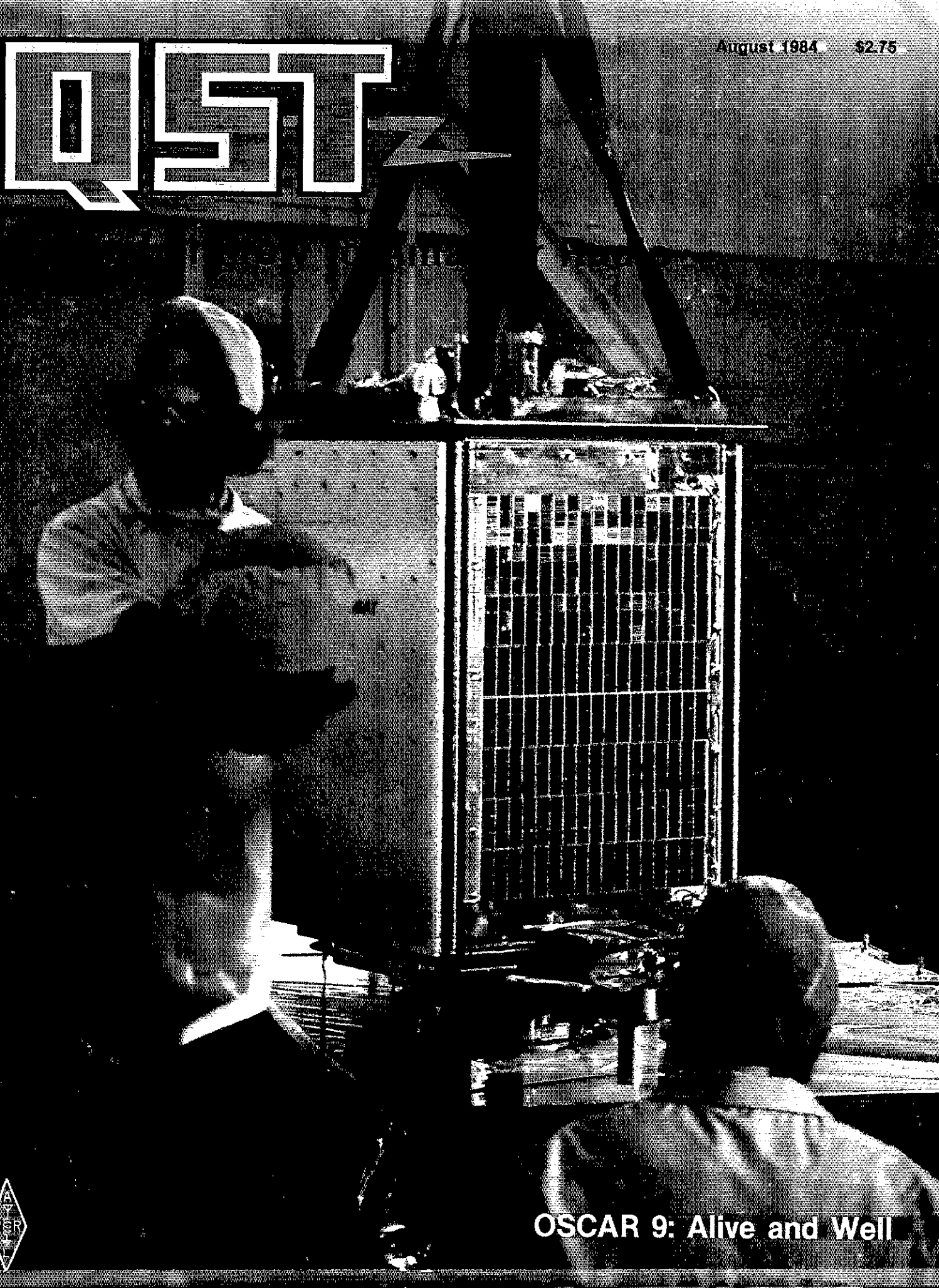
QST

August 1984 $2.75



OSCAR 9: Alive and Well

the tempo S-15

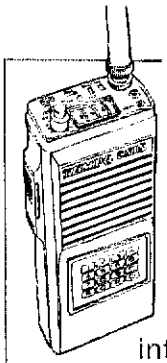
...a no nonsense radio that provides more power, broader frequency range and simplicity of operation

...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)



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...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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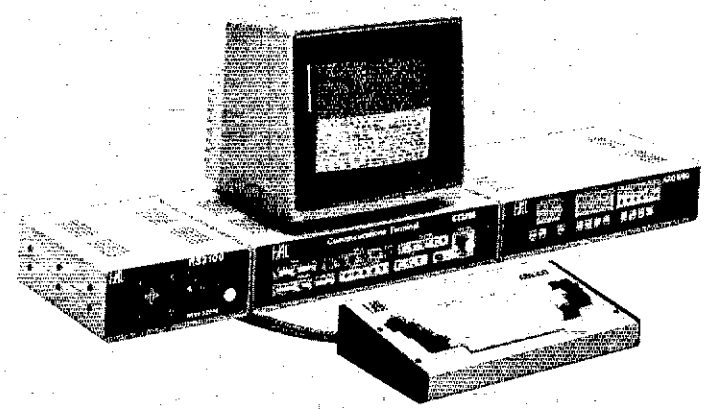
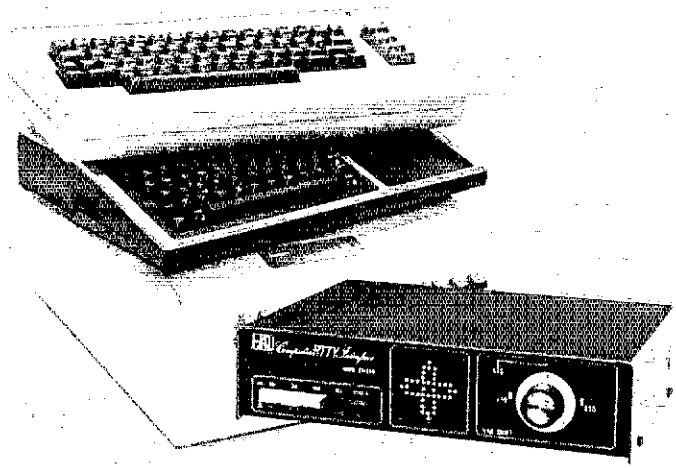
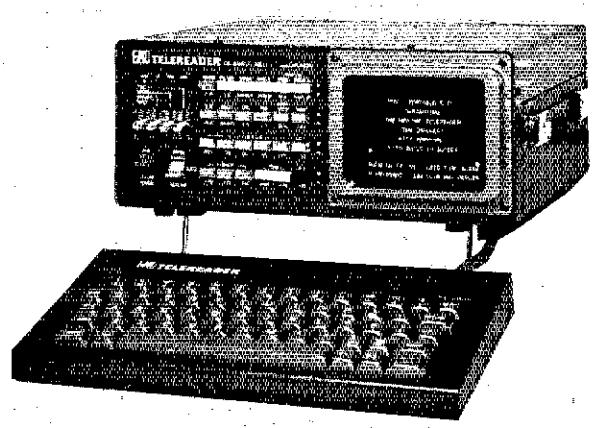
CT2200 + KB2100 + ARQ1000 + RS2100 + KG12:
The CT2200 and KB2100 give you an integrated system that includes video, RTTY demodulators (high, low, modem low, and modem high tones), and many advanced features. Operate Baudot or ASCII at 45–1200 baud and CW at 5–99 w.p.m. Add the ARQ1000 for ALL AMTOR features (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.

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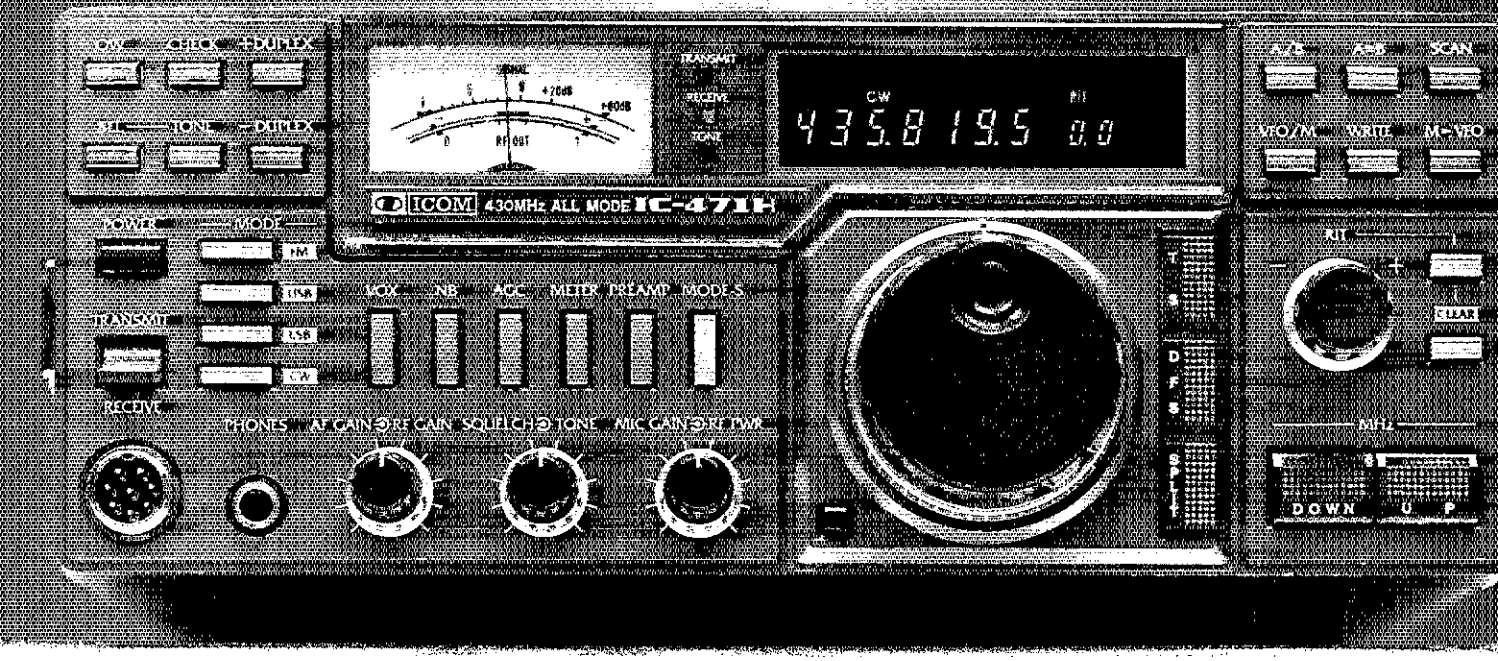
ICOM IC-471H

75 Watt 430-450MHz Base



ICOM presents the IC-471H 430-450MHz base station transceiver with a 75-watt transmitter and high dynamic range, low noise receiver. With FM, CW or SSB modes plus the most advanced 10Hz PLL system, the IC-471H has features which give you maximum UHF operation.

75 Watts. With 75 watts of power, the IC-471H provides the power required for simplex or repeater operation. Power is adjustable in all modes from 10 to 75 watts. This enables adjusting the drive level to a linear amplifier for higher power uses such as moonbounce.

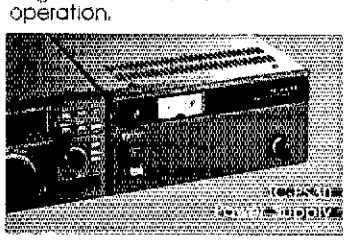
Receiver. An extremely low-noise, professional-grade receiver and a high signal-to-noise ratio PLL which allows the IC-471's synthesizer to lock to 10Hz, provide receiver performance unparalleled by other UHF receivers. A mast-mounted preamp is switchable from the front panel and provides an easy-to-use option for weak signal work.

Mast-Mounted Preamplifier

32 Full-Function Memories. Each tunable memory holds frequency, offset, offset direction, mode and subaudible tone. Each parameter is selected by rotating the main tuning knob in conjunction with the other controls on the front panel.

Subaudible Tones. Included as a standard feature are 32 built-in subaudible tones which are easily selected by rotating the main tuning knob. PL tones may be stored into memory.

Size. Only 11¼ inches wide by 4⅜ inches high, the IC-471H is engineered for ease of operation.

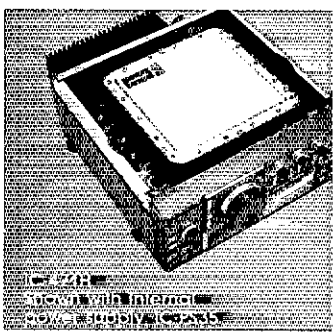


Scanning. The IC-471H can scan its 32 memories sequentially or selectively by mode and by programmed sections of the band. Mode-S scan can be used to scan only memories with a particular mode.

Fluorescent Display. ICOM's high-visibility and easy-to-read display gives all the information necessary for logging a contact. Frequency, mode, duplex, offset direction, RIT frequency, memory channel number and PL tone can be displayed.

Other Standard Features. To facilitate the operation of the IC-471H, ICOM has incorporated a duplex check switch, all-mode squelch, receive audio tone control, S-meter, center meter, seven-year lithium battery memory backup, accessory connector and microphone.

Optional Features. IC-471H options are: AG-25 switchable mast-mounted preamplifier, UT-15 CTCSS encoder/decoder, CT-10 computer interface and EX-310 voice synthesizer. A variety of optional power supplies are available: the IC-PS30 base station supply, IC-PS15, and the internal IC-PS35.



The IC-471A. The 25-watt IC-471A is also available and has the same outstanding features as the IC-471H, plus an optional IC-PS25 internal power supply for portable operation.

Also available to complete your VHF/UHF base station, are its 2-meter companions, the 100-watt IC-271H and 25-watt IC-271A.

See the IC-471H and other ICOM equipment at your local authorized ICOM dealer.

ICOM

The World System

ICOM America, Inc., 2112-116th Ave NE, Bellevue, WA 98004 / 3331 Towerwood Drive, Suite 307, Dallas, TX 75234

August 1984 *Volume LXVIII Number 8*

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CONTENTS

OUR COVER
Both British amateur satellites, UoSAT-OSCAR 9 and U-O 11, are now healthy. Learn how you can copy U-O 9 telemetry by reading the article beginning on page 23. *(photo of G6BTU, G6APF and G3YJO, left to right, by W9KDR)*

TECHNICAL

BEGINNER'S BENCH

NEWS AND FEATURES

OPERATING

DEPARTMENTS

AEA Announces:

MBA-TOR™

A User-Friendly Software Package Designed For Easy Operation of Morse, Baudot, ASCII, and AMTOR. A Feature-Packed Program

Now Available for the Commodore 64 Computer in Two Versions.
MBA-TOR 64 Software Package Only, at $119.95 Suggested Retail.
MAP-64/2 Software with Self-Contained Interface $239.95 Retail.

MAIN MENU SCREEN

```
                                hh:mm:ss
MBA-TOR™
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SELECT:
 M. MORSE
 A. ASCII
 R. RTTY
 T. AMTOR
 U. AUTO AMTOR
 X. AUTO CALL
 C. COMMANDS
 O. OPTIONS
```

Just Look At Some Of The Features:

- CW receive and transmit at 5 to 99 wpm, auto speed track on receive.
- 7 bit ASCII, receive and transmit at 110, 150 or 300 bauds.
- 5 bit Baudot, receive and transmit at 60, 67, 75, 100 or 132 wpm.
- TOR, receive and transmit ARQ (Mode A) or FEC (Mode B) and listen.
- Beacon and WRU system, includes QRG check before XMT, won't QRM.
- Message forwarding system, AUTO-AMTOR still functions in this mode.
- Selects command menu.
- Selects options menu.

+ Complete precompose split-screen display with status information.
+ Complete printer control including SELCALL/WRU printer control.

OPTIONS MENU SCREEN

```
                                hh:mm:ss
 I. CALLSIGN              ??????
 S. SELCALL                ????
 T. ARQ TIMEOUT              30
 U. USOS                     ON
 M. MORSE FILL (BT)         OFF
 R. RTTY SYNC (NUL)         OFF
 A. AUDIO FEEDBACK          OFF
 C. AUTO CR                  ON
 L. AUTO LF                  ON
 B. BEACON RECORD           OFF
 W. WRAP-AROUND              ON
 K. CW BREAK-IN             OFF
 O. OUTPUT MODE            WORD
```

- 24-hour clock, shows time in hours, minutes and seconds.
- Allows entry of your callsign for auto operations.
- Derived from your callsign automatically, can be changed.
- Sets ARQ phasing calls from 1 to 99 seconds.
- Unshift on space, toggles on or off.
- Transmits Morse idle character during breaks in KBD activity.
- Transmits RTTY idle character during breaks in KBD activity.
- Produces click in monitor audio when any key is pressed.
- Sends carriage return the first space after 65 characters.
- Sends a line feed after each carriage return.
- Allows the beacon to be recorded to the QSO buffer for logging.
- Sends CR/LF if there is a space in the last 5 positions on the line.
- Automatic transmit/receive switching during QSO.
- Transmit in word mode (text sent on space) or character mode.

COMMAND MENU SCREEN

```
                                hh:mm:ss

 L. LOAD
 E. EDIT
 M. MOVE
 S. SAVE
 X. SET XMT BUFFER SIZE
 C. SET COLOR
 T. SET TIME
```

+ Break-in buffer on all modes, toggle QSO buffer on or off.
+ CW speed lock and Farnsworth low-speed CW.
+ 10 soft-partitioned™ message buffers plus direct from disk or tape.

- Allows loading of message or QSO buffers from disk or cassette.
- Word processor type edit functions on message and QSO buffers.
- Allows transmission of QSO buffer without disk or cassette systems.
- Allows you to save message and QSO buffers to disk or cassette.
- Set the transmit pre-type buffer to any size you like.
- Choose among any of 16 colors for character, screen or border.
- Lets you set the time of day clock.

+ Insert QSO station's call into any buffer while still copying.
+ Includes a complete manual, keyboard overlays and cables for the AEA Computer Patch™ or Micropatch™ Interface.
+ For more information call AEA, or see your AEA Dealer.

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"I used your new A4 during the 1981 Phone ARRL DX contest. It was dynamite!! In 24 hours I had worked 99 countries. After 48 hours my total was 125. The A74 add-on kit allowed me to work 28 countries on 40 meters alone. It added new versatility to my 40 meter activity. By the end of 48 hours I had worked almost 1500 contacts with 285 multipliers. Thank you for making my operating more fun." ART HAMBLETON, K1LL.

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Pocket-size performers!

TH-21AT/41AT

Kenwood's advanced electronic technology brings you a new standard in pocket/handheld transceivers! The TH-21AT/41AT features a high impact molded case and is designed to deliver convenient, reliable performance in a package so small, it will slip into your shirt pocket! It measures only 57 (2.24) W x 120 (4.72) H x 28 (1.1) D mm (inch) and only weighs 260 g (0.57 lb) with batteries. In typical Kenwood fashion these transceivers provide superior transmit and receive performance.

Both the 2 meter and 70 cm versions deliver one watt R.F. output on HI power and 150 mW low, for really extended battery life! Functional design includes three digit thumb wheel switch for easy frequency selection along with a built-in 5 kHz UP-Shift switch and repeater offset switch. (±600 kHz for simplex, 2m version and ±5 MHz for simplex 70 cm version)

Both the 2 meter and 70 cm pocket/handheld transceivers are available in standard or 16-key autopatch DTMF encoder versions. Kenwood thread-loc antenna connector is also provided.

See your authorized Kenwood dealer and take home a pocket full of 2 m or 70 cm performance today!

Optional accessories:

- HMC-1 headset with VOX
- SMC-30 speaker microphone
- PB-21 Ni-Cd 180 mAH battery
- DC-21 DC power supply
- BT-2 battery case
- EB-2 external C manganese/alkaline battery case
- SC-8 soft case for TH-21A/41A
- SC-8T soft case for TH-21AT/41AT
- TU-6 programmable sub-tone unit
- AJ-3 thread-loc to BNC female adapter

More information available from authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, CA 90220.

TH-21A/41A

Standard versions.

TH-21AT/41AT Subject to FCC approval. Specifications and prices are subject to change without notice or obligation.

KENWOOD

the excellence in amateur radio

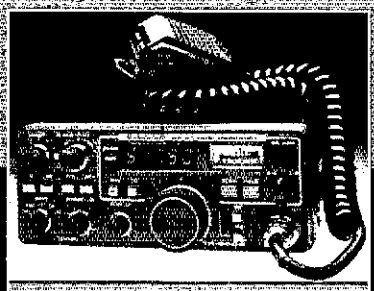
TR-9130

TR-9130 2 meter all mode

The TR-9130 is a compact rig that gives you 25 watts of RF power on all modes!! You can select your tuning steps from 100-Hz, 1-kHz, 5-kHz or 10-kHz. With six memories, you can program your favorite frequencies! (FM 1-5 Simplex or ±600-kHz offset, memory 6 non-standard offset, all six for simplex any mode!) Dual digital VFO's, and transmit frequency tuning enhance OSCAR operations. Internal battery back-up (5 V Ni-Cd not Kenwood supplied) retains memories for approximately 24 hours, in case you operate mobile and base! Other convenient features such as automatic band scan, squelch circuit for FM/SSB/CW, tone switch, repeater reverse switch, CW semi break-in, sidetone, high performance noise blanker Hi (26) Low (5) power switch (FM/CW) RF gain control, and RIT circuit further enhance this expressive package!

Optional accessories:

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



TR-9500

70 CM SSB/CW/FM transceiver

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

TS-780

TS-780 all mode "Dual Bander..."

The TS-780, all mode "Dual Bander" covers both 2 meters (144.000-148.000 MHz) and the middle 70 cm band (430.000-440.000). Its UP/DOWN band switch is fast and convenient. The TS-780's dual digital VFO's allow for split frequency, cross band operation. It also has normal/tight drag switch. VFO steps in 20-Hz, 200-Hz, 5-kHz or 12.5-kHz, plus "FM CH" channelized tuning.

This Rig has ten memories that include band and frequency data, and memories 8 and 10 are for priority instant recall. Scan the band in 0.5, 1, 3, 5, and 10 MHz bandwidths. Memory scan allows you to scan all memories or 2 m or 70 cm only!

Add to these features, others such as IF shift, wide dynamic range, VOX and semi break-in CW, noise blanker (SSB/CW) high sensitivity and you have yourself quite a rig!

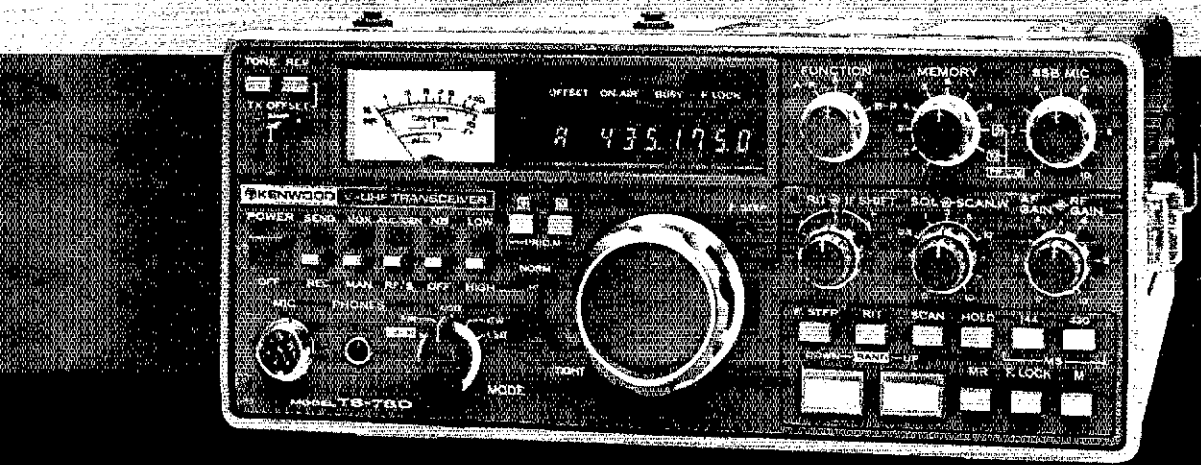
Kenwood's TS-780, an all mode "Dual Bander" for the discriminating Amateur!

TS-780 optional accessories:

- TU-4C programmable two-frequency CTCSS encoder
- MC-43S 500 Ω UP/DOWN hand microphone
- MC-46 16 key Autopatch UP/DOWN microphone
- MC-60A deluxe desk top microphone.
- MC-80 desk top UP/DOWN microphone.
- SW-100B SWR/power meter.

More information on the TR-9130 and TS-780 is available from authorized dealers of Trio-Kenwood Communications 1111 West Walnut Street, Compton, CA 90220.

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



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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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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)
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Wisconsin — Richard R. Regent, K9GDF, 5003 South 26 St., Milwaukee 53221 (414-282-0312)

Dakota Division

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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 (504-837-1485)
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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Ohio — Allan L. Severson, AB8P, 1275 Ethel Ave., Lakewood 44107 (216-521-1565)

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

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 — Vern J. Wirka, WBØGQM, Rural Route, Cedar Bluffs 68015

New England Division

Connecticut — Peter Kemp, KA1KD, 5 Greenwood Ave., Bethel 06801
Eastern Massachusetts — Richard P. Beebe, K1PAD, 6 Tracy Cir., Billerica 01821 (617-667-5809)
Maine — Clevis O. Laverty, W1RWG, 17 Fair St., Norway 04268 (207-743-2353)
New Hampshire — Robert Mitchell, W1NH, RFD 4, Blueberry Hill, Raymond 03077 (603-895-3456)
Rhode Island — Gordon F. Fox, W1YNE, 13 York Dr., Coventry 02816 (401-828-6045)
Vermont — Ralph T. Stetson, III, KD1R, P.O. Box 123, Milton, VT 05468 (802-893-4856)
Western Massachusetts — R. Donald Haney, KA1T, RD 1-Box 237, Myrick La., Harvard, MA 01451 (617-772-4126)

Northwestern Division

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

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Nevada — Leonard M. Norman, W7PBV, 1310 Hazelwood St., Boulder City 89005 (801-586-9859)
Pacific — James F. Wakefield, AH6CO, 647 Kunawai La., #201, Honolulu, HI 96817 (808-524-0050)
Sacramento Valley — Ron Menet, N6AUB, P.O. Box 244, Cedar Ridge, CA 95924 (916-272-4873)
San Francisco — Robert Odell Smith, NA6T, 320 Park St-P.O. Box 1425, Fort Bragg, CA 95437 (707-964-4931)
San Joaquin Valley — Charles P. McConnell, W6DPD, 1658 W. Mesa Ave., Fresno, CA 93711 (209-431-2038)
Santa Clara Valley — Rodney J. Stafford, KB6ZV, 5155 Shadow Estates, San Jose, CA 95135 (408-274-0492)

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West Virginia — Karl S. Thompson, K8KT, 5303 Pioneer Dr., Charleston 25312 (304-776-4352)

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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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West Indies — Gregorio Nieves, KP4EW, 1390 San Bernardo St., Altamesa-San Juan, PR 00921 (809-782-4375)

Southwestern Division

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Orange — Sandra Mae Heyn, WA6WZN, 962 Cheyenne, Costa Mesa, CA 92626 (714-549-8516)
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Oklahoma — Raymond L. Miller, W5REC, 1817 E. Ash, Enid, OK 73701 (405-233-2777)
Southern Texas — Arthur R. Ross, W5KR, 132 Sally La., Brownsville 78521 (512-831-4458)

THE AMERICAN RADIO RELAY LEAGUE, INC.

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

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

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

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

All membership inquiries and general correspondence should be addressed to the administrative headquarters at 225 Main Street, Newington, CT 06111 USA. Telephone: 203-666-1541, Telex: 643958 AMRAD NEWI. MCI MAIL (electronic mail system) ID: 215-5052 (user name: ARRL).

"It Seems to Us..."

Volunteer Examining — At Last

We're in the home stretch! As we went to press with this issue in early July, we received word that final action in FCC Docket 84-265 (the proceeding to permit recoupment of expenses by volunteer examiner coordinators, or VECs) was on the Commission's agenda for its July 13 meeting. As long as one isn't superstitious (the 13th being a Friday!), this is a good omen. There is every reason to believe the Commission will act favorably on the item: The proposed rules simply reflect the stated will of Congress, the rules were proposed by FCC itself, and no comments were filed which could have caused the Commission to change its mind. In short, while it's always dangerous to predict the outcome of government proceedings, it's difficult to see how this one can be an unpleasant surprise.

In anticipation of early FCC action on expense recoupment, on June 27 the ARRL proposal to become a Volunteer Examiner Coordinator was filed with the Commission. Thanks to the thousands of volunteers who have stepped forward to serve as examiners in the League's program, there can be no doubt in anyone's mind of our ability to shoulder this weighty responsibility in all 13 FCC-defined regions as well as overseas. Assuming that the Commission acts on our proposal expeditiously, we should be able to sign the VEC agreement the moment final action in Docket 84-265 is announced. With any luck at all, we'll be able to carry the news of the signing in a banner on the cover; if it's not there, listen to W1AW bulletins for late word.

Based on this assumption, plans have been made for the first League-coordinated examination sessions to be run at hamfests and conventions on Labor Day weekend. The timing is tight; the deadline for filing applications for the first exams is August 8, and even this requires a waiver of the Commission rule requiring 30-day advance notification. Check the "Coming Conventions" column for information on examinations at ARRL conventions; check your local Amateur Radio media for news about exam opportunities at hamfests. Examinations for all license classes through Extra Class will be available.

Things should get down to normal on November 1. On that date, League-coordinated volunteer examiners will commence giving examinations at *any* location, not just conventions and hamfests. While volunteer examiners will not be required to travel outside their own communities to discharge their responsibilities, the opportunities thus provided will be far more convenient and numerous than was ever the case with Commission-supervised exams. Any community with three Extra Class amateurs will be a potential site for all amateur examinations, several times a year.

For our dedicated volunteers, there's still some work to do before the first exams can be given. Administering examinations is not a trivial process; it takes a lot of training to do it right. A couple of weeks ago, several thousand prospective volunteer examiners were sent a 96-page "Accreditation and Resource Manual" which they have been studying ever since. Completion of a self-administered review and return of this final document to Headquarters will complete the accreditation process, though there will be opportunities for additional training as we all gain experience with the new system.

A question which is often asked, and which we can't answer, is what will happen to the volunteer examiner coordinators who stepped forward earlier in the year to coordinate exams in their own call areas. No doubt some of them will continue in operation — and there's nothing at all wrong with that, as long as all examinations for a given examination element are of uniform difficulty. Uniformity is important to success of the program; if applicants can "shop around" for an easy test, the integrity of the process will be compromised. On the other hand, the purpose of the new program is to give people a fair opportunity to *pass* exams, not just to *take* them. ARRL will put not only the *questions,* but also the *answers,* in its multiple-choice question pools into the public domain as soon as they're ready. Thus, anyone who has carefully reviewed the study material provided by any reputable publisher will be able to enter the examination room with confidence that they will be able to pass. Want to memorize the answers to 500 questions in order to pass a 50-question test? Be our guest! You won't be able to avoid learning something in the process. ARRL will be pleased to cooperate with any VEC that shares our goals of fairness and integrity, whether they choose to become a part of the League's program or to maintain a separate administrative operation.

For those of you who have been waiting to take exams, and for the volunteers who stepped forward early to help, it's been a long wait. Your patience is about to be rewarded. — *David Sumner, K1ZZ*

League Lines...

The FCC Field Operations Bureau (FOB) and the Communications Department, American Radio Relay League, Inc., have agreed to develop and implement an amateur auxiliary program with the FOB. In cooperation with ARRL, the FOB is preparing to organize a cadre of volunteers trained to independently handle many of the Amateur Radio-related requests for assistance received by FCC field facilities. Among other things, the volunteers will devise and implement means to foster wider knowledge of the rules, conduct maintenance monitoring of amateur frequencies, and undertake other specific projects identified as the need arises. We expect this new program to begin in September 1984. Individuals interested in volunteering their time may contact: John Lindholm, WIXX, at ARRL Hq. Organizations that qualify for the program may contact: W. Elliott Ours, FCC Field Operations Bureau, 1919 M St., N.W., Room 744, Washington, DC 20554. Tel. 202-632-7090. For further details, see the article beginning on page 11.

Test sessions under the ARRL's Volunteer Examiner Program should be available beginning September 1. Starting with this issue of QST, "Coming Conventions" will announce ARRL-sponsored events featuring VE-administered exams. More details on the ARRL VE program will be in the September issue.

In response to a CRRL request, the Department of Communications (DOC) is allowing Canadian amateurs taking part in the ARRL Antenna-Design Competition (March 1984 QST, p. 56) to transmit on the following frequencies: 18.073, 18.163, 24.895 and 24.985 MHz. Transmissions must be A1 or AØ emission and not exceed 250 watts. Two-way communication is not permitted and transmissions must be for antenna testing only. Canadian amateurs registered for the Antenna Competition must apply to a DOC District Field Office before operating on these frequencies. Permission to use the four frequencies will expire on November 1.

The ARRL is now accessible via computer! MCI Mail users can leave messages to ARRL for $1. ARRL's ID is: 215-5052 (user name: ARRL). CompuServ users can now take a look at The ARRL Letter on the HamNet database.

Because of the great interest in the ARRL Scholarship Honoring Senator Barry Goldwater, K7UGA, ARRL Foundation President Robert York Chapman, W1QV, has extended the deadline for charter contributions to September 1, 1984. The names and callsigns of all charter contributors will be inscribed in a handsome commemorative book to be presented to the Senator later this year. See "Happenings" for details on how to make your donation.

U.S. Attorney for the Northern District of California, Joseph P. Russoniello, filed a complaint to recover a $2000 fine and asked for a court order to stop further unlicensed amateur operation by Gary W. Kerr, ex-WA6JIY, of Los Gatos, California. On July 3, FCC issued a Public Notice saying that this action follows numerous attempts by the San Francisco FCC office to collect the fine levied on April 13, 1983. Kerr was fined and his license renewal denied because of his deliberate interference to 2-meter repeaters in the San Francisco area. The Commission says this action is unusual in a service that has for years prided itself as being self-regulatory. "However, present problems with 2-meter repeater operators have given the Commission serious concerns for the future of Amateur Radio requiring firm enforcement action to halt the degenerative trend."

Effective January 1, 1985, Amateur Radio exams administered by the Commission's Field Offices will be discontinued. The Commission will continue to offer ham exams through the remainder of calendar year 1984.

Richard Palm, K1CE, has been named Acting Manager of the Membership Services Department, filling the vacancy created by the departure of Hal Steinman, K1ET. Hal leaves the post after 10 years of fine service to the League.

The Membership Services Department is looking for a licensed radio amateur for the position of Membership Services Assistant. The successful candidate for this generalist (non-technical) position will have good writing and oral skills, an ability to work effectively with other people, and a desire to work for the interests of Amateur Radio. College degree a plus. Contact Richard Palm, K1CE, at ARRL Hq. for further details.

An apparent new 1296-MHz record was established at 0035 UTC June 24 when N6CA worked KH6HME over a 2472-mile path. Details next month.

The Amateur Auxiliary for Volunteer Monitoring

The ARRL and the FCC's Field Operations Bureau have jointly organized the Amateur Auxiliary, thus maintaining over a half century of amateur self-regulation and insuring for its future.

By John F. Lindholm,* W1XX, and Robert J. Halprin,** K1XA

Originally conceived in 1926, the ARRL Official Observer (OO) program was created as a means of amateurs helping each other keep out of "trouble." One of the first published references to the OO corps appeared in September 1934 *QST*, in which the following objective was stated: "to help brother amateurs by calling attention to violations of good practice ... in the right way ... in bettering operating ... and ham enjoyment." It is this spirit of cooperation, typified in The Amateur's Code (The Amateur is Considerate ... He never knowingly uses the air in such a way as to lessen the pleasure of others), that has endured over the many years of the existence of the OO program. It's the same spirit of assistance to our brother and sister amateurs that must prevail in the further evolution of volunteer monitoring to meet the challenge of the '80s and the decades beyond.

Among the significant aspects of Public Law 97-259 (known as the Communications Amendments Act of 1982 before being signed into law in September 1982) is the one that authorizes the Federal Communications Commission (FCC) to formally enlist the use of amateur volunteers in monitoring the airwaves for rules discrepancies/violations (the same legislation paved the way for the new Volunteer Examiner program). This FCC/amateur cooperation is a crucial factor in maintaining the traditional high standards of conduct on the amateur bands.

The rationale for the enhanced amateur self-regulation posture was aptly addressed by the House-Senate Conference Committee, when P.L. 97-259 was being reconciled between the two legislative bodies:

> The Amateur Radio Service has been praised for being self-regulated. The Commission has reported that less time has been devoted to monitoring and regulating the Amateur Service than to any other service because of its self-policing and discipline. One primary purpose [of the law] is to allow the Amateur Radio Service to continue its tradition as the most self-regulated service in the United States, and to become to some extent self-administered ...

The new law is a milestone in the history of the Amateur Radio Service, a catalyst for a modernized, dynamic service, enabling amateurs to play a much more integral role in their (our) own destiny. With respect to volunteer monitoring, P.L. 97-259 *exempts* Amateur Radio transmissions from the "secrecy of communications" provisions of Section 605 of the Communications Act, clearing the way for a more active role on the part of amateurs in monitoring functions.

The Amateur Auxiliary

As a preface to the implementation of volunteer monitoring, FCC's Field Operations Bureau (FOB) fully recognized the value of the organized and disciplined Amateur Radio community, through its membership organization, ARRL. FOB is also cognizant of the long history and tradition of the League's OO program and the ARRL Field Organization structure, specifically indicating that the volunteer-monitoring program should be compatible with the amateur organizational structure and avail itself of that structure.

To achieve this, FOB is creating an Amateur Auxiliary (parallels in government can be found in the Civil Air Patrol and the Coast Guard Auxiliary). FOB and ARRL have entered into a formal agreement whereby the objectives and nature of the program are clearly delineated, with the League committed to administering the program. In essence, the Amateur Auxiliary/OO program will be administered by the League's Section Managers and OO/RFI Coordinators, with support from ARRL Hq.

In meeting its broad objectives, the Amateur Auxiliary will address both maintenance monitoring and amateur-to-amateur interference (the latter is sometimes misnamed malicious interference). Maintenance monitoring will be conducted through an enhanced OO program. Amateur-to-amateur interference includes inadvertent and careless interference as well as more serious harassment and malicious interference, which might be encountered on VHF repeaters. Such repeater problems will be within the purview of the Local Interference Committee, authorized by the ARRL Section Manager to enter into a local agreement with the local FCC engineer-in-charge or field supervisor. Logically, this is in harmony with a basic tenet of the Amateur Auxiliary that problems must be resolved

*Communications Manager, ARRL
**Deputy Communications Manager, ARRL

at the most-local level possible.

It must be emphasized that the Amateur Auxiliary serves as a forum for technical and operational advice to amateurs *who are receptive.* The task is not to find fault, but to identify cause and effect (often which is *not* based on technical but on behavioral or social issues) and to find ways to achieve solutions. It cannot be stated strongly enough that the mission of the Amateur Auxiliary is *not* direct enforcement. In fact, the law specifically *excludes* amateurs from enforcement activities. However, this does not preclude participation in disciplined evidence gathering at the direction of FCC. Indeed, the Auxiliary will be tasked and trained to do just that in those very few compelling cases that demand FCC attention.

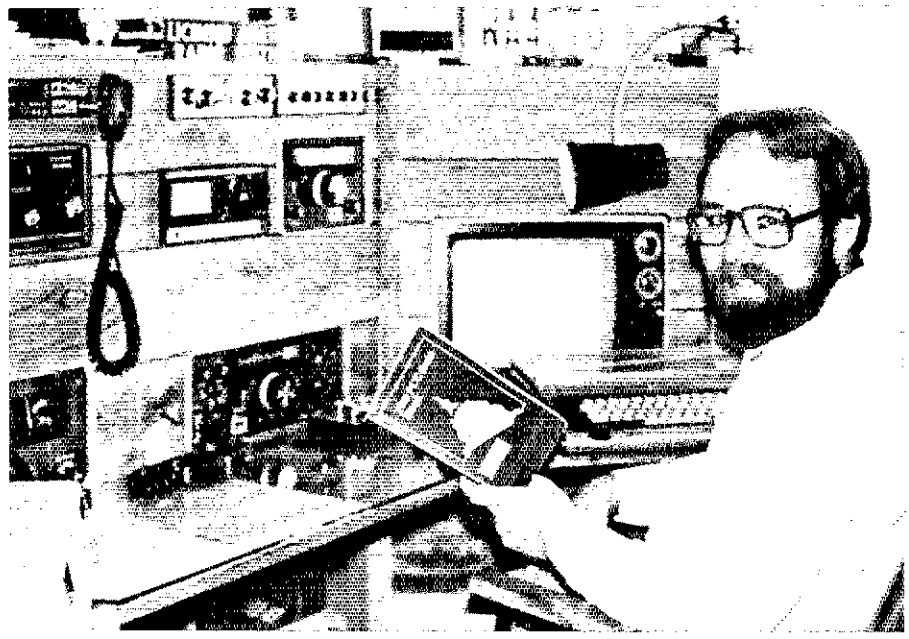
A Multi-Level Approach

The Amateur Auxiliary structure consists of several levels to address operational problems of varying complexity. The vast majority of the activity will engender from OOs utilizing the friendly advisory report to advise of discrepancies. To further project the helping philosophy of the OO program, "Good Guy" reports will also be sent by OOs to those amateurs who exemplify the best in operating and technical on-the-air achievement. Likewise, Local Interference Committees will appropriately address repeater interference, whatever the nature. An OO/RFI Coordinator is delegated by the Section Manager to supervise Amateur Auxiliary activities in each ARRL Section.

There will be situations needing a higher level of expertise to bring about the proper resolution. Rather than immediately look to the overburdened FCC for "solutions," a second tier of the Amateur Auxiliary is reserved for more serious cases. This is where a new appointment, the Regional Monitoring Station (RMS), comes in. The RMS will cover a substantial geographical area, equivalent in scope to an FCC monitoring station. The potential RMS must have impeccable credentials to be considered for this appointment (which will be made by the ARRL President). It is anticipated that the number of qualified RMSs will be limited; only a small number of dedicated amateurs will have the time, maturity, experience and technical wherewithal to qualify for this important, specialized function. Inquiries regarding the RMS appointment should be directed to the Communications Manager at ARRL Hq.

The RMS will work closely with FCC personnel, where appropriate, in those cases requiring action beyond routine OO maintenance monitoring. The RMS will utilize a more compelling advisory notice, but again the thrust will be to bring about voluntary resolution by the individual(s) in potential violation. The RMS will also be a source of assistance to Local Interference Committees coping with difficult cases of true malicious interference. In some instances, the RMS may be manned by a dedicated group of highly qualified amateurs to provide more continuous coverage. In such an arrangement, a "chief" at the RMS facility will be designated.

The "court of last resort" is, of course, the FCC. In keeping with the intent of amateurs solving amateur problems (i.e., self-help), the FCC will be called in only by authorized individuals and then only after all avenues have been exhausted. In short, for volunteer monitoring to be effective, the amateur response through the Auxiliary must be capable of addressing the vast majority of discrepancies within the context of internal procedures. In this way, the FCC will be called upon for assistance only in matters of extreme seriousness, worthy of prosecution, if necessary. Only a well-defined administration of the Amateur Auxiliary can assure success — we must make the volunteer-monitoring program work for us *first* before the desired response from FCC can be obtained.



The League's traditional leadership role in maintaining high standards of on-the-air decorum continues through dedicated volunteers such as Luck Hurder, WA4STO, ARRL OO/RFI Coordinator for Eastern Massachusetts. Luck's state-of-the-art listening (and operating) post is equipped for all bands and modes, including computer-generated RTTY.

Amateur Auxiliary Objectives

1) Foster a wider knowledge of and better compliance with laws, rules and regulations governing the Amateur Radio Service;

2) Extend the concepts of self-regulation and self-administration of the Service;

3) Enhance the opportunity for individual amateurs to contribute to the public welfare as outlined in the basis and purpose (Part 97.1) for the Amateur Radio Service;

4) Enable the FCC Field Operations Bureau to more efficiently and effectively utilize its manpower and resources.

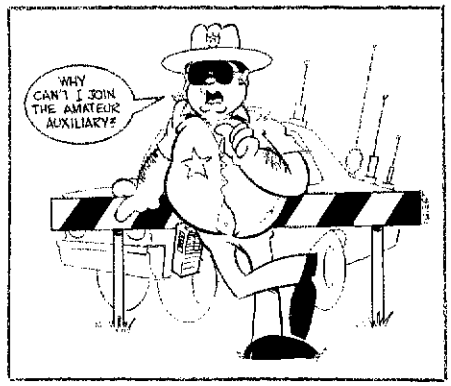
Training and Certification

Amateur Auxiliary members must be properly trained to carry out their important role. The FCC believes such training is absolutely necessary. Potential Amateur Auxiliary members must not only be schooled in the rules and regulations, display technical competence and possess certain monitoring gear, but must be psychologically equipped to exercise the tact and discipline that the program requires. It takes a special kind of dedication to pass up working the DXpedition to rare Catalina Island to go look instead for Novice second harmonics. The potential Amateur Auxiliary member must also be well-versed in the administrative details of the program, particularly knowing whom to call in the chain of command for higher-level assistance. Certification of Amateur Auxiliary members will require the successful completion of a written examination, based on the Amateur Auxiliary *Training Guide* (which will be distributed to all candidates). The training/certification process must be preceded by a recommendation from the candidate's Section Manager and/or OO/RFI Coordinator.

Expectations

The Amateur Auxiliary has the potential for making the ham bands a better place

for all to operate. The biggest obstacle to achieving "Ham Heaven" is unreasonable expectations. That is, the perception that Amateur Auxiliary personnel will be modeled after Boss Hogg or Sheriff Buford T. Justice or on the opposite extreme, Mary Poppins or other goody-two-shoes. None of these personality types possess a club or even a magic umbrella that can cure all of the on-the-air evils. The program must not have the slightest hint of enforcement; there must be a fundamental realization that this program will not be able to eliminate all of the woes of the amateur world. Such problems are often deeply rooted in the psychological inadequacies of our society as a whole. But the Amateur Auxiliary does provide the organized mechanism for addressing most matters pertaining to operating decorum.



Is It You?

Membership in the Amateur Auxiliary should prove to be extremely satisfying and fulfilling, but you must have what it takes to be of service to your fellow amateurs. Maturity, sophistication, competency — these qualities are needed. Don't look for rewards per se, because your efforts will largely go unheralded. Moreover, you will *not* be authorized to dispense anything akin to Mr. T's brand of frontier justice by "knocking heads." The Amateur Auxiliary is based primarily on friendly persuasion and cooperation, values that allow amateur problems to be reasonably resolved within the amateur community in accordance with commonly accepted standards. This good-faith approach, a positive feature of the federal deregulatory environment, should prove effective and beneficial to all concerned. With this affirmative philosophy in mind, if the Amateur Auxiliary/OO program is right for you, go for it!

The foundation of this enhanced program of volunteer monitoring is the dedicated group of ARRL OOs. If you are already an appointed OO, you will be receiving a special mailing containing training materials to give you an opportunity to validate your appointment within the new framework. We also enthusiastically extend an invitation to qualified amateurs not presently OOs to step forward and volunteer. Your first point of contact is your ARRL Section Manager (see page 8 of *QST*).

A final note: According to *QST* archives, pioneer OOs stalked what was termed "prehistoric signals," reportedly a.c., broad r.a.c., chopper, etc. (June 1932 *QST*). There probably aren't many modern Amateur Radio equivalents to these relics of the past, but the basic objective, now and then, is the same: calling attention to discrepancies (whatever they might be) in the spirit of fellowship and friendship, and achieving creative solutions for the overall betterment and enjoyment of Amateur Radio. QST

Strays

A HOBBY SHARED

☐ Most of my married life has been involved with Ken's ham radio. WØMFR became a second name in no time. Little did I realize what this hobby would become when I first reviewed questions with him in preparation for his test, and the great pleasure he had in passing. He continued to be so pleased when he passed the test to be Extra a few years ago. I watched him plan teaching modules for classes in our area. How good he felt when his students passed and received call letters or advanced another level.

Ken *loved* ham radio and what it represented: a hobby with expectations for performance and knowledge. And it enlarged one's world with letters and meeting other hams while traveling. His radio "family" was large and a very special privilege in our life. As a wife, I encouraged his hobby and so enjoyed the friendships and excitement hearing from these friends we never met but knew so well.

When he retired in 1976 and we moved to our lake home, Ken could use all the varied bands and was free to explore at all hours the activity on the radio. He was far from lonesome.

But as his widow, I miss the *sound* of his hobby and the stimulation of an active ham schedule. Silent Key is truly descriptive. Code rhythm had a musical sound, and good code was almost a kind of musical symphony. A visit to a recent Field Day here made me aware of the beauty of the sounds I had heard for so many years.

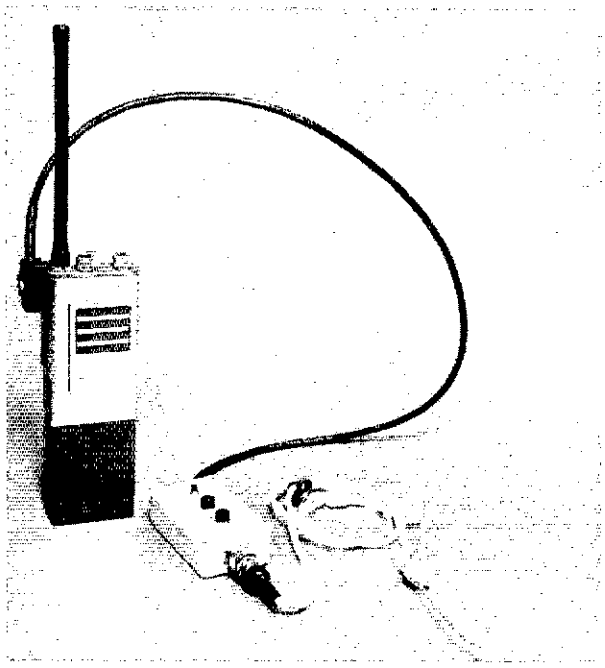
The mailman misses Ken, for WØMFR had the best mail on his route. Foreign stamps on beautiful QSL cards were fun to deliver.

Ken was so excited about others becoming part of his best hobby. He respected the organization, and it enriched our lives so much. Several foreign hams had not heard he had died, and I have received lovely cards and letters that must be answered. They were his friends.

I guess you could call this a tribute to a very fine activity that we enjoyed so much. I couldn't consider it finished until I said it. — *Emma Dahlmeier, XYL of WØMFR*

Shortly after becoming a Novice himself, at age 65, Mike Shepnew, KA2UGR (center), of Scotch Plains, New Jersey, decided to share his new hobby with this group of advanced-achievement students at Woodruff School in Berkeley Heights. One of their projects, quite appropriately, was a code-practice oscillator.

2AGQ (now W2AGQ) and 2AHK (now AE4X) congratulate each other on the 60th anniversary of their first QSO in 1924, which was also 2AHK's first QSO ever.



Amateur Radio's Hand-Held in Space

By Thomas McMullen, W1SL*; Jim Worsham, WA4KXY**; and Harold Sanderson, WB4TTA***

The 2-meter operation by Owen Garriott, W5LFL, on-board the space shuttle *Columbia* is now history. Many lucky amateurs made two-way contact with Dr. Garriott, and untold thousands listened to his signal from space. Having been in assorted hamshacks when contact was established, we can attest to the joyful bedlam that followed confirmation of contact. If such scenes were common in those stations that heard their call returned from space, there must have been a lot of extremely happy hams around the world!

Early phases of the program to put an Amateur Radio transceiver aboard *Columbia* have been documented in earlier *QST* articles, and need not be repeated here.[1] The effort to build the radio to be used on this flight was thoroughly enjoyed by all the members of the Motorola Amateur Radio Club of Fort Lauderdale who participated. Our task was to provide a hand-held 2-meter radio that could be connected to the standard NASA headset, which includes earphones and a microphone. The Project Manager was Jim Worsham, WA4KXY; Ron Alexander, KA4ZLS, served as NASA liaison for testing and qualification of the radio and battery for safety standards; Harold Sanderson, WB4TTA, assembled the radio, gave it a most exacting final test, and coordinated the frequency programming with NASA and W5LFL; John Ray, WB4BFS, designed and assembled the interface box; Bruce Burke, WB4YUC, provided test equipment and fixtures; and Tom McMullen, W1SL, provided documentation and circuit-board layout.

[1]Notes appear on page 17.

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The Radio

The portable radio used by W5LFL on the *Columbia* is basically a standard Motorola MX300-S series, frequency-synthesized Handie-Talkie radio.[2] These radios are used by many law-enforcement officers, public-safety agencies, fire departments and commercial interests throughout the world.

The radio is microprocessor controlled, and of modular construction. It is capable of generating up to 96 separate frequencies (48 transmit and 48 receive) by reading control information encoded in a PROM (programmable, read-only memory). Frequencies are selected by means of switches on top of the radio. A "zone" switch selects one of four "zones," or groups of frequencies, and a frequency-select switch picks one of 12 frequencies for each zone.

Each major circuit is contained in a sealed module for ruggedness and protection against most environmental problems, and these modules plug into a four-layer circuit board that is held in place by rails in the Lexan frame. Controls and battery power are connected to the main circuit board by means of "flexes" that consist of metal conductors bonded between layers of tough, flexible plastic. This type of construction allows easy troubleshooting and servicing. A block diagram of the major circuits in the MX300-S is shown in Fig. 1. Fig. 2 shows an interior view.

The synthesizer reference frequency is provided by the 3.6-MHz crystal-controlled oscillator (reference oscillator, U10). Programmable frequency dividers in the controller/phase-detector assembly, A2, are controlled by the microprocessor, U11. The microprocessor obtains the transmit- and receive-frequency information from the PROM.

The controller provides voltage to the VCO, U14. In turn, it supplies an RF sample to the controller for frequency division and comparison with the product of the reference oscillator.

In the transmit mode, the VCO output is applied to a transmit PLL processor (U102) that locks the transmitter VCO (U103) to the programmed frequency. This VCO operates at the output frequency. Audio modulation is applied to the synthesizer VCO, which applies it to the transmitter VCO through the phase-detector and locking circuitry. FM output from the transmitter is amplified to a 5-W output level and filtered before being routed to the antenna relay and antenna.

During receive, synthesizer VCO output is applied to a multiplier that is part of the receiver preselector assembly, where the frequency is doubled to provide receiver injection for the first mixer. Incoming signals are amplified by U1 before being applied to the RF preselector and mixer. Mixer output is at 21.4 MHz. Filtering and two stages of IF amplification follow the mixer, and the signal is then applied to a crystal discriminator. Discriminator output is routed to audio-amplifier and squelch stages. Full audio output is 500 mW. Nor-

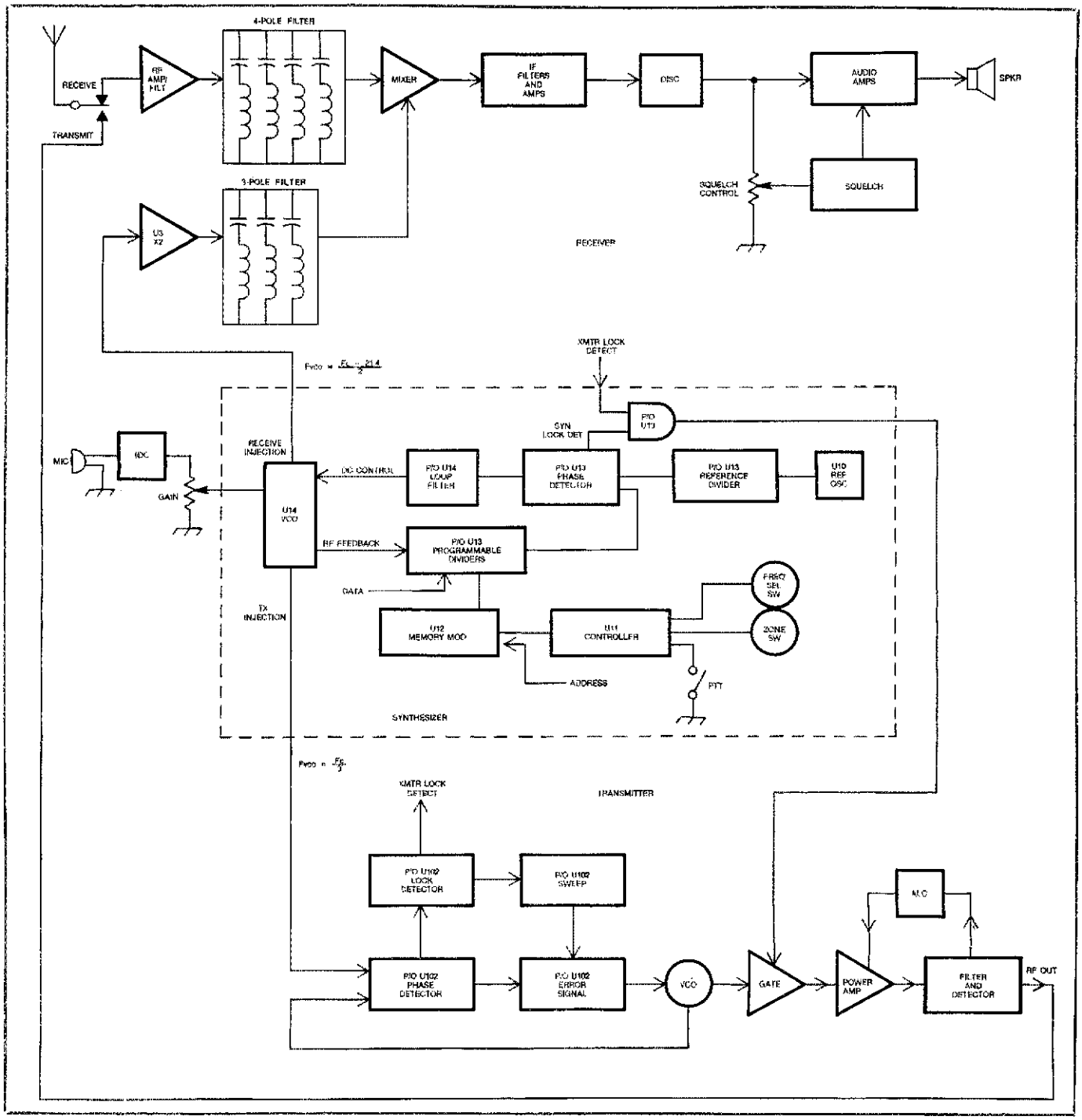

Fig. 1 — A block diagram of the Motorola MX300-S Handie-Talkie radio.

mally, a built-in speaker in the front of the case is used, but audio output is also available at an earphone jack on top of the radio and at an accessory connector on the side.

Audio for the interface box used in the *Columbia* was taken from the accessory connector. Similarly, a built-in microphone is normally used for transmitting but the NASA headset microphone was interfaced to the radio through the accessory connector. The push-to-talk (PTT) circuit and other internal circuits are also accessed through this connector. More about this in the description of the interface box.

Radio battery power is provided by a sealed, 7.5-V NiCd battery. Batteries are available in various sizes: four 2000 milliampere-hour batteries were provided to W5LFL. They proved to be quite adequate for the nine-day mission. Battery life is an important consideration, because no provisions were made to recharge them from the shuttle electrical system.

Modifications to the standard MX300-S radio were minimal: the agreed-upon frequencies were programmed into the PROM, and the transmitter power output was reduced to 4 watts to prolong battery life.

The Interface Box

Electrical and mechanical connections between the radio and the rest of the system are provided by the interface box. It matches the impedances and levels of the headset/microphone and the radio. Power for the headset microphone preamplifier comes through the interface box, and transmit and receive audio for a tape recorder are provided by the amplifier cir-

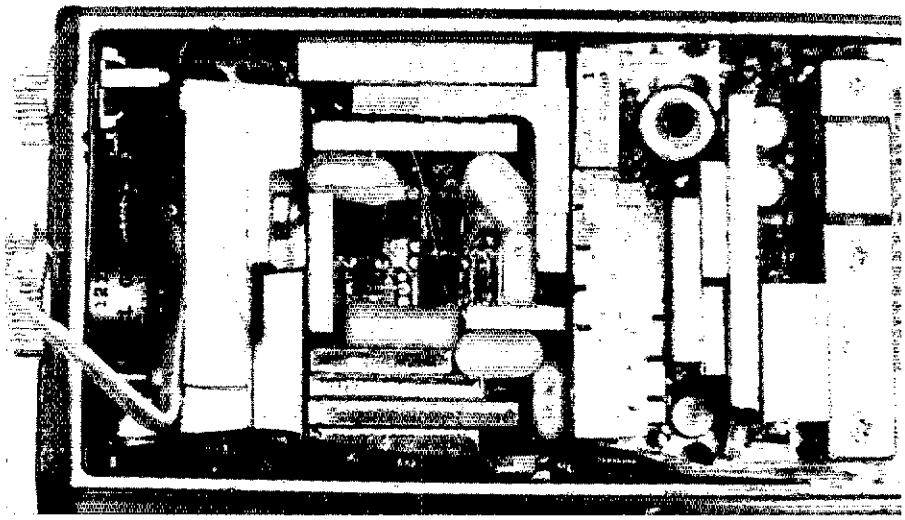

Fig. 2 — Interior view of the MX300-S Handie-Talkie radio with the front cover removed. Modules plug into a four-layer circuit board that is held in the frame by rails. *(photo by WB4YUC)*

cuitry in the box. Also, connections for the headset, tape recorder and radio are made through this interface. The title photograph shows the MX300-S radio with the interface-box cable attached to the accessory connector. Fig. 3 is a drawing of the box, connectors and cabling required. As an example of the details that had to be worked out, this drawing had to be supplied to NASA long before launch so they could provide secure storage space for the equipment!

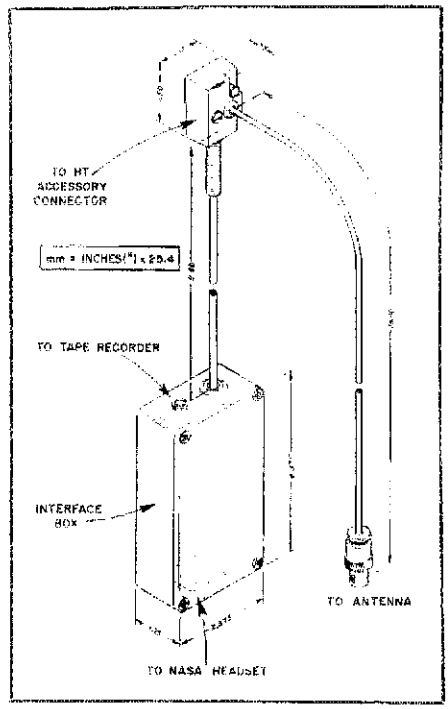

Fig. 3 — A scale drawing of the interface box and associated connectors.

Design

Three design constraints affected the mechanical and electrical configuration of the interface box. First, the total current drain had to be less than 1 mA. This is because the supply voltage from the radio, through the accessory connector, is fed through a 1-kΩ current-limiting resistor.

Second, all materials used had to be approved by NASA. This is necessary to ensure that everything has acceptable levels of resistance to flammability, toxicity and outgassing. (Outgassing is a tendency of plastics and other materials to emit gasses when heated, cooled or subjected to oxygen-rich atmospheres.) These considerations are extremely important when you cannot open the window and get some "fresh air"!

Finally, the box had to be as small as possible. A bulky, hard-to-manage system is difficult to use and reduces operator efficiency.

The Circuit

Interface-box circuitry consists of three parts: a voltage regulator, an audio amplifier and an audio mixer. The regulator handles the supply voltage from the accessory connector on the radio, removing any voltage variations caused by the 1-kΩ current-limiting resistor in the MX300-S radio. The regulated voltage is applied to the headset microphone preamplifier and to the amplifier/mixer in the interface box. One section of the op amp (U1) serves as this voltage regulator. See Fig. 4.

To minimize current drain, the audio amplifier uses the Siliconix L144CJ micropower, programmable, operational amplifier. This device works just like any other op-amp, except that you can "program" its current drain. The drawback to this is that the less current you let it have, the less bandwidth it will let you have! Since all the signals through the interface box are at audio frequencies, this bandwidth limitation is not a problem. The total interface-box current drain is approximately 0.5 mA.

Speaker audio from the MX300-S accessory connector is applied directly to the earphone. Microphone audio is amplified, and a proper impedance match is provided, before the signal is routed to the accessory connector. An audio mixer in the interface box combines receiver and microphone audio and routes it to a tape-recorder jack. The interface-box PTT switch keys the transmitter and turns off the audio amplifier in the receive mode. This prevents background noise from being applied to the recorder through the microphone circuit while the radio is in the receive mode.

To achieve a high degree of reliability, leadless (chip) components are used, as shown in Fig. 5. These chips are very small, and have low profiles. They are soldered directly to the etched circuit board. This minimizes the number of wire leads that can fail because of vibration. The box is cast aluminum with an anodized finish. Wire insulation and other plastic parts are either Teflon or nylon; the hardware is stainless steel; and the circuit board is glass-filled epoxy.

Fig. 5, a photo of the interface-box interior, shows two devices, and the title photo shows knobs labeled for VOX adjustments. Great effort was extended to design a VOX circuit in the early prototype box. This was a difficult task because of the supply current limitation from the radio. Several versions were tried, but none had the proper amount of hysteresis (the difference between turn-on and turn-off levels) for a reliable VOX circuit. At the last minute, a decision was made to forego this convenience — a decision that later proved fortunate. After the mission, W5LFL reported that the cabin background noise was so strong that he sometimes had difficulty understanding people even when their signals were full quieting into the receiver. That amount of noise would very likely have upset even our best efforts at VOX reliability.

Conclusion

Although the bulk of the work on this project was done after hours and at home on weekends, there were some things that just had to be taken care of during normal business hours — phone calls to agencies involved, equipment to be obtained for the next phase and other tasks. We sincerely acknowledge the support of our supervisors and management at Motorola in Fort Lauderdale and in Schaumburg, Illinois.

Stepping back and looking at what we've learned from this project, the results are mostly positive. The circuit is really nothing out of the ordinary: an audio amplifier and a voltage regulator. Electronically, our expertise improved because we entered the

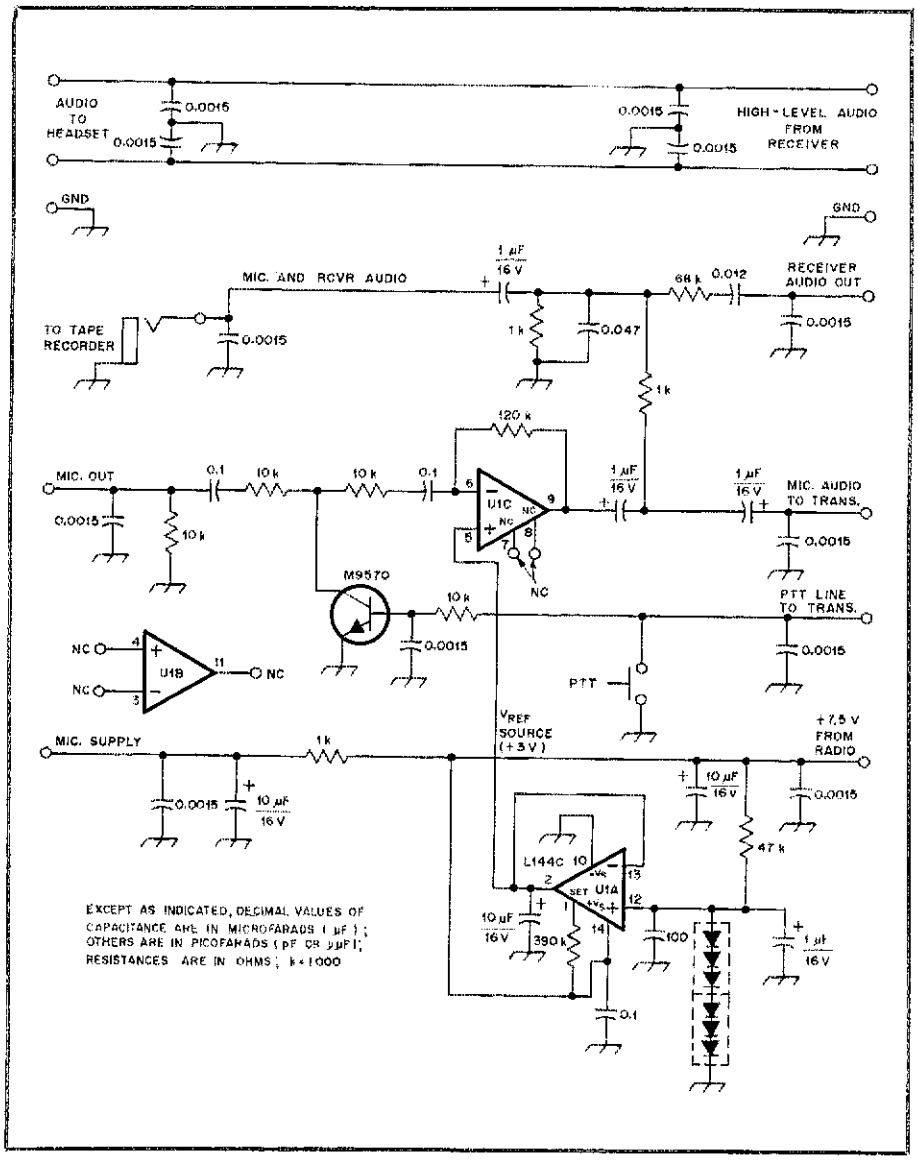

Fig. 4 — Schematic diagram of the interface circuit between the MX300-S radio and the NASA headset and tape recorder. U1 is a Siliconix L144CJ triple, micropower, programmable op-amp.

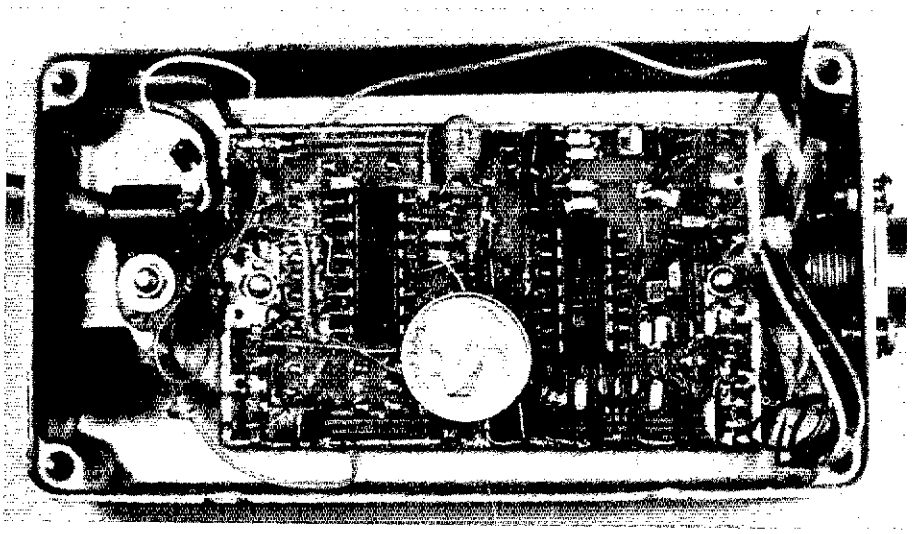

Fig. 5 — Inside the interface box. This version was built with an extra IC for a possible VOX circuit. The dime provides a comparison of size for the chip (leadless) components on the circuit board. *(photo by WB4YUC)*

new, tiny dimension of leadless components. Those things are usually placed on circuit boards by means of automatic machinery, not by shaky fingers and tweezers!

Also, working with all the great people involved in the space program was very educational and uplifting. Working to specifications and a deadline far outside what is normal in Amateur Radio provided a challenge that we're happy to have met, and would gladly do again.

Now, about that first manned mission to Mars . . .

Notes

[1]Amateur Satellite Program News, *QST*, October 1983, p. 77.

[2]Motorola, MX300-S and Handie Talkie are trademarks of Motorola, Inc.

Strays

MOVING, CHANGING CALL?

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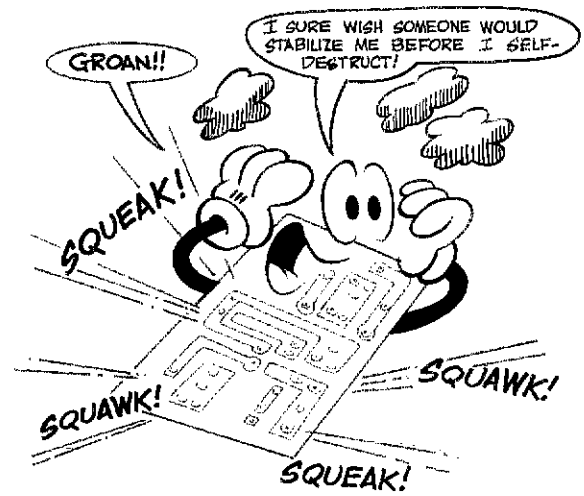
Next Month in QST

If there's one question on most of our minds right now, it's "how do I go about taking an exam?" Now that the FCC is phasing out its test sessions, you'll need to know how to find available test sessions, how to apply, what to expect at the exam site and (naturally) what to study to be able to bring home a new license. A September article will spell it all out, clearly, simply and concisely.

With the fall season nearly here, antennas once again are becoming a priority. September *QST* will provide two very different — but equally effective — designs: The full-wave loop antenna, which need not be at heights that would make the Wallendas swoon, and a ground-plane antenna for the 30-meter band that can be mounted in a tree. In addition, those not yet immersed in the subject will learn the pros and cons of wire, vertical and beam antennas in the First Steps installment.

Some Basics of VHF Design and Layout



Follow the guidelines in this article, and enjoy peak stability and performance from your homemade solid-state VHF gear.

By Doug DeMaw,* W1FB

Blown transistors, squealing signals and lumpy tuning are the common signs of a poorly designed or assembled VHF power amplifier. Have you experienced the futility of trying to make a 2-meter amplifier perform correctly? I think each of us has bitten our lips in private despair while trying to tame a problem amplifier — not once, no doubt, but many times! On the other hand, perhaps our amplifiers operated smoothly, but power output was substantially below the rated value for the circuit. Such maladies are not uncommon. Fortunately, the preventive steps are not difficult or costly. Let's discuss some of the causes for substandard performance and compile a set of notes that can be used for all VHF amplifier designs.

What Can We Expect for Efficiency?

It was a simple matter for designers of vacuum-tube circuits to obtain amplifier efficiencies of 70% for class-C amplifiers, 60% for class-B and 30 to 40% for class-AB operation. The predictable operating angles for tubes employed at their rated frequencies are well established, and those angles dictate the tube efficiency. Generally speaking, we can expect slightly lower efficiency for solid-state amplifiers, respective to the operating angle. Most manufacturers rate their power transistors at 50-55% efficiency for class-C operation, with lower percentages for class-A and class-B angles. One thief of power is heat — power transistors produce considerably more internal heat than is developed with most small vacuum tubes. Internal resistances and reactances within the transistor contribute further to poor efficiency. On the plus side, however, we have no filament power to waste when using transistors. Additional RF power is lost in transformers and other matching networks when using transistors, but in the long term our trade-off in efficiency is worth the benefits of small size, instant operation and device longevity.

Efficiency is determined by comparing the dc input power of the amplifier stage (in watts) against the RF power output of the stage. Thus, if our hypothetical amplifier required 3A of current with a collector voltage (V_{cc}) of 13, our dc input power would be 39 W (I × E). If our RF output power happened to be 19.5 W, we would observe an efficiency of 50% (19.5/39 = 0.5). This would be typical for a class-C solid-state bipolar-transistor RF amplifier of proper design. The rule does not hold for MOS power FETs. Their efficiencies approach, and in some instances exceed, those of vacuum tubes.

Harmonic Output

The industrial literature does not mention the potential problems we may encounter with harmonic output when using RF bipolar devices. Vacuum tubes generate harmonic currents by virtue of "envelope distortion." Excessive grid drive to a tube can worsen the condition. The transistor produces harmonic currents through envelope distortion, but it also generates intense harmonic energy via varactor (variable reactance capacitor) action of the internal junction. Specifically, the junction capacitance changes with the sine-wave amplitude of the driving voltage (signal). This nonlinearity of operation is tailor-made for harmonic production. Unfiltered output from the collector of a transistor amplifier will usually show the harmonics to be a mere 10-13 dB below the power level of the desired output frequency (fundamental). The FCC regulations are very specific about acceptable levels of harmonic and other spurious output energy (−60 dB for VHF amplifiers, and −40 dB for HF-band amplifiers). Although these regulations apply to commercial equipment, they are required by the ARRL for all published circuits. If we are to be conscientious amateurs, we will strive also to meet the criterion in our designs. It will help to prevent TVI, RFI and unwanted interference to other services.

Because of the strong harmonic currents in the output of a solid-state power amplifier, we must take measures that are seldom used in vacuum-tube designs. Harmonic filters are the order of the day. Don't be misled by the simple amplifier circuits you find in the manufacturers' data sheets. They are designed for use in testing a device (TUT, or "transistor under test") to determine its performance at 50 ohms of load resistance. I must confess that I have duplicated a number of these published circuits only to find that they did not work with the values given. So, beware!

A typical data-sheet test circuit is shown in Fig. 1. Most VHF amplifiers are shown in circuits for 175 MHz, but that is close enough to 145 MHz for our purposes. "King Tut" (Q1) in this example remains unidentified for our discussion. Consider it typical of the devices we might obtain for VHF work. At first glance, the circuit looks pretty good for amateur use. But, upon

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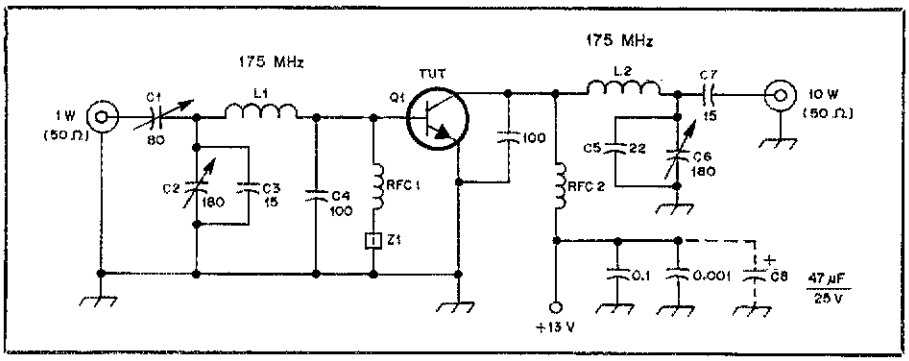


Fig. 1 — Circuit example for a typical VHF amplifier as depicted in the manufacturer's data-sheet literature. See text for a discussion about this and similar circuits.

duplicating it we may find to our dismay that it won't work at all, or if it does, it will exhibit instability, low output and copious harmonics. Remember that this is published in the literature as a *test* circuit, and is not a circuit that one should attach to an antenna.

My recent experience with a circuit of this general configuration (taken from a data sheet) was dismal. With 1 W of input drive I obtained 0.5 W of output! The output tuning network had a definite peak, but the input network had little effect on the power output. The coils (L1 and L2) were built precisely as the data sheet dictated. Careful layout was used, also.

Why did this happen? Well, it seemed a bit unusual to place 100 pF of capacitance from base to ground in a VHF amplifier (C4 of Fig. 1). I removed the "suspect" capacitor and, lo, I was able to extract 10 W of RF output! I suspect that the value listed on the diagram was in error, and should have been 10 pF. Yet, other circuit examples for VHF use — same manufacturer — had the 100-pF value listed. Other similar amplifiers showed *no* base capacitor.

Further testing proved that low-frequency instability was taking place. I added C8 (standard practice) to bypass low-frequency energy, and the self-oscillation ceased. A tendency toward VHF instability was observed while adjusting the input and output networks. I added a ferrite bead (Z1) in series with the base RF choke, and the fault vanished. Addition of Z1 lowered the Q of the choke, which degraded the tuned-base, tuned-collector condition that was present. A 100-ohm resistor in parallel with RFC1 would probably have cured the problem, too, but at a slight loss in effective driving power.

Harmonic output was fierce, as expected. A harmonic filter would need to be added to this amplifier if it were ever used on the air. I learned also that shunt capacitors C3 and C5 were not necessary. These wasted parts were removed. Apparently, they were specified to prevent C2 and C6 from being adjusted for too low a capacitance. The minimum capacitance of the two mica trimmers was high enough to avoid using fixed-value capacitors C3 and C5. Also, greater matching flexibility can be had if we replace C7 with a 30-pF trimmer capacitor.

This exercise was included to illustrate that you should not accept a published circuit as "gospel." Try it out, then manipulate the design to make it conform to your needs.

Dealing with Instability

A well-designed solid-state amplifier should show no instability (self-oscillation), regardless of the load connected to it. In other words, it should be stable even if the input and output terminals are left open. Unfortunately, many amplifiers are stable in that mode, but when made to conduct (drive applied) they go into spasms of self-oscillation. These oscillations may occur at a variety of frequencies, with some as low as the audio-frequency region. If the amplifier "takes off" too vigorously, the transistors may self-destruct from excessive heat or from junction puncture during periods of excessive voltage spikes. Therefore, we should always do our initial testing of a new circuit at reduced supply voltage. I like to commence with 5 or 6 V of V_{cc} when testing a 12- or 13-V circuit. The voltage is increased slowly while looking for instability symptoms; this way, the transistors are less likely to be damaged.

Few amateurs own or have access to a spectrum analyzer, but that would be the best instrument for testing an amplifier. A good scope with a bandwidth suitable for use at the operating frequency or higher may be a good alternative. We may "sniff" for spurious responses by means of a sensitive wavemeter when placing the wavemeter coils near the amplifier output network. The wavemeter method is the least expensive and most practical technique for amateur work.

What are the major causes of amplifier instability? Well, a lack of good grounding may head the list; that is, effective grounding of the parts on the circuit board — those that are returned to ground. This means we need to keep the leads as short as possible. We must also ensure that the ground foils on the PC board are wide and direct. Fig. 2 shows two PC-board patterns. One is good, but the other is unsuitable for VHF work. In fact, it would not be acceptable for most HF-band work. Note the long circuit-board ground foils at B of Fig. 2. These act as unwanted inductances, which can completely spoil the circuit performance — especially at VHF and higher. Remember, small excessive lead lengths present reactances that are in series with the components. In some cases we have inductive reactances in series with inductors, and in other cases we have capacitors in series with inductive reactances. This unwanted condition can render our matching networks unsuitable for the task assigned to them.

The long emitter lead at B of Fig. 2 can cause instability and a loss of gain. The loss of gain is caused by emitter reactance that has the same effect as placing a resistor in series with the emitter lead. This is known as *degenerative feedback*. A secondary effect of degenerative feedback in some amplifiers is a change in the base impedance. The foil pattern at A of Fig. 2 is recommended to minimize unwanted inductive reactance. In other words; the greater the area of the PC-board foil, the lower its effective inductance. These considerations were not as important when we designed with vacuum tubes because of the high input and output impedances of the tubes. But power transistors have very low terminal impedances. At times these impedances are less than 1 ohm! Therefore, small reactances can cause a host of troubles when we work at these low-impedance levels.

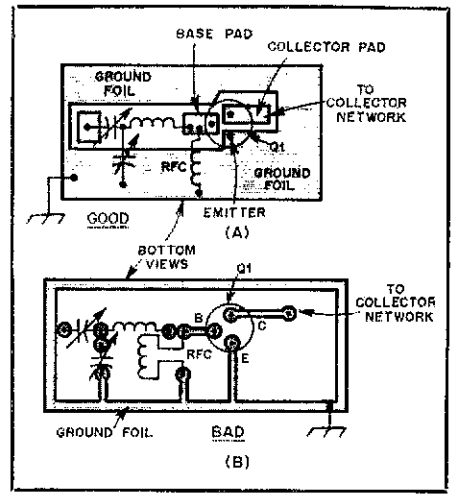


Fig. 2 — Good and bad layout examples for a VHF circuit board. The illustration at A (good) shows lots of copper ground foil, with large pads for attaching the components and keeping the ground leads short. The standard donut-pad/tape format at B is unsatisfactory for VHF circuits, and is not suggested for HF-band projects as well.

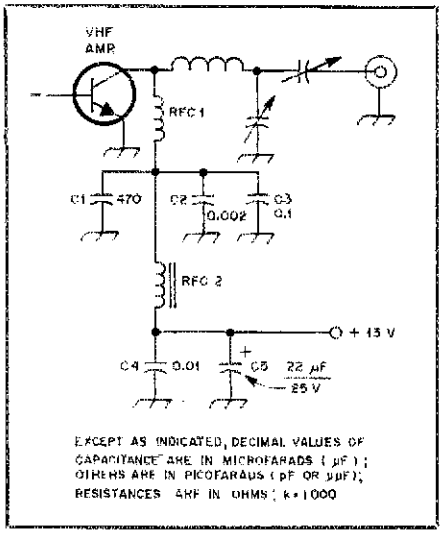


Fig. 3 — The schematic diagram shows part of a VHF amplifier circuit. The bypass capacitors and RF chokes comprise an effective decoupling network for a wide frequency range (see text).

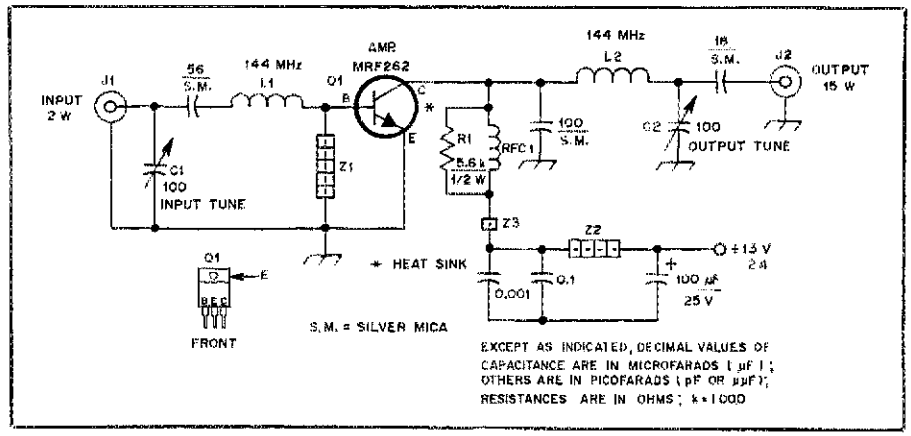


Fig. 5 — Schematic diagram of the 15-W class-C amplifier. It is suitable only for CW and FM use. Q1 would require forward bias on the base in order to use the circuit for linear amplification of SSB or AM signals. Fixed-value capacitors are disc ceramic unless noted otherwise. The polarized capacitor is electrolytic or tantalum.

C1, C2 — 100-pF mica compression or ceramic trimmer.
J1, J2 — SO-239 coaxial connector.
L1, L2 — Two turns of no. 14 wire, 5/16 in ID by 3/8 in long.
RFC1 — 13 close-wound turns of no. 24 enam. wire on a 5.6-kΩ, ½-W carbon-composition resistor.
Z1 — Five 40-μ_i miniature ferrite beads (Amidon no. 63 material) on a piece of bus wire.
Z2 — Four 850-μ_i miniature ferrite beads (Amidon no. 43 material) on a piece of bus wire.
Z3 — A single 850-μ_i ferrite bead, no. 43 material.

Leads that are too long can also set up tuned circuits for spurious frequencies, and that can lead to self-oscillation. It is good practice, also, to use double-sided PC board (copper on both sides). The surface on one side is etched for the desired pattern, but the opposite side of the board is left with all of the copper in place. That side acts as a ground plane, which helps to prevent RF ground loops (current flowing where it is not wanted). This also aids stability. The ground foils on the etched side of the board should be connected to the ground plane at several points. I drill no. 60 holes through the board and use short pieces of bus wire (soldered on each side) to join the grounds.

The component leads that do not return to ground must also be kept short. Fixed-value capacitors are especially critical, for it is almost impossible for us to clip their leads short enough for VHF use. Leadless ceramic chip capacitors are best, but they are difficult to buy and are very costly. Most commercial designs contain them. They are soldered directly to the PC-board foils, hence no leads. I favor silver-mica capacitors as an alternative. I snip the leads off near the body of the component, leaving just enough to make my solder connections to the PC board. Leadless chip capacitors are also effective.

Another important step toward stability is proper layout. The input and output circuits of the amplifier should be as far from one another as possible. Unwanted coupling between network coils can be a problem when seeking stability. When in doubt, place a shield divider across the transistor (ground it well) to isolate the input and output parts of the amplifier.

Collector bypassing is still another matter of importance. Fig. 3 illustrates the use of various values of bypass capacitance, plus a decoupling choke. Note that three bypass capacitors (C1, C2 and C3) are used below RFC1. They, because of their assorted values, provide effective bypassing at low frequency, high frequency and VHF. RFC2 is added to further clean up the +13-V line, and C4/C5 serve for additional bypassing. C5 is used to bypass the voltage bus at VLF and audio. If this is not done (RFC2 and bypass capacitors), RF energy can follow the supply line into other stages of the transmitter (or vice-versa). Wandering RF of this kind can cause feedback that encourages instability.

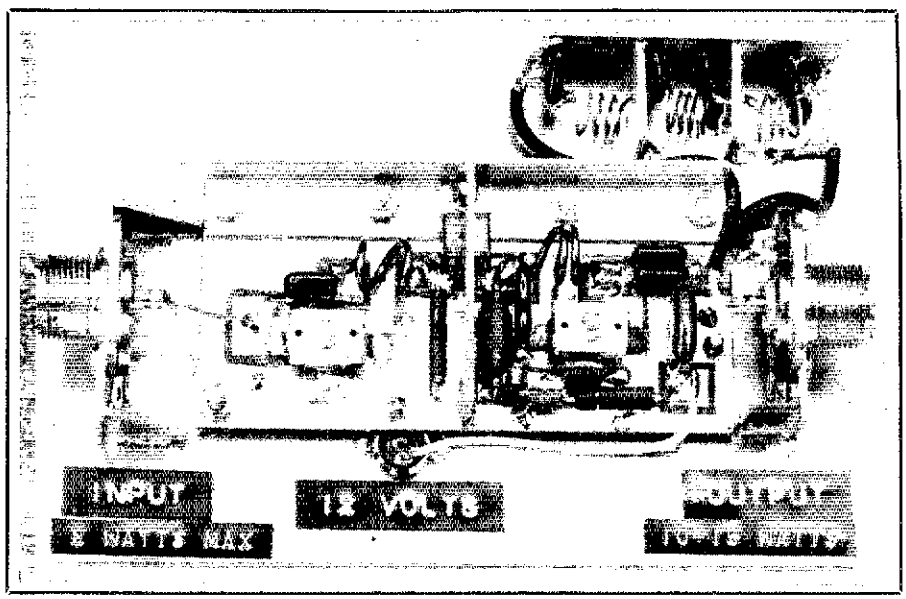


Fig. 4 — The assembled 15-W, 2-meter amplifier. The small harmonic filter of Fig. 6 is seen at the upper right. A shield divider is installed across the center of the transistor to isolate the amplifier input and output circuits. This amplifier is seen in its test fixture. It can be packaged to suit the builder.

A Workshop Project

It's always nice to follow a rhetorical deluge like this with something we can use for hands-on experience. A proven practical 2-meter amplifier is shown in Fig. 4. It is resting in a test fixture, along with a harmonic filter. With 1 W of input power, the output is on the order of 10 W after

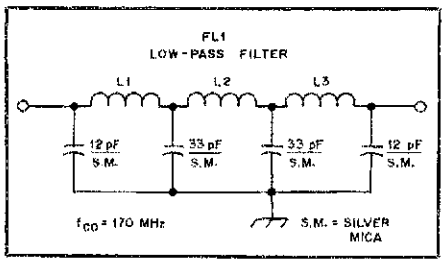


Fig. 6 — Schematic diagram of the seven-element low-pass harmonic filter. The capacitors are silver mica and are used to support the three coils above the PC board. Capacitor leads are cut very short to minimize stray inductance. Shield dividers are used between the coils to aid input/output isolation. Small pieces of double-sided circuit board are used for the partitions. All coils contain four turns of no. 20 wire, 5/16-in ID by 3/8 in long. The filter cutoff frequency is approximately 170 MHz, and the terminal impedance is 50 ohms.

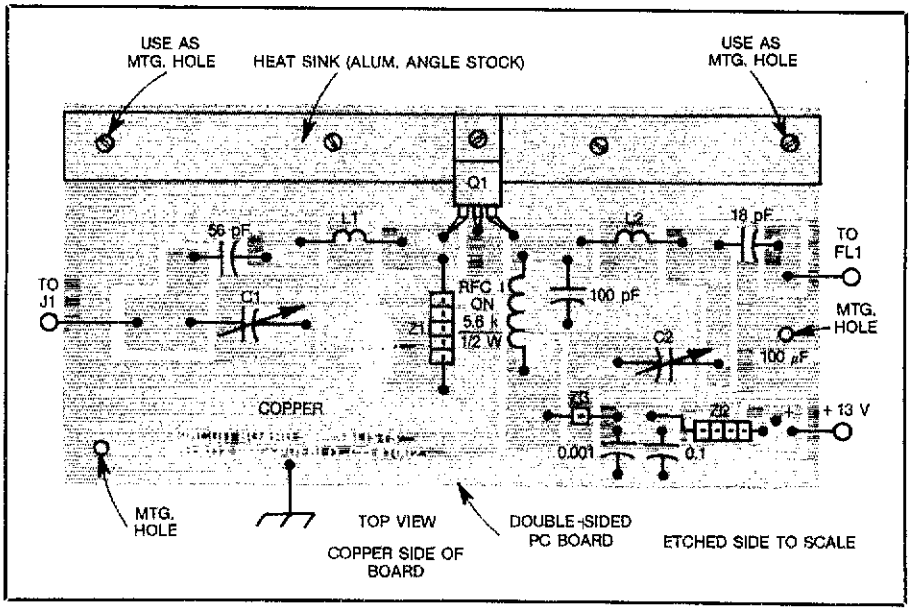


Fig. 7 — Parts-placement guide for the 2-meter amplifier. All of the components are mounted on the etched side of the double-clad board. Through-grounds are placed at several points (see text).

filtering. An output power of 15 W will result when the drive is increased to 2 W. A small shield divider separates the input and output halves of the amplifier. It is made from a piece of double-sided PC board, but flashing copper or brass would serve just as well.

Fig. 5 shows the schematic diagram of the amplifier. It evolved from one of those test circuits on a data sheet, but has been refined to deliver good performance. A Motorola MRF262 is used. It is a plastic-encased TO220 style of transistor.

C1 and C2 are the only adjustment devices used. However, if you want to get fancy, you may use trimmers in place of the input 56-pF capacitor and the 18-pF output capacitor. This will give you added tuning flexibility for the two matching networks. I find that I can obtain the rated output power while using fixed-value capacitors at those points.

Z1 is the base RF choke. I chose ferrite beads in order to keep the Q low in that part of the circuit. If you use a wire-wound choke at Z1, it should have an inductance of roughly 0.5 to 1 μH. This will yield a reactance of approximately 450 ohms from base to ground, which is recommended. RFC1 is wound on a ½-W resistor, and is similarly low in inductance. Z2, also made from a string of ferrite beads, functions as part of a decoupling network for the supply line.

The Harmonic Filter

Fig. 6 shows the circuit for the seven-section low-pass filter. It can be enclosed in a PC-board box to ensure good isolation, but will work as shown on a piece of PC board. Use dividers between the filter sections to provide reasonable ultimate attenuation (resulting from good isolation between the input and output of the filter). The cutoff frequency of this 50-ohm filter is approximately 170 MHz. FL1 ensures that the amplifier complies with FCC emission regulations.

Construction

The amplifier is laid out in accordance with the earlier text discussion. Rectangular isolated pads are formed on a piece of double-sided PC board. A skilled layout person can shrink the size of this amplifier considerably, should a smaller unit be desired. Care must be taken to provide ample heat sink area if that is done. The sink used in this model is a piece of store-bought hobby aluminum angle. It is 4 inches long, and has lips that are ½-inch high. The thickness of the stock is 1/16 inch.[1] Silicone heat-sink grease is used between the angle stock and the PC board, and between Q1 and the angle aluminum. Smaller amplifiers will require a heat sink of commensurate area.

Mica compression trimmers are used at C1 and C2, but ceramic trimmers can be substituted if you have them on hand. L1 and L2 are wound from no. 14 enameled copper wire. The large wire gauge helps to minimize losses by increasing the effective conductive area of the wire. We need to keep in mind the "skin-effect" rule for

[1]Notes appear on page 22.

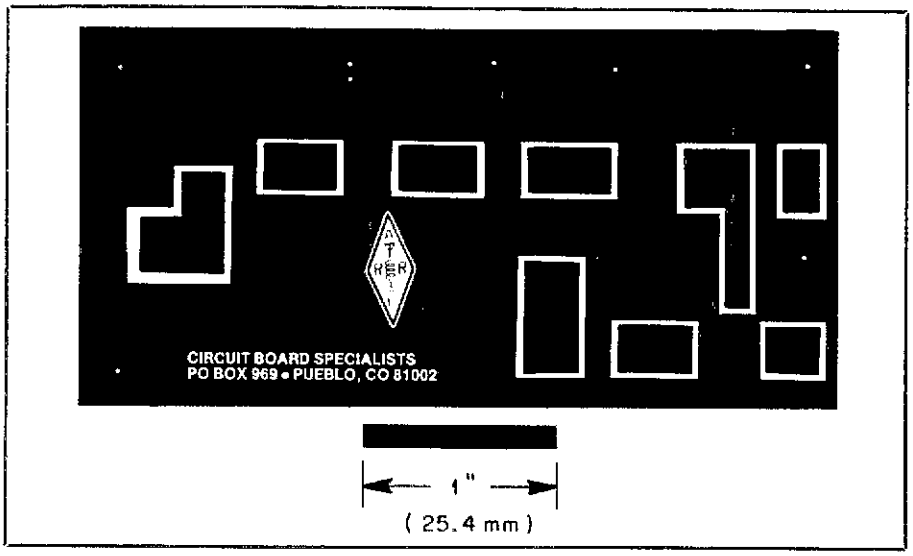


Fig. 8 — Circuit-board etching pattern for the solid-state amplifier of Fig. 5. The pattern is shown full-size from the foil side of the board. Black areas represent unetched copper foil. The components are mounted on this side of the board.

conductors versus oper ating frequency: The penetration of the wire becomes progressively less as the operating frequency is increased.

All of the components are placed on the etched side of the board. Fig. 7 shows the parts placement of the amplifier. A full-scale PC pattern is shown in Fig. 8.[2]

Adjustment

Connect a low-power transmitter or transceiver to J1. Place a 50-ohm dummy load at the amplifier output (J2). *Warning:* Make certain that your exciter can deliver no more than 2 W of output. Power input beyond that amount can destroy Q1 of Fig. 5. Next, apply the operating voltage and observe a wattmeter that has been inserted between J2 and the dummy load. Tune C1 and C2 for maximum output power from Q1. Readjust the capacitors two or three times for maximum output power. There will be some interaction, however slight. Do not use this amplifier on the air unless you include FL1 of Fig. 6 in the output line.

