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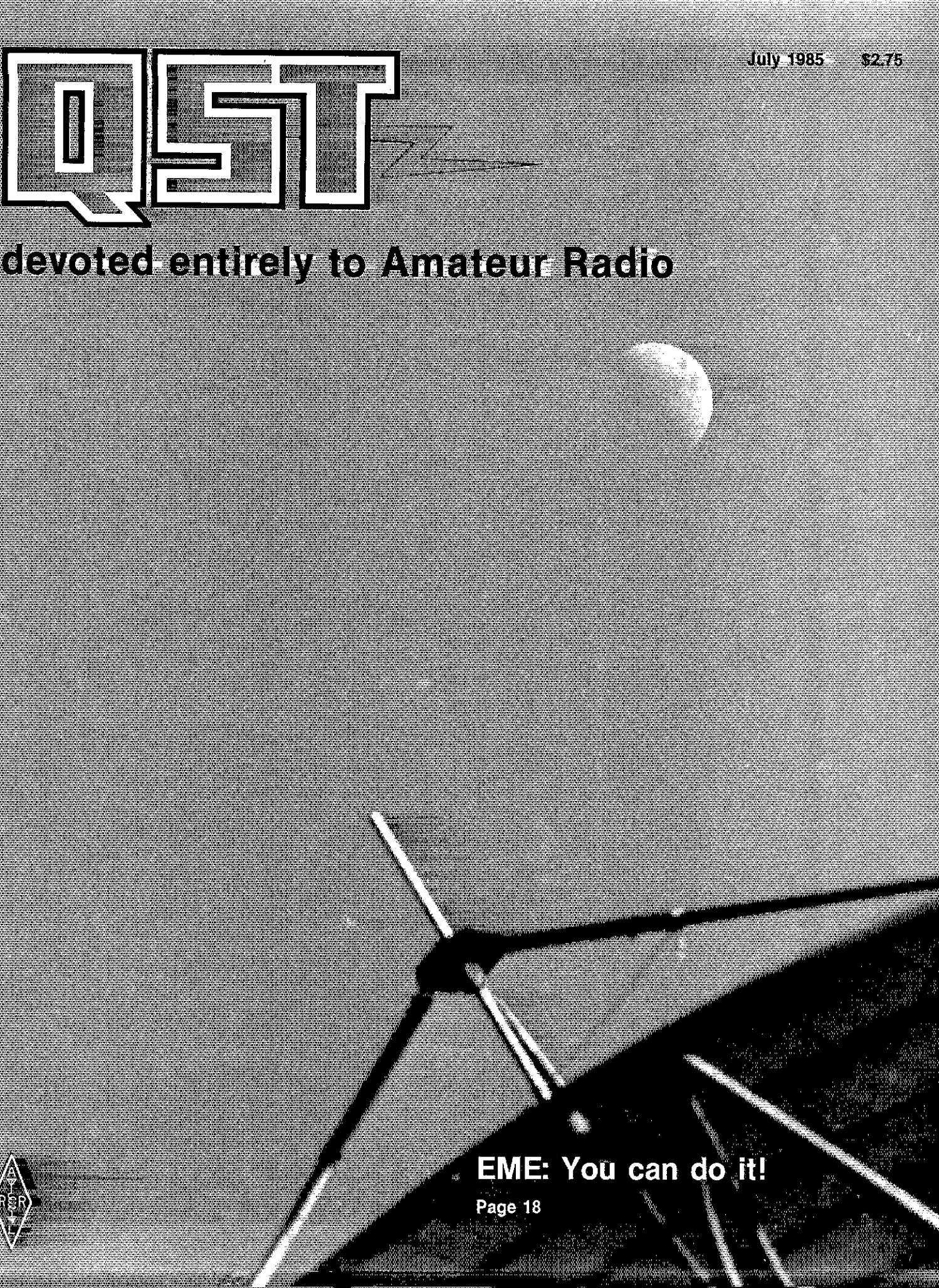

EME: You can do it!

Page 18

AMATEUR

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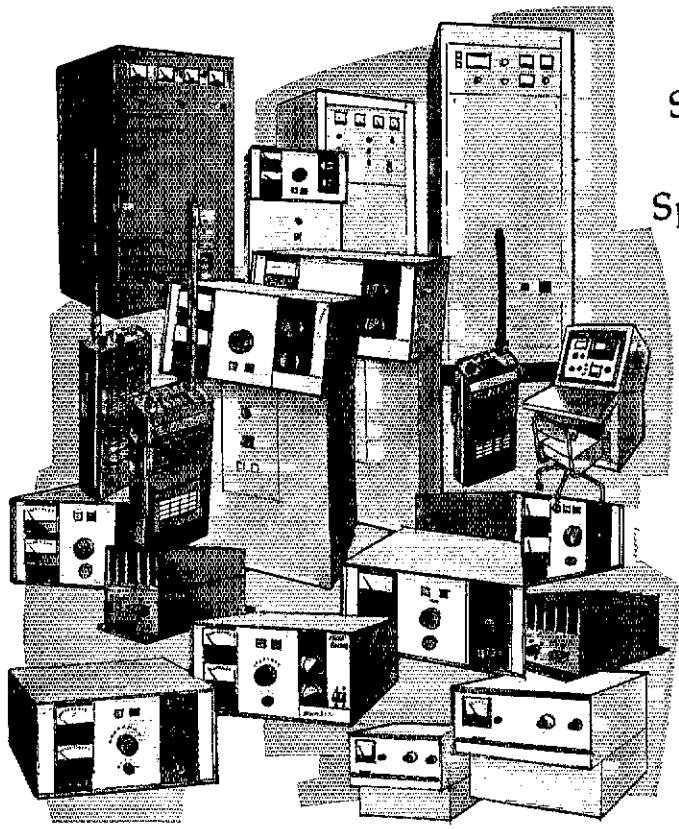

