---|---|---|---|
| 400W Standard | $12 | $12 | $15 | $18 | $22 |
| 2KW Super | $18 | $20 | $22 | $26 | $36 |

Bumper Mounts - Springs - Folding Masts in Stock!

### CUSHCRAFT

**MULTI-BAND HF ANTENNAS**

A3 3-el Tribander . . $219 A4 4-el Tribander . . $289
R3 20/15/10mtr Vert $279 A743/A744 40mtr Kit $75

**HF MONO-BAND ANTENNAS**

| | | | |
|---|---|---|---|
| 10-3CD | $ 95 | 10-4CD | $109 |
| 15-3CD | $119 | 15-4CD | $129 |
| 20-3CD | $199 | 20-4CD | $279 |
| 40-2CD | $289 | D40 | $149 |

**VHF/UHF BEAMS**

| | | | |
|---|---|---|---|
| A50-5 | $ 79 | 617B | $199 |
| 214B | $ 79 | 3219 | $ 95 |
| 220B | $ 95 | 424B | $ 79 |

**OSCAR/TWIST ANTENNAS**

| | | | |
|---|---|---|---|
| A144-10T | $ 52 | A144-20T | $ 75 |
| A147-20T | $ 63 | 416TB | $ 59 |
| A14TMB | $ 29 | PS4 | $ 69 |

**VHF/UHF FM ANTENNAS**

| | | | |
|---|---|---|---|
| A147-4 | $ 29 | A147-11 | $ 49 |
| 214FB | $ 79 | 228FB | $219 |
| A449-6 | $ 29 | ARX2B | $ 39 |

### HY-GAIN

**Broadband 3-el Triband Beam Explorer-14, In Stock—$289**

QK710 30/40 mtr Add-On-Kit . . . . . $79.00
V2S 2-mtr Base Vertical . . . . . $39
TH5MK2S Broad Band 5-el Triband Beam . . . $389
TH7DXS 7-el Triband Beam . . . . . $439
TH3JRS 3-el Triband Beam . . . . . $179
TH2MK3S 2-el Triband Beam . . . . . $159
HY-QUAD 2-el Triband Quad . . . . . $299
402BAS 2-el 40-mtr Beam . . . . . $219
205BAS 5-el 20-mtr Beam . . . . . $329
155BAS 5-el 15-mtr Beam . . . . . $189
105BAS 5-el 10-mtr Beam . . . . . $129
204BAS 4-el 20-mtr Beam . . . . . $249
203BAS 3-el 20-mtr Beam . . . . . $149
153BAS 3-el 15-mtr Beam . . . . . $89
103BAS 3-el 10-mtr Beam . . . . . $69
DB1015BAS 3-el 10/15 mtr Beam . . . . . $179
64BS 4-el 6-mtr Beam . . . . . $59
66BS 6-el 6-mtr Beam . . . . . $119
18HTS 80-10 mtr Hy-Tower Vertical . . . . $429
DC-160 160-mtr Coil Kit for 18HTS . . . . $39
214 14-el 2-mtr Beam . . . . . $39
2BDQ 80/40 mtr Trap Dipole . . . . . $59
5BDQ 80-10 mtr Trap Dipole . . . . . $119
BN86 80-10 mtr KW Balun W/Coax Seal . . $15

### MOSLEY

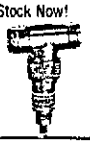
CL-33 3-el Triband Beam . . . . . $279
TA-33 3-el Triband Beam . . . . . $249
TA-33JR 3-el Triband Beam . . . . . $189
TA40KR 40mtr Kit for TA33 . . . . . $119

### Tri-Ex TOWERS SPECIAL PRICES! SAVE$$!

| 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 |

### ALPHA DELTA COMMUNICATIONS

Transi-Trap™ Surge Protectors—In Stock Now!

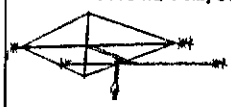


Model LT 200W UHF Type . . $19
Model HT 2KW UHF Type . . $29
Model LT/N 200W N Type . . $39
Model HT/N 2KW N Type . . $44
Model R-T 200W Deluxe . . $29
Model HV 2KW Deluxe . . . . $32

### KLM

| | |
|---|---|
| KT34A 4-el Broad Band Triband Beam | $339 |
| KT34XA 6-el Broad Band Triband Beam | $489 |
| 80m-1 80-mtr Rotatable Dipole | $469 |
| 40m-1 40-mtr Rotatable Dipole | $179 |
| 40m-2 2-el 40-mtr Beam | $309 |
| 40m-3 3-el 40-mtr Beam | $339 |
| 40m-4 4-el 40-mtr Beam | $649 |
| 20m-6 6-el 20-mtr Beam | $689 |
| 15m-6 6-el 15-mtr Beam | $439 |
| 10m-6 6-el 10-mtr Beam | $259 |
| 10-30-7LPA Log Periodic Beam | $639 |
| 2m-13LBA 13-el 2-mtr Beam | $79 |
| 2m-14C 14-el 2-mtr Satellite Antenna | $89 |
| 435-18C 435 MHz Satellite Antenna | $65 |
| 432-16LB 16-el 432 MHz Beam | $69 |