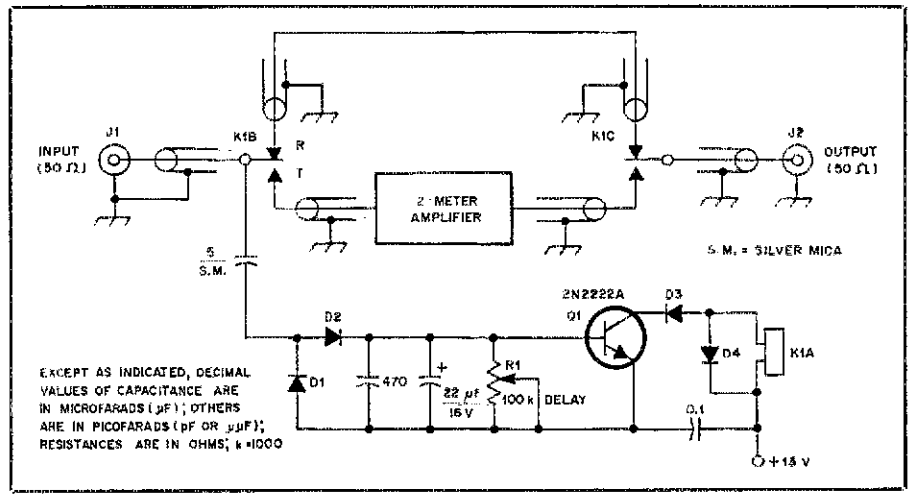


Fig. 9 — Suggested circuit for a switch-around device to permit use of the amplifier with hand-held transceivers. Some RF energy is sampled at J1, rectified by doubler D1/D2 and fed to a timing network that is connected to the base of a dc amplifier/relay driver (Q1). R1, a 100-kΩ control is set for the delay desired between transmit and receive. D1, D2, D3 and D4 are 1N914 small-signal silicon diodes; observe polarity of the diodes. K1 is a small dc relay for 12 V, and is a DPDT type.

Use with a Hand-Held Transceiver

Should you desire to use this amplifier with your hand-held radio, you can try the suggested circuit of Fig. 9. It will enable you to have the required "switch-around" feature during receive periods. Set R1 for the amount of delay you desire. The block diagram shows how to use the switching circuit with the amplifier.

Final Comments

The guidelines given here apply to all solid-state amplifiers. I hope some of your knotty problems have been resolved after reading this installment. A little care and thought in your design and layout will ensure good amplifier performance.

Notes

[1]mm = in × 25.4.

[2]Circuit boards and parts kits for this project are available from Circuit Board Specialists, P.O. Box 969, Pueblo, CO 81002, tel. 303-542-5083.

New Books

ELECTRICITY AND ELECTRONICS

by Dale R. Patrick and Stephen W. Fardo. Published by Prentice-Hall, Inc., Englewood Cliffs, NJ. First Edition, 1984. Hard-bound, 8-5/8 × 11-1/4 inches, 542 pages including index. $21.95.

The authors, who are employed by the Department of Industrial Education and Technology at Eastern Kentucky University, wrote this book for high school and vocational-technical school students. It can also serve as a text for industrial training programs, as a reference book and, to some extent, as a text for home-study courses. Newcomers to electricity and electronics — and that includes many budding radio amateurs — should find this book to be a valuable learning tool.

The book is composed of 18 chapters, eight appendixes and an index. A wide spectrum of subjects is covered: basic electricity, ac and dc motors, electronics basics, transistors, power supplies, oscillators, amplifiers, communications systems, digital electronics and electronic power control.

Large, easy-to-read type combined with many well-done illustrations and clear photos make reading easy. Each chapter contains a brief introduction, followed by a list of "Important Terms" (a glossary) to prepare you for the upcoming text. The body of information covered by that chapter follows. After the study material, there's a comprehensive review. Pages of "Student Activities" comprise the last section of each chapter. This is where you're encouraged to work on some suggested projects to gain a better understanding of the material just covered: the "learn-by-doing" stage.

Appendixes 1 through 8, respectively, contain a periodic table and an alphabetic list of the elements, some hints on soldering, pictures (only) of commonly used electrical tools, electronic and electrical symbols, the use of subscripts in schematic components identification, a discussion of right angles and a table of trigonometric functions, capacitor color codes, and powers of 10 and common logarithms. I think better use could be made of the appendixes; much of the material could have been arranged to fit within pertinent chapters.

Some difficulties may be encountered by those who want to use this book as a self-study course because there are no answers provided for the review questions — a sore point of many otherwise good textbooks, as is this one. Also, certain individuals may not have access to specific items of test equipment (such as an oscilloscope) necessary to perform the measurements required in a number of the projects. Possession of, or at least use of, a VOM is an absolute necessity; nobody contemplating entrance into the fields of electricity and electronics should be without this most basic piece of test equipment. How one overcomes the question/answer and equipment problems depends (to a degree) on individual motivation. Nevertheless, the book contains a wealth of information that is well presented. Instructors of basic electricity and electronics classes should find this book of value. — *Paul K. Pagel, NIFB*

Microcomputer Processing of UoSat-OSCAR 9 Telemetry

Are you interested in what satellites are "saying"? Here are some pointers to get you started examining satellite-transmitted data.

By Robert J. Diersing,* N5AHD

UoSAT-OSCAR 9 was built by members of the Electrical Engineering department of the University of Surrey, England. The satellite was placed into orbit on October 6, 1981. An on-board telemetry system provides data derived from monitoring 60 analog sensor channels and 45 digital status points. Analyzing the data can be a fascinating pastime. (A detailed description of UoSAT-OSCAR 9 may be found in *The Satellite Experimenter's Handbook,* published by the ARRL.)

A second UoSAT, OSCAR 11, was launched on March 1 of this year. The satellite was initially silent, but the engineers and scientists have restored it to operation. It is now transmitting telemetry while its condition is evaluated.

*Assistant Professor of Computer Science, Corpus Christi State University, 4129 Montego, Corpus Christi, TX 78411

Satellite Telemetry System

UoSAT-OSCAR 9 transmits the systems status and experiment measurements in ASCII using FSK with 1200- and 2400-Hz tones and even parity. These frequencies are close enough to the Bell 202 standard tones of 1200- and 2200-Hz that a type 202 modem will work well. (UoSAT-OSCAR 11 tone frequencies are reversed from the Bell 202 standard in their binary meaning.) The data rate can vary between 110 and 1200 bauds, but 1200 bauds is the rate most used.

Different telemetry formats are in use. These are shown in Figs. 1-4. The format shown in Fig. 1 is the older, standard form, combining the spacecraft status and telemetry values. Of the two newer formats, that shown in Fig. 2 has the same 60 telemetry values, but with the spacecraft status deleted and a checksum added for each value. The Fig. 3 format is one in which only certain channels are transmitted repeatedly after having been recorded at regular time intervals during the entire orbit. A sample of the UoSAT-OSCAR 11 telemetry is shown in Fig. 4. I'll concentrate on describing how to get the telemetry data into a computer in a form that will allow you to analyze it within the limitations of your hardware and programming experience.

Telemetry Reception and Capture System

The system in use at N5AHD consists of several processes: (1) orbit prediction, to know when to listen; (2) data capture, live or on audio tape; (3) demodulation of the data and its storage on diskette; (4) editing of the raw data to exclude detectable errors; and (5) analysis and display

```
AMSAT 10101 10000 00000 10000 01110 00011 00001 11001 00000
AMSAT 10101 10000 00000 10000 01110 00011 00001 11001 00000
00110 01160 02765 03001 04001 05433 06370 07303 08486 09482
10100 11100 12000 13366 14314 15188 16420 17885 18442 19438
20170 21470 22724 23024 24006 25422 26419 27267 28493 29611
30280 31180 32666 33235 34012 35333 36401 37401 38509 39313
40070 41110 42736 43102 44044 45000 46002 47467 48526 49502
50070 51000 52274 53089 54637 55450 56463 57488 58486 59507
```

Fig. 1 — Standard format of a UoSAT-OSCAR 9 telemetry frame. The first two lines indicate which spacecraft systems are active. Telemetered values from the spacecraft systems and experiments are contained in the next six lines.

```
UoSAT Computer-generated checksummed telemetry
Format: Per channel, sum 5 data digits (0-9), print as (A-Z,a-p)

00110C01190L02762R03001E04001F05623Q06687b07681W08442S09463W
10100C11080K12000D13370O14311K15660S16572V17234R18373W194000
20150I21160K22727U23117O24010H25418U26428W27283W28458b29584c
30290O31430L32668Z33256T34011J35366X36399e37342T38475b39209X
40090N41090O42744V43019R44141O45001K46003N47410Q48497g49446b
50100G51090P52274U53091S54930V55412R56458c57458d58428b59463b
```

Fig. 2 — The checksummed standard telemetry format. Status lines are deleted, and the letter between measurements can be used to check the validity of the preceding five digits. The message shown above the frame is transmitted by the spacecraft before each frame.

```
0BD501400640024001400240B003024002407A    0107708668000000668000886 29
0BDC0540C119D6750440E187044UF449094016    0108708668000000668000886 28
0BE00240054008400540054003400240800391    0109708668000000668000690 1F
0BE705400240014093720140024002400240D17   010A708667000000668000554 5C
```

Fig. 3 — These columns show two examples of whole-orbit telemetry dump format. With this form, several channels can be sampled by the spacecraft throughout an entire orbit, and the information retransmitted. The data consists of a frame sequence number followed by the measured values and a checksum. Usually, the weekend code-store will tell when the whole-orbit data was collected and what channels were included from the previous week.

```
UOSAT-2          8402245221000
00515101039B020112030102040235050 28F060251070315080329090260
105150110000120056130103140051150004160007177364187368 19736A
205153210322226677230001240017250007260774277367287368297369
305152310165322 84F330000340007350305360005377366383538 39353F
407636410005426880430007440000455056460002477361483539493 46C
505617510172526616532631541110558 52F560003573607587368 F593539
60210561780762800C6300416410036510 0E661405673406680008 69000F
```

Fig. 4 — UoSAT-OSCAR 11 checksummed telemetry sample. *This is* the most common format transmitted to date, but other formats are possible during data collection for and after attitude maneuvers.

of the captured data (see Fig. 5).

Software Configuration

The software I use is written in several programming languages for various reasons. The orbital prediction phase is handled by a program written in PL/I-80.[1] I prefer to do the orbit-prediction phase with a program that compiles to machine language rather than BASIC, which is much slower.

Data capture is done with one of two programs, both of which are written in Z80™ assembly language. One program captures the received characters by polling the serial port to which the modem is attached. It places the characters into a buffer, whose contents can later be transferred to disk. The other program uses interrupts to capture the received characters from the serial port and place them into a buffer. In the meantime, data is taken out of the buffer and sent to another computer for real-time display of decoded telemetry.

The data editing and analysis programs used in steps 4 and 5 are also written in PL/I-80. This is done primarily because of the faster execution times and better file-handling features that are available.

Hardware Configuration

I use a Cromemco Z-2D microcomputer. This is an S-100 bus system, and it uses a CP/M™-like operating system called CDOS. I find most programs are transportable between CP/M and CDOS systems; the programs described in this article operate on a CP/M system. The other system components are a Cromemco SCC (single-card computer), a 16FDC floppy-disk controller, 64 kbytes of memory, a TUART (Twin Universal Asynchronous Receiver-Transmitter) digital interface, a Heath H-19 terminal and a Novation 4202B modem.

Data Capture Procedure

Capturing the data transmissions on a quality cassette tape recorder, with the help of a discriminator meter and an audio-level meter, should pose no problems. Even though you may wish to place the data directly into memory, the cassette tape provides an excellent backup in case you run into problems. If you decide to use the computer to capture the data as you receive it, you may have to spend some time reducing computer RFI so your receiver will operate properly.

To capture UO-9 data, the following steps are required:

1) Audio is fed to the modem directly from the receiver or from the audio tape player. When recording, be sure the audio level is not too high. Even though the limiter circuits in commercial modems are good, it would not hurt to pay some attention to impedance matching. You should check to see if the 2400-Hz tone is much lower in level than the 1200-Hz tone; you may have to pick up the audio just after the discriminator rather than at the speaker leads.

2) The modem output is connected to a serial input port of the computer. The physical connections are defined by the RS-232-C standard.

3) Software that will accept the signals from the computer serial port and store the data in memory must be written (or obtained). This software must also be able to save the captured data in a file on an external storage device, such as a floppy disk.

4) The computer must have an external data-storage device (disk drive or cassette tape). This way, the data-analysis programs can process the data without having to make the conversion of analog (audio) signals into digital signals again.

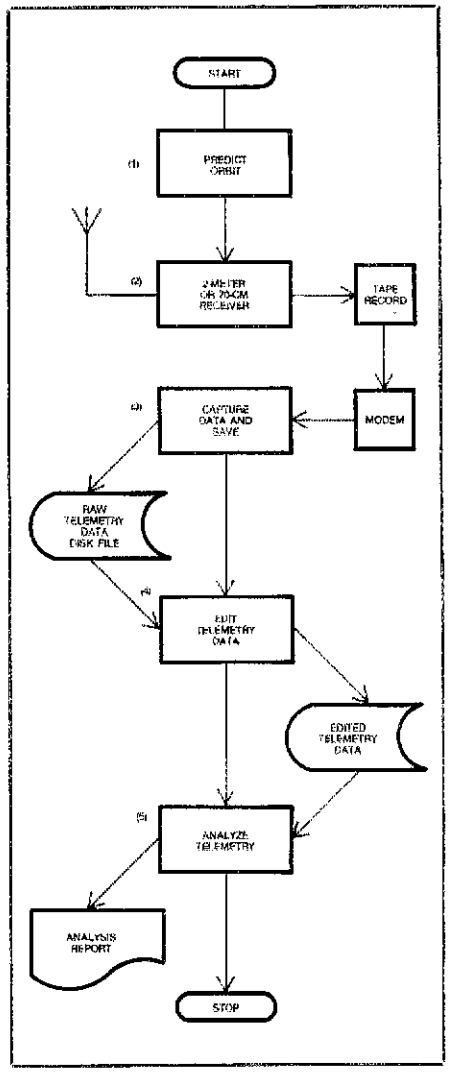


Fig. 5 — Flowchart of the UoSAT-OSCAR 9 telemetry capture and analysis system used at N5AHD.

The Data-Capture Problem

The time it takes the computer to process a single character must be less than the time it takes for the next character to arrive. With data arriving at 1200 bauds, it is usually necessary to write the capture program in the computer's native language. This means writing in assembly language for, say, the Z80. Even if the computer's BASIC interpreter allows access to serial ports, BASIC probably will not be fast enough to process data at 1200 bauds. Rather than attempting to teach assembly language programming, I'll show flowcharts for the data-capture program. There will be an explanation of these later.

Serial Ports and Operation

A data "port" can be thought of as a

[1]Orbit-prediction software is available from the AMSAT Software Exchange, Box 27, Washington, DC 20044.

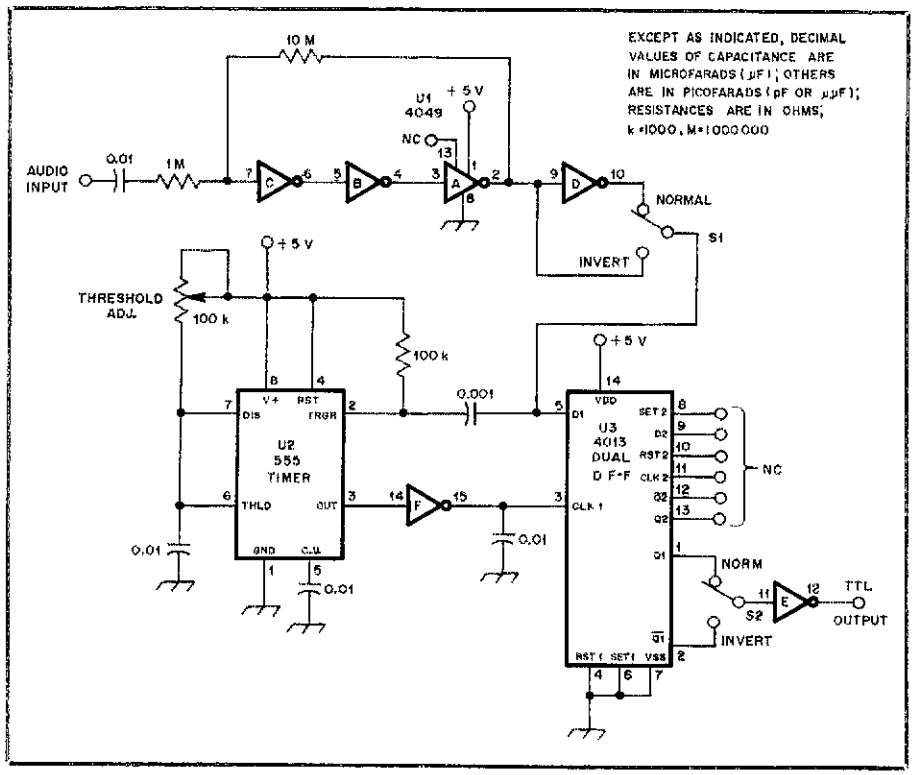


Fig. 6 — A simple demodulator for UoSAT-OSCAR 9 use. The incoming audio should be noise free. This circuit does not regenerate clock pulses, but should work fine for all asynchronous signals. The current drain of this circuit is about 5 mA at 5 V. For initial adjustment, feed an 1800-Hz tone into the input and move the THRESHOLD ADJ. potentiometer until the output of U1 is on the verge of changing state. *(tnx to Steve Gomez, KE5O, for this circuit)*

mechanism by which the microprocessor has access to the data presented. It is a combination of hardware and software.

Serial transmission and reception is a mode in which one bit at a time is sent or received. Since information is transferred bit by bit, the receiver must know the rate at which the transmitter is sending. In this case, the satellite is the transmitter and the receiver is the computer. If the satellite is transmitting at a rate of 1200 bits per second (bit/s or 1200 bauds), the computer must check for incoming bits at the serial port at a rate of 1200 bauds.

A modem is a *mo*dulator/*dem*odulator. In this application, the modem changes audio frequency shifts picked up at the radio receiver into different voltage levels to be sent to the computer serial port. The voltage levels should be in accordance with the RS-232-C standard.

Some microcomputers are supplied with serial ports. Check your hardware manuals to see if a serial port is available. You may be able to use the printer port if it is a serial type. If you need to purchase a serial interface, you can generally find them advertised in many microcomputer magazines. Two interfaces I have used are the Cromemco TUART and the Solid State Music IO-4. Both of these have two serial and two parallel ports on a card that plugs into an S-100 bus system. You can also purchase serial interfaces for the Apple® II and Radio Shack TRS-80® microcomputers. Radio Shack model III and IV computers purchased with two disk drives probably already have a serial port. The TRS-80® Color Computer also has a serial printer port.

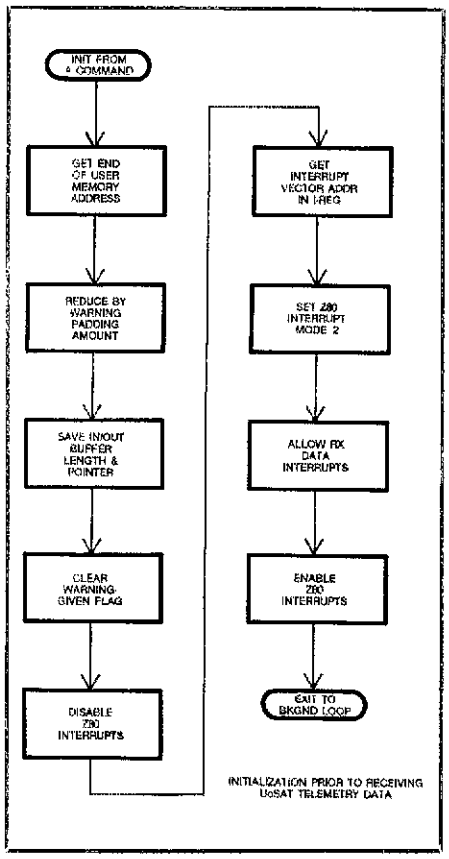


Fig. 7 — Initialization prior to receiving telemetry data.

About Modems

Where do you get a modem? You have two choices: Build one, or purchase one. The schematic diagram for a simple demodulator is shown in Fig. 6.

If you purchase a modem, be sure it is a Bell type 202 modem and not a 212 type. The type 212 modems are popular for 1200-baud transmission over telephone circuits, but do not operate on the proper tone frequencies for this application, nor do they use FSK at this data rate. Type 202 modems show up from time to time as surplus items,

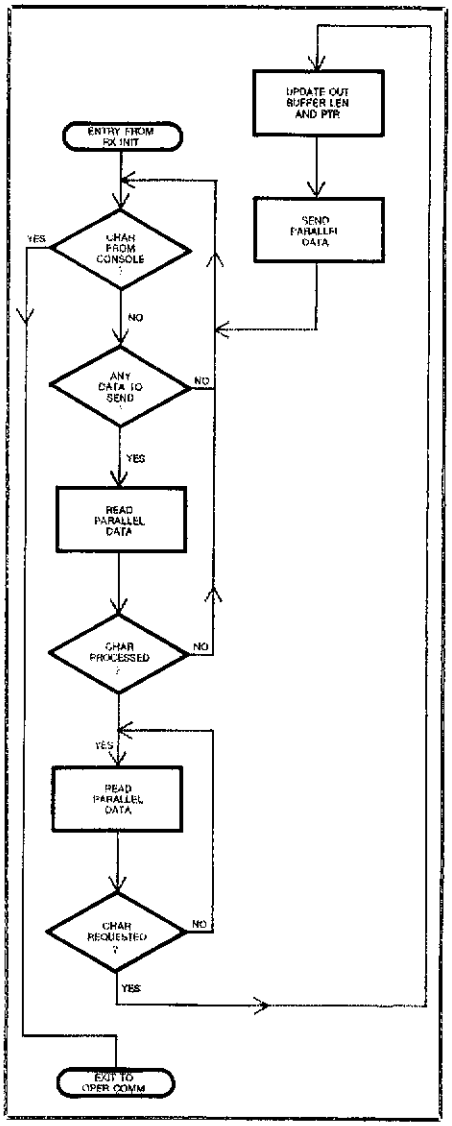
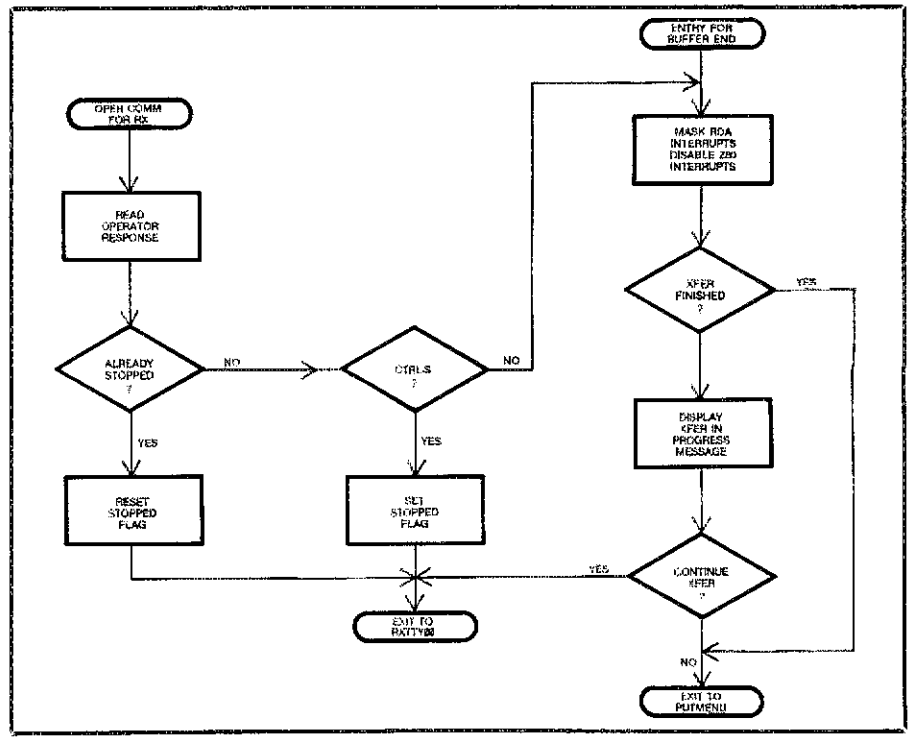


Fig. 8 — The background processing loop communicates with the operator, or transmits data to another computer for decoding and display.

Fig. 9 — Operator communications routine. →



so keep your eyes open for them.

Connecting the Modem and Serial Port

Once the modem and serial interface are on hand, simply connect the serial output of the modem to the serial input of the computer. Only two wires are required: one for data, and one for signal ground. If you have trouble getting data through, the transmit and receive data lines (pins 2 and 3 on the DB-25 connector) might need to be reversed. This is because the RS-232-C specification defines two types of equipment configurations: data terminal equipment (DTE) and data circuit-terminating equipment (DCE). Since these are complementary ends of a circuit, the signals will be reversed at one end. Also, there may be modem signal lines that have to be permanently wired to a logic low or high level. This is because modems control data going in both directions. For our work, the modem needs to be in the receive mode.

All of this may sound complicated, but you will likely find a description of the signals in the modem documentation. Sometimes there are switches inside or on the rear of the modem that change the configuration of some of the signals. If you happen to have a modem that has switches or jumper positions for full-duplex or four-wire operation, you should enable these options.

Software Interface to the Serial Port

Rather than trying to explain the operation of a Z80 (or other) assembly language program, I have divided the functions needed to process serial modem data into separate routines. Flowcharts for these routines are included. Here is a list of the necessary functions and some brief comments about each.

Initialization Prior to Reception

The initialization routine (Fig. 7) must set the operational characteristics (such as the data rate and word length) of the serial port. It is possible that these items are not software programmable, but are hard-wired on the interface. The pointers to the internal received-data buffer must be initialized. If you are detecting received data via interrupts, the proper interrupts must be allowed (unmasked), and the proper interrupt mode for the processor must be specified. It is not necessary for received data to be processed by interrupts. I have included this method because I use it on occasion.

Background Processing

This routine (Fig. 8) executes in between received characters. In a non-interrupt-driven system, it will probably do only two things: check for intervention from the system operator, and see if another

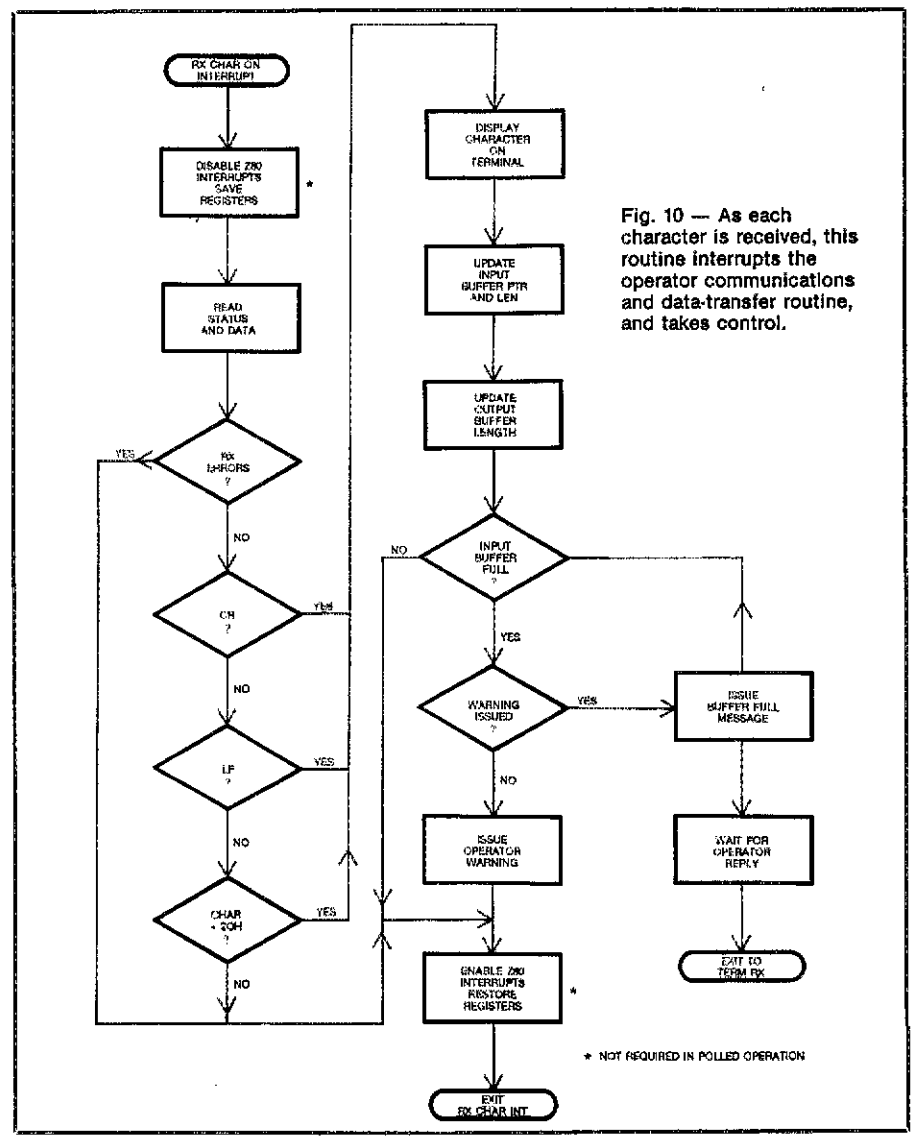


Fig. 10 — As each character is received, this routine interrupts the operator communications and data-transfer routine, and takes control.

Fig. 11 — This routine takes the telemetry data in the computer buffer and saves it on disk. →

character has been received from the modem. In the interrupt-driven system, this routine would still check for operator communications, but the arrival of a new character would be signaled automatically by the interrupt. In my interrupt-driven system, this routine has the additional task of sending the received data to another computer for real-time display.

Operator Communications Routine

At some time during the data-capture process, it may be desirable for the operator to temporarily, or permanently, suspend data capture. The operator communications routine (Fig. 9) processes these requests accordingly. If transmission to another computer is in progress, the operator is warned and can allow it to finish, or abort, the process. If termination is requested and reception is interrupt-driven, the receive-data interrupt must be masked again.

Receive Characters from Modem Routine

If reception is not interrupt-driven, this routine (Fig. 10) would become a part of the operator-communications loop and would be executed if a character is ready to process. In an interrupt-driven system, it is automatically executed as a result of the receive-data interrupt. In either case, the overall function is the same except that in noninterrupt-driven (polled) systems, interrupt-related functions would not be included.

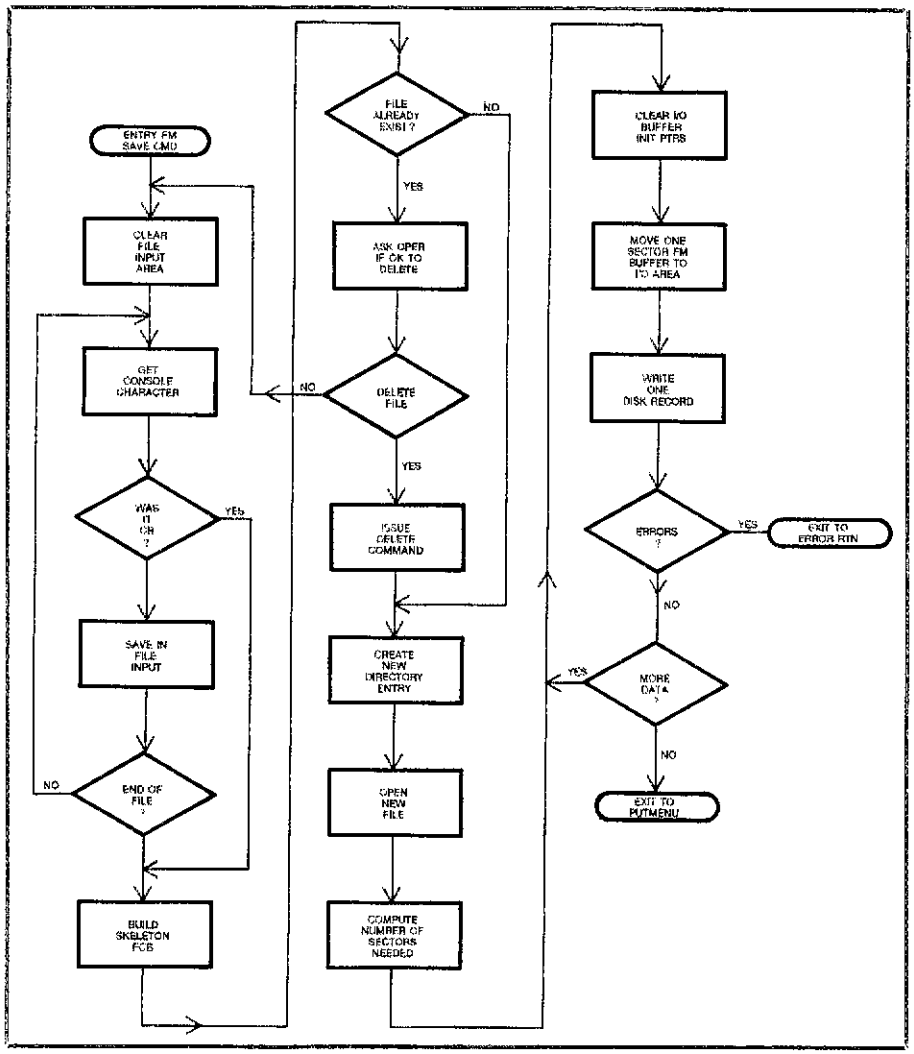
The character-receive routine must accept the character from the modem and perform minimal data error checking. As an example, it could filter out control characters. It must place the character in the buffer and update the buffer pointer and length. Finally, it must decide if the buffer is about to fill up. If so, the operator is given a warning before the condition occurs.

Save Telemetry on Disk

Once reception has ended, the data may be saved on disk. This routine (Fig. 11) must ask the operator for a file name and then check to see if it already exists on the disk. If it does, a new name can be entered or the old file deleted. The amount of space needed is computed, and then the data is moved from the buffer to the I/O buffer, one sector at a time. The only other necessary action is to check for errors after each write to the disk. It is possible that the disk could fill up and the operator would need the chance to save the information on another disk.

Editing and Analysis

Now that the data has been captured on




```
UoSAT OSCAR 9 --- DATE: 84.059 = 02/28/84 --- TIME: 2138 UTC --- ORBIT: 13288
--------- DATA RATE: 01200 BPS --- MODE: ASYNC --- BEACON FREQ: 145.825 ---------
                    ---- SPACECRAFT SYSTEMS STATUS ----

 1) 145 MHz BEACON              ON          2) 435 MHz BEACON              OFF
 3) PRIMARY COMPUTER            ON          4) CCD CAMERA MODULE           OFF
 5) RADIATION DETECTOR - A      ON          6) MAGNETOMETER EXPT.          ON
 7) 7 MHz BEACON EXPT.          OFF         8) 14 MHz BEACON EXPT.         OFF
 9) 21 MHz BEACON EXPT.         ON         10) 28 MHz BEACON EXPT.         OFF
11) 2.4 GHz BEACON EXPT.        OFF        12) 10.47 GHz BEACON EXPT.      OFF
13) 145 MHz COMMAND RX          SQUELCHED  14) 435 MHz COMMAND RX          SIGNAL
15) STATUS CALIBRATE                       16) BATTERY CHG REG STATUS      B
17) H F BEACON EXPT. SYNTH.     OFF        18) TELECMD DECODER STATUS      GROUND
19) MAGNETORQUER                OFF        20) PRI COMPUTER BLOCK LOAD     DISABLE
21) SEC COMPUTER DATA O/P       ACTIVE     22) SEC COMPUTER CLOCK          INT FAIL
23) SEC COMPUTER PROCESSOR      RUNNING    24) SEC COMPUTER POWER DOWN     ON
25) 14 MHz SYNTH LOCK           OUT        26) 28 MHz SYNTH LOCK           OUT
27) 21 MHz SYNTH LOCK           OUT        28) RADIATION DETECTOR - B      OFF
29) TIP MASS UNCAGE CONFIRM     YES        30) SPEECH SYNTH POWER          ON
31) VISUAL MEMORY DISPLAY       OFF        32) GRAV GRAD BOOM MTR PWR      OFF
33) SEC COMPUTER POWER          OFF        34) H F BEACON EXPT. POWER      ON
35) NAV MAGNETOMETER PWR        ON         36) COMPUTER MEM ERR BIT - 1
37) COMPUTER MEM ERR BIT - 2               38) COMPUTER MEM ERR BIT - 3
39) STATUS CALIBRATE                       40) PRI COMPUTER UART O/P       ACTIVE
41) GRAVITY GRAD BOOM MOTOR     FORWARD    42) MAGNETORQUER POWER          FORWARD
43) MAGNETOMETER EXPT.          CALIBRATE  44) NAVIGATION MAGNETORQUER     SAFE
45) GRAVITY GRAD BOOM MOTOR     SAFE
```

Fig. 12 — An example of the decoded spacecraft systems status. The data shown here are decoded from the lines beginning with "AMSAT" as shown in the raw telemetry sample (Fig. 1) for UoSAT OSCAR-9.

the diskette, what can be done to improve its integrity? Several things, and these are accomplished during the editing phase. The edit phase simply reads the captured data and writes a new file containing only error-free records. Some items that can be checked during the editing phase are

1) The length of the telemetry lines that were saved. If any are of incorrect length, the whole line can be discarded.

2) Proper line data. Are the lines spaced properly? Are frame numbers ascending and between the proper limits? Do the values within the lines make sense? Do the checksum calculations yield the proper result?

It is impossible to detect every kind of error, but a good editing job will save you headaches later. You should also add some type of indication as to when the data were collected. (See Figs. 12 and 13.) I add a header to the output file. The header contains the satellite name, data, time, data rate, orbit number, beacon frequency and transmission mode.

The analysis phase consists of reading the edited telemetry file and substituting the values into the calibration equations. You can collect data over a long period of time and then produce graphic displays for that period.

UoSAT OSCAR 9 --- DATE: 84.059 = 02/28/84 --- TIME: 2138 UTC --- ORBIT: 13288
DATA RATE: 01200 BPS --- MODE: ASYNC --- BEACON FREQ: 145.82
--- SPACECRAFT TELEMETRY --- 1 ---

CHANNEL	PARAMETER	RAW VALUE	ACTUAL	UNITS
00	SEC COMP CURRENT	110	132.000	mA
01	SOLAR ARRAY CURRENT +X	020	222.400	mA
02	BATTERY HALF VOLTAGE	773	7.807	Volts
03	RADIATION DETECTOR A O/P	001	41.600	Count
04	RADIATION DETECTOR B O/P	001	41.600	Count
05	MAGNETOMETER HX-COARSE	528	1176.150	nT
06	MAGNETOMETER HY-COARSE	529	2837.620	nT
07	MAGNETOMETER HZ-COARSE	713	27425.480	nT
08	BATTERY PACK-A TEMP	458	3.232	Degrees C
09	+X FACET TEMP	472	0.404	Degrees C
10	VISUAL DISPLAY & CCD CURRENT	100	84.000	mA
11	SOLAR ARRAY CURRENT +Y	150	368.000	mA
12	2.4 GHz BEACON POWER O/P	000	0.000	mW
13	RADIATION DETECTORS EHT VOLTS	370	370.000	Volts
14	RADIATION DETECTORS CURRENT	307	40.180	mA
15	MAGNETOMETER HX-FINE	628	2111.850	nT
16	MAGNETOMETER HY-FINE	564	970.380	nT
17	MAGNETOMETER HZ-FINE	537	479.520	nT
18	BATTERY PACK-B TEMP	393	16.362	Degrees C
19	-X FACET TEMP	416	11.716	Degrees C
20	PRI COMP CURRENT	160	162.000	mA
21	SOLAR ARRAY CURRENT -X	200	424.000	mA
22	BATTERY/BCR 14V BUS	715	15.101	Volts
23	SUN SENSOR +Z AXIS	112	0.566	Volts
24	10.4 GHz BEACON CURRENT	008	-7.760	mA
25	MAGNETOMETER TEMP	419	11.110	Degrees C
26	MAGNETOMETER CURRENT	439	54.573	mA
27	TELECOMMAND RX CURRENT	283	31.773	mA
28	RADIATION EX TEMP +X1	468	1.212	Degrees C
29	+Y FACET TEMP	589	-23.230	Degrees C
30	BATTERY CHARGE CURRENT	310	930.000	mA
31	SOLAR ARRAY CURRENT -Y	390	636.800	mA
32	POWER COND MODULE +10V	667	10.338	Volts
33	TELEMETRY SYS CURRENT	256	8.672	mA
34	2.4 GHz BEACON CURRENT	004	-3.002	mA
35	145 MHz BEACON POWER O/P	357	459.250	mW
36	145 MHz BEACON CURRENT	395	98.358	mA
37	145 MHz BEACON TEMP	358	23.432	Degrees C
38	PRI COMP TEMP -X1	483	-1.818	Degrees C
39	-Y FACET TEMP	220	51.308	Degrees C
40	+14 V LINE CURRENT	090	257.400	mA
41	+5 V LINE CURRENT	100	64.000	mA
42	POWER COND MODULE +5V	739	5.518	Volts
43	SUN SENSOR -Z AXIS	036	0.182	Volts
44	HF BEACONS CURRENT	139	35.638	mA
45	435 MHz BEACON POWER O/P	000	0.000	mW
46	435 MHz BEACON CURRENT	003	-10.881	mA
47	435 MHz BEACON TEMP	424	10.100	Degrees C
48	SEC COMP TEMP +Y1	505	-6.262	Degrees C
49	+Z FACET TEMP	458	3.232	Degrees C
50	+10V LINE CURRENT	100	300.000	mA
51	-10V LINE CURRENT	090	39.000	mA
52	POWER COND MODULE -10V	275	4.113	mA
53	NAV MAGNETOMETER Y-AXIS	115	-100631.062	nT
54	NAV MAGNETOMETER Z-AXIS	863	-99783.333	nT
55	NAV MAGNETOMETER X-AXIS	299	38423.625	nT
56	SPEECH SYNTH CURRENT	462	45.001	mA
57	CCD IMAGER TEMP	469	1.010	Degrees C
58	TELEMETRY SYS TEMP -Y1	441	6.666	Degrees C
59	-Z FACET TEMP	477	-0.606	Degrees C

Fig. 13 — A sample decoded telemetry frame. The channel numbers 00-59 correspond to the first two digits in the 5-digit telemetry groups. The values in the column RAW VALUE are the other three digits from each channel. These are substituted into the proper calibration equation by the analysis program, and the values shown in the right-hand column result.

Summary

This information should provide a starting point for those of you who would like to make a permanent record of the data being transmitted by UoSAT-OSCAR 9. Even though the system I described is dependent on the hardware in my computer system, I hope you will be able to apply the principles shown here to your own computer system.

Strays

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 August 8 for October *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.

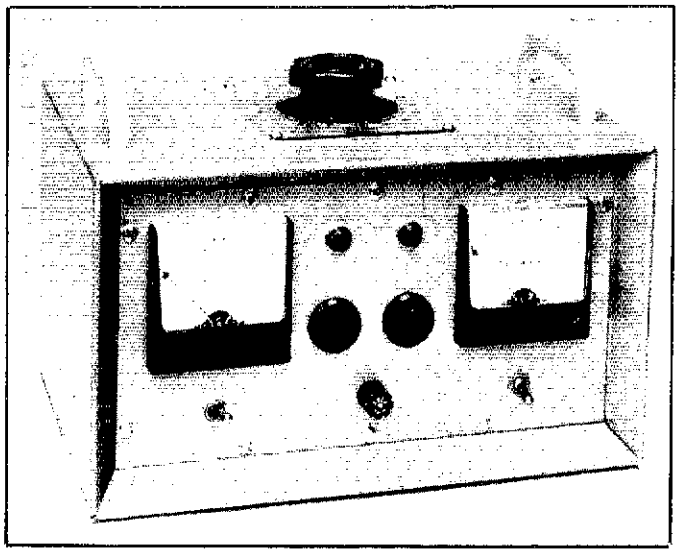
Items submitted are normally acknowledged, but that doesn't necessarily mean that your Stray will be appearing in *QST*. We receive far more material than we can find room for. If you want your material returned, please include a statement to that effect and an s.a.s.e.

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

SCOUT JAMBOREE NEEDS VOLUNTEERS

☐ The Amateur Radio Program at the 1985 National Scout Jamboree, scheduled for July 24-30, 1985 at Fort A. P. Hill, Virginia, is looking for a few good amateurs to volunteer for staff positions. If you'd like to have a great time mixing Amateur Radio with Scouting, contact Leo Kluger, WB2TRN, Recruitment Program Manager, ARRL.

A Variable AC-Voltage Source



If you've ever needed a variable source of ac voltage, you know how valuable it can be. Build this unit over a weekend from junk-box or flea-market parts.

By John E. Magnusson,* WØAGD

Quite often, when troubleshooting equipment, it is convenient and time-saving to have a variable ac-voltage supply to power the unit under test. Use of such a supply is less expensive than continually installing fuses with greater amperage ratings until the defective part finally reveals itself by becoming red hot or filling the room with smoke! Too often the "new fuse" procedure also results in the original defective part taking one or more other circuit components "along for the ride" to oblivion.

Some examples of hard-to-find defective components include (1) a rectifier diode that does not show a short with the low voltage of a digital multimeter applied to it, but fails under normal operation, and (2) a power-supply filter capacitor that breaks down at 30 to 50% of its rated working voltage, but appears to be okay when you disconnect one end from the circuit and check it with a volt-ohmmeter. These are only two familiar examples with which you may struggle until the component breaks down completely or, in total exasperation, you check every suspect item.

Help

To shorten the troubleshooting cycle, a variable ac-voltage source is the answer. You can gradually increase the ac-voltage input to the device under test as you make a few measurements. Simultaneously monitoring the ac-voltage input and the output voltage of a power supply should provide an answer before the input voltage has been increased to the level that causes fuse failure.

Let's say you have a 12-V power supply that has no output voltage with 50% of the line voltage applied. If you have ac voltage at the transformer connections to the rectifiers but no dc voltage at the filter capacitor(s), the problem must be with the rectifiers. If you have dc voltage at the filter capacitor but it disappears before the voltage threshold that causes the fuse failure, the bad component must be the capacitor, or one of the sections in a multisection capacitor. Granted, these are simple examples, but they serve to point out the usefulness of the variable ac supply.

Let's Build One

Scattering a bunch of test leads, meters and an autotransformer on the workbench can prove to be lethal. To keep things tidy and safe, I assembled the variable ac-voltage supply shown in the photos and schematic diagram.

Acquiring Parts

QST ads and flea markets are excellent sources of parts. Flea markets produced the two meters and recessed front panel (shadow box) cabinet. This enclosure provides protection for the meters and the bat-handle switches. Variable autotransformers are available under various trade names, such as Variac™ and Varitron™. Although the variable transformer I used is rated for only 8-A ac, this is a CCS (Continuous Commercial Service) rating. Therefore, ICAS (Intermittent Commercial and Amateur Service) use at 50% overload should not be reason for concern.

Circuit Description

Fig. 1 is a schematic diagram of the unit. S2 is used to switch line-voltage meter M2 from the input line of T1 to the output of T1. This allows the unit to be used as a line-voltage monitor whenever it is not in use as a variable-voltage source. While the unit is in use, M2 provides a quick means of reading the incoming line voltage. DS2 monitors the output of T1.

If installed at point B, M1 shows the amount of current being drawn through T1. This helps you stay below the fuse-failure threshold of the equipment being tested. It also gives an indication of any intermittent arcs in the unit under test, as it is more sensitive to such load changes than the ac voltmeter. M1 and M2 are bypassed with 0.005-μF/500-V ceramic capacitors.

F1 provides protection for the variable transformer and ammeter. S1 is the ON/OFF switch, and DS1 is the accompany-

*5329 Gladstone, Lincoln, NE 68504

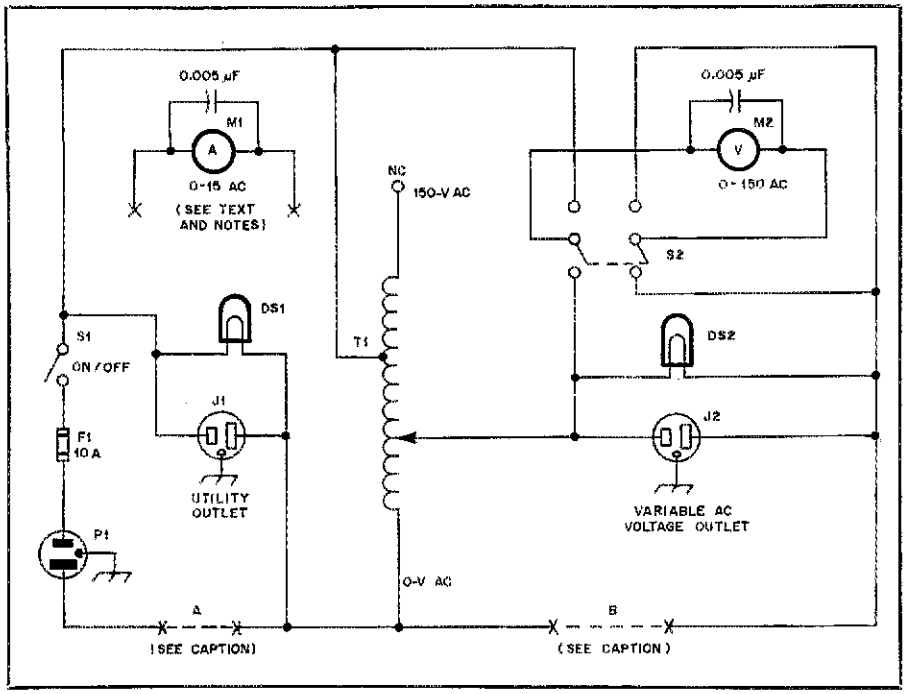


Fig. 1 — Schematic diagram of the variable ac-voltage source. With the ammeter installed at A, the meter will read the sum of the currents drawn from the utility and variable ac outlets. If the ammeter is installed at B, it indicates only the current drawn from the variable ac voltage outlet. (Refer to April 1984 Hints and Kinks for information concerning safe ac-power wiring practices.)

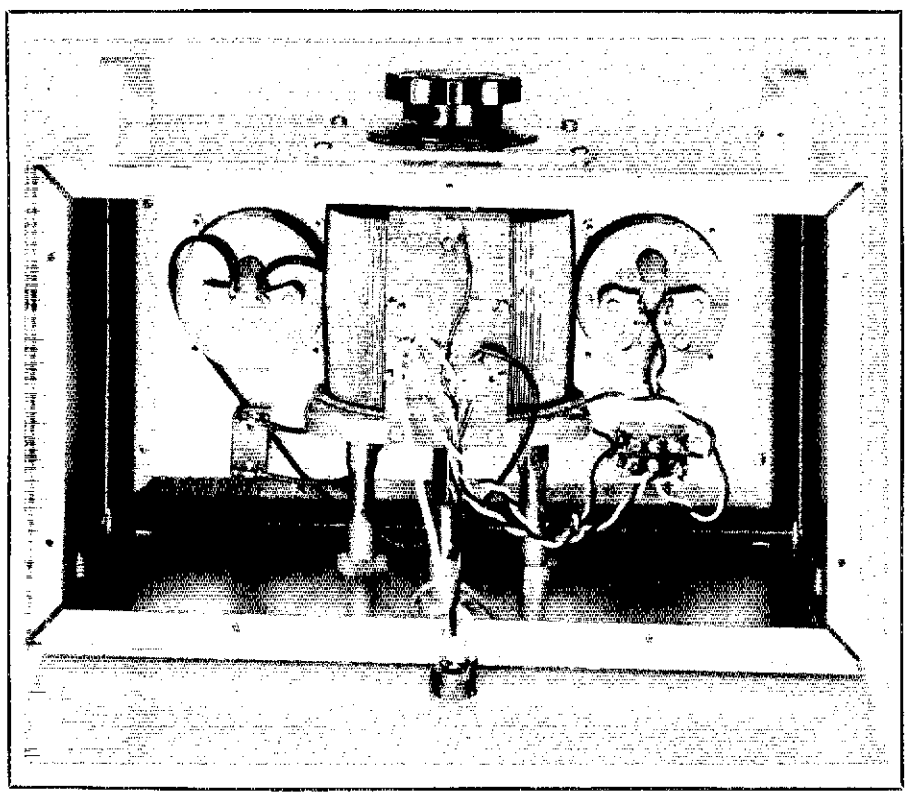


Fig. 2 — An inside view of the variable ac-voltage controller.

ing pilot light. If you're leaving the workbench for a period of time, you need not disconnect the line cord from the wall outlet; just flick the switch.

Two ac outlets are provided. J1 is a convenience outlet for use with your VTVM or other test equipment. J2 carries the variable-voltage output.

Construction

Only aesthetics need be considered when laying out the front panel; parts placement is not critical. I mounted T1 on the inside cabinet top. Two carrying handles make it easy to transport the unit as well as providing some protection for the transformer-adjustment knob.

Fig. 2, an inside view of the power unit, shows the mechanical support of T1. The spacers I used came from my "junk box." Spacers can be made easily from aluminum or copper tubing or small-diameter threaded nipples available from hardware or plumbing stores. An insulated clamp secures the line cord at the rear panel.

Summary

You'll find the construction of this unit to be a relatively inexpensive and easy weekend project. I'm sure this variable ac-voltage supply will be a worthwhile addition to your work bench.

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 July issue were:

- A 9-minute "ID Timer with Tone and Display," by Donald G. Varner, WB3CEH
- A "Coax-Loss Program for the HP-97 and TRS-80C," by I. L. McNally, K6WX
- New computer programs for electronic circuit analysis, signal processing and scientific graph printing, in the "Bits" column.

QEX is edited by Paul Rinaldo, W4RI, and Maureen Thompson, KA1DYZ, 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.

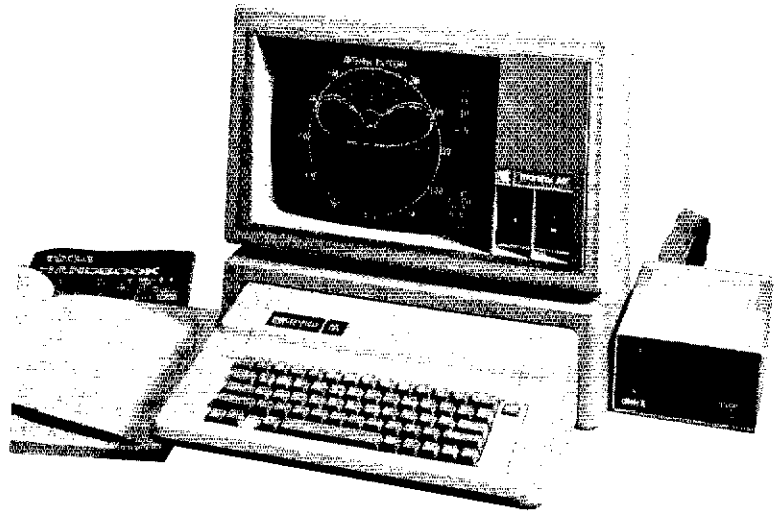
IMPROVING STATION AUDIO SUBJECT OF TRN TALK

☐ "Microphone Equalization for Radio Communications" will be the subject of a talk by noted audio expert Bob Heil, K9EID, on the North American Teleconference Radio Net on September 14 at 7:30 P.M. CDT. Heil, author and lecturer on audio systems, will describe practical ways to improve the sound and effectiveness of your radio station, among other things.

Access to TRN is provided by more than 180 gateway stations, mostly VHF repeaters, linked together to cover virtually every metropolitan area in the U.S. and much of Canada. For information on linking your repeater into the net, send an s.a.s.e. to Honeywell ARC, Mail Station MN26-4201, Honeywell, Inc., Honeywell Plaza, Minneapolis, MN 55408.

The Effects of Real Ground on Antennas

Part 4†: Vertical antennas: Some people swear by them; others swear at them. What do the computers say?



By James C. Rautio,* AJ3K

Vertical, ¼-wavelength, ground-plane antennas are popular because they use little space, require a single support, are easily incorporated into phased arrays and offer the *potential* for low-angle radiation. Vertical antennas radiate equally well in all directions — or, as some say, they radiate equally poorly in all directions.

As with most antennas, ¼-wavelength verticals have advantages and disadvantages. First the good news! The input impedance of a ¼-λ vertical above a perfect ground is 35 ohms, half the input impedance of a dipole in free space. With the impedance cut in half, the current will be double that of a dipole. Since it is current (not voltage) that determines how well an antenna radiates, we seem to have an antenna that is better than a dipole. In fact, with the current doubled, we might expect the antenna to be up to a full 6 dB better. Now for the bad news. The ¼-λ vertical has only half the length of a dipole. This means the 6-dB advantage of a vertical is cut to 3 dB. Also, we are comparing a vertical over a perfect ground to a dipole in free space. Neither of these characteristics is very realistic! If we place the dipole over a perfect ground, however, the direct ray radiated from the dipole can add with the ray reflected from the ground for up to 6 dB more gain than the same dipole in free space.

Thus, a ¼-λ vertical can have up to 3 dB more gain than a dipole in free space. But a vertical over perfect ground has a peak gain 3 dB less than a dipole over perfect ground. If a vertical is automatically 3 dB poorer than a dipole, why should we even consider using one? Fortunately, the vertical antenna may actually have superior gain at low radiation angles, if it is designed properly.

Before we can design a vertical, it is helpful if we can analyze it. In past installments of this series, I have used a program called Annie on the Apple® II computer (which is now available for the Commodore-64™ computer) to analyze antennas over a real ground.[1] Can we use Annie to analyze verticals? There is a problem here. Annie's analysis technique (reflection coefficients) loses precision when the antenna is less than a few tenths of a wavelength above ground. To see how much precision is lost, I modeled a vertical antenna as a group of monopoles. A monopole (see Part 2) is exactly half of a dipole. A single, vertically oriented monopole represents the ¼-λ antenna, and the ground radials are formed by a series of monopoles on the ground. Annie can include up to 48 radials.

[1]Notes appear on page 35.

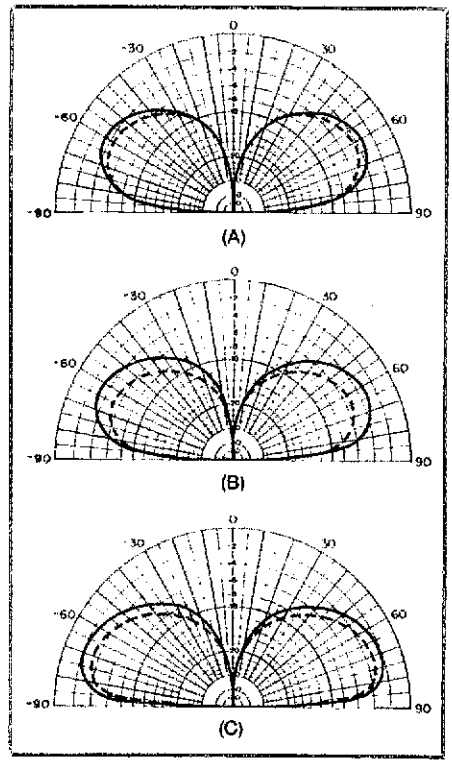


Fig. 1 — The NEC analysis (solid line) and Annie analysis (dashed line) for (A) poor ground, X = 0.1, E_r = 7; (B) good ground, X = 1.0, E_r = 15, (C) very good ground, X = 10.0, E_r = 30. X = conductivity (mS/m) divided by frequency. There are 48 quarter-wavelength radials on each vertical. Add 3 dB to values shown.

The results of the Annie analysis on the Apple computer were then compared with the results of the Numeric Electromagnetic Code — Method of Moments (NEC) program. This large computer program, run on a VAX 11-780® computer, can be considered to give exact results. The Annie analysis is always within 2 dB of the NEC analysis. This is a good agreement in view of the 20-dB price difference between the two computers! The results of this analysis are compared in Fig. 1.

Annie makes an approximate analysis of vertical antennas available to radio amateurs. Brian Edward, N2MF, has gone one step further and used NEC to analyze precisely a wide variety of vertical antennas. His work is the subject of a future *QST* article.

Arrays of Verticals

Verticals are excellent antennas for building large arrays. They may be phased to create a directional antenna, and the phasing can be changed electronically to point the array in different directions. Care must be taken to account for the coupling between verticals, as described by Forrest

*4397 Luna Course, Liverpool, NY 13088

†Parts 1, 2 and 3 of this series appeared in February, April and June 1984 *QST*.

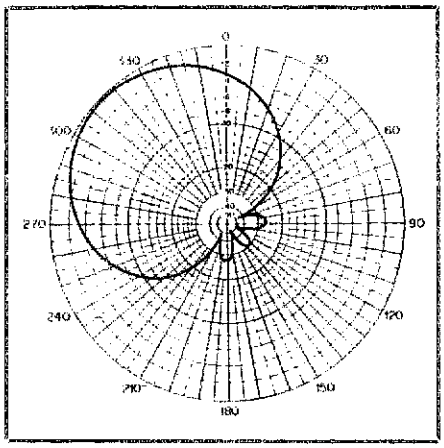


Fig. 2 — A four-element phased array of verticals over perfect ground can provide an excellent front-to-back ratio. The four elements are positioned around the circle at the 45° points. Add 9 dB to all values.

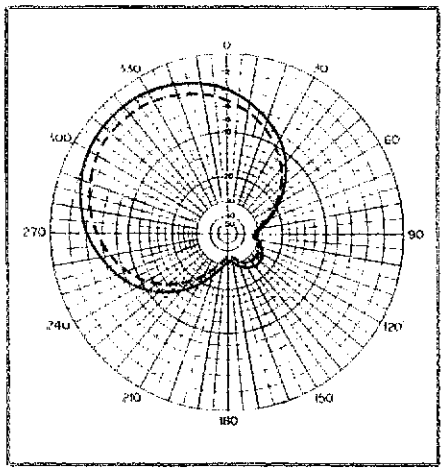


Fig. 3 — A real ground caused the side lobes of the array of Fig. 2 to melt into one and the peak gain to drop. The solid curve is for a very good ground, the dashed line for a poor ground. Add 6 dB to all values.

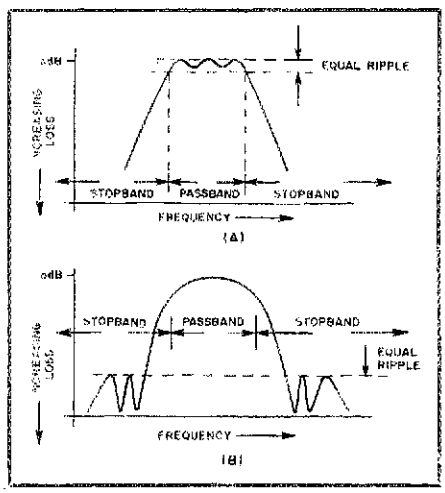


Fig. 4 — The Chebyshev filter can be designed for (A) equal ripple in the passband or (B) equal ripple in the stopband.

The Inverted V Revisited

Reactions to Part 2 of this series (on inverted Vs) varied tremendously. In that article, I stated that an inverted V is significantly poorer than a horizontal dipole. Several hams felt my conclusion was consistent with their experience. One even told me that he went right out and tore down his inverted V. (I forgot to mention that inverted Vs are better than *no* antenna!) One person, however, took exception to my conclusions, and wrote to tell me about it.

I had stated that the reason an inverted V is not as good as a dipole is because the vertical part of the antenna currents tend to cancel. Well, Ken Leiner, N4LC, suggested the following "thought experiment." Take a 100-W transmitter and perfectly match it to a lossless dipole. Now measure the total power radiated into space. The radiated power should be 100 W. Next, form the dipole into an inverted V. With the inverted V also perfectly matched to a 100-W transmitter, measure the total power radiated into space. This power should also be 100 W. But how can that be if half the antenna current cancels as I suggested in Part 2?

At this point, the answer became embarrassingly obvious. Yes, the vertical antenna currents cancel, but the input impedance of the inverted V has decreased (from that of a dipole), which allows the total antenna current to increase just enough to cause the total 100 W to be radiated. The vertical currents cancel, but the horizontal currents increase to make up for it. This means that the inverted V should be just as good as a dipole.

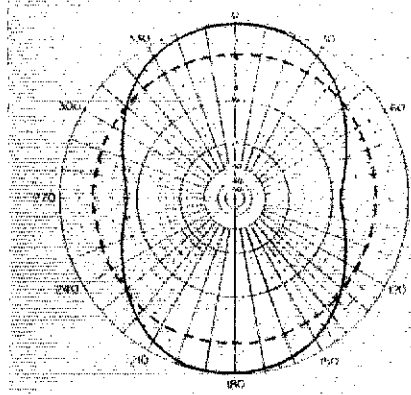
To check this conclusion, I used a numerical antenna analysis program (NEC) to analyze an inverted V in free space. Sure enough, the inverted V input impedance was about 38 ohms (down from the 73 ohms of a dipole) and the antenna current had increased, which compensated for the vertical components cancelling.

The maximum gain is still a ½ dB below that of a dipole. Where did the ½ dB go? When we changed the dipole into an inverted V, that power was taken from the broadside gain and radiated off the ends. In fact, that ½ dB of broadside power starts to fill in the null off the end to make the inverted V a more omnidirectional antenna than a dipole.

What about the effect of ground? NEC was also used to analyze the inverted V above an average ground (5 mS/m, epsilon relative = 15, f = 3.5 MHz). The apex was 0.2 wavelength high with an apex angle of 90°. This antenna was compared to a dipole 0.2 wavelength high.

Ground causes quite a bit of the inverted-V power to be radiated off the ends. In fact, at low radiation angles over perfect ground, there is more radiation off the ends than there is broadside to the antenna. Unfortunately, when we look at an inverted V from off the end, what do we see? It looks like a vertical antenna, and sure enough, the radiation off the end is vertically polarized. A good share of this radiation is absorbed by the ground. The total result for the dipole and inverted V is shown in the accompanying figure. The net result is that the inverted V over average ground is actually about 3 dB down from a dipole. As an omnidirectional antenna, however, it is substantially better.

Thanks to Ken Leiner, N4LC, for a point well taken, and thanks also to Dick Pitzeruse, K2NY, and Brian Edward, N2MF, for the NEC analysis.



The solid line represents the pattern for a dipole, and the dashed line is the pattern for an inverted V. The center of both antennas is 0.2 λ above ground. Add 3 dB to all values.

Gehrke, K2BT, in a series of *Ham Radio* articles.[2]

Gehrke's articles analyze a number of vertical phased arrays over perfect ground. Then he designed feed networks so that each element of the array would be excited with the proper phase signal. I used Annie to repeat one of his array analyses. The array has four verticals at the corners of a square 0.272 wavelength on a side. Two diagonal elements were driven 90° behind one corner element with the remaining corner lagging 180°. The results shown in Fig. 2 agree with his calculations. The array looks quite good over perfect ground. The maximum gain is almost 9 dB better than a dipole in free space, which means it is 3 dB better than a dipole above perfect ground.

What is the effect of real ground? Fig. 3 shows Annie's results for a good and a poor ground. First, the side lobes all melt into one lobe. Fortunately, that lobe is still very small. As for peak gain, the edge of the plot has been reduced to less than 6 dB greater than a dipole in free space. Notice that the array has a peak gain that isn't even as good as a dipole over perfect ground. Since the low-angle radiation of a horizontal dipole over real ground is nearly the same as over perfect ground, the situation does not look good.

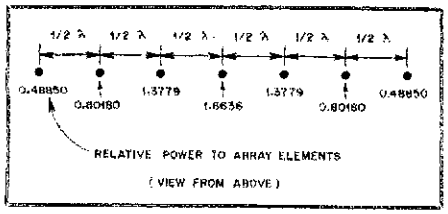


Fig. 5 — The locations (as viewed from above) of the verticals in a Chebyshev antenna array. Each element is labeled with its relative amount of power.

But what do we want from the vertical array? We want low-angle radiation. A dipole must be quite high to provide low-angle radiation. The angle of radiation from the vertical will be low with a high-conductivity ground or, to a lesser extent, with a large radial system.

If properly designed, the vertical array we just analyzed could have significantly better low-angle radiation than a dipole. This makes it a potentially good DX antenna.

Filter or, Rather, Antenna Design

In the last installment, I mentioned that there is a strong similarity between signal processing in the frequency domain (filters) and in the spatial domain (antennas). An antenna can notch out a signal coming from a certain direction just as easily as a filter can notch out a signal at a certain frequency.

If you have worked with filters, you may have heard of Chebyshev filters. These filters are designed to have a frequency response equal to one of a group of equations known as Chebyshev polynomials. A Chebyshev filter can provide equal ripple in the passband (Fig. 4A) or in the stopband (Fig. 4B). Steinberg describes how to design an antenna array that is similar to a filter that has equal ripple in the stopband.[3] The array Steinberg used as an example is shown in Fig. 5. All elements are driven in phase, and the weights are the relative amounts of power going to each element.

Fig. 6A shows the pattern over perfect ground when the elements are spaced ½ wavelength apart. Note that the "equal ripple in the stopband" has translated to equal side-lobe levels. Note also that there are 12 nulls. When the elements of an array are spaced ½ wavelength apart, there are always $2(N-1)$ nulls, where N is the number of elements. In this case, we have seven elements and 12 nulls. (How many nulls does a one-element array have?

Now, suppose we want to electrically point the array in another direction? This is done by phasing the elements. For example, if the first element is kept at its present phase and the second is delayed by 45°, the

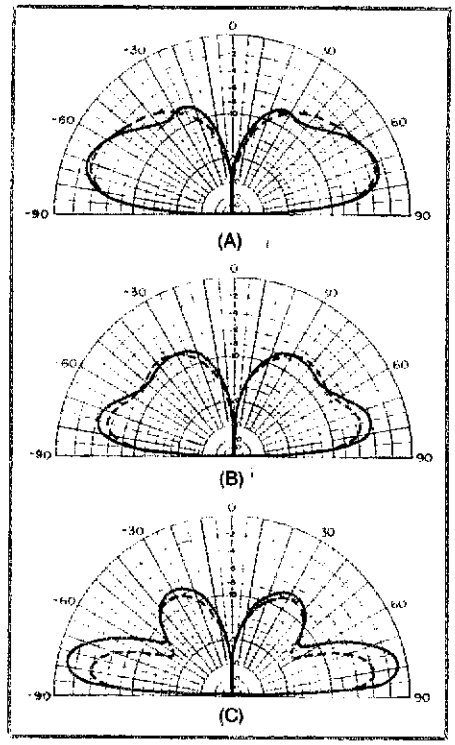


Fig. 7 — The 5/8-λ vertical with 48 quarter-wavelength radials and the same: (A) poor, (B) good, and (C) very good ground as Fig. 1. The solid line is the NEC analysis, and the dashed line is the Annie analysis. Add 2 dB to all values.

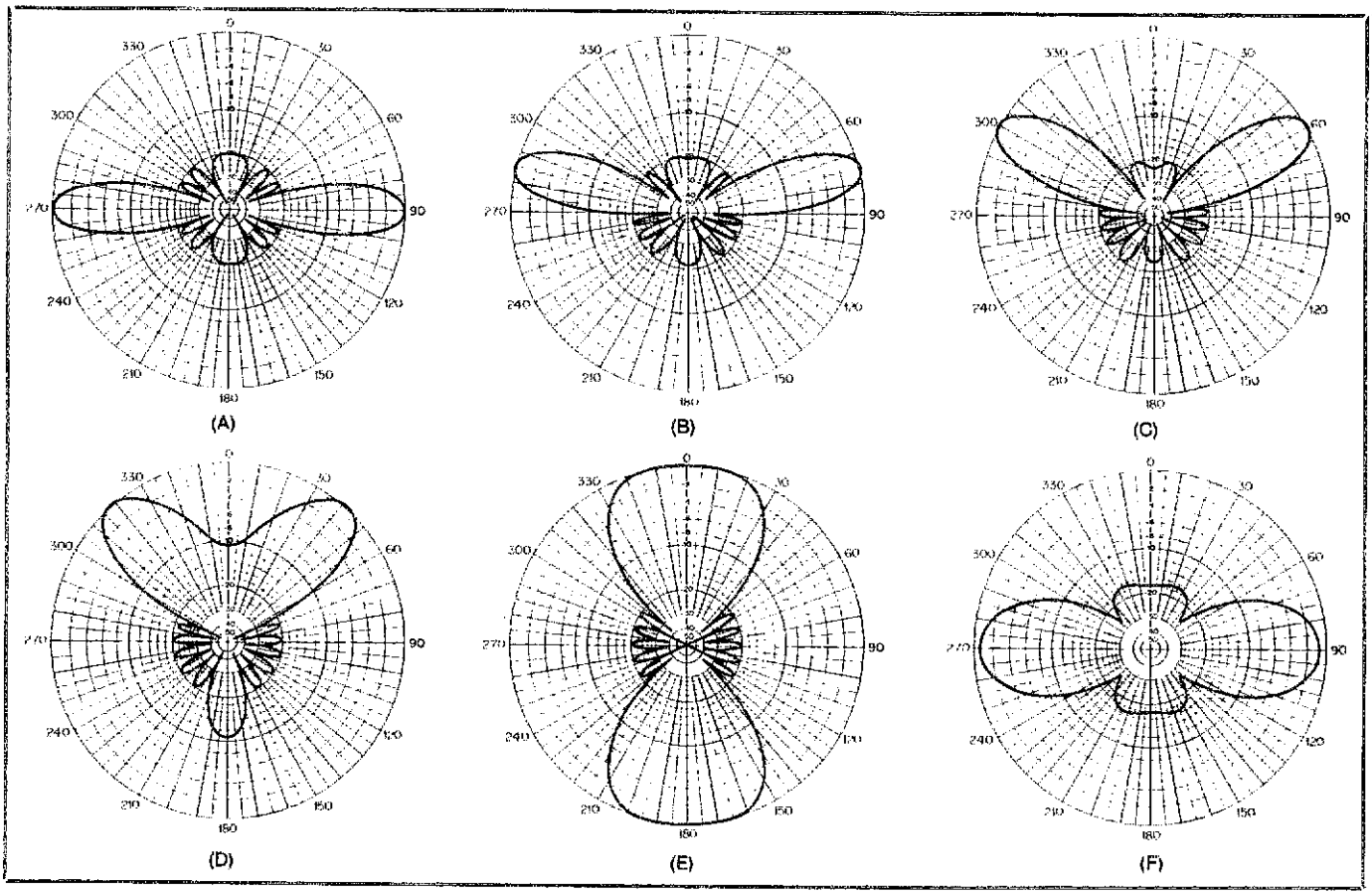


Fig. 6 — Patterns of the Fig. 5 array over perfect ground. At A, all elements are in phase; for B, each element has been shifted 45° from the previous element. At C, the elements are shifted 90°; at D, the shift is 135°; and, at E, the phase is shifted 180° for each element. The pattern at F is with all elements fed in phase, but with a poor ground. Each vertical has 32 quarter-wavelength radials. Add 11 dB to values shown.

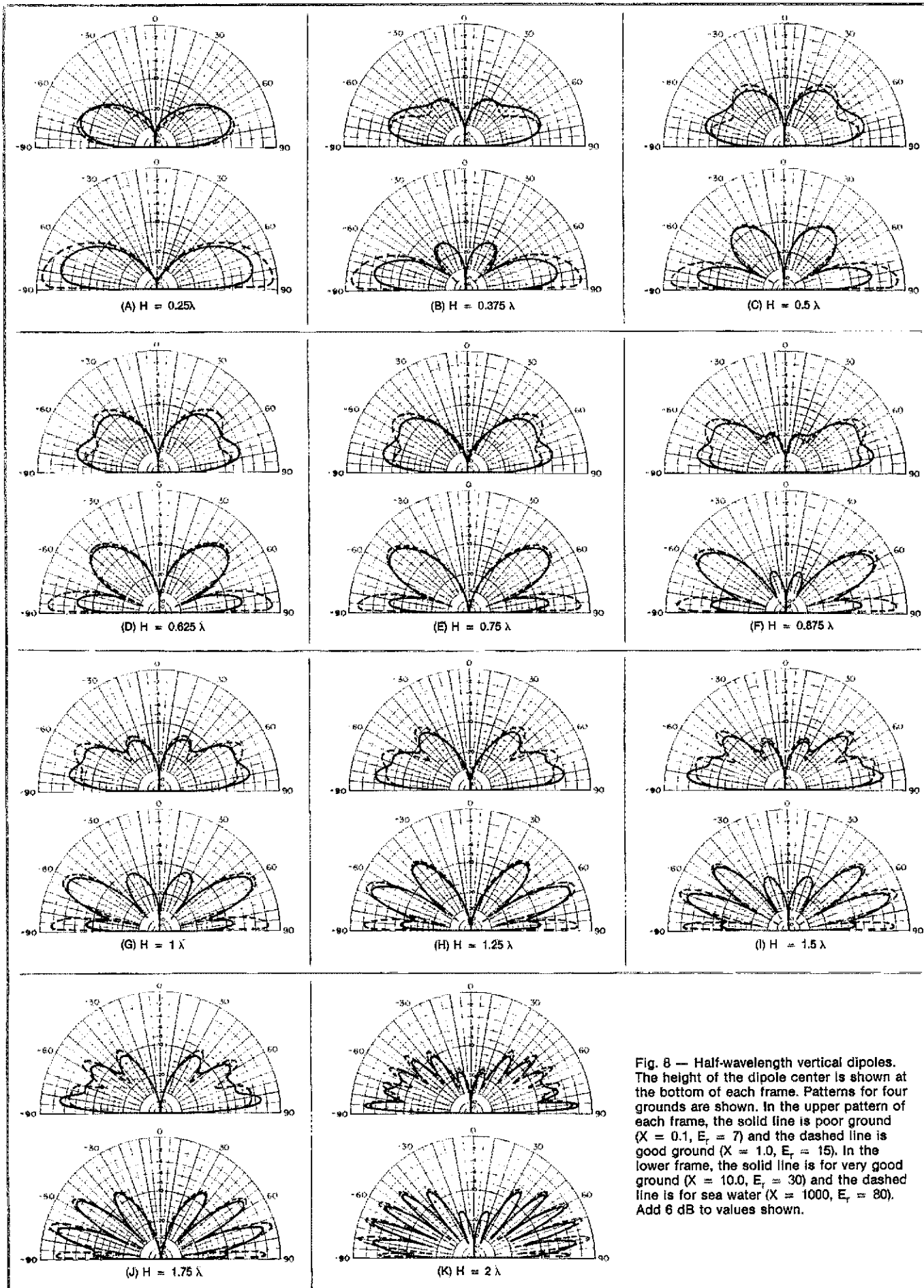


Fig. 8 — Half-wavelength vertical dipoles. The height of the dipole center is shown at the bottom of each frame. Patterns for four grounds are shown. In the upper pattern of each frame, the solid line is poor ground ($X = 0.1$, $E_r = 7$) and the dashed line is good ground ($X = 1.0$, $E_r = 15$). In the lower frame, the solid line is for very good ground ($X = 10.0$, $E_r = 30$) and the dashed line is for sea water ($X = 1000$, $E_r = 80$). Add 6 dB to values shown.

third by 90° and so on, we will have the pattern of Fig. 6B. Note that there are still 12 nulls.

The other parts of Fig. 6 show still other phasing arrangements. Fig. 6A has a very narrow beamwidth, while Fig. 6E has a wide beamwidth. In these plots, we are looking down on the array from above. The array elements are placed on a line that goes from the top of the page (zero degrees) toward the bottom (180°). So an observer at zero degrees would see the elements lined up, one in back of the other, while an observer at 90° would see the verticals all spread out. This gives us a clue as to why the beam is narrower in one direction than another. If you are standing in the direction of the main lobe of the pattern, the bigger the array looks to you, the narrower the beamwidth will be. This is analogous to signals having a narrower bandwidth for wider, or longer, pulses. Compare slow- to high-speed CW signals.

Fig. 6F shows the pattern that results if the ground conductivity is poor (X = 0.1). As before, the nulls melt away and the gain of the array is reduced.

You may wonder why we don't design an antenna that is like a filter with "equal ripple in the passband" or in the direction of the main lobe. When designing filters, we work with a mathematical concept known as poles and zeros. The poles represent parallel resonances, and the zeros represent series filter-circuit resonances. Zeros are simply the antenna-pattern nulls. To design an antenna that has equal ripple in the passband, we would need to use poles in the solution. Here we come to a basic difference between filter design and antenna design: The antenna designer cannot use poles (well, at least not the mathematical kind!).

Is 5/8 λ Better?

Vertical antennas 5/8 λ long are often used to obtain better low-angle radiation. Fig. 7 shows the results of Annie and NEC analysis. Even for the 5/8-λ vertical, Annie's results are always within 2 dB of the more accurate NEC results.

Both NEC and Annie give us a big surprise. The pattern of a 5/8-wavelength vertical above poor ground (Fig. 7A) is better at all angles than above average ground. Except for within about 15° of the horizon, a poor ground is better than a very good ground! What the computers are telling us is that with a poor ground, if you can put up a 5/8-wavelength vertical instead of a ¼-wavelength one, by all means do it. The benefit is especially significant at higher frequencies. We have been estimating how good the ground is by using the variable X defined as conductivity (mS/m) divided by frequency (MHz). The higher the frequency, the poorer the ground for a given conductivity.

There is something unusual in Fig. 7. The very good ground pattern (Fig. 7C) has a null in it that is washed out in the poor ground pattern of part A. Since the only thing that was changed between patterns is the ground, that null must be caused by increasing the ground conductivity. We will run into this effect again.

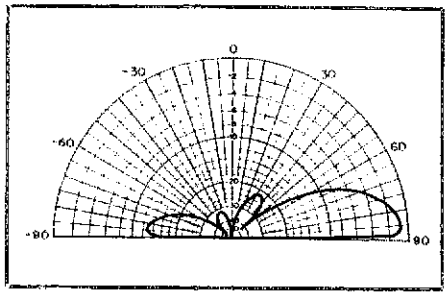


Fig. 9 — The horizontal-plane radiation pattern of two vertically oriented Yagi beams spaced ½ λ apart and fed in phase provide 15-dB gain over a free space dipole (9 dB better than a dipole above perfect ground). This pattern is at 5° above the horizon. Add 16 dB to all values.

Brewster Angle

The vertical, or theta-cut, pattern of an antenna is determined by the vector sum of the direct ray from the antenna and the ground-reflected ray. For horizontal polarization, the amount of the reflected ray that gets absorbed and with what phase the ray is reflected vary only a small amount. Vertically polarized rays, however, can vary widely with only small changes in conductivity or angle.

Foremost among these effects is something known as the Brewster angle.[4] If we have a perfectly insulating ground, then, at some angle, all of the vertically polarized wave is absorbed by the ground and none is reflected. This can hurt the pattern, because it is the reflected wave that provides an antenna with an extra 6 dB of gain over that same antenna in free space. Horizontally polarized waves are unaffected by this Brewster-angle absorption.

If the ground is not a perfect insulator, only some of the reflected wave will be absorbed at the Brewster angle, or, more properly, pseudo-Brewster angle. If the ground is a perfect conductor, none of the reflected wave is absorbed.

Fig. 8 shows a large number of vertical dipoles over various kinds of ground. It is similar to the chart for horizontal dipoles presented in Part 1 of this series. There is one extra curve, for X = 1000 and epsilon relative = 80. This is sea water, with a conductivity of 10,000 mS/m and a dielectric constant of 80. If your antenna points out over the ocean, that's the curve to use.

Some impressive patterns are possible with the ocean nearby. Fig. 8B shows a vertical dipole only 0.375 λ high. The maximum radiation is 5° above the horizon. Little wonder those DXpeditions can turn out such good signals with simple vertical antennas!

To see what the Brewster angle does, look at patterns from a half-wave dipole with its center ¾ λ above ground (Fig. 8E). The curve for X = 0.1 (a poor ground) isn't good, but at least it has a fair amount of low-angle radiation. That strange, washed-out null is there, however, just like it was with the 5/8-λ vertical.

As we might expect, that null is caused by the lack of any reflected wave at the Brewster angle. So, if we increase the ground conductivity (which is easy to do on a computer!), the reflected wave should increase in strength and improve the pattern. What happens is that the null becomes deeper and sharper. This means that the reflected ray is actually out of phase with the incident wave, rather than in phase. We were better off with the reflected wave being absorbed by the poor ground.

Fig. 9 shows the vertical-plane pattern of two Yagi beams side by side and driven in phase, also 0.375 λ high. That is 25 feet high on 20 meters.[5] What Annie is saying is, if you are pointing your antenna out over the ocean, make sure it is vertically polarized and you will have a great time, even if it is only 25 feet high.

Conclusion

Vertical antennas can be good DX performers, if designed properly. With a good ground and a large number of long radials, a ¼-λ vertical can do a good job. With a poor ground, the 5/8-λ vertical is a good alternative. If you're fortunate enough to have an ocean in your back yard, a modest vertical antenna will work wonders. Caribbean, anyone?

Notes

[1]Annie runs on the Apple® II+ (48 or 64 kbyte) or //e, or the Commodore-64™ computer. It is available for $49.95 ($39.95 for the C-64 version) plus $2 handling (NY residents add sales tax). Include full name and call. Sonnet Software, Dept. Q., 4397 Luna Course, Liverpool, NY 13088.

[2]F. Gehrke, "Vertical Phased Arrays," *Ham Radio*, May and June 1983.

[3]B. Steinberg, *Principles of Aperture and Array Design*, (New York: John Wiley & Sons, 1976). pp. 111-119.

[4]C. Hutchinson, "DX and the Brewster Angle," *QST*, May 1983, p. 43.

[5]m = ft × 0.3048.

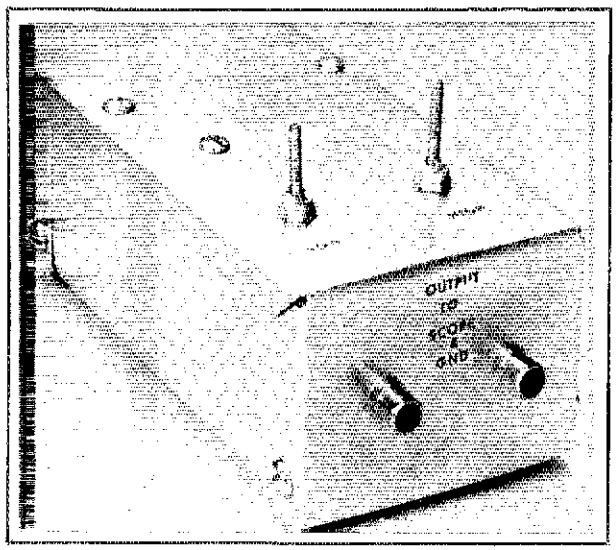
Strays

***QST* congratulates...**

☐ Benjamin G. Shatz, N6COG, of Pacific Palisades, California, on achieving the rank of Eagle Scout.

☐ Doug Smith, KE4KP, on being appointed to the Alabama Forestry Commission.

A Passive RTTY Scope Adapter



This simple project can help you tune in the world.

By Albert F. Lescard,* K1TJV

Nowadays, many of us have a computer in our shack and use it to operate Baudot or ASCII radioteletype (RTTY) and CW. After connecting our computer and modem, we may find ourselves hunting for an RTTY tuning-scope output. Until recently, many modems did not have scope output connections. Many operators like to copy commercial RTTY stations that use various shifts and speeds. Without a scope to display the familiar cross pattern, it's difficult to determine the frequency shift of the received station. Some amateurs own modems equipped only with 170-Hz-shift filters. By using mark- or space-only copy, it is possible to receive stations using shifts other than 170 Hz. If you have a scope, tuning in the station is easy. A special tuning scope is not required. Almost any oscilloscope may be used in this service. Simply connect the mark- and space-filter outputs to the X and Y scope inputs.

The adapter described here connects between your receiver or modem audio output jack and your tuning scope. The adapter needs no power supply. When initially adjusted to display an 850-Hz-shift cross pattern, it is useful with shifts as low as 170 Hz. It can be assembled in an evening, and many parts may be available from your "junk box."

Circuit Description

Refer to Fig. 1. T1 is used to step up the low-level audio input signal to about 5 or 10 V. This potential is applied to the filters. The filters separate the mark and space tones, and feed the signals to the horizontal and vertical scope channels. While a filament transformer is shown being used here, an audio output transformer is also suitable. The 4- or 8-ohm winding of the transformer should be connected to J1.

Construction

J2 and J3 are mounted at one end of the enclosure, about 1¼ inches apart.[1] The audio input jack, J1, is mounted in the center of the opposite end of the box. T1 is placed close to J1, and a six-lug terminal strip is mounted across the middle of the box. The terminal strip simplifies mounting the capacitors and making interconnections among the various components. Two 5/16-inch-diameter holes are drilled in the top of the box near J2 and J3, and the inductors are secured in these holes. The physical layout of my adapter can be seen in Fig. 2.

Tune-Up

Connect the outputs of J2 and J3 to the

[1]mm = in × 25.4.

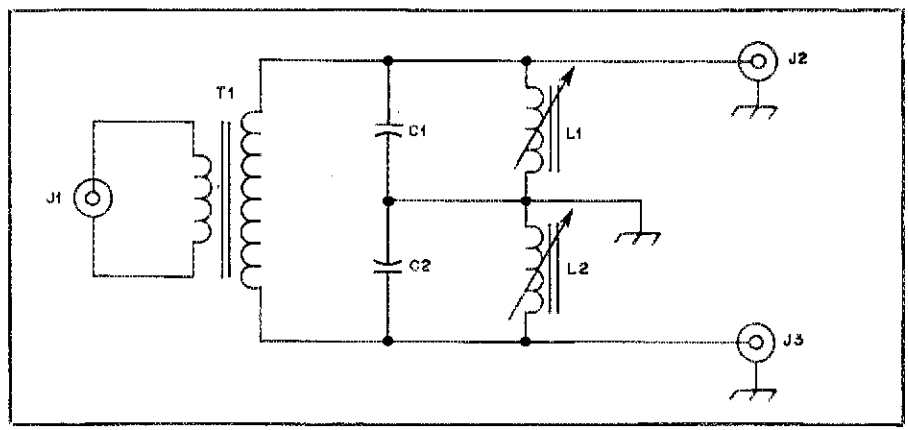


Fig. 1 — Schematic diagram of the RTTY Scope Adapter.

C1 — 0.1 μF/250 V, paper or Mylar.
C2 — 0.05 μF/250 V, paper or Mylar.
J1 — 1/8-inch-diameter, two-conductor phone jack (Radio Shack 274-251).
J2, J3 — Phono jack (Radio Shack 274-346).
L1, L2 — Adjustable inductor, 30-105 mH (J. W. Miller 9007 or equiv.). Available from Bell Industries, J. W. Miller Division, 19070 Reyes Ave., P.O. Box 5825, Rancho Dominguez, CA 90224. [Editor's Note: TV width coils may be used with appropriate changes in capacitor values.]
T1 — 6.3-V filament transformer or audio output transformer.
Misc. — Aluminum box, 2-1/8 × 3 × 5-inch (HWD) (Radio Shack 270-238); six-lug terminal strip (Radio Shack 274-688).

*39 Maplewood Ave., Tyngsboro, MA 01879

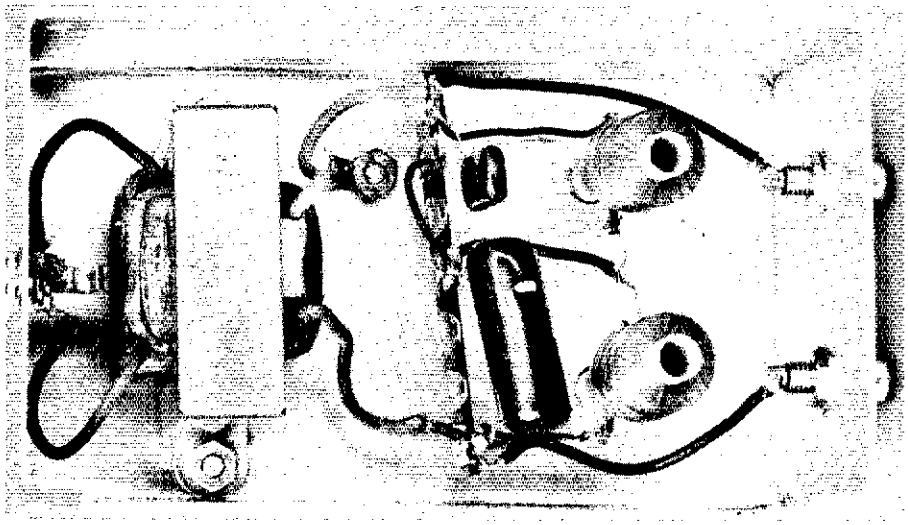


Fig. 2 — An inside view of the scope adapter.

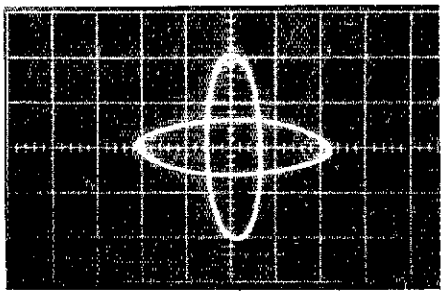


Fig. 3 — Scope display with the adapter set for 170-Hz shift and the signal properly tuned in.

scope terminals, and J1 to an audio source producing a 2125-Hz mark tone. An audio signal generator, or tones from your receiver or modem may be used. Adjust L1 for a maximum indication on the scope. While feeding in a 2925-Hz space tone, adjust L2 for a maximum indication on the other scope axis. The scope adapter is now ready for use with all shifts from 850 Hz to 170 Hz. If the adapter is to be used only on the ham bands, L2 may be peaked for 2295 Hz (170-Hz shift), but the performance of the adapter will suffer if used to display shifts greater than 170 Hz.

Strays

***QST* congratulates...**

☐ the following radio amateurs on 50 years as an ARRL member:

- Lyle W. Mabbott, W7KMF, of Dubois, Wyoming
- Esmond K. Volz, W4WTW, of Palm Harbor, Florida
- Reginald R. Cain, Jr., W4CYC, of Phenix City, Alabama
- Norman T. Dennis, W5YB, of Pensacola, Florida
- Lloyd Frohring, W8PMJ, of Chagrin Falls, Ohio
- Roger W. Barton, W2LOG, of Ithaca, New York

I would like to get in touch with...

☐ anyone in the Minneapolis area interested in working on a cable television show about ham radio. George Fisher, KCØKM, Programming Operations Supervisor, Rogers Cablesystems, 10210 Crosstown Circle, Eden Prairie, MN 55344, tel. 612-941-9820.

☐ anyone with information on converting a Vexilar Model 400 marine VHF transceiver for amateur use on 2 meters. Otto Strecker, N5EO, 214 N. 11th St., Tonkawa, OK 74653.

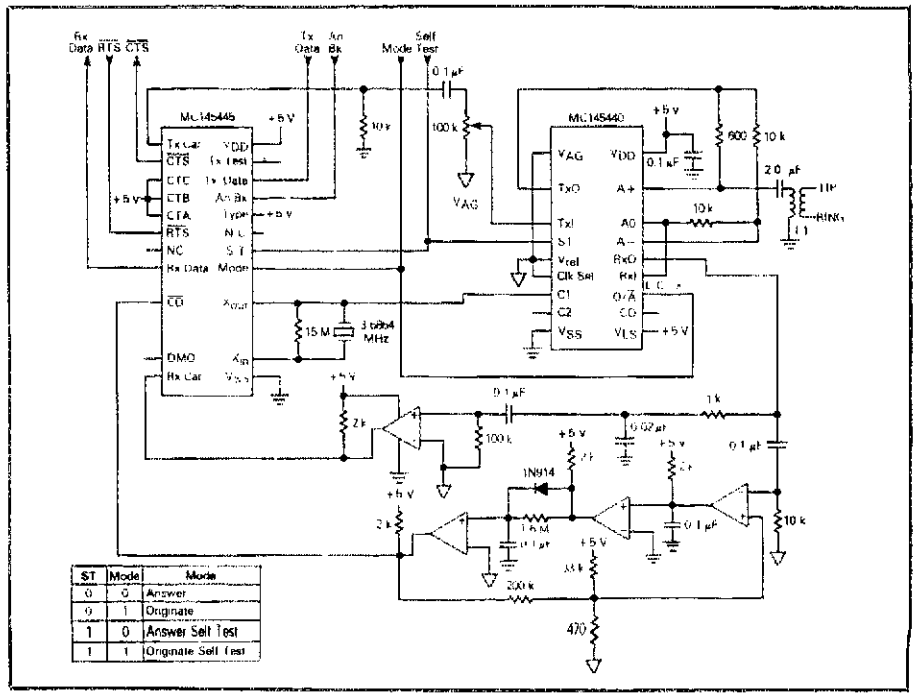
New Products

MOTOROLA MC145445 CMOS 300-BAUD MODEM

☐ Combining the MC145445 modem IC with a Motorola MC145440 filter IC provides you with the major components to make up a 300-baud Bell 103 modem. By tying pin 18 (TYPE) low and substituting an MC145441 filter IC for the '440, a CCITT V.21 modem may be constructed. Fig. 1 is a schematic diagram of a typical modem, taken from the Motorola data sheet.

The MC145445 uses differential delay detector demodulation and provides high-performance, low-cost modem operation with a low bit-error rate. Some of the features of this 22-pin package include: eight selectable RTS/CTS delay options, an answer-back tone generator, a carrier-detect input and TTL compatibility.

The MC145445 is priced at less than $9 in quantities of 1000. Contact your local Motorola sales office or nearest distributor for further information. — *Paul K. Pagel, N1FB*



The Magic of Transistors

Part 8: Invented by Bardeen, Shockley and Brattain at Bell Labs in 1947, the transistor has made our modern electronic world possible. Let's look at how they're used in Amateur Radio.

By Doug DeMaw,* W1FB

Doesn't everything today have transistors in it? Well, not quite. The vacuum tube remains "king of the hill" in terms of power versus cost in some applications. But, most small electronics gadgets and home-entertainment devices rely 100% on transistors or versions of the transistor (integrated circuits, or ICs).

Why is a transistor better than a tube? There are many reasons: greater reliability, increased longevity, lower cost, smaller size and reduced heating. The vacuum-tube equivalent of a 2N3904 transistor (available these days for as little as 15 cents, and smaller than a pea) would be as large as a tube of lipstick, and would cost $8 or $10 new. Furthermore, the tube would be fragile, whereas the transistor could take a pretty heavy buffeting before it became damaged. If we were to regress in the technology, and attempt to build a personal computer or a calculator from vacuum tubes, it would fill an entire living room with racks of equipment and large power supplies. I helped develop one of the first military computers in the early 1950s while employed in a research lab. Known as the MIDAC computer (Michigan digital automatic computer), it was used for BOMARC missile guidance. It filled a huge room, and stood in 6-foot equipment racks lined up side by side in 10-foot rows![1] The same system today could be reduced to the size of an office typewriter (without the radar display tube and electrical joysticks). Dozens of vacuum tubes were used in but one of the many circuits. Today, a single postage-stamp-size IC could be used in place of the tubes.