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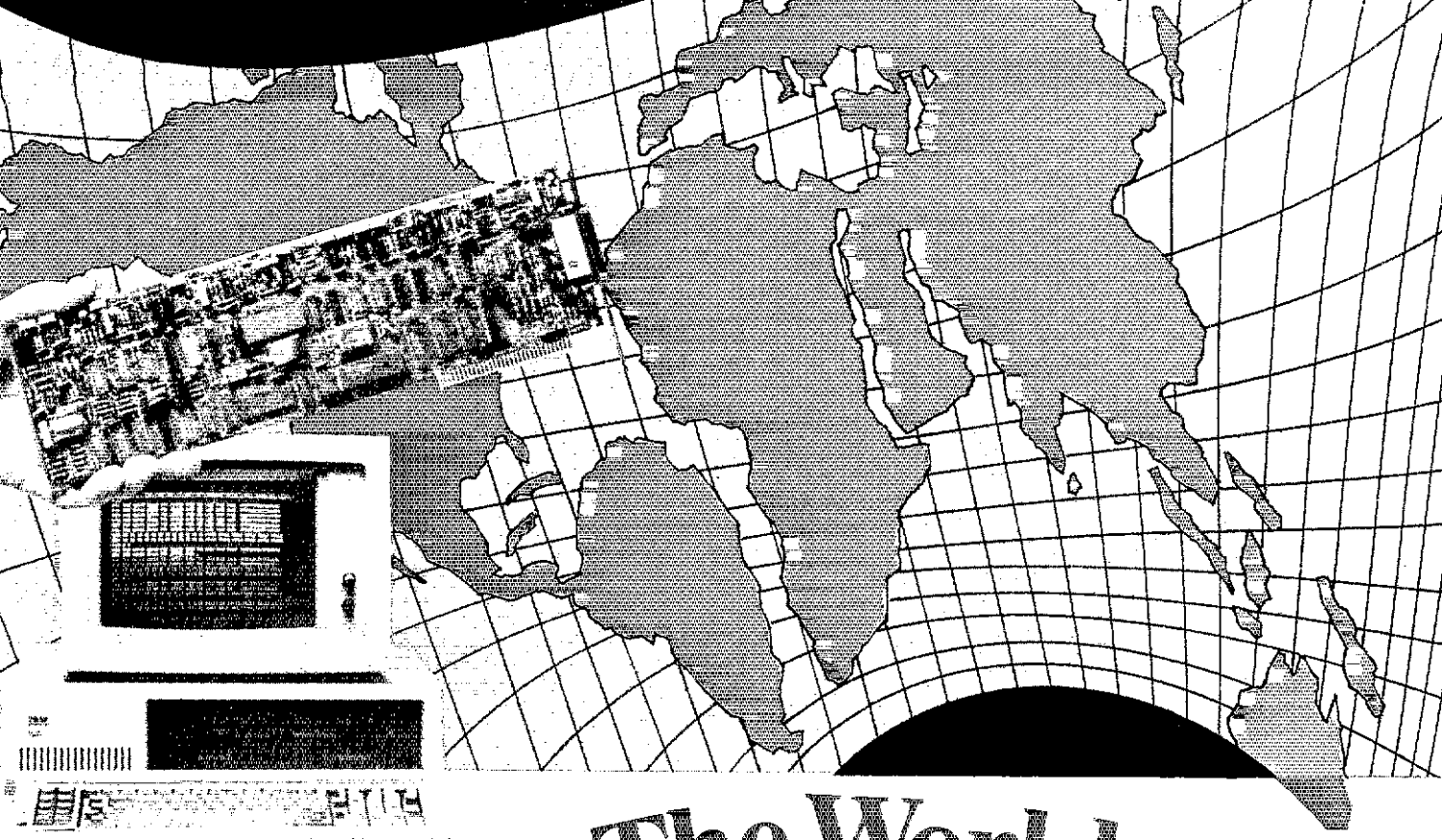

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The new ICOM IC-735 is what you've been asking for...the most compact and advanced full-featured HF transceiver with general coverage receiver on the market. Measuring only 3.7 inches high by 9.5 inches wide by 9 inches deep, the IC-735 is well suited for mobile, marine or base station operation.