### 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

### ROTORS & CABLES

| | |
|---|---|
| Alliance HD73 (10.7 sq ft rating) | $109 |
| Alliance U110 (for small beams & elevation) | $49 |
| Telex HAM 4 (15 sq ft rating) | $199 |
| Telex Tailtwister (20 sq ft rating) | $249 |
| Telex HDR300 Heavy Duty (25 sq ft rating) | $479 |
| Kenpro KR-500 Heavy duty elevation rotor | $189.00 |

Standard 8 cond cable $.19/ft (vinyl jacket 2-#18 & 6-#22 ga)
Heavy Duty 8 Cond cable $.36/ft (vinyl jacket 2-#16 & 6-#18 ga)

### UNR-ROHN GUYED TOWERS

10 ft Sections 20G $37.50 25G $46.50 45G $107.50

Foldover Towers

| Model | Height | Ant Load* | Price |
|---|---|---|---|
| FK2548 | 48 ft | 15.4 sq ft | 829 |
| FK2558 | 58 ft | 13.3 sq ft | $ 899 |
| FK2568 | 68 ft | 11.7 sq ft | $ 959 |
| FK4544 | 44 ft | 34.8 sq ft | $1159 |
| FK4554 | 54 ft | 29.1 sq ft | $1259 |
| FK4564 | 64 ft | 28.4 sq ft | $1359 |
| 25G Foldover Double Guy Kit | | | $249 |
| 45G Foldover Double Guy Kit | | | $269 |

*Above antenna loads for 70 MPH winds and Guys at Hinge & Apex.

All Foldover Towers Shipped Freight Pre-Paid! Foldover prices 10% higher west of Rockies. All Rohn 25G & 45G Accessories in stock - Call!

### TOWER/GUY HARDWARE

| | |
|---|---|
| 3/16" EHS Guywire (3990 lb rating) | $.13/ft |
| 1/4" EHS Guywire (6000 lb rating) | $.16/ft |
| 5/32" 7 × 7 Aircraft Cable (2700 lb rating) | $.12/ft |
| 3/16" CCM Cable Clamp (3/16" or 5/32" Cable) | $.35 |
| 1/4" CCM Cable Clamp (1/4" Cable) | $.45 |
| 1/4" TH Thimble (fits all sizes) | $.30 |
| 3/8EE (3/8" Eye & Eye Turnbuckle) | $5.95 |
| 3/8" EJ (3/8" Eye & Jaw Turnbuckle) | $6.95 |
| 1/2" EE (1/2" Eye & Eye Turnbuckle) | $8.95 |
| 1/2" EJ (1/2" Eye & Jaw Turnbuckle) | $9.95 |
| 3/16" Preformed Guy Grip | $1.99 |
| 1/4" Preformed Guy Grip | $2.49 |
| 6" Diam - 4 ft Long Earth Screw Anchor | $12.95 |
| 500D Guy Insulator (5/32" or 3/16" Cable) | $1.39 |
| 502 Guy Insulator (1/4" Cable) | $2.49 |
| 5/8" Diam - 8 ft Copper Clad Ground Rod | $12.95 |

### PHILLYSTRAN GUY CABLE

| | |
|---|---|
| HPTG2100 Guy Cable (2100 lb rating) | $.29/ft |
| HPTG4000 Guy Cable (4000 lb rating) | $.43/ft |
| HPTG6700 Guy Cable (6700 lb rating) | $.69/ft |
| 9901LD Cable End (for 2100/4000 cable) | $6.95 |
| 9902LD Cable End (for 6700 cable) | $7.95 |
| Socketfast Potting Compound (does 6-8 ends) | $12.95 |

### GALVANIZED STEEL MASTS

Heavy Duty Steel Masts 2 in OD - Galvanized Finish

| Length | 5 FT | 10 FT | 15 FT | 20 FT |
|---|---|---|---|---|
| .12 in Wall | $25 | $49 | $59 | $79 |
| .18 in Wall | $39 | $69 | $99 | $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

# TEXAS TOWERS

DIV. OF TEXAS RF DISTRIBUTORS INC

**1108 Summit Ave., Suite 4 / Plano, Texas 75074**

ALL PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

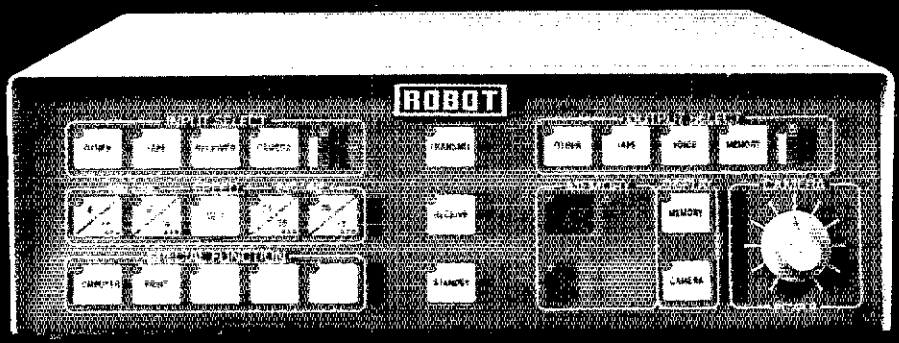
Mon.-Fri.: 8:30 a.m. - 5:30 p.m. Sat. 9 a.m. - 1 p.m.

**TELEPHONE: (214) 422-7306**

MasterCard VISA

CIRCLE 41 ON READER SERVICE CARD

# 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***