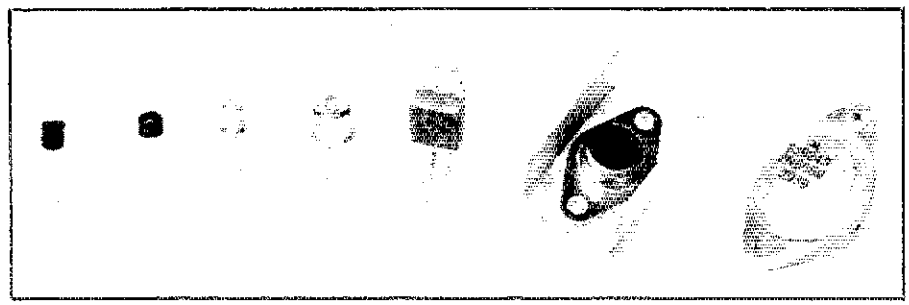


Fig. 1 — Left to right are low-power, medium-power and high-power transistors. There are many case styles for transistors.

What is a Transistor?

A transistor is an active semiconductor with three or more terminals. The name was derived from "transresistor" for "transfer resistor." It is made from silicon or germanium crystals that are usually formed into a junction or sandwich, as are the diodes we discussed last month in *QST*. The main difference is that a transistor has three elements (emitter, base and collector), whereas the diode has only a cathode and anode. The transistor can amplify signal current, but the diode cannot. Also, a transistor requires an operating voltage (it is an *active* device) for it to amplify. A diode, on the other hand, is a passive device; it does not need an operating voltage to make it rectify or clamp. It does, however, need an *applied* voltage if it is to perform a task for us. Junction transistors are commonly referred to as "bipolar transistors," sometimes abbreviated BJT (bipolar junction transistor). Fig. 1 illustrates a variety of styles and sizes of bipolar transistors.

How does a transistor compare to a tube in general terms? Look at Fig. 2 and you will observe a similarity in the symbols for the two components. Each one contains three working terminals, but the tube has two additional terminals (filaments), which are necessary for heating the cathode. Without the heaters or filaments, the tube cannot function. The transistor needs no heater. Some tubes have what are called "directly heated cathodes." They have no cathode element, and the filaments serve double duty as the heater and cathode. Those tubes reach operating conditions

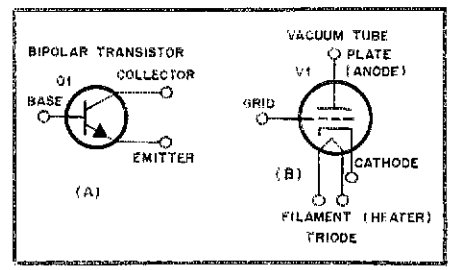


Fig. 2 — Symbol (A) for a bipolar transistor. A triode vacuum-tube symbol is included (B) for illustrating the similarity between the two triode devices.

[1]m = ft × 0.3048.

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

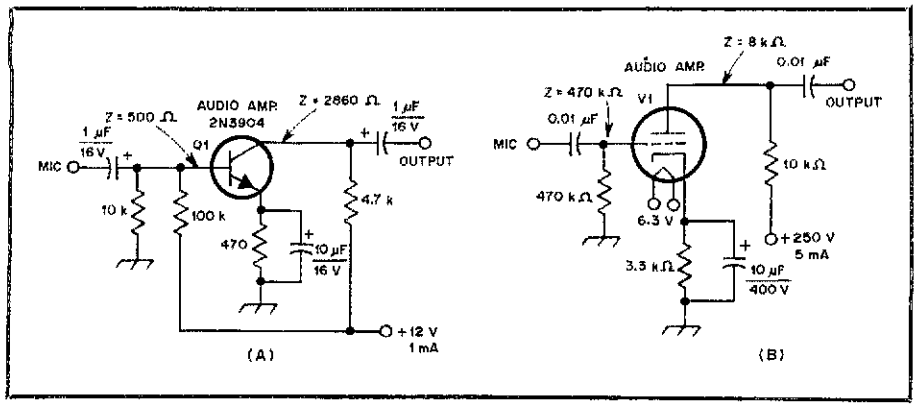


Fig. 3 — A practical circuit example for a transistorized audio amplifier (A) and a tube amplifier (B). Note the differences in the operating voltages and impedance levels (see text).

(from turn-on) almost as quickly as transistors do.

The example of Fig. 2B shows a triode tube that requires a warm-up time. It has separate filament and cathode elements. The transistor of Fig. 2A can be compared to the triode tube. That is, the base equates to the grid, the collector to the plate and the emitter to the cathode. Both are triodes (three electrodes), and both devices amplify ac or RF energy. The transistor amplifies current, however, while the tube amplifies voltage (ac).

Additional differences are (1) the transistor requires much lower operating voltage than does the tube, and (2) the tube has higher impedances at its terminals than does a transistor. For example, the input impedance of the transistor might present an effective impedance (ac equivalent of dc resistance) of 500 ohms at the base (base to ground), but the tube in a similar circuit could have a grid-to-ground input impedance of 1 megohm or greater. Similar comparisons can be made between the transistor collector and tube plate. Therefore, different design methods are needed for the two devices.

Let's look for a moment at Fig. 3. It shows a transistor and a tube in similar circuits. Note the differences in the operating voltages and terminal impedances. You can see there is quite a difference between the two circuits, even though they are each capable of providing approximately the same amount of amplification. The term "Z" is electronic shorthand for "impedance." You will run across this expression many times in your studies. You will observe also from Fig. 3 that the values of the resistors and capacitors are substantially different for the pair of circuits.

Additional Transistor Types

Actually, there are two types of bipolar transistor. One is called an NPN transistor, and the other is a PNP device. Symbols for the two varieties are given in Fig. 4. The NPN (negative-positive-negative) unit requires a positive operating voltage on the base and collector, but the PNP (positive-negative-positive) device needs a negative voltage on the base and collector. The distinguishing feature in the symbol that separates the two types is the direction of the emitter arrow. Observe that the arrow points out for an NPN transistor, while it points in for the PNP unit. Most transistors today are of the NPN kind, except those used for audio work. At the beginning, most transistors were PNP types, because germanium was used instead of silicon for the internal structure.

There are numerous types of tubes — some containing more than three elements. Some have four elements (two grids), and they are known as tetrodes. There are also pentodes and heptodes. In a like manner, we have transistors with an additional element. A common example is the dual-gate FET (field-effect transistor). The symbols for that and a single-gate JFET (junction FET) are shown in Fig. 5. As is the case with bipolar transistors, we have N- and P-channel FETs. The arrow in the symbols indicates the polarity of the device. At A of Fig. 5, we can see a JFET. It has an internal sandwich type of junction, as does the bipolar transistor. The dual-gate MOS (metal-oxide silicon) FET at B of Fig. 5 has a thin layer of oxide as insulating material between the gates and the remainder of the device. The drawing at C of Fig. 5 illustrates in simple terms the names of the elements within an FET. We can equate the FET to the triode tube by saying that the gate and grid are related, as are the drain and plate, and the source and cathode. The major difference between FETs and bipolar transistors is that the input impedance of the FET is similar to that of a triode tube — usually 1 megohm or greater. The effective Z is usually determined by the value of the gate-to-ground resistor used. A practical comparison between a tetrode tube and a dual-gate FET is shown in Fig. 6. We can see that the two transistor gates are used in a similar manner to the pair of grids in the tube example. A popular dual-gate MOSFET is the RCA 40673. Another is the Texas Instruments 3N211 device. When it comes to JFETs, you may recognize the

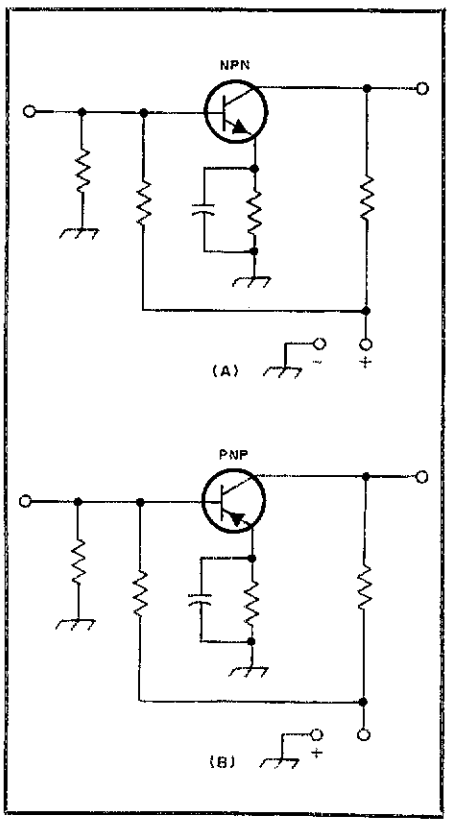


Fig. 4 — An NPN transistor (A) uses a positive collector voltage. The PNP transistor (B) requires a negative collector potential. Note the direction of the arrows for the two devices.

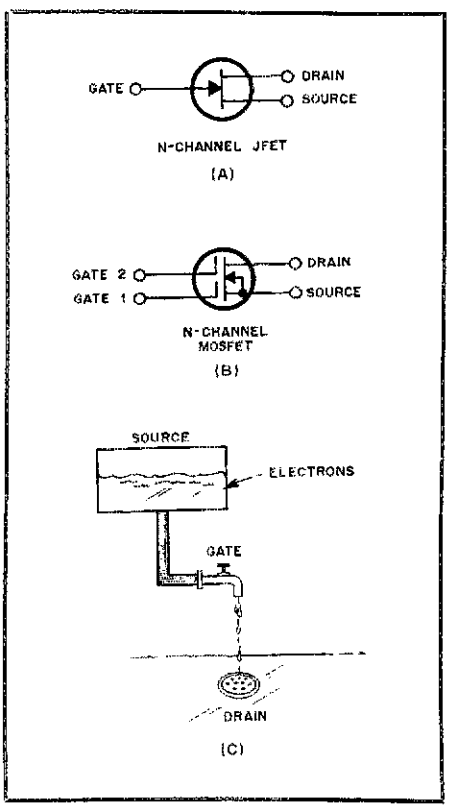


Fig. 5 — A JFET symbol is shown at A. A dual-gate MOSFET symbol is seen at B. The drawing at C shows how an FET operates.

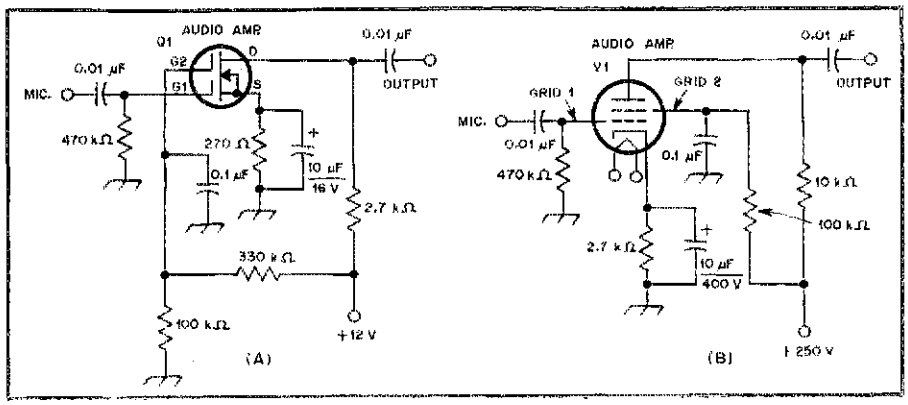


Fig. 6 — Circuit examples of a dual-gate MOSFET (A) and a tetrode tube (B) to show the similarity between the two devices.

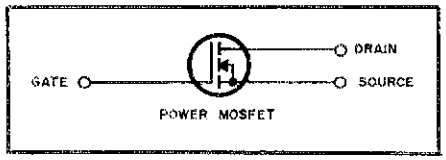


Fig. 7 — Circuit symbol for an MOS power FET of the enhancement-mode variety.

number MPF102, which is an almost generic type of JFET nowadays.

Power Transistors

Thus far we have discussed only those transistors used for small-signal (low-power) applications. But, transistors can also accommodate large amounts of power. By combining many power transistors, we can build audio or RF amplifiers that deliver more than 1000 W of output power. Although no single transistor can do that job by itself, it is entirely possible to obtain more than 1000 W of output power from a single vacuum tube. It is in this area that the tube is still "king of the mountain."

There are high-power bipolar transistors and high-power MOSFETs, too. The electrical symbol for a power FET is somewhat different from that of a small FET (see Fig. 7). FETs with the three lines in place of the single drain-source line (as in Fig. 5B) are called "enhancement-mode FETs." When a single drain-source line is used it signifies a "depletion-mode FET." The difference is beyond the intent of this discussion, but it is worth mentioning to help avoid confusion.

Power transistors can generate a large amount of internal heat when they are operating. For this reason we need to use *heat sinks* to help keep them cool. Cooling fans are used on big tubes for the same reason. Excessive heat is the enemy of all electronics parts. A heat sink is a metal device that conducts the internal heat of the transistor outward. Many heat sinks are made from extruded aluminum, and they may have several rows of cooling fins on them. The transistor must be mated firmly to the heat sink to reduce "thermal resistance." Otherwise, the heat sink may be ineffective and the transistor will be destroyed. A thin layer of silicone grease is generally applied between the transistor body and the heat sink to aid the thermal bond. Some typical heat sinks are shown in the photograph of Fig. 8.

A power transistor can draw several amperes of current when a relatively low operating voltage is applied. Conversely, most power tubes require very high voltage, but draw milliamperes, rather than amperes, of current. The input and output impedances of high-power transistors are very low, often less than 1 ohm! This makes it quite difficult to work with them unless special input and output matching techniques are employed.

Combining Transistors

Everyone has heard about integrated circuits. You may think of them as large families of transistors residing under one roof. It is possible to have literally hundreds of transistors within a single IC. ICs help reduce the parts count in a circuit, leading to more-compact assemblies. The shortfall is that if one tiny internal transistor fails, the entire IC must be replaced! A number of ICs are shown in Fig. 9. ICs are available for amplifying signals to a moderate power-output level, but they are not as husky in that respect as big discrete (individual) transistors are.

ICs may contain MOSFET or bipolar transistors, or a mixture of both. They also contain diodes, resistors and capacitors. The internal workings of a simple IC are shown in Fig. 10. It is designated U1. U, the standard symbol for an IC, stands for "unrepairable." The innards we see at A of Fig. 10 are those of an RCA CA3045 transistor-array IC. Since all of the transistor leads come out of the case separately, we can use this IC in the same

Glossary

heat sink — a metal clip or plate to which a transistor can be attached for the purpose of conducting heat away from the transistor.
heptode — a type of vacuum tube that contains seven electrodes.
JFET — a junction field-effect transistor.
MOS — abbreviation for metal-oxide silicon.
MOSFET — a field-effect transistor that uses MOS material as the gate insulation.
NPN — designator for a bipolar transistor that requires a positive base and collector operating voltage.
pentode — a type of vacuum tube that contains five electrodes.
PNP — designator for a bipolar transistor that requires a negative base and collector operating voltage.
substrate — the crystalline foundation (usually silicon) on which an IC is formed.
tetrode — a vacuum tube that has four electrodes.
thermal resistance — the effective resistance to the passage of heat between two objects bonded together.
Z — abbreviation for impedance.

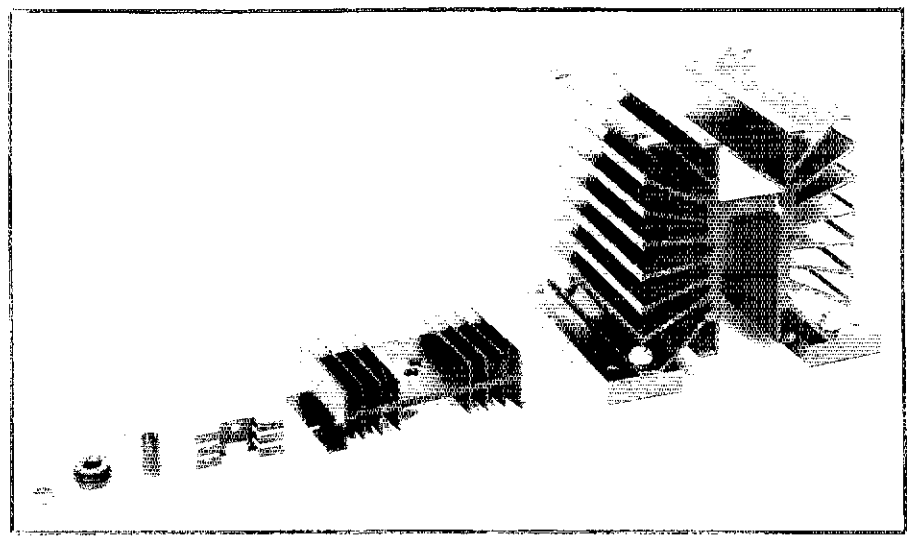


Fig. 8 — Transistor heat sinks, like transistors themselves, come in a variety of shapes and sizes.

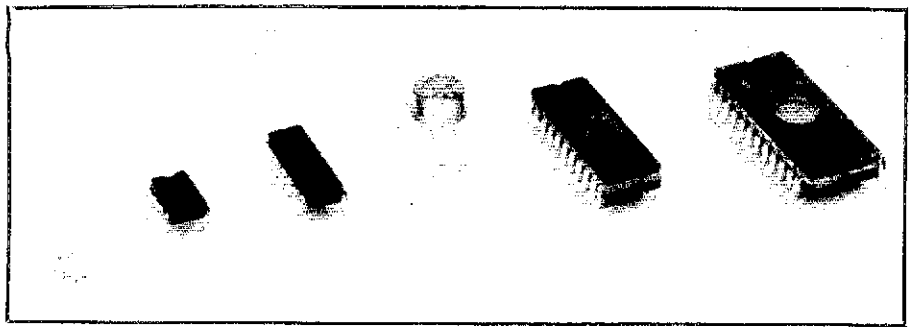


Fig. 9 — Some ICs. Each pin on the case is connected to an internal component, such as a transistor, diode, capacitor or resistor.

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manner as five discrete transistors. Yet they are all contained in a compact assembly. The illustration of Fig. 10B is the physical format of a 14-pin, dual-in-line-package (DIP) IC. The CA3045 is one of the very simple ICs. Hundreds of transistors, resistors, capacitors and diodes can be similarly housed. The really big ICs are called LSI chips (large-scale integration). They may have as many as 40 pins coming from the case. Many LSI ICs can be found in computers and similar equipment.

There are two prominent classes of ICs. Those designed expressly for use in ac and RF circuits are referred to as linear ICs, and those meant for digital and logic applications are called logic ICs. Some hams refer to them as "analog chips" and "digital chips," respectively. The loose term "chip" refers to a piece of silicon crystal on which the IC is formed. This material is known as the "substrate."

Transistor Housing

There are numerous trappings in which a transistor may dwell. You will read about and hear mention of such things as TO-5, TO-3, TO-220, TO-92, TO-18, TO-59 and many other numbers. Don't let this confuse you. It merely signifies the physical format of the case in which the device is contained. The greater the power capability of the transistor, the larger the case it is built into. Many of the cases are designed to permit the transistor body to be mated with a heat sink. Small transistors may be in tiny metal or plastic cases, since they need no heat sinks.

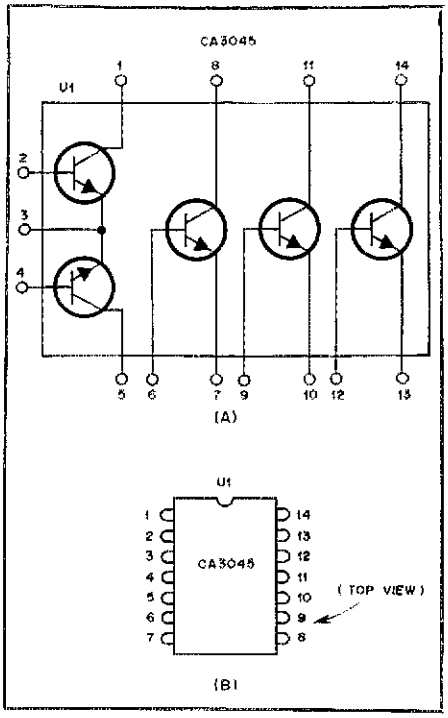

Fig. 10 — Internal circuit (A) of a simple IC. It resembles the device at B when it is enclosed in its case.

Final Comments

We have skimmed the surface in our discussion of transistors. But, for those of you who are new to radio, this treatment should lay the groundwork for further learning.

Strays

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5) Address all technical questions to Technical Information Service, American Radio Relay League, 225 Main St., Newington, CT 06111. — *Bob Schetgen, KU7G, Technical Information Specialist*

Product Review

Conducted By Paul K. Pagel,* N1FB

Kenwood TW-4000A 2-m/70-cm FM Dual Bander

POWER ON. V. GO TEN GO, GO, GO.
POWER ON. V. FIVE POINT FIVE, FIVE, FIVE.

Egad! A talking radio! Kenwood's FM Dual Bander knows more Japanese than I do! (The voice-synthesizer option for the TW-4000A has Japanese and English vocabularies. A switch inside the rig selects the language. More on this later.)

The TW-4000A is Kenwood's latest high-tech VHF/UHF FM transceiver. The 25-W rig sports a liquid-crystal display panel that shows frequency, offset, memory channel, received-signal strength in S units and a relative-power-output bar graph that doubles as a modulation indicator when used in low-power transmissions. All function switches are backlit with a pleasant green.

Kenwood supplies an UP/DWN 16-button DTMF mike. The review unit is supplied with the optional VS-1 voice synthesizer and TU-4C programmable subaudible tone (CTCSS) encoder.

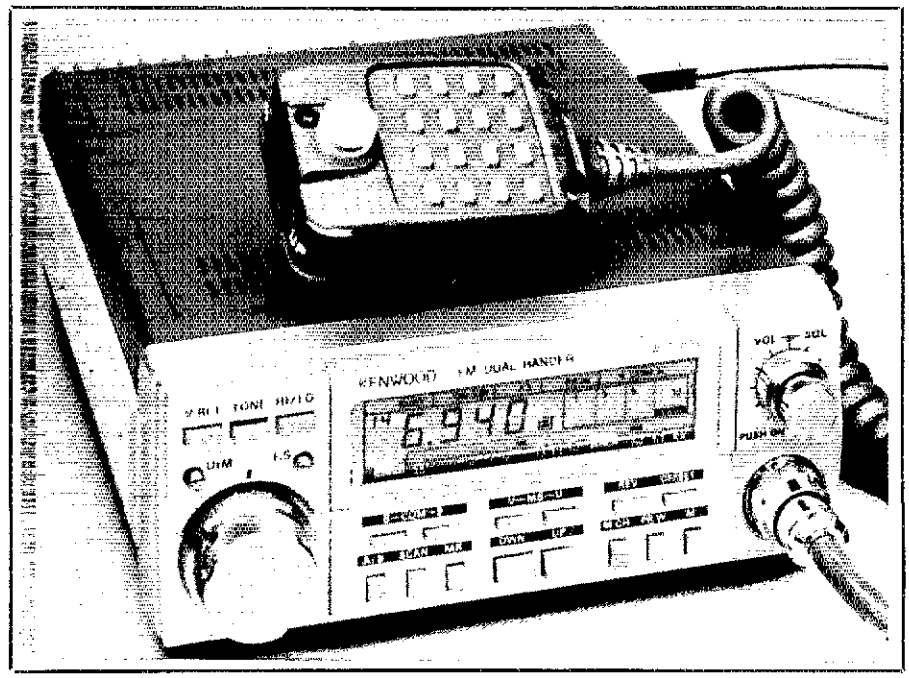
Ten memory channels store frequency and offset. Memory zero can be used to program those "oddball splits," and can be used for crossband (2-m/70-cm) operation. In the "Priority Watch" (PR.W) mode, the rig switches back to Channel 1 for one second of every 10, regardless of mode. Each time the priority channel is checked, the rig beeps. This priority channel watch is a "listen only" function. For example, you have your favorite 2-meter simplex frequency programmed as Channel 1, and you're waiting for a net to start. In the meantime, you are in a QSO through a 440-MHz repeater. Press the PR.W button, and every 10 seconds, the 2-meter simplex frequency will be checked. Press the PR.W key again to cancel the watch.

A programmable scanning feature adds to the versatility of the rig. This gives the operator freedom to choose the scanning sequence. In the Memory Recall (MR) scan mode, you can scan all memory channels, only the VHF channels or only the UHF channels. Any 1-MHz segment of a band can be searched in the VFO scan mode. The COM function is interesting — press the COM 8 or COM 9 key and then press the SCAN button. Memory Channels 8 and 9 are alternately scanned every five seconds, ignoring other channels. To stop the COM scan, press the COM-8 or COM-9 button, or key the microphone. This scan mode does not stop when a signal breaks the squelch. Scanning direction can be controlled by the UP/DOWN controls on the mike or front panel. Want to skip a memory channel during each scan? Press M.

The dual VFOs tune in 5- or 10-kHz steps (2 m) and 5- or 25-kHz steps (70 cm), selectable by the front panel F.S. (Frequency Step) switch. Tuning may be accomplished using the front panel VFO knob or the UP/DOWN mike buttons.

The CTCSS encoder option mounts inside the radio and is programmed with DIP switches. There are two independently programmable encoders, giving you one "reed" frequency for each band. (It looks like a simple matter to expand this by wiring some outboard toggle switches to each DIP switch.)

A spring-loaded "slide lock" mobile mounting bracket is furnished with the rig. I found this an excellent mounting scheme for those, like me, who are wary of "radio rip-off." Simply match the securing bosses to the slots on the bracket and slide the radio right in. It's much easier to remove and stow the radio with this bracket than it is with those wrap-around or thumb-screw type brackets.



Kenwood TW-4000A 2-m/70-cm FM Dual Bander

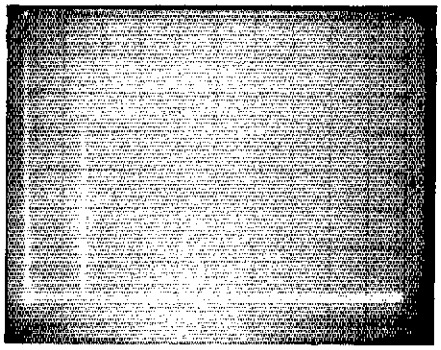
Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency range: VHF — 144.00-148.00 MHz; UHF — 440.00-450.00 MHz.	142-148.995. 440-449.975.
RF output power: 25-W HI (both bands); 5-W LOW (internally adjustable to about 10 W).	VHF: 25 W (HI), 1.7 W (LOW); UHF: 24 W (HI), 3.6 W (LOW).
Spurious requirements: Less than −60 dB.	See photograph.
Power requirements: 13.8-V dc ±15%.	
Current drain (at 13.8-V dc):	
Rx — 0.6 A with no signal;	570 mA
Tx — 7.5 A (HI), 3.3 A (LOW); approx. 2 μA for backup.	6.1 A VHF, 6.6 A UHF (HI); 2.6 A VHF, 2.8 A UHF (LO).
Receiver type: Dual-conversion superheterodyne; 1st IF — 30.865 MHz, 2nd IF — 455 kHz.	
Sensitivity: SINAD 12 dB less than 0.17 μV; S + N/N more than 30 dB at 0.63-μV input.	0.13 μV/12 dB SINAD, 0.76 μV/30 dB quieting (145.45 MHz); 0.15 μV/12 dB SINAD, 0.88 μV/30 quieting (443.5 MHz).
Audio power output (8-ohm load): More than 2.0 W, 10% THD.	1.9 W.
Size (HWD): 2.7 × 6.3 × 8.5 in (60 × 161 × 217 mm).	
Weight: 4.18 lb (2.0 kg).	
Color: Gray, silver, green.	

Operating Impressions

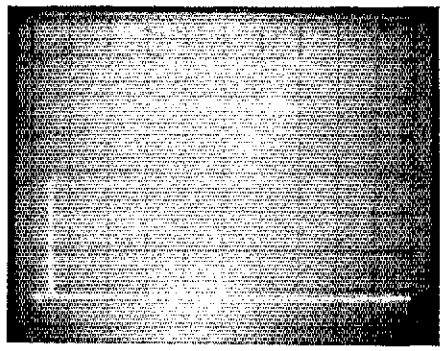
I used the TW-4000 as a mobile rig (with the MA-4000 dual-band mobile whip) and as a base station. Fortunately, I was able to operate the radio while on vacation in sunny Southern California, where 440 machines seem to be in abundance. I made quite a number of new friends while on the air.

The radio itself performed flawlessly, although the voice box developed a case of laryngitis. The voice synthesizer did not work properly when I first got the rig — the "woman" inside would only talk when the V.RCL (Voice Recall) button was depressed and held down. No automatic voice announcement was heard even with the bottom panel V.ON/OFF (Voice On/Off) switch ON. A trip to the Kenwood facility in Compton

*Assistant Technical Editor



(A)



(B)

Fig. 1 — Worst-case spectral displays of the Kenwood TW-4000A. At A, the output power is approximately 28 W at a frequency of 146 MHz. The fundamental has been reduced in amplitude approximately 30 dB by means of notch cavities to prevent analyzer overload. At B, the output power is about 25 W at a frequency of 445 MHz. The fundamental has been reduced in amplitude approximately 42 dB by means of notch cavities to prevent analyzer overload. In both cases, vertical divisions are each 10 dB and horizontal divisions are each 100 MHz. The TW-4000A complies with current FCC specifications for spectral purity.

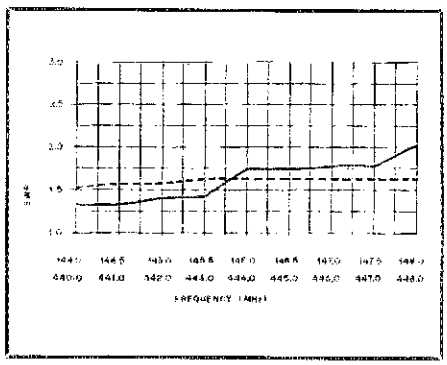


Fig. 2 — SWR curve for the Kenwood MA-4000 2-m/70-cm mobile antenna. Antenna was magmounted to the top center of a pickup truck cab. All measurements were taken with a Sola Basic Dielectric Directional RF wattmeter, Model 1000, 50 ohms. Solid line refers to 2 meters; dashed line to 70 cm.

revealed that a small jumper wire should have been cut when the VS-1 was installed. How embarrassing!

This solved the operational problem, but a few days later the voice became intermittent. So, back to Kenwood it went. An oscillator was replaced. Now the laryngitis is cured, and no malfunctions have reappeared. (A few QSOs with other '4000 users indicate that this problem is an isolated case.)

Programming the radio is surprisingly simple, once you get the hang of it. Simply press the M.CH (Memory Channel) button, which selects the channel number, dial in the desired frequency with either VFO, select the offset using the OFFSET switch and, finally, press M. A beep tells you that the radio will remember your channel selection. A built-in lithium battery backs up the memories, even when the radio is disconnected from the power source.

With the optional VS-1 voice synthesizer, you're never alone. "She" announces "power on" when the rig is powered up. (Interestingly, "power on" is "power on" in Japanese.) Any change in control settings makes her talk.

When the VFO frequency is changed, she says, "V" (for VHF) or "U" (for UHF), followed by the last four digits of the VFO setting. Using the example at the beginning of this review, the VHF frequency is 145.555 MHz. Memory channel number, frequency offset and VFO in use are also announced. Kenwood has thoughtfully provided a control on the voice module to adjust the voice level, as well as a switch (V.ON/OFF) to turn the automatic voice announcement off. When the V.ON switch is OFF, the front panel V.RCL (Voice Recall) button can be used to hear the voice on command. ("Power on" is announced regardless of either switch setting.) I noticed that after a few days of use, the novelty of the voice wore off, and I preferred to hear it only on demand.

On-the-air reports indicate that the transmitted audio is constantly crisp and clear, and 25 W of RF power helps in fringe areas. The compactness of the radio does not adversely affect the ease of operating the front-panel controls; however, the tone-pad mike, with its small rubber buttons, is a bit hard to use. My fingers aren't particularly large, but punching the little rubber keys seemed difficult while mobile. Similarly, I found it hard to keep my fingers off the UP/DWN buttons while holding the mike. At best, this spoils reception; at worst, you can "swish" the VFO while transmitting. A dial-lock feature seems to be needed here. But, after a short period of use, you'll learn to keep your fingers away from the buttons.

The priority-watch function is nice, but it can be annoying sometimes. If you are in QSO, the rig jumps to Channel 1, almost always at the wrong moment. I found that the best time to use the PR.W is when you're listening to the radio on a "dead" night.

The antenna connectors on the rear panel are SO-239s. I thought it a bit strange and felt a bit disappointed that type of connector is used at the 440-MHz port. I expected to see a BNC or N connector there so there could be absolutely no question which port is which. Kenwood does provide UHF and VHF labels, which don't stick very well, to mark the antenna cables.

I had the opportunity to get some operating impressions from Kitty Hevener, WB8TDA, ARRL Handicapped Program Coordinator. Kitty is particularly concerned about a radio's operating ease for physically handicapped individuals. She felt that the TW-4000's small push-button controls would be difficult for persons with limited fine-motor skills to manipulate. On the plus side, Kitty felt that the voice synthesizer and the detents on the VFO knob (the setscrew hole and bevel) would enhance a visually impaired person's ability to locate specific frequencies.

Final Comments

The '4000 is an awesome rig. Everyone is first fascinated by the green glow of the front-panel controls. Then they smile when the radio talks! Kenwood is on the right track for what the mobile operator wants. After getting used to the radio's quirks, I had no problem reaching for the right controls while operating mobile at night.

Owners of this radio have two rigs in one little box. Using the MA-4000 dual-band antenna, there is but a single spike sticking out of the car. And, by adding the VS-1 voice module, you'll never be alone. Who knows? Maybe more hams will become familiar with the Japanese language by using the radio with the module switched to the JA position!

Price classes: TW-4000A, $600; VS-1 voice synthesizer, $40; TU-4C two-frequency programmable CTCSS encoder, $40; MA-4000 dual-band antenna, $45. Contact the Trio-Kenwood Corp., 1111 West Walnut St., Compton, CA 90220, for more information. — *Wayne T. Yoshida, KH6WZ/W1*

MAGGIORE ELECTRONIC LABORATORY HI PRO MK I 2-m REPEATER

☐ This is W1OD listening ... cccssh. If this sounds familiar, you've probably experienced 2-meter FM. Because of the low price of synthesized gear available for this mode, many HF operators have stepped up to the 144-MHz band. Many choices are available to the FM enthusiast, and repeater clubs have sprung up everywhere.

One element universal to 2-meter FM operation is the repeater. The Maggiore Hi Pro MK I is a unit that should be considered by the first-time repeater group that wants to start off right, or for the group interested in upgrading their machine to first-class status without a "3-kilobuck" price tag.

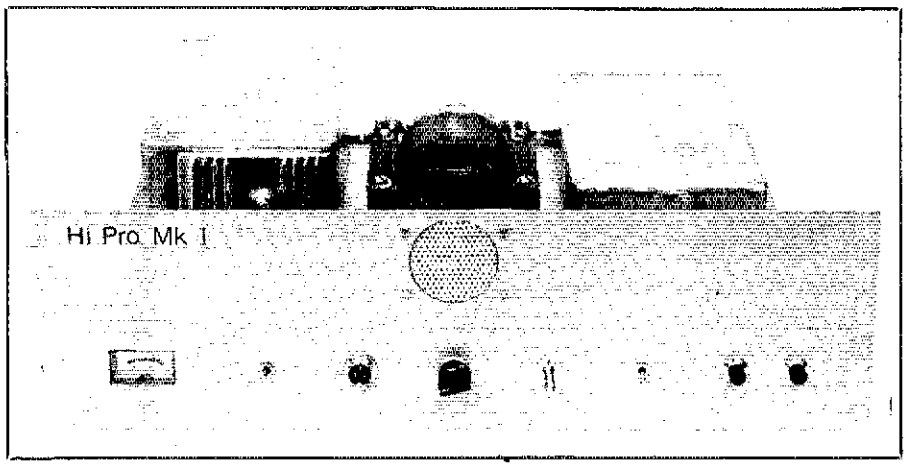
Mechanical Details

Mechanically, the Hi Pro is quite a rugged machine. The transmitter/power amplifier and receiver circuit boards are mounted atop the chassis in heavy-duty, cast-aluminum boxes for mechanical protection and electrical shielding. Shielding is important in repeater operation: without it, receiver desensitization becomes a problem, limiting repeater coverage.

The remaining components are contained on the underside of the heavy-duty chassis, of suitable size for convenient mounting in a standard 19-inch rack.[1] The organization of the components and cable harnesses is neat — there's plenty of room to install custom circuits for your machine. The review unit is a "bare-bones" unit, consisting of a receiver, transmitter/power amplifier and power supply. A built-in ac-operated power supply makes installation of the MK I a "plug-in and go" operation. Connections for external power (such as a 12-V battery for emergency power) and control are made via a terminal strip at the chassis rear.

A built-in 2½ × 1½-inch speaker may be used to monitor local audio. Audio level through this

[1]mm = in × 25.4.



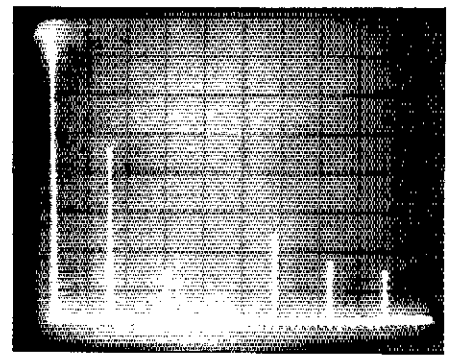


Fig. 3 — Worst-case spectral output of the Hi Pro MK I repeater before the final amplifier board was tightened down. Under these conditions, the transmitter does not meet present FCC spectral purity requirements. Horizontal divisions are each 100 MHz; vertical divisions are each 10 dB. The fundamental has been reduced in amplitude approximately 34 dB by means of notch cavities; this prevents analyzer overload. Power output was approximately 23 W at a frequency of 145.45 MHz.

Maggiore Electronic Laboratory Hi Pro MK I, Serial No. PO51176F

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Receiver sensitivity: 0.35 μV for 20-dB quieting.	0.30 μV for 20-dB quieting.
Audio output power: 2 W at less than 8% THD.	1 W at 10% THD.
Squelch sensitivity: Not specified.	0.46 μV (min.). 2.3 μV (max.).
Transmitter power output: 25 W min.	25 W.
Color: Gray.	
Size: (HWD) 5.5 × 18 × 12 in.†	
Weight: 15 lb.	

†mm = in × 25.4; kg = lb × 0.454.

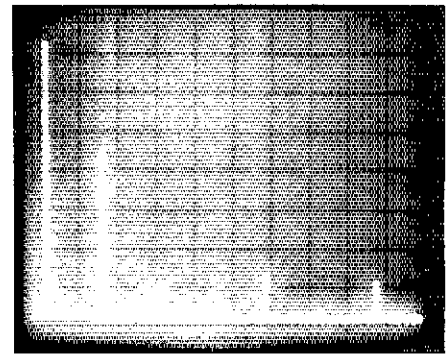


Fig. 4 — Spectral output of the MK I repeater after the final amplifier board was tightened down (see text). Horizontal divisions are each 100 MHz; vertical divisions are each 10 dB. The fundamental has been reduced in amplitude by 35 dB to prevent analyzer overload. Power output was approximately 23 W at a frequency of 145.45 MHz.

speaker is varied by a panel-mounted control. Three switches on the front panel control POWER ON/OFF, S-METER/DISC. and SIMPLEX/REPEAT. The latter control is handy for turning off the transmitter while adjusting the antenna system.

The Receiver

The receiver is contained in a 2-1/4 × 4-5/8 × 7-1/4-inch (HWD) cast-aluminum box. It is a crystal-controlled, dual-conversion superheterodyne, and uses a third-overtone (44-MHz) crystal to determine the operating frequency. A 3N204 is used in the front end, allowing the receiver to boast a 12-dB SINAD sensitivity of 0.32 μV. A 150-μV signal is required to register S9 on the meter.

The Transmitter

The MK1 transmitter is contained on two PC boards: one for the exciter, and another for the power amplifier. Both boards are housed in a sturdy 3¼ × 4½ × 7½-inch (HWD) cast-aluminum box.

The exciter is crystal-controlled, and uses a fundamental-cut 12-MHz crystal for frequency control. A tripler and two doublers are used after the oscillator to generate the 2-meter signal. Exciter output is 4W.

Final amplification is achieved by a single MRF240 operated class C. This circuit, when driven with the 4-W exciter output, generates approximately 25 W of RF output. Adequate heat sinks provide for continuous operation at ambient temperatures below 90° F. The manufacturer recommends fan cooling at temperatures above this level.

Alignment

Receiver and transmitter alignment is straightforward, and should present no difficulty to most users with access to a modest test bench. An FM signal generator and a VTVM are necessary for proper alignment. A purist might find an audio-distortion analyzer helpful in achieving maximum SINAD sensitivity.

Transmitter alignment requires a wattmeter, a frequency counter, a dummy load and a VTVM. After the oscillator is on frequency, certain exciter-board test points are monitored with the VTVM while adjustments are made. To align the final amplifier board, adjust the output LOAD and TUNE controls for maximum power output with minimum driver collector current.

In all cases, the manual clearly calls out each alignment procedure. Pictorial views of each circuit board, with all components clearly labeled, make alignment a simple task.

Operation

The Hi Pro MK I repeater has been in use at W1AW/R for several months, and few problems have been noticed. Our repeater site is atop Cedar Mountain in Newington, on the roof of a hospital. This is a heavily populated site, with several low-band VHF and two UHF transmitters at the same location. Antenna separation is less than 20 feet, providing a severe test of IMD performance. One of the VHF repeaters happens to be separated from our receiver input frequency by 11.155 MHz, the frequency of the second local oscillator. This resulted in a spurious response, and some squelch-breaking interference whenever the local ambulance company had a call! A ¼-wave stub with an antiresonant circuit (an approximate 25-dB notch) was sufficient to totally eliminate the interference.

The transmitter is also rugged. At one point during testing, some receiver desensing was noticed, and the transmitted signal sounded weaker than normal. This situation lasted for two weeks before a trip to the site could be arranged. Someone had detuned the duplexer transmit cavities, and the transmitter was operating into a 5:1 SWR for two weeks! The damage? None! A tribute to a well-designed transmitter.

Some Comments

Two Maggiore units were tested during the review period. The first unit (s/n PO51176F) was obtained by the ARRL directly from the manufacturer. Another unit, procured from an outside source, was tested to verify specifications. As received, the second unit did not meet present FCC spectral-purity requirements: All spurious emissions must be 60 dB below the carrier. Fig. 3 shows the fourth harmonic reduced only 55 dB.

After some head scratching, the lab technician performing the tests noticed that the no. 4-40 screws used to mount the power-amplifier board to the transmitter cabinet were not fastened down — the nuts had never been installed. Installation of two nuts with lockwashers cured the problem. The spectral purity now meets present FCC specifications, as shown in Fig. 4. Results of the laboratory testing are given in the accompanying table.

Thanks to International Crystal Mfg. Co., 10

North Lee, Oklahoma City, OK 73102 for supplying crystals for the review repeater. Their assistance is appreciated.

The Maggiore Hi Pro MK I is available from Maggiore Electronic Laboratory, 845 Westtown Rd., West Chester, PA 19380. Price class: $1325. — *Michael B. Kaczynski, W1OD*

MIRAGE COMMUNICATIONS A1015 6-m AMPLIFIER

☐ Six-meter power amplifiers are few and far between these days. Declining interest in the band has caused manufacturers to devote their efforts to more lucrative bands, such as 2 meters. Mirage, a well-known manufacturer of VHF and UHF equipment, recently introduced a product to warm the hearts of 6-meter devotees. The A1015, a "brick" amplifier delivering 150-W output for 10-W input, is ideal for the operator with one of the 10-W solid-state rigs so popular these days.

The A1015 is a linear amplifier. It features a built-in preamplifier for the receiver, and the preamp is automatically switched out of the line during transmit. A remote-control head, model RC-1, is available should the amplifier be mounted away from the operating position. Although the review unit is not equipped with this option, it is especially attractive for mobile installations.

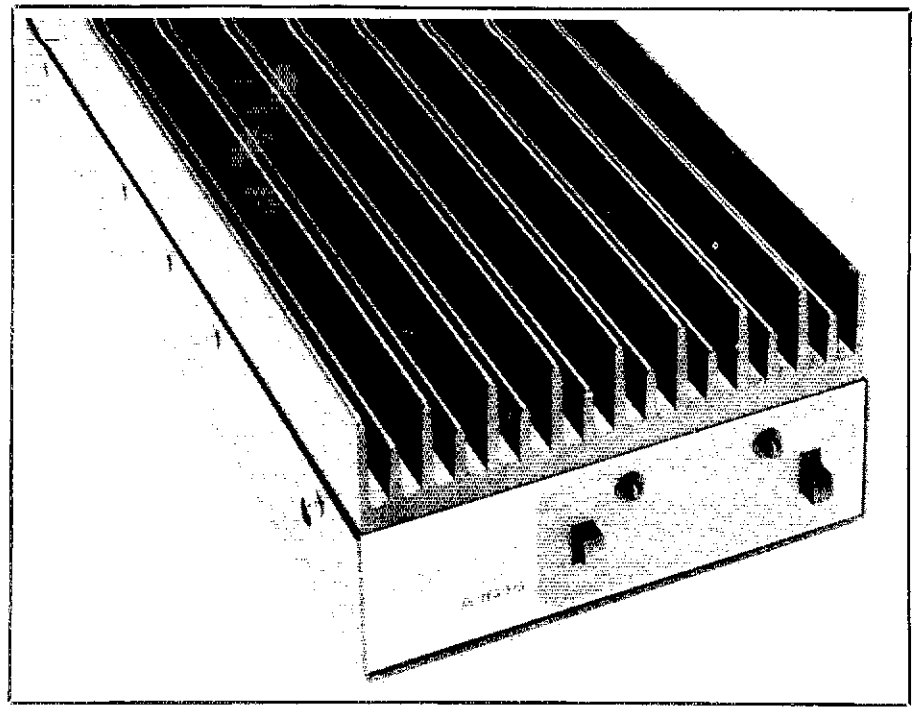
Two switches, POWER ON and PREAMP ON, adorn the front panel. The preamp may be switched on and off independently of the POWER ON switch — that control might be better labeled POWER AMPLIFIER ON. The rear panel holds two SO-239 coax connectors for input and output, a phono jack for TR control, a six-pin connector for the RC-1 and two leads for dc power.

The keying circuit in the A1015 is a bit different from that found in the run-of-the-mill brick. This rig does *not* incorporate an RF-sensing keying circuit. It *must* be hard-wired to key along with the station transceiver. The instruction manual is very explicit in warning that the key line must be hooked up before operating the amplifier. You may switch the A1015 into transmit by applying +5- to +15-V dc to the phono jack, or by shorting across it; the choice is yours. The amplifier comes wired for the +5- to +15-V option.

Changing to the shorting mode involves removing the top cover and moving a soldered jumper wire to a different pad on the PC board. My installation required this change, which was performed in about 15 minutes. Although some operators will miss the convenience of automatic RF-sensed antenna changeover, I find the TR delays inherent in most amplifiers employing that method of keying to be annoying. I much prefer to key the amplifier directly.

The A1015 employs a pair of MRF492 transistors in the power-amplifier section and a U309 in the receiver preamp. All components are mounted on a PC board, which is mounted directly on the heat sink that forms the entire top of the amplifier. A built-in thermostat turns off the A1015 if the heat sink temperature exceeds 170° F. High SWR will not damage the rig, and a 35-A fuse mounted internally on the PC board offers further protection.

Mirage recommends use of no. 8 wire between the A1015 and the power supply. This is sound advice in view of the 20-A current requirement. In my installation, I connected the short no. 10 wires from the brick directly to the power supply. The rest of my installation consists of a Yaesu FT-726R transceiver and a 3-element Yagi at 105 feet fed with about 140 feet of RG-213 coaxial cable.



Mirage Communications A1015 6-Meter Amplifier, Serial No. 165-484

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency range: 50 to 52 MHz.	As specified.
Power output: 150 W or more with 10-W input.	153 W with 10-W input.
Receive preamp: 10-dB gain with 1.5-dB (±0.5 dB) noise figure.	10 dB with 2-dB noise figure.
Power requirement: 13.6-V dc at 18-22 A.	13.6-V dc at 20 A.
Input SWR: Not specified.	1.3 to 1 at 50.1 MHz.
Size (HWD): 3 × 5½ × 12 in†	
Weight: 5 lb.	

†mm = in × 25.4; kg = lb × 0.454.

Day-to-day 6-meter activity is light, even in New England, so I was fortunate to find a small aurora in progress the first night I used the amplifier. A few CQs yielded QSOs with stations in Quebec and western New York. The A1015 seemed to give me a big enough signal to work the aurora; all of the stations I called came back with good reports. The 150 W was plenty for groundwave operation around New England and south into New Jersey and Pennsylvania. It wasn't quite enough for successful scatter operation with my antenna, however. The receive preamp is effective, and its use allowed me to hear several stations that were marginal copy with it turned off.

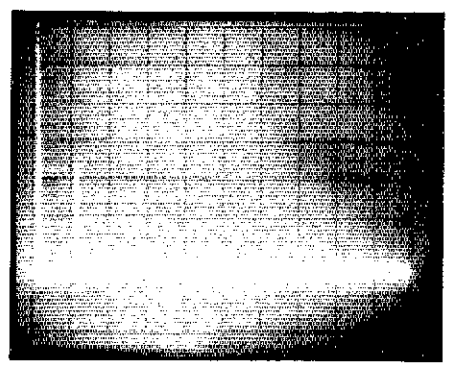


Fig. 5 — Worst-case spectral display of the Mirage A1015 amplifier. Vertical divisions are each 10 dB; horizontal divisions are each 50 MHz. Output power is approximately 125 W at 50.1 MHz. The fundamental (pip at the left of the photo) has been reduced in amplitude approximately 35 dB by means of a notch filter to prevent spectrum analyzer overload. All harmonics and spurious emissions are at least 60 dB below peak fundamental output. The A1015 complies with current FCC specifications for spectral purity.

The A1015 performed flawlessly during the six-week review period. Even during extended operation it became only warm, never hot, to the touch. It did just what a brick is supposed to do — sit quietly (except for the muted sound of clicking relays) and produce power. The instruction manual is informative and clear. Demonstrating extreme faith in their products, Mirage offers a five-year warranty on the A1015 (except for the power transistors, which are warranted for one year). This amplifier is worth considering if you want to upgrade your 10-W 6-meter station.

Price class: $280. Manufacturer: Mirage Communications Equipment, Inc., P.O. Box 1393, Gilroy, CA 95020. — *Mark Wilson, AA2Z*

Hints and Kinks

Conducted By Larry D. Wolfgang,* WA3VIL

A ONE-TRANSISTOR RF AMPLIFIER

☐ After using my modified Astro 103 for more than a year, I decided to add an RF amplifier to the receiver section.[1] I hoped to be able to dig a little deeper into the noise for some weak-signal DX stations. Others may be interested in duplicating this 11-dB-gain amplifier for a variety of applications. It can be used as an add-on RF amplifier for a receiver with a weak front end, to replace the RF stage, or as an IF amplifier.

Some time ago, I built and tested an RF amplifier module similar to that of Fig. 1. While testing this amplifier at a 0-dBm-input level, I ran into a problem that I wish I had more often. The IMD dynamic range of the amplifier was greater than the −65 dB limit of my spectrum analyzer. With the amplifier connected to my receiver, I measured an MDS of −130 dBm, an IMD dynamic range of −37 dB and a blocking dynamic range of 93 dB. All of the tests were performed at 14 MHz, for comparison with ARRL lab tests of Product Review equipment. The third-order intercept point was cut in half, but is still a respectable +9.5 dBm.

The unit I installed in my Astro 103 is built on a 1-3/8-inch square PC board.[2] The circuit traces were hand drawn, and the layout was for the parts I had on hand. The 2N5109 transistor requires a press-on heat sink. A 2N3866 transistor should also work in this circuit. I have found it necessary to hand select and test transistors to obtain the best results. L1 is wound on an FB-43-801 bead with no. 28 or smaller enameled wire. The secondary winding consists of 15 turns, tapped four turns from the supply end. The one-turn primary is polarized, so you may have to reverse the connections to obtain proper operation. The primary should be wound on the end of the coil farthest from the transistor. Don't forget to reset your S meter so it reads S9 with a 50-μV input signal.

Fig. 2 shows another amplifier that I built for further testing. I used an FT37-63 toroid core for the transformer on this unit. I measured the same characteristics for both amplifiers. The input and output impedance is 50 ohms with this circuit. I submitted the second amplifier to the ARRL for testing. Fig. 3 shows the spectrum analyzer display taken during one phase of their testing. [Besides the flat response curve shown here, our testing indicated that this amplifier is a solid performer. It has a low noise figure, good IMD characteristics and a flat response through the 6-meter band. — Ed.]

A circuit-board etching pattern is shown at Fig. 4 and the parts-placement diagram is given at Fig. 5.[3] You may have to experiment with the emitter resistor value a bit to maintain the transistor bias current in the range of 40-50 mA. This ensures the best operation of your amplifier.

[1]W. Cooper, "A New Mixer for the Astro 103 Receiver," Hints and Kinks, *QST*, Oct. 1983, pp. 41-42.

[2]m = ft × 0.3048; mm = in × 25.4.

*Assistant Technical Editor

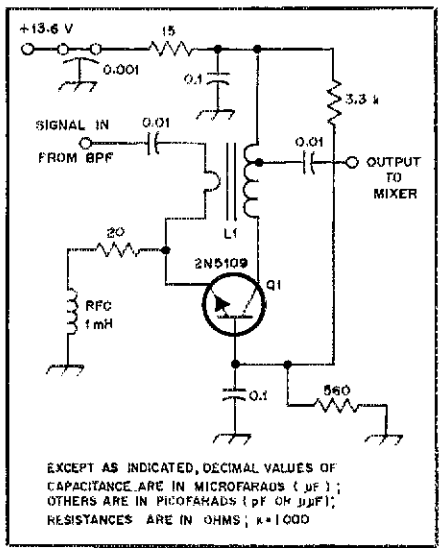


Fig. 1 — Schematic diagram of an RF amplifier built by AG4R. L1 is wound on an FT37-63 toroid core. The secondary winding consists of 15 turns, tapped down four turns from the supply side. The primary is a one-turn loop. You may have to reverse the leads from the primary to obtain the proper polarity.

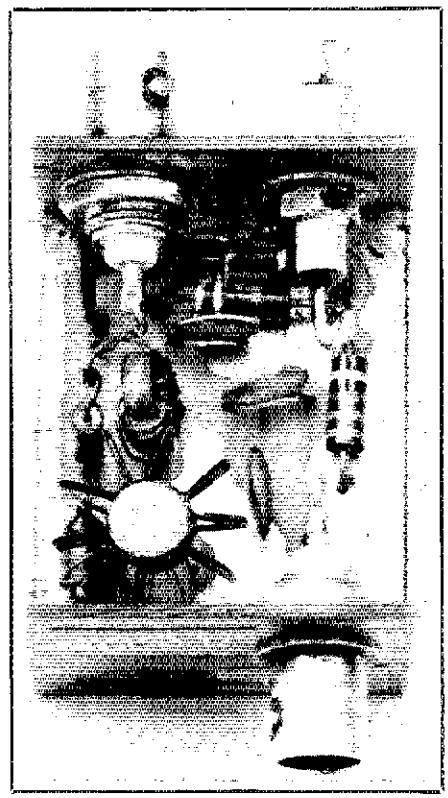


Fig. 2 — The prototype amplifier built by Wayne Cooper.

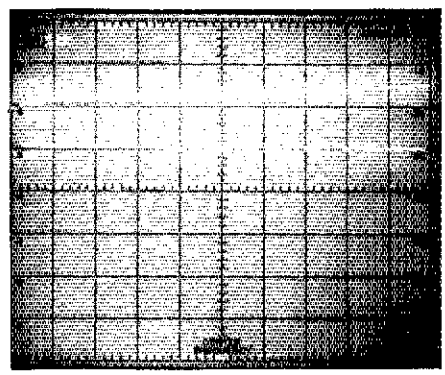


Fig. 3 — Spectral display of the frequency response of the RF amplifier. The lower trace represents the −30 dBm input signal, and the upper trace represents the amplifier output. The center frequency is 30 MHz. Each horizontal division is 5 MHz, and each vertical division is 10 dB.

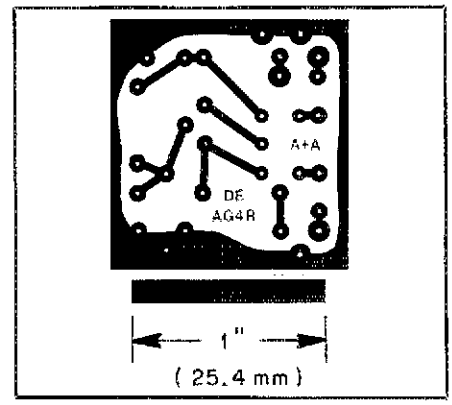


Fig. 4 — Circuit-board etching pattern for the amplifier. Black represents unetched copper. The pattern is shown actual size.

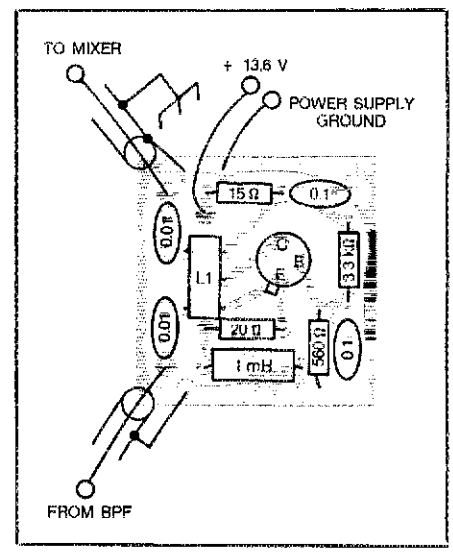


Fig. 5 — Parts-placement diagram for the RF amplifier board. The view is from the component side of the board. Gray areas represent unetched copper on the other side.

[3]Circuit boards and complete parts kits are available from A & A Engineering, 7970 Orchid Dr., Buena Park, CA 90620, and from RADIOKIT, Box 411, Greenville, NH 03048.

No preamplifier is going to be very useful under the strong-signal conditions found on our ham bands if your receiver has a negative third-order intercept point. A preamplifier can improve reception if there are no overpowering signals near the desired frequency. This amplifier has a low noise figure, which should make it ideal for many Amateur Radio applications. — *Wayne Cooper, AG4R, Miami Shores, Florida*

References

Hayward, W. *Introduction to Radio Frequency Design.* Englewood Cliffs, NJ: Prentice-Hall, 1982, p. 218.

Norton, D. "High Dynamic Range Transistor Amplifiers Using Lossless Feedback." *Microwave Journal,* May 1976.

Rohde, Dr. U. L. "Communications Receivers for the Year 2000." *Ham Radio,* Dec. 1981, p. 36.

WORLD-TIME-FINDER SLIDE RULE

☐ Universal Coordinated Time (UTC — from the French spelling, which is the accepted international version) is the standard method of establishing QSO time and date. The use of local time, or an incorrect conversion from local time to UTC, could mean the difference between getting QSL cards for an award or not. Many operators will check their logs only at the date and time when your QSL records the contact, so if your time conversion is wrong by an hour, you won't get a card.

Another complication involved in world-time conversions is the date change incurred when crossing the International Date Line, or when passing through local midnight. To convert time going from west to east, you must back up one day when you cross the date line, or advance one day when you pass local midnight. To convert going from east to west, just the opposite is true.

You should also be careful when recording the date. In the U.S., it is common to record month/day/year, but in many other countries the sequence is day/month/year. So 7/9 may be interpreted as July 9 or as 7 Sept. I avoid this possible confusion by spelling out the month.

My solution to these problems is to use a slide-rule-type device I call a world-time finder. Fig. 6 shows a template for the one I made. I type the lettering on adhesive labels, then cut out the pieces and place them on the master copy. You can photocopy Fig. 6 to obtain the necessary pieces. Cut out the two circles, and glue them to some stiff card stock (such as an index card). Laminate both circles between pieces of clear plastic material. Clear plastic adhesive material for this purpose may be found at most stationery stores. Clear Con-tact® paper should also be suitable.

Punch an appropriate-sized hole in the center, and fasten the assembly together with a small rivet. Use washers on the top and bottom to prevent the rivet from pulling through the paper. This completes the assembly.

The outer scale is simply a 24-hour clock face. At midnight there are two arrows with a plus and a minus sign. This is to tell you to change the date to either "yesterday" or "tomorrow," depending on which way you are going. The movable second scale includes a letter to help you identify the time zones, along with a label for the number of degrees east or west longitude from the Prime Meridian at the geographic center of that time zone. For example, 2100T would indicate 8 P.M. Mountain Standard Time.

Use the slide rule by aligning the time-zone letter you want to convert from with the desired hour. Now move around the scale to the zone whose time you want to find. Notice that if you cross either local midnight or the International Date Line along the way, you must add or subtract one day, depending on the direction. If zone U (PST) is set to 2000 on July 1, the time and date UTC is 0400Z on July 2. In Japan, which is 135° east longitude from Greenwich, England (9 hours later), the time would be 1300I on July 2. Note that this time conversion can be accomplished by going in either direction around the slide rule with the same result. In one direction you pass local midnight, and in the other you cross the date line. — *Robert Schlegel, N7BH, Roy, Washington*

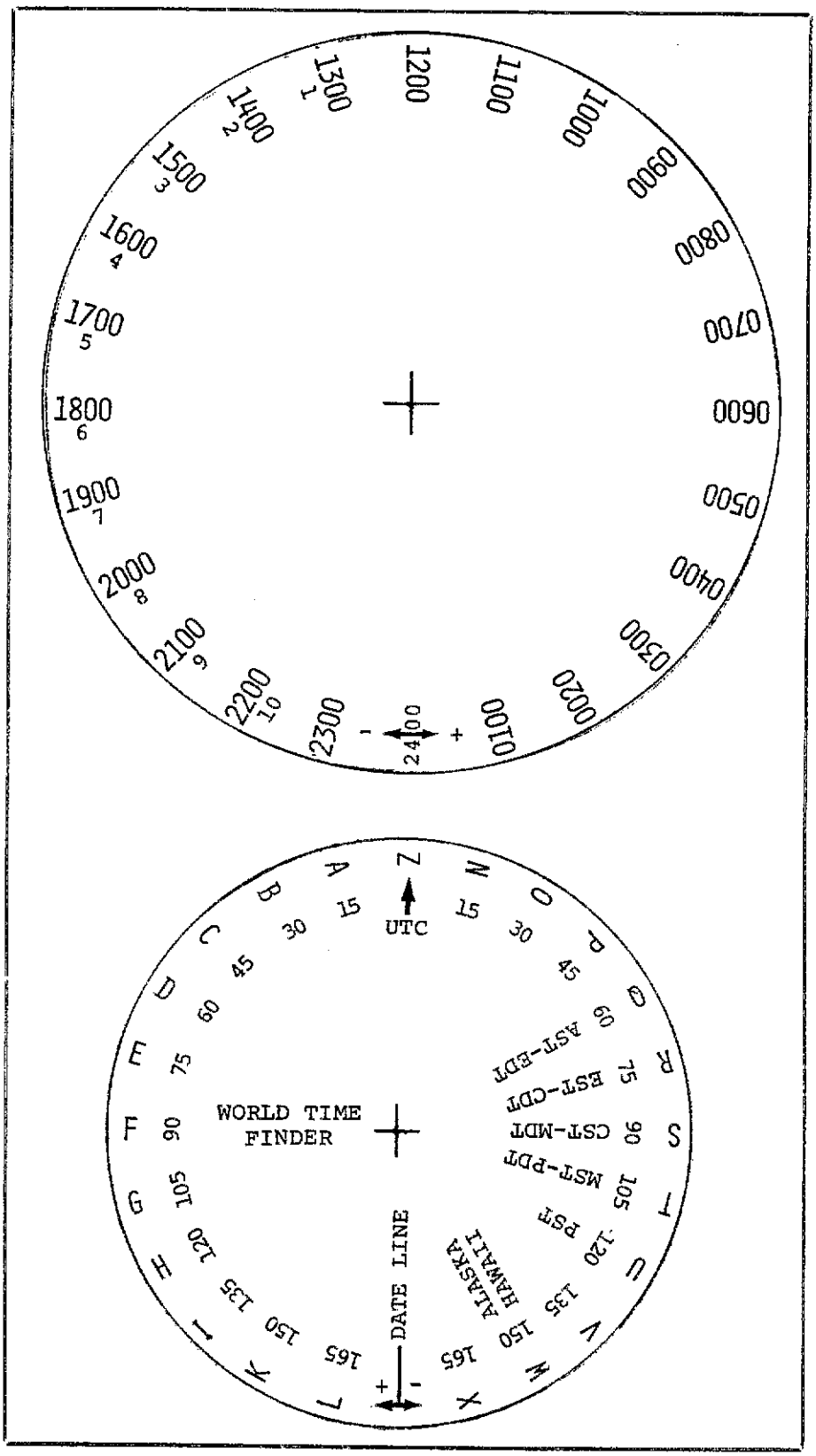


Fig. 6 — Full-size template to make Robert Schlegel's World-Time-Finder Slide Rule.

Technical Correspondence

Conducted By
Bob Schetgen,* KU7G

INVERTED-V ANTENNAS OVER REAL GROUND

☐ I enjoyed reading AJ3K's fine article documenting ground reflections for 0.5-λ horizontal dipoles.[1] The demonstration of a vertically polarized electric-field component, in directions other than broadside, may come as a surprise to many amateurs.

The article might leave an impression that ground reflections are the only factor that affects antenna gain at different heights and for different ground characteristics. While that is true for horizontal antennas more than about 0.2-λ high, an additional factor comes into play for antennas at very low heights. That factor is the change in radiation resistance resulting from mutual coupling with the image antenna.[2]

If we assume a fixed power level and no ohmic losses, the difference in gain, $G_1 - G_2$, of dipoles 1 and 2 in different environments can be expressed by

$$G_1 - G_2 = 10 \log \left(\frac{R_{r1}}{R_{r2}} \right) \qquad \text{(Eq. 1)}$$

where R_{r1} and R_{r2} are the radiation resistances of dipoles 1 and 2, respectively. Therefore, if dipole 1 has the lower R_r, it also has the higher gain.

R_r can be expressed as the sum of the free-space radiation resistance ($R_{r(fs)}$) and the resistive component of the mutual impedance (R_{mut}) produced by out-of-phase coupling with the image antenna:

$$R_r = R_{r(fs)} + R_{mut} \qquad \text{(Eq. 2)}$$

and

$$R_{mut} = R_r - R_{r(fs)} \qquad \text{(Eq. 3)}$$

where

$R_{mut} = R'_{mut} \times R_H$

R'_{mut} = resistive component of the mutual impedance of the antenna and its image at a particular spacing

R_H = reflection coefficient for normal incidence[3]

R_{mut} becomes more negative as the height of a horizontal dipole is decreased. [At antenna heights less than about 0.3 λ — Ed.] This decreases R_r and increases gain.

AJ3K compares an 80-meter dipole at 20 ft (0.071 λ) with a similar dipole 1.2 λ above average ground.[4] Analysis of his results shows that he neglected the gain increase resulting from the deceased R_r of the lower dipole. We can determine this gain increase as follows: R_H, for AJ3K's average ground, is 0.72 (using Eq. 2 from his article). From Fig. 7 (p. 6-4) of *The ARRL Antenna Book*, R_r is 22 Ω when we estimate a perfect reflecting plane to be 10 ft below ground level at AJ3K's location. Then:

$$R'_{mut} = 22 - 73 = -51\ \Omega$$

for a perfect reflector and

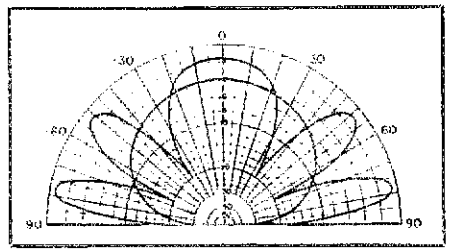


Fig. 1 — Radiation patterns for dipoles 0.071 λ (circular) and 1.2 λ (multi-lobed) above real ground (conductivity = 5 mS/m, dielectric constant = 15). For gain in dBd, add 6 dB to the values shown.

$$R_{mut} = -51 \times 0.72 = -37\ \Omega$$

for AJ3K's average ground. Then:

$$R_r = 73 + (-37) = 36\ \Omega$$

Thus, the gain, $G_1 - G_2$, is:

$$G_1 - G_2 = 10 \log \left(\frac{73}{36} \right) = 3.07 \text{ dB}$$

The dipole at 1.2 λ is so high that R_{mut} is insignificant. Thus, a gain of 3.07 dB must be added to the pattern of the low dipole to be consistent with actual performance.

Fig. 1 shows the vertical radiation patterns of the 0.071-λ and 1.2-λ-high dipoles using AJ3K's data, including the 3.07-dB gain increase for the lower antenna. Compare this pattern with Fig. 2 in the original article. The radiation pattern of the low antenna is not so dismal, especially at the high radiation angles needed for local coverage. At those angles, the low antenna only gives up 2 dB, or less, to the very high antenna.

If you are like most of us and can get your low-frequency dipoles only 15 to 20 ft off the ground, take heart! For coverage out to, say, 150 miles you would need an antenna *much* higher to get 2 dB of improvement (over average ground). The improvement would be less for better ground because R_H is larger and the reflecting plane is closer to the surface; there is greater mutual coupling. — *Mark Bacon, KZ9J, Decatur, Illinois*

The author replies: The method-of-moments program NEC (an industry standard for analysis of wire antennas) was used to analyze the 80-meter dipole at 20 ft above average ground. The pattern calculated by NEC compared very favorably with Mr. Bacon's results. It also agrees with my observation that the antenna works well for local contacts. I point out that for most local contacts (unlike DX) a loss of 6 dB (1 S unit) means little, which provides additional help to the masses (including myself) who have low antennas. The main point, that the low-angle radiation of an antenna depends on height, remains. My thanks to Mr. Bacon for drawing attention to this situation. — *James C. Rautio, AJ3K, Liverpool, New York*

[Details of Mr. Rautio's later analysis of inverted-V antennas appear as a sidebar to his article in this issue. — Ed.]

AN ACTIVE HF SWITCH

☐ A good dc-controlled HF switch is difficult to obtain. One can use small reed relays, but this tends to be an expensive solution because a single relay does not achieve good isolation. Insertion loss is very low with a relay switch, but the incoming signal is not buffered. T-network solid-state switches that use small-signal *diodes* (Fig. 2) have been popular for many years. They offer good isolation and reasonably low insertion loss, but again, there is no buffer action.

An improved HF switch can be built using transistors, rather than diodes, in the T network (Fig. 3). Active devices allow the switch to buffer the incoming signal and retain the isolation properties of its diode cousin. Furthermore, insertion loss is reduced.

When the switch is closed, the control signal to the 2N2222 is low. This allows the high-frequency PNP and NPN voltage-follower stages to operate as buffers that are useful throughout the HF range and into the VHF range as well. To open the switch, the control signal is held high (+12 V; I_b = 4 mA); this drives the 2N2222 into hard saturation.

Certain transistors exhibit a reasonably linear and small resistance near the origin of the I-V characteristic curves, when driven into hard saturation. The 2N2222 is one of those special transistors that makes a particularly good switch (R ≈ 2 Ω when I_b = 4 mA). When the 2N2222 is saturated, it completely removes bias from the voltage-follower stages and puts a well-controlled, harmless, reverse potential across the emitter-base junctions.

The 2N4209 and 2N5179 were selected for their low emitter-base capacitance (1.5 pF and 0.6 pF, respectively) and good high-frequency response. Metal-can packages are preferred over plastic ones because they provide minimal emitter-base capacitance.

I designed the switch for use in a 9-MHz IF strip, where it performs very well. Insertion loss is negligible and isolation approaches a theoretical 110 dB (calculated at 9 MHz with no

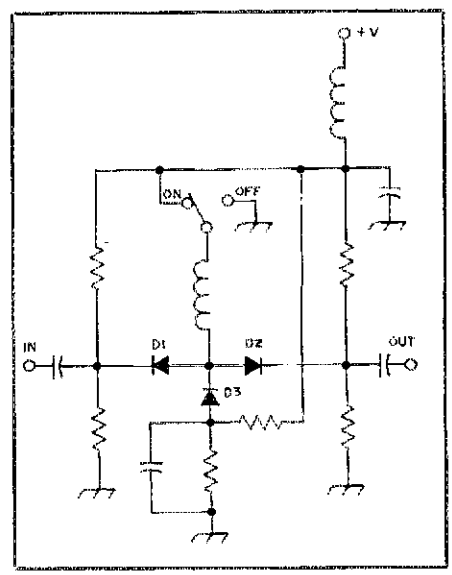


Fig. 2 — A typical T-network HF switch using small-signal diodes.

[1] J. Rautio, "The Effects of Real Ground on Antennas," *QST* Feb. 1984, pp. 15-18.
[2] G. Hall, Ed., *The ARRL Antenna Book* (Newington: ARRL, 1982), pp. 2-19, 2-20.
[3] C. Jasik, *Antenna Engineering Handbook* (New York: McGraw-Hill, 1961), p. 2-7.
[4] m = ft × 0.3048; mm = in × 25.4

*Technical Editorial Assistant

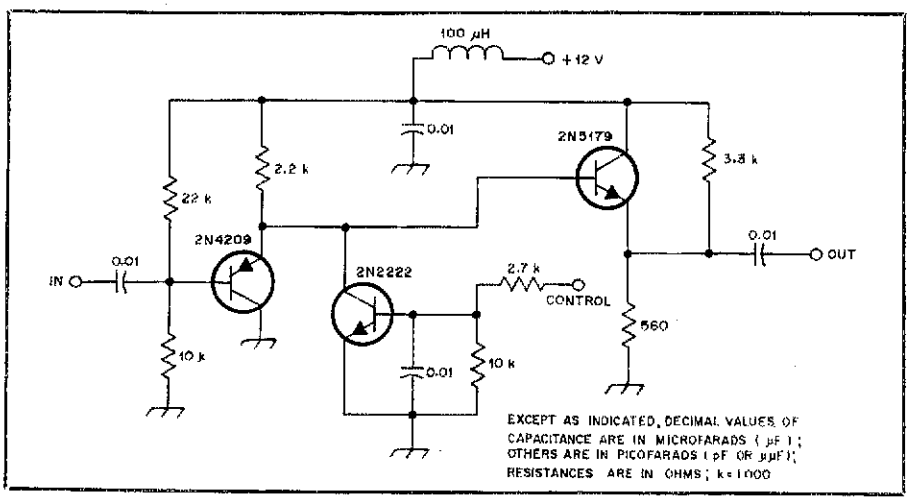


Fig. 3 — A T-network HF switch using active devices that provide excellent buffer action and reduced loss.

load) if good layout practices are followed. For maximum isolation, a shielded partition should be used between the voltage-follower stages. A load of about 500 Ω improves isolation still further at the expense of slightly increased insertion loss. A small-signal output impedance of 6 Ω allows the switch to drive loads as low as 50 Ω without significant loss. Current is limited to 5 mA flowing through the 2N5179. This limits the switched signal to 250 mV with a 50-Ω load; 2.5 V with a 500-Ω load. — *Dennis Monticelli, AE6C, Fremont, California*

BATTERY CHARGING AND SOLDERING-IRON CARE

☐ I just purchased a 1984 *Radio Amateur's Handbook* and found something that could cause trouble. Chapter 10, under "Charging Nickel-Cadmium Batteries," recommends a constant-current charging scheme. This is the best charging method, but it can destroy the battery in some cases. A constant-current system attempts to maintain the same charging rate as the battery approaches full charge. To do this, the voltage across the battery must increase. The voltage applied to a NiCd battery should not be allowed to exceed the potential of the fully-charged cells by more than a few percent. With the Handbook charger, the potential could approach 50 V, which is enough to puncture the separators (or burn out a short). A charging system should include *voltage* as well as current regulation. I use a 723 regulator set to approximately 1.4 V/cell and a current control set to the appropriate current. This system starts charging with a constant current and gradually changes to constant voltage. No timing is necessary and the battery may be charged indefinitely without damage. A 723 can pass 100 mA, so a pass transistor is not needed for AA cells. The system is simple, cheap and safe. — *Warren H. Clark, Balboa, California*

☐ A recent article in *QST*, "Build That Kit Painlessly" (Jan. 1984, p. 19), recommends steel wool to clean a soldering iron. That practice stands alongside the use of acid core solder — as a "no-no." Small pieces of steel wool can stick to the iron and then to the soldered joint. With IC pins 0.01 inch apart, a short can, and frequently will, result. A friend of mine who is in the electronics manufacturing business traced a series of bad boards to the use of steel wool as an iron cleaner. It cost him several hundred dollars to replace the boards. (They had plated through holes, which make the ICs almost impossible to remove.) When you have been at this as long as I have (50 years), you learn a few tricks. — *Warren H. Clark, Balboa, California*

[See, "Construction Practices and Data Tables," *Radio Amateur's Handbook* (Newington: 1984) for methods of cleaning soldering-iron tips. — Ed.]

COMMENTS ON THE PS-5

☐ I have some comments regarding Mr. Gerald Hull's, AK4L article, "Introducing the PS-5 — A Dependable, 5-A Portable Power Supply" (June 1983 *QST*). Several errors have crept into Fig. 2 of the article that should be cleared up before some unsuspecting fellow loses a regulator IC. [See also Feedback in April 1984 *QST*. — Ed.] The following information has been garnered from the various semiconductor manufacturers who have published regulator specification/data sheets and power-supply design references. The bypass capacitors (2 µF/25 V) should be connected to pin 4 of the regulator IC with leads no longer than ¼ inch. Dipped, solid tantalum capacitors are recommended: they have extremely low inductance as well as excellent high-frequency characteristics. When placed within ¼ inch of the IC, these capacitors prevent the IC from "seeing" a resonant circuit (up to 100 MHz and higher) with attendant oscillation and destruction of the regulator IC.

The Fairchild *Hybrid Data Book*, 1978 edition, pages 5-16 through 5-19, gives design information for basic regulated power supplies. Values for R1 and R2 can be determined with the formula:

$$V_{out} = \left(\frac{R1 + R2}{R2}\right)V_{control} \qquad \text{(Eq. 4)}$$

When $V_{control}$ is 5 V and the quiescent current is assumed to be 1 mA:

$$R2 = \frac{5}{0.001} = 5\ k\Omega \qquad \text{(Eq. 5)}$$

Substitute this value, along with an output voltage of 13.8, into Eq. 4 and solve for R1. The answer is 8.8 kΩ. A series combination of 6.8 kΩ, 1.8 kΩ and a 1-kΩ potentiometer is shown for R1 in Fig. 4. The 1-kΩ potentiometer provides adequate adjustment and resolution for amateur use.

Last, Mr. Hull's statement that "crow-bar" circuits are slow is somewhat misleading. A fast-blow fuse can carry 125% of the rated current indefinitely; a 500% overload is required to open the fuse within 50 to 200 mS, according to Bussmann and Littelfuse literature. A thermo-mechanical circuit interrupter, such as Mr. Hull uses, achieves the goal of spare-fuse elimination, but it offers little in the way of protection. The crow-bar, when properly executed, requires much less than 20 mS for operation. It is many times better than the common fast-acting fuse or thermo-mechanical circuit breaker.

I suggest that the crow-bar circuit in Fig. 4 be used to provide protection for the PS-5. The basic crow-bar circuit can be speeded by addition of a transistor amplifier to provide the required SCR-gate signal.

I must compliment Mr. Hull for the PS-5. He met his design goals and produced a very attractive piece of equipment. — *Leroy Smith, WBØLTV, Hot Springs, SD*

Feedback

☐ William Newkirk, WB9IVR, brings to our attention an error in "Understanding Resistors," (March 1984 *QST*). The output waveform in Fig. 5B (p. 13) should be shown 180° out of phase with the input signal.

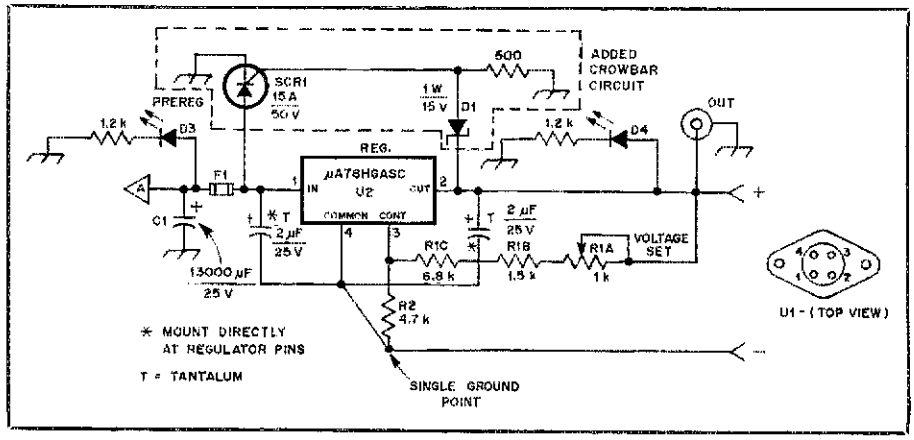


Fig. 4 — A partial schematic of the PS-5 with Smith's suggestions implemented. Resistances are in ohms; k = 1000. F1 is a 5-A, 32-V fuse.

RFing the Little Red Schoolhouse

Turn an average classroom into an extraordinary learning experience — with an Amateur Radio demonstration.

By Maria L. Evans,* KT5Y

You know, it's amazing that hams who climb 200-foot towers, handle voltages hefty enough to raise hair just thinking about them and who regularly go after rare DX in tremendous pileups freeze like a stuck pump handle when asked to do an in-school demonstration. Sure, we visit with folks from all over the world (psychologically safe, of course, with that rig between us and all), but *out in the open? In front of all those kids? No way!* With a little advance preparation, however, you can bring a special touch to a classroom, and maybe just a little magic to an otherwise average school day.

Still a little hesitant? Look at it this way — school bus drivers turn their backs on 60 kids twice a day, and that takes a *lot* more guts than facing them for a few hours. Besides, proper preparation will make you more confident, more secure and better able to loosen up. To help you, I'm going to share some of my experience (some of it gleaned the hard way) on how to make *your* in-school demo a success. Who knows? You might just enjoy it!

The classroom is fertile ground for introducing young people to the excitement of Amateur Radio. These students, shown at club station VE7LPC, need no further convincing. *(photo courtesy VE7TG)*

Step One: Get Your Foot in the Door

This is the easiest part of the whole thing. Everybody (well, almost everybody) knows a teacher. This teacher, of course, knows other teachers. Through this bevy of educators, you can find a home for your demonstration. Teachers are always looking for people who will visit for free, but they don't have the time to go out and recruit, since grading papers, policing ball games and meeting with parents take up most of their spare time. So make yourself available. One note, though: If you are the class teacher and a ham, have someone else do the demo. Your students will enjoy a refreshing new face in your classroom.

Step Two: Set Up Your Station in Advance

You can't imagine how important this step is! Murphy, being the ornery guy he is, will strike at your most inopportune moment. You can be one step ahead of him by having your station in A-1 order before the demo starts. Just in case, though, have some jumpers, PL-259s and maybe a VOM handy. Go to the site before school starts and make a contact just for your own peace of mind.

Step Three: Use Audiovisual Materials

As you well know, we have five sensory inputs to the brain — sight, smell, hearing, taste and touch. Professional educators know that to achieve maximum attention from a student, they must stimulate as many of these inputs in a variety of ways; the more, the better. Anyone who thinks his (or her) ravishing personality will completely captivate a classroom is suffering from delusions of grandeur. Because individuals have different interests, there are different pathways to their full attention. You must cater to as many of these pathways as you can.

This is where you must take a hint from the pros, and provide plenty to see, touch, hear and feel. I always bring along my

*Missouri ACC/PIO, 1112 North Rubey, Macon, MO 63552

"sack of purties" — a code-practice oscillator and key, a call-sign map, a couple of unusual special-event certificates, and some interesting domestic and DX QSLs. Don't worry about getting rare DX QSLs — Clipperton and Heard Island don't mean a thing to kids. I've discovered that Russian, Japanese and Australian QSLs are the overwhelming favorites of kids. On the domestic side, picture and cartoon cards are big winners. Also, don't feel that you have to explain everything you show — if they want to know more about a particular item, they'll ask you.

Step Four: Put Your Presentation Together

For your demo to be a success, you must know exactly *what* you're going to say, *how* you're going to say it and *when* you're going to say it. By that, I don't mean write the whole thing out and read it verbatim, but prepare an outline for the demonstration. Explain your points *simply* and *accurately*.

If you're not used to speaking before groups, *practice* — first in front of mirror, then in front of a captive audience (spouse, kids). Smooth out the rough spots, using your outline as guidance

Step Five: The Demonstration

The easiest way to explain something is to do it, so let's walk through a nutshell version of one of my typical demos. First, I introduce myself and explain that I'm going to share my hobby, Amateur Radio, with the group. I tell about my history as a ham, and that, with a little effort, they can become hams, too.

Next, I explain license classes, and how simple it is to earn the Novice license, and that there are many high school age hams. I teach a letter or two of Morse with the code oscillator, and let a couple of kids send the letter they just learned. They are usually surprised that they now know two letters of code!

After that, I explain how radio signals "bounce" off the ionosphere, and draw a simple diagram. I tune to the CW portion and find a station doing 5-7 WPM just to show how slow that is, and pick out the letters they just learned. Then I switch to the phone portion of the band.

Before going on the air, I explain just what I'm going to do to contact another station. *Be sure to explain that not every CQ gets a response!* If you don't, you are liable to get an earful of silence followed by juvenile laughter, which does zilch for your self-confidence. I explain the "foreign language" of the QSO — terms like QTH, QSB, QRM, QSL, S9, 73 and 88 — so they can follow along when you make a contact (junior high kids tend to get really giggly when you explain the term 88, so be sure to tell them that one!).

Tell your audience to think of questions they would like to ask the contact. Have the teacher pick a couple of volunteers. I like the teacher to pick them, because he or she might know a kid with a special problem who might benefit the most from your QSO.

Once you contact your "victim," explain that you're doing a demo. In fact, you might want to include that in your CQ, as that sometimes brings some of the more interesting conversationalists out of the woodwork, and the ones who like young people. After the typical rig/antenna/weather chat, introduce your first volunteer. I usually kill two birds with one stone by saying something like, "Okay, Bernie, I want you to meet one of my friend John's students. This is Elvira, and before I give her the mike, I'm going to tell her to put her face up to the mike and speak clearly and distinctly in a normal tone of voice. I'm sure she has plenty of questions to ask you. Okay, here's Elvira."

After Elvira finishes, have her introduce the other volunteer. Have this person, in turn, give the mike back to you. When you get the mike again, say you are going to ask the students if they have any other questions, and pass a couple of them along for an answer. You can expect questions like favorite teams, occupation, things to see in the area and ages of family members. Let your partner of the airways add any personal comments about ham radio before you sign off. Also, be sure to ask for a QSL. Even though *you* might have enough QSLs to fill a house trailer, the students will appreciate it for their bulletin board.

Finally, save time at the end for questions and answers. Interject some of your favorite aspects of the hobby, and tell a couple of ham stories. (I usually tell how, Christmas day, I contacted two hams named Mary and Joseph in Bethlehem, Pennsylvania, and how, during my high school days, I used to get a chemistry professor at Ohio State University to help me with chemistry homework on 40 meters!) Try to fill up your alloted time slot as best as possible. You'll find you are the hit of the school day!

Hints Your Mother Never Told You About In-School Demos

1) Do your demonstration on 40 or 15 meters if at all possible. Twenty is pretty crowded, and you're liable to get embarrassed if you check the frequency and hear someone growl, "You're damn right it's in use!"

2) Don't just stand by the rig — move around! Try to spend time on both sides of the room so *all* the students can benefit from your narrative. Of course, you'll have to stay in one place while you're on the air, but be sure to turn the volume up so all can hear.

3) Think back to when you were a Novice, and you used to ask a lot of questions. How did your Elmers answer them? Your audience will probably ask some of the same questions. Keep it simple, and watch their faces to see if you've lost them; if you do, go back and do it even simpler.

4) Don't leave out the teacher. He or she may have a few questions as well.

5) Arrange your demo to coincide with the start of an upcoming Novice licensing class. Invite your students to it, and leave some copies of the pamphlet, "Amateur Radio, the World at Your Fingertips" (available free from ARRL Hq.) for the interested ones.

Millions of students are just itching for new challenges. Your help and experience can be invaluable tools in the shaping of young lives and in the future of our hobby. So, what are you waiting for?

At Mays Elementary School in Indiana, Mick Saunders, N9DGQ (right), explains 2-meter FM operation to some students. Thomas Martz, KA9QFV (seated, right), a 6th grader, is the assistant instructor in this Ham Radio on the Road program. *(photo courtesy N9DGQ)*

Free Recruitment Information

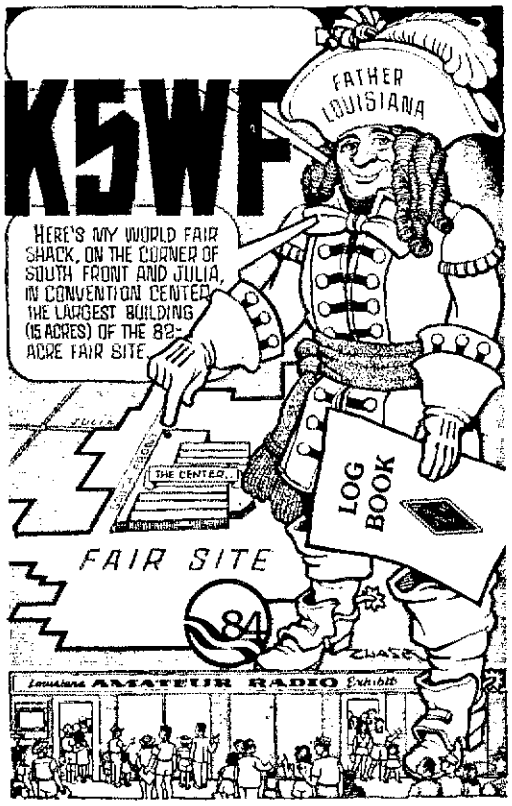
For further information on giving effective demonstrations and on the ARRL Recruitment program, read "Ham Radio On the Road," October 1983 *QST*, page 56, and *Reading, 'Riting and Radio*, November 1983 *QST*, page 62. Also, write to ARRL Hq. for your free Ham Radio on the Road Kit, which includes complete guidelines for giving effective demonstrations and promotional handouts.

Strays

***QST* congratulates...**

☐ Dr. Theodore E. Palmer, WA6MUK, of Pasadena, California, on receiving public service awards from the Southeast Foothills Fire Chiefs Association and the City of Arcadia Fire Department.

☐ Warren Weldon, W5DFU, of Tulsa, Oklahoma, on receiving the 1984 IEEE Centennial Medal.



Amateur Radio at the Louisiana World Exposition

Radio amateurs in New Orleans treat visitors to a world-class exhibit.

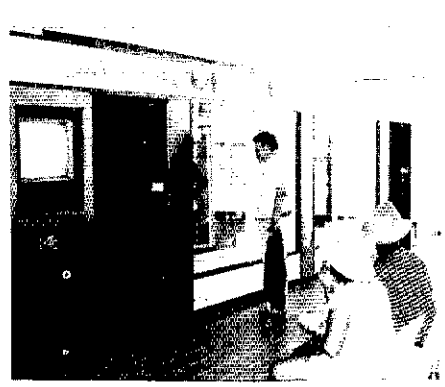
By Wayne M. Knabb,* KO5R

Many radio amateurs visiting the Louisiana World Exposition in New Orleans through November 11 will operate "gondola mobile," as did Jim McNamara, K5DCH, recently. "K5DCH, gondola mobile," he called on a local repeater while riding a tram of the Mississippi Aerial Rapid Transmit (MART), about 350 feet over the Mississippi River.

Aside from gaining the "gondola mobile" designation, Amateur Radio is making its mark on the air from the Louisiana Amateur Radio Exhibit (LARE), near the Julia Street exit of the Great Hall. Soon after the exhibit's transceivers were connected to the antennas on the other side of the Wonder Wall, LARE's station, K5WF, was heard on Norfolk Island, between Australia and New Zealand, more than 7500 miles southwest of New Orleans. Thomas Morgavi, W5FMO, made the station's first contact, with J. B. Smith, VK9NS, two days before the fair opened.

Until mid-August, the exhibit is showing the Smithsonian Institution's new display about radio inventor Guglielmo Marconi, who called himself an amateur. The Marconi exhibit portrays Amateur Radio's heritage, while the operating radio station illustrates the present and ARRL's new promotional film, *Amateur Radio's Newest Frontier,* projects its future.

"Louisiana's radio amateurs have done a professional job of creating a world-class exhibit for the hundreds of thousands of visitors we expect", said John Uhl, KV5E, president and founder of Louisiana Amateur Radio Exhibition, Inc. He had an idea for the booth since 1981, when local promoters announced the fair for New Orleans. LARE, a nonprofit organization, was formed late last year, only for the fair, with Anthony Paladino, WA5ORS, vice president, and Philip Spencer, W5LDH, secretary-treasurer. Paladino was selected for his Latin American Amateur Radio contacts, and Spencer for his experiences as ARRL Delta Division Director from 1964 to 1970.



Visitors to the Amateur Radio exhibit at the Louisiana World Exposition get a look at the old and the new: the Marconi exhibit (right), on loan from the Smithsonian Institution, and *Amateur Radio's Newest Frontier,* shown on the monitor to the left. *(WD5DWP photo)*

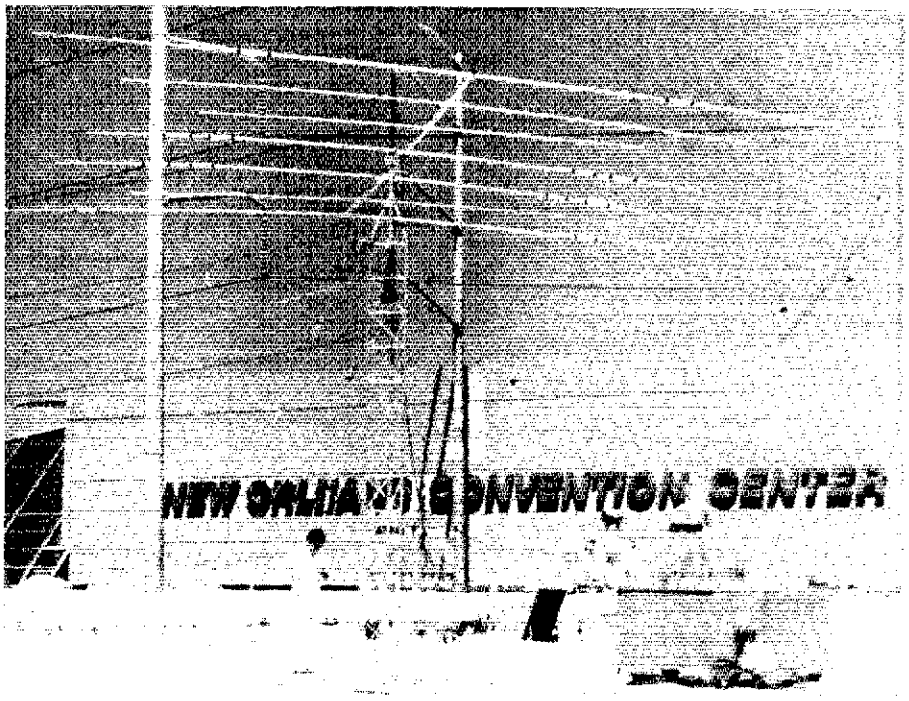
While negotiations to include Amateur Radio at the fair were being completed, the officers formed a committee of area amateurs having skills to produce the booth. After discussing appropriate calls held by area amateurs and clubs, the committee asked for K5WF, held by Howard T. DeLaneuville, for K-5-World's-Fair. Howard agreed, and the call was adopted for the station.

"We caught the Smithsonian at just the right time," Uhl said. The Marconi exhibit was available, but not for the full six months of the fair. LARE is looking for something to follow the Marconi exhibit after mid-September.

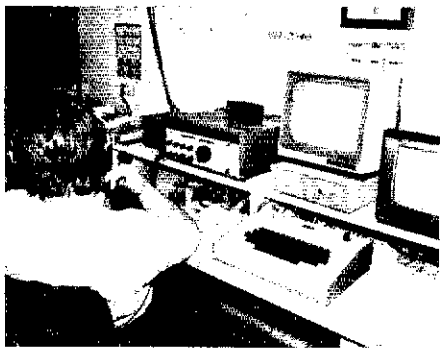
To obtain the Marconi exhibit, Uhl called Elliot Sivowitch, K3RJA, in the Smithsonian's Division of Electricity and Modern Physics, to make arrangements. The Historic New Orleans Collection, the group handling the curatorial requirements in New Orleans for the Smithsonian show, lent Patricia Tusa (XYL of K5EF) to set up the Marconi materials in the amateur booth.

The New Orleans section of the Institute of Electrical and Electronic Engineers (IEEE) has agreed to take responsibility for forwarding the Marconi exhibit to its next

*Publicity Chairman, Louisiana Amateur Radio Exhibition, Inc., 100 Robert E. Lee Blvd., New Orleans, LA 70124



LARE member Nick Tusa, K5EF, inspects one of two towers with rotating beam antennas being used by K5WF in the World Expo operation. *(WD5DWP photo)*



LARE station K5WF is on the air daily during the World Expo on CW, SSB, SSTV and RTTY. *(KV5E photo)*

K5WF World Expo Frequencies at a Glance

LARE members will operate ±5 kHz the following frequencies daily through November 11:

Morse code — 3.535, 7.035, 14.035, 21.035 and 28.020 MHz
RTTY — 3.590, 7.090, 14.090, 21.090 and 28.090 MHz
Novice — 3.725, 7.125, 21.150 and 28.150 MHz
SSTV — 14.230 MHz
SSB — 3.910, 7.235, 14.265, 21.365 and 28.600 MHz
2 meters — SSB, 144.200 MHz; simplex for QSLs (scheduled in advance), 146.550 MHz
Repeaters — 146.34/94 (primary), 146.01/61 (secondary) and 146.16/76 (backup)

show at Oak Ridge, Tennessee. Its members paid to bring Marconi's daughter, Goia Marconi Braga, from New Jersey to New Orleans for June 20-22 to help promote the exhibit. IEEE had helped to develop the Smithsonian's Marconi exhibit.

Many people donated money, expertise, labor and equipment toward the project. The Louisiana World Exposition donated the 600-square-foot area (valued at $36,000) for the six-month fair, while LARE contributed $4800 for maintenance, security and utilities. The Smithsonian pared its $680 monthly fee to a total of $680 for the four months the Marconi exhibit is allocated to New Orleans. The K5WF station equipment is on loan through the generosity of the following manufacturers: Collins-Rockwell, HAL, Heathkit, KLM, George H. Lehleitner & Co., MFJ, Radio Shack, RCA, Robot, Rohn, Telex/Hy-Gain, Telrex and Ten-Tec. Individuals became charter members of LARE by donating $100. Other people and organizations also contributed, including the Louisiana Department of Tourism, Noel Brumfield, Concrete Controls, Inc., Joseph Canizaro Interests and ARRL.