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Superior Performance

It's a high performer on all the ham bands, and as a general coverage receiver, the IC-735 is exceptional. The IC-735 has a built-in receiver attenuator, preamp and noise blanker to enhance receiver performance. PLUS it has a 105dB dynamic range and a new low-noise phase locked loop for extremely quiet rock-solid reception.

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The large LCD readout and conveniently located controls enable easy operation, even in the mobile environment. Controls which require rare adjustment are placed behind a hatch cover on the front panel of the radio. VOX control, mic gain and other seldom used controls are kept out of sight, but are immediately accessible.

Options. A new line of accessories is available, including the AT-150 electronic automatic antenna tuner and the switching PS-55 power supply. The IC-735 is also compatible with most of ICOM's existing line of HF accessories.

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July 1985 *Volume LXIX Number 7*

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OUR COVER
EME, often called "the ultimate long path," is no longer out of reach for many hams. An article beginning on page 18 provides the basics; the rest is up to you. The photo, by ARRL Technical Advisor Paul M. Wilson, W4HHK, shows his 18-foot dish, which he's used since 1964.

CONTENTS

DEPARTMENTS

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CW Band Simulation That Is So Real You Won't Believe It!

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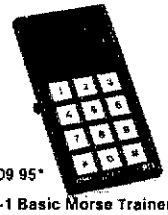

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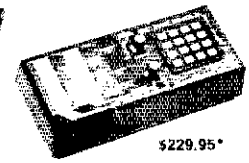

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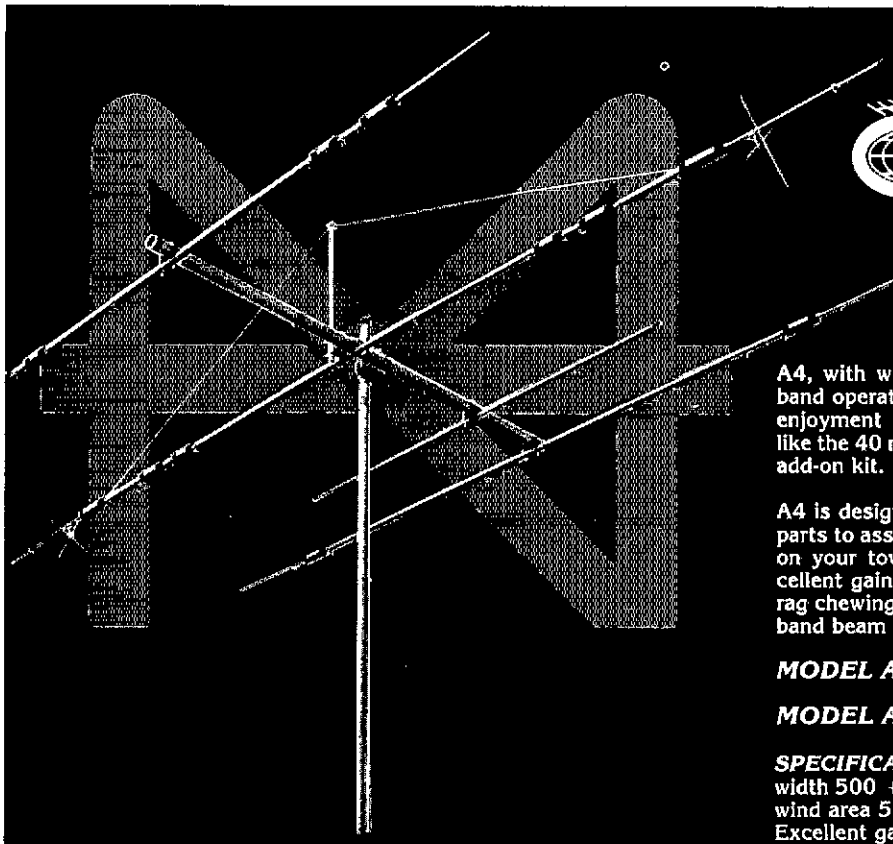

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A4, with wideband performance, easy installation, 4 band operation and moderate price will give you more enjoyment and satisfaction from your hobby. You'll like the 40 meter operating possibilities with the A744 add-on kit.

A4 is designed with you in mind because it has fewer parts to assemble, less weight and minimum wind load on your tower. With the 18 ft. boom, A4 gives excellent gain and front-to-back ratio. If your interest is rag chewing, DX-ing or contesting, A4 is the perfect 4 band beam for you.