A conservative value of the booth, including donated labor and materials, is about $50,000. Edwin J. DeMeritt Jr., KB5GO, an architect, drew the booth's specifications, in cooperation with Patricia Tusa. Philip Buras, WD5DWP, an employee with the New Orleans Department of Streets, helped expedite the building permit through City Hall. Engineering the equipment and antennas were Nick Tusa, Ronald Scalise, WA5ZFP, and Morgavi. They prepared a plastic pipe for the 250-foot cables between the booth and antennas, considering the effects of two 115,000-V power lines paralleling the fair and the intermodulation problems in the central business district. Cabinet maker Leon Lessard, WB5ZED, and maintenance serviceman Ray Crain, KB5GA, spent many workday and evening hours building the booth and supervising the nonprofessional Amateur Radio carpenters, painters, sanders and sheetrock finishers. New Orleans historical cartoonist John Chase illustrated the exhibit's QSL cards. Robert Schmidt, W5GHP, Delta Division Vice Director and former TCC Director, is managing the exhibit's message center. Messages written at the exhibit are relayed by RTTY to Bob for forwarding. Angelo Glorioso, K5KSI, is handling interpreter duties.

While LARE members will not be manning the booth every hour the fair is open, they will staff the Marconi exhibit as much as possible. Visiting amateurs may call on 34/94 to ask for someone to open the exhibit.

LARE station K5WF, which will be on the air daily from about 10 A.M. to 10 P.M. through November 11, is equipped for CW, SSB, RTTY and SSTV. Visitors wishing to operate K5WF must present their licenses. Amateurs contacting the station, or shortwave listeners detailing its transmissions, may obtain a QSL by sending an s.a.s.e. to LARE, C-35GHIJ, 805 S. Front St., New Orleans, LA 70130, USA.

Strays

***QST* congratulates...**

☐ Lew Rambo, WA7ELI, of Bothell, Washington, on being named Citizen of the Day by local radio station KIXI in honor of Lew's having supplied communications during the annual Diabetes Bike-A-Thon for the past 10 years.

I would like to get in touch with...

☐ anyone with instructions on installing a Hornet TB500 beam antenna. Nick Molinini, 26 Troscher La., Bethpage, NY 11714.

☐ anyone using the Xerox 820 microcomputer for CW communications. Bill Payet, OA4BQ, USAID-Peru, APO Miami, FL 34031.

☐ any hams who attended the RCA Institutes 1945-47. Jose A. Fernandez, KP4HH, P.O. Box 2362, Hato Rey, PR 00919.

ARRL, APCO Join Forces in the Public Interest

Mutual cooperation to meet shared goals.

By Steve Smith,* WA4VWW

In March, two of the oldest and most respected organizations devoted to communications in the public interest joined hands. It was in a meeting in Denver, Colorado, on the 21st that the respective presidents of ARRL and the Associated Public Safety Communications Officers, Inc. (APCO), signed a cooperative agreement that establishes a broad framework within which ARRL Field Organization volunteers may coordinate their facilities and equipment with APCO members and their agencies for disaster communications.

Basically, the responsibility for follow-up falls squarely on ARRL Emergency Coordinators, District ECs and Section ECs, and local APCO Chapters. One of the more important tasks facing the League's Amateur Radio Emergency Service (ARES) is that of establishing credibility with law enforcement and public-safety agencies in general. It is my hope and reason for authorship of this agreement that joint recognition of APCO and ARRL would lend some solid credence to the role that ARES can and should play in emergency-communications planning.

Founded in 1935, APCO currently represents over 5000 members whose primary responsibility is the management, design, maintenance and operation of communications facilities at the federal, state, county and municipal levels. APCO has, since its inception, taken the lead in establishing international standards for public-safety communications. As an example, APCO developed the "10-Code," which was designed for law enforcement as their own version of our "Q" signals. Through the APCO national headquarters and the local chapters, they strive for professionalism, continuity, education and standardization in public-safety communications.

My past experiences, as ARRL SEC of Georgia and now Iowa, showed me some difficulty in selling the ARES concept to members of the law-enforcement community. Most agencies, at one time or another, may be a bit reluctant to involve civilians in their disaster planning. The APCO-ARRL agreement lends legitimacy to ARES claims of performance and will contribute to making public-safety agencies more willing to include Amateur Radio in their operations.

Former ARRL President Carl L. Smith, WØBWJ, and APCO President Craig M. Jorgensen after signing the memorandum of understanding on March 21, 1984 in Denver, Colorado. ARRL Field Organization volunteers are encouraged to coordinate with APCO members/agencies so that public-service communications can be used to the fullest advantage during disasters.

"One of the more important tasks facing (amateurs) is establishing credibility with law-enforcement and public-safety agencies ... The ARRL-APCO agreement lends legitimacy to ARES claims of performance."

To further aid the ARES efforts, I author a monthly column in the *APCO Bulletin* to address the many aspects of Amateur Radio, including a history of ARRL and ARES, and the reasons for the cooperative agreement.

Current estimates show that one third of APCO membership are licensed amateurs and are in tune with the goals of ARES. Through the articles, those members of the public-safety community not already hams now have some exposure as well, and presentations at the National APCO Convention were made last year regarding amateur capabilities.

Of prime importance to both ARES and the public safety agency is the concept that amateurs, in their capacity as ARES members, will neither seek nor accept any role other than that of a "professional" communicator. Where our efforts could fall short are in the disease of "deputy dogism." This occurs when a body puts on a jumpsuit with several patches sewn on, puts a mag-mount strobe light on the top of his car and pretends to be an officer of the law. Any hint of symptoms like these are guaranteed to get an ARES group tossed out of an agency. Our offer to a public-safety organization should be to provide a group of responsible, trained and organized communicators.[1]

Lists of local APCO Chapter Officers will be available through the national APCO office (P.O. Box 669, New Smyrna Beach, FL 32070). It is recommended that the appropriate League official(s) establish contact with each APCO Chapter and, making reference to the ARRL-APCO mutual accord, offer a program for an in-person meeting to outline the ARES program.

The mechanics for fostering a good working relationship with public-safety agencies is now in place. The success of the ARRL-APCO agreement is dependent on us; with the groundwork done, it is our responsibility to close the sale!

[1]November 1984 *QST* contains a description of the emergency-communications arrangement between Detroit police and area amateurs, one of the first of its kind. Formal organization of emergency preparedness on the national level followed a year later, with the creation of the ARRL Emergency Corps, a forerunner of ARES.

Steve Smith, WA4VWV, serves a dual volunteer role as ARRL Section Emergency Coordinator for Iowa and as president of the Iowa Chapter of APCO, making him uniquely qualified to represent both organizations. Steve, who is Communications Supervisor for the city of Des Moines, was the prime mover behind and the author of the agreement between ARRL and APCO.

*RR 2, St. Charles, IA 50240

Happenings

Conducted By Richard K. Palm,* K1CE

- *ARRL Elections — VOTE!*
- *League Honors Hart, Eaton, Dannals*
- *Jammer Ballinger: ex-WB6MMJ*
- *FCC Sends CB Gear To Trash Heap*

RM-4040 Epitaph

The Federal Communications Commission has denied ARRL's request to prohibit cable television systems from operating on frequencies assigned to the Amateur Service. The League's petition for rule making was filed January 12, 1982 in an effort to contain the huge problem of interference caused by "closed" cable TV systems to the over-the-air Amateur Service. A side effect has been interference caused to CATV subscribers resulting from amateur signals entering CATV signals, with hams being unjustly blamed.

These problems are caused by cable systems employing inadequate shielding, low-quality components, poor cable installation techniques and inadequate maintenance. Although specific FCC Rules exist to prohibit leakage and interference from CATV systems, the agency has been ineffective in combating the national problem because of its limited enforcement resources.

The agency labeled the League's request "excessive," and added that CATV and Amateur Radio could coexist if a concerted effort is made to resolve interference problems. Steps are already being taken by the National Cable Television Association and ARRL in this direction, thus further eliminating the need for a CATV ban on amateur frequencies, FCC said.

To help clarify the responsibilities of cable operators, the Commission pointed out that if signal leakage from a cable TV system merely breaks the squelch of an amateur receiver in the scanning mode, a violation does not exist unless it can be shown that the leakage levels exceed the limits prescribed by the FCC. However, harmful interference clearly exists if, for example, cable signal leakage interferes with a local Amateur Radio repeater and its users' communications. In such an instance, the cable operator is obligated to use all his resources in cooperating with the amateur to eliminate the interference, regardless of the leakage level. Unless cable TV operators make diligent efforts to resolve interference, the Commission will have no choice but to levy fines for violations, it said. FCC dismissed the League's petition June 15.

For background on events leading to this Commission action, see February 1982 *QST*, p. 9; March 1982, p. 58 (ARRL files RM-4040); June 1982, p. 9 (RM-4040 comments deadline extended); November 1982, p. 62 (ARRL comments on RM-4040); December 1982, p. 56 (NCTA comments; ARRL Reply Comments, RM-4040); March 1983, p. 57 (Cable companies' comments, RM-4040); October 1983, p. 58 (ARRL requests expedited action on RM-4040); November 1983, p. 71 (ARRL replies to NCTA's comments opposing RM-4040 expedited action request). See next month's Happenings for further details on this Commission decision.

SECOND NOTICE — ARRL ELECTIONS

Attention all ARRL members! Nominations are now open for candidates for ARRL Director and Vice Director in each of the following Divisions: Central, Hudson, New England, Northwestern, Roanoke, Rocky Mountain, Southwestern, and West Gulf.

The ARRL Board of Directors is the governing body of the nonprofit, educational and scientific corporation chartered under the laws of Connecticut as the American Radio Relay League. The Board of Directors is ultimately responsible for all League matters, including deciding ARRL priorities and services that will be made available to the membership. There are 16 Directors, who are elected by the membership on a geographical basis. Half of the Directors stand for election in even-numbered years, half in the odd. At the same time Directors are elected, Vice Directors are also chosen, who can fill in when Directors are unable to serve. For this reason, candidates for Vice Director must meet the same requirements as the candidates for Director.

For a candidate to be eligible for the office of Director or Vice Director, he or she must submit a nominating petition bearing the signatures of 10 (or more) full members of a Division naming him or her as a candidate for Director or Vice Director. The petition must be received by League Headquarters no later than noon on August 20, 1984. Each candidate must also provide information (on a form provided by Hq.) that will allow the Executive Committee of the Board of Directors to determine the eligibility of the candidate in accordance with the provision of the ARRL Articles of Association and By-Laws, and a statement of not more than 300 words setting forth the candidate's qualifications, which will be included with the ballot mailed to members. The EC will meet August 26 for this purpose, so candidates should make sure their information form arrives at Headquarters no later than August 23. The candidate's 300-word statement will be reprinted without content editing; if the statement as submitted exceeds 300 words, the first 300 words will be used. The statement must not contain any derogatory reference to any person or entity. The candidate must also submit an accompanying signed statement certifying that the information is true to the best of the candidate's knowledge and belief. Any willful violation of the statement will be grounds for disqualification by the Executive Committee.

The nominee must reside in the ARRL Division he or she seeks to represent. He or she must also be the holder of at least a Technician class amateur license, or a Canadian Amateur Certificate, must be at least 21 years of age, and must have been licensed and a Full member of the League for a continuous term of at least four years at the time of the election. No person is eligible whose business connections are of such nature that he or she could gain financially through the shaping of the affairs of the League by the Board, or by the improper exploitation of his or her office for the furtherance of his or her own aims or those of his or her employer. The primary test of eligibility is the candidate's freedom from commercial or governmental connections of such nature that his or her influence in the affairs of the League could be used for his or her private benefit. The idea behind these rules is to ensure that candidates (1) possess a lasting interest in Amateur Radio and the League, (2) have the legal capacity to make decisions for the ARRL, and (3) are free from conflicts of interest.

The following form for nomination is suggested; it may be copied onto any paper, or a blank following this form may be obtained from Headquarters on request:

Executive Committee
The American Radio Relay League
Newington, CT 06111

We, the undersigned Full Members of the ARRL residing in the ... Division, hereby nominate ... of ... as a candidate for Director; and we also nominate ... of ... as a candidate for Vice Director from this Division for the 1985-86 term (Signature ... Call ... City ... ZIP ... Date ...)

Whenever there is more than one candidate for either office, ballots will be sent to all Full members of the League in that Division who were in good standing on September 10. The ballots will be mailed no later than October 1 and, to be valid, must be returned to Headquarters by noon, Tuesday, November 20. A group of nominators can name a candidate for Director, for Vice Director, or for both, but there are no "slates" as such. Each candidate appears on the ballot in alphabetical order.

All ARRL members who are licensed by the

*Acting Manager, Membership Services, ARRL

FCC or DOC but temporarily residing outside the U.S. or Canada are eligible for Full membership. These members overseas who arrange to be listed as Full members in an appropriate Division prior to September 10 will be able to vote this year where elections are being held.

Even within the U.S., Full members temporarily residing outside the ARRL Division they consider home may now notify the Secretary of the League prior to September 10, giving their current *QST* address and the reason why another Division is being considered home. So if your home Division is Central, Hudson, New England, Northwestern, Roanoke, Rocky Mountain, Southwestern or West Gulf, but your *QST* goes elsewhere, please let the ARRL Secretary know, as soon as possible but no later than September 10, so you will receive a ballot for your home Division.

If a person is nominated for both Director and Vice Director, the nomination for Director will stand and that for Vice Director will be void. A person nominated for both offices does have the option, however, of declining the higher nomination and running for Vice Director if he or she wishes.

Since all the powers of the Director are transferred to the Vice Director in the event of the Director's death, resignation, removal outside the Division or inability to serve, careful selection of candidates for Vice Director is just as important as for Director.

These persons presently hold the offices of Director and Vice Director, respectively, in the divisions conducting elections this year: Central — Edmond A. Metzger, W9PRN, and Howard S. Huntington, K9KM; Hudson — George A. Diehl, W2IHA, and Stephen A. Mendelsohn, WA2DHF; New England — John C. Sullivan, W1HHR, and Richard P. Beebe, K1PAD; Northwestern — Mary E. Lewis, W7QGP, and M. L. Gibson, W7JIE; Roanoke — Gay E. Milius, Jr., W4UG, and John C. Kanode, N4MM; Rocky Mountain — Lys J. Carey, KØPGM, and Marshall Quiat, AGØX; Southwestern — Fried Heyn, WA6WZO and Wayne Overbeck, N6NB; West Gulf Division — Raymond B. Wangler, W5EDZ, and Thomas W. Comstock, N5TC.

Petitions need 10 or more signatures of Full members and are due at League Headquarters by noon August 20. If there is only one candidate for an office, he or she will be declared elected by the Executive Committee; otherwise, ballots will be mailed not later than October 1 to Full members of record September 10. To be valid, ballots must reach Headquarters before noon, Tuesday, November 20. The new term will begin at noon, January 1, 1985.

Nominees or, indeed, any member, may obtain a copy of the ARRL Articles of Association and By-Laws, along with a pamphlet outlining the duties and responsibilities of elected League officials. Interested persons should write to or call ARRL Headquarters, 225 Main St., Newington, CT 06111, tel. 203-666-1541.

For the Board of Directors:
July 1, 1984
David Sumner, K1ZZ
Secretary

FORMER COMMUNICATIONS MANAGER GEORGE HART, W1NJM, ELECTED HONORARY VICE PRESIDENT

At its first Annual Meeting this year in Hartford, the ARRL Board of Directors elected George Hart, W1NJM (right), Honorary Vice President. George served as ARRL Communications Manager from 1967 until his retirement in November 1978, capping a 40-year career at Headquarters. First licensed in 1930, George's reputation as a traffic handler blossomed when he was an operator at the Penn State station, W8YA. He received his BA there and, in 1938, joined the staff of the new ARRL Hq. station, W1AW. In 1949, George developed the National Traffic System, still the backbone of Amateur Radio's commitment to public service. He is a charter Life Member of ARRL.

DANNALS NAMED ARRL PRESIDENT EMERITUS

Harry J. Dannals, W2HD (lower right), has been elected President Emeritus by the ARRL Board of Directors. Harry was ARRL President from 1972 until 1982. He served as SCM for New York and Long Island, 1955-61; Assistant Director, Hudson Division, 1958-61; Vice Director, Hudson Division, 1961-64; and Director, Hudson Division, 1965-1971. The former ARRL President is a director and past president of the Hudson Amateur Radio Council, and is a past vice president of the Single Sideband Amateur Radio Association. He has held numerous other leadership positions with local clubs and organizations. Harry is a Life Member of QCWA and a charter Life Member of ARRL.

DIRECTOR EMERITUS NOEL EATON, VE3CJ

The ARRL Board of Directors has elected Noel Eaton, VE3CJ (below), Director Emeritus. Noel served as IARU President from 1974 until 1982. He was ARRL Vice President for International Affairs for the same period. Noel was the first IARU President from outside the United States.

The holder of a Canadian Advanced Class license, Noel has been licensed since 1937. He served two years as president of the Hamilton Amateur Radio Club, and was the first president of the Ontario Amateur Radio Federation, the predecessor of the Radio Society of Ontario. In January 1960, he was elected Canadian Division vice director; in May, he became the director. He has had an extensive involvement in IARU affairs, including heading the IARU team in Geneva for WARC-79. Noel is a charter Life Member of ARRL.

FCC CENSURE-Y CLUB

FCC Acting Chief Administrative Law Judge Thomas B. Fitzpatrick has ordered the station license of Randy L. Ballinger, WB6MMJ, revoked and his General class operator license suspended for one year for willfully and repeatedly violating Sections 97.84(a) and 97.123 (failure to identify) and 97.125 (willful or malicious interference) of the Commission's rules. According to the Summary Decision released May 10, Ballinger was issued an order to show cause why his station license should not be revoked and his operator license suspended for the remainder of its term.

In 1981, Ballinger complained to the Long Beach, California, FCC office about daily interference he was getting on 144.730 MHz. Ballinger said that the interference came from a daily net. Ballinger's complaints were investigated by James M. Lafontaine, electronics engineer at the Long Beach office. Lafontaine monitored the frequency on three occasions and found no interference.

Beginning at about the same time as Ballinger's complaints, the Long Beach FCC office also received interference complaints from the net operators. These complaints continued for two years.

In mid-November, Lafontaine received an interference complaint from one of the net members. Monitoring 144.735, Lafontaine established the general direction of the interfering signal. The next day, Lafontaine used direction-

Be a Charter Contributor to the Goldwater Scholarship Fund

Here's your opportunity to thank Barry, K7UGA, for his long-term staunch support of the Amateur Radio Service and to let him know of your appreciation. Send in your contribution *now* and be a *Charter Contributor*. All Charter Contributors will have their name and call listed in a commemorative book to be presented to Senator Goldwater prior to the awarding of the first scholarship in his honor. The deadline for donations by Charter Contributors has been extended to September 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.

Recent contributors of $25 or more include: Gerald D. Adkins, N4QA; Matthew S. Ajeman, N7FGZ; Fred Babenkof, KE8V; Mr. and Mrs. Branson, AA6BB & KA6V; John F. Bushati, Esq., KR6P; William G. Coe, W6SV; James S. Collier, K2QB; Wesley G. Duckwitz, W8IPT; Lyman M. Edwards, W5FJ; Bruce A. Eggers, WA9NEW; Charles J. Ellis, WØYBV; Peter G. Fish, KA7FEB; Mrs. Frederick H. Glidemeyer; Edward F. Guida, W4RNM; Guy R. Guthrie, N4DHO; Barrie C. Hiem, Sr., K5SGP; Kevin Higgins, K1GAO; Irving's Radio Service; Mr. Werner J. Larson, WA1DEA; Harry E. Legler, WØPB; Mecklenburg Amateur Radio Society, Inc.; James M. Mozley, W2BCH; George T. Negus, K2OIU; Karl F. Oerlein, W3SHW; L. N. Peterson, WD9AGD; Robert H. Quade, WB3ETO; Hazard E. Reeves, K2GL; R. P. Samuels, 6Y5RS; San Diego County Amateur Radio Council Inc.; Eddie B. Scales, W7MME; William H. Schnaars, W2DHI; Seymour J. Sindeband, J87BI; Raphael Solfer, W2RS; Sonoma County Radio Amateurs, Inc.; Frank J. Stein, W6AXH; L. D. Strieteimeier, AA4OK; James E. Thayer, W1FZ; Robert A. Trenkle, KA4JGJ; West Jersey Radio Amateurs, Inc.; Richard B. Yeager, WB6YKV; Charles E. Ziegler, W8RV

finding equipment to pinpoint the source of interference at the start of the net, and made recordings of the interfering signal.

When the jamming stopped, Lafontaine left the mobile monitoring station and went to inspect Ballinger's station. "On inspection Lafontaine found that Ballinger's transmitter was on, was warm to the touch and was capable of operating on 144.735 MHz."

Earlier, in reply to his Notice of Violation, Ballinger did not dispute the violations. He explained that "since the FCC didn't take any action against the other people on the frequency of 144.734 for maliciously interfering with my communications, the FCC didn't care and were [sic] not going to do anything about problems on that frequency. I was tired of being jammed and something had to be done about the problem."

The "ultimate findings and conclusion" of the FCC stated that "The Review Board has previously emphasized that this Commission cannot tolerate the use of 'vigilante tactics,' noting that one who uses such tactics becomes part of the problem and only aggravates the situation.

"It is established that Ballinger willfully and maliciously violated 47 CFR 97.84(a), 97.123 and 97.125. The Commission has stressed that malicious interference in any radio service is a serious matter, that it is 'the most serious violation' found in the Amateur Radio Service [and] that it warrants the 'most stringent penalty.' " Ballinger has 30 days to appeal.

FCC DESTROYS THOUSANDS OF DOLLARS WORTH OF SEIZED ILLEGAL CB EQUIPMENT

On June 11, 1984, the FCC Norfolk District Office destroyed numerous illegal electronic devices that were used or could be used in the CB Radio Service. The devices included CB linear amplifiers, transmitters and other associated equipment seized by or forfeited to the FCC.

Unauthorized use of amplifiers with CB equipment persists as a major source of home radio and television interference. Therefore, curtailing the manufacture, sale and use of such devices continues to receive considerable FCC attention.

Most of the illegal equipment was seized under various search warrants in a series of criminal prosecutions of amplifier dealers and users. Following pleas of guilty in federal courts to charges of sale and/or use of illegal amplifier equipment, in addition to other penalties, the defendants were ordered to forfeit the seized property to the U.S. Government. Some of the illegal equipment was voluntarily submitted to the FCC for disposal by violators who were found to be using the equipment or were found with the equipment in their possession and advised that the equipment could not be legally sold.

The destruction of the seized equipment was accomplished by crushing the entire lot into scrap metal at the Norfolk Recycling Company at midmorning June 11. Approximately 400 pounds of equipment valued at nearly $12,000 was crushed under supervision of FCC officials.

Seizure of this illegal equipment and the resulting criminal prosecution has assisted in the removal of such hardware from use and, in turn, has helped to reduce the widespread interference caused by such illegal devices. — *FCC News Release*

CONNECTICUT ADOPTS RF EXPOSURE STANDARDS

Connecticut has passed into law standards for the operation of certain sources of nonionizing radiation. The new law directs the state commissioner of environmental protection to adopt the standards recommended by the American National Standards Institute in American national standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 300 kHz to 100 GHz. Sections of the bill requiring prior permission to operate an RF emitter were deleted in the final version.

ARRL GOLDWATER SCHOLARSHIP RECEIVES $1000 FROM CALIFORNIA GROUP

The San Diego County Amateur Radio Council has donated $1000 to the ARRL Scholarship Honoring Senator Barry Goldwater. This outstanding support represents contributions from the following member clubs: Convair ARC, Cubic ARC, San Diego DX Club, El Cajon ARC, North Shores ARC, Pt. Loma ARC, Palomar ARC, Poway ARS, San Diego Chapter QCWA, San Diego Teleprinter Society (SDTS), San Diego Repeater Association (SANDRA), South Bay ARS (SOBARS), 220 Club of San Diego, Coronado ARS.

SECTION MANAGER ELECTION NOTICE

To all ARRL members in the Missouri, Southern New Jersey, South Carolina, Western Pennsylvania, Eastern Massachusetts, Nebraska and New York City-Long Island Sections: You are hereby solicited for nominating petitions persuant to an election for Section Manager. Incumbents are listed on page 8 of this issue.

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

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

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

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

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, September 7, 1984.

Whenever more than one member is nominated in a single Section, ballots will be mailed from Headquarters on or before October 1, 1984. Returns will be counted November 20, 1984. SMs elected as a result of the above procedure will take office January 1, 1985.

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

If no petitions are received for a Section by the specified closing date, such Section will be resolicited in January *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

Washington Mailbox

Conducted By Richard K. Palm,* K1CE

The CO

That's CO, as in Control Operator. The concept of station control in Amateur Radio is as fundamental as a first grader's ABCs, yet can be complex enough to stump the most ardent repeater-auxiliary system operator. This month, we look at this crucial area of the rules: control.

Q. Who is responsible for the proper operation of an amateur station?

A. The licensee and the control operator of the station share responsibility. The station licensee is the person whose name appears on the station license. The control operator is the person who sits at the controls (control point) to perform the immediate operation of the station. Usually, the station licensee and the control operator are the same person — you normally operate your own rig. But occasionally you will invite a ham friend over to your shack to, say, help share operating time in a contest. When your friend is controlling the station, he or she is the control operator, and you both share responsibility for the rig's proper operation (97.79[b]).

The FCC always assumes you are the control operator of your station unless a written record exists to the contrary. So, when your friend is CO, jot down a note to this effect in a record or log book. If he or she breaks an FCC rule while operating, you'll both be responsible (97.79[b]).

Q. When my friend is operating my rig, whose call sign is used? What frequencies and privileges may he use?

A. The control operator is *always* limited to the privileges of his or her own operator license, even if the station licensee's are greater. If, for example, the station licensee is a Novice and the control operator is a General class licensee, the CO may use his or her General class privileges, provided proper ID is made. If the Novice's station call is used, the CO must add his/her own call at the end: KA1KOW/K8CH, for example (97.79[c]) (97.84[b]). Of course, the control operator may simply use his or her own call sign at your shack to ID the operations.

Q. What stations need control operators?

A. Every station must have a control operator when in operation. The control operator must be present at the control point of the amateur station, except when the station is operated by automatic control (97.79[b]). Automatic control is permitted for stations in repeater, auxiliary, space and beacon operation only.

Q. What is automatic control?

A. This type of control allows the control operator to be away from the control point of the station provided there is assurance that the station is operated legally. Devices and procedures must be used to prevent unauthorized tampering with the control functions or the physical equipment itself. It's used mainly for repeaters when it's not feasible to have the control operator on duty at the control point at all times. (97.3[m][3]).

Q. What types of control are used for other stations?

A. Most stations are locally controlled; that is, manual control with the control operator monitoring the operation on duty at a control point of the transmitter with the knobs and dials directly accessible (97.3[m][1]). In other words, he or she sits right in front of the rig to twiddle the knobs and watch the lights blink to make sure it is operated properly. Some stations are operated by remote control.

Q. How does remote control work?

A. In some cases, it's not easy to have a control operator sit right at the transmitter controls. For example, a station placed at the top of a mountain to gain better signal transmission and reception can be operated from one's home in the valley by *remote control.* This is manual control, too, but the control operator performs the control function at a distant control point of the station. Control is established through a *control link* to the transmitter. (97.3[m][2]).

The CO must be able to control the station from the remote control point just as well as if he/she was at a control point physically in front of the transmitter. It's important to remember that if the control link fails, the station's transmissions must cease after three minutes. Most hams install three-minute timers in the control circuitry of the remotely controlled station to meet this requirement (97.88[d]).

Q. What kinds of techniques are used for remote control links?

A. Some hams use wire or telephone lines to send their control commands to the station. Others use radio, or auxiliary operation of a station, to transmit control commands to the remote station. Auxiliary station control links must be placed on frequencies above 220.5 MHz, except 431-433 MHz and 435-438 MHz (97.61[d]).

Q. Do I have to monitor the frequencies used by my remote control station?

A. Yes. Immediately before and during the station's operation, the frequencies employed must be monitored by the CO. He or she must terminate all transmissions immediately if a rule violation occurs (97.88[c]).

Q. Do I have to protect my remote station from tampering?

A. Yes. You must take steps to ensure that your station cannot be operated by unauthorized individuals either by activation through the control link or by some other means. This is accomplished often by using padlocks on the station's housing and keeping command codes and control link frequencies as secret as possible (97.88[g]).

Q. Is it okay to let my unlicensed friend operate my rig? Who's responsible for his operations?

A. Any licensee may permit any third party (someone other than the two control operators — the first and second parties — involved in the communication) to *participate* in your Amateur Radio operations. The key word is *participate.* A third party may never operate (control) a station, but may speak into a mike or use a key or keyboard to communicate with the ham on the other end (or the nonham, if there's another third party at the other station). The control operator (first party) must be present to ensure that the station is operating properly during the third-party messages (97.79[d]). The station licensee/control operator assumes full responsibility for the third party's actions.

Q. How closely must the control operator control?

A. Although there is no specific rule about how close the control operator must be to the transmitter's controls, he or she must be "present at a control point." Practically speaking, the CO should not leave the control point with a third party engaged in communication. While it would be okay to allow the third party to press the PTT switch on the mike, the control op should make all operating adjustments to the transmitter.

The third-party-participation rules were never intended to allow quasi-amateur operation by unlicensed individuals.

Q. What are MSOs, and how are they controlled?

A. MSO, Message Storage Operations, are on-the-air "mailboxes" where hams can leave and receive messages for storage and retrieval. A station is activated by a command and, using digital or other techniques, a message is stored or retrieved from the mailbox memory system.

Just as with any amateur station, an MSO system and transmitter must be controlled either manually or remotely. Most MSOs are not in repeater operation, so they cannot be controlled automatically. Thus, a control operator must be on duty at a control point of the MSO transmitter at all times it is in operation (97.79[b]).

Q. When my repeater is automatically controlled with no control operator on duty at a control point, who's responsible for the station's transmissions?

A. Again, the station licensee is responsible for the proper operation of the station. The key to automatic control is that the station perform just as if the control operator were present at a control point. You must be able to effect control immediately.

[Note: Questions appearing in this column are typical of those frequently asked of the FCC and other agencies. Answers, prepared at ARRL Hq., have been reviewed by the FCC's Personal Radio Branch for agreement with current FCC interpretations and policy. Numbers in parentheses refer to specific sections of the FCC rules.]

*Deputy Manager, Membership Services, ARRL

How's DX?

Conducted By Ellen White,* W1YL/4

Islands in the Sea

[This material continues the coverage of tantalizing DX spots in the Indian Ocean started in the May issue, thanks to the excellent CIA atlas noted therein. — Ed.]

Outsiders have known of the islands of the Indian Ocean for centuries, but have seldom shown more than a cursory interest in them. (Outsiders, in this context, obviously does *not* refer to radio amateurs!) Some of the islands have long histories of human occupancy, but advanced civilizations have developed only on Madagascar and Ceylon (the Malagasy Republic, 5R, and Sri Lanka, 4S). Many of the islands were uninhabited until colonized by European powers in the expansionist periods of the 18th and 19th Centuries. Some are still uninhabited, usually because of an unfavorable physical environment.

The Arabs were the first group to leave their imprint on the islands. Arab dhows (boats) followed the seasonally reversing wind systems of the Arabian Sea, and their crews spread the Islamic religion and left a legacy of trade and seamanship as far distant as Zanzibar (Tanzania, 5H) and the Comoros (D6) to the south and the Malay Peninsula and the Indonesian Archipelago to the east. The westward drift of the South Equatorial Current is credited with bringing the Malayo-Polynesian ancestors of the important Merina tribe to the shores of Madagascar.

Following their development on the subcontinent of India, early Hindu and Buddhist civilizations spread to Ceylon, while Hindu culture expanded into the Laccadives and the Maldives to mix with the Arab influences there. The Indic peoples who brought these cultures were not noted as sailors, and their cultural expansion elsewhere in the western Indian Ocean region came only during the 19th and 20th Centuries as Indian laborers and traders emigrated to areas controlled by the British Empire.

French and British influence on the Indian Ocean islands began in the late 19th Century with the establishment of plantation agriculture to serve rapidly expanding Western European markets. Primary emphasis was placed on the coconut palm, indigenous to the low coral islands, or sugarcane, easily adapted to the fertile volcanic soils, and to coffee, tea, spices and rubber. The language, the religion and the lifestyles of the colonial administrators became the cultural heritage for the successor states of the mid-20th Century. The plantation system is responsible for some of the problems that now afflict the Indian Ocean islands. Among the foremost of these are overdependence on one or two cash crops and the frictions that have surfaced between cultural groups originally brought in as plantation labor.

Population pressure on many of the islands is focusing attention on the emerging problems of food deficits and limited water resources. The more densely populated islands — the Laccadives (VU7), the Maldives (8Q), Sri Lanka (4S), Mauritius (3B8), the Comoros (D6), the Seychelles (S7) and Reunion (FR) — are already net importers of food, and only the larger islands have even the prospect of self-sufficiency. The harvesting of food from the sea is still a primitive pursuit on most of the islands. Even in the Laccadives and the Maldives, whose people are skilled fisherman, modern techniques of ocean fishing have only quite recently been introduced, and only on a limited basis.

The search for economic diversification has turned toward the exploitation of the warm climate and the natural beauty of the islands for tourism. Aided by jet flights, new airports and the boom in world travel, Indian Ocean resorts that appeal particularly to tourists from South Africa, Japan and Western Europe have been constructed. Tourism, however, is accompanied by rising prices, pollution and changing social values.

An uncertain future awaits those small islands with large populations and limited resources that have in relatively recent years become independent. Political and economic relationships among the Indian Ocean islands and littoral countries are rudimentary but growing, stimulated by the increasing interest of the major world powers in the region and by the new influence in the northwestern Indian Ocean of the oil-rich states of the Persian Gulf.

The vast reaches of the Indian Ocean stretch from east Africa to west Australia, from Antarctica to the Indian subcontinent. It takes a highly motivated DX-minded radio amateur to even consider making the trip and activate one of these particularly choice DX locations — a ham, we'd like to think, who would follow the guidelines laid out in the June 1984 issue.

THE CIRCUIT

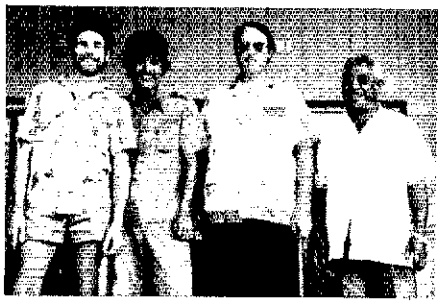
☐ Olympic Games: The American Red Cross and the Northern California DX Foundation will operate two stations (July 28-August 8) — W84OG and K84OG. The group will work MUF and grayline for DX stations, and the first 48 hours of operation from W84OG will be staffed by members of the Northern California DX Club. Send cards via the W6 Bureau or direct to Olympic Games, P.O. Box 9007, Stanford, CA 94305. Cards sent to the Box with an s.a.s.e. (or 3 IRCs and an s.a.e.) will receive a high priority. The goal is 10,000 contacts, phone and CW.

☐ World trip: ZL1AMN and wife ZL1ALE, both DXCC addicts, start in Singapore on August 14, then go on to the British Isles and the continent, winding up in Toronto the end of September. Dave says he may be contacted in the Ontario area via VE3HGA; Seattle, WA7LFD; San Francisco, W6KNH; and Los Angeles, K6INK. Dave's past DXing (he is close to the Honor Roll) includes operation from Kermadec as ZL1AA/K. Until the Johnstons leave New Zealand, they'll make a point of being on 14.265 at 0500-0600Z Tuesday and Friday.

☐ V3X: Peter DeWolf has made plans for the coming year, and they will take him to Belize in late September. Until then, expect V3X/W to be active both portable and mobile in the states, looking for 2-meter contacts. When back in Belize, he will spend most of his time on 10 and 20 phone, centered on 14.298 MHz. Peter also will try 6 and 2 sideband, and will look for a few contacts on OSCAR 10. All of this is projected for the first of October, that is if the tower survives the hurricane season! As a reminder, note that cards for both his W and V3 operations should be via Bill Coverdell, WBØBCX.

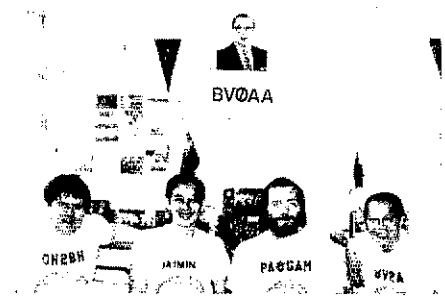
☐ HBØ: At about this time, the Liechtenstein operation by DF4GV, DJ8BD and DL8BH should be winding up. Elmar, DF4GV, notes that radio amateurs in the U.S. have always shown outstandingly good discipline in the pileups.

*19620 SW 234 St., Homestead, FL 33031

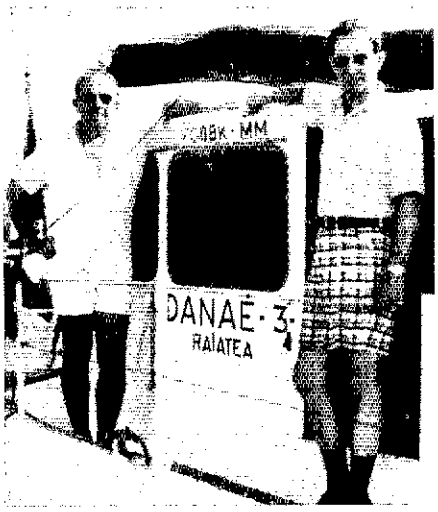


Left to right: ZK2RS, ZK1CG, ZK1XL (K6OZL) and ZK1MA in Raratonga, following ZK1XL's stay at Penrhyn Atoll in the North Cooks. *(tnx K6OZL)*

Over 30 years ago, W1DX (left) and W6QD spent some time looking for a "new one" on W1DX's visit to the coast. These two cohorts were instrumental in developing the concept of that open-ended DX contest of all time, the DXCC Award. *(tnx W6QD)*

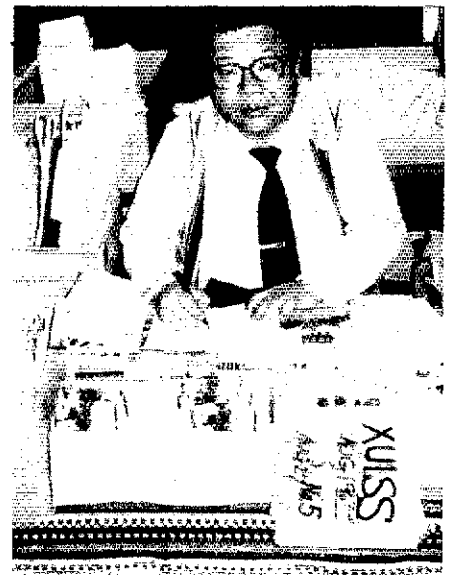


This assemblage provided almost 13,000 contacts using the first BV call sign issued to "foreigners," BVØAA, with permission to use 7 MHz for the first time. *(tnx OH2BH)*



FO8BK (left) on his charter yacht with visitor W2MOF. *(KA2TUU photo)*

SU1ER at his rig earlier this year. *(W4ZWE photo)*



JA1HQG, the DX Family Foundation's QSL Manager.

☐ GB4-D-DAY: This unique call, celebrating the 40th anniversary of the Normandy landing, was used by G4MDN June 5-7.

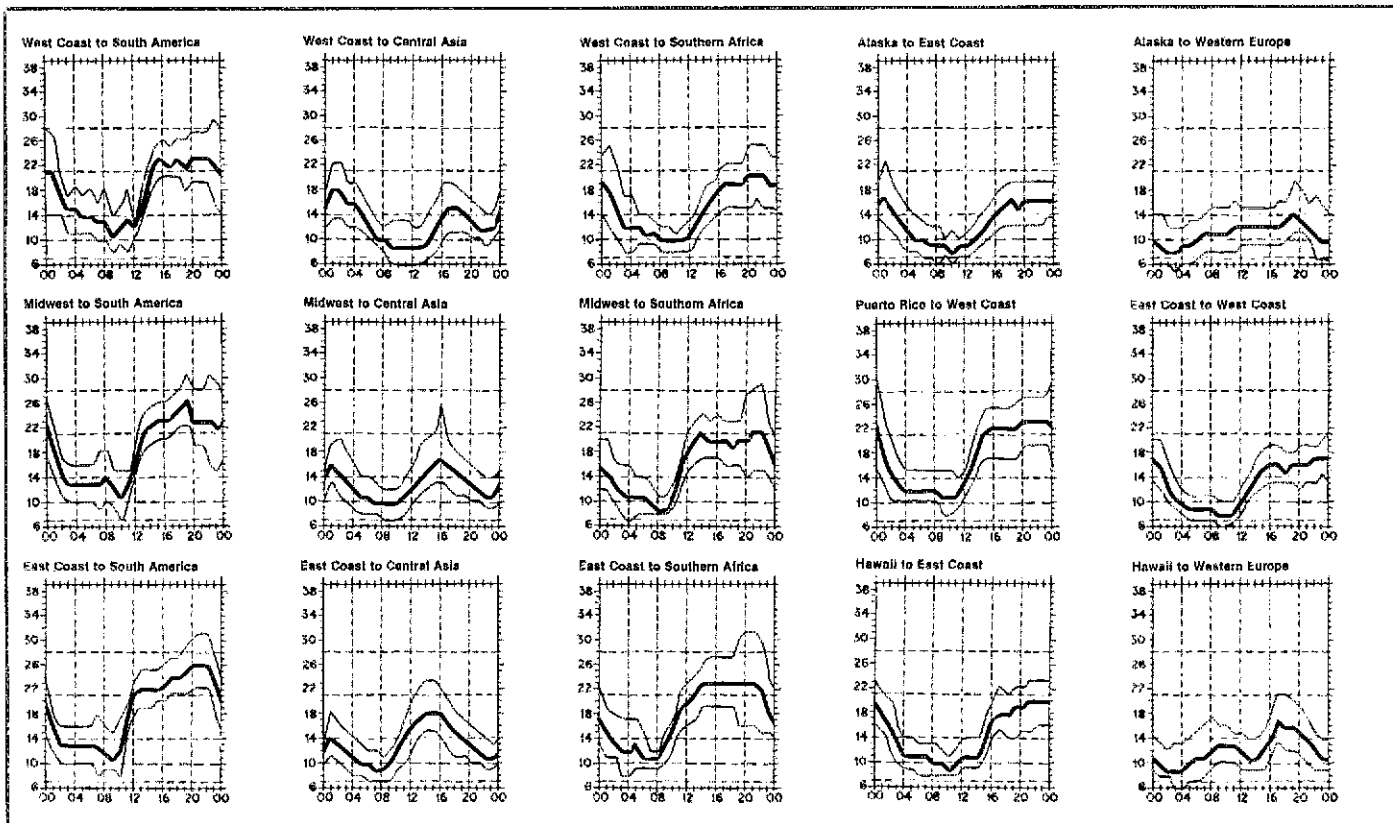
☐ KH8: K2FJ/KH8 operated in American Samoa, but reports that the most wonderful operating and living was on Savai'i Island in Western Samoa, as 5W1ER. Ken notes that island inhabitants were pleasant and friendly, and food was of the finest (that is, lobster every other evening!)

☐ DX was!: W2GT forwards a New Jersey newspaper clipping that notes March 18 was the 75th anniversary of a two-way, 6-mile transmission by a Danish ham. Civil engineer Einar Dessau, now 91, received a special award from the Danish society. First ham operator?

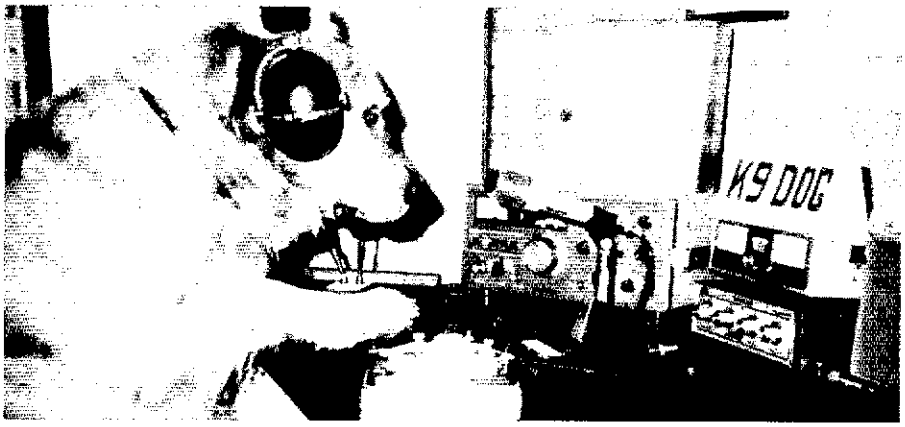
☐ ISØLYN: In a note to W2GT, he states that he cannot verify contacts with 3V8AA after November 1983. The 3V8AA station is genuine, but attendant costs, etc. make things too difficult for ISØLYN.

☐ W1FTX/4: Re The Circuit in the June column: I'm quite sure that the first contacts from PJ7-land via *any* satellite were made on August 4, 1973 between PJ7VL and 8P6DR on OSCAR 6, Orbit 3661. This was followed by QSOs with K2GUG and several other U.S./VE stations. Additional contacts were made on August 6, 1973. (Note: W1FTX has the logs for the operation noted above, and can help with cards for those still in need. Write to Dick Smith, 230 Olde Pointe Rd., Hampstead, NC 28443.)

☐ ZP5XDW/OA4DW's QSL Mgr. has moved. Cards go to Dave Wilson, N4DW, 114334 Rex Baxter, El Paso, TX 79936.



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



VK4ANF evidently feels that ham radio has gone to the dogs. But, at least, it is a CW canine! *(tnx WA3HUP)*

☐ K8PYD/VS6 and XX9YD: Both stations were operated by K8PYD, Leo W. Fry, 5740 N. Meadows Blvd., Columbus, OH 43229.

☐ A volunteer! Russ, KW6H, would like to be a QSL Manager for a DX station, and says that contesters are okay.

☐ French Polynesia: W2MOF, recently back from a visit to the island of Raiatea, extols the virtues of that kind of holiday. Frank had the good fortune to meet with Claude, FO8BK, aboard Claude's charter yacht, the *Danae 3*.

☐ SEANET: The 14th SEANET Convention, hosted by the Malaysian Amateur Radio Transmitters' Society (MARTS), will take place Nov. 16-18 in Penang. For further information, drop a line to Box 13, Penang, Malaysia. NN6U notes that he will be active from Penang through June 1985. Dick plans a lot of 40, 80 and 160 phone and CW activity. QSL via KB6UF.

Strays

I would like to get in touch with...

☐ any Hispanic-American hams interested in participating in a Spanish-speaking net at 1630Z Sundays on 7.267 MHz. Mike Ruiz, WB5WPS, 3105 Laguna Dr., Austin, TX 78741.

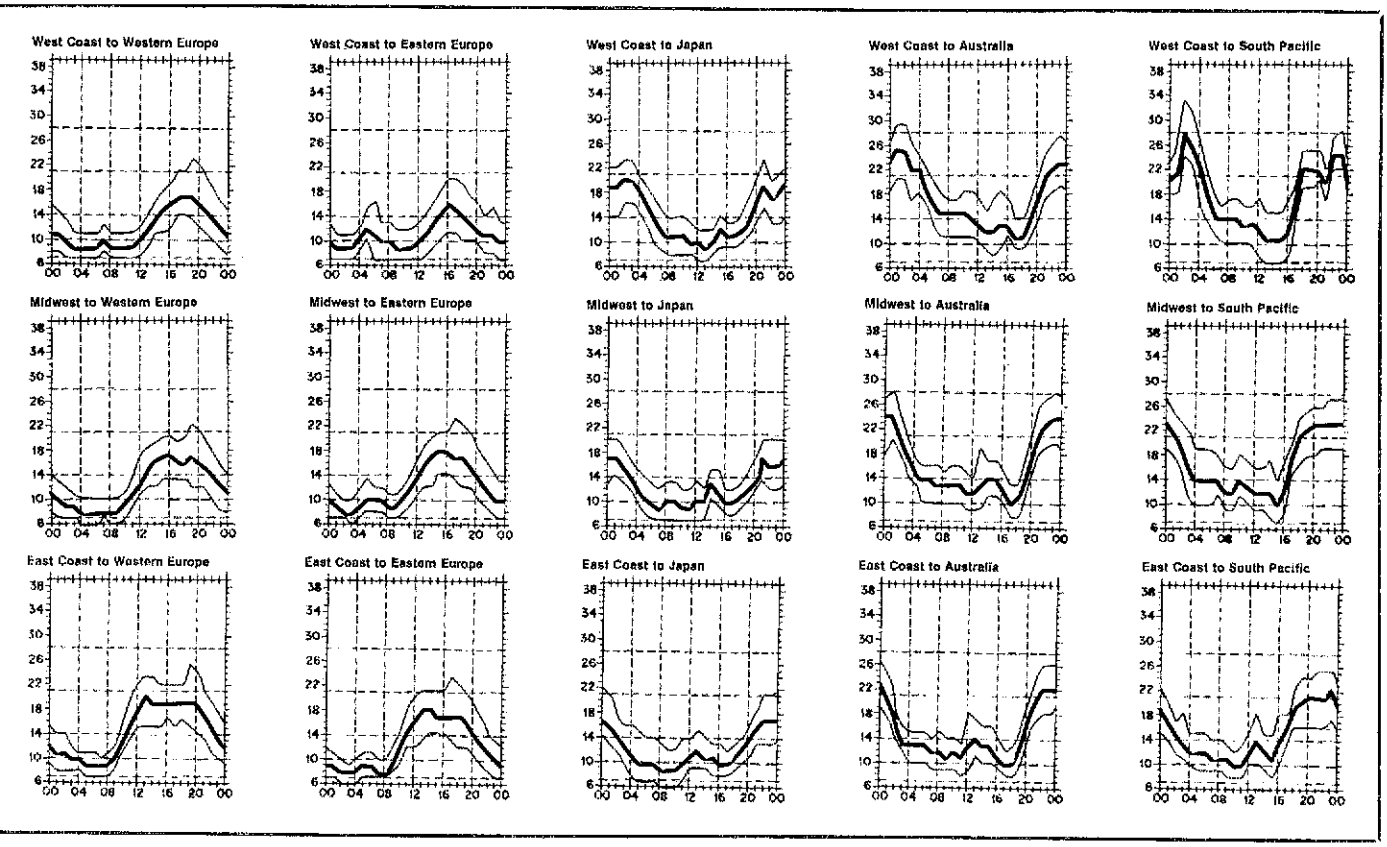
☐ any hams of German extraction. Peter Haberzettl, DD9NM, P.O. Box 52, D-8802 Windsbach, Fed. Rep. of Germany.

☐ any amateurs who are graduates of Cooper Union. John N. Michel, K2JM (Class of '42), 9 Hennessy Dr., Huntington, NY 11743.

☐ any amateurs who served as a Seabee from 1951 through 1955 on the East Coast. Charlie Porretto, WA4TWA, 2908 Shamrock N., Tallahassee, FL 32308.

☐ anyone who has a manual or schematic diagram for the Semcor Capacitor Analyzer, Model RC115. Peter Waasdorp, KF6MM, 324 Calle Adela, San Marcos, CA 92069.

During a visit to California, New Zealand Ambassador to the U.S. Lance Adam-Schneider (left) had an opportunity to listen in on a QSO on 15-meter phone between WA6ZUF (center) and KB6FX in Palm Springs, and ZL1BQD and WA6TWI (who was visiting) in Auckland, New Zealand.



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 August 15 to September 15, 1984 assume a sunspot number of 43, which corresponds to a 2800-MHz solar flux of 97.

DX Century Club Awards

Administered By Don Search, W3AZD

The ARRL DXCC is awarded to amateurs who submit written confirmations for contacts with 100 or more countries on the official ARRL DXCC List. You may also submit cards to endorse your award in 25-country increments through 250, 10-country increments through 300, and in 5-country increments above 300. The totals shown below are exact credits given to DXCC members from May 1 through May 31, 1984. An s.a.s.e. will bring you the rules and application forms for participation in the DXCC program.

New Members

Mixed

AL7BL/230	HB9QR/336	OK1TN/197	YU5FET/104	KR2K/100	KD4OW/113	KC5YB/103	N8AID/125	N9EAJ/101
DF6KB/107	JA1NLI/283	PY3OS/102	YU5GL/127	KY2O/125	KF4QD/104	WB5ZDP/104	N8FGH/103	KØEFK/102
DF7TU/108	JH3DTG/110	PY3ZZ/172	YU7BCF/178	KY2P/125	KF4ZR/100	K6CZN/156	WB8LFO/261	KØIYF/110
DF9IF/107	JK3AXT/109	PY4EU/109	6Y5WC/168	N2BAT/250	N4AEA/100	WB6STZ/184	KC9DJ/176	KCØIT/100
DK8NB/102	JA4LXY/312	SMØLQA/101	KB1EW/100	KB3ZB/101	N4GKE/107	W7BKR/311	KD9BG/140	KDØJL/105
F6DZU/307	JA4WFG/111	UK2BAS/312	KF1C/103	KK3K/101	N4IQZ/107	KC8MK/108	N9CVO/112	KUØA/103
F9DK/104	JA6CBG/114	VE3JGC/W4/110	W1NYL/100	WB3ICR/100	K4TSU/100	KD8FU/102	N9DOK/219	WAØQVC/145
G3JJG/250	JA7MF/244	VKØCW/101	KA2HWY/119	AD4U/227	WA4BKD/102			

Radiotelephone

AL7BL/228	EA4CFZ/157	JA1SFL/187	YB2BNJ/145	KA2LIM/132	K3APM/100	KC5YB/101	W6UVW/110	KC9V/161
DA2HT/101	EA5ALW/106	JK3AXT/104	YC3CEV/130	KB2VP/239	AD4U/226	NK5Z/153	KC8MK/108	KC9ZZ/101
DK5PE/129	G4LMO/107	JA6CBG/107	YU2SPT/105	KD2Z/232	KE4SX/100	NI5T/105	KC8QS/100	WB9WIC/104
DL1BPP/107	G4ULC/107	OY8R/129	6Y5WC/168	WA2MJA/177	N4EM/101	W5BJD/109	WB8LFO/261	KUØA/102
DL4FW/216	GW4OFQ/102	PA3AAN/138	KB1EW/100	WB2IJD/228	N4GKE/103	K6CZN/147	KB9YY/104	WAØCLN/108
EA3CUO/128	J73PB/107	VE1BNN/110	KA2HWY/118	WB2NJH/113	K5ABD/152			

CW

DL7UX/191	JR2IAC/100	JA7MF/219	PA3BWQ/100	VO1AW/209	WA2ASQ/100	W6MND/104	KV8Q/106	KØVGB/100
G3KDB/253	JA4IYL/108	OE2BZL/123	VE1AWM/139	XE1OX/110	KA4RPI/112	K8YWI/100	N8DCJ/160	KCØXK/109
G3NBZ/W6/103	JA4LXY/271	PY2ZEB/111	VE1BNN/109	WA1GOS/104	KG4O/100	KB8RH/107	KF9U/100	WAØGUD/103
IT9TQH/153	JA4TF/155	PA3BQX/106	VE3CKF/301					

RTTY

UT5RP

160 Meters

N4KE	W2BXA	W9ZR	K6SE	EA3VY	VE1BNN			

5BDXCC

OK1TN	K6EID	K9BIL	AI1S	KT7V	UA3AEL	OHØW	I1POR	VE1BNN
W2UP	HB9ALO	VE7AAQ	VE3IPR	KF3V	UA3HB	JA1JAN	KB1I	N2VW
KF9W								

Endorsements

Mixed

DF6FK/307	JA2DOU/283	TI2BEV/200	W1PNR/282	K3FN/314	W4MGX/303	KE6LT/282	KT8W/211	KR9O/298
DJ9RQ/316	JA2IIG/289	VE3DR/307	W1WW/260	K3LWM/311	W4PTH/315	KM6K/284	KV8Y/285	KS9Z/305
DK9IP/201	JA4CQS/320	VE3IPR/304	WA1AER/318	K3UA/318	WA4CCP/251	N6ND/315	N8ATR/269	N9ANR/262
DL1BS/321	JA4JBZ/205	VE3MV/291	K2RSG/175	K3WGR/161	WB4FLB/175	N6OZ/300	N8CKP/168	N9EZ/164
DL4FW/220	JA7BWT/181	VE7RG/271	KB2G/196	KC3AJ/280	WB4LJP/203	N6RA/319	N8FU/280	W9AG/328
DL7JY/291	JA7FEX/184	YU7DX/291	KB2RZ/297	KO3N/127	WB4NDX/316	N6VR/318	N8ZA/305	W9RF/331
DL7MAT/158	JA7GLB/318	YU7NZR/252	KC2SB/174	W3KH/283	WB4PAB/312	N6ZU/119	W8CEU/280	W9SC/307
DL9VR/280	JH7RKT/154	4X6AG/273	N2ATD/301	W3BTX/324	WD4NKP/300	NE6I/232	W8HN/340	W9WAQ/265
EL2AM/212	JA8AQ/325	4Z4UX/258	NA2G/176	W3MZG/289	WM4W/125	W6EKQ/135	W8MEP/153	WA9TVM/320
F6BWJ/315	JA8CFR/283	AD1S/300	W2ELH/270	AA4M/310	K5BLV/310	W6OAT/321	W8SEY/326	WD9DID/198
G3FKH/225	JA8FKO/314	AK1E/230	W2FCR/306	AA4V/316	K5FA/300	W6SWM/303	W8ZET/343	KØTLM/275
G3KDB/327	LA4O/158	K1HZ/253	W2GA/323	K4KYI/200	KA5HSA/126	WB8FDQ/200	WA8CZS/254	KCØFZ/187
G3YMC/221	LA8PF/249	K1JIU/127	W2GT/359	K4LRX/150	KD5RO/281	WB8QTB/188	WA8PYL/322	KCØMS/209
GM4FDM/229	OE2BZL/176	K1RM/335	W2GZZ/335	K4UEE/323	KE5CK/347	AD8I/300	WD8OTZ/263	KDØB/254
HZ1AB/306	OE6MKG/316	K1WJB/270	W2JB/324	KC4QT/225	N5FW/314	K8DJC/294	K9CJK/339	KGØE/284
I2LLD/321	OE8RT/334	KM1R/201	W2MJ/349	KF4YH/152	W5NUT/PJ7/184	K8EFS/269	K9DDO/241	NØASA/186
I2QMU/252	OH6RA/333	KR1R/225	W2SR/292	N4FAQ/259	W5RDA/347	K8NWD/291	K9GPN/204	NØBZP/125
I4FGG/187	OK3MM/354	N1ALR/265	W2SUA/331	N4JJ/317	WA5IEV/334	K8QXB/284	K9IW/307	NAØY/343
I8TOH/125	OZ2NU/207	N1BRT/207	W2SY/327	N4KE/325	WA5IPS/228	K8RD/315	K9PQG/321	WØCON/202
I8TSL/225	OZ6ZZ/291	W1BLJ/310	WA2AHP/175	NE4R/311	WB5ZGP/290	K8ZTT/287	K9VQK/317	WØHBH/315
IT9JLA/308	PT2BG/128	W1DQH/326	WA2FBE/128	W4BBP/347	AJ6V/290	KB8LH/277	KA9EMF/253	WØIH/209
JA1IOA/301	PY4DD/270	W1GDQ/324	WA2MNM/304	W4FLA/327	K6DG/290	KD8CG/140	KF9W/275	WØSYK/359
JA1SFL/255	SM7CMY/231	W1KDD/124	WA2VUY/302	W4KEB/197	K6NL/294	KG8V/324	KR9F/207	KØGVB/331
JH1FDP/275	SP9PT/326	W1LF/124	AI3Y/266	W4MAT/SV/134	K6SE/238	KN8P/288		

Radiotelephone

CE5CNT/177	I7IVL/310	OZ2BM/249	KM1R/178	WA2BGE/263	K5OVC/330	WA6RTA/326	KC8EU/281	KR9F/159
CP5EDE/175	I8IGZ/127	PY2CSV/236	KR1R/225	WA2VUY/301	N6AJW/305	WB6STZ/183	KC8KE/201	KR9O/297
DF6FK/304	I8TOH/125	PY4VX/310	N1ALR/265	WB2CJL/260	N6FW/298	K7DOR/201	KV8Y/282	KR9R/226
DJ3AR/310	I8TSL/225	PZ5JR/168	W1PNR/282	WB2NIC/291	W5CRP/230	KC7XB/152	N8ATR/269	KS9R/152
DJ9RQ/315	IT9WPO/152	VE3IPR/300	WA1AER/317	K3LWM/302	W5LLU/271	KD7EC/226	N8BNE/175	KS9Z/305
DK6XR/319	IØMPF/318	VE3LRU/266	K2VAM/201	K4KYI/199	W5NUT/PJ7/184	W7BKR/311	W8HFK/227	N9ANR/260
DL1BS/264	JA1NLI/283	VE3MRS/307	KA2HHW/159	KB4IY/215	WA5BBR/251	W7DSZ/300	W8QHG/247	W9AG/274
DL4FV/183	JA2IIG/277	VE3MV/291	KB2RZ/297	KE4YD/202	WA5IEV/333	W7FDJ/306	W8SEY/217	W9CRN/293
EL2AM/211	JA4DLP/316	VE4IS/269	KC2SB/169	KF4YH/152	K6DG/290	WA7COD/231	W8RNB/150	W9HUW/201
F6DZU/306	JA7GLB/316	YB2BOT/201	N2ATD/297	N4BSH/131	K6SE/132	AD8I/294	W8ZET/343	W9VSL/136
GM4FDM/227	JA8FKO/154	ZP5WU/202	N2BAT/250	N4CC/320	KA6V/250	K8DHK/165	WA8CZS/250	KØTLM/268
HZ1AB/181	J73PD/171	4X6AG/250	W2ELH/254	N4DIT/205	KB6OK/261	K8DJC/294	WA8PYL/312	KCØFZ/187
I1ZFT/284	JY3ZH/309	4Z4UX/257	W2FCR/306	N4FAC/258	KE6LT/281	K8EFS/267	WD8LMU/155	KCØMS/205
I2EOW/201	LA8PF/134	AD1S/297	W2GA/315	N4JF/280	KM6K/277	K8MID/200	WD8OTZ/263	KDØB/252
I2LPA/327	LU7MAJ/289	K1LHT/326	W2GT/307	N4KE/323	N6EI/181	K8NWD/283	K9IW/302	NØZA/280
I2ZGC/316	OE2BZL/167	K1RAW/316	W2IJB/302	NE4R/299	W6BAF/350	K8ZTT/277	K9PQG/315	NAØY/334
I5ICY/279	OE2WR/201	KA1BRD/270	W2IOO/315	WB4NDX/315	W6JQT/227	KB8LH/273	K9ZO/290	WØUGV/151
I5IGQ/273	ON4SZ/353	KA1PM/225	W2SUA/329	K5MLG/251	W6SWM/288	KC8CY/303	KF9W/274	WØZX/205

CW

DJ5JH/280	HP1AC/227	LA9XG/177	AD1S/164	K2BZT/294	K3FN/312	AC5K/139	WB6FDQ/137	K9IW/294
DL1HBT/150	HZ1AB/170	OH6EW/173	KB1I/140	KB2G/195	K3LWM/242	KC5M/150	W7EEJ/225	K9VAI/225
DL9VR/252	JA1SFL/197	OZ6ZZ/261	KE1K/154	KA2DIV/253	K3WGR/150	N5CID/252	AD8I/275	KR9F/126
G3YMC/182	JA2IIG/232	PY2OO/203	WA1AER/298	W2ELH/126	KC4HN/127	N5FW/283	K8ZTT/177	KR9O/184
HA8UB/225	JH7ARV/229	VE3IPR/254	AA2Q/175	W2FTY/226	N4JF/244	KB6WI/139	W8SEY/182	W9RKP/200
HB9CGO/178	JH7RKT/140	4X6AG/177	AK2O/176	W2SR/275	N4KE/251	W6SN/250	WA8YTM/125	NØZA/250

DXCC Notes

Correction: CW K9AJ/306. Honor Roll Corrections: Mixed — N4NX 306/315, AB9E 306/315, W7CNL 313/325. Phone — TI2HP 315/363, W4MGN 312/338.

Correspondence

Conducted By Peter R. O'Dell,* KB1N

MACARONI OR MARCONI?

☐ Discrimination against women by the amateur community is, of course, nothing more than a reflection of negative attitudes that have prevailed traditionally in society as a whole. However, given that the radio art serves as a matrix for the development of various special modes of communication between people, it is especially ironic and sad if we are to develop ever more sophisticated devices only to *mis*communicate the same old myths electronically.

The measure of truly meaningful communication between any people is largely determined by the readiness to perceive others as they present themselves as individuals — which may be at considerable variance from stereotypes based on sex, color, etc. The reality for myself, for example, is that I happen to find it more rewarding to file QSL cards than recipes and — brainwashing efforts of the media notwithstanding — am more curious about how my transmitter works than how to combat "ring around the collar." My attendance at hamfests will, logically enough, reflect my interest in ham radio.

On the other hand, there are many women who will take macrame or macaroni over Marconi any day of the week, and this is very FB. Moreover, the two worlds are not necessarily mutually exclusive. The point is, we are not dealing with the immutability of Ohm's Law, but a matter of personal choice — our birthright in this supposedly enlightened 20th Century America. I think it behooves the amateur community to select terminology that is consistent with that fact when planning hamfests and other activities. — *Carol A. Metzger, KA2PQG, Somerville, New Jersey*

KUDOS, *QST!*

☐ I would like to thank Brice Anderson, W9PNE, and *QST* for the article on the X beam (March 1983 *QST*, p. 33). The X beam looked easy enough to build and relatively inexpensive. I built the 15-meter version for the 21.100-21.200 MHz CW part of the band. The cost of the beam varies and depends on the cost of the tubing, rope, wire, connectors, base, screws, etc. The cost of the beam was in the range of $35 for parts, not counting the coax, ends and balun.

It rained the evening of the day I installed the beam, and later on that same evening I had QSOs with Texas and New York, both with an RST of 599. The next day I made contact with Masterton, New Zealand, a new country for me. With the heavy amount of rain here, the SWR remained constant.

All in all, I have been extremely pleased with the results of this beam, not only from the economical point of view, but also from the performance and the personal satisfaction of building it myself.

Thanks again for this excellent article. — *Larry Heller, KA9PCU, Galesburg, Illinois*

☐ *QST* and Richard Buchan, WØTJF, are to be congratulated on a very useful article in the May issue: "Eliminate TVI With Common-Mode Current Controls." So very little has been written on the subject of establishing working ground systems under practical conditions. I can now see why several problems in my shack exist, and I have some good ideas on how to rectify them ... although it looks like major work!

Ground loops and nonfunctional ground systems are abundant, as one can tell by listening to all the hum and RF feedback distortion evident on the bands. Of course, this is only the tip of the iceberg ... harmonics and other spurious radiation are not so easily observed, except on our neighbors' TV sets!

More articles on this subject are certainly needed. Such topics as measuring ground impedance, connecting to other ground systems, and establishing a working HF ground in a second story wood-frame home, I'm sure, would be welcomed by many amateurs. The *Handbook* could devote an entire chapter to this all-important subject! — *Ron Castro, N6AHA, San Bruno, California*

DAY-TO-DAY CALCULATIONS

☐ Calculating sunrise and sunset times in K1KI's article (June *QST*, p. 56) is a lot easier on a computer. A short but very effective low-level BASIC program to calculate sunrise, sunset and twilight times (astronomical, nautical and civil) was written by William C. Bell, and appeared under the title of "Computing Times of Sunrise, Sunset and Twilight" in the April 1984 issue of *Astronomy* (AstroMedia Corp., 625 E. St. Paul Ave., P.O. Box 92788, Milwaukee, WI 53202). According to the author, the program is so small that it can run on the small pocket calculators of Radio Shack, and the BASIC is easily adapted to any of the popular microcomputers. I've modified my version to take advantage of the 80-column (more labels and prompts) formatting on an Apple II Plus. Questions can be addressed to me on the SOURCE (STC ID: BCF811). — *Thomas R. Sundstrom, W2XQ, Vincentown, New Jersey*

GREMLINS

☐ Your publication, *Radio Frequency Interference*, was well worth the three bucks I paid for it. That, plus a minimal cash outlay (around $35), helped me eliminate a TVI "condition" from a color TV set located about 20 feet from my rig and chase the gremlins out of other audio devices around the house. While it may be too soon to tell for certain, I think that I have saved my neighbors, my wife and myself from a lot of aggravation. The suggested remedies in your book made this paperpusher-*cum*-Novice look good, and I gained quite a bit of practical knowledge from the experience.

Now if you only published a book called *The Lazy Person's Guide to Lawn Care ...* — *Randy Kemp, KA1LTJ, Trumbull, Connecticut*

A CHALLENGE

☐ I would like to propose a challenge to the producers of coaxial cable: Why not colored cable? A lot of amateurs like me like to have a lead-in for each antenna to have the capability of using each antenna on a different set at the same time. This is a good capability, especially during contests!

Recent heavy winds prompted this letter. One cable was snapped during the winds. It was not difficult to discover which one, but it would have been much easier if you could just look up the tower and see which color of cable snapped. — *Harold D. Donaldson, WB6SKV, Fair Oaks, California*

THANK YOU, 14,313

☐ Late last month (May) I was happily sailing a 40-foot ketch to Bermuda and back, carrying a 150-W transceiver and a ¼-wave vertical on 20 meters.

300 miles at sea and on a completely dark night two red emergency flares were sighted nearby, and a Mayday message was sent on 14,313 kHz in behalf of the person(s) in trouble ... a message of last resort and grave importance.

This is the frequency of the InterContinental Net, The Coast Guard Net, the Maritime Mobile Net and the SeaFarers Net, and operates 'round the clock worldwide for hams at sea and U.S. citizens living abroad. The service is unique in that it doesn't hang on the coattails of any other services.

With the most efficient and intelligent operating I've heard in 38 years as a ham, the frequency was cleared, the U.S. Coast Guard was brought on frequency, the FCC triangulated our position, and the essentials were communicated. At daylight a Coast Guard plane was sent on search and rescue from New York, but to date I don't know if the poor souls in trouble were ever found.

Ten days later, 150 miles NNE of Bermuda, a violent storm hit us with 70-MPH-plus winds and 45-foot seas. We survived, but three ships did not. Four are still missing (as of June 11), two were demasted and one limped home with a broken boom.

With an almost fatherly capability the nets kept in regular touch with us, fed our position to the Coast Guard, reported to our families, and gave us highly accurate weather reports that at one time allowed us to sail quickly out of the weather. I hope that you good people of the nets will understand the importance of the comfort and help you gave us. I can't name all your call signs; there were just too many; besides, I didn't have time to keep a decent log.

But the point of all this is not simply telling a story. The point to be made is that the net operators at no time lost their composure. At no time was there mayhem from the neurotic need to be part of the act. Instead, there was incredible professionalism, all tempered with wisdom and something unusually close to the elusive altruism.

To you, ladies and gentlemen of the nets on 14,313 kHz, thank you. Amateur Radio has at last grown up, and I'm proud as hell of you. — *Mac Reynolds, W9EVI, Bannockburn, Illinois*

*Public Information Coordinator, ARRL

IARU News

Conducted By Richard L. Baldwin,* W1RU

IARU HAS TWO NEW MEMBERS

Congratulations to the two newest members of the IARU — The Chinese Radio Sports Association, representing the People's Republic of China, and the Vanuatu Amateur Radio Society, representing the Republic of Vanuatu. Each of these new members received 87 affirmative votes. This brings the total membership of IARU to 121, representing about 1.5 million radio amateurs. We welcome our two new members and look forward to their enthusiastic participation in the activities of IARU.

IARU HAS A NEW CONSTITUTION

Five years ago, during WARC-79, the members of IARU started a restructuring process, to modernize the constitution of IARU in order to make the Union more competent to cope with present-day challenges. Many distinguished amateurs contributed a great deal of time and energy to this project, which was brought to a successful conclusion on May 30, 1984 with the completion of voting on the proposed new constitution. It has been adopted by an overwhelming majority of 98 votes. This is a considerably greater number of votes than ever before cast on an IARU proposal, and very comfortably exceeds the 80 votes (2/3 majority) required for adoption.

AMATEUR SATELLITE JAS-1

JAS-1, a new amateur communications satellite with analog and digital transponders, is being developed by the Japan Amateur Radio League, Inc. (JARL), with support from JAMSAT (the Japanese AMSAT). It is scheduled for launch in early 1986. See Amateur Satellite Program News, July 1984 *QST* (page 77), for more details.

OBTAINING AN AMATEUR RADIO LICENSE IN THE U.K.

Two basic types of Amateur Radio licenses are issued in the United Kingdom by the Department of Trade and Industry: Class A and Class B. The Class A license gives access to all amateur bands and requires the passing of a Morse test administered by British Telecom, whereas the Class B license gives access to amateur bands above 144 MHz and does not require a Morse test or permit its holders to use CW.

The technical qualification required for both classes of license is to pass the Radio Amateur's Examination. This consists of two parts: One covers licensing conditions and awareness of the interference problems that can be attributed to Amateur Radio operation, and their solution. The other is concerned with purely technical matters. A "pass" is required in both parts of the examination, and candidates must take both sections on their first attempt. However, if the candidate has the misfortune to pass one part but not the other, he or she is only required to reattempt the section in which success was not achieved.

The examination has a total duration of three hours. The first part consists of 35 multiple-choice questions, of which 23 are concerned with licensing conditions and 12 with interference. This lasts for one hour. There is then a break of 15 minutes, which is followed by the second section lasting 1 hour 45 minutes. It consists of 60 multiple-choice questions on operating practices and procedures, electrical theory, semiconductors, radio receivers, transmitters, propagation, antennas and measurements.

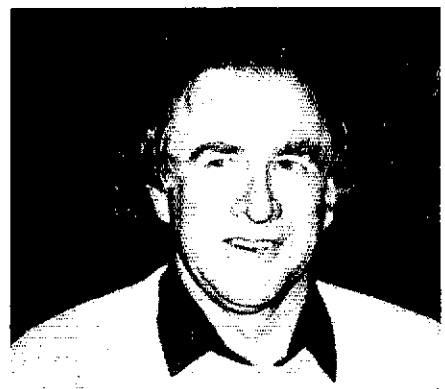
The examination is set and administered by the City and Guilds of London Institute, acting on behalf of the Department of Trade and Industry. Currently, it is held three times per year at various centers, such as colleges, polytechnics and some that are specifically set up by the RSGB for the purpose.

Passing the Radio Amateur's Examination is all that is required in order to apply for a Class B license. If a Class A license is required, it is necessary to pass a Morse test, which consists of sending and receiving at 12 WPM. This may be taken either at main BT testing centers in London and other major cities or at coastal radio stations run by British Telecom as part of the maritime radio service. The test consists of sending and receiving 36 words with an average length of five letters in two 3-minute periods; up to four errors are permitted in the copy received, and up to four corrections may be made while sending. No uncorrected sending errors are permitted. Also, 10 groups of five figures must be sent and received in two periods of 1.5 minutes with a maximum of two errors in the received copy and two corrections in the figures sent.

A pass in the Radio Amateur's Examination is valid indefinitely, whereas a pass in the Morse test is valid only for 12 months; it is, therefore, advisable to take the Morse test after the RAE has been taken and passed. There are now no exceptions from either the RAE or the Morse test on the grounds of professional or armed forces qualifications, and every intending radio amateur must sit one or both according to the class of license required.

Further information can be obtained from RSGB. — *G3OUF*

May 1984 visitors to JARL Hq. included ARI President Rosario Vollero, I8KRV, and Mr. R. Rosa, I8YRR. Their tour guides were Shozo Hara, JA1AN, president of JARL, and Masa Fujioka, JM1UXU, secretary of IARU Region 3. Left to right are JM1UXU, JA1AN, I8KRV and I8YRR.



At the 48th annual convention of the Wireless Institute of Australia, held on the weekend of April 28-30, Dr. David Wardlaw, VK3ADW, was elected WIA president for the coming year. He has long been active not only in WIA affairs but also in IARU, and was a member of the Australian delegation to WARC-79.

*President, IARU

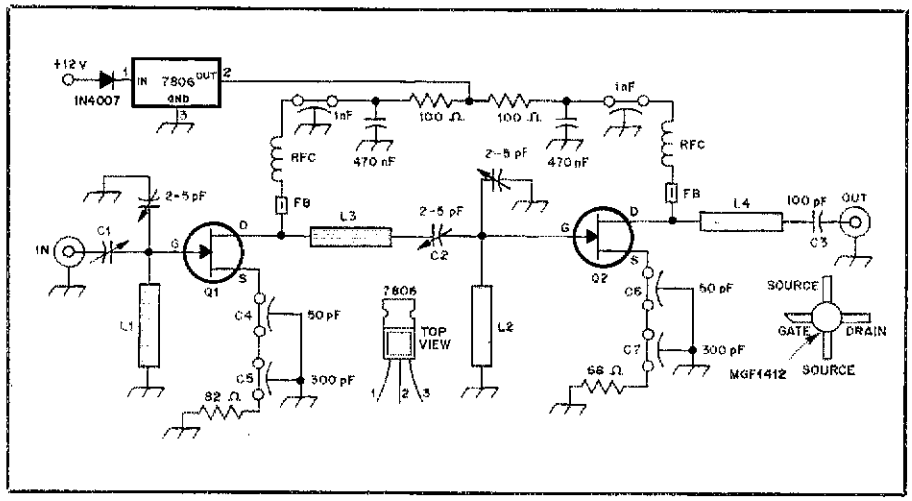
The New Frontier

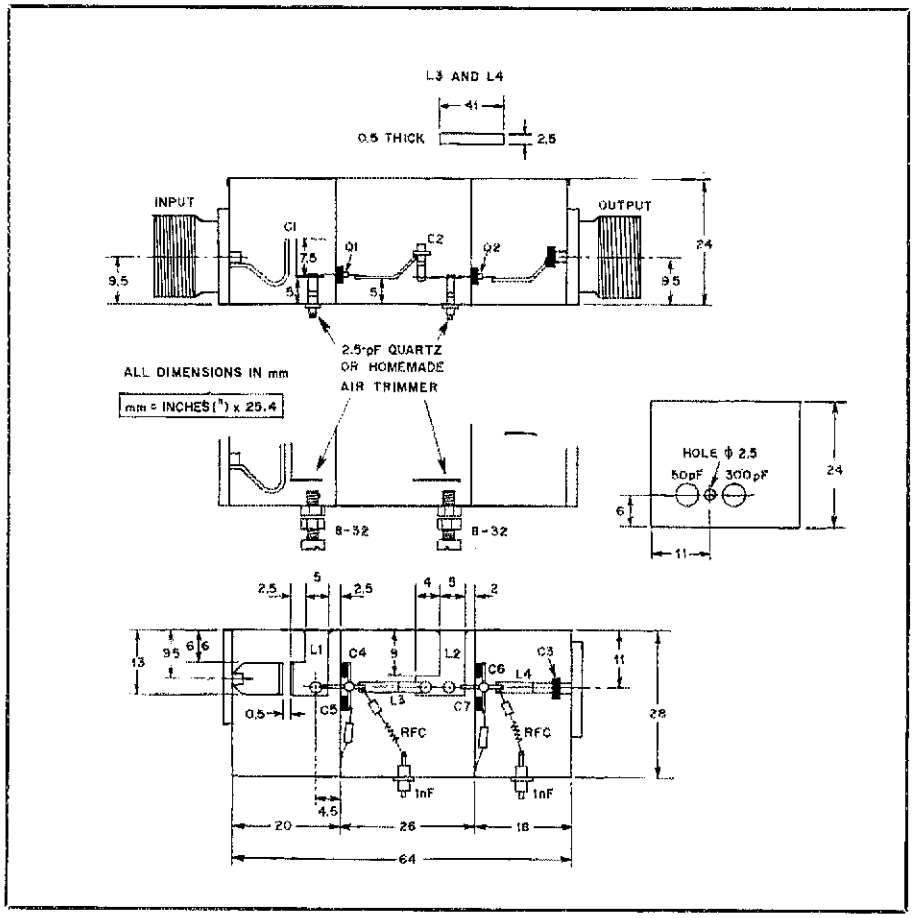
Conducted By Bob Atkins,* KA1GT

13-cm GaAsFET PREAMP

The preamp shown was designed by Peter Riml, OE9PMJ. Thanks to Peter for permission to reproduce it here. It uses two MGF 1412 GaAsFETs, and shows a noise figure of < 0.6 dB at 2300 MHz with an associated gain of 32 dB (enough to overcome even the noisiest mixer!).

G3WDG reports building a single-stage preamp using the input circuit from the first stage and the output circuit of the second stage. Using an MGF 1403 with an 82-ohm bias resistor, he reports a noise figure of about 0.5 dB with a gain of 15 dB. In its two-stage configuration, the first GaAsFET is an MGF 1412-11-09 and the second an MGF 1412-11-10. The first has a slightly lower noise figure (and consequently costs slightly more). The devices are available from Applied Invention (RD 2, Box 390, Rte. 21, Hillsdale, NY 12529) at a cost of around $25 each.





2300-MHz preamplifier. Q1 and Q2 have two opposed source leads. These leads are decoupled by one 50-pF and one 300-pF capacitor (C4, C5) on each transistor. These capacitors should be low-inductance types, preferably chip capacitors or at least UHF "button" types. Input and output connectors should be SMA or type "N." The inductors, L1-L4, can be silver plated. This may improve Q and/or reduce corrosion.

Q1 — MGF 1412-11-09.
Q2 — MGF 1412-11-10.
L1, L2 — See figure.
L3, L4 — 11 × 2.5 × 0.5-mm copper
RFC — 7 turns of 0.3-mm-diameter wire on 3-mm form.
FB — Ferrite bead.

23-cm QRP DX

John Pearson, KF4JU, has written with details of a recent QRP contact on 23 cm. On April 28, he worked a path between his QTH in St. Petersburg and W4ODW in Niceville, Florida — a distance of 322 miles — using a transmitter with 150-μW output, and received a report of 339. John's transmitter consisted of a 1150-MHz local oscillator feeding a 3/2-λ rat-race mixer along with a 146.1-MHz IF signal, to give an output on 1296.1 MHz. The final output was filtered with a three-pole filter, and power output was measured with an HP 436A power meter. The feed line was 100 ft of Belden 9913, and the antenna a 15-el quagi. The antenna used at W4ODW was a 4-ft dish. John wonders whether this contact constitutes any kind of QRP record, at about 2.15 million miles per watt. Does anyone keep track of these things? Incidentally, a rough calculation shows that the signals received over this path were only about 16 dB below that expected for a free-space path.

MICROWAVE NEWSLETTER TECHNICAL COLLECTION

Regular readers of this column will have noted that from time to time I refer to articles appearing in the *RSGB Microwave Newsletter*. Some readers have inquired as to how to subscribe. First, you have to be a member of the RSGB, then you pay your subscription! Now, however, non-RSGB members may purchase a compilation of all the technical articles that have appeared in the *Newsletter* over the period of April 1980-May 1983 together with some articles from *Radio Communication*. This RSGB compilation is titled *The Microwave Newsletter Technical Collection*. It will be available soon from ARRL Hq. for $10. Articles cover 1.3 to 24 GHz, and include mixers, oscillators, multipliers, antennas, test equipment, and much more. Since it is a European publication, some of the semiconductors used may be hard to find in the USA. Nevertheless, this is a publication that should be on the bookshelf of every microwave enthusiast. Thoroughly recommended reading!

13-cm NEWS

Paul Wilson, W4HHK, has written with details of the first Tennessee-Texas contact on 13 cm. On May 24, at 0212 GMT, he worked Al Ward, WB5LUA, at a distance of 425 miles. Both stations were using 1-kW-input klystron amplifiers. Paul used an 18-ft dish 35 ft above ground, and Al used his 24-ft dish. Propagation was over-the-horizon scatter — not EME — and CW was used. On the following day, Paul copied some SSB from Al. An interesting historical sidenote is that the last time Paul heard signals from Al's klystron was in 1970 when it was used by W3GKR in the W4HHK-W3GKP 13-cm EME contact (the first ever on that band).

*103 Division Ave., Millington, NJ 07946

Canadian NewsFronts

Conducted By Harry MacLean,* VE3GRO

CRRL,Box 7009, Station E, London, ON N5Y 4J9, Tel. 519-451-3773
CRRL Outgoing QSL Bureau, Box 113, Rothesay, NB E0G 2W0

Reginald Fessenden Memorial ARC

You don't have to be a big club to be a good club. Reginald Fessenden Memorial ARC only has three members: Bruce Weber, VE3ACN; Tom Vince, VE3HM; and Al Ilridge, VE3JM.

As with all clubs, everyone likes to get together to build, experiment, operate and generally enjoy Amateur Radio. This club, however, has an additional purpose: to publicize the work of "Radio's First Voice," Reginald Aubrey Fessenden.

Fessenden was born in East Bolton, Quebec. As a young man he applied for a job in Edison's laboratory, but was rejected because Edison had " . . . enough men who don't know anything about electricity." Fessenden persisted and eventually became part of Edison's team. In 1900, Fessenden made the world's first radio voice transmission. Spark and arc transmitters, however, didn't modulate too well. Eventually, Fessenden developed an *alternator* capable of producing RF at 70 kHz.

On Christmas Eve 1906, operating from Brant Rock, Massachusetts, Fessenden made the world's first radio broadcast. Sailors had been warned to expect something unusual on the air that night. They were greeted with the strains of Handel's "Largo" played on a phonograph. This was followed by Fessenden himself, playing the violin while an assistant sang "O Holy Night." Finally, the sailors were wished a Merry Christmas.

The entire membership of Reginald Fessenden Memorial ARC — plus one (l-r): VE3ACN, CRRL President VE3CDM, VE3HM and VE3JM. *(VE3AND photo)*

In years that followed, Fessenden invented everything from submarine communications systems to iceberg detectors. When he died in 1932, he had some 500 patents to his credit.

Members of Reginald Fessenden Memorial ARC feel their man has been a bit neglected. They feel he should be remembered right alongside the other greats of early radio: Marconi, De Forest and Armstrong. They're doing what they can to improve the situation.

Their club repeater, located in Thorold, Ontario, carries the call VE3RAF, and their club call, active every Field Day, is VE3RFM. When they get together for their annual meeting in St. Catharines, Ontario, the talk is usually about promoting Fessenden.

No, you don't have to be a big club to be a good club. You just need a focus, a special reason for coming together. This club's got it.

CRRL REGIONAL DIRECTOR ELECTIONS

To all CRRL members: You are hereby solicited for nominating petitions pursuant to an election for CRRL Regional Directors.

CRRL Regions are as follows: Western (British Columbia and the Yukon), Prairies (Alberta, Saskatchewan, Manitoba and the Northwest Territories), Ontario, Quebec and Atlantic (New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador).

A petition, to be valid, must carry the names of 10 or more Full members of the League residing in the Region concerned. Photocopied signatures are not acceptable. Signatures must be *on the petition*. It is advisable to have more than 10 signatures on a petition.

Petition forms (EDC-1) are available from the CRRL Headquarters Office in London, Ontario, but are not required. The following form is suggested:

(Place and date)

The Secretary, CRRL
Box 7009, Station E, London, ON N5Y 4J9

We, the undersigned Full members of CRRL, the Canadian Radio Relay League, residing in the . . . Region, hereby nominate . . . as CRRL Director for this Region for the next two-year term of office.

(Signatures . . . Calls . . . Addresses including postal codes . . .)

A CRRL Director candidate must (1) reside in the CRRL Region he or she wishes to serve, (2) have been a member of the League for a continuous term of four years before the date of nomination, (3) have held a Canadian Advanced Amateur certificate throughout that time, and (4) be at least 21 years of age.

Petitions must be received at the CRRL Headquarters office on or before noon EDT August 20, 1984. Eligibility of candidates will be checked shortly after that. If there is only one eligible candidate in a Region, that candidate will be declared elected without opposition. If there is more than one eligible candidate in a Region, the CRRL Secretary, on or before October 1, 1984, will send ballots to all those in the Region who were Full CRRL members on September 1, 1984. Marked ballots will be accepted at the CRRL Headquarters office in London, Ontario, until noon EST November 20, 1984, and will be counted shortly after that in the manner prescribed in the CRRL By-laws. Results will be announced on W1AW, through the *CRRL News* bulletins and in *QST*.

CRRL Regional Directors elected as a result of the above procedures will serve on the CRRL Board for a two-year term that begins on January 1, 1985.

You are urged to take the initiative and file a nominating petition immediately.

Harry MacLean, VE3GRO
CRRL Secretary

SECTION MANAGER ELECTION NOTICE

To all CRRL members in the Quebec and Saskatchewan Sections: You are hereby solicited for nominating petitions pursuant to an election for Section Manager. Names of the incumbents are listed on page 8 of *QST*.

A petition, to be valid, must carry the names of five or more Full members of the League residing in the Section concerned. Photocopied signatures are not acceptable. Signatures must be *on the petition*. It is advisable to have more than five signatures on a petition.

Petition forms (CD-129-C) are available from the CRRL Headquarters office in London, Ontario, but are not required. The following form is suggested:

(Place and date)

The Secretary, CRRL
Box 7009, Station E, London, ON N5Y 4J9

We, the undersigned Full members of the League residing in the . . . Section, hereby nominate . . . as Section Manager for this Section for the next two-year term of office.

(Signatures . . . Calls . . . Addresses including postal codes . . .)

A Section Manager candidate must have been a member of the League for a continuous term of at least two years, and be a licensed amateur holding a Canadian Amateur certificate or higher immediately prior to the receipt of nominating petition at the CRRL Headquarters office.

Petitions must be received at the CRRL Headquarters office on or before 5:30 EDT September 10, 1984.

If only one valid petition is received for a Section, the person nominated will be declared elected without opposition. If more than one valid petition is received for a Section, there will be a balloted election. Ballots will be mailed from the CRRL Headquarters office on or before October 1, 1984. Returns will be counted on November 20, 1984.

Section Managers elected as a result of the above procedures will serve for a two-year term that begins on January 1, 1985.

If no petition is received for a Section by the specified closing date, the Section will be resolicited in January 1985 *QST*. A Section Manager elected after resolicitation will serve for 18 months.

Vacancies in any Section Manager office between elections will be filled by appointment made by the CRRL Secretary, acting on the advice of the CRRL Board.

You are urged to take the initiative and file a nominating petition immediately.

Harry MacLean, VE3GRO
CRRL Secretary

CRRL NEWS

☐ Many thanks to Norm Waltho, VE5AE, who has retired as Manager of the CRRL VE5 Incoming QSL Bureau. Norm, is also CARF Western Director, is moving to Alberta. Best wishes to Bjarne Madsen, VE5ADA, who is new Bureau Manager.

☐ More and more amateurs are using the CRRL Outgoing QSL Bureau. Bureau Manager Don Welling, VE1WF, processed some 21,482 cards in the first quarter of 1984. The service is free, but for CRRL members only. It's one of dozens of good reasons to join CRRL.

☐ If your Amateur Radio club or group is trying to solve a cable-television-interference problem, ask to

*163 Meridene Crescent West, London, ON N5X 1G3, Tel. 519-433-1198

borrow the CRRL Cable Television Interference Kit. This kit, prepared with the assistance of Robert Smits, VE7EMD, of the British Columbia F. M. Communications Association, and CRRL Director Bill Kremer, VE7CSD, contains copies of government and industry documents about cable television, copies of letters about interference, copies of interventions prepared for the recent CRTC hearings in Vancouver and a videotape of the amateur presentations at those hearings. It's all useful material that can help put your cable-television interference problem into perspective and suggest ways of working to a solution.

☐ Nominations are open for CRRL Amateur of the Year. This can be someone who should be recognized for a particular achievement or someone who has given long-standing service to Amateur Radio. Send nominations and support material to CRRL by September 14.

DOC NEWS

☐ DOC has informed CRRL of a new reciprocal-operating agreement with Grenada, J3. The agreement took effect April 11.

☐ DOC has issued a new TRC-68 outlining certification requirements for cordless telephones. According to this document, cordless telephones that operate in the 1.6- and 49-MHz bands (these are the ones that show up on our 160-metre band) may be produced only until October 1. Cordless telephones that operate in the 46- and 49-MHz bands may be produced only until 1989 February 15. DOC expects all cordless telephones manufactured after that date to operate in the 900-MHz band.

☐ DOC has announced the dates for its 1985 Amateur Radio examinations: February 13, April 17, June 19 and October 16. Deadlines for submitting applications to write are January 16, March 20, May 22 and September 18, or about one month before the date of each writing. Remaining date for DOC Amateur Radio examinations this year is October 17. Deadline for applications is September 19.

NOTES FROM ALL OVER

☐ Welcome to Dana Shtun, VE3DSS, who is new Canadian member of the ARRL VHF-UHF Advisory Committee. Dana is an engineer with Ontario Hydro and has been active on the VHF/UHF bands, working DX, contesting, and building and experimenting since 1969.

☐ Colin Dumbrille, VP9BK, formerly VE2BK, was ARRL Canadian Vice Director from 1962 to 1970. Recently, Colin celebrated 50 years as a radio amateur. To mark this event, the government of Bermuda honoured Colin with a special call, VP9C. CRRL also honoured Colin with a Certificate of Merit, in recognition of Colin's many years of service to Canadian Amateur Radio.

☐ CRRL President Tom Atkins, VE3CDM, is Treasurer of IARU Region 2. Tom represented Canadian amateurs at a three-day IARU Region 2 Executive Committee meeting held in Mexico City on June 15-17.

☐ If you shop at Dominion Stores or Best for Less stores, Libby Steven, VE3IOT, wants your cash register tapes. They'll be used to purchase an electronic wheelchair for Jocelyn Lovell, Canada's former gold medalist in cycling who became a quadriplegic when he was struck by a truck last summer. Jocelyn has been interested in Amateur Radio. He plans to work for his licence when he is released from hospital later this year. Send those tapes to Libby Stevens, VE3IOT, 1 Ida St., Thornhill, ON L3T 1X4.

In Training

MAKE THE BEST OF AUDIOVISUALS

Audiovisual presentations can make you — or break you. A good tape or film, well-matched to your audience and to your purpose, can literally wake your class up. Of course, the converse can also hold true. Knowing how to use audiovisuals is a skill you, as an instructor who cares, will want to master.

Let's say you've decided to use a prepared program to supplement your Amateur Radio course. You want to capture your students' attention and heighten curiosity. A well-chosen audiovisual program can help you do that, but you can follow a few guidelines that will help your students derive even more from the presentation. In particular, your part in handling the introduction is important: You'll be establishing continuity with the class session's objectives.

Preparation

Review the audiovisual program first. Whether it's film, videotape, audiotape or slides, a review will let you know if the program and equipment are in proper working condition.

Try to pinpoint the overall objective of the program and match that to your course objectives. You'll find that many audiovisual programs assume prior background or knowledge of the subject. Is it assuming too much or too little for your class? Keep these things in mind during your review, and take notes.

Before presenting the program to the class, prepare the students for what they will see or hear. Tell them the relevant points to look for, and then distribute a printed sheet outlining those points for the students' reference. Explain how you expect your students to use the information. Will the show be a review of a previous classroom discussion, or will it introduce a new subject? Perhaps it will illustrate while you speak (e.g., using the ARRL Novice slide show). Be sure to point out any specific facts presented in the audiovisuals that will help them understand answers to study questions in their textbooks.

Summarize

After the presentation, have the class organize a summary of the major points. You can start with the overall theme and decide how the major points tie into it. Try to relate the information just presented with facts your students are already familiar with. It will help them to remember and learn.

This part of the class session may trigger questions or responses that may need more exploration. Be open to this opportunity, and plan future class discussions accordingly. Remember: It's the attention-grabbing element of audiovisuals at work!

Audiovisual Search

ARRL Headquarters is conducting a nationwide survey of manufacturers, educational institutions and professional associations to determine what audiovisual aids (movies, videotapes, slide shows, film strips, etc.) are available for use by ham classes and/or clubs. We expect to review at Headquarters all such available aids, and will publish a list of them later this year.

The only qualifications, insofar as subject matter is concerned, is that the aid must be relevant to some field of telecommunications. It's not necessary for the aid to be immediately relevant to Amateur Radio. (For instance, we would be interested in an aid concerning satellite navigation. Although Amateur Radio is not directly involved with that subject, the techniques used are adaptable to OSCAR.) If you know of any such aids, please drop us a line at the ARRL Training Branch.

NOVICE QUESTIONS REVISED

The FCC has revised the Novice class (Element 2) question pool slightly. Two questions were replaced and two questions were reedited in the May 1984 issue of PR Bulletin 1035A. In addition, the numbering of questions in Subelement 2A was adjusted to compensate for a rule change.

All of these revisions affect only Subelement 2A on Rules and Regulations. We've listed the questions that were either reedited or replaced. You'll find the original Novice question pool, released as PR Bulletin 1035A (July 1983), in September 1983 *QST*, pp. 57-59, and in the latest edition of *Tune in the World.*

2A-7.2 What is the term for the amateur radio operator designated by the licensee of an amateur radio station to also be responsible for the emission from that station?

2A-23.2 (formerly 2A-24.2) What is the maximum transmitter power ever permitted to be used at an amateur radio station transmitting on frequencies available to the Novice class operator?

2A-23.3 (formerly 2A-24.3) What is the amount of transmitter power that an amateur radio station must never exceed when transmitting on 3.725 MHz?

2A-23.4 (formerly 2A-24.4) What is the amount of transmitter power that an amateur radio station must never exceed transmitting on 7.125 MHz?

Twenty Novice questions based on operating rules have been assigned new question numbers. When PR Bulletin 1035A was released in July 1983, several questions on station logging requirements had already been built into the pool before the FCC eliminated the rule. Therefore, Subsection 2A-22 was reserved for logging rule questions that were never used.

The May 1984 revision simply reassigned 2A-22 to "station identification." Questions about Novice power limitations (2A-23), official notices of violation (2A-24) and control-operator requirements (2A-25) follow in order.

QUESTION POOLS IN MANUAL

The FCC question pools for Technician/General, Advanced and Extra Class exams are now included in the latest edition of the *Radio Amateur's License Manual,* published by ARRL and available for $4. The questions are in the same format as they appear in the FCC PR Bulletin 1035 series.

This edition of the *License Manual* is intended to be used with the *FCC Rule Book* and other ARRL reference texts. It will help serve Amateur Radio students desiring to upgrade their licenses until brand new ARRL manuals for each license are published.

ARRL Assistant Training Manager Steve Ewald, WA4CMS, wrote this month's column.

The World Above 50 MHz

Conducted By
Bill Tynan,* W3XO

A New Technique for Meteor Scatter?

Except for the introduction of SSB a few years ago, we here in North America are accomplishing MS communication pretty much the way we did when W2UK and W4HHK made their first 2-meter contacts via the mode some 30 years ago. Generally, we set up a schedule that specifies the frequency and transmission method to be used, CW or SSB, along with the sequence, transmit and receive periods for each station. Normally, 15-second sequences are employed. Station 1 transmits for the first and third 15-second segments of each minute, and station 2 for the second and fourth.

Particularly during meteor showers, this scheme works quite well for exchanging calls and specially formatted reports. This is enough to constitute a contact, and many states have gone into logs on 2 and 1¼ meters and even 70 cm in this way. For those who haven't installed some kind of automation, such as a programmable keyer or continuous-loop audio tape for use on SSB, the one-half- to one-hour-long schedules can become quite grueling. Nevertheless, it's fun and quite productive in getting new states.