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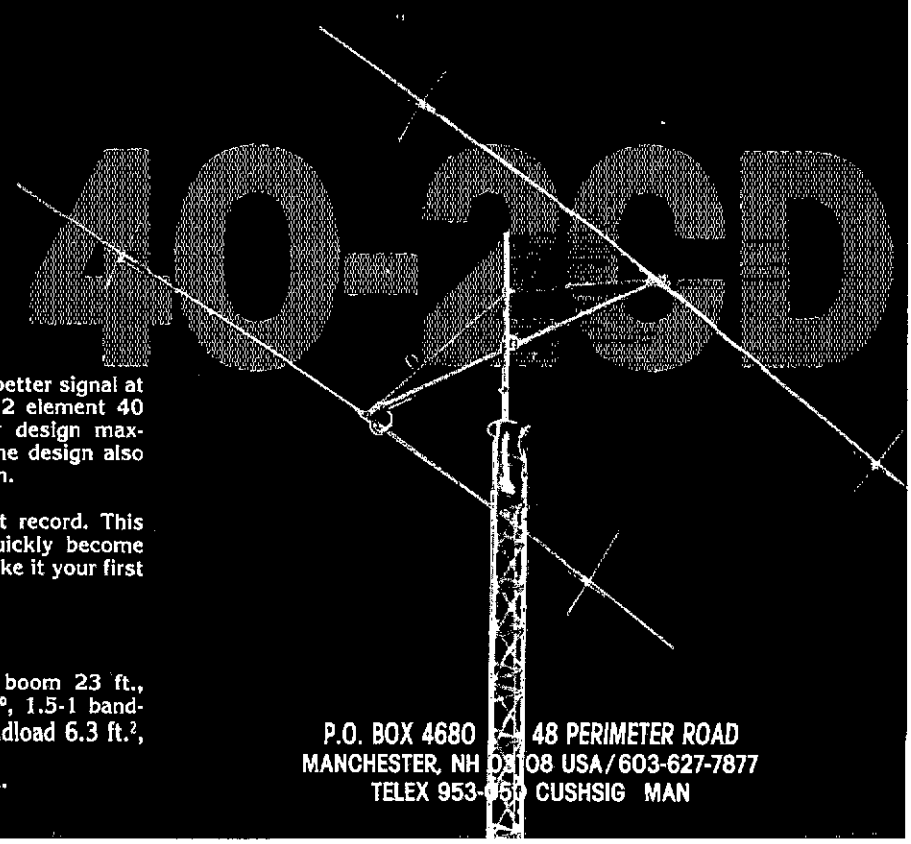
MODEL A744 40 METER ADD ON KIT

SPECIFICATIONS SWR 1.2-1 bandwidth 500 +KHz, boom 18 ft., longest element 32 ft., wind area 5.5 ft.², turn radius 18.4 ft., weight 37 lbs. Excellent gain.

MORE CONTACTS, MORE SATISFACTION WITH *CUSHCRAFT BEAMS*



More contacts, less interference and a better signal at the receiving end are yours with this 2 element 40 meter Skywalker Yagi. The computer design maximizes gain and reduces side lobes. The design also gives low SWR with excellent bandwidth.

Holder of the North American contact record. This compact two element antenna has quickly become "the most wanted" 40 meter beam. Make it your first choice.

MODEL 40-2CD 40 METERS

SPECIFICATIONS boom 23 ft., longest element 42 ft., beamwidth 70°, 1.5-1 bandwidth 180 KHz, turn radius 24 ft., windload 6.3 ft.², weight 40.7 lbs. Excellent gain.

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Handy Handful...

TR-2600A/3600A

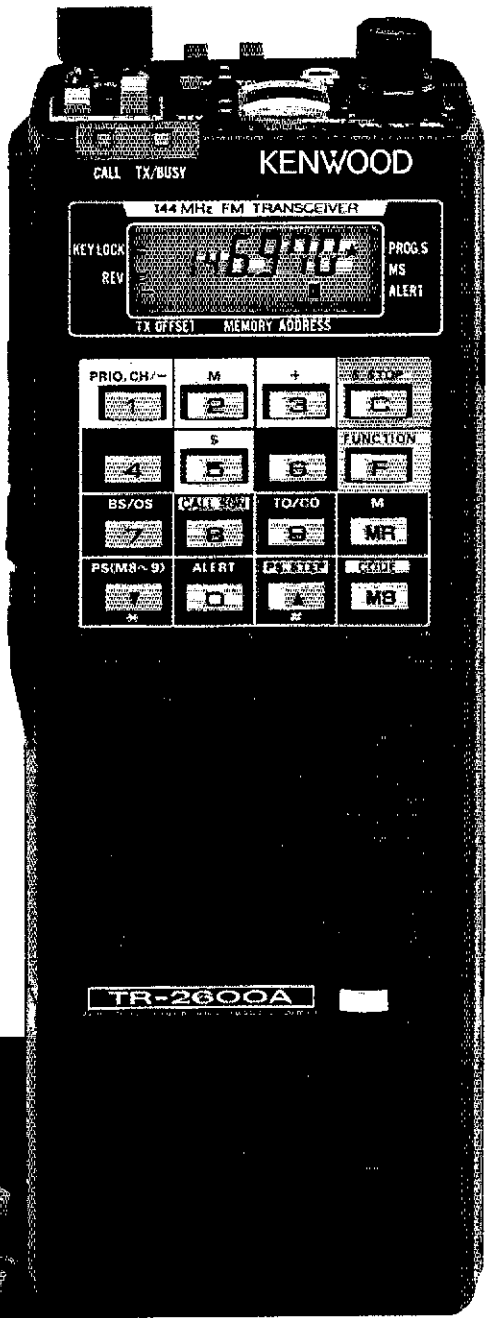
Kenwood's TR-2600A and TR-3600A feature DCS (Digital Code Squelch), a new signalling concept developed by Kenwood. DCS allows each station to have its own "private call" code or to respond to a "group call" or "common call" code. There are 100,000 different DCS combinations possible.