Those who have not tried it by all means should. The best opportunity of the year is coming up about two weeks after this appears in mailboxes. It's the Perseids Meteor Shower, expected this year about August 11. It is best for those just getting their feet wet in MS to start with a schedule or two. By all means, start with 2 meters, rather than one of the higher bands. If you have 100-W output (or more) and a reasonably good beam, you should stand a good chance of success during this shower. Select a station who is experienced with the mode, preferably in a state you need about 800-1100 miles away. The 2-meter standings box carried in last month's column is a good source of potential candidates. Give one or more of them a call and ask for a sked. Most of those who have enough states to be listed have had some experience with the "ping mode," as it is affectionately called. Most can help explain the procedure and reporting scheme, as well as suggest a preferred transmission mode.

The use of CW or SSB in company with relatively long (15-second) transmissions is not universal. In Europe, it is customary to use shorter transmissions and tape machines sped up so the CW rate is several hundred words per minute. After the sked, the tape is slowed down to determine what was received. Although more effective on short meteor bursts than is the system we use, it is difficult to conduct interactive communication using this method.

A new form of communication that has come on the amateur scene in the past year or so may hold promise of being able to better utilize the shorter bursts and provide very good interactive communication. In fact, it may make possible almost continuous keyboard communication even during nonshower periods. It's called packet radio. Short bursts of transmission, typically about 1 second in length, are sent out, and received and stored by the other station. Acknowledgments are then exchanged, confirming receipt of the transmission. This is followed by the next packet until the message is completed.

To date, much of the packet work has been done in local areas on 2-meter FM using AFSK, although FSK, both on HF and through the OSCAR 10 satellite, is also being accomplished. The use of FSK on 2 meters for MS would probably pose difficulties because of the rather narrow filters used in the modems associated with packet boards, and the Doppler shift, which often accompanies meteor bursts.

A worthwhile subject for experimentation might be to develop a way to get around this problem, as the use of FSK would offer considerable signal-level advantage over FM with AFSK. Transmission rates on most of the HF bands are limited by FCC rules to 300 bauds. On 2 meters and through the satellite, most work is done at 1200 bauds.

A few of those experimenting with packet intend to attempt to establish long-haul communication during the Perseids using FM with AFSK, just to see if it is feasible. Some of those involved include W3IWI and K1HTV/3 here in the Washington area, WØPN in Minnesota and WØRPK in Iowa. The standard frequency in this part of the country for local work is 145.01 MHz, although the long-haul attempts will probably be made off this frequency, with 145.05 the most likely choice. Many of those involved in packet today use either the TAPR (Tucson Amateur Packet Radio Corporation) terminal node controller (TNC) or a similar one from the Vancouver Amateur Digital Communications Group (VADCG). Another unit based on the TAPR TNC is now available from AEA. GLB and Ashby also are said to be marketing packet TNCs. (For more information, see On Line, this issue.)

Those who already have packet capability as well as a capable 2-meter station may wish to contact one of the organizations or manufacturers listed above to join in on the long-haul MS experiments. Those with packet capability but possessing only low-power equipment for 2 meters may wish to participate by attempting to receive the periodic transmissions some of the above stations will be transmitting. Others, not yet packet-equipped, might want to listen just to see if they can hear the various stations via meteor bursts. Those intending to participate in one way or another should coordinate via telephone with one of the above stations, or via either the Central States VHF Society liaison frequency (3818 kHz) or the AMSAT Tuesday evening net beginning at 2100 Eastern Time on 3850 kHz. The Central States frequency is usually active during meteor showers and during their regular net at 2030 Central Time Sunday evenings.

For more information about packet radio, this new and exciting facet to our hobby, see the 1984 edition of the *Radio Amateur's Handbook*, page 14-49. Maybe by Perseids time next year, we will have many more exchanging packets via the fiery meteor trails.

ON THE BANDS

6 Meters — As of mid-June, the 1984 E_s season seems to be somewhat of a mixed bag. From this vantage point in the Mid Atlantic states, it got off to a great start in early May. But, as May gave way to June, the frequency and quality of openings seemed to diminish. Maybe that perception is caused by the fact that some days in May were so good. Of course, the optimistic view is that the best should be yet to come. In other years, the period from mid-June to mid-July is usually the most productive, especially of long-haul propagation.

One of the stellar days for May came the 19th. Following good openings to the Midwest and Gulf Coast states, LUs began to be heard about 2050Z. This conductor was finally at the right place at the right time and managed to work LUs 7DZ, 9AEA, 3DCA and 8AHW. See the 2-meter section for what happened next! Back to 6 and a contact with VP9GE, which was repeated once the Sprint got underway. The 6-meter Sprint was very good for such a short affair here. In this part of the country, the highlight was working YS1ECB for an unexpected multiplier for all and a new country for most. The appearance of VP9GE also provided an element of excitement. These, along with a good smattering of domestic contacts via the E layer, including strong signals from the south and backscatter from northerly stations, made the Sprint a lively time indeed. From this location, the June VHF QSO Party was pretty much a matter of working the tropo range stations and then eking out as many additional sections as possible on scatter. Exceptions were a short opening to the Midwest and Western states Saturday evening and a solid, hour-long opening to Florida Sunday evening. That was preceded by a few scattered signals from the Caribbean, with W4UWH/KP2, several KP4s, C6ANY and VP2EME workable from this area. More on the VP2E operation later. Generally, however, in comparison to other years, multipliers were hard to come by and 6 meters did not "walk away with the contest" as it is occasionally accused of doing by some. Again, it is emphasized that these observations are those of this conductor in this particular location.

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

1¼-Meter Standings

For WAS holders, listing is WAS number, call, state, call areas worked and grids worked. For others, call, state, U.S. states worked, call areas worked and grids worked. Call areas are the 10 U.S. call areas plus KH6 and KL7, plus each VE and XE call area plus DXCC countries not located within the continental limits of the U.S., Canada or Mexico. In order to make the Standings a true reflection of stations currently active on 1¼ meters, those not reporting activity within the past two years have been dropped. They will be reinstated upon written presentation of continuing activity. It is not necessary to have worked additional states to remain in the standings or to be reinstated, merely to indicate that you are still on the band. WAS holders are listed in any case. Compiled June 15, 1984. Deadline for next update is December 1.

1	WØVB*	MN	13	—	—
2	WØSD*	SD	—	—	—
2	WBØTEM*	IA	—	—	—
4	K5FF*	NM	14	—	—
5	W5FF*	NM	13	—	—
6	WB5LUA*	TX	—	—	—
	W1JR*	MA	39	14	56
	K1FO	CT	22	7	—
	K1PXE	CT	18	6	—
	W1YTW	ME	14	8	—
	W1GXT	MA	14	8	—
	W1HDQ	CT	13	5	—
	W1QXX	MA	13	5	—
	K1JIX	MA	13	4	—
	W1AZK	NH	10	3	—
	K1BFA	MA	10	3	—
	W2CRS	NY	21	—	—
	K2CBA*	NY	19	7	—
	W2PGC	NY	16	10	—
	W2DWJ	NJ	15	6	—
	K2DNR	NY	15	6	—
	K2YCO	NY	14	7	—
	WA2FGK	NJ	14	6	—
	WA2FUZ	NY	14	5	—
	W2SEU	NY	13	5	—
	W2WW	NY	9	4	12
	WA2YWP	NY	6	2	—
	W3GPY*	PA	40	12	—
	K3HZO	MD	20	10	—
	W3UJG	MD	15	8	—
	W3RUE	PA	14	7	—
	W3IP	MD	13	6	—
	W3HMU	PA	13	4	—
	WA3JUF	PA	12	5	—
	K3IUV	PA	12	4	—
	W3XO	MD	9	4	—
	WD4DGF	TN	24	7	—
	W3IY/4	VA	23	10	—
	K4LHB	VA	21	9	—
	WA4COG	AL	20	—	—
	WD4IIS	GA	18	7	—
	K4GL	SC	14	6	—
	WA4SBC	VA	14	5	—
	KC4P	AL	9	2	—
	K4IXC	FL	5	3	—
	W5RCI	MS	24	6	—
	K5CM	OK	22	—	—
	W5HN	TX	21	6	—
	K5SW	OK	15	5	—
	N4JS/5	MS	13	7	—
	N5KW	OK	12	—	—
	W5RCI	MS	10	5	—
	K5JL	OK	7	4	—
	W5NZS	OK	4	2	—
	WA5VJB	TX	5	3	—
	WB6NMT*		10	6	—
	W6WSQ		6	4	—
	K7NII*	AZ	16	11	—
	W7JF	MT	8	5	1
	W7CNK	WA	6	3	—
	K7ICW	NV	4	2	—
	WB8BKC*	MI	28	9	—
	WA8TXT	OH	20	10	—
	WB8PAT	OH	16	8	—
	W8IDU	MI	15	7	—
	K8AXU	OH	12	7	—
	K8HWW	MI	11	7	—
	K9MRI*	IN	34	9	—
	K9XY*	WI	28	13	—
	K9HMB*	IL	23	10	—
	WB9SNR	IL	22	9	—
	K9KFR	IN	11	6	—
	KB9NM	WI	5	4	—
	KAØY*	IA	32	11	—
	WØPW*	CO	20	8	—
	KØALL	ND	17	9	—
	KØDAS	IA	16	7	—
	KBØQR	NE	8	3	8
	WAØNOK	MO	6	2	—
	KØTLM	MO	5	2	—
	WBØZKG	IA	5	2	—
	WAØQLP	SD	4	2	—
	KCØW	ND	3	1	—
	VE1UT		4	1	—
	VE2YU		8	3	—
	VE2DFO		7	8	—
	VE2HW		5	2	—
	VE3EMS		47	14	—
	VE3DSS		13	7	—
	VE3AIB		10	12	—
	XE1BC*		2	3	—

*Indicates some contacts via EME

Other parts of the country may have an entirely different slant.

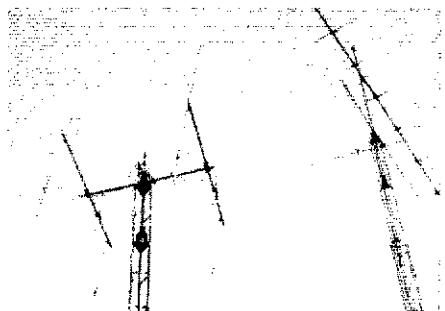
As of the end of May, WBØZKG Toledo, Iowa, contends that conditions have been very good indeed. Charlie notes openings during 15 days in May, some of them excellent. In just two months of operating, April and May, he reports contacts with 45 states plus VE1, VE2, VE3 and VE5, eight countries and 205 grids. N5GYT Fort Worth, Texas, reports that June 6 was particularly good in his part of the country. At 2155Z, Fred hooked up with V3FB Belize and five minutes later contacted XE1GE. In addition to working some Florida stations, Fred capped off the evening by putting XE3VV into the log.

W6JKV reports on the trek that he and Rob, WB6SHD, made to Anguilla as VP2EME and VE2ESE, respectively. Jim says that he made some 300 tropo and E_s contacts, and that VP2ESE (operated by Rob) had quite a few QSOs as well. The secret weapon this time was an array consisting of two 50-foot-long 11-element, 6-meter Yagis designed by K6MYC. The two monsters were separated by 24 feet on a horizontal cross member with the antennas oriented vertically. This arrangement made them much easier to mount than if they had been vertically stacked and mounted for horizontal polarization. Despite being cross polarized with virtually all 6-meter stations, Jim says that on E_s the big antenna was almost always considerably better than the single seven-element KLM they also had in operation. This observation is, of course, consistent with the widely held view that matching polarization between two communicating stations is not necessary in the case of ionospheric propagation.

As effective as the big beam was for E_s, the real story was the 6-meter moonbounce tests the two conducted with K6MYC and K6HCP. Using the setting moon, both California stations were able to hear them, and vice versa, during every schedule. Obviously, Jim expressed great pride in what had been done; he is so high on the 50-foot boom Yagi that he plans to cart at least one of them to Greenland later this month. W6JKV has promised to come up with a more detailed description of the antenna and their Anguilla operation. I will try to get it into a *QST* feature or include it in this column in the not-too-distant future.

NU6S suggests that the DX calling frequency be moved from 50.110 to 50.120 because of the many carriers often found just above 110, apparently caused by TV games, computers, and the like. He points out that sometimes the carriers are quite strong and can make copying a weak DX station difficult. Sounds like a good idea, Tim. The proposed frequency would still be compatible with the concept of leaving the first 25 kHz above 50.1 free for attempting DX contacts. DX stations please take note.

2 Meters — This band has been performing very well so far this season. A real surprise presented itself to many of us in the Washington area at about 2145Z May 19. As those of us who also work 6 meters were searching for more South Americans, the word was flashed that VP9IB was in on 144.197! You could almost hear the switches being thrown and the beams turning all over town as more area stations came on frequency and exchanged quick reports with the Bermuda station. Tom's signals were quite strong for about 10-15 minutes, and then it was over. It may not have lasted long, but people will be recounting for some years to come how they worked Bermuda on 2 meters. VP9GE was also on and is known to have worked at least one area station, W3IP. Early-in-the season E_s was not the exclusive property of us on the East Coast. The following day, May 20, beginning about 2330Z, W5UWB Kingsville, Texas, reports working 12 Nebraska stations, two in Minnesota, one each in Iowa and Kansas. John says that the opening lasted almost two hours.



The EME array consisting of four 13-element RIWs in use at JA1RJU.

An example of the level of European interest in VHF and UHF: Pavel Sir, OK1AIY, of Mrklov, Czechoslovakia, builds all of his equipment and runs 500 W on 2 meters and 70 cm. 60 W on 23 cm and 80 W on 13 cm. A varactor multiplier and 1-meter dish handle chores on 3 cm. Pavel's best DX on 23 cm is 1350 km (845 miles) to G3AUS; on 13 cm, it is 1028 km (645 miles) to G4BYU. This photo, supplied by W3EP, shows OK1AIY at a portable location in the mountains near the Polish border.

Early June brought more E_s to large areas of the country. K5SW Muskogee, Oklahoma, lists 16 Florida stations worked between 0000Z and 0200Z June 5. KB4CVN Miami, reporting from the other end of the path, turns in a list of nine 5s and 0s he worked during the same opening. E_s on that day was apparently quite widespread and intense. WA5IYX San Antonio, a longtime watcher and recorder of VHF ionospheric propagation, says that by 1600Z he was receiving signals from the West right up to the top end of the FM broadcast band. At 1633Z, he worked WB7OHF in Arizona. No more activity could be found to work on 2 meters, but he did receive signals as high as the video for Channel 8. Calculations convince Pat that frequencies approaching 220 MHz might have been open. He notes that this is the highest E_s MUF he has recorded since February 1977, when he received Channel 13 from Sioux Falls, South Dakota.

E_s was not the only attraction to keep 2-meter operators happy. That staple of all VHF propagation — tropo — also provided considerable interest. In his report, K5SW highlights the evening of May 24, on which Sam lists 17 contacts in Tennessee, Kentucky, Alabama, Georgia, Illinois, Indiana, Ohio, Michigan and Pennsylvania. K1FJM/4 in south Florida caught a very nice tropo opening the evening of June 6. Pete made contacts with two stations in Louisiana, one in Alabama, one (W4GJO) in north Georgia, plus W5TVW/MM in the Gulf of Mexico operating from EL58.

WA8MIL wishes it known that he has moved and must start over again on his states. Therefore, Stan is anxious for whatever Perseids schedules he can arrange. His phone number is 616-874-8697. The new QTH is in EN73.

The Higher Bands — W4HHK Collierville, Tennessee, continues his pioneering work on the 13-cm band. This time the station on the other end is WB5LUA McKinney, Texas. Both have dishes and klystrons putting out about 300 W. Success first came over the 425-mile path the evening of May 24. The following evening, they repeated the contact with somewhat better results, although 2 meters was not as good that night as it had been the previous one. W4HHK notes that his dish is 18 feet in diameter and is mounted with its center at 35 feet above ground. It has been in service for 20 years, and Paul wonders if that is a record. Incidentally, Texas makes state number five for W4HHK. He worked W3GKP in Maryland on EME in 1970. Since then, Alabama, his own state, Michigan and Texas have been added, all on tropo.

On Line

Conducted By Stan Horzepa,* WA1LOU

Packet Radio — A Novice's Reflections

I took the plunge. After reading about it, talking about it, writing about it and dabbling in it for three years or more, I finally decided to get on the packet-radio mode (some gentle coaxing by CompuServe Hamnet sysop W3VS finally pushed me over the brink).

When I began shopping around for packet-radio equipment, I did not have any wish list in mind because, being new to the mode, I really did not know what I would need. However, I did know that there were two operating protocols in amateur packet radio — Vancouver and AX.25 — and I wanted to be sure the equipment I purchased was compatible with both protocols. As it turned out, all of the available packet-radio equipment is compatible with both protocols. (A protocol is a set of procedures that determine how information is exchanged within a network.)

Vancouver and AX.25 Protocols

The Vancouver protocol was the first popular amateur packet-radio protocol. It was developed by Doug Lockhart, VE7APU, of the Vancouver Amateur Digital Communications Group (VADCG, 953 Odlin Rd., Richmond, BC V6X 1E1, Canada), and has been in use for a number of years.

AX.25, the result of a joint effort by various U.S. packet-radio groups, principally by Terry Fox, WB4JFI, of the Amateur Radio Research and Development Corporation (AMRAD, P.O. Drawer 6148, McLean, VA 22106), incorporates Vancouver protocol functions and then some. AX.25's popularity is increasing, and it has gradually replaced the Vancouver protocol as the most popular one on the air.

Assembled, Tested — and Inexpensive

After doing some comparison shopping, I ordered a GLB PK1 because it was assembled and tested, and inexpensive. It was delivered in 10 days, and I immediately began hooking it up. I used a Radio Shack ac adapter (part number 26-3804) to supply the 12-V dc that the PK1 required.

The connection to my terminal was simple. Five leads (transmitted data, received data, request to send, clear to send and ground) of the standard RS-232-C interface were connected to my TRS-80® Model 100 computer via a ribbon cable and a male DB25 connector.

Transceiver Connection

The connection to my ICOM IC-290A 2-meter transceiver was a bit more involved. Ground and PTT were not a problem; they were available on the nine-pin auxiliary socket on the rear of the radio. However, I needed to pick off a good, clean, unadulterated signal from the receiver.

The GLB manual recommends taking audio directly from the discriminator. With all of the LSIs that are now filling our radios, this is not always easy to accomplish. The best I could do was to take audio from the output of the second local oscillator/second mixer/second IF amplifier/FM detector LSI (pin 9 of IC12).

*75 Kreger Dr., Wolcott, CT 06716

Available Equipment

* The VADCG packet-radio controller, the first amateur controller design, consists of a bare board that must be populated with parts. It requires a power supply and modem (a modem kit is also available). The size of its RAM and EPROM is 4 kbytes each.

* The Tucson Amateur Packet Radio Corp. (TAPR, P.O. Box 22888, Tucson, AZ 85734) board has been called the "Cadillac of packet radio controllers." It is a kit that provides the user with a complete packet-radio system requiring no additional software or hardware (except an enclosure). The TAPR board operates full- or half-duplex at 50-4800 bauds. RAM is expandable (8-64 kbytes). The kit includes more than 200 pages of documentation with clear instructions that simplify kit assembly.

* Bill Ashby & Son's (Box 332, Plukemin, NJ 07978) PAC/NET is based on the VADCG design and is available as a bare board or assembled and tested. A modem and power supply (8-10 V dc, 500 mA) are required.

* GLB's (1952 Clinton St., Buffalo, NY 14206) PK1 is assembled and tested and only requires a power supply (12-V dc, 200 mA). This design is different from the VADCG and TAPR designs in that the GLB uses software to perform the functions that VADCG and TAPR boards handle in hardware. As a result, the PK1 has fewer components. The PK1 operates on the air at 600 or 1200 bauds half-duplex. RAM is expandable (4-14 kbytes), and an enclosure is optional.

* The Richcraft Engineering, Ltd. (1 Wahmeda Industrial Park, Chautauqua, NY 14722) Synchronous Packet Radio Using the Software Approach consists of software for the Radio Shack TRS-80 Model I/III that allows the computer to emulate a packet-radio controller (see On Line, Feb. 1984 *QST*). It is available in Vancouver and AX.25 versions (Volumes I and III use the Vancouver protocol; Volume II uses AX.25). A modem and an interface are required.

* AEA (P.O. Box C2160, Lynnwood, WA 98036-0918) recently introduced the PKT-1, basically a TAPR-clone that is assembled and put inside an box. In addition to the features of the TAPR kit, the AEA model can operate from 12-V dc.

Packet Notes

☐ While playing with the GLB PK1, I discovered some undocumented commands (DD, DE, DF, DT, DZ, OR, OS, OY, OZ, S and SU). K1HOP did a little more investigating and found that DD plus four digits produced a hex dump of memory, DT plus four digits produced an ASCII dump of memory, and DT and DZ placed the PK1 in the digital repeater mode.

☐ I was not satisfied with the performance of the PK1's demodulator. Unfiltered, receive signals are fed directly into its demodulator chip (an XR2211). Other packet-radio modem suffer from similar design. So, I added an active audio filter and an equalizer circuit in front of the XR2211 to help pull out those weaker signals. The circuits seem to help a little. Perhaps, after some more experimentation, there will be greater improvement. Stand by and I will let you know what happens.

Feeding audio into the transmitter was easier. The IC-290A has a four-pin connector (J8) mounted on its PC board for connection to a tone generator. It provided the ideal place to feed the mark and space signals from the PK1!

Both the receiver output and transmitter input points were brought out to unused pins of the auxiliary socket, and a suitable multiconductor cable was used to interconnect the PK1 to that socket. All nice and neat!

I set the Model 100 built-in terminal program to STAT 58N2D (1200 bauds; eight character bits, no parity; and two stop bits), transferred to the terminal mode, and hit the ENTER key. The LCD displayed "GLB PK1 V 2.30:" for the first time. I was pleased. Everything seemed to be working, so far!

W1AW Packet Digital Repeater

Since mid-February, Jeff, K8KA, and Jon, KE3Z, of ARRL Hq., have had a packet digital repeater in operation on 145.010 MHz. My QTH is a mere 15-mile stone's throw from Newington, and the PK1 was able to print the W1AW/R 1D message every time without fail. The problem was, I could not transmit anything through the repeater.

For nearly a week, I played with the PK1, trying various commands without any success. I ran approximately 150 W to an omnidirectional antenna, so the repeater should have heard me. It was a very frustrating experience!

K8KA and KE3Z were also puzzled by my inability to be repeated; finally, they tracked down the problem. The repeater's antenna relay was at fault. It was introducing approximately 20 dB of attenuation into the receive circuit! No wonder I wasn't being heard.

First Packet QSO, and More

Finally, on May 20, I had my first QSO through the repeater. It was with KE3Z, and we talked for approximately a half hour, while I tried to familiarize myself with the PK1's commands. There was some stumbling and bumbling and a little confusion, but we succeeded in completing the first packet QSO through the repeater.

Suddenly, packet people were coming out of the woodwork. Rick, AB1U, had just finished building a TAPR board he had purchased at Dayton. Russ, K1HOP, pulled his GLB out of mothballs (when he had first gotten his board on the air, there was no one else on packet radio locally). WA1DCP could be heard beaconing up in the northeast corner of Connecticut, and W2JUP could be heard from Long Island.

Two weeks later, the repeater was moved to a 120-foot tower at K1ZZ's QTH in South Windsor and a second W1AW packet station with bulletin-board functions was set up in Newington.

One night recently, K1ZZ had his first packet QSO with me, and now Dave has joined the fray. Another night, K8KA QSO'd through the Mount Greylock, Massachusetts, digital repeater. Soon, the Connecticut connection will be permanently linked into the packet-radio network (EASTNET) that is being formed in the Northeast.

Things are happening very fast. All of this has occurred in a matter of weeks! Meanwhile, everyone is having a great time experimenting and operating in this new mode.

Error-free, high-speed data exchange with minimal radio equipment — they said it couldn't be done!

YL News and Views

Conducted By Jean Peacor,* K1IJV

Somewhere in the Pacific

The latest directory of calls lists her QTH as Santa Clara, California; prior to that, the address listed was Livermore, California. It's doubtful that you'll find her in either place. Leona Wallace, WA6OHB, is somewhere in the Pacific. She's retired! Among other things, to retire means to depart, and depart she did.

Leona and her husband, Carl, K6YEO, chose early retirement — Leona from teaching, and Carl from his specialized technical lab work. They also chose to realize a life-long dream when they sold their home and bought a 44-foot ketch, the *Malaga*. They set sail from San Francisco on St. Patrick's Day 1981, and have been living the good life ever since.

Their sail down the coast of California proved to be slower than planned because of bad weather. Their plans changed somewhat during their stay in San Diego, as Carl took a temporary job developing an excimer laser for a company in Kearney Mesa. On the Pacific coast, you need a "hurricane hole" during that season, and San Diego became theirs for what turned out to be two hurricane seasons.

Leona's time was well spent during their stay, as she earned her General class license and enrolled in a class for her Advanced while there. When it became necessary to suspend the class for a few weeks because they lost their meeting place (would you believe the fire department chose to burn down their classroom building for practice?), Carl agreed to continue teaching the carload of boaters who had been attending the classes with Leona. Everyone passed their respective exams, prompting Carl to hold another Novice class the following spring, which added even more Novices to Amateur Radio's ranks.

They sailed south again in February 1983. Their planned itinerary includes Costa Rica, the Galapagos, Pitcairn, Henderson, French Polynesia, Samoa, Fiji, Australia and New Zealand. When Leona last wrote, in February 1983, their port was Bahia Tenecatita Jalisco, Mexico. They had taken three months, during the extremely hot months near the equator, to return to the United States, and had just returned to their boat. They were gearing up to resume their travels.

Hams Everywhere

At any of Leona and Carl's stops along the way, if there weren't hams there when they arrived, there sure were when they left. At Cabo San Lucas, they met and helped Debbie Dye, KA6YBB, to improve the antenna system on her sloop, *The Flying Gull*, before she and her OM departed for French Polynesia.

Also in Cabo San Lucas, they met a man from the state of Washington who wanted to become a ham, and quickly provided him with tapes and reading material. They helped Paula's (KF6IY) OM, Bob, to study for his Novice exam. Both Paula and Bob have since passed their Extra Class exams, and are now NX6F and NX6K. Ralph McDonald, NV6G, one of their Novice students — now Extra Class — was there, as was Frank Lara, KA6OTT.

Taping Interviews

The many interesting YLs Leona met prompted her to start taping interviews. One, with Nancy Lee Hinz, KE6QI, was taped in November 1983, shortly after Nancy Araujo and Harry Hinz, KE6RJ, were married. Perhaps you witnessed their wedding; they were married on October 22, 1983 in the radio room of the Seal Beach Yacht Club in Long Beach, California, by the Reverend Ray Vance, KB6X, first by voice for those in attendance, then by CW at 1930 UTC on 7.133 MHz. It was Amateur Radio that had brought them together — they both like CW — and they decided that their knot should be tied with a *key*, allowing many of their friends who were unable to attend to witness their ceremony.

Nancy was first licensed in 1979, while living in Brazil, as PT7ZNA (the Z suffix is issued to those not Brazilian, and NA are Nancy's initials). Her first introduction to Amateur Radio? Imagine going to a Brazilian airport to meet your sister, who was to arrive from California, and not finding her on the plane. At the time, telephone calls from Brazil were directed first to Argentina and then to California, taking a total of three days. Amateur Radio came to her rescue — her sister was still safely at home.

It was a *QST* Stray that brought Nancy and Harry together. Harry was seeking those interested in a German-speaking net. Nancy was studying and looking for ways to improve her German. The net did not materialize, but correspondence regarding it did. They met when Nancy returned to California. Their mutual interest in German, coupled with a great love of sailing, which they did on Harry's 31-foot sloop, *Wind Tree*, resulted in this exciting marriage.

Another YL interviewed is Janet Erken, N7AWL, who earned her General class license in 1979 in Hawaii then upgraded to Advanced in San Diego in June 1983. What's unusual is that all her studying was done on the high seas of the Pacific Ocean. Leona taped her interview with Janet in Mexico in October 1983; at the time, Janet was waiting to hear the results of her Mexican Amateur Radio exam she had just taken — all in Spanish.

Janet, born and brought up in Seattle, graduated from high school and the University of Washington there. She majored in Spanish and Education. Her goal was to teach, and she did for five years. She also liked to sail. In 1976, when Mike, son of W7HFN, suggested that she join his shakedown cruise of the boat they'd been building, Janet was first on board. The six-week cruise took them to Canada — Vancouver Island and points north.

At the end of the cruise, the sea had lured Janet away from teaching. She signed on to work on a fishing research vessel sailing out of Seattle. Their research was done in the Bering Strait and near the Pribilof Islands. Janet operated the MARS station on board, making many phonepatches for the crew. She also obtained her Oiler's Ticket and became a wiper in the engine room during the year and half she was gone.

When Janet returned to Seattle, Mike was gathering a crew for his first big cruise. In September 1977, Janet was off to the South Seas. Mike's dad stressed the importance of having radio gear on board, and his advice was taken. Mike had been a Novice and had a head start toward taking the Amateur Radio exam. By the time they got to San Francisco, he was ready to take and pass his Technician exam.

A few islands later, having visited Mexico, Marquises, Tahiti and French Polynesia, and sailed as far west as Bora Bora, they visited the Hawaiian Islands, where they stayed for nine months. Janet took and passed her General exam in Hawaii in 1979. At the time of Leona's interview, Mike, Dave, N7ACG, another crew member, and Janet had all upgraded to Advanced.

N7ACG is their most avid radio operator on board, but they've all learned the great value of being able to keep in touch with family, friends and the world through Amateur Radio. How long will they continue to cruise in the Pacific? In Janet's words: "As long as our money holds out!"

A friend of Leona and Carl had asked the question: "Wouldn't you be more comfortable in a house?" Leona's reply: "I've never felt uncomfortable on the boat, and where can you go in a house? We would not have spent several years studying seamanship, sailing, meteorology, coastal piloting, celestial navigation, French and Spanish, nor upgraded our Amateur Radio licenses to Advanced, just to live in a house. We probably wouldn't even have taken early retirement."

So now they're somewhere in the Pacific enjoying early retirement. Keep listening to the airwaves for the latest on their travels!

Nancy Hinz, KE6QI

Leona Wallace, WA6OHB

Janet Erken. N7AWL

*Country Club Dr., Monson, MA 01057

Silent Keys

It is with deep regret that we record the passing of these amateurs:

W1ARU, Richmond H. Blake, Orleans, MA
*W1DDC, Charles W. J. Brown, Ayer, MA
KA1DYP, Jerry W. Williams, Vernon, CT
W1HRA, Charles G. Symonds, Hollywood, FL
WA1KRL, William A. Bedard, Manchester, NH
W1MNA, Ercole Sideri, Methuen, MA
W1SRW, Joseph B. Pike, Jr., Bridgton, ME
*K1VWI, Joseph C. Kern, New Britain, CT
W1WZC, Richard S. Gay, Groton, NH
W1YW, Charles L. Woodford, Arlington, MA
W1YWT, Helene K. Cheney, Xenia, OH
KA2CSD, Hugh M. MacPherson, Rochester, NY
W2CSO, Charles R. Hamilton, Camisano, Italy
WA2DHR, Leonard "Len" Bender, Freehold, NJ
W2DUV, Augustus F. Roth, Massapequa, NY
K2HJP, William N. Bonter, Spencerport, NY
WA2LDH, Carole M. LaMontagne, Syracuse, NY
WA2NPY, Alexander J. Howarth, Short Hills, NJ
WB2VEH, H. Dwight Richardson, Riverdale, NJ
WB2VLU, George J. Hooretz, Port Orange, FL
K2ZRO, Kaz Deskur, Endicott, NY
*WA2ZXU, Kenneth G. Garner, Fulton, NY
N3AVL, Larry E. Robin, Philadelphia, PA
K3EMT, Edgar B. Baylis, Chesapeake City, MD
WA3HQM, Patrick J. Boyle, Edison, NJ
W3KFQ, Clarence H. Fry, Downingtown, PA
K3MVL, L. Arden Kolkhorst, Hagerstown, MD
W3NXZ, Albert W. Clark, Chambersburg, PA
K3OBY, James C. Bowman, Philadelphia, PA
WA3RHQ, John D. Entwistle, Lewes, DE
W3UMZ, William J. McKnight, III, Cape Coral, FL
K3VAA, W. Roderic Bliss, Chambersburg, PA
W3WUX, Robert W. Pattison, Havertown, PA
WA3YTG, James A. Archibald, Philadelphia, PA
WA3YZD, Judith A. Kocher, Dallas, PA
W3ZOR, Walter R. Kiefer, Broomall, PA
K4BHE, Marion L. Childress, Cayce, SC
WA4DEV, Fred E. Bock, Ormond Beach, FL
KA4EES, Pinckney Keel, Donelson, TN
KB4FPX, Aden "Bud" Birch, West Palm Beach, FL
NZ4H, John F. Noonan, Lakeland, FL
K4HNL, Adrian D. Armstrong, DeBary, FL
K4JWI, Ray H. Brown, Largo, FL
KC4NS, Frank J. Blair, Kingston, TN
K4QL, Joseph F. McKay, Lake Placid, FL
K4VZI, Floyd E. Lamb, Knoxville, TN
W5ASL, Edward F. Garland, New Orleans, LA
W5AVH, David A. Wommack, Atlanta, TX
WD5BSU, Ralph H. Cross, El Paso, TX
WA5CBR, Raleigh P. Lampley, Zapata, TX
W5EER, Jack D. Risner, Pryor, OK
KA5FFQ, Fred M. Purser, Jackson, MS
W5HHI, Frank Morris, Jr., Welch, TX
WD5IVT, Hardy C. Pattillo, Georgetown, TX
KA5KZK, Marvin B. Hare, Horseshoe Bend, AR
W5LIM, Fred C. McKay, Madison, MS
KB5N, Kenneth W. Bolt, Rogers, AR
K5OOU, John E. McGinness, Jr., Houston, TX
WA5UYE, Otto L. Schneider, San Antonio, TX
W6ATK, Harold "Bill" Bundlie, San Jose, CA
W6CH, Hugo Romander, San Francisco, CA
WD6EBW, Walter B. McMenamy, Los Angeles, CA
KD6GY, Gary Watt, Nevada City, CA
W6JN, Herbert J. Breuer, Sacramento, CA
W6JSD, Douglas H. Taylor, LaPuente, CA
W6KTG, George M. Greene, Los Angeles, CA
KA6LIR, William L. Robinson, San Pedro, CA
W6MUO, Richard J. Saunders, Oceanside, CA
W6OO, George C. Farmer, Windsor, CA
WB6QDQ, Harry L. Chaffin, Fresno, CA
W6SAR, Robert J. Newson, Redwood City, CA
W6TTR, Arthur S. Chantry, Victorville, CA
K7BKH, Winnifred M. Cox, Billings, MT
N7CZ, Edwin J. Volkomener, Fort Peck, MT
AF7E, Myron T. Steffy, Sun City, AZ
W7GMG, Archie J. Maus, Carson, WA
WA7GMP, Roland B. Nuckols, Phoenix, OR
KA7KWV, John A. Archer, Green Valley, AZ
KA7MLS, Stanley A. Huser, Bremerton, WA
W7MM, Earle J. Lander, Great Falls, MT
W7QER, Kenneth M. McCaw, Aberdeen, WA
NC7W, Mark T. Johnson, Beaverton, OR
W8BIQ, C. Gail Beelman, Toledo, OH
WD8DVR, Patrick L. Camody, Tucson, AZ
KA8HWO, Carlton F. Paul, Avon Lake, OH
W8IDB, Gordon A. Murray, Brighton, MI
KA8IKI, Charles R. Carroll, Centerville, OH
W8IWP, Edward J. Gates, Parma, OH
K8KPW, Jack E. Decker, Muskegon, MI
W8LIO, Jack D. Rodebaugh, Andover, OH
W8SPO, Steve Vancea, Jr., Houston, TX
WA9ABD, Leonard W. Pfleeger, Pontiac, IL
K9BLK, Billie M. Mercer, Brazil, IN
W9KGJ, Cecil L. Kiltz, Elgin, IL
W9KYW, Charles A. Weinberger, Towanda, IL
*NØCXE, Elaine B. Harrell, Grand Junction, CO
KAØFCD, Joseph D. Schlanger, Grand Junction, CO
WØGQQ, Ernest H. Benway, Hannibal, MO
WØIQZ, Maurice W. Mitchell, Denver, CO
WØNNW, LeMoine M. Menshik, Pacific Junction, IA
WØODT, Robert S. Johnson, Ellis, KS
WØTXC, Robert K. Murdock, Milan, MO
WØUI, William T. Bishop, Jr., Kansas City, MO
WH6AJV, Frank M. Searl, Honolulu, HI
KH6FF, David C. K. Enomoto, Kahului, Maui, HI
KP4MS, Rosendo Rios-Vega, Santurce, PR
VE3EDS, Evelyn P. Goodier, Picton, ON
VE6KM, Keith M. Millar, Edmonton, AB
LU9PC, Luis E. Marchese, San Juan, Argentina
PAØAG, R. H. Brouwer, Rijssen, The Netherlands
VK4HG, H. J. Hicks, Tolga, Queensland, Australia

*Life Member, ARRL.

In order to avoid unfortunate errors in the Silent Keys column, reports of Silent Keys are confirmed through acknowledgment only to the family of the deceased. Thus, those who report a Silent Key will not necessarily receive an acknowledgment from Hq.

Note: All Silent Key reports sent to Hq. must include the name, address and call sign of the *reporter* as well as the name, address and call of the Silent Key in order to be listed in the column. Please allow several months for the listing to appear in *QST*.

50 Years Ago

August 1934

☐ Mobile operation has now been authorized for 5 meters (56-60 Mc.), without any requirement for advance notice to the district inspector. This means automobiles, trailers and boats in addition to aircraft operation previously okayed. (And you can use *any* frequency above 110 Mc. if you can get gear working there!)

☐ For the home station, Ross Hull and George Grammer pool their talents in producing some simple, stable, basic gear for 5 meters. The three-tube receiver is superregen, but has an r.f. stage to reduce self-radiation.

☐ There ain't no such thing as "noiseless" aerials, as some ads elsewhere proclaim. Former staffer Lou Hatry tells us about the fine points of noise-*reducing* antennas, particularly as concerns matching coax lead-in and grounding at specific points. The main hurdle is our need to cover such a wide range of spectrum in the amateur band family.

☐ J. N. A. "Bud" Hawkins, W6AAR, regales us with a diary of events in the development of a new broadcast receiver, from concept(s) to finished product. Though fiction, some of the most ridiculous blunders and equally hilarious "solutions" have likely actually happened.

☐ Clif Harvey and Dick Purinton share their design of a neat medium-power c.w. and voice rig for 80-40-20 meters. It starts with the now-usual tri-tet exciter and ends with a pair of the new RK-20s.

☐ Beth (Mrs. W. M. "Soupy") Groves recites the highlights in her struggle to join hamdom — which she did as W5DUR. The Editor appends a note hoping for more YL and YF news.

☐ The Federal Radio Commission, which was initially created with a one-year life but lasted nearly seven, has now been replaced by the permanent Federal Communications Commission, with responsibility for wire telegraphy and telephony as well as radio.

☐ Dr. J. H. Dellinger of the Bureau of Standards suggests that amateurs can be very useful in reporting instances of the rare and mysterious phenomenon of long-delayed echoes.

☐ As a result of the Madrid (1932) radio conference, many overseas amateurs are, for the first time, receiving band assignments provided for in the treaty (and which we have long had).

☐ The "Red" Network of NBC radio is broadcasting a series of programs on amateur radio, largely based on emergency exploits.

25 Years Ago

August 1959

☐ California to Hawaii on — hold your breath — 220 Mc., no less! Pioneers W6NLZ and KH6UK accomplished the feat after months of planning and preparation, plus the experience of doing the same thing on 2 meters a couple of years ago.

☐ One key to success of the above was a parametric amplifier built by Frank Jones, W6AJF, who describes his gear in this issue. Pretty deep stuff — pump frequencies, idlers, varactors — for us 1934 average types.

☐ The "Book of Proposals," recapping various nations' plans for changing world frequency allocations, is now out in advance of the Geneva conference later this autumn. Many would expand short-wave broadcasting at the expense of amateur bands, particularly 7 Mc. And India proposes a maximum of 10 kc. for us at 80 meters!

☐ W2EWL's "cheap and easy sideband" has been a popular design for do-it-yourselfers. K2GC reworked the basic unit a bit to get output on 15 meters as well as 80 and 20.

☐ With careful measurement of the elements, W3QEF found a way to feed his tri-band quad with one line, versus the three in the original design.

☐ W6ACT rewound an old audio transformer to use with a transistor oscillator input and bridge rectifier output to obtain 90 volts for a mobile receiver.

☐ Using principles of early Japanese radar — "flutter" on the TV picture when a plane flies nearby — several hams at General Electric have been detecting satellite (nontransmitting types) passes by reflection of WWV signals off the ionized cloud created by the 18,000-m.p.h. craft.

☐ If the one-element rotary in earlier *QSTs* and the *Handbook* is so good, W4UVY figured that adding a reflector should greatly increase effectiveness, and did so with his 15-meter beam.

☐ FCC solicits views on how the Extra Class license can be made more "meaningful." (Few amateurs have bothered to attain that class since the Commission, over strong League objections, gave former restricted voice privileges to all amateurs in 1951).

☐ The ARC-5 surplus series is still ideal for many ham uses in receiver design. VE3DPC installed a BC-453 (190-550 kc.) as a third i.f. stage, and greatly improved selectivity.

☐ W6DTY takes Novices by the hand to teach some fundamentals of good operating — particularly as concerns use of abbreviations.

☐ Clubs in the Delaware Valley, led by the South Jersey Radio Association, pooled talent to produce, for Channel 10 in Philadelphia, a television show to educate the public on amateur radio.

☐ W6NSV and K6YYF pointed radiating horns at each other for 500 feet of DX on 36,500 Mc.! — *WIRW*

Amateur Satellite Program News

Conducted By
Bernie Glassmeyer,*
W9KDR

SPACE PERSPECTIVES

[The following editorial by AMSAT Executive Vice President Vern Riportella, WA2LQQ, appeared in Amateur Satellite Report, No. 77. — Ed.]

Owen Garriott's 2-meter operation from the Space Shuttle *Columbia* (STS-9) last autumn garnered the attention of radio amateurs worldwide. W5LFL opened a stimulating new chapter in Amateur Radio while becoming the first genuine Ham in Space.

However, the STS-9 mission has not been without its critics. The intervening months have seen several negative assessments of the whole W5LFL effort. The critics have bemoaned STS-9 and soundly disparaged prospects of imminent reprise.

We are surprised and puzzled by the myopia manifested in our colleagues. With planning well advanced for the next Ham in Space mission, we think it important to peel back the facade and get on to the basics. What really lay beneath the hoopla and ballyhoo carnival atmosphere? Was anything meaningful accomplished on STS-9?

The critics focus on two major themes: (1) havoc reigned supreme as thousands jammed limited 2-meter frequencies, and (2) the announced schedule was inadequate or not observed. Both themes warrant scrutiny.

The first criticism is accurate, factual. Unprecedented QRM erupted on 145 MHz in some areas. Discourtesy and downright reprehensible behavior was occasionally observed (and adequately reported). But the existence of QRM is not at all the point. There are more important issues involved than QRM!

Similarly, the second criticism is accurate, factual. Operational constraints, simply the need to put space science ahead of Amateur Radio, meant limits on available air time. In some cases, schedules had to be changed. Just as Amateur Radio is an adjunct to our daily lives, W5LFL's operation on STS-9 was an adjunct to the main business of flying a complex mission in space. Criticism here seems based more on factors of disappointment and chagrin in having missed out, we conclude. But again this criticism, although accurate, misses the larger point of the mission. In fact, the *real* point lies several layers above the muck of 2-meter QRM, above the disappointment of unfulfilled wishes to QSO Owen.

What was intended by NASA, W5LFL, ARRL, AMSAT, K6DUE and others who helped put the package together was to expose a broader segment of society (primarily the world's youth) to the wonder, fascination and challenge of Amateur Radio in the space context. Unequivocally, this was accomplished. With Pete O'Dell of ARRL, Doug Ward of NASA and Roy Neal of NBC feeding the press, truly unprecedented coverage was afforded W5LFL. As a result, thousands have been prompted to study to become licensed radio amateurs. How many other tens of thousands may enter technical careers as a result of this episode is probably unknowable. An unqualified success in this category, we'd suggest.

What was also intended was to crack the door a bit for a future, more-ambitious synthesis of Space Shuttle and Amateur Radio. The aim was to show the rigorous safety and performance requirements of a manned spacecraft would not be the anathema to Amateur Radio equipment, be it a simple transceiver or more complex arrangements. This was clearly demonstrated with a modest beginning on STS-9. Everything worked well. We note with satisfaction the more ambitious, equipment-intensive plans for the spring 1985 flight of Dr. Tony England, W0ORE. An unqualified success in this category as well, we'd suggest.

Seen in context of primary objectives, who can deny STS-9 was enormously successful? In finding fault, the critics of W5LFL's efforts fail to peer through the QRM to the fundamental issues. Moreover, some self-described leaders in amateur space fail in a more serious sense.

Surely some of the QRM on 145 MHz was deliberate. There are a few nihilists out there who will "shoot" at anything resembling organized productive activity. But most of the QRM we observed resulted from simple ignorance of operating guidelines set forth to contact W5LFL. People were transmitting on the downlink frequencies, for instance. Others were calling W5LFL while Owen himself was transmitting. Others had not the slightest notion of what they could do to increase their chances of success in contacting Owen. We ask whose responsibility it is to educate the ill-informed in the correct approach? We suggest it may be some of the self-same who are now most vocal in their criticism. They should be leading the way to new and more effective ways to show folks the *right* way to do it next time.

We challenge the critics, the myopic moaners and groaners to channel their energies into making it work better next time. The inveterate complainers, we submit, would do well to light a few candles rather than curse the QRM.

So while the criticism may accurately cite fact (QRM and schedules), the critics are shortsighted. Certainly we can do better next time. But it will take better education of the users, more productive use of leadership energies and a firm view of objectives and the future if we are to unmire ourselves from the terminal stillness we saw played out on 2 meters last autumn. Given the uproar, it's a credit to the mission that so much was accomplished.

The mark of success is simply the degree to which an endeavor meets its established objectives. W5LFL's initial Ham in Space mission met every important objective, and more. NASA was impressed. The public was inspired. Amateur Radio operators were challenged. Some succeeded; most had some fun trying. In the long view it was one of the most significant episodes in Amateur Radio history. We look to the myopic critics to get their collective wits together and prepare the public for the ambitious W0ORE mission next spring. They owe nothing less to those who seek leadership qualities in them.

As KO5I put it recently, "Either lead or follow, but please don't block the road for those who would move forward."

*Satellite Program Manager, ARRL

Student Involvement Program

The Shuttle Student Involvement Program was established to promote science education in our nation's schools. Sponsored jointly by the National Science Teachers Association and NASA, the program is designed to encourage students to take a more active interest in science and mathematics. In an annual competition, up to 20 national winners are chosen from students in grades 9-12 who have proposed scientific experiments to be performed on the Shuttle on a space-available basis. Seven such experiments, dealing with life sciences and materials processing, have already flown.

Industry and other non-NASA groups are being invited to sponsor student winners. Sponsorship provides opportunities to work with exceptionally bright students, help them learn more about what industry has to offer, and support a successful science-education program.

Sponsors are asked to assign a company scientist to work with the student, as well as provide necessary funding for student travel, hardware development and other costs related to pre- and post-flight analysis and reporting. A NASA field-center scientist will also be assigned to consult during development of each student's experiment.

Program sponsors have found it to be a very rewarding and beneficial investment. Companies or other organizations interested in serving as sponsors for students should write to Michael Bowie, MC-7, NASA Headquarters, Washington, DC 20546, or call 202-453-2574. Alternatively, they may contact John Jackson, EN43, NASA Johnson Space Center, Houston, TX 77058, tel. 713-483-3173. (tnx Mission Integration Bulletin No. 2)

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 affix 2 units of postage to each s.a.s.e.

☐ The OSCARLOCATOR package second revision is now available for $8.50 U.S., $9.50 elsewhere. This package and *The Satellite Experimenter's Handbook* contain all the information you need to get started using the Amateur Radio satellites.

☐ 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.

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	June 1984, p. 82
Board Standing Committees (Minute 65)	May 1984, p. 60	Outgoing	March 1984, p. 65
Call Sign Assignment System	June 1983, p. 61	*QST* Abbreviations List	Jan. 1984, p. 53
Contest Guidelines	July 1984, p. 88	Reciprocal-Operating Countries	Nov. 1983, p. 71
FCC Exam Schedule	Jan. 1984, p. 59	Section Emergency Coordinators	Oct. 1983, p. 95
License Renewal Information	Jan. 1984, p. 51	Third-Party-Traffic Countries	This issue, p. 77
Major ARRL Operating Events and Conventions — 1984	Jan. 1984, p. 52	UHF Contest Rules	July 1984, p. 78
MARS Information	April 1984, p. 86	U.S. Amateur Frequency and Mode Allocations	Jan. 1984, p. 51
Pending Dockets	Feb. 1984, p. 65		

Rules, September VHF QSO Party

The rules changes that were instituted in the 1983 September VHF QSO Party have met with overwhelming approval. Thus, the 1984 running of this event will be a carbon copy of that contest. The multipliers will again be grid squares (aka the 2° × 1° Maidenhead grid-square locators) worked per band. See Rules 4 and 5. Information on determining your grid-square locator can be found in January 1983 *QST*, starting on page 49. Grid-square maps are available from ARRL Hq. for $1.

Official summary sheets and log sheets are available from ARRL Hq. for an s.a.s.e., and all entrants should send for a set. Good luck from FN31!

Rules

1) **Object:** To work as many amateur stations in as many different 2° × 1° grid squares as possible using authorized amateur frequencies above 50 MHz.

2) **Contest Period:** Begins 1800 UTC Saturday, Sept. 8 and ends at 0300 UTC Monday, Sept. 10.

3) **Categories:**

(A) Single operator: One person performs all operating and logging functions.

(1) *Multiband.*

(2) *Single band:* Single-band entries on 50, 144, 220, 432, and 1296-and-up categories will be recognized both in *QST* score listings and in awards offered. Contacts may be made on any and all bands without jeopardizing single-band entry status. Such additional contacts are encouraged and should be reported. Also see Rule 9, Awards.

(B) Multioperator: Multioperator stations must locate all equipment (including antennas) within a circle whose diameter does not exceed 300 meters.

4) **Exchange:** Grid-square locator (see Jan. 1983 *QST*, page 49). Example: W1AW in Newington, CT would send FN31. Exchange of signal reports is optional.

5) **Scoring:**

(A) *QSO points:* Count one point for each complete 50- or 144-MHz QSO. Count two points for each 220- or 432-MHz QSO. Count three points for each 1296-MHz QSO. Count four points for each 2.3-GHz-or-higher QSO.

(B) *Multiplier:* The total number of different grid squares worked *per band.* Each 2° × 1° grid square counts as one multiplier on each band it is worked.

(C) *Final score:* Multiply the total number of QSO points from all bands operated by the total number of multipliers for final score. Example: K3ONW works WA2GBG in FN12 on 50, 144, 220 and 432 MHz. This gives K3ONW 8 QSO points (1 + 1 + 2 + 2) and also four grid-square multipliers. Final score is 8 QSO points × 4 multipliers, or 32 points.

6) **Use of FM:**

(A) Retransmitting either or both stations, or use of repeater frequencies, is not permitted. This prohibits use of all repeater frequencies. Contest entrants may not transmit on repeaters or repeater frequencies on 2 meters for the purpose of soliciting contacts.

(B) Use of the national simplex frequency, 146.52 MHz, or immediate adjacent guard frequencies is prohibited. Contest entrants may not transmit on 146.52 for the purpose of making or soliciting QSOs. The intent of this rule is to protect the national simplex frequency from contest monopolization. There are no restrictions on the use of 223.50 MHz.

(C) Only recognized simplex frequencies may be used, such as 144.90 to 145.10; 146.49, .55 and .58, and 147.42, .45, .48, .51, .54 and .57 MHz on the 2-meter band. Local-option simplex channels and frequencies adjacent to the above that do not violate the intent of (A) or (B) above or the spirit and intent of the band plans as recommended in the *ARRL Repeater Directory may* be used for contest purposes.

7) **Miscellaneous:**

(A) Stations may be worked only once per band for credit, regardless of mode. Crossband QSOs do not count.

(B) Partial QSOs do not count. Both calls, the full exchange, and acknowledgment must be sent and received.

(C) Fixed, portable or mobile operation under one call from one 2° × 1° grid square only is permitted. A transmitter used to contact one or more stations may not be used subsequently under any other call during the contest period (with the exception of family stations where more than one call is assigned to one location by FCC/DOC); one operator may not give out contest QSOs using more than one call sign from any one location. The intent of this rule is to accommodate family members who must share a rig, not to manufacture artificial contacts.

(D) Only one signal per band (6, 2, 1¼, etc.) at any given time is permitted, regardless of mode.

(E) While no minimum distance is specified for contacts, equipment should be capable of real communications (i.e., able to communicate over at least 1 km).

(F) Multioperator stations may not include QSOs with their own operators except on frequencies higher than 2.3 GHz. Even then, a complete, different station must exist for each QSO made under these conditions.

(G) A station located *precisely* on a dividing line between grid squares must select only one as the location for exchange purposes. A different grid-square multiplier cannot be given out without moving the complete station (including antennas) at least 100 meters.

(H) Above 300 GHz, contacts are permitted for contest credit only between licensed amateurs of Technician class or higher using coherent radiation on transmission (e.g., laser) and employing at least one stage of electronic detection on receive.

8) **Reporting:** Entries must be postmarked no later than 30 days after the end of the contest.

9) **Awards:**

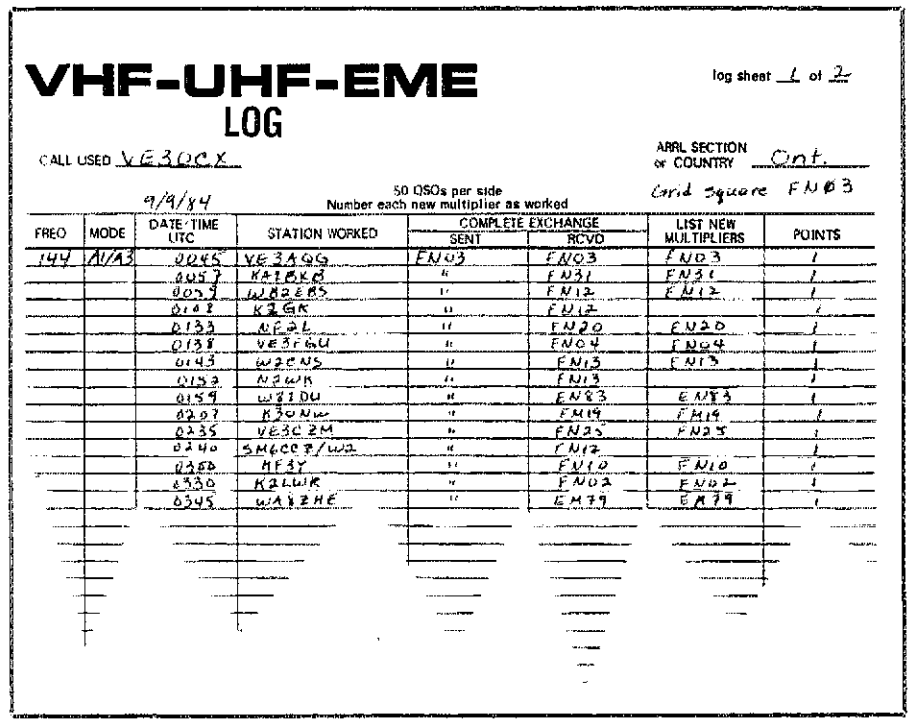
(A) Single operator

(1) Top single operator score in each ARRL Section.

(2) Top single operator on each band (50, 144, 220, 432, and 1296-and-up categories) in each ARRL Section where significant effort or competition is evidenced. [Note: Since the highest score per band will be the award winner for that band, an entrant may win a certificate with additional single-band achievement stickers.] For example, if WBØTEM has the highest single-operator all-band score in the Iowa Section and his 50- and 220-MHz scores are higher than any other IA single op's, he will earn a certificate for being the single-operator Section leader *and* endorsement stickers for 50 and 220 MHz.

(B) Top multioperator score in each ARRL Section where significant effort or competition is evidenced. Multioperator entries are *not* eligible for single-band awards.

10) **Disqualifications:** See January *QST*, page 80.



VHF-UHF-EME
LOG

log sheet 1 of 2

CALL USED VE3OCX

ARRL SECTION or COUNTRY Ont.

9/9/84

50 QSOs per side
Number each new multiplier as worked

Grid Square FNØ3

FREQ	MODE	DATE/TIME UTC	STATION WORKED	COMPLETE EXCHANGE SENT	COMPLETE EXCHANGE RCVD	LIST NEW MULTIPLIERS	POINTS
144	A1/A3	0045	VE3AQG	FN03	FN03	FN03	1
		0057	KA1BKD	"	FN31	FN31	1
		0057	WA2EBS	"	FN12	FN12	1
		0108	K2GK	"	FN12		
		0133	NF2L	"	FN20	FN20	1
		0138	VE3FGU	"	FN04	FN04	1
		0143	W2CNS	"	FN13	FN13	1
		0153	N2WR	"	FN13		
		0159	W2IDU	"	FN23	FN23	1
		0207	K3ONW	"	FM19	FM19	1
		0235	VE3C2M	"	FN25	FN25	1
		0240	SM6CCP/WA	"	FN12		
		0250	HF3Y	"	FN10	FN10	1
		0330	K2LWK	"	FN02	FN02	1
		0345	WA1ZHE	"	FM29	FM29	1

Properly completed sample log sheet.

Rules, 1984 CRRL Can-Am Contest

No, it's not a new contest. It's been around in one form or another since 1932. Back then it was called the "Canada-USA Contact Contest" and billed as "three evenings of fun for U.S. and Canadian hams." Why was this contest originated? A quote from a letter, written by one of "Ontario's progressive Route Managers," VE3GT, on the occasion of the first of these contests says it all: "To many new Ws on the air this fall it will give an opportunity for that first VE contact ... it will bring us closer to our amateur friends across the border ... it will dispel some mistaken illusions about Canada. We don't have snow all year 'round and hunt polar bears in the summer for amusement!"

Well, we all know that, don't we? We also know that over the years, friendship between U.S. and Canadian amateurs has remained strong. Still, every now and then, amateurs on both sides of the border find it worthwhile to take time to reaffirm that friendship. Of course, that's what the Can-Am Contest is all about. And that's why CRRL has agreed to become the new sponsor of this contest. We hope you'll join in the fun in this year's version. Now, on to the rules. — *Harry MacLean, VE3GRO*

Rules

1) **Object:** For U.S. and Canadian amateurs to work as many stations in as many states and provinces, etc. as possible during the contest period on the 1.8, 3.5, 7, 14, 21 and 28-MHz bands.

2) **Contest Period:** Phone (third weekend in September) — from 1800Z Saturday, September 15, until 1800Z Sunday, September 16, 1984; CW (fourth weekend in September) — from 1800Z Saturday, September 22, until 1800Z Sunday, September 23, 1984. Single-operator stations may take one or two rest periods totaling 4 hours, and operate for a maximum of 20 hours on each weekend. Multioperator stations may operate for the full 24-hour period on each weekend.

3) **Categories**

(A) Single operator: One person performs all operating and logging functions.

(1) Multiband

(2) Single band

(3) QRP: Maximum 10-W input for the entire contest.

(B) Multioperator: Single-transmitter stations using more than one operator or a station operated by someone other than the licensee or a club station.

4) **Exchange:** Signal report (use RS on phone, RST on CW) *plus* sequential QSO number (begin with 001) *plus* multiplier area abbreviation. U.S. amateurs use two-letter postal abbreviations for the 50 states, CN for possessions in the Caribbean, and PC for possessions in the Pacific and Antarctica. Canadian amateurs use NL in Newfoundland and Labrador, NB in New Brunswick, NS in Nova Scotia, PE in Prince Edward Island, SI in Sable and Saint Paul's Islands, PQ in Quebec, ON in Ontario, MB in Manitoba, SK in Saskatchewan, AT in Alberta, BC in British Columbia, YU in the Yukon and NW in the Northwest Territories.

5) **Scoring:** Phone and CW portions are considered separate contests, but phone and CW scores will be combined to determine overall winners. Stations may be worked only once on each band and each mode. U.S.-to-U.S. and Canadian-to-Canadian contacts count 2 points each. U.S.-to-Canadian and Canadian-to-U.S. count 3 points each. Multipliers are the 50 U.S. states *plus* the Caribbean and Pacific, and the 10 Canadian provinces *plus* the two Canadian territories and Sable/Saint Paul's Islands for a total of 65 possible multipliers per band (390 multipliers possible on all six bands).

6) **Reporting:** Keep logs in UTC (Z) time. Indicate multipliers only the first time on each band. Check logs carefully for duplicate contacts, correct QSO points and multipliers. Single-operator stations must clearly indicate official rest periods in their logs. Complete entries consist of log sheets, dupe sheets and a summary sheet showing all scoring information, category of entry, operator's name and call, address of station used and operator's signature. Entries with over 200 QSOs must also include dupe sheets for each band. Official log, dupe and summary sheets are available and recommended. Send your request and an s.a.s.e. to CRRL or ARRL Hq.

Entries must be postmarked no later than October 30, 1984. Mail entries to CRRL Can-Am Contest, Box 65, Don Mills, ON M3C 2R6.

7) **Awards:** Certificates for top single operators on both phone and CW in each multiplier area. Top five multioperator stations in U.S. and Canada will receive certificates based on combined phone and CW scores. Trophies will be given to top U.S. single-operator and multioperator stations, and top Canadian single-operator and multioperator stations, based on combined phone and CW scores. Trophy presentations will be made at the 1985 Dayton Hamvention.

8) **Miscellaneous:** Usual disqualification criteria will apply. Decisions of the CRRL Can-Am Contest Committee are official and final. Further information is available from Contest Chairman Yuri Blanarovich, VE3BMV, at the address given in Rule 6. QST

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; TThSSn: 2000; Sn: 0200
	Fast Code Practice	MWF: 2000, TTh: 0200, 1300; TThSSn: 2300, S: 0200
	CW Bulletins	Dy: 0000, 0300, 2100; MTWThF: 1400
	Teleprinter Bulletins	Dy: 0100, 0400, 2200; MTWThF: 1500
	Voice Bulletins	Dy: 0130, 0430
EDT	Slow Code Practice	MWF: 9 A.M., 7 P.M.; TThSSn: 4 P.M.; 10 P.M.
	Fast Code Practice	MWF: 4 P.M., 10 P.M.; TTh: 9 A.M.; TThSSn: 7 P.M.
	CW Bulletins	Dy: 5 P.M., 8 P.M., 11 P.M.; MTWThF: 10 A.M.
	Teleprinter Bulletins	Dy: 6 P.M., 9 P.M., 12 P.M.; MTWThF: 11 A.M.
	Voice Bulletins	Dy: 9:30 P.M., 12:30 A.M.
CDT	Slow Code Practice	MWF: 8 A.M., 6 P.M.; TThSSn: 3 P.M.; 9 P.M.
	Fast Code Practice	MWF: 3 P.M., 9 P.M.; TTh: 8 A.M.; TThSSn: 6 P.M.
	CW Bulletins	Dy: 4 P.M., 7 P.M., 10 P.M.; MTWThF: 9 A.M.
	Teleprinter Bulletins	Dy: 5 P.M., 8 P.M., 11 P.M.; MTWThF: 10 A.M.
	Voice Bulletins	Dy: 8:30 P.M., 11:30 P.M.
MDT	Slow Code Practice	MWF: 7 A.M., 5 P.M.; TThSSn: 2 P.M., 8 P.M.
	Fast Code Practice	MWF: 2 P.M., 8 P.M.; TTh: 7 A.M.; TThSSn: 5 P.M.
	CW Bulletins	Dy: 3 P.M., 6 P.M., 9 P.M.; MTWThF: 8 A.M.
	Teleprinter Bulletins	Dy: 4 P.M., 7 P.M., 10 P.M.,; MTWThF: 9 A.M.
	Voice Bulletins	Dy: 7:30 P.M., 10:30 P.M.
PDT	Slow Code Practice	MWF: 6 A.M., 4 P.M.; TThSSn: 1 P.M.; 7 P.M.
	Fast Code Practice	MWF: 1 P.M., 7 P.M.; TTh: 6 A.M.; TThSSn: 4 P.M.
	CW Bulletins	Dy: 2 P.M., 5 P.M., 8 P.M.; MTWThF: 7 A.M.
	Teleprinter Bulletins	Dy: 3 P.M., 6 P.M., 9 P.M.; MTWThF: 8 A.M.
	Voice Bulletins	Dy: 6:30 P.M., 9:30 P.M.

Code practice, Qualifying Run and CW bulletin frequencies: 1.818, 3.58, 7.08, 14.07, 21.08, 28.08, 50.08, 147.555 MHz.

Teleprinter bulletin frequencies: 3.625, 7.095, 14.095, 21.095, 28.095, 147.555 MHz.
Voice bulletin frequencies: 1.89, 3.99, 7.29, 14.29, 21.39, 28.59, 50.19, 147.555 MHz.

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 2200 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 June 1984 *QST*, pages 9 and 85" 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 85.

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 3:30 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 September 3.

Station staff: Chief Operator/Asst. Communications Manager C. R. Bender, W1WPR; Charles Chadwick, K8AXL; Bruce Hale, KB1MW.

Public Service

Conducted By Robert J. Halprin,* K1XA

Delivery: Do It Right

The most important feature of handling formal written traffic seems to receive the least attention. Books and magazine articles address themselves to the many problems of handling traffic: correct word count, how to book messages, the right and wrong ways to write a radiogram, the importance of handling instructions, etc. Unfortunately, all of these things go for naught if message delivery is botched up or, worse yet, the traffic is not delivered.

Let's assume that you're sitting in front of your rig with a message hot off the traffic net, ready for delivery. Curb your first impulse to dash off to the telephone. Give some thought to your presentation. The delivery of any message has a two-fold purpose: a recital of the actual message, and a subtle sales pitch for ham radio. Never forget that many people will receive their first contact with Amateur Radio through your telephone call.

The wrong way to start is with something like, "I gotta message for you" and immediately launch into it. Most likely, you will finish delivery talking into a dead telephone. In this day-and-age of high-powered telephone sales pitches and nuisance phone calls, most people have become very skeptical of talking with strangers. The correct telephone procedure should begin with an introduction and a statement concerning the purpose of your call.

Let's assume that your message is for a Philip Dunn and is from his sister, Gladys, in North Carolina. Your conversation should begin thus: "Good evening. Mr. Philip Dunn, please ... Mr. Dunn, my name is Brad Wells. I am a ham radio operator. One thing we do as a public service is handle messages for people, similar to Western Union, but free of charge. I have a message for you from North Carolina." This type of brief introduction accomplishes several things. The person on the other end of the telephone has been given your name, the reason for your call, a brief sales pitch for Amateur Radio, and some idea of who the message is from.

After this introduction, proceed to read the text and signature. Don't forget to convert the ARL text, if any. Please don't say something like, "The message is ARL FORTY SIX, which means happy birthday, and it's from Gladys." The correct procedure would be, "The message reads: 'Greetings on your birthday and best wishes for many more to come, and is signed 'Gladys.' " Most messages are relatively straightforward, but occasionally you'll get one that only makes sense to the addressee. With the exception of ARL text, don't try to interpret the content of a message. You don't have to understand what it means to deliver it. Above all, don't change it into what you think it should mean.

The final function of a correct delivery is the origination of a return message. When you volunteer to do this, emphasize again that this service is free of charge. About 50 percent of the time, people will take you up on your offer. Explain that you need the name, address and the telephone number of the party for whom the message is intended. Normally, most return messages will be an acknowledgment of your delivery. Don't turn off prospective "customers" by telling them to keep the message under 25 words, or that no commercial content is allowed, or by launching into a detailed explanation of how the message will get to its destination. Since most people who want to send a reply won't know what to say, give them some guidance in their choice of a message. Do this so as to maximize the use of ARL text in the return message.

In winding up your delivery, leave the "customer" your name and telephone number, so he or she may send messages in the future. Again, reemphasize that this is a free public service provided by hams as a part of their hobby.

Every reasonable attempt should be made to deliver a message in a timely fashion. Sometimes, this will entail a bit of detective work on your part — tracing down an addressee. However, even the best detectives can fail. If, for any number of reasons, you are unable to deliver a message, always send a service message to the station of origin. Be sure to include all pertinent information.

Let's assume you were unable to deliver message number 342. The correct format for the service message is, "ARL SIXTY SEVEN number 342 X Phone number 206 573 4598 disconnected X No listing for Philip Dunn with phone company X 73." Always include the addressee's name and phone number as you received it so the originating station can verify this information with his records. In addition, when sending a service message on a piece of MARS (Military Affiliate Radio System) traffic, always include the filing time and date with the message number. Without this information, the MARS operators have no way of sending a service message back overseas.

Handling formal message traffic is one of the most rewarding aspects of our hobby. It is a specialty that naturally seems to attract many of the best operators. However, operating is but one part of this public service. The real payoff is the delivery. Properly done, it is highly rewarding, much fun and the best possible public relations available for Amateur Radio. — *Bradley Wells, KR7L, Seattle, Washington*

1984 NWA AWARDS PROGRAM

The National Weather Association has announced its Awards Program for 1984. As was the case last year, organizations and members of the Amateur Radio community may well qualify for recognition under two of the award categories. Those two categories are

1) The greatest contribution to meteorological operations by an organization not directly a part of the professional meteorological community. This category could include clubs, the Amateur Radio Emergency Service, or Radio Amateur Civil Emergency Service groups or nets distributing vital forecast information that results in prompt evacuation of people from an area where severe weather has been forecast.

2) The greatest contribution to meteorological operations by an individual who is not a member of the professional meteorological community. This could be a ham operator who transmits observations to the National Weather Service during a hurricane or heavy rain from an area where there is a scarcity of data, or distributes warnings of severe weather to an area where normal communications are limited or have been disrupted.

Narrative nominations, with comments or endorsements as might be applicable, should be forwarded to Mr. Edward J. Maree, Chairman, NWA Awards Committee, 25 Hillcrest Dr., Pembroke, MA 02359.

Nominations should be received by the NWA committee prior to September 30, 1984. The presentation of award plaques and possible honorable mention certificates will be made at the National Weather Association's annual banquet. If you need any additional information on this program, contact Darell R. Whitehead, Member, NWA Awards Committee, 11 Patterson Rd., Bedford, MA 01730. tel. 617-861-2552.

COMMUNICATIONS SERVICE OF THE MONTH

The Northern New Jersey Flood

Wednesday, April 4 (1984): Four more inches of rain is added to already high water levels from last week's heavy snow.

Thursday, April 5, 0745 hours: Rain continues. The first of many highway-flooding reports is heard on the Amateur Radio Highway Net, a traffic and hazard reporting net serving Morris and adjacent counties.

Passaic County Thursday, 1600: EC K2SE is asked by the Wayne Emergency Management director to activate the Ramapo Valley Emergency Net (RAVEN), which links several flood-prone communities for the purpose of exchanging river-marker readings, road-closing information and mutual-aid requests. An upstream dam in New York State has broken, and heavy flooding is expected. Stations are activated in Pompton Lakes, Pequannock, Butler, Kennelon and Wayne.

Thursday, 2000: River markers are completely submerged. Many roads and bridges are closed, and evacuation to several area schools is underway. The evacuation centers are tied into RAVEN to relay information and requests for supplies.

Because of the large number of evacuees in Pompton Lakes, additional supplies are required for the evacuation center. A convoy is dispatched by the Red Cross, but by this time Pompton Lakes is isolated by the flood waters. The only access is over a bridge that is closed to vehicular traffic but passable on foot. WB2IXS and K2SE devise a plan whereby K2SE leads the convoy to the Wayne side of the bridge while WB2IXS dispatches trucks to the Pompton Lakes side. The supplies are then hand-carried across the bridge. The transfer operation is completed successfully by 2300.

Telephone service throughout the Ramapo Valley in the evening is shaky, at best. When telephone service to the Oakland fire house is lost, K2VAC in Oakland contacts K2JFJ in Butler, who notifies telephone company emergency-repair crews. Outgoing telephone service at the Wayne flood-control center is also lost, leaving the RAVEN net as the only link to outside assistance.

RAVEN activity continues on Friday, and the net is finally secured on Saturday morning, April 7.

Morris County Thursday, 1600: The county EOC (Emergency Operations Center), already staffed by

*Deputy Communications Manager, ARRL

county OEM (Office of Emergency Management) coordinator WA2ARZ and deputy coordinators K2GDD and WB2AQT, remains open until 0200. Additional radio amateurs are called in to run the county net, man the 2-meter link to the state EOC and assist RAVEN.

In Denville, WA2VQF and WA2SOC are busy handling local communications and maintaining contact with the county EOC. When K2IPX's wife suddenly becomes ill, he decides to transport her by jeep to St. Claire's hospital. The hospital is practically surrounded by water, but WA2VQF directs K2IPX in the back way, assisted by WB2VUF at the county EOC.

Although Parsippany experiences only minor flooding, the local RACES team is activated under the direction of deputy radio officer KC2KE to provide communications for the fire department, whose trucks are running a ferry service through flooded streets for residents of the Lake Hiawatha area.

Meanwhile, the Morris County EOC is busy handling traffic from the Ramapo Valley, including a request from N2DPV at the Pequannock EOC for a state marine police boat for rescue operations, and a request from N2DZZ at the Wayne EOC for additional evacuation centers. The EOC operation is finally secured at 0200 Friday.

Friday, April 6, 0830: The Morris County EOC is busy again with the daytime crew of WA2VWE, WA2VVX and W3FKT handling communications with K2GDD, WB2AQT and WA2ARZ, who are in the field with the damage-assessment teams. RAVEN is also active throughout the day.

WB2VUF, ARRL SEC for Northern New Jersey, contacts RAVEN stations and key NTS operators to set up a procedure for handling health-and-welfare traffic in case telephone service at the evacuation centers fails. The plan calls for stations at the Evac centers to transmit lists of evacuees to NTS operators, who would then generate bulk ARL ONE messages (one of the standard ARRL messages that can be used in emergencies. It means "Everyone safe here. Please don't worry.").

Saturday, April 7: Amateur Radio operators provide communications for state OEM and FEMA (Federal Emergency Management Association) officials who are conducting damage surveys of the flooded areas. K2GDD goes aboard an Army helicopter to relay locations and observations to WA2VQF and WB2VUF at the county EOC. By Tuesday, April 10, preliminary damage surveys are completed and the Amateur Radio circuits return to normal.

Lessons Learned

Several important lessons were either learned or reaffirmed as a result to the flood-relief operations. Most of the traffic was of a 'tactical' or nonformatted, nature. Our local ARES and RACES teams were in a high state of readiness for this type of operation, owing to considerable experience gained by providing tactical safety and coordination communications for community events. Some traffic must go by formal radiogram, however. Detailed status reports and official requests for assistance cannot be accurately or efficiently handled by means of informal message. Fortunately, our better operators are NTS-trained, so they can switch from tactical to formatted traffic as the situation requires. Formal traffic produces a hard-copy record, but tactical traffic does not. Therefore, when there is a large volume of tactical traffic, it is advisable to have a COR (carrier-operated relay) logging recorder or an operator dedicated to monitoring the TAC frequency to take notes.

Logistics was not a problem in this operation, again owing to the experience of our teams in setting up portable stations for civic events, SET and Field Day. Most of the EOCs not equipped with permanent 2-meter stations have permanently installed power supplies and antennas to allow rapid setup of a transceiver. Evacuation centers were covered by mobile or hand-held radios. When operating a hand-held radio in a noisy vehicle, such as a heavy truck or helicopter, earphones and a noise-canceling microphone allow the operator to hear and be heard. Military-surplus handsets and headsets work very well in this application.

Any disaster will bring out three kinds of people: those thinking only of others, those thinking of only themselves, and those not thinking at all. It would be deceptive to pretend that there were no coordination and management problems, and it would be folly not to learn from and correct these problems before the next disaster strikes.

A few problems that show the need for better coordination among ARES (Amateur Radio Emergency Service) and RACES (Radio Amateur Civil Emergency Service) personnel and local government officials arose, although in fairness it must be stated that our ECs have worked very hard in this area. We radio amateurs tend to view everything through the eyes of the communicator, but some local government officials simply do not understand the disaster communication problem and how a good volunteer radio communications system can help them.

For example, a mobile unit was dispatched by the Wayne EOC to Oakland to relay river-marker readings to the towns downstream. The radio amateur was denied access to the town, although a mutual-aid agreement between Wayne and Oakland was in effect. He was essentially told, "If you want river readings, call us on the phone." Telephone service out of the Wayne flood control center failed shortly thereafter and, ironically, telephone service at the Oakland fire house also failed. As stated earlier, Amateur Radio was instrumental in getting landline service restored.

In another incident, N2DPV arrived at an evacuation center in Lincoln Park and found only telephone available for the evacuees. He attempted to originate Welfare traffic, but was denied permission to do so on the grounds that it would upset the evacuees! This unreasonable and arbitrary decision certainly falls into the "not thinking" category. Persistence paid off, however, and N2DPV was eventually able to send out a few messages.

Another strange action, or a lack thereof, occurred when the Passaic County EOC, operating during the disaster, inexplicably failed to activate its RACES station even though requests to do so by towns within the county that were faced with critical problems and a collapsing telephone system. Fortunately, the Morris County EOC station was able to relay traffic from the Passaic County stations. My best advice to ECs and ROs faced with a disaster or potential disaster is, "Don't wait!" Don't wait for officials to call you. In the early stages of an emergency, they may not be thinking about communications; in the later stages, they may be too bogged down with problems to be able to contact you in time. When disaster threatens, call your local officials and tell them your group is activating and is available. It is better to spend a few hours at the EOC "standing by" than to wait until communities are isolated by floodwater and failed telephone service before thinking about activating your net.

Of course, the various problems described are not radio problems per se, but they are included in this report "as a warning for those who would be warned" in order to encourage radio amateurs and local officials to pursue coordination to the maximum extent possible.

Another tip I would give to ECs is, if you operate in an urban or suburban area, pick an odd frequency for your simplex net. The popular 2-meter simplex channels are sometimes difficult to clear in an emergency. In one instance, our operation was temporarily disrupted by two hams far removed from the disaster area who were obviously using tight squelch and high power.

Conclusion: Despite the problems mentioned, which can (and will) occur during any emergency, this emergency communications operation was successful. The conduct "under fire" of the ARES and RACES operators who participated was exemplary. Most had never been in the middle of a real disaster before, yet they handled themselves like old pros. We were pleasantly surprised by the "woodwork" operators who came out to help. Although lacking formal training, they exhibited a high degree of discipline. We hope some of them will become permanent members of the team. We must also thank those operators who merely stood by until they were sure they could assist. Restraint in an emergency is often the hardest skill to learn. Of course, many more radio amateurs participated in this operation than are mentioned in this report. This is the great strength of our system: many people, of various backgrounds, working together to accomplish a difficult task without any thought of compensation.

It can be stated without reservation that those agencies that utilized Amateur Radio were far better equipped to handle their disaster-relief tasks than those that did not and were consequently forced to operate in a partial communications vacuum. In short: Amateur Radio was needed, Amateur Radio was there, Amateur Radio was ready. Those who participated expended huge quantities of time and effort, and it is this volunteer spirit that makes our towns and counties not just places but communities, and Amateur Radio not just a hobby but a service. — *Robert F. Weingaertner, WB2VUF, ARRL SEC, Northern New Jersey*

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	VR6	Pitcairn Islands†
CE	Chile	J7	Dominica	XE	Mexico
CO	Cuba	J8	St. Vincent	YN	Nicaragua
CP	Bolivia	JY	Jordan	YS	El Salvador
CX	Uruguay	LU	Argentina	YV	Venezuela
EL	Liberia	OA	Peru	ZP	Paraguay
HC	Ecuador	PY	Brazil	3D6	Swaziland
HH	Haiti	TG	Guatemala	4U1ITU	ITU, Geneva
HI	Dominican Republic	TI	Costa Rica	4X	Israel
HK	Colombia	V2	Antigua and Barbuda	6Y	Jamaica
HP	Panama	V3	Belize	8R	Guyana
HR	Honduras	VE	Canada	9G	Ghana
J3	Grenada	VK	Australia	9Y	Trinidad and Tobago

†Informal agreement. See League Lines, Oct. 1981 *QST*, for details

ARRL SECTION EMERGENCY COORDINATOR REPORTS

☐ For May, 42 SEC reports were received, denoting a total ARES membership of 22,815. Sections reporting were: AB, AZ, AR, CO, ENY, EMA, EPA, ID, IN, IA, KS, KY, ME, MI, MN, MS, MO, NE, NH, NFL, NTX, OH, OK, ON, OR, PAC, SV, SDG, SF, SJV, SCV, SC, SD, SFL, TN, UT, VA, WA, WV, WMA, WNY and WI.

NATIONAL TRAFFIC SYSTEM

Congratulations to W2CS who was elected to chair the Eastern Area Staff. Gary will continue in his capacity as director of TCC-Eastern/cycle 4. Certificates for 2RN/cycles 3 & 4 were awarded to: WB2VUF, ND2S, W2DBQ, WA2FJJ, KA2OIW, KC2TF, VE2FMQ, WA8MAZ, W2PKY and WA2NKC (2nd annual); K2ZM, W2YGW, W2VY and WB2RBA (3rd annual); N2AKZ, N2XJ, KA2BHR, KG2D, KD2V, WD5DEA, WB2IDS, WB2JCE, KB2KW and W2LWB (4th annual); W2AET, W2QNL, W2ZOJ, AA2H, KS2L, AG2R, WA4JRP and WB2MCO (5th annual); WB2EAG, WB2ZCM and W2XD (6th annual); WB2QIX, WB2EUF, K2VX and W2WSS (8th annual); WA2CJY (9th annual); W2BIW (10th annual); W2MLC and WA2ICB (11th annual); W2ZEP (12th annual); W2FR and W2TZ (14th annual); W2RQ (15th annual); W2MTA (16th annual).

May Reports

1	2	3	4	5	6	7
Cycle Two						
Area Nets						
EAN	31	872	28.1	.600	90.9	
CAN	31	1050	33.9	.637	100.0	
PAN*	61	768	12.6	.300	96.8	
Region Nets						
1RN	61	475	7.8	.323	87.4	96.6
2RN	55	270	4.9	.263	55.9	93.6
3RN	31	302	9.7	.451	85.5	93.6
4RN	62	601	9.7	.412	73.0	96.8
RN5	62	900	14.5	.489	95.8	100.0
RN6	62	417	6.7	.284	97.6	98.4
RN7	62	776	12.5	.877	88.9	96.8
8RN	58	359	6.2	.362	83.9	96.8
9RN						100.0
TEN	62	607	9.8	.377	73.5	100.0
ECN						67.7
TWN	56	380	6.8	.339	73.2	95.2
TCC						
TCC Eastern						
TCC Central	78[1]	447				
TCC Pacific						
Cycle Four						
Area Nets						
EAN	31	1785	57.6	1.340	94.6	

CAN	31	965	31.1	.962	99.5	
PAN	31	1173	37.8	.892	94.6	
Region Nets						
1RN	59	856	14.5	.569	94.4	100.0
2RN	93	662	7.1	.530	94.0	83.9
3RN						100.0
4RN						100.0
RN5	62	861	13.9	.574	90.9	98.4
RN6	62	786	12.7	.624	97.1	98.4
RN7	62	718	11.6	.864	88.5	100.0
8RN	57	381	6.7	.381	87.0	87.1
9RN	62	446	7.2	.480	96.4	100.0
TEN	62	374	6.0	.379	77.2	100.0
ECN						96.8
TWN	54	321	5.9	.312	77.1	85.5
TCC						
TCC Eastern	118[1]	737				
TCC Central	48[1]	348				
TCC Pacific	98[1]	833				
Sections[2]	7610	31,347	4.1			
Summary	8970	56,534	6.3			
Record	10,319	50,268	18.4			

*PAN operates both cycles one and two.
[1]TCC functions not counted as net sessions.
[2]Section and local nets reporting (264): AENB AEND AENR AENX AENY AENZ ATNM WAEN (AL), ACN ATEN HARC (AZ), SWN (AZ/NM), BCEN (BC), NCN NCTN RTTY SCN SCN/V (CA), DEPN DTN SEN (DE), AIN BEN CFRN DEN ENMC FAST FMSN FMTN FPON FPTN GCVTN GN GCEN LSTTN NFPN PBTN PEN PRVAN QFN QFNS SEFTN SPARC SVTN TPTN (FL), I75MN ICN TLCN (IA), ILN ISN ITN (IL), ICN IRN ITN QIN (IN), KMWN KPN KSBN KWN QKS QKS-SS (KS), 3ARES 4ARES 7ARES 11ARES BARES CARN KNTN KTN KYN KYPON MKPN NKARC TSTMN WTEN (KY), CITN EM2MN EMRI EMRI2MTN EMRIPN EMRISS HHTN WMFN WMTN (MA/RI), MEPN MMN MTN WRIN (MB), CMEN CVEN IFN LAAN LO2CW NEMOE SARN (MD), AEN CMEN MPSN PTN RACES SGN (ME), MAC6 MITN MNN QMN UPN (MI), MNAMWXNT MSN MSPN MSSN PAW (MN), ACAN HBN JCCC MEOW MON MOSSB MTTN PTN RRBN ZAEN (MO), MSN MTN (MS), MTN (MT), CNCTN NCEN NCMN PCTN RARS (NC), CN CSN (NC/SC), 5BARES BRARES BVARES CC2MN EN2MARES MARES MNARES NCHN NCWN NE40 NE75 NNN NSN PARC PV2MN QCWA WNN (NE), GSFM (NH), HCATEN JSARS MCN NJM NJN NJPN NJSN NJVN OBTTN TCETN (NJ), NSN (NV), BRVTN BSN CDN CNYTN EPN HVN NLIPN NYPON NYS NYS/M NYSPTEN QNET SDN WDN (NY), ALERT BN BNR BRTN BSSN COARES HCARES MCTN NEON O6MN OSSN (OH), CARA EATIN NWOSN OLZ ONON OPEN OTWN QCWA-63 STN (OK), KTN OLN OPN OSN OSND TIN (ON), BSN LBLARES OARES OHNN OSN PTTN SOFM THN (OR), NWPATMTN WPA WPA2MTN WPAPTN (PA), GPD2MN LC2MN SCNTN SCSSBN (SC), BHN PDRN SDEN SDN SDTN SMN WCEN (SD), TNCW TNPN TNVN (TN), DFW NET TEX TSN TTN (TX), BUN DCESN UCN (UT), STARES SVEN VLN VN VSBN VSN VTN (VA), EWTN NTN NWSSBN PSTS WARTS WSN (WA), BEN BWN EXPO NWTN WCWTN WIN WNN WSBN WSSN (WI), WINB WINS (WIN), WVARN WVFN WVN WVNDN WVNN (WV).

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — AVERAGE
5 — RATE
6 — % REP.
7 — % REP. TO AREA NET

Transcontinental Corps

1	2	3	4	5
Cycle Two				
TCC Eastern				
TCC Central	93	83.9	992	447
TCC Pacific				
Summary	93	83.9	992	447
Cycle Four				
TCC Eastern	155	76.1	1479	737
TCC Central	62	77.4	780	348
TCC Pacific	124	79.0	1544	833
Summary	341	77.5	3803	1918

1 — AREA
2 — FUNCTIONS
3 — % SUCCESSFUL
4 — TRAFFIC
5 — OUT-OF-NET TRAFFIC

TCC Roster

The TCC Roster (May) — *Cycle Two* — Eastern Area (KA1GBS, 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) — N5AMH N5AMK K9AZS N5BT W5CTZ N5DFO KA0EPY NG5G KW9J W4JL WA4JTE W9JUJ K5KJN W5KLV WB9NVN WB5OXE KA4SAA K5UPN WF4X WB5YDD. Pacific Area (W0HXB, Director) — KT6A N7CSP N0CXI KU6D W0EJD WD5ESV KB7FE W7GHT N6GIW W0HXB W5JOV KR7L KB0MB K6OWA KF7R ND5T NV6T W7TGU K6UYK KO7V WB7WOW K6YBV. *Cycle Four* — Eastern Area (W2CS, Director) — AA4AT VE3AWE K1BA W3BBN KI3C WA4CCK N3COY W2CS N8CW KA3DTE WB2EAG W1EFW W2FR WD4FTK KA1GBS W2GKZ VE3GOL WB3GZU KB2HM WB9IHH W1ISO K4JST KN1K N4KB AH2M W2MTA W1NJM WB4PNY W3PQ W8QHB W1QYY W2RQ K3RZR KA1T KB3UD WB4UHC W4UQ W2VY VE1WF W2XD N2XJ W1XX N8XX WB8YDZ K4ZK W2ZOJ. Central Area (K5GM, Director) — W0AM W9CXY W5GHP K5GM W0HI K5OAF W5RB N5TC W5TFB K5TL K0SU WB9UYU KB9X KV5X. Pacific Area (KN7B, Director) — AD0A K0BN KA7CPT KC0D W7DZX W6EOT W7EP W7GHT N2IC W6INH W5JOV W7LG W7LYA WB7NHR W0OGH ND5T WA7TEH W5UH W7VSE W6VZT KM7Z VE7ZK.

Public Service Honor Roll May 1984

This listing is available to amateurs whose public service performance during the month indicated qualifies for 60 or more total points in the following nine categories (as reported to their SM). Please note maximum points for each category: (1) Checking into CW nets, 1 point each, max. 30; (2) Checking into phone/RTTY nets, 1 point each, max. 30; (3) NCS CW nets, 3 points each, max. 12; (4) NCS phone/RTTY nets, 3 points each, max. 12; (5) Performing assigned NTS liaison, 3 points each, max. 12; (6) Delivering a formal message to a third party, 1 point each, no max.; (7) Handling an emergency message, 5 points each, no max.; (8) Serving as Emergency Coordinator or net manager for the entire month, 5 points, max. 5; (9) Participating in a public service event, 5 points, no max.

This listing is available to Novices and Technicians who achieve a total of 40 or more points. Stations that are listed in the Public Service Honor Roll for 12 consecutive months, or 18 months out of a 24-month period, will be awarded a special PSHR certificate from Hq.

264
K7VW
229
K5CXP
215
WB7WOW
161
KA3DLY
149
WD8LRT
146
K4SCL
142
KK3F
137
KA0EPY
136
KM9B
129
KB2HM
128
KA1KML
KS7I
127
WB4WYG
126
KC9CJ
125
N4GHI
KC0AF
124
K4JST
WF4X
123
KA1GBS
122
KD7ME
121
KB0Z
120
WF4Y
119
KA1EXJ
AL7W
117
WB1HIH
116
KB5X
115
KF8J
N2XJ
114
KX7W
WD8LDY
W7VSE
112
W0OYH
WD8MIO
111
W2MTA
110
W1EOF
AA4AT
109
KB4WT
WB3GZU
K0SI
WB2MCO
KC4VK
108
WD8RHU
107
W2PKY
WB2OWO
106
KS5V
W1RWG
W1PUO
WA2JBO
WA4JBH
KA8CPS
KT9I
WA2FJJ
W1TN
105
KA4SAA
KJ3E
104
W9JUJ
WD4ALY
W1KK
KA0ARP
WA4PFK
K4ZK
KT5Y
WD4ALY
103
WA4CCK
AF3S
KO7V
KA8GJV
KC2TF
K8ND
KA2BHR
WA4CCK
102
KB7FE
WB2VUK
N1BJW
101
KR4V
WB4WII
W4ANK
KB4OZ
AE5I
KC2QQ
WB2ZCM
KC3LY
KR4V
KZ8Q
100
WX4J
99
KA5HDT
WB2KCR
KC2ZO
WB1GLH
98
VE3GT
K4KDJ
W2VY
WB1GXZ
W6HUJ
WA1YNZ
KA4BCM
97
N2AKZ
KC3Y
96
WA0TFC
WB2KLF
VE3BDM
N9BDL
N3COY
KO1K
95
AK1W
KA8NCR
93
K7GXZ
92
W6VOM
N6AWH
91
WD0FWB
WX4I
90
VE3WM
KT6A
VE3DPO
W0KK
89
WB0TED
WB2RBA
WA4LXP
AG9G
N1CPX
N1ARI
KD0JM
KA0BWM
88
N8EVC
87
KA6BNW
KI1M
KA0BCB
W2AET
86
K9FW
KA2OPG
KA1EPO
KZ9V
WB2IKL
85
W2BIW
K4IWW
W5CTZ
WB4HRR
84
KT6D
KJ3T
W6NTN
W8QHB
KR7L
KA2QIK
83
NI6A
W3DKX
W6INH
KD5FR
W9DM
W6HUJ
K3JL
82
K4VWK
N0CFS
WD5JYI
W7LG
81
KA4GUS
W9QBH
WB5MMI
80
WB6QBZ
K6APW
N4PL
79
W9FRI
N1AJJ
WA4EIC
KA5LQA
KA4MTX
NV6T
WA7MEL
78
KI5P
KA8MYJ
N7BGW
77
KA8PQH
WA2KOJ
K2ZM
WA8MAZ
N9EM
WB4TZR
76
N6CVF
K3NNI
WA3UNX
KF4U
KV7F
W8UE
K2ZVI
KB4GTN
ND0N
WB7JMH
75
WB2OMZ
K0GP
N4EDH
WB2OMZ
74
WB2QIX
KB4LB
WA7ZUD
KD2BE
W8CUP
KA1BHT
73
VE3GOL
KX7T
WB6DOB
K0GP
WB8SYA
72
N5EZM
ND2SM
W9NXG
KD9K
WB2IDS
WB8MTD
WD8OUO
AK2E
W4LXB
K4NLK
K4ZN
WD0BOX
KA4BBA
71
KG2D
WB5YDD
W5KLV
KC3AV
70
K6AGD
N5DKW
69
K0PCK
KA9FFD
W0IKT
KC0OO
K1JHC
W7LNE
KP4DJ
KA1IEK
68
KX2T
KA2DQA
WA4RNP
WB4UHC
67
WD4PBF
KA4SKV
VE2FMQ
N6EPG
N5DFO
W2GJ
WA1DXT
66
K8JDI
WD4HBP
KD8KY
65
KA3DTE
KC0T
N0EBC
KA3DTE
K2YQK
K7OVK
64
VE3KK
W4HON
WA8DHB
KA1EGE
W0LAE
W4FMZ
KA9EWN
KA0ODQ
KA1GWE
KF7R
WA4UYU
63
W1TN
KR7F
KA4YHS
WB7OEX
62
KL7IJG
WB2BNA
WD8KBW
KA2TOC
WA4GYR
N3DPE
WD4BSC
61
WD8KQC
KG9B
AI8O
KA1T
WA4JTE
W4ZJY
K5SOR
W2XD
60
WD8EIB
WB5LBR
59
KA2HNQ/T
56
N4JOA/T
53
KA6HJK/T
48
WB8NHV/T
45
WB2ANK/T
44
KA1HPO/T
41
N5GKF/T
KA8GGZ/T

Brass Pounders League May 1984

BPL Medallions (see April 1979 *QST*, page 77) have been awarded to the following amateurs since last month's listing: AK1W, WB1GXZ, KB4WT, WD4ALY.

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	735	972	1481	112	3300
KA9CPA	39	1416	136	997	2588
N0BQP	34	1405	141	835	2415
WB7WOW	19	544	843	64	1470
WA0HJZ	0	887	31	565	1463
KA1GBS	9	499	490	27	1025
W1EOF	0	395	581	14	994
W9JUJ	0	459	476	3	938
W3VR	311	197	319	26	853
WF4X	4	397	423	23	827
W7DZX	22	371	360	8	761
WA4JDH	1	373	331	5	710
KA1KML	1	329	298	31	663
K0JAN	0	377	31	235	643
KD7ME	7	233	262	16	618
AA4AT	20	297	277	10	604
WA4CCK	1	289	305	2	597
W7VSE	2	313	267	8	590
KA8CPS	3	241	263	51	578
N4PL	64	215	266	32	567
WD8MIO	39	298	195	28	560
W5CTZ	1	252	303	1	557
N4GHI	25	253	231	36	545
W6IPL	0	278	245	7	530
KS7I	64	196	246	23	529
KT6A	1	285	205	17	508
W8QHB	0	233	273	0	506
WB1GXZ	6	243	244	9	502
Multioperator station:					
AK5M	394	16	394	16	820
BPL for 100 or more originations plus deliveries:					
N2NS	267				
AA4FG	154				
K5CXP	145				
WA4JXJ	139				
KC3VK	126				
W1FYR	122				
KB5EK	110				
KC3Y	106				
K5CXP (April)	103				
K5CXP (March)	132				
KB5EK (March)	108				
Multioperator stations:					
K4KDJ	115				
WA1NPO	114				

1 — CALL
2 — ORIG.
3 — RCVD.
4 — SENT
5 — DLVD.
6 — TOTAL

Independent Nets (May 1984)

1	2	3	4
Amateur Radio Telegraph Society	31	326	323
Central Gulf Coast Hurricane	31	167	2846
Clearing House	31	89	265
Early Bird	31	1259	366
Empire Slow Speed	31	49	416
Golden Bear	31	269	1893
Hit and Bounce Traffic	31	316	592
IMRA	27	767	1484
Midwest RTTY	30	27	152
Mission Trail	31	129	1047
North American SSB Traffic	26	46	162
Southwest Traffic	31	165	1305
Vermont Sideband	31	137	518
West Coast Slow Speed	31	154	515
75-Meter ISSB	31	326	937
7290 Traffic	59	842	3124

1 — NET NAME
2 — SESSIONS
3 — TRAFFIC
4 — CHECK-INS

Coming Conventions

SOUTHEASTERN DIVISION CONVENTION
August 18-19, Huntsville, Alabama

The Southeastern Division Convention and Huntsville Hamfest will be held on Saturday and Sunday, August 18 and 19. All events and activities will be in the Von Braun Civic Center (VBCC) Exhibit Hall. The hamfest is open to the public from 10 to 5 on Saturday and from 9 to closing on Sunday. There will be commercial exhibits, dealers and a large indoor flea market. Two food-concession areas will be available inside the Exhibit Hall, and there will be a hospitality room at the Huntsville Hilton. Amateur license exams for Technician through Extra Class will be given at the hamfest. See accompanying sidebar for details.

Several technical forums are planned, and meetings for the QCWA, MARS, DX and YL/XYL hams will be held. There will be ARRL forums with ARRL Southeastern Division Director Frank Butler, W4RH, *QST* Senior Technical Editor Paul Rinaldo, W4RI, and Communications Manager John Lindholm, W1XX. Activities for women are scheduled, and there will be movies and video games for the children. Tours of the Alabama Space & Rocket Center are available for the entire family. Big Spring Park is adjacent to the VBCC, Monte Sano State Park is only 10 minutes away and Point Mallard recreation area is located in nearby Decatur.

There is no hamfest admission charge for the public, though parking in the VBCC garage and lots is $2. Flea market tables are $4/day and should be reserved prior to the hamfest to ensure availability. Motel reservations may be made through the Huntsville Hilton (1-800-241-5838). Mention the Hamfest to obtain a special rate.

Talk-in will be on 34/94. Other area repeaters are 78/18, 90/30, 705/105 and 825/225. For more information, write to Huntsville Hamfest, 2804 S. Memorial Pkwy., Huntsville, AL 35801, tel. 205-533-7757.

ILLINOIS STATE CONVENTION
August 26, St. Charles

This year, The Fox River Radio League is celebrating its 60th anniversary as an organized club. Part of this celebration will be the club's sponsorship of another State ARRL Convention in conjunction with its annual hamfest — also its 60th year.

A special commemorative station will be in operation during the convention, and all licensed hams are invited to operate (bring a clear photocopy of your license). Operation will be in the bottom 10-kHz portion of the General class bands on 15, 20 and 40 meters.

The convention/hamfest will be held on Sunday, August 26, 1984 at the Kane County Fairgrounds in St. Charles. Located midway between Elgin and Aurora in the Fox River Valley, the 1984 Illinois State ARRL Convention can be reached easily from either the Northwest or East-West Tollways via the State Route 31 exits and driving south or north, respectively, to St. Charles.

Talk-in will be on 146.94 simplex or 81/21. All commercial exhibits, contests, demonstrations and part of the flea market will be indoors. Additional flea market will be outside, adjacent to the main hall.

Overnight parking Saturday, August 25, for campers and motorhomes is available by prior arrangement for a fee of $3. Campers, commercial exhibitors and flea marketers contact George R. Isely, WD9GIG, 736 Fellows St., St. Charles, IL 60174.

Gate tickets are $3, advance tickets, $2. Send a business-size s.a.s.e. to Gerald Frieders, W9ZGP, 1501 Molitor Rd., Aurora, IL 60505.

PACIFIC DIVISION CONVENTION
August 31, September 1-2, Santa Clara, California

The Associated Radio Clubs of San Jose will sponsor the 1984 ARRL Pacific Division Convention, to be held August 31, September 1-2, 1984 at the Marriott Hotel in Santa Clara. Programs will include an ARRL forum, a legal forum discussing selected areas of Part 97, emergency communications forum, DX forum, contest forum, CW contest, traffic program, satellite forum, Sunday evening banquet, many technical talks and a Woulf Hong ceremony after the banquet. An exhibit room will be open Friday evening, Saturday and Sunday. There will also be a hospitality room at the hotel with amateur-related videotapes running continually.

Amateur Radio exams will be given on Friday, Saturday and Sunday. See accompanying sidebar for details.

A flea market will be held Saturday, September 1 on the top level of the hotel parking garage. Sellers' spaces for the flea market are $5 each. Admission to the flea market for buyers is free with convention registration.

Special preregistration rate is $25, which includes the banquet if postmarked on or before August 20, 1984. Registration for the forums, technical talks, exhibits and entrance to flea market is $10. Talk-in frequencies: 146.76, 146.385 and 147.39.

For more information, write to Associated Radio Clubs of San Jose, Box 6, San Jose, CA 95103-0006.

August 3-5
Idaho, Montana and Utah State, Jackson, WY

August 4-5
North Florida Section, Jacksonville

†August 18-19
Southeastern Divison, Huntsville, AL

August 26
Illinois State, St. Charles

†August 31, September 1-2
Pacific Division, Santa Clara, CA

September 15-16
Delta Division, New Orleans, LA

September 22-23
Roanoke Division, Virginia Beach, VA

†September 29-30
New England Division, Boxboro, MA

†September 29-30
Great Lakes Division, Louisville, KY

October 6-7
Texas State, Houston

October 12-13
Iowa State, South Sioux City, Nebraska

October 12-14
Southwestern Division, Santa Maria, California

October 27-28
Tennessee State, Chattanooga

November 24-25
South Florida Section, Clearwater

ARRL NATIONAL CONVENTIONS

October 4-6, 1985
Louisville, Kentucky

September 5-7, 1986
San Diego, California

June 19-21, 1987
Atlanta, Georgia

†Amateur Radio exams are scheduled to be given at these conventions.

How to Register for Upcoming Exams

August 18-19, Southeastern Division Convention (Huntsville, AL). Exams (Technician to Extra Class) given on Saturday, August 18, starting at 9 A.M., at Von Braun Civic Center. Advance registration preferred, but walk-ins accepted. Mail completed Form 610 to "EXAMS," Don Tunstill, WB4HOK, 1215 Dale Dr., Huntsville, AL 35801.

August 31, September 1-2, Pacific Division Convention (Santa Clara, CA). Application must arrive by *August 8.* Exams given on Friday, Saturday and Sunday. Mail check for $4 (payable to "ARRL/VEC") and completed Form 610 to "EXAMS," Associated Radio Clubs of San Jose, Box 6, San Jose, CA 95103-0006.

September 29-30, New England Division Convention (Boxboro, MA). Application must arrive by *August 30.* Exams given on Saturday, September 29, and Sunday, September 30 (Technician through Extra). Mail check for $4 (payable to "ARRL/VEC") and completed Form 610 to "EXAMS," North Shore Ham Services, P.O. Box 54, West Lynn, MA 01905. VEC: ARRL.

September 29-30, Great Lakes Division Convention (Louisville, KY). Application must arrive by *August 29.* Mail check for $4 (payable to "ARRL/VEC") and completed Form 610 to "EXAMS," Walter Bowman, WD4RAK, P.O. Box 603, Radcliff, KY 40160. VEC: ARRL.

Strays

QST congratulates...

☐ Steven O. Sellers, WD5JGC, of KISS-FM in San Antonio, on being honored by the Texas Veterinary Medical Assn. for his reports on rabies in south Texas.

☐ Professor Donald L. Kinser, W4IAM, of Vanderbilt University, on having his glass experiment as part of the Space Shuttle *Challenger* mission last April.

☐ Wayne S. Green, W2NSD, on being awarded an Honorary Degree by Central New England College, Worcester, Massachussets.

☐ former Hudson Division Director Stan Zak, K2SJO, on his appointment to another term as Deputy Mayor of Rye Brook, New York.

☐ J. Gary Eden, KC9M, on being promoted to professor in the Department of Electrical and Computer Engineering, University of Illinois at Urbana-Champaign.

☐ Gregg Robinson, KA7MDM, on being named Volunteer Fireman of the Year by the Greater McMinnville (Oregon) Chamber of Commerce.

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. Hamfest information is accurate as of our deadline; contact sponsor for possible late changes.]

Connecticut (Torrington) — September 9: CQ Radio Club will sponsor a hamfest from 8 A.M. to 4 P.M. at the Torrington Drop-In Center for Retirees, East Albert St. (follow the hospital sign from Rte. 8). Admission is $2. Tables inside, $7; tailgaters, $5. Talk-in on 84/24. Further information from Donald Taylor, KA1GKJ, P.O. Box 455, Watertown, CT 06795, tel. 203-274-3337.

Delaware (Newark) — August 19: The Delmarva Hamfest will be held at the Newark campus of the University of Delaware. Admission is $2.50 in advance, $3 at the gate. Food and drink available. Talk-in on 52 and 13/73. For more info, send an s.a.s.e. to the Amateur Radio Association at the University of Delaware, 140 Evans Hall, University of Delaware, Newark, DE 19716.

†**Florida (Melbourne) — September 8-9:** The 19th Annual Platinum Coast Hamfest sponsored by the Platinum Coast ARS will be held at the Melbourne Auditorium on Saturday, Sept. 8, from 9 A.M. to 5 P.M., and Sunday, Sept. 9, from 9 A.M. to 4 P.M. Admission is $3 advance, $4 at the door. Meetings, forums, MARS, commercial exhibits, swap tables, net meetings, awards, QCWA, ARRL forum and technical talks. Food service available and free transportation between hamfest and Hq. Talk-in on 25/85 and 52. For information and advance tickets, write to PCARS, P.O. Box 1004, Melbourne, FL 32901, tel. 305-773-0063.

†**Georgia (Madison) — August 25-26:** The Confederate Signal Corps, Inc., hamfest will be held at the Holiday Inn in Madison on Saturday, 9 A.M. to 5 P.M., and Sunday, 9 A.M. to 2 P.M. Admission is $1. Inside and outside exhibit space, dealers, flea market, entertainment. Parking free. Special rate on rooms. Talk-in on 3.975 and 52. For further information, write to Ivan White, K4VJM, 6085 Phillips Dr., Morrow, GA 30260, tel. 404-961-5335.

†**Illinois (Willow Springs) — August 12:** Hamfesters Radio Club, Inc., will sponsor a hamfest at Sante Fe Park, Willow Springs (near Chicago). Admission is $4. For further information, write to Ernest L. Kaiser, KV9G, 5145 S. Kildare Ave., Chicago, IL 60632.

†**Illinois (Danville) — August 26:** The Vermilion County ARA hamfest will be held at the W9MJL Clubhouse in Danville. Admission is $1 in advance, $1.50 at the gate. For further information, contact Hamfest Chairman Joe Mayer, tel. 217-267-2946.

†**Illinois (Carterville) — September 9:** The Shawnee ARA will sponsor the SARA Hamfest, from 7 A.M. to 2:30 P.M. (setup time 7 A.M.), at John A. Logan College, Greenbriar Rd., Carterville, 9 miles east of Carbondale. Admission is $3. Indoor flea market, women's program, talks, computers, new and used equipment, crafts, weaving demo. Food (cafeteria-style), parking, camping across the road, motels nearby. One free table no charge for vendors and flea-market dealers, electrical hookups. Talk-in 3925 kHz at 8-9 A.M., 146.85. For information, write to Bill Johnson, W9ERI, 502 W. Kenicott, Carbondale, IL 62901, tel. 618-457-7586.

†**Indiana (Lafayette) — August 19:** The Lafayette Hamfest sponsored by the Tippecanoe ARA will be held at the Tippecanoe County Fairgrounds, SR 25 in Lafayette, from 8 A.M. to mid-afternoon. Admission is $3. Flea market, camping available Saturday night. No charge, other than admission, for indoor or outdoor flea market vendors. Talk-in on 13/73 and 52. For further information, write to Lafayette Hamfest, Rte. 1, Box 63, West Point, IN 47992, tel. 317-572-2755.

Indiana (Argos) — August 26: The Marshall County ARC is holding their annual hamfest from 8 A.M. to 2 P.M. at the Marshall County 4H Fairgrounds in Argos. Dealers admitted at 6 A.M. Advance tickets $2; at the door $3. Electrical outlets; 8-ft tables, $5. For further information, write to Marshall County ARC, P.O. Box 151, Plymouth, IN 46563, or call Bob Nellans, KB9DE, tel. 219-892-5224.

Indiana (Marion) — September 8: The 5th Annual Grant County (Indiana) ARC Hamfest will be held at McCarthy Hall, St. Paul's Catholic Church, Marion. Doors open at 8 A.M. Refreshments, parking. Table reservations: $2 for 8-ft table. Donation: $2 in advance, $3 at gate. Talk-in on 19/79 and 52. For information/tickets, send an s.a.s.e. to Jim Allman, WD9EOI, 1108 Spencer Ave., Marion, IN 46952.

†**Iowa (Des Moines) — August 19:** The Des Moines Radio Amateur Association Ham & Computerfest '84 will be held at Veteran's Memorial Auditorium from 9 A.M. to 5 P.M. Advance donation $3; at the door $4. Expanded flea market, amateur dealers, computer dealers, consignment tables. Food and drink available. Talk-in on 22/82 and 440.5 MHz. For information and tickets, write to Bob Tucker, KDØEO, P.O. Box 3711, Urbandale, IA 50322, tel. 515-276-4415, or Louis Seibert, NØELI, 7515 Roseland, Urbandale, IA 50322, tel. 515-276-0272.

†**Iowa (Hampton) — August 26:** The Iowa 75 Meter Picnic sponsored by the Iowa 75 Meter Net will be held in WKW Park on Hwy. 65. Starting in A.M., potluck at noon, closing late P.M. Program around 2 P.M. Talk-in on 75/15. Further information from Lovelle Pedersen, WBØJFF, 2327 W. Reinbeck Rd., Hudson, IA 50643, tel. 319-988-3790.

†**Kentucky (Georgetown) — August 12:** The Bluegrass ARS will sponsor the Central Kentucky ARRL Hamfest at Scott County High School, Longlick Rd. and U.S. Rte. 25 (off I-75/64), Georgetown, from 8 A.M. to 5 P.M. Advance admission $3.50; at the door, $4. Technical forums, awards and exhibits. Outside flea market. Snack bar. Talk-in on 16/76. Further information from Edward B. Bono, WA4ONE, 2077 Dogwood Dr., Lexington, KY 40504, or Bill DeVore, N4DIT, 112 Brigadoon Pkwy., Lexington, KY 40503, tel. 606-277-3768 or 606-272-3533.

†**Louisiana (Shreveport) — August 11-12:** The Shreveport Amateur Radio Association (SARA) will host the Shreveport Hamfest at the Convention Center on the riverfront in Shreveport, from 9 A.M. to 5 P.M. Saturday and from 9 A.M. to 3 P.M. Sunday. Included will be new-equipment dealers, parts dealers, forums, swap tables, flea market and special events. Free admission. Talk-in on 63/03. For more information, contact John Harris, KD5QS, 129 Herndon, Shreveport, LA 71101, tel. 318-222-5886.

†**Maine (Windsor) — September 8:** The Windsor Hamfest — 1984 sponsored by the Augusta Emergency Amateur Radio Unit will be held at the Windsor Fairgrounds from 8 A.M. to 10 P.M. Admission is $1. Net meetings, flea market, casserole supper, commercial dealers, programs, camping, musical entertainment. Talk-in on 22/82. Further information from Don Hanson, N1AZH, RFD 2, Box 3678, Greene, ME 04236.

Maryland (West Friendship) — July 29: The Baltimore Radio Amateur Television Society (BRATS) again presents the BRATS Maryland Hamfest and Computerfest on Sunday at the Howard County Fairgrounds, Rte. 144 at Rte. 32, adjacent to I-70, about 15 miles west of the Baltimore Beltway (695) in West Friendship. Indoor tables along wall, with A/C, $20 each; indoor tables in center of the floor, without A/C, $10 each. Quantity discounts and booths available. Outdoor tailgating. Dealer setup begins Saturday at 2 P.M., overnight security provided. RV hookup available. For table reservations and information, write to BRATS, P.O. Box 5915, Baltimore, MD 21208, or call Mayer Zimmerman, W3GXK, at 301-655-7812. Table sales by advance reservation only. Talk-in on 16/76, 63/03 and 52.

Massachusetts (Taunton) — August 25: The Pilgrim, Massasoit and Whitman ARCs will hold an indoor ham radio flea market on Saturday, from 11 A.M. to 4 P.M., at the Taunton VFW, 82 Ingell St., Taunton. Dealers may set up at 10 A.M. Tables are $8 each (includes one free admission). General admission is $1. Refreshments and free parking. Talk-in on 735/135 and 52. For space reservations, send check payable to Massasoit Amateur Radio Assn., c/o Gary L. DeCoster, 42 South Dr., Bridgewater, MA 02324.

Michigan (Flint) — August 26: The eighth annual Five County Swap-N-Shop will be held on Sunday, from 8 A.M. to 3 P.M. (5 A.M. for dealers); at Bentley High School, 1150 Belsay Rd., Flint. Advance tickets are $2; at the door, $3; children under 12 free. For table reservations, contact Bill Cromwell, KU8H, 1214 Overland Dr., Lennon, MI 48449, tel. 517-288-5046. Sponsors are Genesee County RC, Bay Area ARC, Lapper County AR and Repeater Club, Saginaw Valley ARA and Shiawassee ARA.

Michigan (Marshall) — August 26: Fifth annual "Trunk-n-Trailer Bash" will be held at Calhoun County Fairgrounds, I-94 — I-69. Donation $2 ($1.50 in advance), trunks $3, insiders $5. For overnight camping, daredevil pacs, unique deals, send an s.a.s.e. to K8UCQ, 117 East Michigan, Marshall, MI 49068. For further information, call 616-781-5555. Sponsor is the Calhoun Amateur Radio-Electronics Society.

Minnesota (Sauk Rapids) — August 12: The St. Cloud ARC will hold its annual hamfest Sunday, from 8 A.M. to 4 P.M., at the Sauk Rapids Municipal Park in Sauk Rapids. Talk-in on 34/94. For further information, contact the St. Cloud ARC, P.O. Box 141, St. Cloud, MN 56302.

†**Mississippi (Greenville) — August 11-12:** The Mid-Delta Hamfest will be held at the Mainstream Mall Civic Center in Greenville on Saturday, from 8 A.M. to 5 P.M., and Sunday, from 8 A.M. to 2 P.M., sponsored by the Delta ARA. No admission charge. Flea market. Talk-in on 3987.5 and 22/82. Further information from Michael A. Roark, WA5TSU, P.O. Box 5551, Greenville, MS 38704, tel. 601-378-2064.

†**Missouri (Springfield) — August 19:** The Southwest MO ARC hamfest will be held at Lake Springfield Pavillion, Springfield. Admission $3 (2/$5). Food and drink includes. For further information, write to Ray Morris, WBØTNX, 2627 N. Kellett, Springfield, MO 65803.

†**Missouri (St. Charles) — August 26:** The St. Charles Amateur Radio Club's Hamfest '84 will be held at the St. Charles City Hall Complex. The Harvester Lions will be providing the barbecue. Riverfront Park and historic South Main Street are just a few blocks away. General admission $1. Talk-in on 07/67 and 52. For more information, contact Ron Ochu, KØØZ, 1914 N. 5th St., St. Charles, MO 63301.

Missouri (Monett) — September 9: The 3rd Annual Ozark Amateur Radio Club Congress and Swap Fest, sponsored by the Ozarks ARS, will be held in Monett City Park, at the junction of U.S. 60 and State Rte. 37, between Springfield and Joplin. Swap Fest at 11 A.M. Buffet dinner at 1 P.M. Admission free. Swap space available on a first-come, first-served basis, without fee. Buffet dinner will be "country style" — bring a single dish and share in the feast. Contact the Ozarks Amateur Radio Society, Box 327, Aurora, MO 65605, for complete information. Talk-in on 37/97 and 7.250 MHz.

Montana (Havre) — August 17-19: The Northcentral Montana Hamfest will be held at Marden's Campground, 28 miles south of Havre, in beautiful Beaver Creek Park. Sponsor is the Hi-Line Radio Club.

†**New Jersey (Oakland) — August 18:** The Ramapo Mountain ARC, WA2SNA, presents its 8th annual flea market at the Oakland American Legion Hall, 65 Oak St., just 20 miles from the George Washington Bridge. Talk-in on 147.49/146.49 and 52. Indoor tables $6.50; tailgating $3. Admission $1; nonham family members free. For information, contact Tom Risseeuw, N2AAZ, 63 Page Dr., Oakland, NJ 07436, tel. 201-337-8389 (after 6 P.M.).

†**New Jersey (Sewell) — August 26:** The Gloucester County ARC will sponsor the Gloucester County ARC Ham/Computerfest at Gloucester County College, Sewell, from 8 A.M. to 4 P.M. Advance admission $2; at the door $2.50; tailgaters $3 per space. All facilities, food, soft drinks. Seminars, contests, computer demonstrations, flea market, commercial displays, women's activities under N2RE. FCC exams, Novice through Extra. No appointment required. Form 610 will be supplied. Bring your license. Exams given from 9 A.M. to 11:30 A.M. and from 1 P.M. to 3:30 P.M. Talk-in on 78/18, 52 and 223.36/224.96. For further information and advance tickets, write to Milt Goldman, 801 Crown Point Rd., Westville, NJ 08093, tel. 609-456-0500 or call J. M. Fisher, K2JF, tel. 609-589-2318.

†**New York (Hamburg) — September 7-8:** The ARA of the Tonawandas, Buffalo ARRA, Radio Assn. of Western New York and South Town ARS are the joint sponsors of "Ham-O-Rama '84," to be held at the Erie County Fairgrounds, Hamburg. Advance tickets $3.50;

†ARRL Hamfest

*Convention/Travel Coordinator, ARRL

at the gate $4.50. Indoor and outdoor flea markets, exhibitor/vendor displays, technical programs, women's activities. Personal computers will be featured. RV parking with hookups, free parking, snack bar. Talk-in on 31/91 and 52. Advance tickets: Dick Diehl, WB2JCB, 316 Oakvale Blvd., Kenmore, NY 14223, tel. 716-835-5666. Chairman: Kevin Kedzierski, tel. 716-834-3042.

†**New York (Ithaca) — August 25:** The Finger Lakes Hamfest will be held at the Trumansburg Fairgrounds, 12 miles northwest of Ithaca. Exhibits, flea market, refreshments. Overnight camping available. Contact Wanda Lovejoy, KO2X, 443 Jerry Smith Rd., Lansing, NY 14882.

†**North Carolina (Shelby) — September 1-2:** The Shelby Hamfest, sponsored by the Shelby ARC, will be held at the Cleveland County Fairgrounds, Bus. 74 east of Shelby. Full hookup for campers. For further information, contact Robert Hamrick, WA4QDU, P.O. Box 86, Boiling Springs, NC 28017, tel. 704-434-6242.

†**Ohio (Marysville) — August 26:** The Union County ARC will sponsor the Marysville Hamfest at the Fairgrounds, from 6 A.M. to 4 P.M. Admission in advance $2; at the door $3. ARRL forum, flea market. Talk-in on 99/39 or 52. Further information from Union County ARC (Gene Kirby, W8BJN), 13613 U.S. 36, Marysville, OH 43040, tel. 513-644-0468.

†**Ohio (Warren) — August 19:** The Warren ARA will hold their 27th annual hamfest on Sunday at Kent State University Trumbull Campus. Flea market opens at 6 A.M., with 10-ft space for $2. Registration is $2.50 in advance and $3 at the gate. Dealer displays, DX program, technical programs, FCC forum. For tickets or more info, send an s.a.s.e. by August 1 to WARA Hamfest, c/o KD8KJ, P.O. Box 809, Warren, OH 44482.

†**Ohio (Findlay) — September 9:** The 42nd annual Findlay Hamfest sponsored by the Findlay Radio Club at the Hancock Recreational center, 3430 North Main St., on Sunday, from 6:30 A.M. to 5 P.M. Advance tickets $3; at the door $4. Cutoff for advance tickets is September 1. Arena tables $6 each. Flea market outdoor spaces $3 each. Talk-in on 75/15. For more information, write to the Findlay Radio Club, P.O. Box 587, Findlay, OH 45839.

Oklahoma (Great Salt Plains Lake) — August 26: The 2nd annual Great Salt Plains Hamfest sponsored by the Great Salt Plains Radio Club will be held at GSP Lake Community Bldg., south side of lake, from 9 A.M. to 5 P.M. Technical forums, organizational meetings, free swap tables, refreshments, Novice exams, noon potluck dinner. Overnight camping and RV hookups at state park. Talk-in on 90/30. Further information from Steven Walz, WA5UTO, Box 222, Cherokee, OK 73728, tel. 405-596-3487.

Ontario (London) — September 23: The 7th Annual London ARC Swap 'N' Shop indoor and outdoor flea market will be held at the Pot of Gold Bingo Palace, Hamilton and Gore Rd., London, from 8 A.M. to 4 P.M. (sellers 7 A.M.). Large indoor sales area with excellent lighting and large paved parking lot, commercial snack bar. Admission $2 (under 16 free); sellers' tables $3. Free tailgate selling, guides and assistance to vendor tables, test bench with power, consignment table, money-change booth. Talk-in from 6 A.M. on 52 or VE3LAC 66/06 and on VE3LON on 3.750. For reservations and information, contact London Amateur Radio Club, Inc., c/o Rob Hockin, VE3NMT, Box 82, Stn. B, London, ON N6A 4V3.

Ontario (Hamilton) — October 6: The Hamilton Amateur Radio Club, Inc., 2nd Annual Flea Market will be held on Saturday in Marritt Hall, Ancaster Fairgrounds, 625 Highway 53 East. Vendors setup is 7 A.M. to 8:20 A.M.; general admission 8:30 A.M. Admission $2. Vendors: flea market — $4/8-ft table, plus admission; commercial vendors — $10/8-ft table, admission included. All tables supplied by HARC. Order space early from HARC Flea Market Committee, P.O. Box 253, Hamilton, ON L8N 3C8. Talk-in on 16/76.

†**Pennsylvania (Hershey) — August 26:** The Central Pennsylvania Repeater Assn., Inc., 11th annual Hamfest/Computerfest will be held in the HERCO Service Bldg., adjacent to "Hersheypark," Chocolate Town, USA, Hershey. Registration $3; women and children free. Special reduced admission to Hersheypark for families of registrants. Large indoor dealer and flea market area, large outdoor tailgating area; food and refreshments available. Ten-foot indoor spaces $8 each; 8-ft tables $4 each; single electric plugs $1 each. Talk-in on 145.47, 146.76 and 52. For further information, contact Timothy R. Fanus, WB3DNA, 6140 Chambers Hill Rd., Harrisburg, PA 17111, tel. 717-564-0897 (noon to 8 P.M.).

Pennsylvania (Blossburg) — August 25: The Tioga County ARC will hold its 8th annual hamfest at Island Park, Blossburg, from 9 A.M. to 5 P.M. Island Park is just off Rte. 15. Flea market, dealers, traders, computer demo, QSL contest, on-premises transmitter hunt, women's interests, harmonic program, two-way ATV demonstration, radio-control airplanes, snack bar. Talk-in on 19/79, 52 and CB. Admission is $3; women and children free. For more information, contact Carl E. Kimble, WB3EUE, P.O. Box 37, Cowanesque, PA 16918, tel. 814-367-5345.

†**Pennsylvania (Warrington) — August 12:** The Mid-Atlantic ARC announces its annual hamfest, to be held from 9 A.M. to 4 P.M., rain or shine. Tailgate setup begins at 8 A.M. at Bucks County Drive-in, Rte. 611, Warrington (5 miles north of the Willow Grove exit of the Pennsylvania Tpke). Admission $3; $2 additional for each tailgate space. Bring your own table. Ample parking, refreshments. Talk-in on WB3JOE/R, 66/06 and 52. For further information, write to MARC, P.O. Box 352, Villanova, PA 19085, or call Bob Josuweit, WA3PZO, tel. 215-449-9727.

Pennsylvania (Uniontown) — September 8: (W3PIE) Uniontown ARC will hold its 35th Annual Gabfest on the Saturday after Labor Day on the club grounds, located on Old Pittsburgh Rd., just off Rte. 51 and the 119 bypass in Uniontown. Talk-in on 645/045 and 144.57/145.17. Free parking, free coffee, free swap & shop with registration. Registration $3 each or 2/$5. Refreshment stand. Further information, contact UARC Gabfest Committee, c/o John T. Cermak, WB3DOD, P.O. Box 433, Republic, PA 15475, tel. 412-246-2870.

Tennessee (Lebanon) — August 26: The Lebanon Hamfest, sponsored by the Short Mountain Repeater Club, will be held at Cedars of Lebanon State Park, U.S. Hwy. 231, Lebanon. Outdoor facilities only; exhibitors bring your own tables. Talk-in on 31/91. Food and drink available. For further information, contact Morris Duke, W4WXQ, 210 Disspayne Dr., Donelson, TN 37214.

†**Texas (Odessa) — August 25-26:** The 1st Annual Odessa Amateur Radio Hamfest, sponsored by the West Texas ARC, will be held in "Barn A," Ector County Coliseum, Odessa, on Saturday, from 10 A.M. to 5 P.M., and Sunday, from 8 A.M. to 3 P.M. Exhibit setup on Friday, 6 to 10 P.M. Advance registration is $5; at the door $6. Tables free with registration. ARRL forum with Ray Wangler, W5EDZ, ARRL West Gulf Division Director; "What is DX?"; QRP forum; operating practices; 12,000-sq. ft A/C swapfest area. For further information and tickets, write to WTARC, Box 7033, Odessa, TX 79760, 915-362-6069 (NG5R) or 915-367-4027 (K5IID).

†**Texas (Austin) — August 10-12:** The Austin Repeater Organization and Austin ARC will sponsor a hamfest at the Marriott Hotel. Preregistration is $5; $7 at the door. For details, write to Ed Golla, K3AHS, 608 Buckskin Dr., Round Rock, TX 78664.

†**Virginia (Berryville) — August 5:** The 34th annual hamfest, sponsored by the Shenandoah Valley ARC, Inc., will be held at the Ruritan Fairgrounds in Berryville, from 7 A.M. to 4 P.M. Admission is $3. Ruritan chicken barbecue. Talk-in on 146.82. For further information, contact JoAnn Aaron, 544 Monticello St., Winchester, VA 22601, tel. 703-662-0951.

†**West Virginia (Bluefield) — August 26:** The 1984 Bluefield Hamfest, Computer and Satellite TV Fair will be sponsored by the East River ARC at Brushfork Armory, Bluefield, from 9 A.M. to 3 P.M. Admission is $3; children under 12 free. Dealers, indoor flea market. No tailgating. Food on premises. Tables $5 each; $3 each for three or more. Talk-in on 144.89/145.49 and 52. Further information from Don Williams, WA4K, 412 Ridgeway Dr., Bluefield, VA 24605, tel. 703-326-2411.

†**West Virginia (Cottageville) — September 8:** Jackson County ARC, Inc., will sponsor the Jackson County ARC Hamfest at the 4H Fairgrounds in Cottageville, 6½ miles west of Ripley on U.S. 33, from 9 A.M. to 4 P.M. Admission is $3. Talk-in on 07/67 and 52. Additional information available from Lesley Shockey, WB8SNO, Rte. 2, Box 36A, Sandyville, WV 25275.

Wyoming (Cheyenne) — September 7-9: The fifth annual High Plains Ham Roundup will be held in the Medicine Bow National Forest, Yellow Pine Campground, 35 miles west of Cheyenne. The event is sponsored jointly by the Northern Colorado ARC, the University of Wyoming ARC, and the Shy-Wy ARC for hams and families from the CO-WY-NE area. A campfire cookout and bring-your-own covered dish extravaganza is scheduled for Saturday. Barbecued hamburgers and liquid refreshment provided by the committee. Giant tailgate swapfest, transmitter hunt and technical displays on Saturday program. No registration fees except modest Forest Service charge for campers. Talk-in on 22/82 and 25/85. For further info, write to W7CGK, 1321 E. 22 St., Cheyenne, WY 82001.

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.

Special Events

Conducted By Edith Holsopple,* N1CZC

Palo Alto, California: In honor of the 1984 Olympic Games, W84OG and K84OG are being sponsored by the Area Chapter of the American Red Cross and the Northern CA DX Foundation. They will operate from 0000Z *July 28* through 2400Z *August 8*. Recommended frequencies: CW — 3.505 3.535 7.005 7.035 14.005 14.035 21.005 21.035 28.005 28.035; phone — 3.783 3.930 7.206 7.230 14.160 14.230 21.175 21.360 28.560; Novice — 3.725 7.125 21.125. QSL via the W6 Bureau or Olympic Games, P.O. Box 9007, Stanford, CA 94305.

Doylestown, Ohio: Silvercreek ARA will have their annual Skunk Day on *August 4*, from 1400Z to 2300Z, on the 20- and 40-meter phone bands. Scratch 'n' sniff certificate available via KA8MPH, 1241 Comet Rd., Clinton, OH 44216.

Harlan, Indiana: The Fort Wayne RC will operate W9TE from 1500 to 2300Z on *August 4* to commemorate Harlan Days. Phone frequencies will be 3.910, 7.280, 14.285 and 21.385 MHz (operation will be primarily on 40 meters). Certificate via P.O. Box 15127, Fort Wayne, IN 46885.

Tehachapi, California: The Southern Sierra ARS will be conducting Operation Thunderbold-Hotfoot from the peak of Mt. Whitney, the highest point in the lower 48 states. Operation will be from 0200Z *August 4* to 0500Z *August 5* on or around 21.110 and 7.110 MHz. Certificate via SSARS, c/o KD6XG, P.O. BOX 6214, Tehachapi, CA 93561.

Somerset, Pennsylvania: Somerset Co. ARC will operate from Mt. Davis, the state's highest point, from 1800Z *Aug. 4* to 1800Z *Aug. 5*. Operation will be in the upper 25 kHz of the General portion of the bands, and CW in the Novice portion on 80 and 40 meters. Certificate via Box 468, Somerset, PA 15501.

South Belmar, New Jersey: The Jersey Shore ARS will operate KF2T at the Oyster Creek Nuclear Generating Station from 1400Z *August 4* until 1800Z *August 5*. Phone operation will be approximately 3.930 7.270 14.270 14.270 21.270 28.570 146.58 MHz. Novice operation will be 30 kHz from lower band edges. RTTY will be on 3.640 7.080 14.080. A special QSL card is available via JSARS, 619-17th Ave., South Belmar, NJ 07719.

Friendship, New York: Allegany Highlands ARC will operate KW2J from 1300 to 2100Z *August 6* in observance of National Friendship Day. Frequencies: CW — 3.745 7.145 14.060 21.145; phone — 3.880 7.280 14.280 21.380; RTTY — 14.080. Certificate via P.O. Box 373, Friendship, NY 14739.

Philadelphia, Mississippi: Neshoba ARC will operate

*Communications Assistant, ARRL

N5DUZ from the world-famous Neshoba County Fair from 1900Z to 0100Z *August 6-9*. Frequencies: phone and CW — upper 25 kHz of each band, and some Novice operation. Commemorative QSL via N5DUZ.

Scotch Plains, New Jersey: Tri-County RA will sponsor station W2LI starting at 1300Z *August 11* in celebration of the 300th birthday of Scotch Plains. Phone operation will be in the lower 25 kHz of the General portion of the 40 meter band. Commemorative QSL via Tri-County RA, Box 412, Scotch Plains, NJ 07076.

Olean, New York: The Enchanted Mountain Amateurs will activate station WA2TQM from the Olean Recreation Center, from 1300Z to 2100Z *August 11*, in commemoration of the Enchanted Mountain Festival. Phone frequencies will be in the lower 25 kHz of the General class band. Cerificate via Special Events, P.O. Box 668, Olean, NY 14760.

Bemidji, Minnesota: The Bemidji ARC will be operating station KCØMJ to commemorate Smokey the Bear's Birthday at the home of Paul Bunyan and Babe the Blue Ox from 1400Z to 2200Z *August 11* and *12*. Frequencies will be 10 kHz up from the lower edge of the General class phone bands on 20-40-80-meters. Special certificate via Bemidji ARC, P.O. Box 524, Bemidji, MN 56601.

Columbia, Missouri: The Central MO RA will be operating WDØDVG from the MO State Fair *August 16-25*. QSL via KØPCK.

Lake Villa, Illinois: The Amateurs for Better Communications RC will operate KA9KOL from 1700Z to 2300Z *August 18* and *19*. Operation will be from Lindenfest, a community celebrating its second annual festival. Frequencies are 7.240-7.245 and 14.280-14.285. QSL via Terry Drews, KA9KOL, 37326 N. Fairview W. La., Lake Villa, IL 60046.

Paramus, New Jersey: Bergen ARA will operate K2TM from 1500 to 2400Z *August 18-19* to celebrate the club's 21st anniversary. Frequencies: 7.235 14.275 21.375 28.675 146.520, Novice — 7.125. Certificate via K2UFM, 31 Forest Dr., Hillsdale, NJ 07642.

Marysville, California: The Nevada County ARC will operate from the county fair from 1600Z to 0500Z daily, from *August 22 to 26*. Frequencies: phone — 3.928 7.230 14.325 21.410 147.015+ 600; CW — 7.055 14.055 21.055. Nevada County cerificates via P.O. Box 2923, Grass Valley, CA 95945.

Canon City, Colorado: The Royal Gorge ARC will operate station NØBIB from 1700 to 2400Z *August 25* from the world's highest suspension bridge to celebrate the reopening of the bridge. Frequencies: phone — 21.375 14.250 7.250; CW — 21.150. QSL via NØBIB.

St. Charles, Illinois: The Fox River Radio League will operate W9CEQ to celebrate the FRRL's 60th year. Operation will be from the Kane County Fair Grounds *August 26*, from 1300Z to 2000Z. Suggested frequencies are 10 kHz up from lower portions of the General class phone bands on 40-20-15 meters. Certificate or QSL via FRRL, P.O. Box 443, Aurora, IL 60507.

Cobb, California: The Lake County ARS will sponsor station N6GJM at the Lake Co. Fair Grounds from *August 31* to *Sept 3*. Operation will be 10-20 kHz from the bottom of the General portion of the CW and phone bands, 15-80 meters. Daily times are 1700Z to 0500Z. Certificate available from KR6G, P.O. Box 682, Cobb, CA 95426.

New Orleans, Louisiana: The Wireless Institute of New Orleans will operate K5WF to celebrate Wonderful WINO Weekend at the World's Fair. Times will be 0300Z-0700Z on both *Sept. 1* and *2*. Operation will be on phone, around 7.240 MHz, and possibly on 75 and 20 meters. QSL/Certificates available from WINO, Box 6541, New Orleans, LA 70174.

Note: The deadline for receipt of items for this column is the 15th of the second month preceding the publication date. For example, your information would have to reach Hq. by August 15 to make the October issue. For the convenience of those wishing to operate, please be sure that the name of the sponsoring organization, the location, dates, times(Z), frequencies and call sign (if any) of the special-event station are included. Request for donations will not be published.

Contest Corral

A Roundup of Upcoming Operating Events

Conducted By
Edith Holsopple,* N1CZC

JULY

31

West Coast Qualifying Run, 10-40 WPM, at 0400Z August 1 (9 P.M. PDT July 31). W6ZRJ alternate. Frequencies are approximately 3590/7090 kHz. Underline one minute of the highest speed you copied, certify 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.

AUGUST

4-5

YO-DX Contest, July *QST*, page 87.
ARRL UHF Contest, July *QST*, page 78.
160-Meter SSB Contest, July *QST*, page 87.

5-6

Illinois QSO Party, July *QST*, page 87.

6

W1AW Qualifying Run, 10-35 WPM, at 0200Z August 7 (10 P.M. EDT August 6). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 147.555 MHz. See July 31 listing for more details.

11-12

European DX Contest, CW, July *QST*, page 87.

11-13

New Jersey QSO Party, July *QST*, page 87.

18-19

Alaskan QSO Party, sponsored by the Alaska DX Assn., from 0200Z August 18 until 0200 August 19. Work stations once per band and mode. KL7 stations send signal report and judicial district. Others send signal report and serial number. Suggested frequencies: phone — 3.895 7.260 14.285 21.360 28.660; CW — 1.807 3.560 7.060 14.060 21.060 28.060. AK stations count two points per 10-15-20 meter QSO and five points per 40-80-160 meter QSO. Multiply by total states, VE/VO provinces and DXCC countries worked per band. Others count 5 points per KL7 QSO on 10-15-20 meters and 10 points on 40-80-160 meters. Multiply by the total KL7 judicial districts worked per band (max. 4 per band). Mail entry by Oct. 1 to KL7AF, P.O. Box 1614, Kodiak Island, AK 99615.

SEANET Contest, phone, July *QST*, page 87.

24-27

A5 North American ATV Contest, sponsored by *A5 Magazine*. Contact Mike Stone, WBØQCD, P.O. Box H, Lowden, IA 52255-0408, for details.

25

W1AW Qualifying Run, 10-35 WPM, at 2000Z (4 P.M. EDT). See August 6 listing for more details.

25-26

Alabama QSO Party, sponsored by the Chattahoochee Valley ARC, from 1600Z Aug. 25 until 2300Z Aug. 26. Work stations once per band and mode. Work mobiles again as they change county. AL-to-AL QSOs permitted. Exchange signal report and QTH (county for AL stations; state, province or country for others). Suggested frequencies: CW — 65 kHz up from low end; phone — 3.965 7.265 14.265 21.365 28.565; Novice — 25 kHz up from lower band edges. Count one point per QSO. AL stations multiply by total states, provinces and countries worked. Others multiply by total AL counties worked. Mail logs by Sept. 30 (include large s.a.s.e. for results) to Johnny Royster, WA4VEK, P.O. Box 494, Fairfax, AL 36854.

Occupation Contest, sponsored by the Radio Assn. of Erie, from 1800Z August 25 until 2400Z August 26. Exchange signal report, occupation and state, province or country. Suggested frequencies: phone — 3.920 7.250 14.300 21.400 28.600; CW — 40 kHz up from lower band edges. Count three points for each QSO with a station giving a new occupation. Count one point per QSO with stations sending a similar occupation to one already worked. No multiplier. Mail logs by Oct. 1 (include a large s.a.s.e. for results) to Harry Arsenault, K1PLR/3, 603 Powell Ave., Erie, PA 16505.

All Asian DX Contest, CW. See June *QST*, page 73, for details.

SEPTEMBER

2

LZ-DX Contest, sponsored by the Bulgarian Federation of Radio Amateurs, from 0000Z to 2400Z Sept. 2. No rules received this year. Last year's rules are as follows. CW only. Work stations once per band. Entry classes: single op, multiband; single op, single band; multiop, all band; SWL. Exchange signal report and ITU zone. Suggested frequencies: 3.510-3.590 7.005-7.040 14.010-14.090 21.010-21.125, 28.010-28.125. Count six points per QSO with LZ stations, one point per QSO with stations on the same continent (including the same country) and three points per QSO with stations on other continents. Multiply by the sum of different ITU zones worked per band (max. 375). Mail logs within 30 days to BFRA, P.O. Box 830, Sofia 100, Bulgaria.

5

West Coast Qualifying Run, 10-35 WPM, at 0400Z Sept. 6 (9 P.M. PDT Sept. 5). See July 31 listing for more details.

5-6

YL Howdy Days, sponsored by the Young Ladies Radio League, from 1800Z Sept. 5 until 1800Z Sept. 6. Only YL-to-YL QSOs count. All bands and modes; work a station only once. Exchange call signs and "yes" or "no" indicating YLRL membership. Count two points per YLRL-member QSO, one point for nonmembers. No multipliers — score equals number of QSO points. Suggested frequencies: 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 21.380-21.410 28.580-28.610. Mail logs by Oct. 5 to Marty Silver, NY4H, 3118 Eton Rd., Raleigh, NC 27608.

8-9

European DX-Contest, phone, July *QST*, page 87.
ARRL September VHF QSO Party, this issue, page 74.

11

W1AW Qualifying Run, 10-35 WPM, at 0200Z Sept. 12 (10 P.M. EDT Sept. 11). See August 6 listing for more details.

15-16

Ohio QSO Party
Scandinavian Activity Contest
Can-Am Contest, phone, this issue, page 75.

15-17

Washington State QSO Party
Kansas State QSO Party

21

W1AW Qualifying Run

21-23

Maine QSO Party

22-23

Can-Am Contest, CW, this issue, page 75.

29-30

Delta QSO Party

30-1

Classic Radio Exchange

*Communications Assistant, ARRL

Section News

The ARRL Field Organization Forum

Coordinated By Jim Clary, WB9IHH

CANADA

ALBERTA: SM, E. Roy Ellis, VE6XC — SM/SEC: VE6XC. A/SM: VE6AMM. STM/DEC/NM (APSN & ATN): VE6ABC. Prov AARC's Net future in doubt as yours truly as NCS for last 25 years is retiring and is looking for new NCS. Any takers contact me for info. NARC continues to work out Com system for Papal visit and also a large FD opn. NARC & CARA to supply abt 50 hams to cover the 24-hour Intl Relay Race between Jasper and Banff consisting of approx 100 teams of racers. Traffic: VE6CHK 70, VE6ABC 11, VE6EB 7, VE6EO 5.

BRITISH COLUMBIA: SM, H. Ernie Savage, VE7FB — British Columbia Emergency Net by reports has seen a great increase in the QNI, but not a great increase in QTC. British Columbia Phone Net Manager VE7QC reports faithfully their activity as follows: high 191, low 85, average 149, total checkins 4484. Very little else; seems to happen by the lack of mail or information for VE7 section. Traffic: VE7BNI 303, VE7ZK 142, VE7CDF 104, VE7EDN 71, VE7FB 24, VE7BZI 4.

MANITOBA: SM, Peter Guenther, VE4PG — ASM: VE4AJE. The Manitoba Traffic Net is back to a summer schedule, M-Th. VE4AFO will take over the evening phone net as net manager, effective July 1. A special meeting held at beausejour May 29th indicates we will have a restructuring of ARES. SEC VE4FK, DEC VE4AGR, outgoing SEC VE4HK, as well as yours truly attended. All nets are well attended, and traffic is slightly up from previous years. VE4GB is back from the south for summer. Looks like a busy time all around this year for Field Day. MTN QNI 156, QTC 46, sess. 19. MMN QNI 560, QTC 38, sess. 31. MEPN QNI 927, QTC 26, sess. 31. WRIN QNI 190, sess. 9. Traffic: VE4RO 38, VE4PG 32, VE4TE 32, VE4JA 26, VE4AAD 21, VE4AJE 20, VE4LB 9, VE4AFO 6, VE4GB 6, VE4ADS 5, VE4ALO 5, VE4JF 5, VE4AEY 4, VE4MG 4, VE4DT 3, VE4HK 3, VE4AEZ 2, VE4CR 2, VE4ID 2, VE4NE 2, VE4XN 2, VE4AET 1.

ONTARIO: SM, Larry Thivierge, VE3GT — PGL: VE3AR. SEC: VE3GV. A/STM: VE3GT. TC: VE3EGO. Special thanks to VE3IBV who has carried out the duties of Bulletin Manager for the past year. Dick is taking a year off from amateur activities. Regretfully, I report the following have become Silent Keys: VE3AW (a pioneer of Amateur Radio in Canada and one of the founders of the CNB network of radio clubs; upon examination in Sault Ste. Marie, he received the very first certificate of proficiency in radio telegraphy, dated July 29, 1920, from the Department of Naval Service.); VE3ST (founder of the popular CJ Net); VE3NQR (ex-VE3HM, the oldest member of the KW Coffee Club); VE3FFP. New traffic op VE3BCZ teaches a course in folk music at the Univ of Waterloo. VE3SM has moved to Chatham, from Sarnia. The Essex Co. VHF Society Sunday Night Net is alive and well on VE3WIN repeater, at 2000 local. The Sun Parlor ARC in Leamington has moved into new digs. The new board of directors of the TFMCS, who incidentally will be celebrating their 20th anniversary in 1985, are: VE3s KA BDW EKF IOG BDJ GBK. You might be amused: At the recent Ajax Fleamarket, VE3GFN was invited to talk on NTS acitivites. Off he went, armed with pictures, articles and ideas to liven up the discussion. While there is usually some interest, his audience consisted only of the "Terrible Trio," VE3s AWE BZB and CYR, all A1 traffic ops. New Advanced Amateurs are VE3s GIP MQR NJY and OAT. Repeater VE3TTT has added a new feature called "speed calling." QCWA Southern Ontario Chapter 73 elected VE3AR as President and VE3EFX as secy./treas. Congrats to both. VE3KK has accepted the Net Manager appointment of OSN2. The Wilsons, VE3IGW and VE3IGV, have moved back to Edmonton. New Trilliums are VE3s IYY IPY and NXG. Don't forget to register for the RSO Convention in Ottawa held during the Thanksgiving weekend in October. Traffic: VE3KK 255, VE3GT 190, VE3HGJ 116, VE3BCZ 102, VE3CYR 96, VE3AJN 89, VE3GNW 82, VE3DPO 81, VE3KCZ 81, VE3KCZ 74, VE3AWE 73, VE3BDM 72, VE3KXB 60, VE3GOL 59, VE3FGU 54, VE3GFN 54, VE3BAJ 45, VE3JSM 43, VE3WM 22, VE3WV 15, VE3KLX 13, VE3EWD 10. (Apr.) VE3HTL 106, VE3MPF 7.

QUEBEC: SM, Harold Moreau, VE2BP — STM: VE2EDO. BM: VE2ALE. PIO: VE2YW. TC: VE2ED. NMs: VE2EDO VE2FSA. Code and theory classes are showing good results, as many new calls are heard since last spring. The Sorel Hamfest was much bigger than last year and CRRL may have a booth next year. To all, I wish a very good summer; enjoy safe vacations. Plusieurs amateurs ont participes au Hamfest de Sorel. A tous, je souhaite une tres bonne ete et soyez prudents durant les vacances. Traffic: VE2EDO 69, VE2BP 49, VE2EKC 43, VE2EC 35.

SASKATCHEWAN: SM, W. C. (Bill) Munday, VE5WM — STM: VE5HG. SEC: Vacant. TC: VE5GF. NMs: VE5NJ VE5AEJ VE5AEM VE5BAF VE5EX VE5HG. The Moose Jaw ARC held a windup BBQ at the Wild Animal Park. Special guests were VE5AE and VE5AFA, who are being transferred. A sincere "thank you" was extended to both for their Amateur Radio activities while stationed here. Summer events include holidays, public service activities and hamfests. We look forward to seeing many of you at the Swift Current hamfest.

ATLANTIC DIVISION

DELAWARE: SM, John Hartman, WA3ZBI — STM: W3DKX. SEC: W3PQ. PIO: N3DIP. PSHR: K3JL W3DKX. Congrats to W3WR and W3WJ for 140 years of combined activity as Amateur Radio operators. DTN QNI 461, QTC 58 in 23 sessions. DEPN QNI 60, QTC 15 in 4 sessions. SEN QNI 58, QTC 2 in 5 sessions. Traffic: W3QQ 174, WB3DUG 82, W3DKY 68, N3SJ 59, WA3WIY 30, WA3ZBI 21, K3JL 13, KC3JM 8, KC3FW 6.

EASTERN PENNSYLVANIA: SM, Mark J. Pierson, KB3NE — ACC: KB3NE. PIO: W3AMQ. SEC: WA3PZO. SGL: N3CJP. STM: KB3LF. DECs: K3QXC AA3C W3EEK KB3UD N3BFL KB3LR N3AIA.

Net	Time	Freq.	QNI	QTC	Sess.
EPA	7/10 PM Dy	3610	420	175	61
EPAEPTN	6 PM Dy	3917	391	200	31
PTTN	6:30 PM Dy	3610	199	78	29

Local and VHF net reports: (QNI/QTC/sess.): PWAARES 89/10/4; D5ESN 66/4/4; ATN 46/15/9; LUZARES 48/8/8; D6ARES 50/6/5; CSVARS 40/0/4. OO Reports: W3FAF W3GTN W3KEK K3UWJ. OBS reports: W3CL W3VA KC3LY. Congrats to ten new Novices in the York Co. area. Keystone VHF Club has acquired a new repeater; FB. Silent Key: Carroll O. Thieme Jr., K3HPI who will be greatly missed by fellow Keystone Club members, and by all of us who knew him for the past 30 years. W3AJF received his ARRL 50-year plaque from Director W3ABC at the May meeting of the Mt. Airy VHF Club. WA3EPU received a Certificate of Merit from W3ABC. I also want to acknowledge her fine efforts in Amateur Radio. Warminster RC will set up a message booth at the Middletown Grange Pavilion on Aug. 16-18 for the annual county fair. New officers for Schuylkill ARA: KC3HH, pres.; K3BWE, v.p.; WB3CRM, secy.; KC3NB, treas.; W3EEK, TA. New Dist. 2 EPA ARES net on Thursdays at 8 P.M. local. Net Mgr. is N3CFD, and Asst. Net Mgr. is WA3TNO. AA3C is looking for ECs for Lebanon & Dauphin Cos.; anyone interested, please contact AA3C. Many local clubs participated in Walk-a-Thons in late April. Phil Mont ARC again did a fine job with communications for the Penn Relay Marathon. Way to run, fellas. Traffic: N3COY 279, KA3DLY 271, KA3IME 94, N3CD 88, WB8KPE 72, N3AIW 52, KC3LY 45, W3AKN 35, W3FAF 33, W3TWN 29, KB3FW 26, W3HK 23, W3ADE 19, W3CKA 12, W3CL 12, N3BFL 5, W3VA 5. (Apr.) WA3WQP 59, N2BSK/3 32.

MARYLAND-DISTRICT OF COLUMBIA: Karl R. Medrow, W3FA — ACC KA3DRO suggests a "interclub meeting of the minds" get together for all MDC radio clubs. Contact him for details or ideas. Chesapeake ARA has KC3IQ, pres.; WB3ISS, v.p./treas.; KD3B, secy. SMARC has WA3UMI, pres.; KA3AHI, v.p.; W2GJS, secy.; KA3GCC, treas. Our SGL, KA3ERP, says don't cover both ears when mobile; it is a state no-no. SEC WA3TAI is looking for EC reports, and PIO KA3DBN is ready to help. Tnx to CARA, FAR, GARC, AARC and SMARC for this month's newsletters. KA3HUT is pleased with his Eastern Shore link to the nets. KG3M finds his HF OBS skeds harder than his VHF RTTY ones. KA3EWV earned a net certificate on MSN. W3BWN passed his Extra; congrats. N3QA is back at sea. WA3ESE becomes net manager of the Chesapeake Bay Wx and Tfc Net. The Laurel ARC is VEC for the 3rd call area. Contact W3DQI, KD3S or K3LDE for info. Advanced class training instructors for MSN are N3DE K3NNI and KC3Y. KJ3T may be in Florida, but a regular MDD late session. WB3GZU on vacation from work, but not from ham radio! KA3R says it's tomato time. W3CDQ is out of report cards. W3ZNW is doing well with MRN. KC3D has a new vehicle, but is thinking more wire. KH6IMW WA3UMY K3JYD WA5UNR W4OKW WB3IXC KA3IWH W3GYT KA3ECN KC3DF all helped the St. Mary's REACT team in celebration of Maryland's 350th. KF3T is ARRL/SCC Liaison and WB3KKO is PRM for the SMARC. W3LDD gets alternate NCS exercise. W3OYY is watching his chores get done. WB3FUE was in the middle of Salisbury's Airport Appreciation Day. KK3F's antenna problem is one of space. N3DPE is moving to NY. WB3BFK is ubiquitous. K3NNI has a lot of liaison jobs. N3IT reports in person. W3YVQ reports Ned Murray is Md. CD director, a friend of ham radio. KJ3E has a printer to go with that computer system. W3UT was in the midst of a public event. W3FZV likes the new Yaesu and Armed Forces Day Net/Manager sessions/traffic/QNI average. MEPN/KJ3E 30/99/28; MDC PON/W3OYY 5/5/15; WR PON/WB3BFK 22/23/12.5; WC 2-Mtr/WA3VDX 5/1/15; MSN/KC3AV 31/91/8.9. 100% WB3BFK and W3DKX. Traffic: WB3GZU 479, KC3Y 282, KJ3E 206, K3NNI 169, W3FA 141, N3DPE 122, KC3DW 120, KC3AV 95, KA3EWV 93, KK3F 90, W3UT 48, W3DQI 38, W3ZNW 37, WB3BFK 28, N3IT 21, WB3FUE 19, W3LDD 11, W3FZV 9, W3YVQ 5, KC3D 4. (Apr.) N3DPE 33, W3YVQ 15.

SOUTHERN NEW JERSEY: SM, Richard Baier, WA2HEB — SEC: K2QIJ. STM: WA2HEB. ACC: K2IXE. BM: WB2UVB. SGL: W2XQ. TC: W2IJX. PIO: WB2RVE. New SEC for SNJ is George Ford, K2QIJ of Burlington. He has been involved with public service for many years and is currently EC of Burlington Co. As promised, here is the on-the-air directory of our section's officials. Please feel free to call upon us. We serve YOU.

SM — WA2HEB, Toms River — 146.31/.91
ACC — K2IXE, Forked River — 146.235/.835
SEC — K2QIJ, Burlington — 147.75/.15
TC — W2IJX, Toms River — 146.31/.91
PIO — WB2RVE, Blackwood — 52.64 (K3VAN) output)
BM — WB2UVB, Moorestown — 147.75/.15
STM — see WA2HEB
ORC — OPEN (see WA2HEB)
SGL: W2XQ, Vincentown — 145.52

I very much want to put out a section newsletter, but the funds I'm allowed are very limited. The postage alone will be around $300. About the only way that this can be swung will be if someone who does printing can give us a good deal. If anyone can, please get in touch with me. Traffic: WB2IKL 150, KA2ANJ 12, WA2HEB 11.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA — SEC: W2BCH. ACC: N2EH. PIO: WA2PUU. TC: K2QR. SGL: KO2X. BM: W2GLH. OO/RFI: W2AET. Appts: EC — WA2OEP Lewis Co., KY2F Oswego Co.; OES-W2AET KA2BHR K2CJ K2DTQ WB2EXL KY2F W2GJ WV2HJK WB2JAB WA2KOJ WB2KWF KA2LHO K2NV K2OC K2OIU W2PHQ W2PPS WA2HXB WA2TCZ W2TFL K2UNY. CLUB OFFICERS: Auburn ARA-KA2FES KA2HUO WB2NYO K2ZOD; RAGS-K2SDD N2BNE. Rome Radio Club received FIFTY YEAR Affiliation plaque at Ham Family Day Dinner — Congrats. HAMFESTS: Trumansburg Aug. 25, Hamburg Sept. 8, Elmira Sept. 29, Syracuse Oct. 13. Tfc Handlers Picnic Newark Valley August 11.

NYS/1*	3677	1000/Dy	WB2EAG	344-128-31
WDN/M*	04/64	1100/Dy	KC2QQ	311-063-30
Mike Farad	3925	1300/M-S	VE2FMQ	163-046-26
NYPON*	3913	1700/Dy	WA2KOJ	649-344-31
NYSPTEN	3925	1800/Dy	WB2HKU	621-061-31
ESS	3590	1800/Dy	W2WSS	416-049-31
OCTEN/E*	34/94	1830/Dy	WB2HLY	580-062-31
Q Net	31/91	1830/Dy	KA2CMQ	342-009-31
WDN/E*	04/64	1830/Dy	KC2QQ	633-118-31
Blue Line	93/33	1900/Dy	WA2SEF	—
NYS/4*	3677	1900/Dy	WB2MCO	446-229-31
JCARCN	10/70	2000/Dy	WA2WAX	—
OARCN	25/85	2000/Wed	K2VTT	055-000-05
BRVSN	055/655	2100/Dy	WB2OFU	382-016-31
CNYTN*	90/30+	2115/Dy	WA2PUU	416-075-31
OCTEN/L*	28/88	2130/Dy	WB2HLY	222-027-30
STAR*	99/39	2130/Dy	N2BLX	—
WDN/L*	04/64	2130/Dy	KC2QQ	592-083-31
NYS/5*	3677	2200/Dy	WB2MCO	473-345-31

*NTS Net. THIN 1600 Sun. 3913. VHF THIN 2000 Tues. 04/64. WNY EC NEt 2000 third Sunday 3955. ARES Nets: Lewis Co., St. Lawrence, Central District (see *Net Directory*). PSHR: W2AET KA2BHR KG2D KA2DQA WA2FJJ VE2FMQ W2GJ WB2IDS WA2KOJ W2MTA WB2OWO KA2QIK WB2QIX ND2S KX2T. Congrats: W2CNS first 2-meter WAS in second call region; Lewis Co. has 7 new Novices; LARC has 35 in Novice class; successful hamfests at Owego (1,000), Rochester (10,000), K2RJ Ham-of-the-Year, Rome (1,000), WA2NKC Central New York Ham-of-the-Yar, W2QJN (former W8PFJ), past Pres. Utica ARC (1937) fifty-year ARRL member, WA2ANU and K2QR for On-the-Road shows. Thanks: N2EH AF2K K2MP WB2PID KC2QQ WB2OWO and numerous others for FB efforts in Night Tango III exercise. Western NY Wireless newsletter is now out thanks to publishing skills of WA2QFC and W2GJ. COMMS: Owego Run for Hope-W2EWO, many Memorial Day parades. Traffic: WB2IDS 294, WB2OWO 290, WA2FJJ 269, W2MTA 223, KC2QQ 176, W2AET 168, WB2QIX 156, W2FR 148, VE2FMQ 140, KA2BHR 135, W2YGW 124, WA2KOJ 101, KG2D 90, ND2S 78, W2GJ 70, W2UYE 68, WA2HSB 56, KX2T 52, KA2DBD 46, W2ZOJ 44, AF2K 36, WA2RXO 37, KA2QIK 24, KA2DQA 22, WB2PID 21, NF2G 15, KC2SJ 15, WA2FGW 11, K2QR 10, K2VR 7, K2RN 6, K2IUT 4, WA2OEP 4, WB2NAO 2. (Apr.) K2QR 14.

WESTERN PENNSYLVANIA: SM, Otto L. Schuler, K3SMB — SEC: AB3Q. STM: AC3N. ACC: N3EE. OO/RFI: KN3B. PIO: WB3IZJ. TC: W3FE. BM: WN3VAW. SGL: K3HWL.

Net	QNI	QTC	Sess.	kHz	T/D
WPA	318	170	31	3585	7 P/D
WPAPTN	477	136	31	3983	6:15 P/D
WPA2MTN	475	44	31	146.28/88	8 P/D
NWPA2MTN	343	5	29	145.13/53	0200 UTC

It is with sorrow I announce three SKs: W3NXZ W3ZUT W3ENA. Condolences to their families. Upgrades: WN3VAW to Extra; KA3KSD to General; from NARC new Novices KA3s MLK MLJ MLI MLG MLH MLF MIH MLE MLD MLC & MLB. CONGRATS TO ALL. From *Sine of The Times*, WB3JCU has been appointed editor of the *Economy* magazine, a statewide publication. Congrats. The Foothills ARC celebrated its 25th anniversary. Best wishes for a lot more. The Olympic Torch Run passed through the area and amateur participation was great. The repeaters in the area were put at their disposal and operated very well. Congrats to WB3FXV for her awards for her dedicated work with the Boy Scouts. From what I hear, they were well earned. We still need traffic ops for the WPACW and WPAPTN nets. These nets are training grounds and will make emergency operations easier for all in time of need. There are operating practices that can only be learned on well run nets. BE THERE. We need ORS, ECs, etc. Traffic this month has dropped and fewer stations have reported than usual. I hope all will come back soon. Traffic: W3EGK 380, AC3N 150, K3CR 120, W3NGO 118, W3OKN 112, WA3UNX 100, WA3QNT 96, N3FM 83, K3NPW 62, K3SMB 59, KC3JQ 51, W3RUL 46, KQ3M 34, WN3VAW 26, W3MML 19, W3KUN 14, N3CYN 14, K3HCT 14, K3LTV 9, W3KMZ 8, K3NPX 8, W3SN 6, WA3DBW 6, N3KB 5, W3TTN 4. (Apr.) WN3VAW 12.

CENTRAL DIVISION

ILLINOIS: SM, David E. Lattan, WD9EBQ — SEC: W9QBH. STM: KB9X. OO/RFI: K9MX. BM: K9ZDN. PIO: WD9EED. SGL: W9KPT. ACC: WB9SFT. ASM: K9ORP.

Net	Freq	Times (Z Win)	QNI	QTC	Sess.
ILN	3690	0030/0400 Dy	644	232	62
ITN	3705	0100 Dy	307	55	31
ILPN	3915	2230 Dy (X Sn)	753	78	31
NCPN	3915	1300 Dy (X Sn)	412	66	27
NCPN	7270	1815 Dy (X Sn)	184	56	24
IEN	3940	1500 Sn	102	2	4
IARES	3915	2230 1+3 Sn	57	—	2
ISN	3905	0000 Dy	404	135	31

Illinois was represented 100% to 9RN by stations K9AZS K9BVE K9GMZ K9QEW K9SW N9DR N9EM N9TN WB9NVN KA9EWN KA9FEZ W9NXG KZ9I KW9J KD9K KW9T and KB9X. Illinois was represented 100% to D9RN by stations KA9FEZ W9HOT W9NXG KW9J WB9NVN WB9ODN K9AZS and K9EHP. D9RN was represented 100% to CAND. Illinois stations were W9HOT W9JIJ K9AZS KW9J W9NGX WB9NVN and KA9FEZ. Special thanks this month to KA9PKG for the plug given to NTS in his local club newsletter. Those of us that are involved with public service need to let the rest of the local gang know that it's not only painless, but also fun! Warmer weather means more activity for hams as is evident in the reports for the month. EC WB9VLW and his crew provided communications services for a walkathon and bikeathon. WB9YVE and the Okaw Valley ARES helped with a bikeathon and had several SKYWARN nets last month. Fulton Co. EC W9MUL reports that N9GA lost his 76-foot tower to winds from a storm that were clocked at 77 MPH. Adams Co. EC NA9Q reports that the Western Illinois Emergency Radio Service net participated in a simulated tornado disaster in cooperation with the Adams Co. ESDA, the American Red Cross and the Quincy police and fire departments. The net was activated at 1740 and concluded at 2053 after handling 15 messages and involving participation of 20 area amateurs. Platt Co. ARES with help from Macon and DeWitt Co. provided communications for a 10,000-meter run. Congrats and thanks to all who participated in the above events, and make sure that your local PIA and the *media are kept informed of your activities*. Congrats also to WA9SID on his recent upgrade to Extra, and to W9LNQ on reaching DXCC Honor Roll. NTS and ARES folks: Keep an ear to the ground regarding the 1984 SET. As was discussed at last year's Illinois ARES seminar, a section-wide scenario is being planned.

The goal is to have an integrated exercise with as few participants as possible knowing about the time of the event. Local planners should contact WD9EBQ W9QBH or KB9X for suggestions on local activities specific to their areas that will tie with the major theme. We also wish to generate a lot of traffic in a fairly short period of time to really load down NTS and see where the problems of such a situation will occur. Traffic: W9JJ 436, KA9FEZ 381, WB9NVN 198, KB9X 198, W9NXG 149, K9BVE 86, W9HLX 86, W9QBH 73, W9HOT 71, N9DR 63, KA9EWN 55, N9EM 55, K9QEW 53, WA9SHE 46, KD9K 43, W9DBO 31, K9EUI 26, W9RTD 24, WB9RFB 17, KZ9I 16, KB9QX 11, KA9BBV 11, KB9QX 11, K9EHP 8, W9VEY/M 8, KA9PKG 7, WA9RUM 7, WD9CJB 7, K9WMP 8, W9LNQ 4, KA9NZI 4, WD9HQW 3, WD9IBH 2, KZ9I 2, KW9I. 2, W9MUL 1, WB9WGD 1.

INDIANA: SM, Bruce Woodward, W9UMH — SEC: WB9ZQE. STM: W9JUJ. ACC: K9TUS. TC: WD9ADR. SGL: WA9VQO. BM: KC9TA. PIO: K9DIY. SRC: N9WB. SHC: WA9FUD. OO/RFI: KJ9G. NMs: ITN-KD9DU; QIN-KJ9J; ICN-KA9CZD; IRN-KB9SU; VHF-W9PMT; IWN-KA9ERC.

Net	Freq.	Time Daily UTC	QNI	QTC	QTR	Sess.
ITN	3910	1330/2130/2300	2884	340	2089	93
QIN	3656	2315	121	40	718	31
ICN	3705	2315	121	40	718	31
IRN	3629	0000	190	37	904	31
IWN	3910	1310	1957	—	470	31
IWN VHF Kokomo			1127	—	253	31
IWN VHF Bloomington			1132	—	310	31

Hoosier VHF nets: QNI 5113, QTC 191, QTR 4334, Bulletins 41, sess. 147 for 20 ents. 9RN/cycle 4 QNI 374, QTC 446, QTR 930. In 100% stns N9AEI W9CFJ W9EI W9FC N9HZ KJ9J W9JUJ WA9QCF WB9UYU K9WWJ. D9RN 383 messages in 1141 minutes. IN 100% stns. W9JUJ K9CGS W9URQ. CAND 1050 messages in 31 sessions. D9RN 100% IN stns W9JUJ W9URQ. Appts: OHS-N9AEI W9BDP W9DKP W9ENU K9FG KB9NR WA9OKK W9UPI W9URQ W9ZW; OO-K9FW; OBS-KB9NR; NM (ITN)-KD9DU; SEC WB9ZQE; EC W9VP Carroll Co., K9UJK Delaware Co., N9AM Lagrange Co., WD9BKA Owen Co., K9LMH Park Co., N9CJD Shelby Co., WB9RVN Tippecanoe Co. Silent Keys WN9FZC W9IJ K9SSI. Our sympathy to K9VFE on the death of his daughter. W9PRD spoke to 40 girls and boys about Amateur Radio who were involved in a 4H Electric Project. He has been asked to repeat the program for another 4H group. Informally the Indiana digipeater frequency for northern Indiana is 144.95 MHz. The Martinsville Hamfest will be March 10, 1985. Congrats to WA9GOP, new president of the Michiana ARC. W9QYY has decided to resign as net manager of the ITN. He has been net manager for the past five years and will be missed. Thanks for a job well done. KD9DU will be the new NM. Congrats to K9UDF as the recipient of the Fort Wayne ARC Service Awad. Thanks to all who helped with the 500 Festival Parade, the Mini-Marathon, and the State Special Olympics. I participated with the Red Cross RC and I must say we were need and appeciated. Congrats to N9DJD Lake Co. ARC Ham of the Year. Thanks to N9AJM and W9JVF for the Indianapolis RC's new *Central Indiana Directory*. Traffic: W9JUJ 938, KJ9J 237, W9EI 181, KM9B 142, WB9UYU 134, W9QYY 109, W9CNE 80, W9URQ 70, N9AEI 60, KA9FFO 45, W9UMH 45, WA9QCF 41, KB9HH 39, W9UEM 37, W9JZV 36, W9HZ 35, W9PMT 34, WA9OKK 21, K9FW 19, K9PS 18, KK9D 16, WD9HII 16, AB9A 15, K9KTB 14, WB9OZZ 14, KW9D 13, N9DHX 12, WD9DWD 12, W9PRD 12, KA9LAU 11, WD9ART 10, WB9AWI 10, WD9GET 9, W9URS 8, KQ9K 8, WD9CIV 7, K9OUP 7, K9BRF 7, K9VFN 7, KW9C 6, K9DIY 6, K9CGS 5, KK9N 5, W9XD 4, WB9ZQE 3, K9SBW 2, WB9AJY 2, W9RTH 2, W9UP 1, W9BDp 1, KB9DE 1, W9IOH 1, WB9TOW 1.

WISCONSIN: SM, Roy Pedersen, K9FHI — Don't forget the WNA Picnic, Sept. 15th at North Wood County Park. Camping facilities available. Very nice place; I have ordered good weather for it, hope to see you all there. Are your ARRL appointments up to date? You MUST be an ARRL member to hold a Section appointment. Ozaukee RC Swapfest was well attended. New Novices in Sheboygan area are KA9RLU KA9RLV. K9EC AC9C and WB9YSE receiving electrical engineering degrees from UW-Madison. N2NU, past President of Badger ARS — W9YT, graduated from UW-Madison. Mancorad banquet was well attended; all had a good time. Thanks to the club for the swell plaque; much appreciated. Regret to report N9DAA a Silent Key. Your new SM, Rich, K9GDF, is now at the helm. Give him your support. Good luck, Rich. STM K9UTQ is thinking of starting a new RTTY net. If interested, let him know. K9FHI had an enjoyable visit to Norway for 3 weeks. Traffic: KA9CPA 2,588, KC9CJ 249, W9CXY 213, K9GDF 201, W9CBE 199, N9BGE 172, W9YCV 155, WA9WYS 138, KA9BHL 131, WD9IID 127, W9UCL 102, K9FHI 95, KA9AFB 88, WB9ICH 80, N9BDL 79, KA9OBP 79, K9UTQ 71, WB9ESM 70, KC9VM 66, WA9ZTY 58, W9DND 56, AG9G 56, WD9FRI 55, W9SQ 54, KG9B 50, W9LDO 50, N9BCX 48, K9AKG 47, N9DHT 46, WB9JSW 44, W9IHW 40, WB9JGA 36, KZ9V 33, W9IEM 32, W9FDY 31, N9DCF 28, WA9YVC 26, K9JPS 23, W9UW 13, KA9BHK 12, KN9P 11, KV9U 5, KA9NOT 3. (Apr.) W9CXY 268, K9JPS 18, KA9NOT 3.

DAKOTA DIVISION

MINNESOTA: SM, Helen Haynes, WBØHOX — ASM: KCØT. SEC: KAØARP. STM: KDØCI. Hello again. I hope everyone enjoyed themselves at the Duluth Area Hamfest. I'm always happy to be in on that one, as well as the others I'm able to make. It's great to see the people and match the faces with the voices! KCØT has been appointed Assistant SM in lieu of the upcoming election for SM. I'm always looking for ways to improve the "Section News" column to make it more enjoyable for all in our section. If YOU have news on any thing pertaining to Amateur Radio, whether it be upgrading your license or a club activity, etc., contact me (KDØCI). I'm available most evenings on MSPN/E, or send your news to me. I'm good in the '84 *Callbook* under that call. Net news: The MNAMWXNT closed down for the summer on May 31. That net will resume on Sept. 1. The Piconet has dropped its 4th and 5th hours for the summer. They will be resumed on Labor Day. If you participate in any of our section nets, you're entitled to a certificate. Let the net mgr know if you want one. New Novices: KAØSVS KAØSXH KAØSYL. Upgrading from Novice to Tech: KAØKER KAØKVH KAØPIB KAØPIC KAØPJD KAØPKQ KAØRTC KAØRWN KAØSCE; Novice to General: KAØSCG; General to Advanced: KAØNAO. Call sign change: KAØIYQ now NØFKJ. Congrats to all of you. A reminder of the upcoming hamfests in Park Rapids on Aug. 4th, and St. Cloud Aug. 12th. With computers becoming more of a necessity than a luxury these days, maybe it's time we look into starting a RTTY Traffic Net. If any of you RTTY buffs are interested, contact KCØT or KAØEPY with your ideas. Finally in closing, I deeply regret to report the passing of KØFLT. He was very active on MSPN/N, and he will be missed. NET MGRS: MSN/1 WØEHI, MSN/2 KAØEPY, MSSN KAØODQ, MSPN/N

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Matches everything from 1.8 to 30 MHz: dipoles, inverted vee, random wires, verticals, mobile whips, beams, balanced and coax lines.

Built-in 4:1 balun for balanced lines. 1000 V capacitor spacing. Black. 11 x 3 x 7 inches. Works with all solid state or tube rigs. Easy to use anywhere.

MFJ-940B, $79.95, 300 watts, SWR/Wattmeter, antenna switch on rear. No balun. 8 x 2 x 6 in. eggshell white with walnut grained sides.
MFJ-945, $79.95, like MFJ-940B with balun, less antenna switch.
MDJ-944, $79.95, like MFJ-940B with balun, antenna switch on front panel, less SWR/Wattmeter.
Optional mobile bracket for 940B, 945, 944, $5.00.

MFJ-900 200 WATT VERSA TUNER

Matches coax, random wires 1.8-30 MHz. Handles up to 200 watts output; efficient airwound inductor gives more watts out. **$49.95** (+$4)
5x2x6 in. **Use any transceiver,** solid state or tube. Operate all bands with one antenna.
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MFJ-901, $59.95, like 900 but includes 4:1 balun for use with balanced lines.
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$139.95 (+4) **MFJs best 300 watt Versa Tuner II. Matches everything** from 1.8 - 30 MHz, coax, randoms, balanced lines, up to 300W output, solid state or tubes.

Tunes out SWR on dipoles, vees, long wires, verticals, whips, beams, quads.

Built-in 4:1 balun. 300W, 50-ohm dummy load. SWR meter and 2 range wattmeter (300W and 30W).

6 position antenna switch on front panel, 12 position air-wound inductor; coax connectors, binding posts, black and beige case. 10 x 3 x 7 in.

MFJ-962 1.5 KW VERSA TUNER III

Run up to 1.5 KW PEP **$229.95** (+$10) and match any feedline continuously from 1.8 to 30 MHz; coax, balanced line or random wire. Built-in SWR/Wattmeter has 2000 and 200 watt ranges, forward and reflected power. 2% meter movement. **6 position** antenna switch handles 2 coax lines (direct or through tuner), wire and balanced lines. 4:1 balun 250 pf 6 KV variable capacitors. 12 position inductors. Ceramic rotary switch. All metal black cabinet and panel gives RFI protection, rigid construction and sleek styling. Flip stand tilts tuner for easy viewing. 5 x 14 x 14 inches.

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$329.95 (+$10) **Meet "Versa Tuner V". It has all the features you asked for,** including the new smaller size to match new smaller rigs - only 10 3/4"W x 4 1/2"H x 14 7/8"D.

Matches coax, balanced lines, random wires — 1.8 to 30 MHz. 3 KW PEP- the power rating you won't outgrow (250 pf-6KV caps).

Roller inductor with a 3-digit turns counter plus a spinner knob for precise inductance control to get that SWR down to minimum every time.

Built-in 300 watt, 50 ohm dummy load, built-in 4:1 ferrite balun.

Built-in 2% meter reads SWR plus forward and reflected power in 2 ranges (200 and 2000 watts). Meter light requires 12 VDC. Optional AC adapter MFJ-1312 is available for $9.95.

6-position antenna switch (2 coax lines, through tuner or direct, random/balanced line or dummy load). SO-239 connectors, ceramic feed-throughs, binding post grounds.

Deluxe aluminum low-profile cabinet with sub-chassis for RFI protection, black finish, black front panel with raised letters, tilt bail.

MFJ-981, $239.95. 3 KW, 18 position switched dual inductor, SWR/Wattmeter. 4:1 balun.

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Net	Freq	Time	QNI	QTC	Sess.
MSN/1	3685	6:30P	366	86	31
MSN/2	3685	10:00P	325	55	31
MSSN	3710	6:00P	138	21	30
MSPN/N	3945	12:05P	626	76	31
MSPN/E	3929	5:30P	1000	138	30
MNAMWXNT	3929	6:15P	649	406	28
PICONET	3925	9:00A	2106	198	27

Traffic: WAØTFC 323, KT9I 214, KAØEPY 186, KAØARP 156, WØEHI 142, KDØCI 131, KAØJUX 84, WØHZU 83, NØCLS 74, WØOJH 66, W9DM 49, KTØR 49, KZØH 47, KCØT 45, KAØODQ 40, WØMFW 33, WDØBGS 32, WBØHOX 31, KØOGI 26, KAØBFP 25, WBØUKI 23, KØCSE 22, KØCVD 20, NØEXP 20, KAØAJF 8, WØRIQ 8, NØJP 6, KN9U 6. (Apr.) KZØR 12.

NORTH DAKOTA: SM, Ron Roche, KØALL — Another excellent hamfest was held at Mayville on June 3. The Goose River ARC of Mayville-Portland and surrounding area meets the first Saturday of each month at 7:30 P.M. at the Mayville bank. Officers are: WØKZU, pres.; KCØGV, treas.; KAØEDB, secy. KØALL just received 2-meter WAS #61. I need your news and net reports by the 6th of each month. I'm sure a lot of you are doing newsworthy things that I don't hear about. Goose River 81 QNI, 3 QTC. DATA Net 232 QNI, 13 QTC. Let me know about your Field Day activities and any special club projects you have.

SOUTH DAKOTA: SM, Fredric Stephan, KCØOO — Official bulletins transmitted total of 73 times for whole section. Send me your nominations and donations for this upcoming prestigious S.D. Section Public Service Award. We welcome all nominees. The FCC was here in SW SD on official business first part of the month. Hope you were all aware. We are looking for volunteers to help with the soon to be released S.D. Amateur Radio Newsletter and to assist editing the So. Dak. Amateur Quasi-Official Callbook. Buffalo Chip Radio Amateur Practitioners Society recently formed and membership is piling up quickly. Representatives from all SW SD ARCs heard excellent presentation of the ARRL involved VEC program from ARRL Hq rep WB9IHH at the famous Wind Cave Ranch near village of Pringle. Well attended with much enthusiasm. Rocky Mountain Division Convention in Aurora, CO, gave four of us SD section volunteers an opportunity for meeting other SMs, SECs and VIPs and for discussing mutual interests and problems. Entire program was worthwhile and their Directors were always available. Hope to make it to their div. convention again sometime. NTS TEN and DTEN liaison sations were WAØNZA WBØKWX WBØLTV KCØAF and KCØOO. PSHR: NØCFS KCØAF KCØOO. ARRL NTS affiliated nets: So. Dak. Emergency Net QTC 72, QNI 143, sess. 27; So. Dak. CW Traffic Net QTC 30, QNI 142, sess. 23; Walworth Co. Emergency Net QTC 10, QNI 23, QTR 4; Sunday Morning Net QTC 9, QNI 22, sess. 4; So. Dak. Hispeed CW Net QTC 8, QNI 21, sess. 10; Prairie Dog Amateur Radio Net QTC 4, QNI 15 sess. 4; So. Black Hills Emergency Net QTC 3, QNI 6, sess. 2. Traffic: KCØAF 141, NØCFS 88, KCØOO 66, WØDVB 62, WØYMB 31, WBØOMF 29, WBØKWX 13, NBØD 10, WAØNZA 8, NØEEH 6, WBØLTV 3, KØZBJ 2, WØHOJ 1.

DELTA DIVISION

ARKANSAS: SM, Joel M. Harrison, WB5IGF — SEC: N5BPU. STM: AE5L. ACC: AD5M. TC: W5FD. PIO: K5DW. SGL: W5LCI. The SET is forthcoming; contact N5BPU for state details. The Section Manager's newsletter is now being sent to all clubs and ARRL field appointees in the state. If you have not been receiving one, or would like to, contact me. If you have computer question and cannot find an answer, try our technical coordinator, W5FD. Maybe he can help.

Arkansas Traffic Nets:

Ark. Phone Net	3937 kHz	6 A.M. M-S
Ark. Razorback	3995 kHz	6:30 P.M. Dy
Ark. Mockingbird	3928 kHz	4:30 P.M. M-F
Ozk (Ark. CW)	3760 kHz	7 P.M. Dy

Traffic: WD5FCE 119, W5TUM 105, W5UAU 28, W9YCE 20, W4AZJ 14, N5EJE 14, WB5IGF 14, W9OK 10, N6VC 10.

LOUISIANA: SM, John Wondergem, K5KR — SEC: KA5PFB. ACC: K5DPG. SGL: KD5SL. N5ADF has taken over as La. Emergency Net Manager. New Orleans VHF Club election: W5VBX, pres.; K5RR, v.p.; N85G, secy.; WD5IAA, treas. Mark your calendar for Sept. 15-16. New Orleans Hamfest/Delta Division Convention/Worlds Fair Ham Weekend. Contact the Landmark Motor Hotel in Metairie and request AMACOM room reservations at special reduced rate. K5WF (K5 World Fair) is the call of the Louisiana Amateur Radio Exhibition at the Worlds Fair. A partial list of the CHARTER MEMBERS that made the World Fair Amateur Radio Exhibit possible are: KV5E, pres.; WA5ORS, v.p.; W5LDH, secy.; W5VBX, treas. The ARRL La. Council of Amateur Radio, Westside ARC, Delta DX Assn., Central LA ARC, Jefferson ARC, New Orleans VHF Club, Baton Rouge ARC, Southeast LA ARC, Twin City Hams, Acadiana ARC, Inc., Thibodaux ARC, Jackson ARC, W5FEB WA5MJM WD5DWP WD5DWO W5KK K5KR KB5GO W5HQA KA5AKH WB5ZED WB5WPG W5OB KB5GA KO5R W5OUD WB5LBN W5CB K5FF W5KC W5EM WA5IEV WA5JKS W5OSD K5PO W5TOY WD5DUD N5GPP WB5MXS WA5VUC WB5LBR W5FMO W5IVZ WA5RBQ W5KJD AG5I WA4MXT WA5SMV. Traffic: W5GHP 455, KA5HDT 144, WB5LBR 77, N5ANH 28, K5WOD 6.

MISSISSIPPI: SM, Tom Hammack, W4WLF — Jackson did a great job on the hamfest. Congrats to NA5Y and the whole gang. As usual, there were lots of goodies and good times. Rankin Co. ARC has been running Novice and higher license classes. Laurel club active in classes, producing at least 11 new Novices, de AJØX. Club now meets 1st and 3rd Monday. Lots of good work done during the recent tornadoes in northern Mississippi. ND5M working & getting good PR. Laurel & Hattiesburg clubs have a picnic planned for July 28. All are invited; bring your own food.

Net	Sess.	QNI	QTC
MTN	30	122	51
GCSBN	30	605	8
MSBN	30	2306	102

Traffic: N5AMK 453, K5OAF 232, AJØX 188, N5AXV 52, WD5JXT 19, W5LSG 18.

TENNESSEE: SM, John C. Brown, NO4Q — ASM & ACC: WA4GLS. OO/RFI: W9FZW. PIO: WK4V. SEC: WA4GZQ. SGL: WA4GZZ. STM: NG4J. TC: W4HHK. The amateurs of Tennessee have won a battle related to auto call plates but we have lost a very staunch friend in the House of Representatives of the Tennessee Legislature in Representative, W. C. Herndon, Jr. He was fighting OUR battle when he died on the floor of the Legislature. We will be getting our motor vehicle call plates at the regular price, but you must show membership in the Amateur

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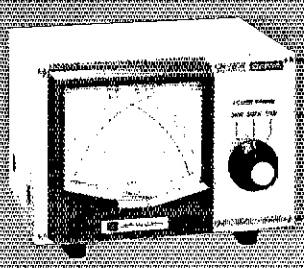
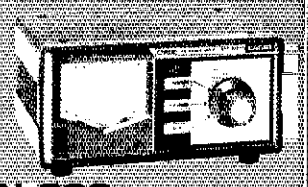


CN-720B

Frequency Range: 1.8-150MHz
SWR Detection Sensitivity: 4 W min.
Power: 3 Ranges (Forward, 20/200/2000 W)
(Reflected, 4/40/400 W)
Dimension: 180×120×130 mm;
7×4.75×5 in.

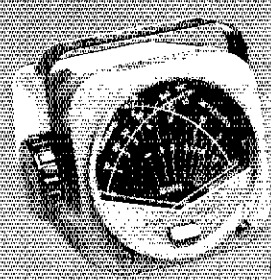
CN-620B

Frequency Range: 1.8-150 MHz
SWR Detection Sensitivity: 4 W min.
Power: 3 Ranges (Forward, 20/200/2000 W)
(Reflected, 4/40/400 W)
Dimensions: 180×85×120 mm;
7.12×3.37×4.75 in.



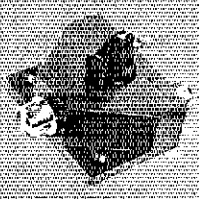
CN-630

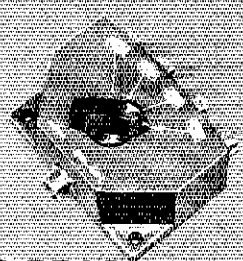
Frequency Range: 140-450 MHz
SWR Detection Sensitivity: 4 W min.
Power: 2 Ranges (Forward, 20/200 W)
(Reflected, 4/40 W)
Dimensions: 180×85×120 mm;
7.12×3.37×4.75 in.



	CN-410M	CN-460M	CN-465M
Frequency Range:	3.5-150MHz	140-450 MHz	140-450 MHz
SWR Detection Sensitivity:	3 W min.	3 W min.	3 W min.
Power Range: Forward	15 W/150 W	15 W/150 W	15 W/75 W
Reflected	5 W/50 W	5 W/50 W	5 W/25 W
Dimensions:	71×78×100 mm; 2.8×3.1×3.9 in.		

all Models Back Lit



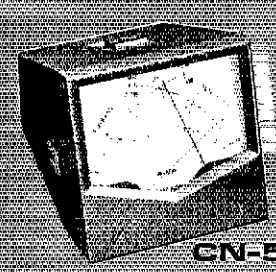


COAXIAL SWITCHES

	CS-201 2position	CS-201G 2position	CS-401 4position
Frequency:	500 MHz	1.3 GHz	500 MHz
Connectors:	SO-239	N Type	SO-239
VSWR:	Below 1:1.2		
Insertion Loss:	Less than 0.2 dB		
Isolation:	better than 50 dB at 300 MHz better than 45 dB at 450 MHz adjacent terminal		

Exclusive agent for above units:

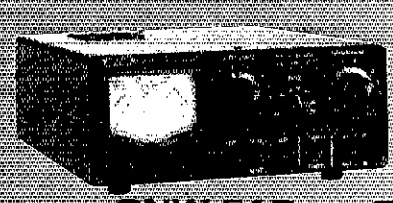
J. W. MILLER DIVISION/Bell Industries
19070 Reyes Ave., Rancho Dominguez, CA 90224
(213)537-5200 TWX 910-346-6740



CN-520 CN-540 CN-550

	CN-520	CN-540	CN-550
Frequency Range:	1.8-60 MHz	50-150 MHz	144-250 MHz
Power Range:	200/2000 W	20/200 W	20/200 W
Dimensions:	72×72×95 mm; 2.83×2.83×3.74 in.		

ANTENNA TUNERS



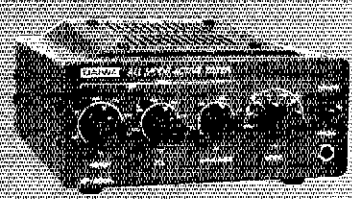
	CNW-518	CNW-419
Frequency Range:	3.5-30 MHz (8 bands)	1.8-30 MHz (17 bands)
Power Rating:	1 KW CW (50% duty)	200 W CW (3.5-30 MHz) 100 W CW (1.8-3.4 MHz)
Output Impedance:	10-250/25-100 ohm (Opt. 3.5 MHz)	10-250 ohm
Dimensions:	225×90×275 mm; 8.9×3.5×10.8 in.	225×90×245 mm; 8.9×3.5×9.6 in.

POWER AMPLIFIER

LA-2035

Band:	144-148 MHz
Input Power:	0.5-3 W
Max. Output Power	30 W plus
Power Consumption:	13.8 VDC, 4.5 A max
Dimensions:	100×35×125 mm; 3.9×1.4×4.9 in.

AUDIO FILTERS



AF-606K & AF-406K

Four stages of filtering, variable bandwidth over broad range... remarkably improved reception for all modes...razor sharp CW reception...built-in speaker.

The AF-606K adds PLL Tone Decoder circuitry for the ultimate in CW reception. PLL locks onto the desired CW signal and reproduces it with utmost clarity.

Dimensions: 150×62×150 mm; 5.9×2.4×6.9 in.

Exclusive agent for above units:

MCM Communications
858 Congress Park Dr., Centerville, OH 45459
(513) 434-0031 Telex: 288-349

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CROSS NEEDLE METER
DAIWA

DAIWA INDUSTRY CO., LTD.
Los Angeles Representative 25130 Narbonne Ave. #107
Lomita, CA 90717
(213) 530-1888 TLX NO. 887631 DAIWA UD

Radio Emergency Service. That is part of our own organization and not some political person like the County Sheriff as was first proposed or we would have to pay $25 per year extra as a vanity motor vehicle plate. I know that 2304 MHz is not DX but you gotta admit that the effort in that line requires as much effort when working all states. Our Technical Coordinator, W4HHK, has managed to work five states, TN, AL, MD, MI and TX. It has been mentioned in this report some issues back about WA4HGN having the 28-foot dish and doing much work with EME. He and N4MW are also working the 2304 MHz area. If you want to really do some different Amateur Radio, get with them and have some new experiences. The Texas distance was 425 miles. We were represented 100% on the DRN5 net this report. Can't ask for anything better. Tnx. The CW net honor roll has W4DDK WV4E K9IMI NG4J and NN4D. Good work amateurs. The Volunteer AR Club of Dickson Co., received their Charter of Affiliation this period. Congrats to another "Up and Coming" club. Certificate was awarded at a club picnic by your SM. Many TNX to NM4W and WD4Q for representing the section in the National Communications System Emergency Communications Test "Night Tango III." Section traffic for period is LF — sessions 76, QNI 3515, QTC 129; VHF — sessions 103, QNI 2127, QTC 572; RTTY — sessions 27, QNI 80, QTC 0; CW — sessions 49, QNI 136, QNI 33. Sure would like some help and participation in CW area. Traffic: KA4RSC 211, W9FZW 159, K4WWQ 122, W4ZJY 90, WV4E 38, W4TYV 35, WD4GYT 29, KE4LS 23, W4PFP 21, WB4YPO 18, NM4W 16, NN4S 13, K4WOP 12, W4PMP 10, K4JGW 9, KB4UQ 6, W4EWR 6, KI4V 4. (Apr.) K4VMO 8.

GREAT LAKES DIVISION

KENTUCKY: SM, Ann Jackson, KA4GFU — SEC: WA4JAV. STM: KA4BCM. BM: WA4AGH. OO/RFI: N4GD. PIO: W4TAJ. NEWS: Lexington Hams assisted with the Olympic Torch Run and Horse Trials. Owensboro Ham WD4IYK served as communicator and unofficial torchbearer during the eastern U.S. portion of the run. W4RUZ received his 27th consecutive certificate for successfully copying the Armed Forces Day message. Federal agencies have appropriated special funds for disaster planning in states contiguous to the New Madrid Fault. A major western Kentucky earthquake is expected. Nets: MKPN 1112 119, KTN 1150 109, KYN 165 82, KNTN 328 69, KYPON 41 8, BARES 106 6, CARN 127 6, NKARC 105 1, TSTMN 603 44, 3ARES 33 3, 4ARES 91 13, 7ARES 29 0, 11ARES 66 9, WTEN 55 7. Traffic: WA4JTE 252, KA4SAA 99, K4MHL 75, KB4OZ 63, WD4BSC 51, KA4SKV 48, WA4JAV 40, KA4YIV 31, WD4RWU 30, KA4MTX 22, WK4D 21, WB4ZDU 18, K4HOE 15, WA4YPQ 15, WA4AVV 14, WD4IXS 10, WA4AGH 9, WD4CQF 8, N4HZT 7, WD4PBF 7, WD4CJQ 6, W4PKX 6, KA4GBZ 5, W4TPB 1.

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	Ttc	Sess.
QMN*	3663	1800 Dy**	1080	314	92
MITN*	3953	1900 Dy	679	248	31
MACS*	3953	1100 Dy**	542	150	31
GLETN	3932	2100 Dy**	977	103	31
MNN*	3722	1730 Dy**	281	69	62
UPN*	3922	1700 Dy**	706	67	35
WSSBN	3935	1900 Dy	706	33	31
TASYL	3922	1900 M	7	3	3
VHF nets		20 rpts	1921	72	153

*NTS Nets. Times local. **QMN late net, 2200; MNN late net, 2000; MACS Sn 1300, ARES Net Sn. 3932, 1730. ARRL Info Net, Sn, 3953, 1500. 3932 is MI HF Emer Freq. Silent Key, with deep regret, W8FYN. New PIA, N8ALL. New ECs: KA8AID (Delta); KB8TD (St. Clair); WB8WJY (Tuscola). Very special thanks to both K8UPE and WA8CKT, retiring ECs in St. Clair and Tuscola Cos., for their long and faithful service. This is twice now that this column has been prepared at least in part from a hospital bed during my terms in this office. At this point, all I can say is THANKS! for the dozens of cards and letters; for the extra effort my absence has meant for some; and for the continued support that is being shown all over the state for the good programs we have started and running. Public service through Amateur Radio is a team effort. The team we have in MI is great, as good as any you'll find anywhere. BPL: KA8CPS, W8QHB. Traffic: KA8CPS 578, W8QHB 506, WD8LRT 395, W8UE 156, KA8OWN 137, WD8RHU 120, KA8NCR 100, K8KQJ 88, WA8YMH 80, KA8PQH 77, WA8DHB 75, K8OCP 73, WB8MTD 71, W8IHX 65, K8UPE 63, AF8V 60, WD8EIB 58, N8CNY 57, W8CUP 57, WD8MJB 52, WD8OUO 49, KA8PAK 48, W8SCW 40, K8ZJU 38, WB8TTA 36, K8EQO 33, W8YIQ 32, WB8SYA 31, KI8Q 22, KA8JCL 17, N8EBN 11, KB8GT 11, WB8ITT 11, WD8KQC 10, KD8QW 10, KS8P 8, W8LDS 7, KB8TD 5, W8URM 5, K8DD 4, KA8SSU 3.

OHIO: SM, Allan L. Severson, AB8P — SEC: K8AN. STM: K8OZ. ACC: K8US. PIO & SGL: N8CVK. TC: KB8MU.

Net reports:

Net	QNI	QTC	Sess.	Time (local)	Freq.
BN	339	213	62	6:45/10 P.M.	3.577
BNR	310	189	31	6 P.M.	3.605
BSSN	343	209	56	9:45 A./7:15 P.	3.927
ONN	96	20	22	6:30 P.M.	3.708
OSN	274	127	31	6:10 P.M.	3.577
OSSBN	2115	869	93	10:30 A.M., 4:15 & 6:45 P.M.	3.9725
OSSN	178	86	31	6:45 A.M.	3.577
O6MN	295	19	31	9:00 P.M.	50.160

Congrats to K8AN and all Ohio EC's for this year's tremendous SET performance. My deepest thanks and admiration goes out to all who reported and had their call and total listed in June *QST*. If you are an EC, and don't see your call, I hope you will participate this year. SET is not a contest — it's serious stuff, and it would be inexcusable for a county's amateur group to be unprepared if their services were needed. If you've noticed that your county wasn't included in the June report, perhaps it's because it doesn't have an EC. If you, or someone you know, is interested in holding this position, please contact K8AN, and he will put the wheels in motion. To continue on the ARES line: WB8GGR, EC of Richland Co., wrote one of the neatest, most concise descriptions of the ARES and a logical ARES organization I've seen, as reported in May's edition of the MASER newsletter. If you'd like a copy, let me know. Several months ago, I sadly related that we'd lost WA3ZBU as editor of the *Carascope*. I'm glad to say new editor KA8GZQ has taken up the golden quill and is doing a fine job. For example, his report of the Ohio State Patrol's operation REDD! — "Report Every Dangerous Driver Immediately." Of last year's 10,714 calls, 70% came from Amateur Radio operators. Another good job, Ohioans! Thanks for the info, Warren. Another editor packing up her typewriter is Lois, WD8JAJ, of the *O-Fiver*, from Oh-Ky-In. Lois has written and edited one of the more in-

MISSOURI RADIO CENTER

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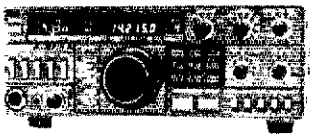

TS-430S Most Advanced, Compact HF Transceiver

• General Coverage Receiver • USB/LSB/CW/AM/Optional FM • 10Hz Dual Step Digital VFO • Eight Memories w/Lithium Back-up • Memory and Band Scan

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TS-930S Top of the Line HF Transceiver

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TR-7950/7930

• Large LCD Readout • 21 Multi-Function Memory • Lithium Back-up • Automatic Offset • Built-in Encoder • Memory or Band Scan

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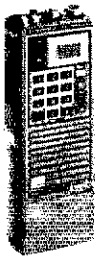
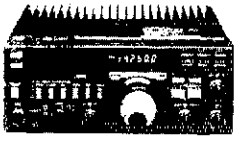


TR-2500

2.5W/300 mW (Switchable) 2 Meter Handheld Transceiver

• LCD Readout • Ten Memories w/Lithium Back-up • Band and Memory Scan • Built-in Sub-tone Encoder

YAESU

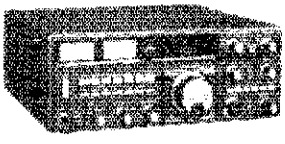


FT-757 GX

Compact General-Coverage Receiver

• General-Coverage Receiver • USB/LSB/CW/AM/FM • Dual VFOs • Memory/Band Scan • Speech Processor • CW Filter and CW Keyer included

YAESU



FT-726R VHF/UHF

All Mode Tri-Band Transceiver

• 50-54 Mhz • 144-148 Mhz • 10 watts output on all bands • 430-450 Mhz

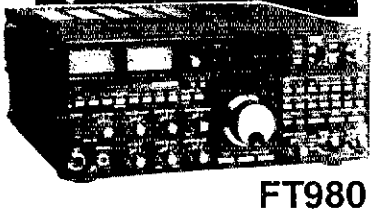
YAESU

FT203R

New* Yaesu FT203R

• Compact VHF Handy Talkie • S-Meter • Small Light Weight

YAESU

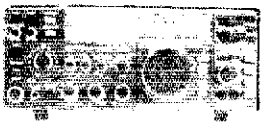


FT980

CAT SYSTEM—ComputerAided Transceiver

• Wide Dynamic Range • General Coverage • Low Noise Front End • 10 Hz Digital Readout • All Mode Transceiver—CW/SSB/AM/FM/FSK!