The Kenwood TR-2600A and the TR-3600A pack "big rig" features into the palm of your hand. It's really a "handy handfull"!

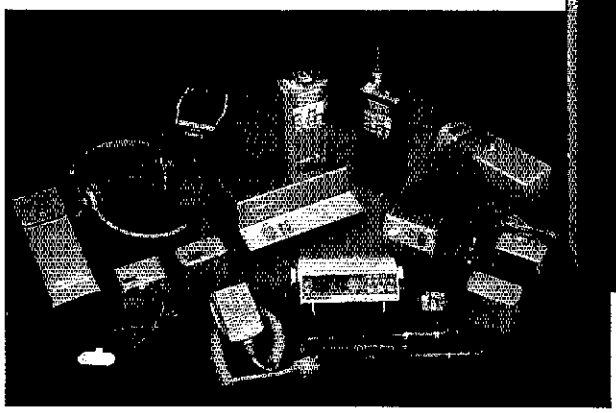
Optional accessories:

- 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 with belt hook
- BT-3 AA manganese/alkaline battery case
- EB-3 external C manganese/alkaline battery case
- RA-3 telescoping antenna
- RA-5 2-m/70-cm telescoping antenna
- CD-10 call sign display
- BH-2A belt hook

More TR-2600A and TR-3600A information is available from authorized Kenwood dealers.



- **Simple to operate**
  Functional design is "user friendly." Built-in 16-key autopatch encoder, TX STOP switch, REVerse switch, KEYboard LOCK switch, high efficiency speaker.
- **Large LCD**
  Easy to read in direct sunlight or in the dark with convenient dial light that also illuminates the top panel S-meter.
- **Extended frequency coverage**
  Allows operation on most MARS and CAP frequencies. Receive frequency range is 140-160 MHz; transmit capability is 142-149 MHz. (TR-3600A covers 440-450 MHz).
- **Programmable scan**
  Channel scan or band scan, search for open or busy channels.
- **SLIDE-LOC battery case**
- **10 Channels**
  10 memories, one for non-standard repeater offsets.
- **2.5 watts high power, 350 mW low**
  TR-3600A has 1.5 watts high or 300 mW low.



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TR-2600A shown. TR-3600A is available for 70 cm operation.
Complete service manuals are available for all Trio-Kenwood transceivers and most accessories.
Specifications and prices are subject to change without notice or obligation.

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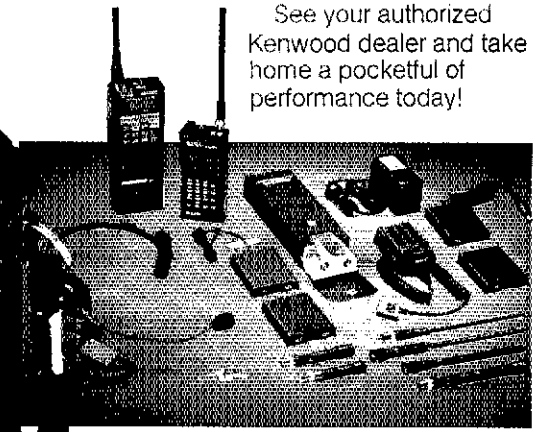
- **Pocket portability!** Kenwood's TH-series HTs pack convenient, reliable performance in a package so small, it slips into your shirt pocket! It measures only 57 (2.24) W x 120 (4.72) H x 28 (1.1) D mm (inch) and weighs 260 g (.57 lb) **with batteries!**
- **Expanded frequency coverage (TH-21AT/A).** Covers 141.000-150.995 MHz in 5 kHz steps, includes certain MARS and CAP frequencies.
  TH-31AT/A: 220.000-224.995 MHz in 5 kHz steps.
  TH-41AT/A: 440.000-449.995 MHz in 5 kHz steps.

- **Repeater offset switch.**
  TH-21AT/A: ±600 kHz, simplex.
  TH-31AT/A: −1.6 MHz, reverse, simplex.
  TH-41AT/A: ±5 MHz, simplex.
- **Standard accessories:** Rubber flex antenna, earphone, wall charger, 180 mAH NiCd battery pack, wrist strap.
- **Quick change, locking battery case.** The rechargeable battery case snaps securely into place. Optional battery cases and adapters are available.
- **Rugged, high impact molded case.** The high impact case is scuff resistant, to retain its attractive styling, even with hard use.

See your authorized Kenwood dealer and take home a pocketful of performance today!



- **Easy-to-operate, functional design.** Three digit thumbwheel frequency selection and handy top-mounted controls increase operating ease.

Optional accessories:

- **HMC-1** headset with VOX
- **SMC-30** speaker microphone
- **PB-21** NiCd 180 mAH battery
- **DC-21** DC-DC converter for mobile use
- **BT-2** manganese/alkaline battery case
- **EB-2** external C manganese/alkaline battery case
- **SC-8** soft case for TH-21A/31A/41A
- **SC-8T** soft case for TH-21AT/31AT/41AT
- **TU-6** programmable sub-tone unit
- **AJ-3** thread-loc to BNC female adapter
- **Service manual**

More information on the TH-series HTs is available from authorized Kenwood dealers.