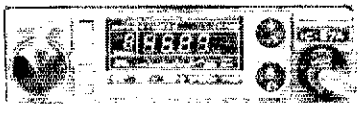
ICOM



IC-745 HF Base

All ham band HF transceiver. 16 memories. 100KHz to 30 MHz general coverage receiver and adjustable noise blanker and AGC

ICOM



IC-27A Compact Mobile

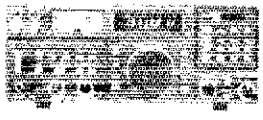
A breakthrough in 2-meter mobile communications! Most compact on the market (5½" x 6" x 2" H x 7" D), contains internal speaker for easy mounting. 25 watts. 32 PL frequencies. 9 memories, scanning and touchtone mic.

ICOM

IC-02AT

The IC-02AT 2-meter LCD readout handheld features 10 memories, 32 PL tones, scanning, keyboard frequency entry, dial lock, 3W std., 5W opt. DTMF

ICOM



IC-R71A General Coverage Receiver

The IC-R71A 100KHz - 30 MHz superior-grade general coverage receiver features keyboard frequency entry, 32 memories, SSB/AM/RTTY/CW, selectable AGC and noise blanker, and wireless remote controller (optional).

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formative and literate of the newsletters I'm lucky enough to receive. However, I know the quality of the *Q-Fiver* will continue under Susie, N8CGM. Susie hasn't failed at anything I've seen yet, including the choice of an OM, WD9HDZ. Congrats to WB8ZTV, K8AN and TSRAC for their historic HT operation through OSCAR 10 and the gateway repeater, KD8GL. Upgrades to Extra: WD8AFF N18S KA8POM. Appointment: WB8EHS, to EC Mahoning Co. Congrats all!

Local Nets	QNI	QTC	Sess.
ALERT	80	4	4
BRTN	272	119	31
COARES	133	5	4
MASER	95	1	4
Medina Co.	352	49	31
NEON	153	48	26
TATN	281	89	31
TSRAC	1083	98	42

Traffic: WD8MIO 560, N2NS 398, K8JDI 364, WB8DMF 302, W8EK 264, WD8KFN 263, K8OZ 247, W8BO 230, N8FCQ 207, W8SKP 206, KA8GJV 190, KF8J 179, AB8P 178, W8QZK 169, WA4JXJ 139, KA8CGF 128, W8LT 99, N8AKS 96, WA8SSI 96, WB8JGW 86, N8EVC 83, WA8GMT 83, KA8KHS 83, K8AN 74, KD8KY 74, K8ND 73, WD8KBW 64, W8SZU 64, WB8MEK 46, WD8RGP 43, KA8TAN 42, W8WEG 42, WB8HMI 40, WD8IKC 34, K3RC 34, W8BHL 31, WA8HED 30, WB8HHZ 28, K8VOY 27, N8FPH 26, WB8MRL 22, N8CW 21, N8FNP 21, KA8ICB 21, NE8X 20, N8EMR 18, WD8RGS 18, KG8H 14, WB8VOA 14, NC8Q 13, WB8NHV 12, K8NJQ 12, W8FUP 10, WD8OYK 10, WB8SRC 10, K8DXZ 9, KA8GGZ 9, W8RG 9, WD9HDZ 8, W8OQL 8, N8CJS 7, W8ZM 7, N8AJU 6, K8CKY 6, WB8KWD 6, N8CGM 5, WD8CSP 4, WB8NTR 4, WD8EKI 3.

HUDSON DIVISION

EASTERN NEW YORK: SM, Paul S. Vydareney, WB2VUK — STM: WB2MCO, SEC: AK2E. BM: WB2EAG. SGL: KB2HQ. ACC: N2BFG. Nets: EPN QNI 152, QTC 69; ESS QNI 401, QTC 46, NYPON QNI 649, QTC 344; CDN QNI 708, QTC 89; QNI 446, QTC 229; NYS/L QNI 473, QTC 345; HVN QNI 262, QTC 97; SDN QNI 452, QTC 92; Col/Grn Tfc Net QNI 68, QTC 2; Schen. 2-Mtr Net QNI 59, QTC 4; Ulster RACES QNI 24, QTC 1. Club News: SARA reports Silent Key W2FEU and new member WA2ALV. Also, every weekend in June filled with PS activities. AARA reports Silent Key W2CJS; also W2AAO received QCWA certificate marking 70 years as licensed Amateur Radio operator. Mt. Beacon ARC had hamfest on July 14. CCNR working towards getting 450 rptr on air. WECA has new microprocessor control circuitry on line on 147.06 rptr. Ulster RACES/Overlook Mt. ARC provided comm. for Walkathon with WA2KLV WA2RUW N2EIK W2XL WA2ONN KY2J KA2TIP WA2YMF W2ZW WB2OXY N2FS AK2H assisting. Your help is sought on the traffic nets during the summer. Let's all try and get on whenever possible. Remember, there is probably a VHF TFC NET within walking distance even when you are on vacation. PSHR: WB2MCO W2PKY WA2JBO KC2TF WB2VUK WB2ZCM WB2KCR KC2ZO KA2OPG W2BIW KA2MYJ WA8MAZ K2ZM K2ZVI AK2E KA2TOC N2EQM. Traffic: KC2TF 350, W2PKY 200, WB2MCO 169, K2ZM 165, KC2ZO 150, WB2VUK 144, WB2KCR 121, W2BIW 80, WB2ZCM 70, WA8MAZ 64, K2ZVI 63, WA2JWL 62, WA2YBM 55, KA2OPG 49, WA2JBO 43, WA2CJY 38, K2HNW 34, N2AWI 31, KA2TOC 28, KA2MYJ 24, N2EQM 23, AA2Y 22, AK2E 17, WB2SON 12, N2BFG 9.

NEW YORK CITY — LONG ISLAND: SM, John H. Smale, K2IZ — SEC: WA2SUB. STM: K2GCE. ACC: WB2IAP. OO/RFI: NB2T. TC: W2JUP. PIO: W2IYX.

NLI CW*	3630	1900/2200	N2AKZ
NLIPN*	3928	1815	KS2G
NCVHF	6.145/745	1930 M-F	K2MT
SCVHF	4.77/5.37	2030 M-F	W2GZD
BAVHF	6.07/67	2000 M-F	WB2BNA
ESS	3590	1800	W2WSS
NYS/M	3677	1000	WB2EAG
NYS	3677	1900/2200	WB2EAG

*Denotes section net; all times are local; please try and help out by checking in whenever possible. K2GCE has resigned as of 30 June as STM, owing to his retirement, finally after 36 years with his nose to the grindstone with the State of New York. What else is there to say but "Thank You for all the help you have given to the people, the traffic nets and the section." Hopefully, by the next column I will be able to list his replacement. On May 20th, for the 3rd year in a row the Nassau Co. RC provided communications for "Cropwalk," a walkathon sponsored by the Hempstead Cluster of United Methodist Churches to raise funds for World Hunger, stations participating were KA2EJD KA2CAF N2CCF W2KIV and K2TNN who was the walk coordinator. Recent upgrades from Wantagh ARC are N2ETB to Advanced, and KA2PKW to Tech. Larkfield ARC runs a tube bank. Contact WB2ZIT if you have tubes you wish to donate or any tubes you need. The following Larkfield members participated in the Eagle Hill School 5 mile run: NCS K2NQ, W2JYD K2LFH KC2DH K2YEW WA2TSN. N2BTK reports that Clegg has gone out of business but they sold their test gear and spare parts to Dutchland Electronics in Lancaster, PA. Their telephone number is 717-569-8967. New Novices in the Gt. South Bay ARC are KA2UWQ KA2UWS KA2UWU KA2UWV KA2UWR KA2UWT and KA2UWW. The club also plans to hold Novice and upgrade classes in the fall. KA2MUM, v.p. of Radio Central, brought his complete OSCAR station to Field Day for the club. Anyone needing info on where license courses are being held please contact WB2IAP at 516-431-2895. BAVTN celebrated their 5th anniv on June 11 with a picnic. Traffic: N2AKZ 390, K2YQK 106, W2GKZ 54, WB2BNA 46, W2DBQ 44, K2GCE 21, NB2T 20, KS2G 13, N2BQD 9.

NORTHERN NEW JERSEY: SM, Robert Neukomm, KB2WI — SEC: WB2VUF. STM: W2XD. BM: N2BOP. ROC: W2CC. SGL: W2KB. PIO: WB2NQV. TC: AD7I. ACCs: KK2U KY2S. NMs: W2CC KB2HM WB2RMJ WB2ANK WB2IQJ KY2D N2XJ W2PSU.

Net	Freq.	Time	Sess.	QNI	QSP
NJM	3695	1000 Dy	31	154	55
NJPN	3950	1600 Dy	35	406	114
		0900 Sn			
NJSN	3735	1830 Dy	31	186	113
NJN/E	3695	1900 Dy	31	269	108
NJN/L	3695	2200 Dy	31	210	102
TCETN	147.255	1930 Dy	—	—	—
OBTTN	147.12	2000 Dy	31	372	80
NJVN	49/49	2230 Dy	28	202	76
NJRTTY	147.51	Autostart			

The month of May in Northern New Jersey demonstrated the need for greater participation in emergency communication. RAVEN did a Trojan job in this area as did several other emergency units. SEC WB2VUF needs more volunteers for ECs in all areas. If you have handy-talkies PLEASE give him a call and your support in so vital an area as ARES. As to Traffickers: K2VX, one of our ironmen,

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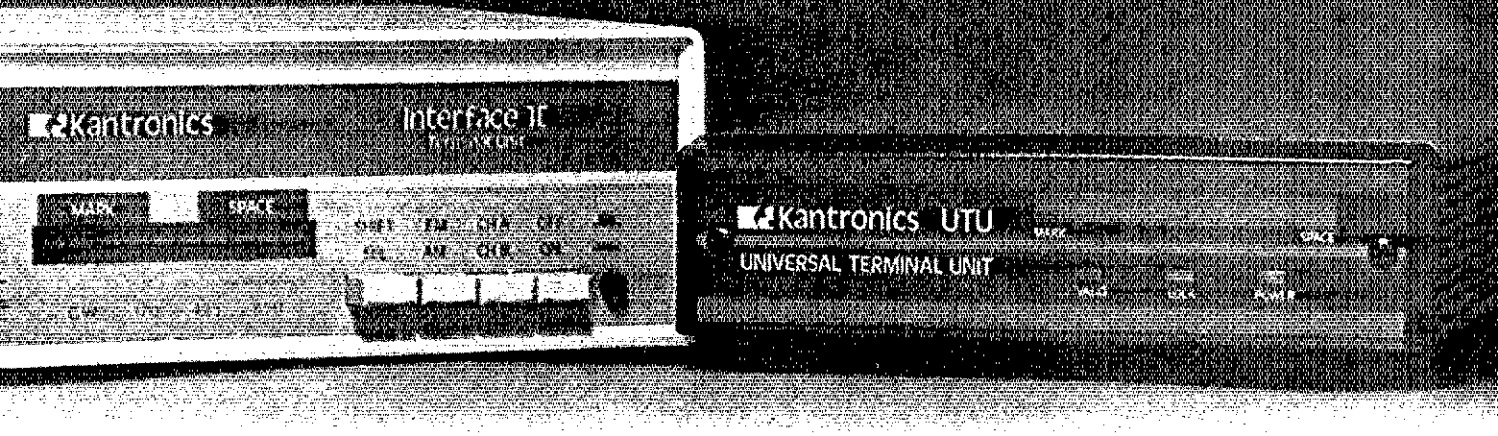

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Apple	●		●	●	
Atari	●	●	●		
VIC-20	●	●	●	●	●
Comm-64		●	●	●	●
TRS-80C	●	●			
TI-99/4A	●				

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will not be as active in the past owing to a job commitment. He has been a continous operator, and without fail has made PSHR for over three years. We will miss your faithful service! WB1GXZ, assistant NM for the NJSN, reports a new member from Connecticut is KA1GWE. K1AOS is to be commended for his faithful work in sending training messages and really holding the training program together — CGNS! Welcome to the new "Clifton Amateur Radio Society" with WA2KBI as its new president. OOs WA2QZD & KJ2O report no violations this month. We will be needing more OOs in NNJ as the FCC turns over this phase of monitoring to the amateur fraternity. Members of ARRL, please contact me for more particulars. Particular congrats to KK2U for setting up the VEC program in the 2nd call district and especially the exams at the Rochester Hamfest. Newsletter of the Radio Club of America listed KA2ORK and N2DRA were principle speakers at the Diamond Jubilee dinner where they were made members of RCA. DJ2LR spoke for the incoming "Fellow" members where W4KFC became a Fellow. Traffic: KB2HM 363, N2XJ 345, W2VY 162, WB2KLF 55, W2ZEP 55, KA2HNQ 47, WB2ANK 43, W2XD 41, W2CC 28, KA2SPH 24, KD2BE 16, KA2OIW 16, N2DZZ 14, W2UH 9.

MIDWEST DIVISION

IOWA: SM, Bob McCaffrey, KØCY — SEC: WA4VWV. STM: KAØX. PIO: KBØZP. ACC: WBØQAM. SGL: AKØQ. BM: KØIR. TC: KØDAS. Good totals and lots of FD activities. Hope everyone got to participate with the RAGBRAI Message Relay. Thanks to all the location manager as well as KBØZP. Look forward to seeing everyone at the DSM hamfest Aug 19 and at Hampton for the 75-Meter picnic Aug. 26. Contact KØDAS or WØRPK for the info on the Section Seminar Sept. 22, have lined up some excellent speakers. What does "Potowonok" mean? New officers in DSM are WA4VWV KDØEO NAØR AKØQ and KAØJQG. Good coverage for the June SKYWARN activities; hats off to all for excellent coverage. If your area was not covered let me know. Oskaloosa rptr 145.49.

Net	QNI	QTC	Sess.	Freq.	Day	UTC
75MPhone	1843	158	52	3970	Dy	1730/2300
TallCorn	343	142	62	3560	Dy	2330/0300
IaCode Net	113	53	20	3713	M-F	0100

New Club in the section is SW Iowa ARC in Council Bluffs. DRAC operation station at Rock Island Arsenal on Armed Forces Day. New club station at Scott Co. Court House. Soo-land planning a new repeater installation, very much "state-of-the art." WBØFBP proudly accepted the Zombie Award. Traffic: WDØFWB 155, WØSS 153, KØGP 97, WØYLS 89, KAØADF 66, W4JL 62, KDØBG 57, KØCY 55, KØØI 50, WBØAVW 48, KCØXL 33, KAØQAH 28, WØHTP 24, NCØR 20, KØBRE 18, WDØFOY 18, KBØOZ 18, KCØSC 16, WØLFF 11, WDØGVY 10, NØEFG 9.

KANSAS: SM, Robert M. Summers, KØBXF — WØKL, one busy SEC, has been presenting the HANDIHAM program to various radio clubs as well as to Kiwanis Clubs. He had to miss the State Convention at Salina this year, for of all reasons, a 50-year class reunion. Guess not too many of us get to attend several 50-year reunions in a life time!!! Congrats Doc. Congrats also to KDØJM who upgraded to Extra May 8. Net reports as follows: net QNI/QTC. KSBN 912/126; KPN 348/12; KWN 739/524; KMWN 649/558; CSTN 1025/105; QKS 362/117; QKS-SS 49/16. More participants are needed for QKS-SS. How about sharpening up your CW skill by showing up at least once a week, 3735 kHz @ 7:30 local time. Monday, Wed. or Friday. Congrats to KAØQVW on his recent award winning efforts in the Novice Roundup. The Johnson Co. Radio Amateur Club held annual election of officers for next year: KDØJM, pres.; KDØFD, v.p.; KDØJB, treas.; KAØKKV, secy. Was glad to see the *Transceiver* bulletin of the Kaw Valley ARC back in publication again. NØCBG is acting editor. Had word of a tornado touchdown in Hiawatha just as report was about to be finaled. Perhaps next month we will have a report of the ham radio activity taking place during the disaster. Last but not least, yours truly is off the crutches and hopes never again to be a dependent on such a mode of transportation. Traffic: WØKL 201, WØFIR 180, WØHI 150, ACØE 140, WAØLBB 124, WØOYH 101, WBØZEN 94, KØBXF 90, WØFDJ 86, WØQMT 55, KØGSC 26, KDØJM 21, WØMYM 18, WØPB 14, KAØE 11, NØBDG 12, WØCHJ 12, WØRBO 12, KAØCUF 6, WAØOWH 2. (Apr.) WØHI 163, WAØOWH 4.

MISSOURI: SM, Ben Smith, KØPCK — Effective June 1, NØBKH resigned his Section ARRL Leadership position as Bulletin Manager. Since assuming that position Jan. 1, 1983, he had provided excellent leadership for the OBS program. No appointment has been made to fill the vacancy. The club officers for 1984/1985 of the Tri-Lakes ARC are: KAØOKE, pres.; KCØPY, v.p.; WBØVFG, secy.; KAØMPI, treas.; WØPH, public relations. K9OCS received an OES Field Appointment. Lake of the Ozarks ARC 1984 officers are: KVØV, pres.; K9IMX, v.p.; KDØAW, secy/treas. The Missouri Side Band Net Picnic will be held Sunday, Sept. 9 at Binder Lake in Jefferson City. All amateurs and their families are invited. Contact Net Manager KT5Y for more information. KAØETG was elected VP of the Rolla Regional Amateur Society at their May meeting. He will also be chairman of the repeater committee. It is with regret to report that KBØDA became a Silent Key May 21. Nets reporting:

Net	QTC	QNI	Sess.	Mgr
MON	207	394	62	KØSI
MOSSB	100	666	31	KT5Y
HBN	27	364	23	KØDSQ
MEOW	23	450	30	KØDSQ
MTTN	21	98	23	KAØPGN
PTN	8	29	13	WBØROQ
RRBN	6	317	26	KAØBKR
NEMOE	5	139	13	WØYRL
CVEN	5	31	13	WØYRL
CMEN	2	122	5	KØPCK
LAAN	2	34	6	WBØRHC
INF	1	30	3	WØRNF
LOZCW	1	19	3	WØRTL
SARN	0	66	5	WØENW
ACAN	0	58	6	NØEHU
ICCC	0	48	5	KCØSF
ZAEN	0	45	4	K9OCU

Traffic: KT5Y 247, KØSI 196, WØBMA 142, WAØYJX 95, KØPCK 93, AIØO 89, NDØN 81, KCØAS 74, KØBM 74, WØOUD 48, NØEVC 39, K2ONP 32, KYØU 31, WBØHOP 11, WBØRHK 4, K9OCU 2.

NEBRASKA: SM, Reynolds Davis, KØGND — A month of transition: Our Affiliated Club Coordinator, Keith Erickson, KØGNW, has moved to MN. We wish him well in his new job. I, too, have submitted my resignation as SM effective July 15 which means that the "Section News" will have a new author for October: Vern Wirka, WBØGQM, who will be acting SM for the remainder of my term. All info including club newsletters should go to Vern at RR 81, Capehart Rd., Papillion 68133. I'll be moving to Brussels, Belgium in a new role with my employer and expect to be back in a couple of years. I have applied for an ON8

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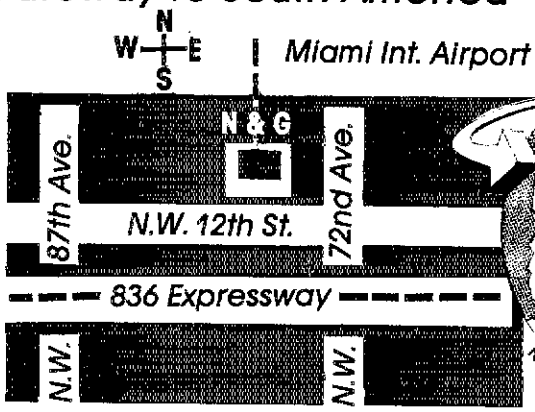

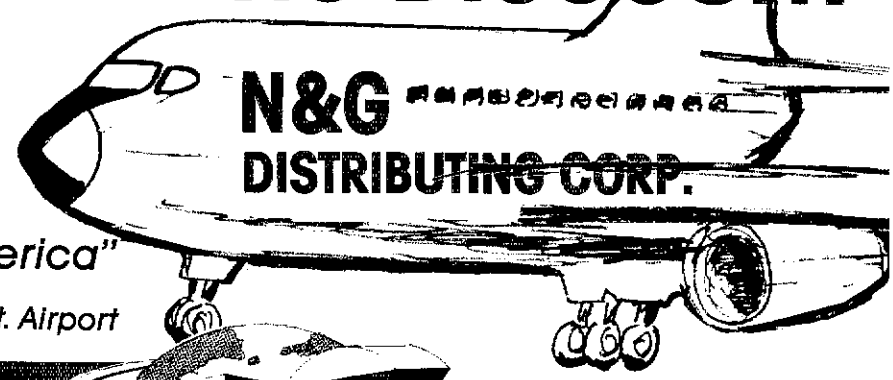

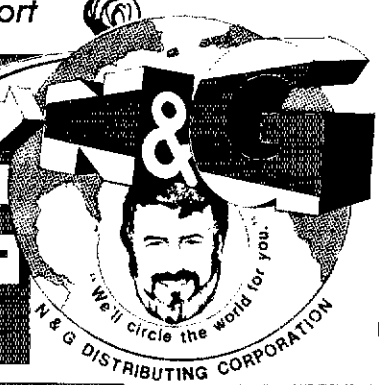

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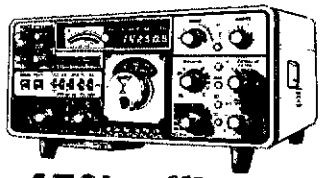

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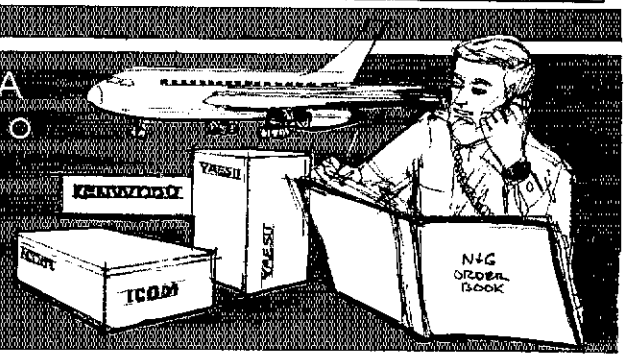


call and plan to keep in touch. I am sure that Vern will do a super job in the interim. One new appointment this month: Lyle Kurth, WDØBOX, is the new manager of the NE Novice Net which continues to grow. Traffic: WØKK 140, WBØTED 138, KØDKM 134, KAØBCB 41, WDØBQG 35, KØIXY 29, WDØEGK 23, KAØBWM 20, WAØBOK 8, KØGND 6, KAØFEW 5, WBØGMQ 5, KØODF 4, WDØBOX 2, KØFRU 2, WØNIK 2, KØTUH 2.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Pete Kemp, KA1KD — SEC: K1WGO. STM: K1EIC. BM: K3ZJJ. OO/RFI: KA1ML. SGL: K1AH. PIO: WB8TDA. TC: W1HAD. ACC: N1AZF.

Net	Freq.	Local Time	QTC	QNI	NM
CN	3640	1900/2200	266	480	K1EIR
CPN	3965	1800/1000 Sn	127	314	KA1BHT
NVTN	28/88	2130	39	276	WA1EMI
WCN	78/18	2030	90	422	WB1GXZ
RTN	13/73	2100	71	304	KA1JAN

Upgrades: General KA1ISX; Tech KA1LGN; New Novices KA1LUT KA1LUX KA1LUY KA1LUZ. The NW CT ARES now meets Wednesday at 2030 (local) on the K1BYD (146.955) repeater. MARS is now operating the 147.09 repeater in Glastonbury. W1VS has moved to Georgia. The tCRC/CRA annual summer picnic and softball game is scheduled for August 12th. The VHF Frequency Coordination meeting has been rescheduled for Sept. 15th, in Worcester, MA, to coincide with the New England Division Cabinet Meeting. SCARA will be providing communications for the Labor Day Road Race and the Fireman's Muster in Sept. The City of Danbury will be celebrating its Tercentennial in Sept. KA1ECL is coordinating the Amateur Radio communications. The CARA flea market will be held Sept. 23, talk in on 147.12. Welcome WF4R to the ARRL Hq. staff. AK1O and WB9IHH recently passed the FCC Commercial phone and telegraph examinations respectively. A BIG TNX to all Connecticut hams who provide communications assistance with the June flooding problems. The FCC will be giving Amateur Radio examinations in Hartford during October. Be sure to get your 610 Forms into the FCC Boston Field Office ASAP. The OBS program has been growing steadily. The following stations provided bulletin assistance to the section during the months of Mar/Apr/May: KA1XG 40, W1LUH 17, WA1HFE 11, KA1XZ 5, K3ZJJ 4, K1VKO 4. In addition to CPN, WCN, RTN, NVTN, WA1GOO/RBBS, KA2BCD-K1LTJ/RBBS and FARA. Congrats to the Mt. Tom RA for taking on the responsibilities of the W1-QSL Bureau. Traffic: WB1GXZ 502, W1EFW 357, KO1K 147, K1UQE 127, KA1GWE 92, KA1JAN 85, KA1BHT 75, KA1EGE 58, K1AQE 30, W1BDN 26, WB1ESJ 19, KA1JXX 10, K3ZJJ 9, W1CUH 8, W1QV 6.

EASTERN MASSACHUSETTS: SM, Rick Beebe, K1PAD — STM: KA1GBS. SEC: W1IAY. ASM: K9HI. ACC: K1AZE. BM & OO/RFI: WA4STO. TC: KA1IU. PIO: WA1IDA: SGL: K1BCN.

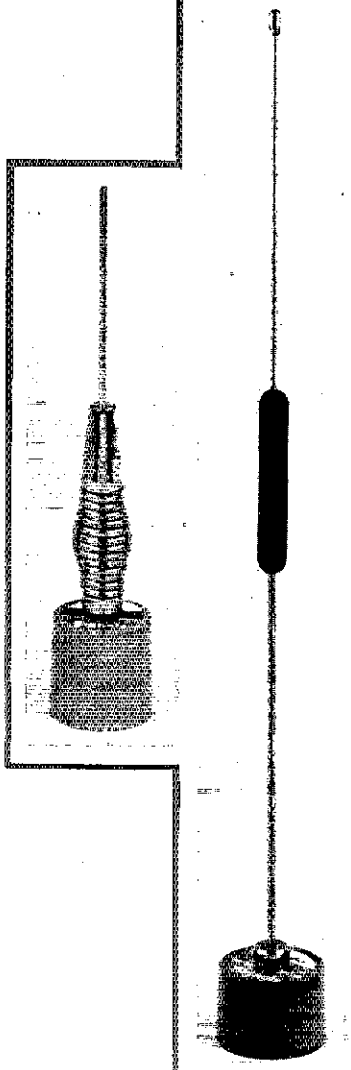
Net	Freq.	Time(loc)/Dy	QNI	QTC
EMRI	3.658	1900/2200/Dy	394	494
EMRIPN	3.959	1730/Dy	291	278
EM2MN	23/63	2000/Dy	461	232
NEEPN	3.945	0830/Sn	59	7
HHTN	04/64	2230/Dy	443	317
EMRISS	3.715	2030/Dy	172	102
CI2MN	045/645	1930/Dy	175	40

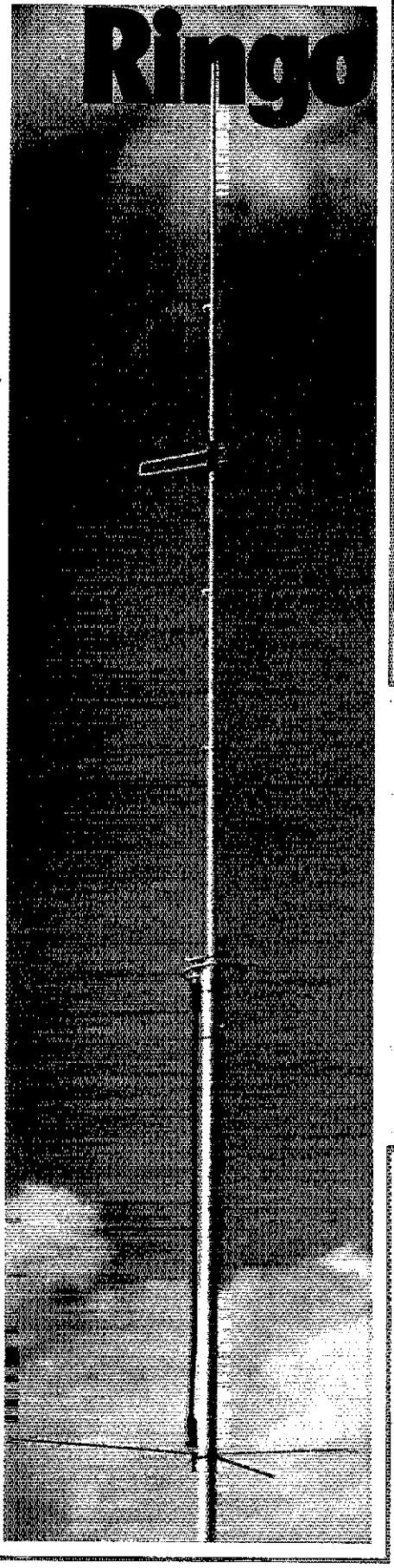
After a lot of hard work WD9ERI received her PhD in Biochemistry from Harvard and is moving on to MIT. W1VRK and his team are working real hard to put on a fine hamfest in Boxboro in Sept. It may include perhaps the first volunteer examinations in New England. Keep your ear to your local repeater for details on registration deadline etc. We have not had a 2-mtr frequency coordinator for a while now in the Eastern Mass area. There will be a meeting of repeater owners in the Worcester area about the middle of Sept to discuss how to proceed. New England ARRL officials will be in attendance to facilitate but not to dictate the meeting. Watch *QST* for details. Active traffic handler WB3FOC moved to the WPA section to be a minister of another church there. Packet radio enthusiasts gathered at a meeting of NEPRA recently to tune up/show off their new toys. WA1JGU won informal best design. If you want to hear what it sounds like, tune to 145.01. The CW IDs will locate the stations for you. Billerica club had an interesting talk on Apollo Space Flight Communications. Sturdy Memorial Club members busy fixing antennas after the harsh winter and spring winds. Massasoit club also doing antenna work on the 78/18 repeater. Framingham club member WA1UEH is retiring as editor of their newsletter after many years of faithful service. Always public service minded Wellesley club provided communications for the Wellesley Teachers Assn bike-a-thon. Norwood club finished successful Novice class. North Shore RA new officers: WA1WTP, pres.; WA1KVQ, v.p.; KA1DYL, secy.; K1EYN, treas.; KA1NV WB1GXS AG1F, directors. Middlesex club planning a flea market. Colonial club had a talk by the Concord emerg officer. Greater Lawrence club ran a demo of ham radio at Methuen Mall. Traffic: KA1GBS 1025, KA1EXJ 404, N1BGW 339, N1AJJ 245, N1BHH 232, W1NPO 228, KA1EPO 191, N1BQG 138, N1ER 135, K1BZD 133, K1CB 104, K1ABO 90,K1BA 84, W1CE 75, WA1DXT 73, WA1LPM 70, KA1FIP 68, KA1AMR 49, WA4STO 49, WA1FNM 32, N1CKN 30, W1MJ 24, W1QLL 12, KA1DJV 6, K1LCQ 6, KA1EID 4, W1ZHC 3, K1OGF 2, WA1FCD 0. (Apr.) N1ER 107. (Mar.) N1ER, 108.

MAINE: SM, Cliff Laverty, W1RWG — SEC: KL7IJG. STM: AK1W. PIO: KA1TJ. TC: KQ1L. OO/RFI: W1KX. BM: W1JTH. ACC: KB1JF. SGL: K1NIT. Providing comms in Lewiston Triathlon were WA1SCQ W1WYX W1BMX K1YXO WA1JZP N1CIQ & KA1BQR. Providing comms for Spec Olym at Colby College were K1AII W1SIN WA1JZP W1TGY & W1JTH. Mid Coast Amateur Rptr Club held successful annual picnic/meeting at Warren and elected K1JHN, pres.; N1CST, v.p.; KA1FKS secy/treas.; W1RJP, director.

Net	Sess.	Checkins	Tfc	NM
SGN	27	940	400	K1GUP
PTN	59	430	196	AC1G/WA1YNZ
CMEN	9	185	22	W1WCI
MPSN	4	61	17	KL7IJG
RACES	4	47	5	W1RWG
AEN	5	59	0	WA1YNZ

Tfc count in May to/from State of Maine 495, and involved W1LDF AK1W KA1KFC AC1G N1BLZ W1BU WB1GLH WB1GDB KA1GBS & W1RWG. PSHR: W1RWG N1BJW WB1GLH WA1YNZ AK1W KL7IJG. Traffic: AK1W 411, W1RWG 178, KA1KFC 163, N1BLZ 154, W1LDF 147, WB1BCP 129, WB1BYR 119, W1KX 115, W1ISO 111, W1BMX 107, WB1GLH 98, N1BJW 92, W1JTH 91, KA1JOJ 57, N1BME 50, WA1YNZ 48, K1UMZ 47, W1VEH 39, KL7IJG 34, W1WCI 20, KA1FTL 2, W1GKJ 10. KA1ENL 9, W1OTQ 8, K1TEV 4, KA1ENM 2.





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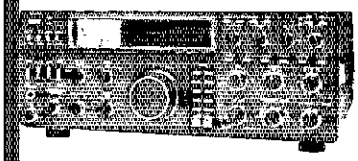

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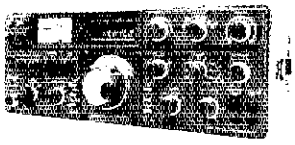

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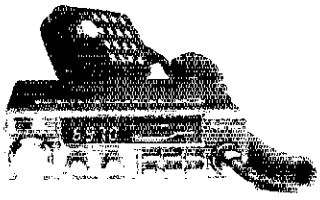

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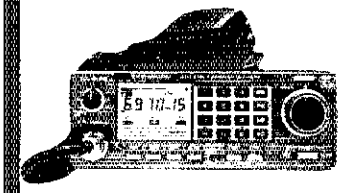

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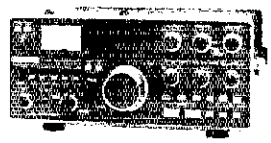

TS-780 List $999.95
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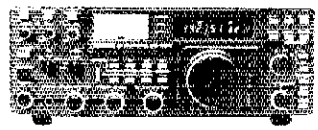

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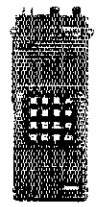

IC-2AT $219
IC-3AT $239
IC-4AT $239

All Accessories In Stock!

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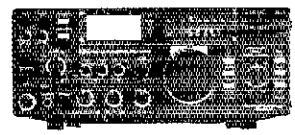
BP3 Battery Pack	$29.50
BP4 Battery Case	$12.50
BP5 Battery Pack	$49.50
BC35 Base Charger	$69.00
CP1 Lighter Cord	$9.50
DC1 DC Cord	$17.50
HM9 Speaker/Mic	$34.50
LC10 Leather Case	$34.95



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Compact General-Coverage
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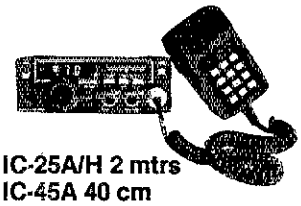

IC-25A/H 2 mtrs
IC-45A 40 cm
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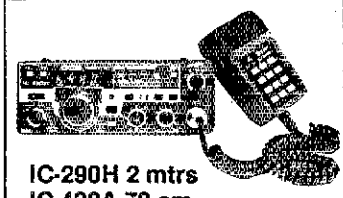

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Special
Price!

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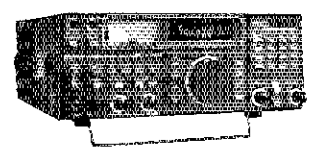

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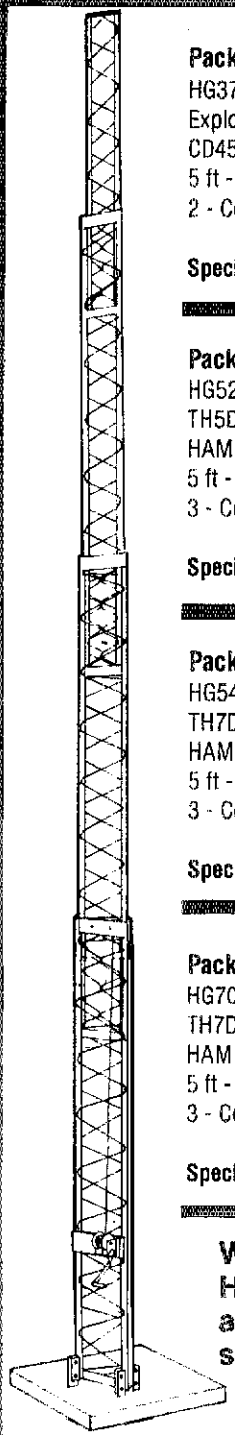

Package #1

HG37SS 37 ft Tower	List	$844
Explorer 14 Triband Antenna	List	$453
CD45II Rotor	List	$196
5 ft - 2 in. Diam Mast	List	$52
2 - Coax Arms	List	$26
	Total List	$1571

Special Freight Paid Package Price $1249!

Package #2

HG52SS 52 ft Tower	List	$1234
TH5DX Triband Antenna	List	$575
HAM IV Rotor	List	$303
5 ft - 2 in. Diam. Mast	List	$52
3 - Coax Arms	List	$39
	Total List	$2203

Special Freight Paid Package Price $1749!

Package #3

HG54HD 54 ft Tower	List	$1927
TH7DX Triband Antenna	List	$665
HAM IV Rotor	List	$303
5 ft - 2 in. Diam. Mast	List	$52
3 - Coax Arms	List	$39
	Total List	$2986

Special Freight Paid Package Price $2399!

Package #4

HG70HD 70 ft Tower	List	$3106
TH7DX Triband Antenna	List	$665
HAM IV Rotor	List	$303
5 ft - 2 in. Diam. Mast	List	$52
3 - Coax Arms	List	$39
	Total List	$4165

Special Freight Paid Package Price $3399!

We can substitute other HyGain antennas, rotors and accessories at similar savings—Call today!

ROHN TOWER TRUCK LOAD SALE!

Save a bundle on your new Rohn Tower during our summer 1984 **Truck Load Tower Sale!**

Rohn Tower Co. will be expediting Tractor Trailer Loads of all popular models to Texas Towers during this special promotion—These high volume purchases will allow unprecedented savings on Rohn Towers and accessories!

Even Rohn's big **55G** model Tower is included in this special promotion!

Rohn Guyed Tower Kits

Height	25G Price	45G Price	55G Price
40 ft	$ 469	$ 839	$1049
50 ft	$ 519	$ 949	$1189
60 ft	$ 569	$1059	$1319
70 ft	$ 619	$1169	$1459
80 ft	$ 779	$1469	$1599
90 ft	$ 829	$1589	$1899
100 ft	$ 899	$1699	$2039
110 ft	$1089	$1819	$2189
120 ft	$1149	$1939	$2329

Above Tower Kits are **complete** with factory recommended accessories including Mid-Sections, Top Section, Base Assembly, Rotor Plate, Guy Brackets and Torque Bars, Guy anchors, Turnbuckles, Guy Wire and associated connection Hardware.

We can **substitute** items and/or **custom design** your system at similar savings. Just let us know what you need!

All above Guyed Towers are shipped Freight Collect F.O.B. our Dallas Texas warehouse.

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NEW HAMPSHIRE: SM, Robert C. Mitchell, W1NH — STM: N1NH. NMs: N1NH KK1E KI1M. Great Bay RC Novice class to start in Rochester Sept. 25. Contact W1HJT. N1CWB now Extra. The Seacoast Emergency Net new frequency is 146.805 (Portsmouth repeater). KA1FQZ now Advanced. KS1S came out of the woods to attend Deerfield fleamarket. KN4F in Tennessee needs NH on 160. EC W1FYR and others supplied communications for Red Cross during the Keene flood. K1PQV's signal is back up; antenna tuner no longer a dummy load. Amherst club plans fox hunt activities for the Fall. EC reports from N1ACB & W1FYR. KI1M plans next New Hampshire ARA meeting in August. Effective immediately, traffic reports not received by 7th of the month will not be published. Enjoy the summer. Traffic: KK1E 320, N1NH 229, N1CPX 216, W1FYR 178, W1TN 157, KI1M 125, AK1E 87, K1YMH 87, K1PQV 58, W1MHX 49, W1ALE 40, WB1CFP 37, WB1GXM 36, N1AKS 33, K6UXO 32, W1CUE 28, K1TQV 17, KA1HPO 15, W1VTP 14, KA1HKB 13, N1ALM 6. (Apr.) W1FYR 68, KA1HKB 17, K1TQY 10, W1OKU 6, K1OIQ 3.

RHODE ISLAND: SM, Gordon F. Fox, W1YNE — Acting SEC: KB1G. STM: W1EOF. TC: AB1D. NM: WA1OSL. ACC: N1BEE. SGL: K1DA. KA1EK upgraded to General class, and was top RI station in Novice Roundup. Sorry, but that's all the info that was received this month. Traffic: W1EOF 994, KA1KML 663, K1AOS 67, KA1IEK 59, WA1CRY 57,WA1CSO 33.

VERMONT: SM, Reed Garfield, WB1ABQ — This is my final activity report. I want to thank all the officers who have worked with me for their support. Pete, AE1T, is our first BM, Joe, W1KRV, our first SGL, and Gerry, KA1AKI, our first ACC. With Bob, W1RNA, as SEC and "asst. SM" and Bert, N1ARI, as STM, we have had one of the best ever VT ARRL staffs. Many thanks to all. Also want to thank all VT hams who have supported me. Best of luck to Ralph, KD1R, your new SM. Very 73. Nets — VTN (NTS) 31/133/70, VFMTN 31/418/64, VSBN 31/518/137, GMN 27/386/35, Carrier 27/660/30, VPN 4/132/5. Traffic: N1ARI 134, AE1T 75, W1KRV 68, N1COB 43, W1OAK 32, KT1Q 13.

WESTERN MASSACHUSETTS: SM, Don Haney, KA1T — OO/RFI: N1CM. PIO: WB1CJH. SEC: WB1HIH. STM: W1UD. TC: KA1JJM. Is your club planning a Novice course this fall? Lots of interest in new licensees since STS-9 and Grenada, so take advantage of it while we can attract some additional hams. By the way, the STS-9 videotape, available from ARRL Hq., is great. Would be a good program for your club if you haven't seen it yet. Montachusett club's first flea market very successful. They had ideal facilities. Club newsletter editors, please include KA1T on your mailing list; I enjoy keeping up on your club doings and they provide info for this report. PSHR: WB1HIH W1PUO W1KK K1JHC KA1T. Traffic: W1PUO 303, W1UD 143, KA1T 78, K1PUG 71, WB1HIH 65, W1KK 61, K1JHC 39, WA1OPN 32, K1IJV 25, W1SJV 12, WA1MJE 5, W1ZPB 4, WB1HKN 2.

NORTHWESTERN DIVISION

ALASKA: SM, David W. Stevens, KL7EB — STM: KL7T. SEC: KL7SQ. PIO: NL7CP. OO/RFI: AL7FL. Congrats are in order for Daniel Stevens, KL7WM, being elected president of Anchorage ARC. KL7QS informs me of a new state Dept. of Emergency Services agreement with Federal Emergency Management Agency. Contact KL7EB for the loan of some excellent VHS tapes describing public service and amateur radio. These VHS tapes are excellent for club meetings or public display. The new Snipers Net manager is KL7JKW. Traffic: NL7BE 79, AL7FJ 75.

IDAHO: SM, Lem Allen, Jr., W7JMH — STM: W7GHT. SEC: KD7HZ. PIO: WB7PFQ. OO/RFI: KU7Y. CLUB NEWS: Twin Falls Club furnished 2-meter comm for Walkathon for March of Dimes May 5. KC7FS organized the group of 15 amateurs, who furnished 110 man-hours of time. Nice job, gang. Thirty-five hams from the Boise Club furnished comm on 2 meters for the Handicapped Special Olympics at 7 Boise locations May 29-31. Our hats are off to you who helped. PEOPLE AND THINGS: W7AXL has sent 6028 weather reports to the Denver Weather Center since 1963. WA7GSM has sent 3060 such reports since 1966. Congrats to two dedicated fellows! ARRL MATTERS: W7JMH KD7HZ and WB7PFQ attended NW ARRL Convention at Seaside June 1-3. Many interesting Seminars attended, Much ARRL material covered. NET REPORTS:

Farm	3935	8 P.M. Dy	31	2007	44
Idaho CD	3990	8:10 A.M. M-F	23	729	23
IMN	3635	9 P.M. M-F	22	279	97
SW ID 2M Emg	146.34/94	8:30 P.M. Sn	4	205	0

GENERAL: Please notify SM when you upgrade so we can publish it here. Traffic: W7GHT 148, W7JMH 19.

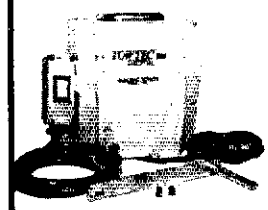
MONTANA: SM, Les Belvea, N7AIK — New calls: KA7JBI, now KD7VG; KA7RHI/N7GDZ; KA7FBX N7GEA; WA0NGR/N7GAE. Many members from the Capital City ARC, under the direction of EC KS7R, participated in a local SET. Many thanks to N7AYE and crew from Glasgow for hosting the annual N.E. Montana picnic at Ft. Peck. N7AFS DID IT! WB7AZJ from the Gallatin ARC led a geology field trip though Yellowstone Park using 2 meters, and wound up with a camp out at the QTH of W7OTJ. Thanks to N7DKY, the Great Falls ARC donated an *ARRL Handbook* to their library in memory of W7MM. PSHR: KF7R.

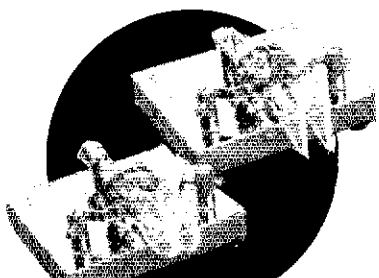
Net	Sess.	QNI	QTC	Mgr.
MTN	31	1420	171	KB7SE
IMN	22	279	97	KY7I
MSN	4	42	0	KØPP

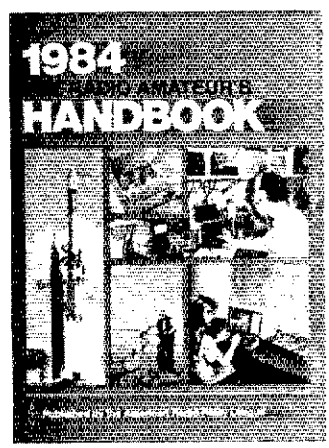
Traffic: KF7R 108, WB7WVD 89, N7AIK 37.

OREGON: SM, William R. Shrader, W7QMU — STM: W7VSE. SEC: N7CPA. PIO: KC7YN. SGL: KA7KSK. ACC: WB7WTD. RFI: AK7T. OO: N7SC. TC: N7ENI. Upgrades: KA7SOU (Novice); KA7PVL KA7RJP (Adv); K7TJR (Extra); KA7SUL (Tech). AA7C was named "Citizen of the Year" in McMinnville. N7DRP won the first prize at PR "Kenwood Day." A wine produced by N7BLS won recognition in world competition. W7AAI has retired from the North Bend School District after 30 years service. WB7RQG was awarded a "Fred Harris Fellowship" by the Medford Rotary Club. KA7FEE KA7FEF and WA7GFE are new Official Observers in Oregon Section. WA7JAU was recently honored by the Saudi Arabian government for "Medical Excellence" for a resuscitation of a cardiac arrest victim. WA7TYD N7ASC and W7TZO have spent a lot of time and effort getting W7TZO/R on Elk Peak, east of Reedsport, to fill in a previously uncovered 2-meter area. Congrats to the whole bunch; it's quite a list this month. ARRL NW Division Net has been moved to 3893 kHz starting first Monday in July at 9 P.M. West Coast time (PDST/PST), so General Class can participate. OSN totals are QNI 528, QTC 477. Traffic: W7VSE 590, KX7W 262, AL7W 229, W7ZB 154, K7OVK 125, WB7OEX 96, KX7T 83, KV7F 71, N7BGW 48, WA7VTD 24, W7LNE 16, K7TDX 15. (Apr.) WB7OEX 69, W7LNE 23, W7DAN 4.

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	3219	291	31
WSN	3590	0245/0545	652	247	62
PSTS	145.33	0130/0830	176	156	62
NTN	3970	2000	1130	76	31
EWTN	146.04	0130/0830	90	75	62
NWSSB	3945	0230	681	40	31

Hamfests, etc.: Western Country Cousins 7/27-29; Okanagan HF 7/28-29; NW DX Convention, Beaverton OR 7/28-29; NW Country Cousins Wasougal WA 8/3-5; CBN Picnic Swauk Park 8/4-5; Tacoma HF PLU 8/11-12; Int'l Picnic, Port Angeles 8/19; Walla Walla HF 9/22-23. The Yakima HF was good in all around, attendance, weather and good cheer. Vancouver HF (except seminars) was in one building this year. It had a big flea market/dealer area. The event was very well attended. The NW Division Conv. at Seaside, OR, was reported to have a record crowd. Hams were able to talk to ARRL Pres. W4RA and WB9IHH from Hqs. Roy Neal's banquet talk was great. The NW Chapter QCWA elected K7AJT Chairman and W7CKZ Vice Chairman. Olympia ARS: WB7UEU reports the Olympic Marathon Trials comms. was successful with hams assisting from OARS, RCT, Mason Co. ARC, et al. PIO W7CKZ is working up the media stories. He is also working on promotion for "Amateur Radio Week" Sept. 10-16 and is covering a satellite dish antenna ordinance in Olympia. Chehalis VARS: 11 mbrs work the Historic Run with great success. KA7NZC is new PR committee chairperson Lewis Co. EC KA7EOV spoke on emerg. comms. KD7AB says their swapfest was a success. WWDXC: WA7WKC presented a good program on "The Voice of the Andes" station, HCJB. Mt. Baker ARC: 10 mbrs provide comms. for M.O.D. Wakathon and 13 work on Ski to Sea Race. Issaquah ARC goes first class for Field Day this year with special FD T-shirts. Tri-Cities ARC has super busy weekend with 51 hams working on M.O.D. Walkamerica, Columbia River Rowing Regatta, S&R exercise, Fun Run and a Bike-a-thon. Lots of good public serv.! Lower Col. ARA graduated 19 new Novices who are waiting for their calls. Congrats! N7CFA is awarded "Ham of the Year" at their successful Spring Dinner, organized by KA7LCB. Kamiak Butte RA 28 Novice/Tech/Gen. licenses were issued to their class members with more to come. KBARA reports their Pullman Volunteer Exam. team presided over the first vol. exams in the Inland Empire (except for Hamfests) held under the 7th Region VEC. Congrats to all the tfc handlers for a fine job, especially our four BPLs moving lots of Mother's Day traffic. Traffic: WB7WOW 1470, W7DZX 761, KD7ME 618, KS7I 529, KR7L 337, W7LG 274, N7ANE 169, K7GXZ 165, W7HNA 120, K7CTP 86, W7GB 83, WA7BDD 78, KR7F 78, W7IEU 51, W7APS 43, N7FXM 19, KD7G 19, W7LUP 10, K7AJT 8, K7OXL 8. (Apr.) N7DDP 82.

PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W6RGG — ASMs: W6ZF N6DHN. EC: W6LKE. STM: NI6A. I had the pleasure of speaking to EBARC on ARRL awards and contests. While there I also got to meet many of our section's traffic handling stalwarts! Their Salvation Army meeting room and emergency station are very nice indeed. New members are KY9G and KA6ZCA. HARC is still looking for a new editor for *The Chewed Rag*. The latest issue is being put out by Pres. N6BNY. N6IUH has volunteered to do the next issue! *QRZ NBARA* has a slick new format, thanks to editor N6BLG's printer. LARK is very active working with their city planning commission on an unneeded tower ordinance. They were well prepared when called upon by the commission to provide information and comments. MDARC is also involved in an antenna issue in the City of Clayton. It was another well organized presentation. Traffic: W6VOM 128, K6AGD 119, NV6T 110, WB6DOB 98, K6APW 83, NI6A 82, WB6UZX 33.

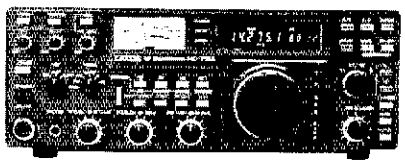
NEVADA: SM, Leonard M. Norman, W7PBV — SEC: WB5VDV. STM: W7BS. DEC: K7HRW. ACC: KX7Q. W7BS reports W7UIN is Silent Key. K7ZOK reports W7JUO is Silent Key. N7NV and W8IXD/7 are OCWA members. WADG designated a Special Service Club KA7BRF N7EAG N7FNI W7GRY K1HNY/7 WD5IZC/7 WB6NSG/7 KD7PD and W7UPS provided communications for Winnemucca Walkathon. WA7BWF W7CFF WA7SDO and WA6VVC/7 provided communications for Elko Walkathon. New WADG officers: N7RH, chairman; WB7TUT, vice chairman; N7EQV, secy.; N7DOD, treas.; WA6ICB/7 KB7VT N7DFY, board members. NNARA officers: WA7BWF, pres.; W7GRY, v.p.; N7EAG, secy/treas. W7BS W7GR K7AZ WB7EIV WB7ELX WB7UXO WA7KCD N7FEM N7KPQ N7FEQ KA7BYM and KA7CYB provided communications for Reno Junior Olympics. Traffic: W7BS 37, W7PBV 11.

PACIFIC: SM, James Wakefield, AH6CO — KH6GS has new 2-element 40M beam up. KH6QI attended the Los Angeles Chapter of YLRL on June 2. QI also has a new TS-820 set-up with VFO, speaker and scope to match. Also TL-922A Linear and MN-200 Tuner and TR3A beam. On Maui, WH6AZH and WH6AZI are new Techs. ARRL bulletins on Maui Emergency Net on 147.63/.03 at 1900W on Monday. KH6B has new Ten-Tec Argosy. Sad to report a Silent Key: KH6OA passed away on May 20. He was a personal friend of mine of many years from W6-land. Look for KH6B as T32AV in Nov. KH6HQ and KH6INK are now permanent in W6-land. Thanks to them for their service to HARC over the years. Hawaii West ARC handles communications for the Kam Day Parade. W6NFE back in Kona again. ARRL Bulletins on Kauai ARC net at 0600 Tuesday on 146.31/.91. Aloha. Traffic: KH6S 54, KH6HIJ 41, KH6RQ 22, KH6H 15.

SACRAMENTO VALLEY: SM, Ron Menet, N6AUB — SGL: WB6WFG. OO/RFI: WB6TNC. STM: KY6Q. SEC: WA6ZUD. Nevada Co. ARC very busy with public service events: Nugget 50-Miler, Sto-pokes 10K, Gold Country Marathon. STM & OO/RFI Coord. still searching for a few good operators to serve as OOs to to be on section Health and Welfare traffic team. Please send all formal traffic reports, CD-210, to STM KY6Q, USING A CUT-OFF DATE OF THE 25TH OF THE MONTH, so they can get to me in time to be included here. Do you have ideas on how to improve the workings of the Section? Let me or one of the other section officials know. All suggestions will be considered. Nominations for Pacific Division Court of Honor are now being accepted. Send particulars and background information to me. Must be ARRL member, in good standing to qualify. Let's make sure we have some nominees from SV Section, 73, Ron. Traffic: WA6WJZ 186, N6CVF 83, WB6CLD 70, WB6SRQ 38, WA6ERZ 12, WA6ZUD 10, KY6Q 4, N6EPG 2.

SAN FRANCISCO: SM, Bob Smith, NA6T — All the DEC positions are filled in the section. Volunteers are needed for the EC positions within each region. Contact SEC KE6LF if you are interested. MARC now has emergency

ICOM KENWOOD YAESU



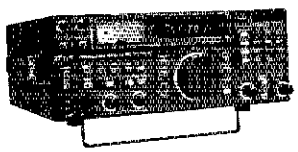
		Regular	SALE
IC-751	9-band Xcvr/.1-30 MHz Rcvr	$1399.00	Call
PS-35	Internal power supply	160.00	144.95
FL-52A	500 Hz CW filter	96.50	89.95
FL-53A	250 Hz CW filter	96.50	89.95
FL-33	AM filter	31.50	
RC-10	External frequency controller	35.00	
CR-64	High stability reference xtal	56.00	
IC-745	9-band Xcvr/.1-30 MHz Rcvr	$ 999.00	Call
PS-35	Internal power supply	160.00	144.95
CR5-455K5	2.8 KHz wide SSB filter	TBA	
IC-271H	100w 2m FM/SSB/OW Xcvr	TBA	
IC-271A	25w 2m FM/SSB/CW Xcvr	699.00	Call
IC-471A	10w 430-450 SSB/CW/FM Xcvr	799.00	Call
PS-25	Internal power supply	99.00	89.95
EX-310	Voice synthesizer	39.95	
IC-290H	25w 2m SSB/FM Xcvr		Call
IC-22U	10w 2m FM non-digital Xcvr	299.00	249.95
EX-199	Remote frequency selector	35.00	
IC-25A	25w, 2m, gm leds, up-dn-TTP mic.	359.00	319.95
IC-25H	as above, but 45 Watts	389.00	349.95

IC-27A 25w 2m mobile Xcvr ..... TBA

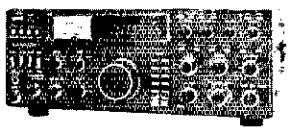
IC-45A	10w 440 FM Xcvr, TTP mic.	399.00	359.95
EX-270	CTCSS encoder	39.00	
BU-1	Memory back-up	38.50	
RP-3010	10w 440 MHz FM repeater	999.00	899.95

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

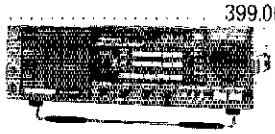
SPECIAL SALE

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-430S		Call

TS-530SP	749.00	Call
VFO-240	169.95	
AT-230	194.95	
AT-130	144.95	
TS-430	895.95	Call
PS-430	149.95	
AT-250	399.95	
TS-130SE	629.95	Call
TS-660/GMI	699.95	Call

TL-922A 2K AMP	$1229.95	Call
SM-220	359.95	

TW-4000A	599.95	Call
VS-1		
TR-9130	529.95	Call
TS-780	995.00	Call
TR-7950	399.00	
TM-401	399.00	



R-2000 Short wave receiver ..... Call

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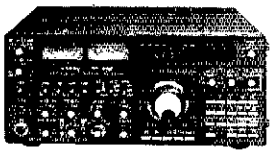
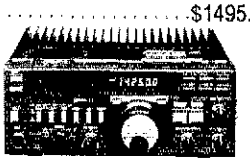


		Regular	SALE
FT-One/All	Optional (except key unit)		1995.00
FT-980		$1495.00	Call



FT-757GX		829.00	Call
FT-726R		899.00	Call
Optional modules in stock			Call
FT-230R		359.00	Call
FT-730R		399.00	359.00

SPECIAL SALE

FT-208R, FT-708R
FT-757GX, IC-751 W/PS
IC-745

FT-203R	New	239.00	215.00
FT-208R		319.00	279.00
FT-708R		319.00	Call
FT-102			Call Special
FRG-7700		549.00	395.00

Short wave receiver

MIRAGE

B-3016	239.00	199.00
B-1010	319.00	289.00
B-1016	279.00	249.00
B-23	89.00	79.00

SANTEC

ST-142	Call
ST-220	Call
ST-440	Call

AEA

CP-1/20	229.00
CP-1/64	229.00

KANTRONICS

Interface	169.00	129.95
Interface II	269.00	239.00
DK-1000	595.00	Call

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power at the HAFB clubhouse station. If you get a chance visit their clubhouse because they have a FIRST CLASS operation. Next FCC exams are scheduled for Nov. 5-9. Cutoff date for applications in Oct. 15. DON'T FORGET. W6BIP and WA6DJI won both the CW and & SSB Multi-op 1983 ARRL SS for the Pacific Division. The ARES/RACES groups in SF Co. are being restructured. N6ECT took on the packet radio duties for the City. Contact KE6CD if you are interested in the ARES program for SF. SCRA's CDF-VIP program is in full swing; contact KD6LC for info. SCRA flea market is Sept. 15 at Sebastopol Community Center; contact N1AL. FWRA-HARC Field Day used ARES members to teach EMERGENCY COMMUNICATIONS — just what Field Day is for! Traffic: W6IPL 530, K6TWJ 143, K6TP 137, KK1A/6 110, KE6LF 21, WB6RTE 15.

SAN JOAQUIN VALLEY: SM, Charles McConnell, W6DPD — SEC: WA6YAB. STM: N6AWH. TC: WA6EXV. The Tulare Co. ARC is experimenting with RTTY on 146.28/88 on Tuesdays at 8:30 P.M. The 42nd Fresno Hamfest commemorated the Fresno Club's 50-year affiliation with ARRL. W6DWE, the vice president in 1934, attended. Director Stevens presented the 50-year plaque. W6YQM won the grand prize, and KA6HME won the pre-reg prize. Congrats to the following who upgraded: General KA6YNA; Tech KB6BSE KB6BSD KB6BSF KA6RBS KB6CEM KB6CEL KB6DXZ KB6DYA KB6DXM KB6ECF KB6EDT KA6CHL KB6DXX KB6DXK KB6EBI; Novice KB6FEK KB6FEL KB6FEM KB6FEN. K6CZO has a TR7950. WB6JQC has a Collins S-line. WB6GIT has an IC730. WB6ITM has an IC02AT. K6KDM and WB6DBJ have IC37As. Emergency Coordinators are needed in Mariposa and Mono Cos. Traffic: N8AWH 125, W6SX 19, WA6YAB 15, W6DPD 7.

SANTA CLARA VALLEY: SM, Rod Stafford, KB6ZV — SEC: K6ITL. STM: W6PHT. TC: K6HLE. ACC: W6MKM. PIO: WB6BPU. W6PHT reports that there is a new net in Santa Cruz Co. Net control is KH6PP and the net is devoted to training amateurs in the handling of emergency and non-emergency traffic. The new net meets at 8:30 P.M. (local) on Mondays on 146.79. WVARA members KU6U and NV6Z recently set up a 40-meter HF station at Casa de Fruta near the Pacheco Pass Highway as a demonstration of Amateur Radio. All reports indicate it was a public relations success. It was operated in connection with the Cal. Division of Forestry's "V.I.P." program. W6QZE and WB6UGG were active in recruiting and administering the "Red Flag Patrol" on July 4th for CDF. This is a program involving numerous amateurs who patrol the very dry foothills in the Bay Area spotting fires. This has been, and continues to be, a very successful volunteer program for CDF and good public exposure for the amateurs. Monterey Co. recently presented a Certificate of Appreciation to WD6EKR, EC for Salinas Valley, for the fine work that all the Salinas Valley ARES members have done in that area over the recent years in handling emergency communications. The San Lorenzo Valley RC received a Certificate of Appreciation from the Santa Cruz Co. Board of Supervisors for contributions of time and effort during the last few winters handling emergency communications. The Gabilan ARC and the IBM ARC handled communications for a 100-mile bike tour in Gilroy recently. SPECS worked the "Streets of Palo Alto" 10-km race through downtown Palo Alto and used the W6ASH repeater. No communication problems in the household of N6FAD. His wife is KB6BHM, his daughter is KB6CRC, his son-in-law is KB6CRD and his son is waiting for his ticket! PAARA club prez KB6WP recently wrote an interesting and useful article for *Paaragraphs* about the various kinds of coaxial cable that are available and which ones should be used to minimize loss. Palo Alto EC WA6NIL organized the communications for the annual Palo Alto City Tennis Tournament. Forty two local amateurs participated in the event. W6APZ/R and W6ASH/R were used for the event. WA6VEF gave talk to PAARA on the CQ World Wide Phone Contest in JA-land. KB6ZV gave a talk on Amateur Radio to the Scotts Valley Rotary Club. Traffic: W6YBV 209, W6KZJ 185, W6PRI 93, W6PHT 39, KH6PP 6. (Mar.) W6ASH 12.

ROANOKE DIVISION

NORTH CAROLINA: SM, Rae Everhart, K4SWN — SEC: AB4W. STM: K4NLK. BM: K4IWW. SGL: AB4W. PIO: WA4OBR. ACC: K4SWN. Top May News is more tornadoes and flooding hit STOKES CO. with 1 fatality. Amateur Radio answered the call. Carolina Evening Net and JFK Net have merged to form the new North Carolina Evening Net (NCEN) on 3923 kHz daily at 6:30 P.M. Broader section coverage and checkins. Greensboro Weather Service (N4KEE) has established Triad Skywarn Weather Net each Monday at 8:30 P.M. on 146.19/79 WB4IKY/R. ARRL Section Net 1st, 2nd, 3rd, 4th Thursday at 8 P.M. on K4ITL's link repeater system (2M) with EC/DEC training, traffic handling/NTS discussion, SM Q&A session regarding League affairs, section-level appointees meeting. Like to have all in section meet with us. Thanks to all who have made new nets possible. Congrats to W4BFB which is our first Section Special Service Club. To Western Carolina ARS for becoming the first FCC-approved VEC in the 4th call area. Want to become a VE? Radiogram me for an application. WANTED: Qualified League member for section OO/RFI & TC. Interested? Let me know. Reminder that FCC is scheduled to give exams Oct. 2. All 610s MUST BE in Norfolk by Aug. 31. Silent Keys: W4LSO K4GCN. ARRL Charter Life Members: W4ACY, W4RVE. Public service in Amateur Radio. Do you give your talent as a Radio Amateur? Do we give in the public interest? Does your club have a good relationship with your community? Check with PIO WA4OBR; let him help with public relations. He's looking for PIAs. Let him know if you or club is interested. Mark your calendar for big Shelby Hamfest Sept. 1-2. It's the granddaddy of them all. ECs, start making plans for SET Oct. 20-21. Chasing DX. Send me your news. NC Amateurs given booth at state fair. Need your help and clubs to man booth operating station 3-4 hour, schedule. Interested and can help. Advise immediately. T-shirts available to those who helped with tornado disaster. Contact your EC or SEC for details. Ham Watch license plates coming. See your EC or SEC for details. Traffic: K4NLK 255, WB4WII 220, WD4LRG 185, K4JHF 164, KA4EYF 139, WB4HRR 136, NJ4L 104, WB4N 88, WA4MNR 81, K4IWW 56, KU4W 55, WA4OBR 53, WD4CEB 46, WD4DAR 46, NT4K 45, WA4SRD 41, WB4CYN 35, NE4J 35, K4SWN 30, N4CJJ 24, WD4EQK 23, KA4KJI 23, K4RWV 13, K4YJB 13, K4GI 11, K4DDY 10, WA4PID 9, WD4HTE 6, KB4FWL 5, W4PRG 5, W4ZCV 5. (Apr.) KA4EYF 141.

SOUTH CAROLINA: SM, Jimmy Walker, WD4HLZ — For some reason, South Carolina seems to have a problem finding CW operators who will do CW net liaison work. This should be a great concern to all of us. We have an excellent CW training net called the Carolinas Slow Net. CSN meets now at 7115 kHz at 2200Z/6 P.M. EDT. They operate at 10 to 15 WPM but will gladly QRS. You learn

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RADIO WAVE PROPAGATION
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by checking in and participating. The net lasts about 30 minutes and does handle traffic. A CW training net exists to help you learn CW net operation and improve your skills. I can assure you a hearty welcome! Encourage club members to go to CSN with you. Listen a couple of times to get the idea then check in. You'll not be asked to handle traffic until you are ready. CSN Net Manager is Gale, NJ4L. For info contact WØIKT. Our SC nets' future depends upon our operators being encouraged to learn CW net procedures and represent us on CN/E, CN/L, D4RN and 4RN. So break out the key; you'll be encouraged by CSN. Traffic: (Apr.-May): K4ZN 413, W4FMZ 255, K4WJR 245, W4NTO 189, W4ANK 149, WØIKT 125, KA4LRM 108, WB4UDK 76, K4FRX 65, K4ZB 63, WD4FJP 43, WJ4P 14, W4DRF 8, WA4JWS 8, KA4AUR 7, WA4MIY 4.

VIRGINIA: SM, Claude Feigley, W3ATQ — STM: WD4ALY. SEC: WB4UHC. ACC: WD4KQJ. OO/RFI: W4HU. PIO: WN4VAU.

Virginia Traffic Net (VTN)	1 P.M.	7260
Virginia Sideband Net (VSBN)	6 P.M.	3947
Virginia Slow Net (VSN)	6:30 P.M.	3680
Virginia Net (VN)	7/10 P.M.	3680
Virginia Late Net (VLN)	10:15 P.M.	3947

Congrats to Ethel, K4LMB, for receiving "The Special Achievement Award" at this year's Dayton Hamvention. She received the award in recognition of her work in organizing the "YLRL." WN4VAU acted as NCS for the Mid-Atlantic Weather Watch Net during the May 30 eclipse. SEC WB4UHC reports 5 DECs, 20 ECs and 12 OESs reporting this month. W4HU WB4J WB4CGI and KE4EQ are busy as "OO" stations. Twenty nine stations with N4EXQ as NCS participated in the Annual Whitewater Canoe Race on the James River. The section needs more Official Bulletin Stations (OBS). Anyone interested contact W3ATQ for details. The 1985 National Boy Scout Jamboree will be held at Fort A. P. Hill July 24-30, 1985. Plans are to operate the on-site station 24 hours-a-day. Operators will be needed; contact the "SM" for details. If this Jamboree is like the last one, we will need plenty of help in handling the traffic, it's not too early to start making plans. If you are interested in being a volunteer examiner, send your name to the League Hq. See you at the Roanoke Division Convention, Virginia Beach, Sept. 22-23. Traffic: AA4AT 604, WA4CCK 597, N4GHI 545, K4KDJ 292, N4EXQ 288, W3ATQ 276, KR4V 218, WD4ALY 190, K4JST 184, WD4OCW 166, WB4PNY 137, KB4WT 118, KA3DTE 94, K4JM 90, WB2RBA 62, KA4IUM 59, WB4UHC 57, K4VWK 56, NT4S 53, KB4OG 46, K4GR 44, WB2OMZ 44, WB4EDB 40, NN4I 39, WB4KIT 37, KI4LO 37, KA4ZTB 37, N6ANQ 25, K4MLC 21, WB4DQZ 18, W4PVA 13, N4FNT 12, KM4X 12, K4LMB 11, W4LXB 9, WA4TVS 8, W4TZC 7, WB4ZNB 7, WA1VRL 6, KC4HN 2, W4KX 1.

WEST VIRGINIA: SM, Karl S. Thompson, K8KT — SEC: K8QEW. STM: KD8G. ACC: WA8CTO. SGL: K8BS. TC: K8CG. Thanks to all who attended and helped make LPM '84 a success. Congrats to all who upgraded in May. The 145.47 rptr is back on the air and wounding good. Tnx to W8WHQ and all who helped out. New rptr is on the air in Weston and is providing much needed coverage along I-79.

Net	Time	QNI	QTC	Sess.	NM	Freq.
Hillbilly	Noon Sn	135	18	4	KC8YU	14290
WVNN	6:15	179	31	31	KD8RD	3730
WVMD	11:45	782	43	30	W8FZP	7235
WVN	7:00	218	53	31	W8LYV	3557
WVFN	6:00	641	112	31	N8AJC	3900

Traffic: KZ8Q 158, WD8LDY 147, K8TPF 90, WA3NUI 82, KA8OGF 52, N8AJC 42, N8EMQ 40, KD8G 35, K8KT 33, W8FZP 30, K8QEW 28, W8HZA 22, WA8KCJ 18.

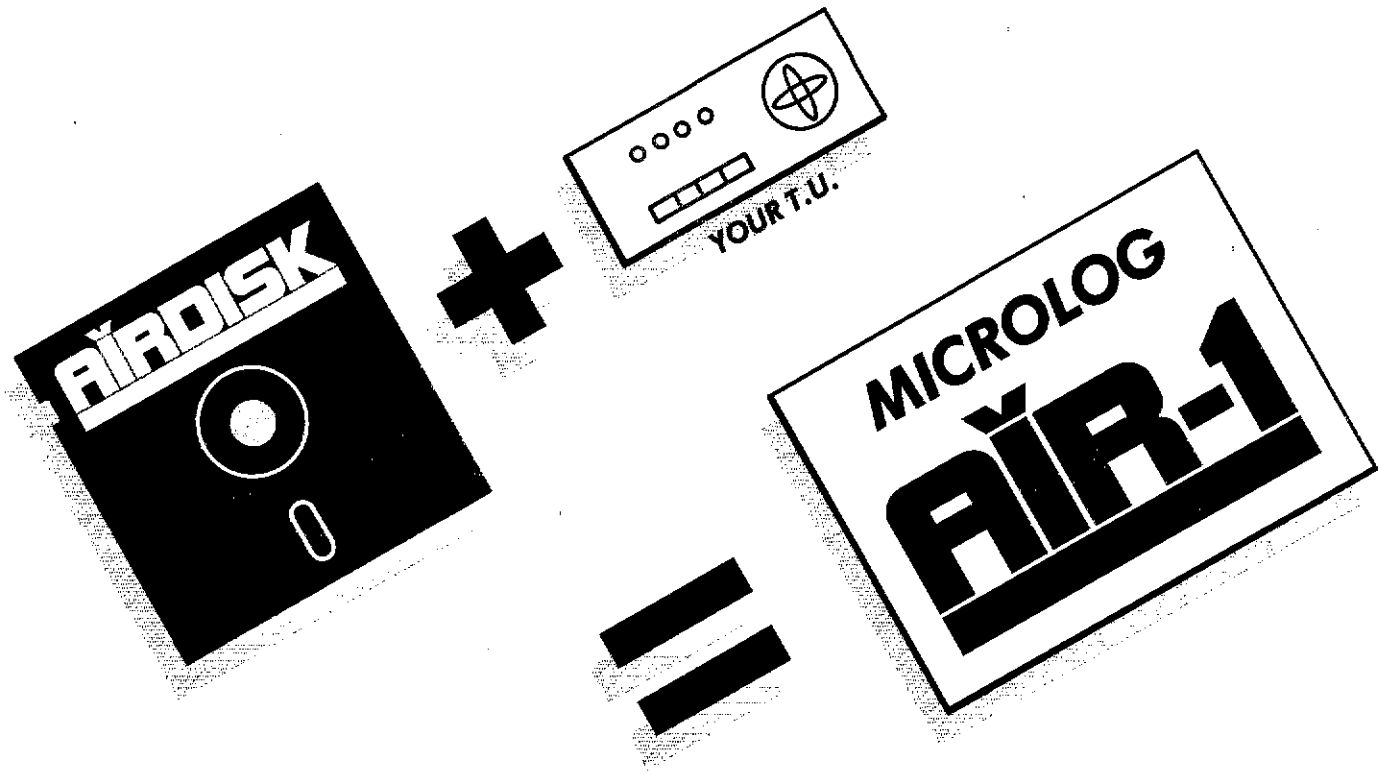
ROCKY MOUNTAIN DIVISION

COLORADO: SM, Bill Shetfield, KQØJ — SEC: WBØFQB. STM: WDØAIT. ACC: WBØDUV. OO/RFI: NCØF. TC: KQØP. SGL: WDØGQL. BM: WØMDT. At the recent Division Convention, "The Rocky Mountain Packet Radio Assn." was established. WBØDUV was awarded Section Amateur of the year. KØRZ was awarded Division Amateur of the year. Certificates of Merit given to KØCL WBØZID AAØL WAØHJZ & KØWOP. Congrats to all & also to the section winners in NM, UT & Wyo. WØBWJ was given an award from the division amateurs for his 25 years of service to the section, division & nation. He has asked me to convey his heartiest thanks to all. We in Colorado can be very proud that after 40 yrs the Maxim Memorial Award has been reinstated. This year's winner is our STM, Jon Willis, WDØAIT. Nominations came from all SMs. We are extremely proud that WDØAIT has become the 5th recipient of this prestigious award, a fine testimony to this young man's accomplishments. He brings pride not only to Colorado, but to the Rocky Mt. Division. He received $1000 & a trip to the Nat'l Conv. Pikes Peak ARC & ARA are scheduling Aug. picnics. WIMU is Aug 4th & 5th in Jackson, Wyo. Colo Junk Movers Swap is Aug 23rd in the metro area. NETS: Col QNI 716, QTC 83, inf. 218, time 758, 27 sess.; CWN QNI 132, QTC 84, time 593, 30 sess. CWXN QNI 2649, QTC 3147, time 2790, 31 sess.; HNN QNI 1436, QTC 95, inf. 229, time 1170, 31 sess. Traffic: NØBQP 2415, WAØHJZ 1463, KØIAN 643, WØACH 430, KØRXK 360, NØCXI 251, KAØCZW 206, WDØBSZ 166, KBØZ 114, WØLAE 86, WBØNHA 70, WDØAIT 60, WØEJD 36, W5HRS 30, WØNFW 27, WØLQ 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 7083 at 1930 local and handled 205 msgs with 208 stations in. New Mexico Breakfast Club meets daily on 3939 at 0630 local and handled 190 msgs with 889 stations in. Yucca 2-Mtr Net 78/18 & 93/33 handled 11 msgs with 437 checkins. Caravan Club 2-Mtr Net 66/06 handled 9 msgs with 166 checkins. SCAT 2-Mtr Net 66/06 handled 8 msgs with 447 checkins. Earlybird Net 735 ckins & 14 msgs. Vy sorry to report the passing of W5QNT. He will certainly be missed! Rocky Mt. Division Convention was a huge success. Over 1200 attended. Good to meet with W4RA, K1ZZ, N3AKD, KB1O & WB9IHH along with the other ARRL Officials. Congrats to W5HD on his award in Denver. Traffic: W5UH 249, W5JOV 232, W5DAD 154, W5ENI 77, N5EXC 63.

UTAH: SM, Ron Todd, K3FR — STM: W7OCX. SEC: NA7G. BM: WA7MEL. OO/RFI: KD7FL. ACC: KB7XO. PIO: N7BHC. TC: K7RJ. New club in Tooele/Dugway area is the CEDAR MTN ARC. Members of the Moab ARC responded to no less than three emergency situations and also manned the Friendship Cruise base station over the Memorial Day weekend. Good job, folks! Friends and family presented W7YPC a new IC-730 station as thanks for all the help Dee has provided as an Elmer over the years. Congrats to all who upgraded this season. To those who just missed, keep trying; it is worth the effort. Division convention in May was great. Sorry there weren't more from Utah there. If you would like me to make a club meeting, just drop

Now, turn the AIR-1 program loose on YOUR terminal unit . . .



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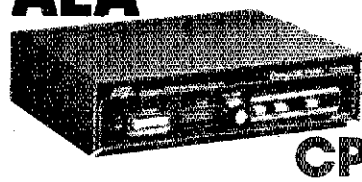

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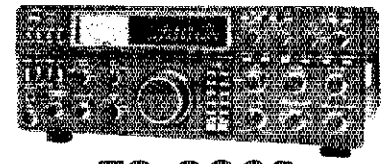

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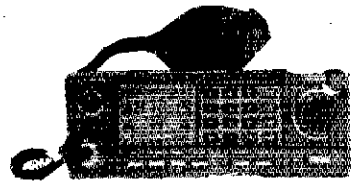

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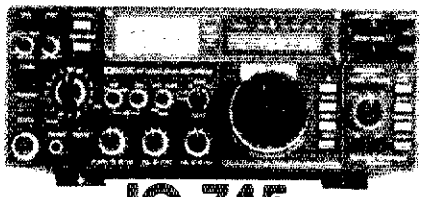

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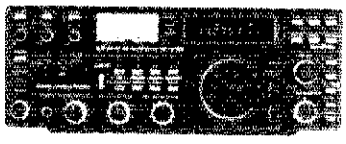

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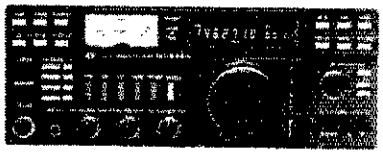

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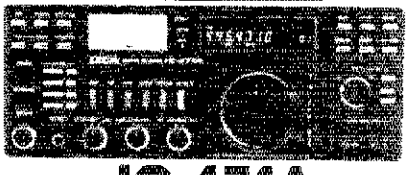

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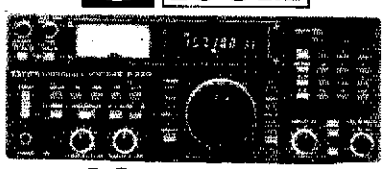

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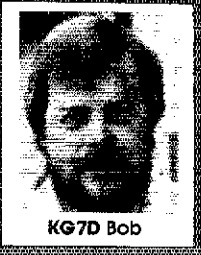

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WYOMING: SM, Dick Wunder, WA7WFC — SEC: W7TVK. STM: W0OGH. Congrats to Sam Zuckerman, W7FT, as the AMATEUR OF THE YEAR for the Wyoming Section. Also, congrats to Jack Hayes, W7CGK, for recognition of his contributions to Amateur Radio. Many thanks to KQ0U and his convention committees for hosting a very fine Rocky Mt. Division Convention. Wyo. now permits co-ownership of a vehicle in eligibility for Amateur Call License Plates, with applications due by October. Packet radio is now operational in Cheyenne, with more stations coming on the air soon. KD7AN has been active with the State Civil Defense in conducting ELT direction finding training and field exercises. Traffic: WB7NHR 232, W7RLA 71.

SOUTHEASTERN DIVISION

ALABAMA: SM, Joseph E. Smith, WA4RNP — SEC: N4DMA, STM: N4JAW, SGL: KA4WVU, PIO: WO4W, BM: KF4VV, OO/RFI: K4ELV. This month the Southeastern Division convention will be held at the Huntsville hamfest on Aug. 18th and 19th. I hope to see a lot of you there. I understand that exams will be given up thru Extra Class. I will have a section ARES meeting on Sunday in which you may air your feelings on any section or League matter. I invite all to attend. I'm sure there have been a lot of upgrades but I can't list them if I don't get the word. Drop me a line at the address on page 8 if you do something special or your club has a special activity or election or whatever. I still need someone for the section job of Technical Coordinator. If you think that you qualify see me at a hamfest soon or drop me a line and we can discuss it. Nets: CAND reports 1050 messages in 31 sessions with Ala rep 100% by WX4I and W4CKS. DRN5 passed 900 messages in 62 sessions with W4CKS WA4JDH WB4IXA W4WJF WX4I KC4GS and NW4X rep Ala. BPL: WA4JDH. PSHR: WA4JDH W4CKS WX4I WA4LXP WB4GTN. 73, for now. Traffic: WA4JDH 710, W4CKS 163, WX4I 89, WB4IXA 70, WA4LXP 62, NW4X 36, KB4GTN 32, K4AOZ 30, WA4RNP 25, W4DGH 12, K4HJX 10, WB4TVY 8, W4WJF 7, KF4VV 3.

GEORGIA: SM, Eddy Kosobucki, K4JNL — SEC: WB4ABY. STM & OO/RFI: K4VHC. ACC: WA4ABY. BM: W4BIA. PIO: WA4PNY. SGL: W4BTZ. TC: K4UDR. NWS: WA4PZD. Hope all had a gud FD. Send in the reports. If you have been an ARRL member for 25, 40, 50 or 60 yrs. U qualify for an award. Contact me. Our nets are now more important than ever. We all get tax at one time or another. With the world situations such as they are, we might get called on to do a job for our great nation. Try to check in to either GCN, GSN, Ga Tfc, GSSBN or ur local net. K4VHC, the section STM, informs me that he needs CW ops for both daily GSN skeds. Won't U help? The Confederate Sig Corps invites all to Madison on Aug. 25 & 26 for their hamfest. Bring the family for a real weekend. Georgia Tech's W4AQL real active on the recent Eclipse Net relaying info. Many clubs holding election of club officers this time of the year. Please keep me informed so that we can list them in this column. BGMRC in Newnan once agn active at Powers Crossroads. Kennehoochee ARC braved the heavy rains furnishing communications for the recent March of Dimes Walk-a-thon. Colquitt Co. HRS has FB General class going with WD4A & AA4P as instructors. Tnx guys. WA8IW's OSCAR 10 reports just outstanding. Wish all in that phase of the hobby could read it. I told all of U guys that the ladies of MALARC were going to make a name for themselves. They really had a lot of activities on tap at the Atlanta Hamfestival. Keep up the gud work, girls. Everyone who holds an appointment must remember that U have to be a current ARRL member to remain so. Now that Hq is completely on an in-house computer, they can give info to the SMs immediately. Check ur expiration dates. The League needs all of us. In fact, see if U can get a new member so that we can increase our numbers.

NORTHERN FLORIDA: SM, Billy Williams, N4UF — Very sorry to learn that WD4NIX became a Silent Key. He was EC of Seminole Co. Lots of activity on tap for FD. New NM for the Northern Fla Phone Net is KC4FL. Tnx to WF4Y for an outstanding job as NM for the past year. Also WB4GHU completed a one-year term as NM of QFN. KF4U continuing as GN NM. The continued high level of VHF net activity is encouraging. Tnx to the following for their timely reports of activity: LSTTN (NQ4P); SVTN (KB4LB); KD4QZ (EOEN); GCVTN (K4VND); VEN (W4LDY). Bad bands continue to hamper operations, but the wide area VHF nets help much. One Jax ham has been threatened by FCC with quiet hours. Seems he interferes with reception of cable channel 18 (144-150 MHz) ONLY. It will be interesting to see if FCC gets away with this since it would seem the ham should have the right of way when such a problem develops. Several reports of very discourteous treatment of upgrading applicants by FCC Tampa office. Seems the code test was infiltrated by bad echos and other extraneous material, with the result of less than 10% passing the exam. One upgrader went to the restroom after completing the cw test and was disqualified. Attitude of FCC office employees was described as obnoxious. Many hams traveled several hundred miles for such an unfair quarterly opportunity. If that was the case, it's no wonder we have few upgrades and growth is stagnating. Surely someone can get FCC employees instructed to treat the taxpayers courteously and to administer fair exams! Traffic: WF4X 827, N4PL 567, WB4ADL 475, AA4FG 389, WF4Y 353, KC4VK 305, WB4CZR 245, WD4HBP 204, N4EDH 200, KB4LB 159, WA4EYU 142, KB9LT 142, WD4IIO 138, KD4KK 123, W4GUJ 114, W4MGO 89, NF4O 78, WX4J 75, K4VND 70, N4GMU 69, WA4QXT 63, KF4U 63, KD4QZ 60, W4KIX 59, KC4FL 48, WD4IUI 42, WD4MLQ 40, NQ4P 39, N2AMG 32, WA4STZ 31, WD4HUZ 25, KA4RBY 24, KA4ETX 22, NS4C 22, NA4F 21, N4JHI 16, WX4H 16, KI4CQ 16, W4DTV 11, W4LUW 10, W8IM 8, KF4GY 8, N4IIP 4, N4UF 4, WA4PUP 4, N4HTU 1.

SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFK — SEC: W4SS. STM: K4ZK. TC: KI4T. BM: WA4EIC. ACC: AA4WJ. PIO: W4WYR. SGL: KC4N. OO/RFI: W4SS. Congrats to the PLATINUM COAST ARS for having been officially designated a Special Service Club. Exercise NIGHT TANGO III was held in May and involved Providence, RI, Boston, MA, Rochester and Buffalo, NY, Nashville and Memphis, TN, and Miami, Fla. W4DL and KI4T were the hams representing Miami in the exercise. KI4T reported that within three minutes of receipt of a message for Rhode Island he went to twenty meters and found his counterpart there looking for Miami and exchanged messages. If not a record, it certainly is excellent turnaround time! NIGHT TANGO is sponsored by the National Communications System to demonstrate the capability of Amateur Radio, MARS, and the CAP to support national security and emergency preparedness telecommunications requirements. OBSs reporting this month were WA4EIC WT4F WD4KBW W4DL W4ESH

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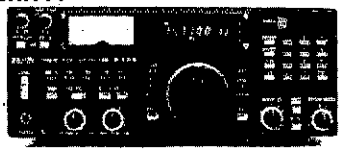
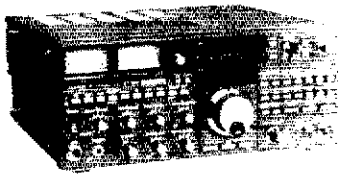
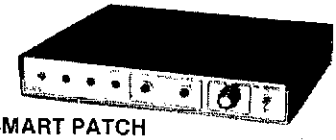


ICOM
IC-R7IA, IC-751A, IC-745, IC-27A/H, IC-37A
IC-47A, IC-271A/H, IC-2KL, IC-471A, IC-290H,



YAESU
FT-ONE, FT-980, FT-230R FT-757GX
FT-726R, FT-77, FRG-7700, FT-203R



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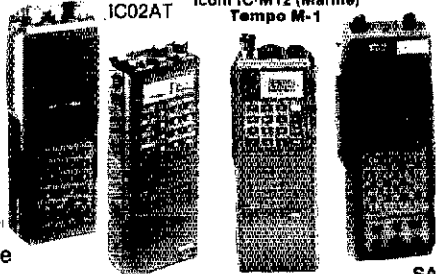
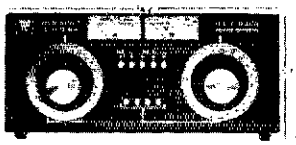
Yaesu FTC-2203, FT-4703
Icom IC-M12 (Marine)
Tempo M-1



DRAKE, EARTH SATELLITE STATION, ESS-2250, ESR-24.



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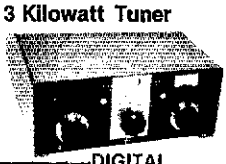

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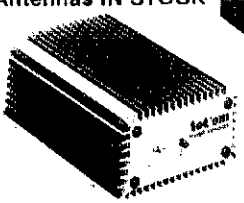
ST-142/UP
ST-442/UP
HT-7



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AA4BN and AA4MI. There were 64 bulletins received and 98 transmitted by these stations. BM WA4EIC is presently on vacation. SEC W4SS and TC KI4T have teamed up with a letter to the affiliated clubs promoting interest in packet radio as a means of emergency traffic handling. They are doing a great job with this. W4JM is sorry to report that Lakeland Silent Keys are WB4AZQ and NZ4H. W4JM lost his quad to the wind, and now has a tri-band Yagi. KB4AEV/TPA, the ten-year-old daughter of ACC AA4WJ, has passed her Technician test and is now on two meters. Congrats, Sarah! Congrats also to KA4YHS who is now General class. W4LLA reports that he handled 50 phone patches during May. W4SS reports that WT4B is now EC for Manatee Co. 73 de WA4PFK. Traffic: W3CUL 3300, W3VR 853, WA4PFK 370, K4SCL 347, K4ZK 314, W4NFK 297, K4EUK 190, WB4WYG 182, KJ3T 181, WA4EIC 165, KA4GUS 142, AF3S 126, K4IA 122, W8BZY 105, W4DL 95, WB2NVJ 95, KF4JA 88, WB4AID 83, AA4BN 67, W4LLA 64, KF4RL 61, WD9AEP 59, KA4NXF 52, WA4HXU 47, W4YCL 46, AA4MI 44, WB4GCK 40, KA4FZI 38, KA4BBA 37, K4FQS 37, W3TLV 37, WA4NBE 35, K5IHH 34, K4JI 28, WD4KBW 26, WT4F 25, WA4GYR 24, W3IJR 17, KA4YHS 17, KA4RWV 16, N2WX 14, N4KB 13, KF4AX 12, WD4NXK 12, WB2OUK 12, W4ESH 12, AA4BY 11, KB4KB 11, AA4WJ 11, KA9AKY 10, WB4HYB 10, N4JOA 9, W4WYR 9, WD4AWN 8, WK4F 8, KA4KDD 8, WV4F 8, K7LCA 6, WD4MCC 6, K4VSN 6, KA4SIH 5, KY8T 5, WB4SNT 4, KM4Y 4, KA2RRU 3, W4EOB 2, WB4LPX 2, W3IJC 1, KB4AEV 1, N4AKA 1, WB4GJH 1. (Apr.) W4SME 94, WD4AWN 49. (Mar.) KA4RWV 151.

WEST INDIES: SM, Gregorio Nieves, KB4EW — West Indies Net Slow (WINS) daily 7 P.M. (2300 UTC) on 3.710 MHz. West Indies Net Central (WINC) daily 6:30 P.M. (2230 UTC). West Indies Net Borinquen (WIMB) on 3.930 MHz. LSB (2230 UTC). The Desecheo Island will be revisited for a week next July, according to plans, by a group of enthusiastic DXers who are planning a DXpedition to this island. The dates planned are July 23 to 31. The group consists of WP4ATF HI3RST/KP4 NP4KA KP4BZ KP4HA and NP4GD. The first DXpedition to this island was in March 1979, operated by KP4AM/D. A few months ago the prefix KP5 was assigned to this island. They are looking for the backing of the Puerto Rico ARC, and definite plans will be announced. Good luck to this group in this new adventure. The ARES nets will be resumed this month in preparation for the just started hurricane season. KP4DJ reports the following totals for WINS: QTR 347, QNI 110, QTC 31, 31 sessions. Traffic: KP4DJ 64, NP4D 29. (Apr.) KP4EBJ 5.

SOUTHWESTERN DIVISION

ARIZONA: SM, Erich J. Holzer, N7EH — STM: W7EP. DECs: W5KMF W7KAX KB7XN. ACC: N7ECE. NMs: WA7FDN WA7KQE K6LL. W7KAX reports the following provided comm. for Balloon Race: W9FKE WA6ZVN WB7RYR. KB7FE reports that W7KCM is the new editor of DTWN newsletter as well as the winner of the DTWN logo contest. WA7NXL reports that he and KD7RG upgraded to Extra and that KA7RNG upgraded to Advanced. The TRA reports that the following provided comm. for a benefit bike ride sponsored by the Greater Arizona Biking Assn.: K7KYW KC7AQ W7HSH and WB7OWA. A review of all the club newsletters I received thus far for May indicate that there is going to be a large number of participants in this year's Field Day. Good luck to all. I missed the St. David Hamfest. Work sort of interrupted my plans. Hope to see all at Ft. Tuthill. There are still openings in the Arizona ARRL Field Organization. There are still openings in the Arizona ARRL Field Organization. There is even a place for you. Please contact me for info. PSHR: KB7FE KO7V. Cactus Net: QNI 694, QTC 146. ATEN: QNI 931, QTC 170. SWN: QNI 208, QTC 205. Traffic: KB7FE 450, W7AMM 239, KO7V 206, K6LL 155, W7EP 135, WA7KQE 25, KA7JNU 23, W7KXE 20, KA7HEV 12, K7PDF 5, K7NMQ 4, WA7NXL 1.

LOS ANGELES: SM, John Walsh, N6UK — STM: W6INH. SEC: N6ZH. ACC: NF6D. Congrats to AK6Y, president of the Associated Radio Amateurs of Long Beach, and to K6OSC, station mgr of W6RO aboard the R.M.S. Queen Mary. The 5th anniversary of operation of W6RO was celebrated at a gala on the QM hosted by Joseph F. Prevratil, President of Wrather Port Properties, Ltd., owners of the QM. Thanks to all the amateurs whose dedication makes this operation so successful. Olympic fever is growing and LA amateurs are getting involved. Each week the requests for help put more demand on our resources. ARES is about to get a real test in LA's biggest "disaster." As noted above, N6ZH has accepted the LA SEC post. He is fully involved with ARES and is doing an outstanding job. In addition to normal SEC activities, he is responsible for the implementation of the ARES agreement with the City of Los Angeles. Currently, he is providing ARES assistance in setting up a RACES group for the LA County Fire Department. All this and Olympics too! At this time we are sure that ARRL will have at least one station operating at the Olympic Village at UCLA. Congrats to WB6OSM and his colleagues. The W6FNO/R ARES group gave a hand to the Forest Service and environmental groups by supporting two Super Sweeps during which volunteer groups take tons of litter out of SoCal forest areas. The SCN is looking for more check-ins. If traffic is your thing, you should be on the SCN roster. For a good SCN rundown, contact SCN/CW Mgr. AI6E or the LAX SM for info. Traffic: K6UYK 459, K6YBV 278, W6INH 239, WA6OCM 89, KT6D 69, N6DZQ 34, W6NKE 18, WD6FWZ 18, W6ORF 13, K6CL 12.

ORANGE: SM, Sandra Heyn, WA6WZN — SEC: W6UBQ. STM: WA6QCA. ACC: KA6NLY. BM: W6DXL. OO/RFI Coord: W6RE. PIO: NS6W. SGL: N6BIQ. TC: AA6DD. DECs (by counties): WB6JBI (Orange); W6LKN (Riverside); WA6IKH (San Bernardino); KA6HII (Inyo). Note W6RE has replaced N6PE, whom we thank for his dedicated service as OO/RFI Coord. We also congratulate W6RE for his appointment as an Asst. Director by Director WA6WZO. Additional new Division appointments include W6POU, Emergency Communications Advisory Committee and N6VI, Contest Advisory Committee. Asst. EC WB6ULU has a new position in the Coast Guard Aux. as liaison to Amateur Radio Emergency Services. W6POU is NM of Division public service net held 5 P.M. Sun 3907 kHz. K6RAU has changed his code course on 80 meters to 6:30 A.M. Mon thru Fri on 3865 kHz starting the first Mon of each month. If interested in QRP write W6QJM for info on QRP ARC International. New club officers: Big Bear ARC — N6EFT pres.; WB9ZDI, v.p.; N6JKI, treas.; W6OZW, secy. On May 17th, the ARES Red Cross net assisted the Red Cross with three mock disasters. These activities started at 7 A.M. and continued for twelve hours. Those participating were: W6RE N6EXV WB6GDZ KA6NNU K6VD KA6HWV and K6LJA. The ARES Red Cross Net meets each Wed at noon on 145.14, down 600. We are looking

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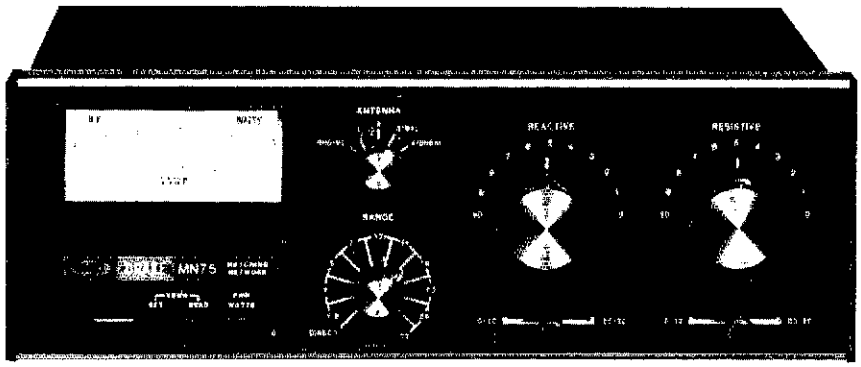

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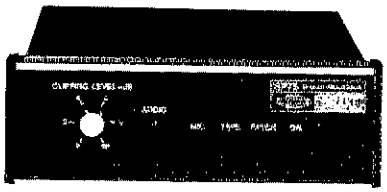

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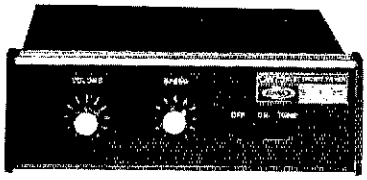

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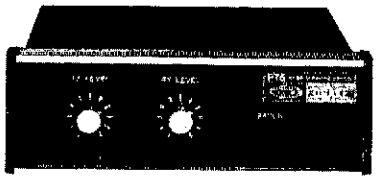

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for additional help. Check in and be appreciated. Asst. EC NR6P reported the following active in the Gordon Bennett Balloon Race: WB6VMR NR6P KA6IYS WA6MFS K6JUA WB1DAZ KA6TFT WB6CJX WA6OQH KA6YQN WB6QJJ W6SMP N6IZH KA7HLT KB6CUW W6LKN W6UBQ N6FRW N6HOJ KA6YOB N6KFE W6RPD W6IMT WA6YES W7JRJ KE5NY WA6ZVN WØFKE K6HIT W7MWF WA6MGR WB6RVQ WB7RYR N6ANL W6GUP K6OLT. If you are interested in the Teenage ARA, contact KA6WBF 714-671-0760. Orange Co. DEC WB6JBI held 2nd meeting of County Emergency Services leadership. WB6ORK volunteered for Chairman with Vice Chairman WB6JBI and Secy. N6HIQ. SW Division convention will be held Oct 12-14; with WB6UCK (Region 1 & 6 State OES Communications Coord), planning hospitality suite for ARES/RACES leaders. The first FCC-approved VEC in Calif is the Greater Los Angeles Amateur Radio Group (GLAARG) with chairman NE6L and the San Diego Council of Amateur Radio Clubs (SANDARC) with chairman W6SLF. If you are interested in becoming a volunteer examiner (VE) write one of the chairmen. PSHR: KA6BNW W6NTN WB6QBZ KA6HJK/T.