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Note: Specifications guaranteed for the 144.000-148.000 MHz Amateur band only (TH-21A) shown. Standard versions TH-21A/31A/41A without DTMF pad also available. Specifications and prices are subject to change without notice or obligation

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North Dakota — Joseph M. Gregg, KNØA, R #1—Box 31, Horace 58047
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Tennessee — John C. Brown, NO4Q, P.O. Box 37, Eva 38333 (901-584-7531)

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Missouri — Benton C. Smith, KØPCK, 3301 Sinclair, Rte. 3, Box 196-A, Columbia 65203
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Eastern Massachusetts — Luck Hurder, KY1T, P.O. Box LL, North Eastham 02651 (617-255-2029)
Maine — Clevis O. Laverty, W1RWG, 17 Fair St., Norway 04268 (207-743-2353)
New Hampshire — William Burden, WB1BRE, 11 Briand, Nashua 03063 (603-882-0021)
Rhode Island — John Vota, WB1FDY, 41 Brookside Ave., Centerdale 02911 (401-231-1934)
Vermont — Ralph T. Stetson, III, KD1R, P.O. Box 123, Milton 05468 (802-893-4856)
Western Massachusetts — R. Donald Haney, KA1T, RD 1—Box 237, Myrick La., Harvard 01451 (617-772-4126)

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Montana — L. C. "Les" Belyea, N7AIK, P.O. Box 327, Belgrade 59714 (406-388-4253)
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Utah — James R. Brown, NA7G, 865 Manchester Rd., Kaysville 84037
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Northern Florida — Phillip O'Dwyer, WF4X, 543 Mooney Rd., N.E., Fort Walton Beach 32548 (904-862-2353)
Southern Florida — Richard D. Hill, WA4PFK, 3800 S.W. 11th St., Ft. Lauderdale 33312 (305-583-6932)
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THE AMERICAN RADIO RELAY LEAGUE, INC

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

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

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

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

All membership inquiries and general correspondence should be addressed to the administrative headquarters at 225 Main Street, Newington, CT 06111 USA
Telephone: 203-666-1541
Telex: 650215-5052 MCI.
MCI MAIL (electronic mail system) ID: 215-5052 (user name: ARRL)

"It Seems to Us . . ."

Novice Enhancement

Last October, the ARRL Board of Directors set an ambitious goal for growth in the Amateur Radio Service: 600,000 radio amateurs in the U.S. by the end of the decade, an increase of nearly 50% over the present number. Since then, League members have given considerable thought to how this goal can be achieved, consistent with the need for quality, as well as quantity, in our ranks.

It has become apparent that the Novice license, as presently constituted, is not doing the job for which it is intended: to provide a training ground on which newly licensed amateurs can develop the radiocommunication skills and knowledge necessary for upgrading. Of the 79,000 Novice licensees, the vast majority are inactive; indeed, tens of thousands have never used their Amateur Radio privileges to make a single contact! Lots of Novices do upgrade, of course, but these days it's seldom as a result of experience gained in operating on the air in the Novice bands—quite a contrast to 10 or 20 years ago.

If Novice privileges are insufficiently attractive to entice those who have earned them to get on the air, they are even less effective in motivating prospective hams to join our ranks. While Morse code is, and probably always will be, an integral part of Amateur Radio, it is not the only mode that is appropriate for a beginner to use. This was recognized as early as 1951, when the Novice license was established; Novices were given phone privileges at 145-147 MHz and retained them until as recently as 1968, when the privilege was withdrawn by FCC "to foster the code proficiency of these licensees." At the time the license was non-renewable, so it was "up or out" for Novice licensees—a situation that no longer exists, since the license is now renewable and carries a 10-year term.

Another category of privilege that many feel should be available to Novices is in the area of digital communication. By giving beginners the chance to hook a home computer to a ham rig, we can tap a promising source of prospective radio amateurs.

Discussions at the March meeting of the League's Executive Committee showed that there was considerable support, in principle, for enhancing Novice privileges. The development of specific proposals, to form the basis for further discussion at the May EC meeting in Rochester, was left to staff. In the meantime, we learned that there were other Novice proposals awaiting attention by FCC staff; if a League proposal were to be considered at the same time it would have to be filed quickly.

What emerged from the massaging of the staff recommendations by the Executive Committee was the following package:

1. Development of a plan for more efficient beacon operation in the 28 MHz band (beacons now occupy 100 kHz of the band, from 28.2-28.3 MHz), to permit that spectrum to be put to another use.

2. Expansion of the existing 28-MHz Novice/Technician band to permit CW and data communication (e.g., RTTY, AMTOR, and packet up to 1200 bauds) at 28.1-28.3 MHz, and CW and SSB at 28.3-28.5 MHz, at the present Novice/Technician power limit of 200 watts output. (Double-sideband AM would not be permitted, to prevent 27-MHz AM operating practices from being transplanted into an amateur band.)

3. Revival of the 1979 ARRL proposal for Novice privileges at 220 MHz, which was dismissed by FCC in 1983. (All authorized modes would be permitted, with an output power limit of 25 watts. Novices would be permitted to operate through repeaters, but could not be the licensees or control operators of repeater stations.)

4. Privileges similar to those requested for 220 MHz, but for a segment of the 1240-MHz band such as 1246-1260 MHz. The power limit here would be 5 watts output, to preclude concerns related to exposure to RF energy at close range by inexperienced persons.

5. Elimination of the rule limiting all licensees to Novice power levels in the Novice bands, so the privileges of other licensees would not be reduced as a result of Novice enhancement.

6. Expansion of the Element 2 (Novice) written examination syllabus to include basic digital communication and voice operating techniques, and expansion of the Novice exam from 20 to 30 questions (and the question pool from 200 questions to 300) to cover the new material. Present licensees would not be required to retake the exam.

The package was submitted to the ARRL Board, and by mail vote a petition to FCC was authorized. The petition was filed on June 6 by the League's Counsel.

This Board action may well be one of its most important of the decade. When the goal for growth was established last fall, it was clear that the Amateur Radio "product" would have to be improved for it to appeal to its "market" of potential hams. Making the Novice license relevant to the interests of young people is an essential step if the Amateur Radio Service is to continue, in future decades, to fulfill its basis and purpose. The majority of today's "Old Timers" started in Amateur Radio when they were teenagers, or younger. This early opportunity for hands-on experience with telecommunications technology and concepts shaped many careers and interests later in life, which in turn has benefited the nation immeasurably.

The particular privileges being proposed for Novices represent a balance between a number of conflicting considerations. Ten-meter phone and data privileges will permit Novices to pursue these activities with the same equipment that can be used for developing Morse code skills, but are not so attractive as to discourage upgrading. (If a

(continued on page 48)

Hugh Fallis, VP Engineering, Radio Free Europe, Munich, stands beside CE 100 kW HF transmitter using EIMAC 4CV100,000C tube.

EIMAC tubes provide long life for Radio Free Europe Service.

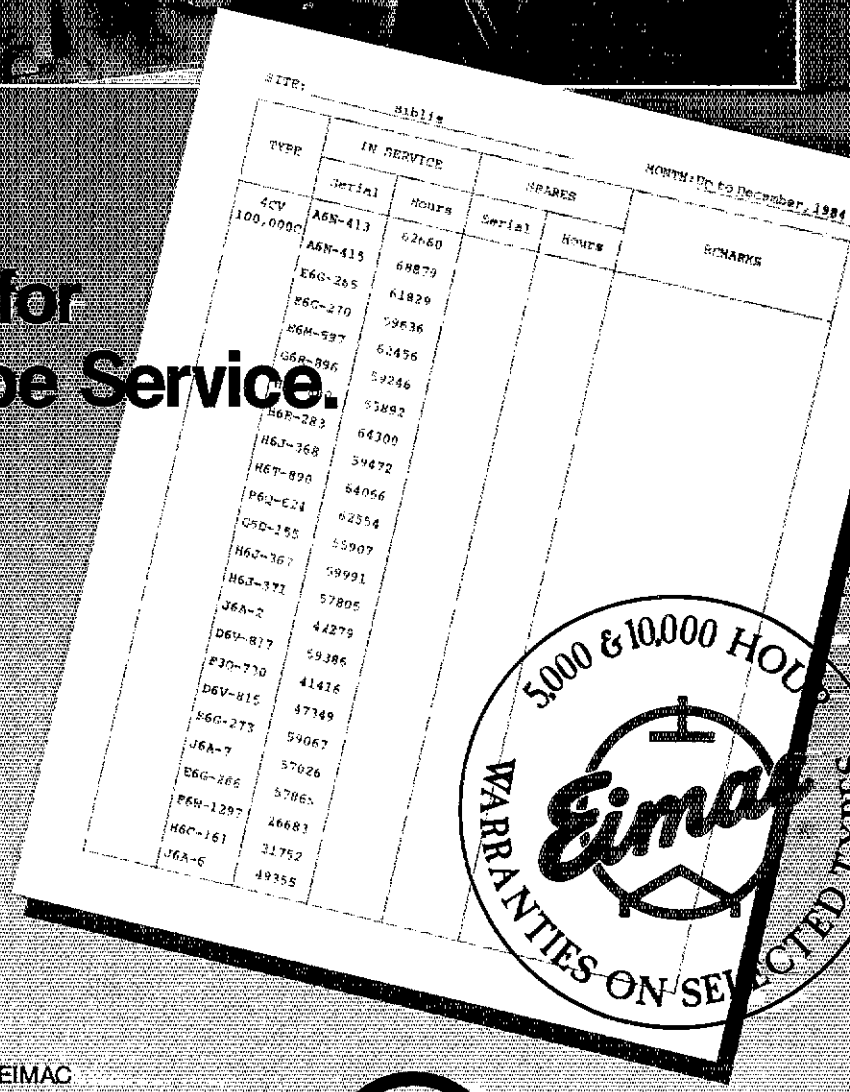
Radio Free Europe transmitters in Biblis and Lampertheim, West Germany, use EIMAC 4CV100,000C power tubes in 12 Continental Electronics 100 kW HF transmitters.