Net	Freq	Time	QNI	QTC	NM
SCN/1 (20+)	3598	7 PM	348	314	AI6E
SCN/2 (13-)	3598	8:15 PM	251	192	AI6E
SCN/V (FM)	146.645	9 PM	520	330	WA6QCA
RTTY/VHF	145.12	9 AM	491	101	KA6HJK

Traffic: WA6QCA 184, KA6HJK 153, W6RE 130, WB6QBZ 120, AI6E 93, K6GGS 74, W6NTN 68, KA6BNW 53, N6GOT 52, AD6A 46, K6ZCE 23, W6TKV 8, WA6WZN 2, WA6WZO 1.

SAN DIEGO: SM, Arthur R. Smith, W6INI — TC: N6NR. BM: WA6HJJ. STM: N6GW. SEC: W6INI. PIO: WA6CUP. ACC: WA6COE. Are you interested in learning how to handle formal messages? For CW oprs, try the slow-speed SCN/2 at 2015 daily on 3.598 MHz. Voice oprs can join the North County Tfc Net daily at 2000 on 146.13/73 MHz, the Palomar ARC repeater. Get involved in emergency and public service activities by checking in on one of the following ARES nets:

Time	Day	Freq (MHz)	Mode	NM
0830	Sun	146.13/73	FM	WA6EYX
0900	Sun	3.905	SSB	K6DBJ
0930	Sun	3.770	CW	WA6IIK
1000	Sun	29.275	SSB	W6TET
1100	Sun	1.945	SSB	W6TET
1900	Sun	146.52	FM	KM6S
1930	Wed	147.78/18	FM	N6ATV
1900	Sat	223.3/4.9	FM	N6IGP
2000	Sat	144.25	SSB	N6CQW
2000	Sat	446.0	FM	W6BLK

North County Tfc Net held 30 sessions and handled 105 msgs in May. KT6A and W6HJJ made PSHR. Traffic: KT6A 508, W6HJJ 260, KM6I 210, KU6D 151, KB6AI 105, N6AT 72, KF6TF 29, N6GW 15, WA6IIK 8.

SANTA BARBARA: SM, Ernest L. Kapphahn, WB6HJW — K6HXW rports that over 200 attended West Coast VHF Conference held at Paso Robles. Congrats to K6HXW and crew for a very successful event. Santa Maria amateurs provided comms for annual Elks Parade. Twelve amateurs participated, with WB6IIY as NCS. San Luis Obispo Co. amateurs were active during several May fires and fire alerts. Working with the California Div. of Forestry (CDF), 18 amateurs patrolled on fire watch. May 9, 14, and 26-28. On May 30, ARES set up a fire camp at Bidwell Park in response to a 1 A.M. call out from CDF. N6BUY WB6IIY N6BDE N6HMZ WD6EYE and WB6LDW participated. SLO Co. ARES participates in the VIP (Volunteers in Prevention) program with CDF. This allows them to be reimbursed for mileage travelled during these activities. You should have received along with our director's letter a registration form for the SW Division ARRL Convention to be held at Santa Maria, Oct. 12-14. This may be the only flyer sent this year, so send it in now! If you did not receive a flyer, contact Jim Murren, WA6QQZ, Box 2457, Orcutt 93455. From attending West Coast conventions these past 15 years, I've gotten the impression that many amateurs don't know what goes on at a convention, and therefore don't attend. First of all, you do not have to be an ARRL member to attend. Secondly, there are no delegates, caucauses or political rallies. What you will find at a SM Div. convention is the largest annual gathering of amateurs in the most populous state in the union, a great ham radio "trade show," technical sessions on the latest developments in our hobby, and this year the world famous Santa Maria style barbecue-banquet. Any amateur not already written up in the Silent Key column would find something of interest. See you there.

WEST GULF DIVISION

NORTHERN TEXAS: SM, Phil Clements, K5PC — ASM/ACC: NI5V. SEC: W5GPO. PIO: N5FDL. OO/RFI: WB5JBP. BM: W5QXK. TC: WB5IIR. SGL: W5UXR. STM: AE5I. North Texas Hamfest Calendar: Aug. 4 & 5 the Golden Spread Hamfest in Canyon; Aug. 25 & 26 First Annual Odessa Hamfest (write West Texas ARC, Box 7033, Odessa 79760); annual WARS Tornado Alley Hamfest in Wichita Falls, Sept. 22 & 23. (write WARS Hamfest, Box 4363, Wichita Falls 76308). The Texoma Hamarama will again be in late October; details later. W5GPO and I hope to see you at one or more of these fine activities. Looks like hurricane season is coming in with a bang; tropical depressions forming at this writing (June 7th), while tornadoes continue to rumble over our section. Let's stay ready to move on these; we need more quick response teams, especially out in the western areas. Red Cross ID cards are available for these teams. Contact me for details. Hamcom 84 was a great event. Record attendance and record sales by dealers and swappers. Congrats to KA5AZK, winner of the Whitney Nugget from the 7290 Net, and to W5BJ, winner of the Charles Gore Award from the Dallas ARC. PSHR: AE5I WD5JYI N5DKW KA5LQA N5GKF K5SOR KD5FR N5EZM. Your new Section Traffic Mgr. is Gene Smith, AE5I. Thanks, Gene, and thanks to Art Evans, W5VMP for his years of service to us in that capacity. Traffic: WD5JYI 302, KD5RC 218, K5PC 149, AE5I 140, KD5FR 74, KA5AZK 71, KA5LQA 46, NI5V 45, K5SOR 36, N5DKW 22, N5GKF 9, KA5QWN 8, WB5YUC 6, N5EZM 5, K2SCU 1.

OKLAHOMA: SM, Ray Miller, W5REC — W1GOM has resigned as SM. W5REC will serve the remainder of the term. We thank W1GOM for all he has done. Hamfests at Lawton, Mooreland and Green Country were enjoyed by all. Eyeball QSOs are great! Old timers like W5PML W5FW WA5OUV W5ZKK K5GBN WA5KBJ W5EDZ and all bring good memories. WA5OUV received the Director's plaque for outstanding service and KK5I and KD5OE received the Certificate of Appreciation. GPARC members working the Roadrunner Marathon at Gage were NC5C N5CCV W5KFK WA5OUV WB5OVT WA5PLW KA5SDD KA5STB KA5STC and KB5XI. N5DUB and WA7UIB say 145.29 is up and they are planning to link with the Salt Plains (147.30) and also

to Okla. City on 444.85. Ponca City is the first in Oklahoma to have a 10-meter repeater — Congrats! W5QMJ reports an autopatch on the 450 machine. New 2-meter repeater at Cedar Springs. Lookin' good! Traffic: K5CXP 378, W5AS 248, KB5EK 224, KV5X 201, W5VXU 166, WB5OHK 154, W5RB 144, WA5ZOO 77, KI5P 76, W5REC 75, WA5OUV 70, KD5GB 57, WD5IFB 54, KC5OU 51, WA5IMO 47, KB5XI 41, W5FW 37, WB5ELG 33, W5SUG 33, WA5OGC 28, W5VLW 21, NG5O 25, W5VOR 21, WB5LSW 9, K5ENA 3, NØIN 3. (Apr.) K5CXP 225, KV5X 125, NØIN 8. (Mar.) K5CXP 264, KB5EK 218.

SOUTHERN TEXAS: SM, Arthur R. Ross, W5KR — SEC: OPEN! STM: K5QEW. ASM: N5TC. BPL: W5CTZ, multi-op AK5M. OOs reporting: K5RVF and new OO WA2VJL, who reports that he has just confirmed his 185th country. AK5M, operating as a special events station at Kerrville Arts and Crafts Fair, handled 820 messages in the two weeks of the show. EC WØGUR and amateurs of Cameron Co. took part in Exercise Polly III, a hurricane communications drill especially for Amateur Radio under the Texas Department of Public Safety, as a result of the work by amateurs, DPS Emergency Management adopted the ARRL message format. Along with WØGUR were KA5PXS K5JYF W5KR WBHQ KA5KVB N5AYI WD5GLS N5EVV and K8JTO. Asst Director W5APX also reported that amateurs in the Port Arthur area also took part in Polly III. OBS W5KLV spread 8 bulletins, 31 satellite bulletins, 3 DX bulletins, 6 CRRL bulletins and 4 propagation forecasts over 8 nets in 154 readings. ORS K5RG is building a new home, which will include the "perfect hamshack." DRN5 Manager WB5YDD reports 90% representation from Southern Texas Section by W5CTZ W5KLV N5DFO WB5EPA WB5FQU N5AMH W5TUK KS5V N5EFG W6URN and WB5YDD. CAND Manager W5KLV reports DRN5 represented 100% by Southern Texas stations N5CRU N5AMH N5EFG N5DFO WB5YDD and W5KLV. Two-meter Emergency Nets being planned by KA5PEX in Seguin and by KS5V in Canyon Lake; they know that being ready is the big thing in any sort of emergency so give them all the help you can. OO K5VRF has inaugurated his RTTY system into AMTOR; he uses a Collins 51S1 in the system. Traffic: AK5M 820, W5CTZ 557, N5DFO 392, WB5YDD 382, W5KLV 288, KS5V 186, K5QM 163, K5OWK 93, WB5EPA 73, W5KR 73, WB5MMI 60, WØGUR 31, K5HZR 19, WA2VJL 10, K5RG 7, WD5GKH 4. (Apr.) W5TFB 191.

Ham-Ads

(1) Advertising must pertain to products and services which are related to Amateur Radio.

(2) The Ham-Ad rate is 85 cents per word. A special rate of 25 cents per word applies to hamfest and convention announcements, to individuals seeking to dispose of or acquire personal equipment, and to other advertising which, in our opinion, obviously qualifies for the individual rate.

3) Remittance in full must accompany copy since Ham-Ads are not carried on our books. Each word, abbreviation, model number, and group of numbers counts as one word. Entire telephone numbers count as one word. No charge for postal Zip code. No cash or contract discounts or agency commission will be allowed. Tear sheets or proofs of Ham Ads cannot be supplied. Submitted ads should be typed or clearly printed on an 8-1/2" × 11" sheet of paper.

(4) Closing date for Ham-Ads is the 20th of the second month preceding publication date. No cancellations or changes will be accepted after this closing date. Example: Ads received August 21 through September 20 will appear in November *QST*. If the 20th falls on a weekend or holiday, the Ham-Ad deadline is the previous working day.

(5) No Ham-Ad may use more than 100 words. No advertiser may use more than two ads in one issue. A last name or call must appear in each ad. Mention of lotteries, prize drawings, games of chance, etc. is not permitted in *QST* advertising.

(6) New "commercial" advertisers must submit a production sample of their product (which will be returned) and furnish a statement in writing that they will stand by and support all claims and specifications mentioned in their advertising before their ad can appear.

The publisher of *QST* will vouch for the integrity of advertisers who are obviously commercial in character, and for the grade or characters of their products and services. Individual advertisers are not subject to scrutiny.

Clubs/Hamfests

QCWA Quarter Century Wireless Association is an international nonprofit organization founded in 1947. You are eligible for membership if licensed 25 or more years ago, and presently licensed. It is not necessary to have been licensed the entire 25 years. Members receive QCWA publications and participate in QCWA activities. Come grow with us! Write QCWA, Inc., 1409 Cooper Drive, Irving, TX 75061.

PROFESSIONAL CW operators, retired or active, commercial, military, gov't., police etc. invited to join Society of Wireless Pioneers — W7GAQ/6 Box 530, Santa Rosa CA 95402.

IMRA-International Mission Radio Association Helps missionaries by supplying equipment and running a net for them daily except Sunday, 14.280 MHz, 1900-2000 GMT. Br. Bernard Frey, 1 Pryer Manor Rd., Larchmont, NY 10538.

THE Veteran Wireless Operators Association, a non- profit organization of communications people founded in 1925, invites your inquiries and application for membership. Write VWOA, Ed. F. Pleuler, Jr., Secretary, 46 Murdock Street, Fords, NJ 08863.

JOIN the Old Timers Club, an international non-profit organization. If you operated a radio station, commercial, amateur or Armed Forces 40 or more years ago, and have an Amateur license at present you are eligible. Join the real pioneers of ham radio. Write O.O.T.C. Box AA, Mamaroneck, NY 10543 for details.

HAVE A-M capability? Join S.P.A.M. (Society for Promotion A-M) Membership is free. Write: F.A. Dunlap (S.P.A.M.), 14113 Stoneshire, Houston, TX 77060 (S.A.S.E. please).

FIND OUT what else you can hear on your general coverage transceiver or receiver. Complete information on major North American radio listening clubs. Send 25¢ and S.A.S.E. Association of North American Radio Clubs, 1500 Bunbury Drive, Whittier, CA 90601.

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.

MUSEUM for radio historians and collectors now open. Free admission. Old time amateur (W2AN) and commercial station exhibits. 1925 store and telegraph displays. 15,000 items. Write for details. Bruce Kelley, AWA, Holcomb, NY 14469.

THE Central Kentucky ARRL Hamfest, sponsored by The Bluegrass Amateur Radio Society, will be held Sunday, 8:00 AM to 5:00 PM August 12, 1984 at Scott County High School, Longlick Road and US Route 25, Georgetown, Kentucky (Off I-75/64). Technical forums. Awards and Exhibits in A/C facilities. Outside Flea Market space, no charge. Tickets $3.50 advance and $4 @ gate. For more information or tickets write Edward B. Bono, WA4ONE, P.O. Box 4411, Lexington, KY 40504.

HAMFESTERS' 50th Annual Hamfest. One of the Midwest's largest. Sunday, August 12, 1984. Santa Fe Park, 91st and Wolf Road, Willow Springs, IL., Southwest of Chicago. Exhibitor Pavilion and the Famous Swappers Row. Tickets: Gate $4, Advance $3. Tickets available, check or M.O. to Hamfesters, P.O. Box 42792, Chicago, IL 60642. Talkin 146.52.

ILLINOIS: Sept. 15 & 16, The Peoria Area Amateur Radio Club presents Peoria Superfest '84 at Exposition Gardens, W. Northmoor Rd., Peoria, IL. Admission $3 advance, $4 gate, children under 12 free. Gate opens 6:00 AM, commercial building 9:00 AM. Talk-in 146.16/76 call W9UVI. Latest Amateur & Computer product displays, huge flea market, free bus to Northwoods Mall on Sunday. Full camping facilities. Sat. night informal get together at Heritage House Smorgasboard. 8209 N. Mt. Hawley Rd. For tickets and info SASE to Superfest '84, P.O. Box 3461, Peoria, IL 61614.

RADIO EXPO 84, sponsored by the Chicago FM Club, will be held Saturday and Sunday, September 22nd and 23rd at the Lake County Fairgrounds, Rts. 120 & 45, Grayslake, IL. Flea market opens 6:00 AM and exhibits open 9:00 AM. Displays by major manufacturers and gigantic outdoor flea market area. Free parking & overnite camping. Reserved indoor flea market tables available at $5 per day. Seminars, technical talks and ladies' programs. Awards every hour. Tickets good both days, $3 in advance, $4 at gate. Talk-in on 146.16/76. Send SASE to RADIO EXPO 84, Box 1532, Evanston, IL 60204, or call 312-562-6923.

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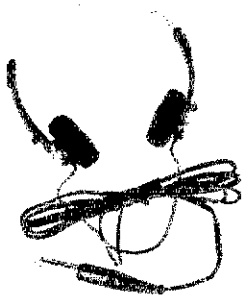

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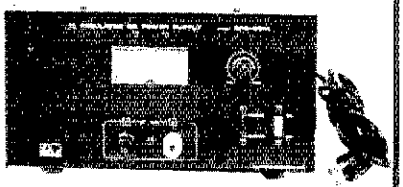

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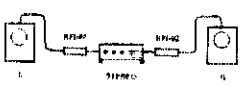

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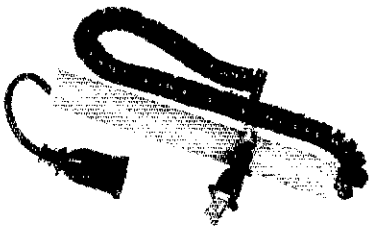

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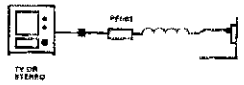

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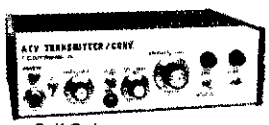

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MMT144-28 2mtr transverter	199.95
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MMC144-28 2mtr converter	51.00
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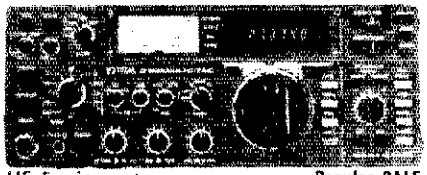
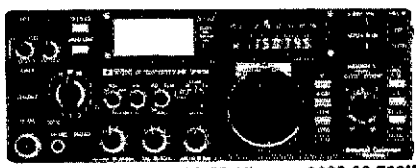


HF Equipment	Regular	SALE
IC-740* 9-band 200w PEP xcvr w/mic	$1099.00	**899.95**

***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	**769.95**
PS-35 Internal power supply	160.00	**144.95**
CFJ-455K5 2.8 kHz wide SSB filter	4.00	
HM-12 Hand microphone	39.50	
SM-6 Desk microphone	39.00	
**See IC-740 list above for other options (*)*		
Options: 720/730/740/745	Regular	SALE
PS-15 20A external power supply	$149.00	**134.95**
EX-144 Adaptor for CF-1/PS-15	6.50	
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, R-70A	39.95	
SP-3 External base station speaker	49.50	
Speaker/Phone patch - specify radio	139.00	**129.95**
BC-10A Memory back-up	8.50	
EX-2 Relay box with marker	34.00	
AT-100 100w 8-band automatic ant tuner	349.00	**314.95**
AT-500 500w 9-band automatic ant tuner	449.00	**399.95**
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**

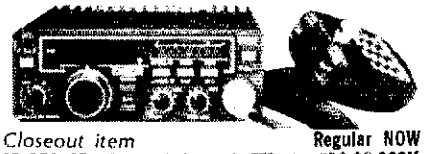
ICOM

Options - continued	Regular	SALE
CF-1 Cooling fan for PS-15	45.00	
PS-20 20A switching ps w/speaker	229.00	**199.95**
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	899.00	**799.95**
IC-471H 75w 430-450 SSB/CW/FM xcvr	1099.00	**Call**
PS-35 Internal power supply	160.00	**144.95**
PS-15 20A power supply	149.00	**134.95**
IC-271A 25w 2m FM/SSB/CW xcvr	699.00	**619.95**
AG-20/EX-338 2m preamplifier	56.95	
IC-471A 25w 430-450 SSB/CW/FM xcvr	799.00	**699.95**
PS-25 Internal power supply	99.00	**89.95**
EX-310 Voice synthesizer	39.95	
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	

ICOM 2m Closeout



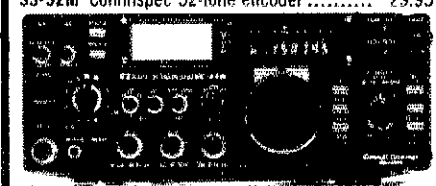
Closeout item	Regular	NOW
IC-25A 25w, 2m, grn leds, up-dn TTP mic	359.00	**269.95**
BU-1 Memory back-up	38.50	†10.00
IC-25H as above, but 45 watts	389.00	**299.95**
BU-1H Memory back-up	38.50	†10.00

†BU-1/H **$10** purchased w/IC-25A/H, otherwise **$38.50**

IC-27A Compact 25w 2m FM w/TTP mic	369.00	**329.95**
IC-27H Compact 45w 2m FM w/TTP mic	409.00	**369.95**
RP-3010 10w 440 Mhz FM repeater	999.00	**899.95**
IC-37A Compact 25w 220 FM, TTP mic	449.00	**399.95**
IC-47A Compact 25w 440 FM, TTP mic	469.00	**419.95**
UT-16/EX-388 Voice synthesizer	29.95	
IC-120 1w 1.2 GHz FM transceiver	499.00	**449.95**
RP-1210 10w 1.2 GHz FM repeater	1199.00	**1089**
Cabinet for RP-1210 or RP-3010	249.00	
Duplexer 1210 10w 1.2 GHz duplexer	1199.00	**1089**
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	

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	379.00	**339.95**
Standard models	**Regular**	**SALE**
IC-2A for 2 meters	$ 239.50	**214.95**
IC-2AT with TTP	269.50	**219.95**
IC-3A for 220 MHz	269.95	**234.95**
IC-3AT with TTP	299.95	**239.95**
IC-4A for 440 MHz	269.95	**234.95**
IC-4AT with TTP	299.95	**239.95**

Accessories for Deluxe models	Regular
BP-7 800mah/13.2V Nicad Pak - use BC-35	67.50
BP-8 800mah/8.4V Nicad Pak - use BC-35	62.50
BC-35 Drop in desk charger - all batteries	69.00
BC-16A Wall charger - BP7/BP8	10.00
Accessories for both models	**Regular**
BP-2 425mah/7.2V Nicad Pak - use BC35	39.50
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	29.50
BP-4 Alkaline battery case	12.50
BP-5 425mah/10.8V Nicad Pak - use BC35	49.50
CP-1 Cig. lighter plug/cord - BP3 or Dlx	9.50
DC-1 DC operation pak for standard models	17.50
LC-2AT Leather case for standard models	34.95
LC-14 Soft case for Deluxe models	17.95
HM-9 Speaker microphone	34.50
HS10 Boom microphone/headset	19.50
HS-10SA Vox unit for HS-10 (dlx only)	19.50
HS-10SB PTT unit for HS-10	19.50
ML-1 2m 2.3w in/10w out amplifier	**SALE** 79.95
ML-25 2m 2.3w in 20w out amplifier	**SALE** 179.95
3A-TTN Optional TT Pad - 2A/3A/4A	39.50
SS-32M Commspec 32-tone encoder	29.95



Shortwave receivers	Regular	SALE
R-71A 100 Khz-30 Mhz digital receiver	$799.00	**689.95**
FL-32 500 Hz CW filter	59.50	
EX-310 Voice synthesizer	39.95	
RC-11 Wireless remote controller	59.95	
CR-64 High stability oscillator xtal	56.00	
R-70 100 Khz-30 Mhz digital receiver	749.00	**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	
CK-70 (EX-299) 12v DC option	9.95	
MB-12 Mobile mount	19.50	

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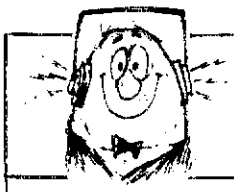

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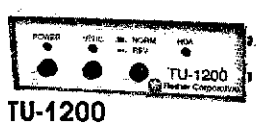

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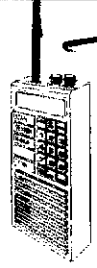

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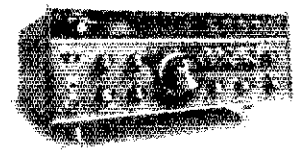

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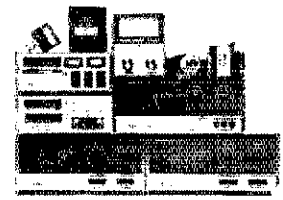

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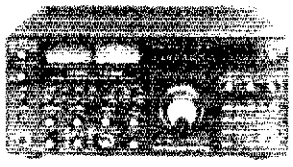

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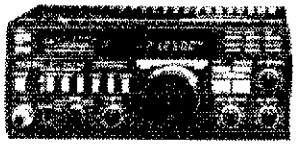

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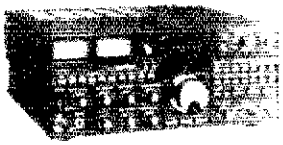

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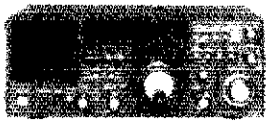

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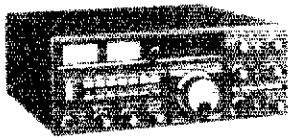

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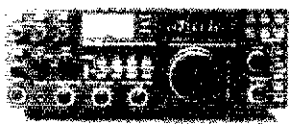

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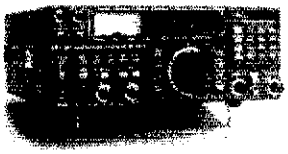

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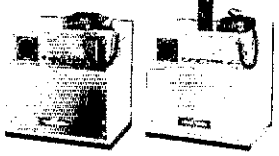

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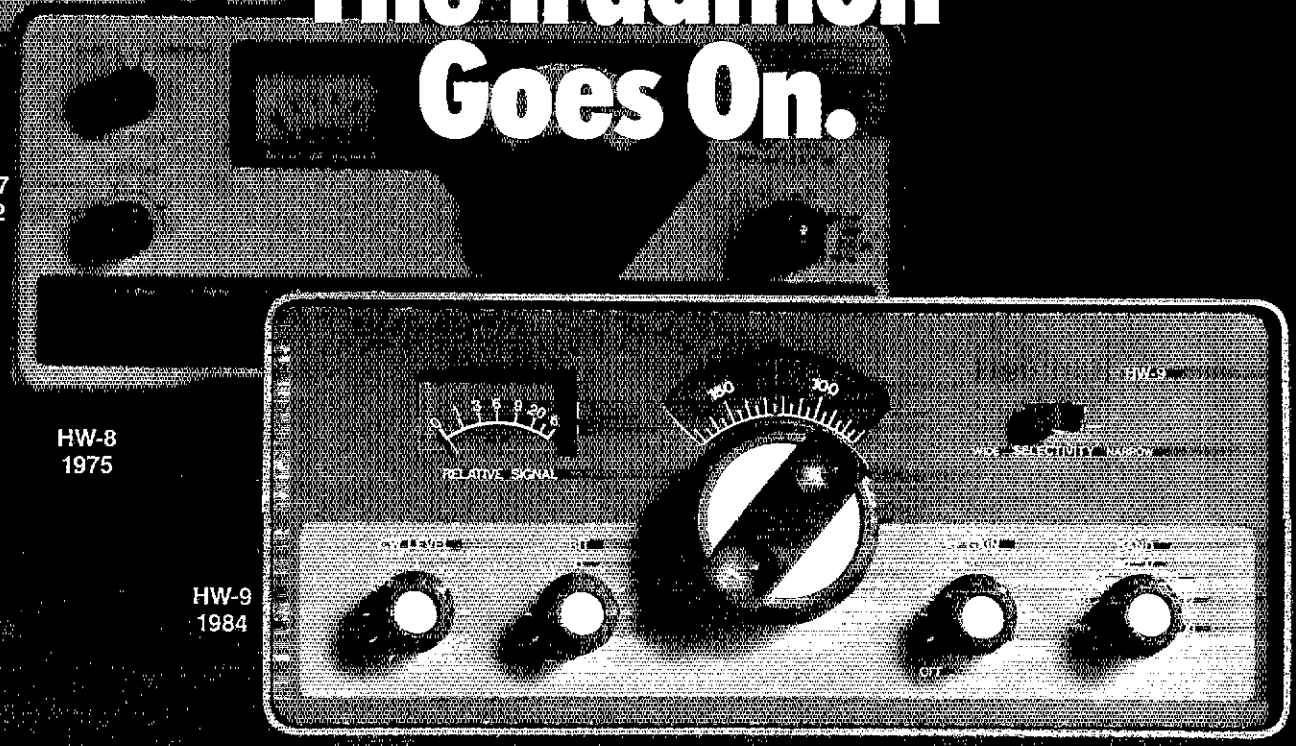

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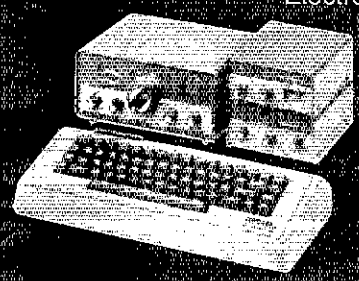

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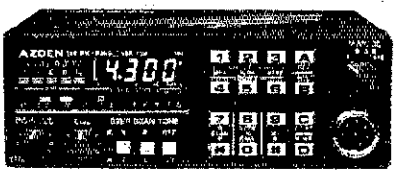
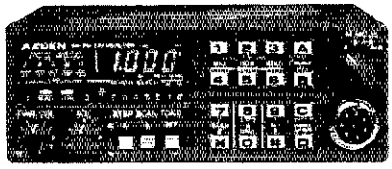
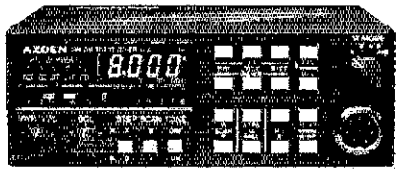


PCS-4300 70-cm FM Transceiver



PCS-4500 6-m FM Transceiver



PCS-4800 10-m FM Transceiver

SALE

PLEASE CALL FOR SPECIAL PRICE

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; autoresume 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 ACQUISITIO 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 frequenc 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-480 Transmitter power is fully adjustable.
- **SUPERIOR RECEIVER:** Sensitivity is 0.2 uV or better for 20-dB quieting. Circuits are designed ar manufactured to rigorous specifications for excep tional 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, rugge 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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JPC AZDEN **JAPAN PIEZO CO., LTD.**

1-12-17 Kamirenjaku, Mitaka, Tokyo. 181 Japan Telex: 781-2822452

6 METERS: Yaesu FT-690R all mode transceiver. Mint, in original box with all accessories. $240 postpaid. Steven J. Mottola, WB3GUS, 712 Azalea Drive, Rockville, MD 20850.

SELL-Drake TR22C, 1.5w, port/mobile, 6ch's, TT mike $100. Standard SRC146 5ch handheld w/nicads, desk chrgr, ext mike $125. CAP xtals available for both. WD4KDN 703-344-5694.

BOUND QST books from 1924 to 1970. 12 issues in each binder. Best offer FOB. Telephone 308-287-2179 Leta Larimore, Box 210, Brule, NE 69127.

COLLINS 51S1 receiver, excellent condition, WE with manual, $550, K6ZN, 101 Alma St., Apt. 1206, Palo Alto, CA 94301. 415-325-4848.

REALLY LEARN something about computers! Mint condition Heath ETS-3401 microprocessor course, trainer and 4-K memory expansion module teaches you everything you could want to know about 8-bit micros. Also, EE-3404 course and adapter turns the ET-3400 into a 6809-based computer and teaches you about this advanced 8-bit family. List prices: ETS-3401, $484.85 and EE-3404, $99.95. Willing to trade for Commodore C-64, disc drive and RTTY package. Peter O'Dell, 203-666-1541 days, 203-644-3543 weekends.

SELL: Omni-D Series B. Modified adjustable AGC, CW filter, remote VFO & power supply. Original carton. $675. K8LZ 304-562-9171 evenings.

TS830S, CW filters, mint. $650. Louis, N7BFN, 206-939-6899.

WANTED: 1930s National receivers: SW-58; RIO; 58C; AGL; AGU: junker NC-200, NC-240D, HRO or AGS. Nagle, 12330 Lawyers, Herndon, VA 22071.

WANTED, mobile antenna components. Webster Bandspanner, Master or Swan coils, Master motorized inductor, quick disconnects. K8NUN, Box 182, Mackinaw City, MI 49701.

YAESU FT901DM hf transceiver, c.w. filter, d.c. power cable, new pair spare finals, owner & service manuals. All mint. $650. Heathkit SA-2060 antenna tuner, never unpacked. $200. Dave, W7BER, Tempe, AZ 602-820-9111.

TENTEC Argonaut 515, ps, notch/CW filter $350. IC502A. $125. All absolutely mint. Jerry, KE1S, 617-877-6119.

NH ALL-BAND QTH. South slope retreat; Crotched Mountain, Greenfield; 4-room lodge; separate bunkhouse; 920' elevation, 1200' from highway and power mains; paved access; privacy; 59 acres. $95,000. Clarence Farr, (W1WMK), Broker, Greenfield, NH 03047, 603-547-2053.

TECHNICIANS and ENGINEERS — Master the essentials of microprocessor maintenance. Gain a firm understanding of microprocessor fundamentals and learn specialized troubleshooting techniques. Attend the highly acclaimed Troubleshooting Microprocessor-Based Equipment And Digital Devices 4-day seminar, scheduled in Washington, DC, and Boston in September; Phoenix and Los Angeles in October, and Atlanta and Miami in November. Cost is $695. Micro Systems Institute, Garnett, KS 66032. 913-898-3265.

ABSOLUTELY MINT Alpha 76-CA with three 8874's and 2.5 kVA xfmr. Used less than 50 hours. $1500 plus shipping. Icom 720-A in excellent condition with all filters and PS-15 power supply. $700 plus shipping. Contact Jim Vanelli, K5LKS at 713-481-4823 after 6 PM CDT.

WANTED: KWM-2 with 516F-2 power supply also 4CX 1000-A tube. W1MZB.

WANTED: YM-34 desk mike for FT-707 contact. WB4TMP-Callbook.

COLLINS 75S3B, 32S3, 312B4, 516F2, DX Speech Processor, cables, D-104 mic, instruction manuals, original cartons, mint condition. $1,100 Steve W6QKB 1463 Edgecliff lane, Pasadena, CA 91107. 818-795-8641 days/798-1230 evenings.

COMPLETE STATION: Heath SB-104, remote VFO, phone patch, electronic key, power supply, speaker, Warrior kilowatt linear amplifier, Cushcraft three element beam ant., cables, manuals, code tapes, many extras. $1,000. Bill Basil, 301-574-4318 after 6:00 P.M.

HEATHKIT SB-230 1kW conduction cooled linear $385. Also SB-301 receiver $225. Both mint condition. Tom Futch, 505 S. O'Connor, Irving, TX 75060, 1-214-253-3249.

YAESU FT101ZD Mk II with mike. Mint condx. Will ship with original carton and manual. $525. Dick, NF2K, 201-256-7832 evenings.

HEATHKIT HW-101 power supply, speaker and desk mic. Good working and looking condition. $350 or trade even for 1kW used amp, firm. KA5NSK, Bill, 806-799-6282.

HEATH HW8 almost new $100, TS530 with c.w. filter $500, FRG 7700 with memory $350, all like new, B. Dreyer, W7OUW, Box 286, Lakeside, OR 97449.

C-LINE: Late prod. R-4C (28,510), T-4XC (22,662), AC-4, 4-NB, Torrestronics digital readout, 500 Hz filter. Absolutely perfect condition. Extras include Sartori mods, 2-speed fan, xtals for full ham, some SW coverage, spare MP finals, Sherwood AM filter, equip. covers. $775. Avery Comarow, W4OGK, 524-B Springvale Rd., Great Falls, VA 22066, 202-842-9544 work, 703-759-9097 home.

LOGBOOK-V2 A complete log maintenance program consisting of seven modules to handle all phases of logging. Features multi-key and multi-level searching of thousands of records in seconds and full feature editing. Prints Station Logs, Contest Logs, Contest Dupe Sheets, QSL Cards, WAS Lists, DXCC Lists, 6-Band Lists. For TRS-80 Model I, Model III & Model IV. Price $39. Reviewed December QST. Supplied on 5¼" DOSPLUS formatted disk with complete documentation. Specify model/density of computer when ordering. WB8YUO, 6333 Willowdale Court, Columbus, OH 43229. 614-895-1130.

WANTED — Collins R-390A receiver, Owen Royce P.O. Box 187, Mequon, WI 53092. 414-241-8335.

MICROLOG ATR — 6800, companion printer, perfect, $1200 or B/O. Lunar 2-mtr all-mode amp. 10 watts in-160 watts out-asking $200. TenTec Corsair, power supply/speaker, 4 filters, desk mic, B/O above $1000. Charles Marino, 3892 Jerusalem Ave., Seaford, NY 11783, KQ2X, 516-826-6757.

CRYSTALS, TUBES: write for crystal listings and circuits, 1700 to 60000 kilocycles. See May advertisement. Long SASE or stamp. "Crystals Since 1933." WØLPS. Antique tubes, oldtimers, collectors, 203-A triodes $9.95, 860 tetrodes $12.50, 800 triodes $4.95, 872-A rectifiers $7.50. All unused new condition. Postage $2.50. Technical data supplied. C-W Crystals, Marshfield, MO 65706.

HENRY 2KD Classic linear $795, Icom PS-30 $175, EX-243 $35, EX-242 $25, EX-106 $85, BP-2 $20, VIC-C2N Datasette C20/64 $35, AEA MM-1 contest/memory keyer $75, More, SASE list, K6KUQ, 209-564-3960.

ROSS $$$$ New August Specials: If this month's special is not what you are looking for send Call Letters name & phone # for personal price quote. Over 6,000 ham related items in stock. Rohn HDBX-48 $329.90 Icom # IC-02AT $304.90, IC-471A $709.90, IC-490A $554.90, IC-45A $309.90, IC-25A $279.90, IC-R70 $569.90, IC-R71A $849.90, Kenwood # TS-430S $849.90, TR-8400 $379.90, TR-9000 $379.90, TS-530S $569.90, TR-9130 $449.90, TS-780 $839.90, TR-7950 $358.90, Yaesu # FT-208R $229.90, FT-757GX $749.90, FT-208R $229.90, FRG-7700 $379.90, FRG-7 $239.90. All major lines stocked, L.T.O. mention ad. Prices cash, FOB Preston. Closed Monday at 2:00. Ross Distributing Company, 78 South State, Preston, ID 83263. 208-852-0830.

FPM-300 need a little work $250. Radio Shack general coverage rec. Mint $50. Wilson-Brewster, MA 02631. 896-3549.

ICOM 720, PS15 power supply, CW, AM filters. Mint $890. Harvey, AD2S, 212-263-3494.

RTTY: Perfect, never-used IRL FSK-1000 TU w/AFSK option; RS-232 i/o for computer RTTY. My cost $545, you pay $425 or best offer. Avery Comarow, W4OGK, 524-B Springvale Rd., Great Falls, VA 22066, 202-842-9544 work, 703-759-9097 home.

ROSS $$$$ Used August Specials: Kenwood TS-930S $1069, VFO-820 $129.90, VFO-180 $95, TS-830S $669, TR-8400 $295, RM-76 $39, AT-230 $139, PC-1 $49.90, TS-130S $469.90, TS-180S $529.90, TS-520 $429, TS-520S $479.90, TS-600 $399, TS-820 $495.90, TS-820S $585, Yaesu FR-101, FL-101 $499.90, FT-620B $259, CPU-2500 $187, FT-107DMS $579.90, FT-707 $456, FT-127 $189, FT-310D $329, Drake MN2000 $139, R4,T4X,AC3 $399. If this month's special is not what you're looking for send Call Letters & phone #. Over 6,000 ham related items in stock. Mention ad. Prices cash, FOB Preston. Closed Monday at 2:00. Ross Distributing Company, 78 South State, Preston, ID 83263, 208-852-0830.

TI-99/4A Basic Cassettes, quality tapes: Send/Receive Code Practice, $8.95; MINIMUF Propagation, $9.95; Ham Computations and Design (Yagis, Pi and L Networks, Beam Heading, Line SWR and Input Impedance, Inductors, Dipoles, Ground Reflection Factors) $10.95, A C Buxton, W8NX, Ham Software Co., 2225 Woodpark, Akron, OH 44313.

51S1 $650. 30L1 $595. 75S3B, 32S3, 516F2, 312B4 $750. TS520, 6P520 $395. New Electro-Voice 12" musical instrument 300W speakers, 2/$75. W1FBG, 603-964-6658.

KENWOOD TR-530S w/CW & SSB filters, hand mike, mint, $500. KDK 2030 2M FM, mint, $175. If you want a good rig, this is it! K4JCX, 615-483-1427.

ROHN TOWERS — Wholesale direct to users. 23% to 34% discount from dealer price. All products available. Write or call for price list. Also we are wholesale distributors for Antenna Specialists, Regency, Hy-Gain. Hill Radio 2503 G.E. Road, P.O. Box 1405, Bloomington, IL 61701-0887, 309-663-2141.

DATABASE — Great Circle Bearings Computer owners! Calculate great circle bearing lists to anywhere on earth from your QTH. We furnish latitude, longitude, geographic name, callsign prefix for 860 DX and 450 USA/Canada locations, sample FORTRAN program included. Data sorted 3 ways. Paper listings $9.95 or 5¼ inch floppy (select CPM or IBM-PC) $19.95, AE8G, 901 S. Buckingham Ct., Sterling, VA 22170.

FOR SALE: Yaesu FT-102, great rig, low hours, mint condition. Will ship UPS in original carton. $525. Call Harry, NF5R, 405-252-2585, before 1900 CDT please.

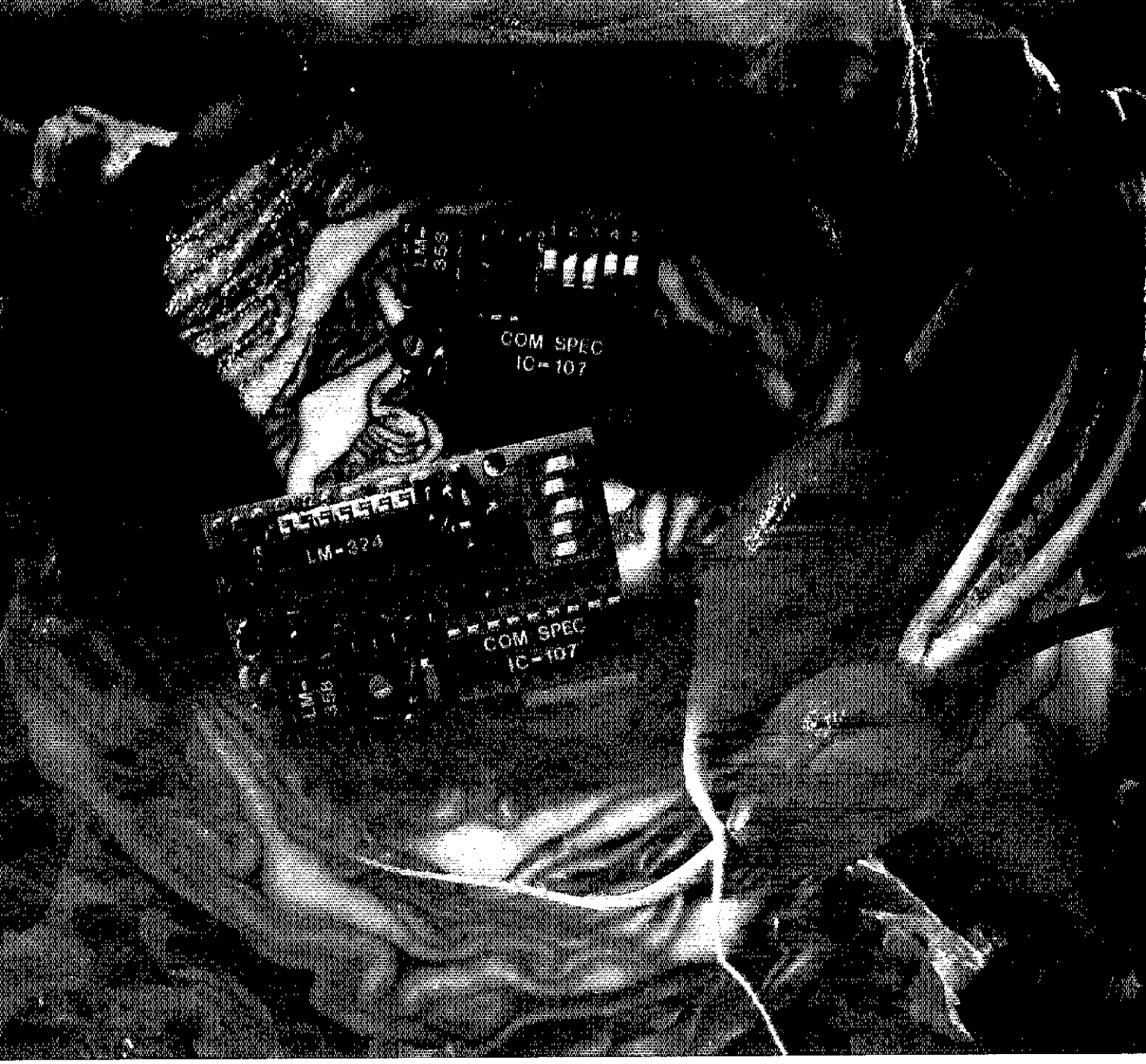
KENWOOD TS-520, $400. Realistic DX-160 receiver, $100. Matric 15 watt CW transmitter, $30. Keyers, mike and more. George Chatson, 81 Sherman Avenue, Williston Park, NY 11596, 516-741-8410 NOT after 9:00 PM please.

DRAKE TR-7, PS-7, RV-7, MS-7, 6.0 kHz, 2.3 kHz, 1.8 kHz, 500 Hz filters, fan, NB, aux. range board, WARC bands, all mint condition, original cartons, service manual, $1,350, Dick, KV4B, 615-892-4181.

DIGITAL AUTOMATIC displays for FT-101's, TS-520's, Collins, Drake, Swan, Heath and others. Write for information. Grand Systems, PO Box 3377, Blaine, WA 98230. 604-530-4551.

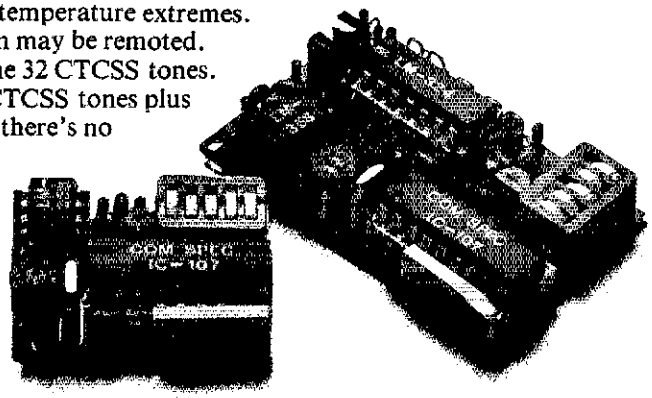
COLLINS: CP-1 Crystal Pack $165, 32S-2 with extra crystal board like 32S-3A $395, 32S-1 $195, 75S-1 $175, 516F-2 $115, 312B-4 $135. Collins filters: X455KQ200 $115, F455J05 $85, F455J31 $50, F455Q5 $50, F455N20 $45, F455N40 $45, F455N160 $45, F500B14 $60. Rick, K5UR, 501-988-2527.

WE BUY, Sell & Trade all types of new and used amateur radios, scanners, antennas & accessories. Huge selection. Shaver Radio, 1775A, S. Winchester Blvd., Campbell, CA 95008.



A fresh idea!

Our new crop of tone equipment is the freshest thing growing in the encoder/decoder field today. All tones are instantly programmable by setting a dip switch; no counter is required. Frequency accuracy is astonishing ±.1 Hz over all temperature extremes. Multiple tone frequency operation is a snap since the dip switch may be remoted. Our TS-32 encoder/decoder may be programmed for any of the 32 CTCSS tones. The SS-32 encode only model may be programmed for all 32 CTCSS tones plus 19 burst tones, 8 touch-tones, and 5 test tones. And, of course, there's no need to mention our one day delivery and one year warranty.



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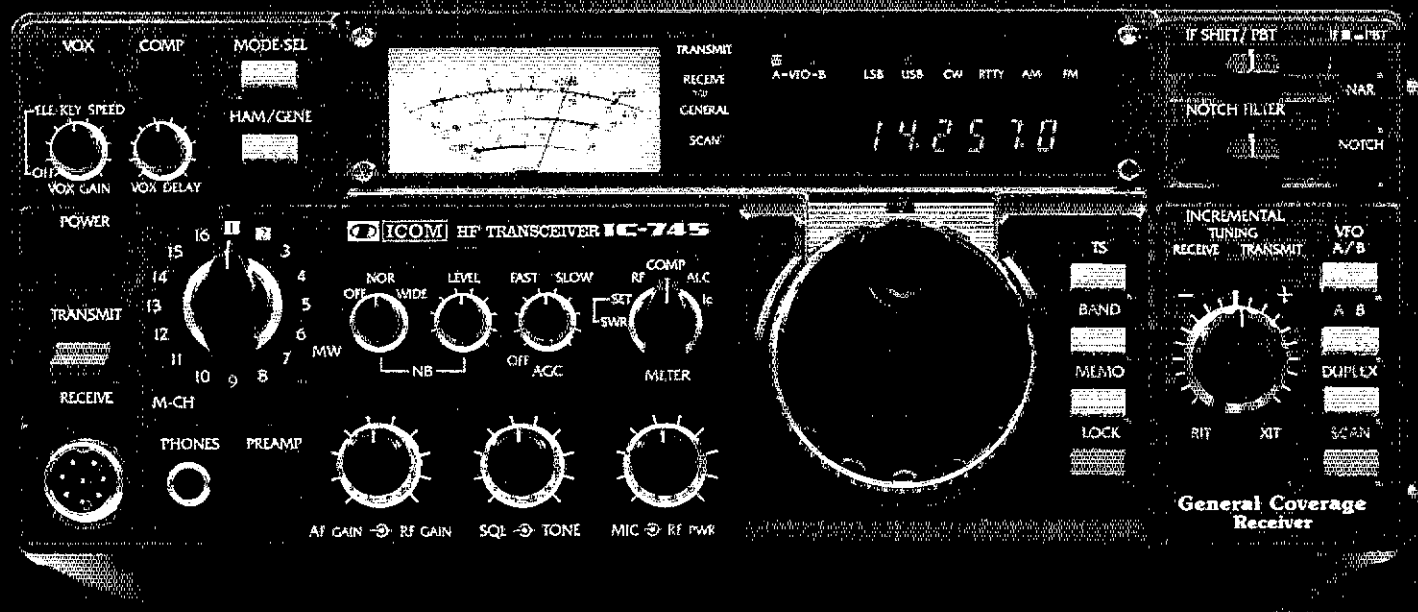
SS-32 $29.95, TS-32 $59.95

ICOM IC-745

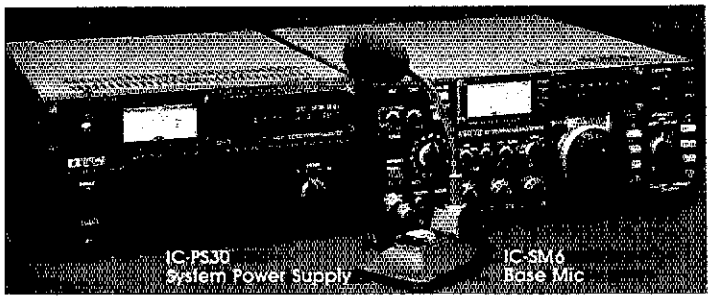
160-10 MTR 100W XCVR / 0.1-30MHz RCVR



The IC-745 represents a major breakthrough in the ham industry... a full featured HF base station transceiver with a combination of standard features found on no other transceiver in its price range.

Compare these exceptional standard features:

- **100KHz - 30MHz Receiver**
- **16 Memories**
- **100% Transmit Duty Cycle Transmitter with exceptionally low distortion**
- **IF Shift AND Passband Tuning**
- **Receiver Preamp**
- **10Hz/50Hz/1KHz Tuning Rates with 1MHz band steps**
- **Adjustable Noise Blanker (width and level)**
- **Continuously Adjustable AGC with an OFF position**
- **Full function Metering with a built-in SWR Bridge**
- **Optional Internal AC Power Supply**



Other Standard Features. Included as standard are many of the features most asked for by experienced ham radio operators: dual VFO's, RF speech compressor, tunable notch filter, all-mode squelch, program band scan, memory scan (frequency and modes are stored), receiver and transmitter incremental tuning and VOX.

ICOM's proven transceiver designs and technology are used in the IC-745 all ham band transceiver which includes SSB, CW, RTTY, AM receive and an optional FM **plus** a 100KHz to 30MHz general coverage receiver.

ICOM System. The IC-745 is compatible with ICOM's full line of standard HF accessories.

Accessories available include the IC-PS15 base supply, IC-PS30 system power supply (switching), IC-PS35 internal power supply, the IC-2KL linear amplifier, AT100 automatic antenna tuner, AT500 automatic antenna tuner, HP1 headphones, and HM12 hand or SM6 base microphone.

Options. The EX241 marker and EX242 FM module, plus a wide variety of filters for sharp audio reception are available.

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

The IC-745 is the only transceiver today that has such features standard...the number options and accessories available...and such an affordable price.

ICOM

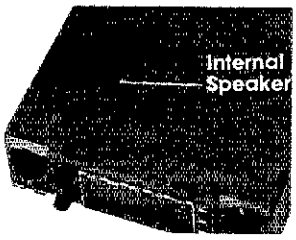
The World System

ICOM America, Inc., 2112-116th Ave NE, Bellevue, WA 98004 (206)454-8155 / 3331 Towerwood Drive, Suite 307, Dallas, TX 75234 (214)620-278

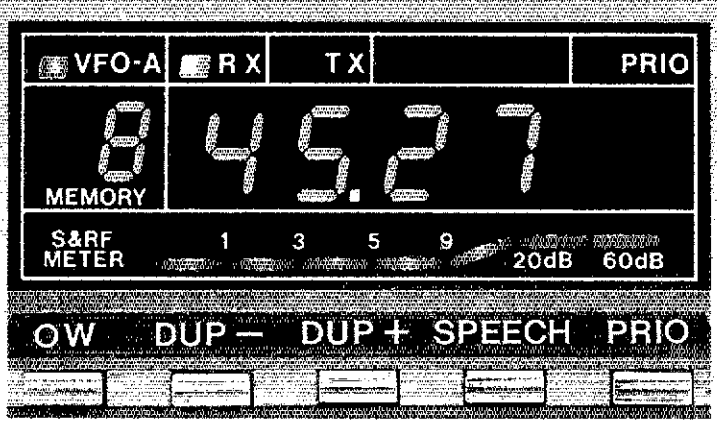
ICOM IC-27H

Ultra Compact 45 Watt 2-Meter Mobile!

Now ICOM offers the best choices in compact 2-meter FM mobiles...the IC-27H 45-watt compact (1⅝"H x 5½"W x 9⅜"D) and the IC-27A 25-watt super compact mobile. The IC-27A and IC-27H are the smallest full-featured 2-meter mobile transceivers available, and feature an internal speaker for easy installation. For the ultimate portable station, the IC-37A 220MHz and IC-47A 440MHz 25 watt compact mobiles are also available.



45 Watts. The IC-27H provides 45 watts of output power, while the IC-27A provides 25 watts of output power.



32 PL Frequencies. The IC-27A and IC-27H come complete with 32 PL frequencies ready to go and are 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 and offset.

9 Memories. The IC-27A and IC-27H have nine 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/H features an optional speech synthesizer to verbally announce the receiver frequency of the transceiver through the simple touch of a button.

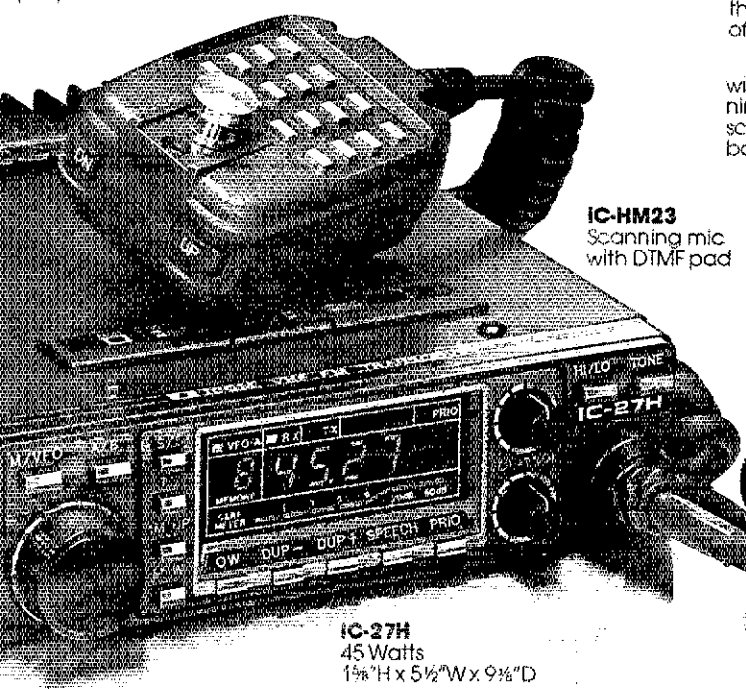
Scanning. Included with the IC-27A/H is a scanning system which allows scanning of the entire band.

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 of interest is free or busy.

See the IC-27A/H compact mobile transceivers at your local ICOM dealer. For superb performance, reliability, and the ultimate in a VHF mobile radio, your only choice is an ICOM.

The IC-25A 2-meter 25-watt mobile and its 45-watt companion, the **IC-25H**, are also available.

IC-HM23
Scanning mic with DTMF pad



IC-27H
45 Watts
1⅝"H x 5½"W x 9⅜"D

IC-27A
25 Watts
1⅝"H x 5½"W x 7"D

Also Available: IC-37A 220MHz and IC-47A 440MHz Compact Mobiles

ICOM

The World System

ICOM America, Inc., 2112-116th Ave NE, Bellevue, WA 98004 / 3331 Towerwood Drive, Suite 307, Dallas, TX 75234

AL-80 Compact 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.

- Individually tuned broad band pi network input presents a 50 ohm resistive load to the transceiver.
- A built-in ALC circuit controls the exciter gain to allow the highest average power without peak clipping.
- The AL-80 incorporates the rugged 3-500Z tube.
- Compact size: 12"W × 6.6"H × 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.

Power required: 120 volts 50/60 Hz 15 amperes or 240 volts 50/60 Hz 7.5 amperes.

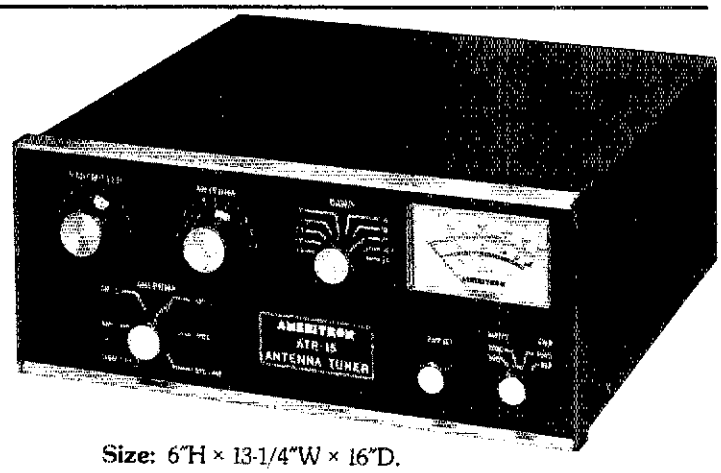
ATR-15 Antenna Tuner

The **Ameritron ATR-15** is a 1500 watt "T" network tuner that covers 1.8 through 30 MHz in 10 dedicated bands. Handles full legal power on all amateur bands.

Exceptionally efficient performance on all frequencies is achieved by the proper internal placement of variable capacitors and inductors.

Five outputs are selected from a heavy duty antenna switch allowing the rapid choice of three coaxial lines, one single terminal feed or a balanced output. An internal balun provides 1:1 or 4:1 ratios (user selectable) on the balanced output terminals.

A peak reading wattmeter and SWR bridge is standard in the **ATR-15.** It accurately reads envelope powers up to 2KW.



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DRAKE TR4 CW transceiver, NB-4 noise blanker, AC-4 power supply, MS-4 speaker. $325. E-Tek digital readout for TR-4CW $100 or will make very good deal for the set. K1XM, 11 Michigan Drive, Hudson, MA 01749, 617-562-5819.

SELL: CENTURY, digital. Perfect. $250. D'Onofrio, 1523 Central, Yonkers, NY 10710.

HAMMARLUND Super-Pro and National WRR-2 general coverage receivers — $100 each or best offer. Dan Burbach, 805-529-2243.

WANTED multi-mode 2M transceiver, solid-state 2M amplifier, 160-10 3kW tuner, Tailtwister rotator. Price and condition to KE7X.

WANTED: HP23 power supply KZ4I Gene, 213 Christin Dr., Clinton, TN 37716. 615-457-5953.

WANTED: Drake MS-4 Speaker. W6ALO: 706 East Adams Ave., Orange, CA 92667.

RTTY HAL CT-2100 and KB-2100, mint condition. $599 or best offer in first month. SSTV Venus SS2 and C1 camera $350 or best offer. Jim Orleff, 3170 West American Dr., Greenfield, WI 53221, 414-281-9135.

WANTED — 14C2 DC Converter for Swan 500CX. Mark Mohrmann. WA2FXM, 1210 Bellevue Ave., Syracuse, NY 13204.

WANTED: Hallicrafters FPM-300 Safari in good working condx. Bill Gieckel, W2OWH, 14 West Holly Drive, Sayville, NY 11782.

FOR SALE: TR-22C 2M portable $40. 2M repeater SCR-01, 7W output, 0.3 microvolt sensitivity $200. KE7X 406-586-2582.

WANTED: Old transmitter parts. Rod, W7PXS, Rt. 1, Box 273-A1, Mt. Pleasant, TX 75455.

HEATH HX-1681 CW transmitter & ps - $150, HR-1680 rcvr - $125 - $250 both. Don, KD9FK 414-921-5508.

IC-502 - $125. New KVG XF-9B filter - $50. K7XR, 26102 13th Pl. S., Kent, WA 98032.

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WANTED: Drake TR-7A, PS-7, and accessories. Ed, WB6WGL, 714-985-4577.

URGENTLY NEED manual or schematic, GE oscilloscope Model 4ST2A-2, Instructions ESD-157; buy or copy. Sandy, K8HE, 619-745-6940.

6-METER GEAR wanted - tube - or transistor. K2LGO, Box 158, Riverhead, NY 11901.

HEATH SB102, CW filter, SB630 console, HP-23 supply, SB600, "+2" microphone, $375. Globe Chief 160-10 transmitter, $40. Johnson ten-meter SSB, professionally converted, $95. All near mint, manuals, N5MG, 914-268-7420.

DRAKE R4C mint. 500 Hz filter, $275. Hallicrafters HT32 SSB/CW works good, $100. Sorry, no ship. Dave, AK2A, 914-362-1499.

SELL: KENWOOD TS520S, $385, mint, KB8JV, 517-631-5479.

RAMSEY CT-90 600 MHz frequency counter $79. Janel 144CF 144-28 receive converter $29. Beckman RMS 3060 digital multimeter, mint, sacrifice, $239. W2HG, CBA, 716-225-6754.

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DRAKE TR-5 with FA-7 fan and power supply - used little trade for TS-530S or FT-102. KD8LF, 1-419-726-2467.

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TS-930S "DX-traordinary"

TS-930S

We call it "DX-traordinary" because the TS-930S has now become the favorite rig of the serious contester! Its superior capability for full break-in split-frequency operation, the speed and convenience with which its eight memory channels can be accessed, its unsurpassed receiver dynamic range and its remarkable ability to select the desired signal during periods of heavy QRM, utilizing VBT, Slope tuning, IF Notch filtering, and tuneable audio filtering, have all combined to make this the rig that gives you the EXTRA EDGE!

The TS-930S is loaded with all the special features that you always wanted in an HF transceiver. Full coverage of the 160 through 10 meter bands, including the new WARC frequencies, (easily modified for HF MARS), plus a general coverage receiver that can tune any frequency from 150 kHz to 30 MHz. Operation in the SSB, CW, FSK, and AM modes, with selectable full or semi CW break-in. All solid-state, with 250 watts PEP input on SSB, CW, FSK, and 80 watts input on AM. SWR/power meter. Triple final protection circuits plus two cooling fans built-in. 10-Hz step synthesized frequency control. Available with optional automatic antenna tuner built-in, another industry first! Dual digital VFO's. Eight memory channels that store both frequency and band information, with internal battery back-up, (batteries not supplied). Dual mode adjustable noise blankers, especially effective in eliminating "woodpecker" type interference. SSB IF slope tuning, for maximum rejection of interference. CW variable bandwidth, with pitch and sidetone control. IF notch filter. Tuneable audio peaking filter. Unique six digit white fluorescent tube digital display is easy-on-the-eyes during those long contests. RF speech processor, for higher average "talk-power." SSB monitor circuit. 4-step RF attenuator. VOX. 100-kHz marker. AC power supply built-in, 120, 220, or 240 VAC.

TS-930S Optional Accessories:
AT-930 automatic antenna tuner, SP-930 external speaker, with selectable audio filters, YG-455C-1 (500 Hz), YG-455CN-1 (250 Hz), YK-88C-1 (500 Hz) CW filter, YK-88A-1 (6 kHz) AM filter, all plug-in type, SO-1 commercial stability TCXO, MC-60A deluxe desk microphone, MC-80 and MC-85 communications microphones, MC-42S mobile hand microphone, TL-922A linear amplifier (not for CW QSK), SM-220 station monitor, PC-1A phone patch, SW-2000 SWR/power meter, 160 ~ 6 meter, SW100A SWR/power/volt meter 160-2m HS-4, HS-5, HS-6, and HS-7 headphones.

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

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

Specifications and prices are subject to change without notice or obligation

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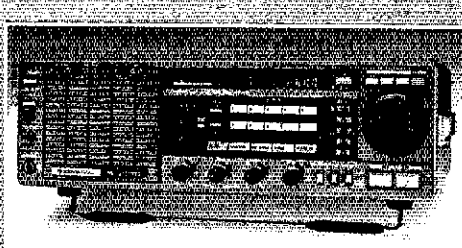
R-11 portable receiver

Kenwood's R-11 is the perfect "go anywhere" portable receiver. It covers the standard AM and FM Broadcast bands, plus nine additional short wave bands. The R-11's selectivity is greatly enhanced by the use of double-conversion on short wave frequencies above 5.95-MHz. High sensitivity coupled with a dual antenna system (telescopic and ferrite core) allow it to reach out and bring in those distant stations from all over the world.

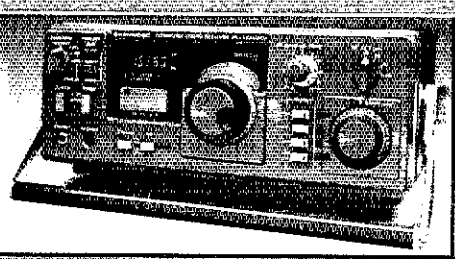
Simplicity of operation is enhanced by a band-spread type tuning control. Electronic band switching, with LED band indicator, along with a tuning meter to indicate received signal strength, combine to provide you with superior listening capability. Safety Hold-Release switch prevents accidental station loss. Large front mounted speaker provides excellent sound quality. Tone switch adjusts for high, low and voice transmission. Optional HS-7 micro-bead phones allow for private listening pleasure.

All this along with a record output jack, external antenna terminal and a rugged and attractive carrying case make the R-11 portable receiver the perfect travel companion!

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

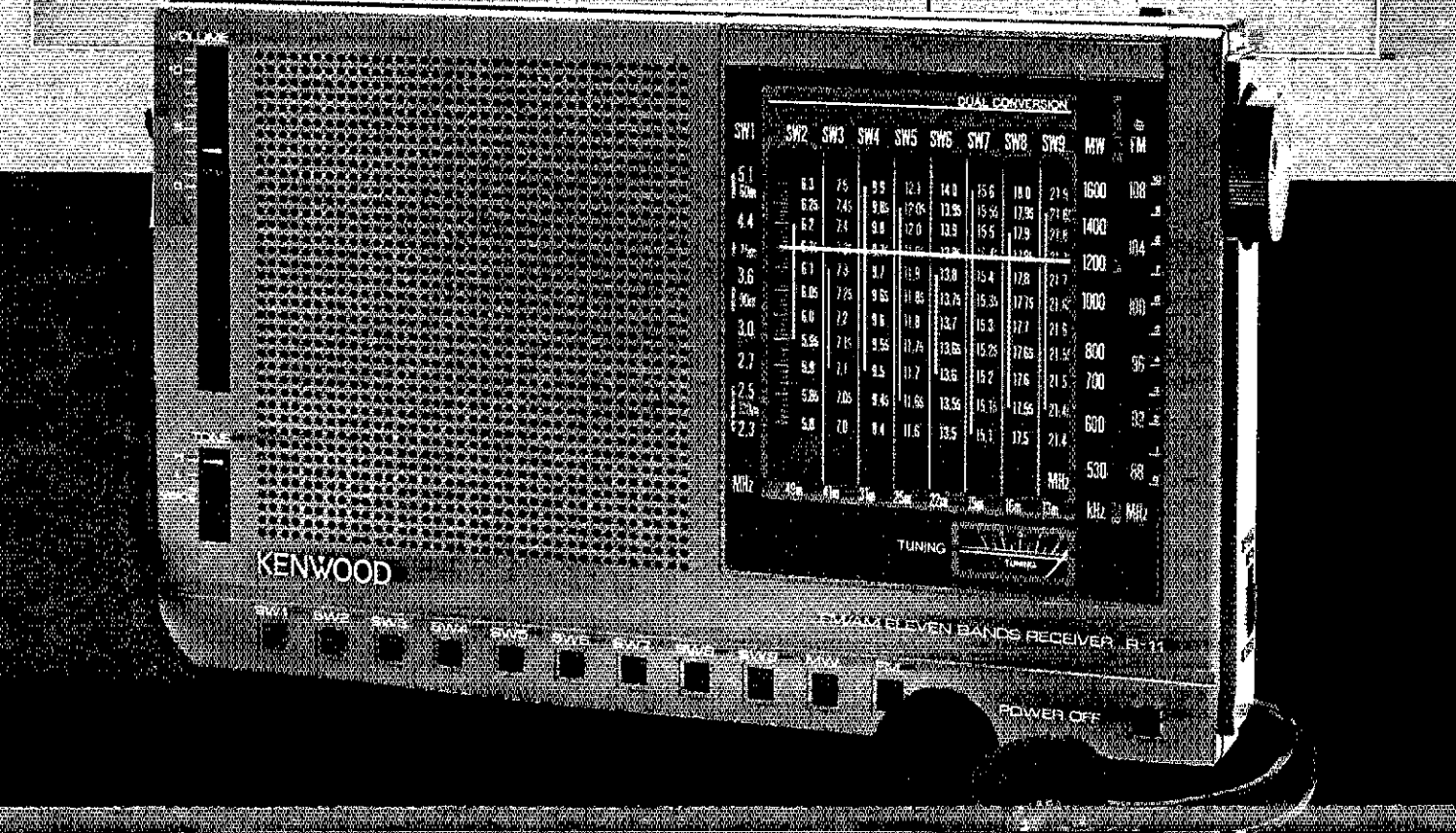


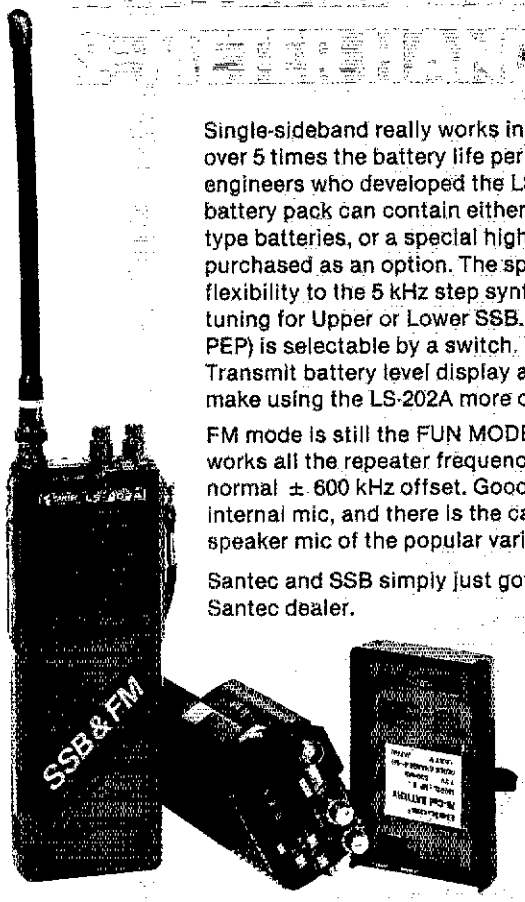
R-2000 Top-of-the-line general coverage receiver • 150 kHz to 30 MHz • Ten memories • Dual 24-hr clock with timer • Scanning • 100-240 VAC (Opt. 13.8 VDC) • Opt. VHF (118-174 MHz converter).



R-1000 High performance receiver • 200 kHz - 30 MHz • digital display/clock/timer • 3 IF filters • PLL UP conversion • noise blanker • RF step attenuator • 120-240 VAC (Optional 13.8 VDC).

R-600 General coverage receiver • 150 kHz - 30 MHz • digital display • 2 IF filters • PLL UP conversion • noise blanker • RF attenuator • front speaker • 100-240 VAC (Optional 13.8 VDC).





Single-sideband really works in nonrepeater situations and has over 5 times the battery life per battery charge according to the engineers who developed the LS-202A. The slide-on, locking battery pack can contain either Ni-Cd 'AA' cells or 'AA' alkaline-type batteries, or a special higher voltage Ni-Cd pack can be purchased as an option. The special VXO and RIT circuits add flexibility to the 5 kHz step synthesizer to provide continuous tuning for Upper or Lower SSB. High (2.5 W PEP) or Low (0.5 W PEP) is selectable by a switch. Lighted receive 'S-Meter' with Transmit battery level display and thumb-wheel switch lighting make using the LS-202A more comfortable.

FM mode is still the FUN MODE to many people, and the LS-202A works all the repeater frequencies from 144 to 148 MHz with the normal ± 600 kHz offset. Good, crisp audio comes from the internal mic, and there is the capability of using an external speaker mic of the popular variety.

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Technical Talk

SPECIFICATIONS	SSB/FM
Freq. Range	144.000–147.995 MHz
Synthesizer	5 kHz Steps + VXO
Modes	USB (A3J), LSB (A3J), FM
Voltage Range	6–12 VDC
Current Drain	30 mA RX Standby 750 mA TX Peak
Power Output	2.5 W PEP (9 V) 3.5 W PEP (10.8 V)
Receiver Bandwidth	2.4 kHz (– 6 dB) SSB 15 kHz (– 6 dB) FM
Sensitivity	0.25 uV (12 dB S/N) SINAD
IF Frequencies	10.695 MHz SSB, 10.695 MHz and 0.455 MHz FM
Spurious	– 60 dB

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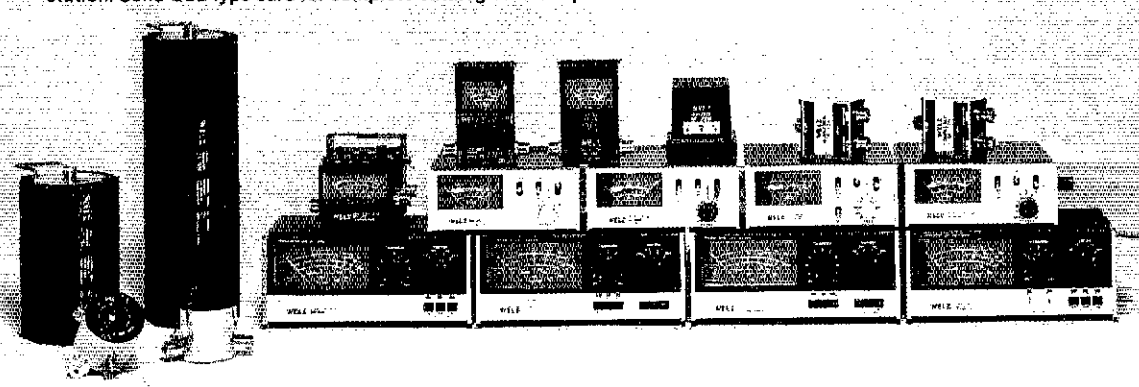

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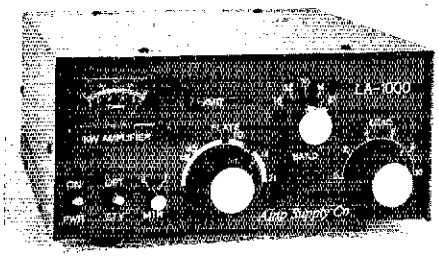
LA-1000A 1200 WATT AMPLIFIER



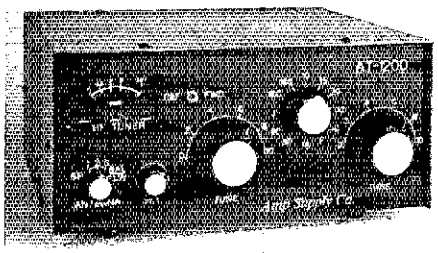
LA-1000A

The LA-1000A is a portable kilowatt now covering 160-15 meters. Typical drive requirement is 100 watts PEP yielding 1200 watts PEP SSB 800 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 $449.50*

AT-1200 TUNER



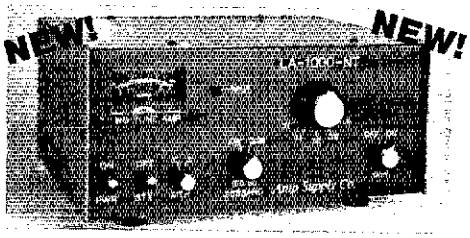
AT-1200

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 ..... $189.50*

BL-1500 9:1 5 KW Balun $29.50*

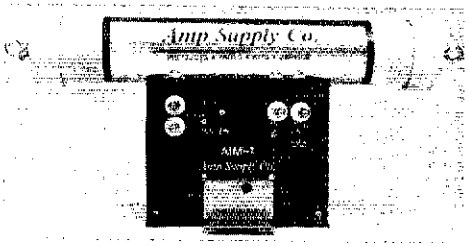
THE NEW NO TUNE — LA-1000-NT



More contacts, eliminate tune-up time, and less tune-up interference are yours with the NEW LA-1000-NT. The NO TUNE LA-1000 offers full coverage of the 160-15 meter amateur bands. A powerful 1200 watts PEP input and 800 watt DC input is the power rating of the LA-1000-NT. As with all Amp Supply Amplifiers, the NO TUNE LA-1000 features QSK, full break-in CW. Computerized CW and Keyboard Operators will love conversation-like full break-in (QSK) CW.

If you desire a compact killowatt amplifier that needs no tuning and you have a transceiver capable of delivering 100 watts PEP—The LA-1000-NT is the perfect addition to your radio station!!

LA-1000NT No Tuneup $529.50*



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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

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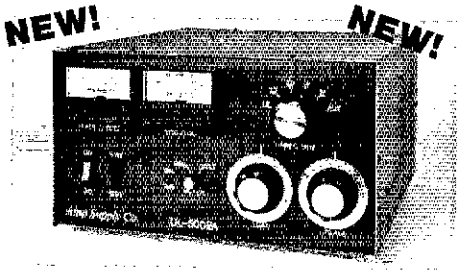
Stranded Ant. Wire $.08 ft.

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 comes completely assembled and covers 160-15 meters. Two Eimac 3-500Z triodes in grounded grid are featured with a dual cooling system, one for the power supply and the other cooling the 3-500's. There's only one 2.5 KW amplifier with a pair of 3-500Z tubes in the world that sells for under $900.00.

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
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- New Improved Bridge Power Supply with Computer Grade Electrolytics
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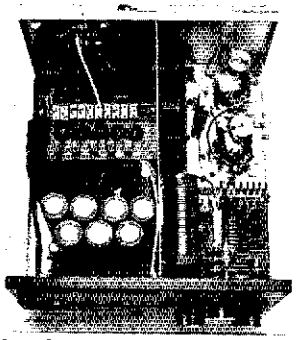

Interior view of LK-500ZA with "Peter Dahl" Hipersil Transformer

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Wired and Tested $889.00*
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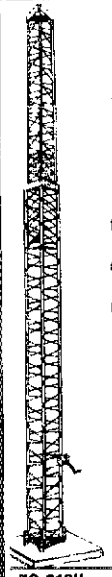

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- Totally self-supporting—no guys needed

Model	Height	Load	Sale Price
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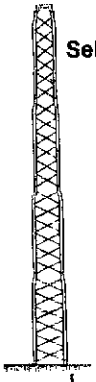
HG52SS	52 ft	9 sq. ft.,	$1049
HG54HD	54 ft.	18 sq. ft.,	$1629
HG70HD	70 ft	16 sq. ft.,	$2599

Masts—Thrust Bearings—Other Accessories Available —Call! Prices Shown Are Your Total Delivered Price In Continental U.S.A.!



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Model	Height	Ant. Load*	Weight	Delivered Price*
HBX40	40 ft	10 sq ft	164	$319
HBX48	48 ft	10 sq ft	303	$399
HBX56	56 ft	10 sq ft	385	$489
HDBX40	40 ft	18 sq ft	281	$379
HDBX48	48 ft	18 sq ft	363	$469

*Your Total Delivered Price Anywhere in Continental 48 States. Antenna Load Based on 70 MPH Wind.

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These rugged crankup towers now available from Texas Towers! All models available On Sale for tremendous savings to you!

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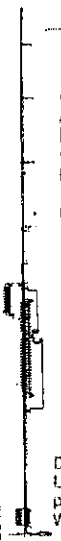
WT51	51.0 ft	20.5 ft	9.0 sq ft	$1154	$999
LM354	54.0 ft	21.0 ft	16 sq ft	$2010	$1599
LM470D (Motorized)	70.0 ft	22.0 ft	16 sq ft	$4195	$2999
DX86 (Motorized)	86.0 ft	23.0 ft	25 sq ft	$7200	Call

BUTTERNUT ELECTRONICS CO.



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- 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.)

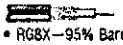
RG-213U

$.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

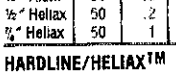


- RG8X—95% Bare Copper Shield
- Low Loss Foam Dielectric
- Non-contaminating Vinyl Jacket

Coaxial Cable Loss Characteristics (DB/100 ft)

Cable Type	Imped.	10MHz	30MHz	150MHz	450MHz
RG-213/U	50	.6	.9	2.3	5.2
RG8X	52	.5	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 UG23D N Female . $2.95
UG21B N Male . . $2.95

ANTENNA WIRE & ACCESSORIES

14 Ga. Stranded Copperweld	$.10/ft
450 Ohm H.D. Line	$.16/ft
18 Ga. Copperweld ¼wl	$.30
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	040	$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	220FB	$219
A449-6	$ 29	ARX2B	$ 39

HY-GAIN

Discoverer 2-el 40-mtr Beam	**$319**
Discoverer 3-el Conversion Kit	**$199**
Explorer-14	$309
QK710 30/40 mtr. Add-On-Kit	$79
V2S 2-mtr Base Vertical	$49
TH5MK2S Broad Band 5-el Triband Beam	$389
TH7DXS 7-el Triband Beam	$439
TH3JRS 3-el Triband Beam	$189
TH2MK3S 2-el Triband Beam	$179
205BAS 5-el 20-mtr Beam	$349
155BAS 5-el 15-mtr Beam	$199
105BAS 5-el 10-mtr Beam	$129
204BAS 4-el 20-mtr Beam	$259
64BS 4-el 6-mtr Beam	$69
66BS 6-el 6-mtr Beam	$135
18HTS 80-10 mtr Hy-Tower Vertical	$439
LC-160 160-mtr Coil Kit for 18HTS	$45
214BS 14-el 2-mtr Beam	$49
2BDQ 80/40 mtr Trap Dipole	$69
5BDQ 80-10 mtr Trap Dipole	$129
BN86 80-10 mtr KW Balun W/Coax Seal	$22

MOSLEY

Pro37 7-el Triband Beam	$489
CL-33 6-el Triband Beam	$279
TA-33 3-el Triband Beam	$249
TA-33JR 3-el Triband Beam	$189
TA40KR 40 mtr Kit for TA33	$119

MINI-PRODUCTS HQ-1

LIST $182.50 SALE $159

- Wing Span - 11 ft
- Wind Area - 1.5 sq ft
- Boom - 54 in. long
- 1200W P.E.P. Input

ALPHA DELTA COMMUNICATIONS

Transi-Trap™ Surge Protectors—In Stock Now!

Model LT 200W UHF Type	$19
Model HT 2KW UHF Type	$29
Model LT/N 200W N Type	$39
Model HT/N 2KW N Type	$44
Model R-T 200W Deluxe	$29
Model HV 2KW Deluxe	$32

KLM

KT34A 4-el Broad Band Triband Beam	$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	$439
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

ROTORS & CABLES

Alliance HD73 (10.7 sq ft rating)	$109
Alliance U110 (3 sq ft rating)	$49
Telex HAM 4 (15 sq ft rating)	$219
Telex Tailtwister (20 sq ft rating)	$769
Telex HDR300 Heavy Duty (25 sq ft rating)	$519
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)

SOUTH RIVER ROOF TRIPODS

HDT-3 3 ft Tripod	$19	HDT-5 5 ft Tripod	$29
HDT-10 10 ft Tripod	$49	HDT-15 15 ft Tripod	$69

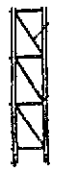
Heavy Duty Tripods include mtg hdw-UPS Shippable

ROHN GUYED TOWERS

10 ft Stack Sections

20G $37.50 25G $46.50
45G $107.50 55G $127.50

All 20G, 25G, 45G and 55G Accessories In Stock at Discount Prices - CALL!

Foldover Towers	Model	Height	Ant Load*	Price
	FK2548	48 ft	15.4 sq ft	$ 829
	FK2558	58 ft	13.3 sq ft	$ 899
	FK2568	68 ft	11.7 sq ft	$ 959
	FK4544	44 ft	34.8 sq ft	$1159
	FK4554	54 ft	29.1 sq ft	$1259
	FK4564	64 ft	28.4 sq ft	$1359
	25G Foldover Double Guy Kit			$199
	45G Foldover Double Guy Kit			$229

*Above antenna loads for 70 MPH winds and Guys at Hinge & Apex.

TOWER/GUY HARDWARE

3/16" EHS Guywire (3990 lb rating)	$.13/ft
1/4" EHS Guywire (6000 lb rating)	$.16/ft
5/32" 7 x 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
Sockethast Potting Compound (does 5-8 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	$39	$59	$79
.18 in Wall	$39	$69	$99	$109
.25 in Wall	$69	$129	$189	$249

TEXAS TOWERS

Telephone (214) 422-7306

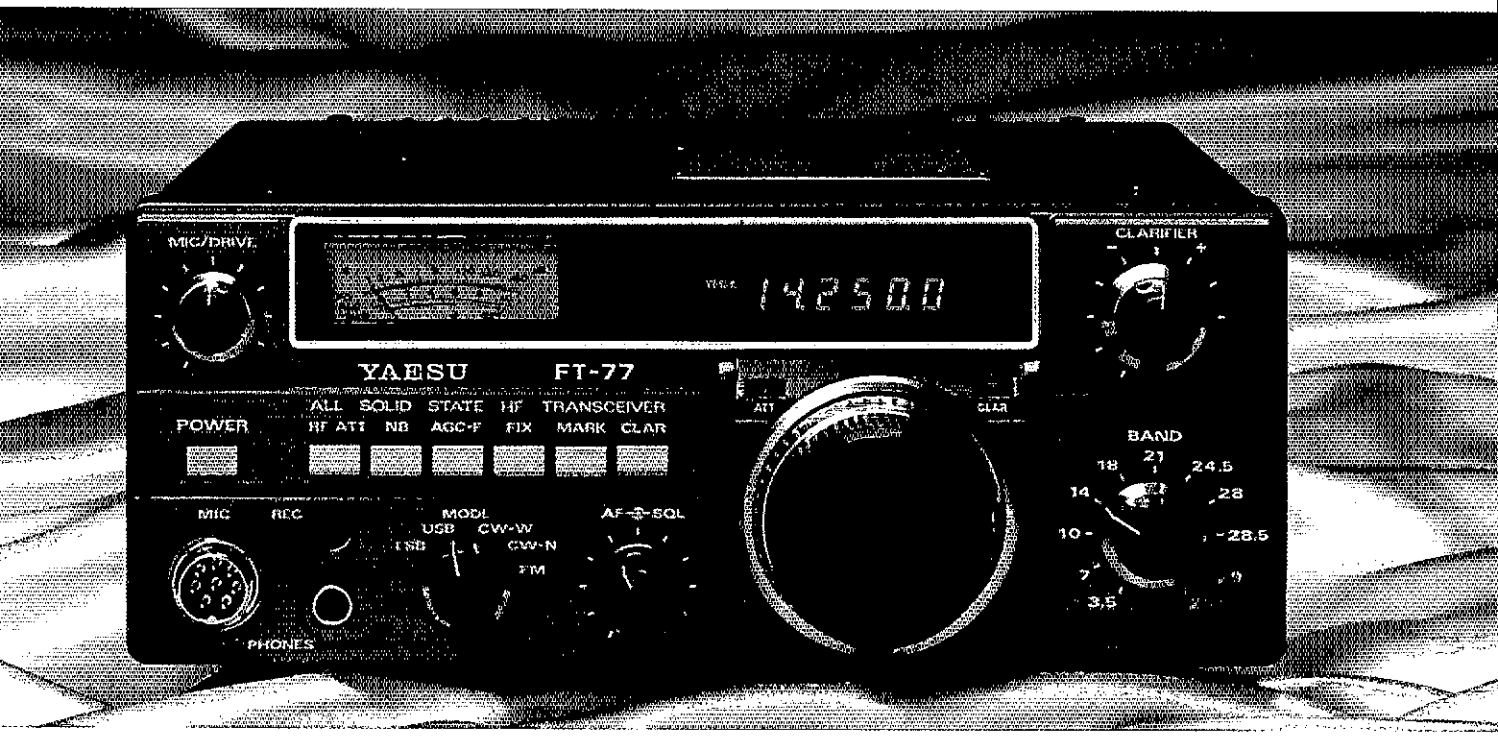
VISA MasterCard

Div. of Texas RF Distributors Inc.
1108 Summit Ave., Suite 4 • Plano, Texas 75074

Store Hours: Mon-Fri: 9am - 5pm Sat: 9am - 1pm

FT-77 The Rig for All Seasons!

Answering the call for an HF rig that goes everywhere, sounds great, and is cost-effective, Yaesu proudly introduces the FT-77 Compact HF Transceiver System.



Computerized Design and Manufacture

The FT-77 design engineers utilized the latest computerized circuit board layout methods, resulting in a compact, reliable transceiver with maximum utilization of available space. Automated insertion techniques are used in assembly, providing improved reliability and quality control over earlier designs.

Operating Versatility

The FT-77 is equipped for operation on all amateur bands between 3.5 and 29.7 MHz, including the three new WARC bands. Fully operational on SSB and CW, the FT-77 includes a dual width noise blanker (designed to minimize the "Woodpecker" or ignition noise), full SWR metering, R.I.T., and optional CW filter with wide/narrow selection. The optional FM-77 permits operation on the FM mode, with front panel squelch sensitivity control.

Expandable Station Concept

Ideal for mobile operation because of its compact size and light weight, the FT-77 forms the nucleus of a versatile base station. Available as options for the FT-77 are the FP-700 AC Power Supply, FV-700DM Synthesized External VFO and Memory System, FTV-707 VHF/UHF Transverter, and FC-700 Antenna Coupler, providing top performance at an extraordinarily low price.

Best of All, It's a Yaesu!

With the most experience in transceiver design and manufacture, the Yaesu trademark is your guarantee of quality and durability. We've got all-new technology and an all-new warranty policy to back it up.

See the FT-77 and the all new line of Yaesu HF, VHF, and UHF transceivers, receivers and accessories at your Yaesu Dealer today! *It's time you tried a Yaesu!*

Price And Specifications Subject To Change Without Notice Or Obligation

Special Supplier of Ham Radio Equipment for the Sarajevo 1984 Winter Olympic Games
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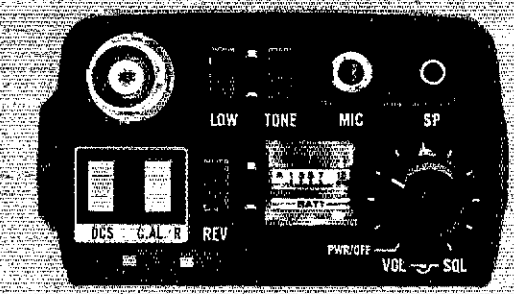
KENWOOD

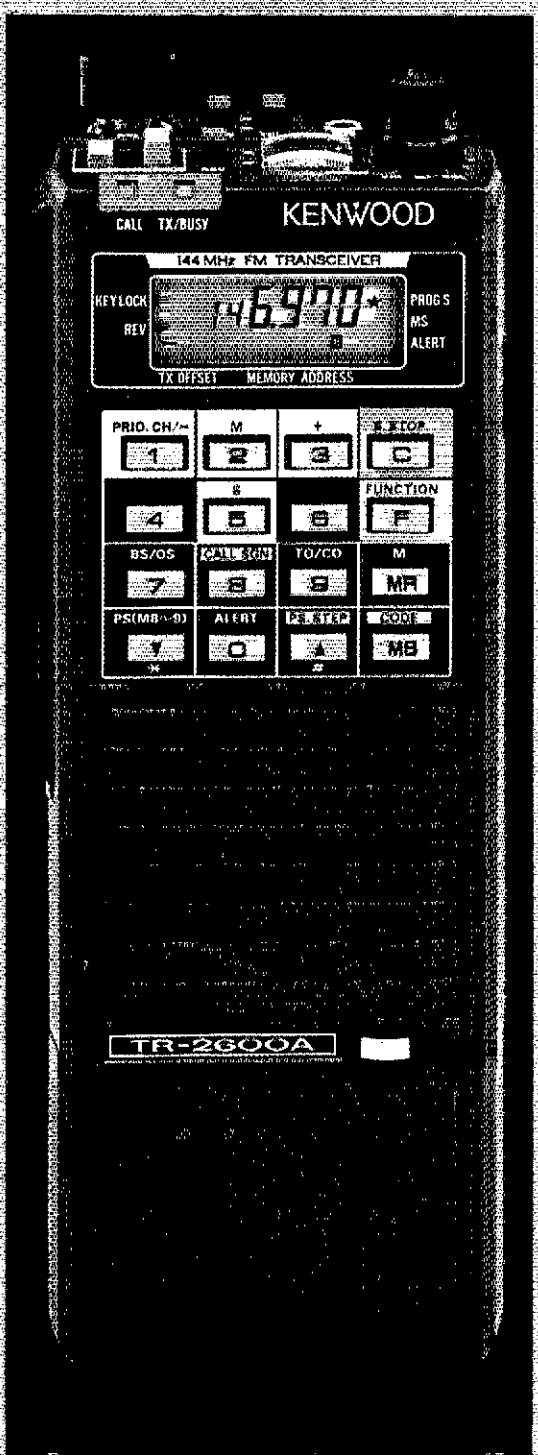
pacesetter in amateur radio

Digital Code Squelch...

TR-2600A

Kenwood's TR-2600A introduces DCS (Digital Code Squelch) circuitry, a signaling concept developed by Kenwood. DCS allows each station to have its own "private call" code or to respond to a "group call" or "common call" code. There are 100,000 different 5-digit ASCII code combinations possible. You can program in call signs up to 6 digits in the ASCII code. When operating in the DCS mode, this information can then be automatically transmitted, each time the transmit key is depressed. This revolutionary feature is only the beginning! The TR-2600A also sports a high impact plastic case, that is extra rugged and scuff-resistant. The molded-in color adds to the attractive appearance. The large L.C.D. display is easy to read in direct sunlight or in the dark with a convenient lamp switch. It displays transmit/receive frequencies, memory channels, and five arrow indicators for "F.LOCK" frequency lock, "REV" repeater reverse, "PROG.S" programmed scan, "MS" memory scan, "ALERT.S" alert scan. A star indicates "MEMORY LOCK-OUT" is activated, and repeater offset indicated by "+, –, S and M". The TR-2600A has 10 memories, nine for simplex or transmit with frequency offset ±600 kHz and one (memory 0) for non-standard split frequencies. Memory scan and programmable band scan have the added convenience of "Time operated Resume" that stops on busy channel and holds for approximately 5 seconds, then resumes scanning, or "Carrier Operated Resume" that stops on busy channel and resumes when signal ceases. Memory scan, scans only those memories in which data is stored, and memory lock-out allows you to skip selected memory channels





without loss of data previously stored! Manual Scanning UP/DOWN in 5-kHz steps and programmable automatic band scan are also useful features. The TR-2600A has a built-in "S" meter on the top panel which also indicates battery level when in transmit mode. Extended frequency coverage, 142.000-148.995 MHz allows transmit capability in 5-kHz steps for simplex or repeater operation on most MARS and CAP frequencies. Receive frequency coverage includes 140.000-159.995 MHz.

These features only tell part of the story. The TR-2600A also has keyboard frequency selection, built-in 16-key autopatch encoder, "TX STOP" switch, HI (2.5)/LOW (300 mw) power switch, REV switch, "SLIDE-LOC" battery pack, high efficiency speaker, BNC antenna terminal, and all of this in an extremely compact and lightweight package!

Kenwood's TR-2600A, with D.C.S., leads the way in high technology handheld transceivers!

Optional accessories:

- TU-35B built-in programmable sub-tone encoder
- ST-2 Base Stand
- MS-1 Mobile Stand
- PB-26 Ni-Cd Battery
- DC-26 DC DC Converter
- HMC-1 Headset with VOX
- SMC-30 Speaker Microphone
- LH-3 Deluxe Leather Case
- SC-9 Soft Case
- BT-3 AA Manganese/Alkaline Battery Case
- EB-3 External C Manganese/Alkaline Battery Case
- RA-3, 5 Telescoping Antenna
- CD-10 Call Sign Display

More information on the TR-2600A is available from authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, CA 90220.

TR-2600A Subject to FCC approval

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