The station logbook shows most tubes have over 50,000 hours of service, and many tubes logged over 60,000 hours! And EIMAC tubes are still running strong—that's long life!

These figures are representative of the long life EIMAC tubes log in a variety of high power broadcast applications.

Take advantage of proven reliability, longest warranty in the industry and 50-year expertise. Choose EIMAC, the world's foremost manufacturer of high power broadcast tubes.

Call Varian EIMAC or contact any Electron Device Group sales organization worldwide.



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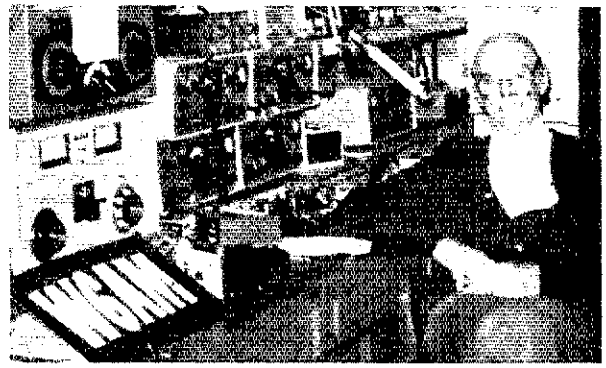
UP FRONT in QST

Meteor-Scatter Communications Breakthrough

Two U.K. amateurs have achieved what they believe to be the first amateur picture transmission using meteor scatter. At 0640 GMT May 7, Jeremy Royle, G3NOX, in Saffron Walden, Essex, England, transmitted composite, high-definition, single-frame color SSTV to Chris Tran, GM3WOJ, in Rosemarkie, Ross-shire, Scotland, on 50 MHz via meteor scatter. GM3WOJ received a single burst of the G3NOX test signal at 5-9+, long enough to produce the image in the accompanying photograph, taken directly from the monitor. This and subsequent tests are being carried out as part of a 50-MHz propagation experiment under special permits granted to some U.K. operators. A similar test is being arranged with Norwegian stations who also have permits to use the 50-MHz band.



Don C. Wallace, W6AM, one of the world's best known and most admired Amateur Radio pioneers, has become a Silent Key. An enthusiastic DXer from the early days of radio, Don established his rhombic antenna farm on the Palos Verdes Peninsula in Southern California as one of the most famous Amateur Radio stations ever assembled. For a brief look at Don's contributions to Amateur Radio, see this month's How's DX? column. The August 1981 How's DX? column lead was devoted to this unique ham.

OSCAR Commemorative Stamp Update

We should know something concrete by the end of the month about the possibility of a commemorative postage stamp being issued to honor the 25th anniversary of the launch of the first amateur satellite, OSCAR I, on December 12, 1961. The stamp will again be considered by the Citizens Stamp Advisory Committee at its meeting on July 26. The ARRL has been busy seeking support for the idea from prominent citizens in and out of government. See page 48 of this issue to find out how you can help.

Amateur-Shuttle Mission Goes Up This Month

All systems are "go" for the Amateur Radio operation aboard this month's Space Shuttle flight, scheduled for liftoff on the 12th. During the 51-F mission, NASA Astronauts Tony England, WØORE, and John David Bartoe, W4NYZ, will attempt to make two-way contacts with groups paired with ham clubs. **The primary downlink frequency will be 145.55 MHz,** and the first amateur operations could come as early as the second half of Day 2. Early transmissions will likely be on slow-scan television rather than two-way voice. See page 44, this issue, for a complete rundown of the mission, including planned frequencies for Shuttle operation updates and communications retransmissions.

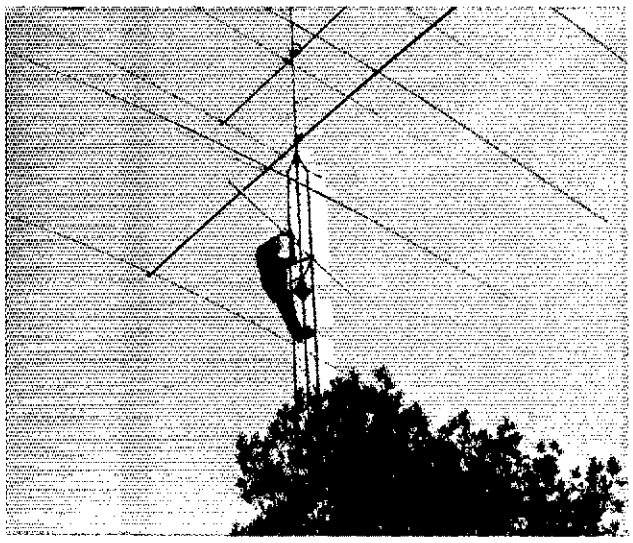
ARRL Novice-Privileges Plan Unveiled

At its May 18 meeting, the ARRL Executive Committee took a big step toward ensuring the future vitality of the Amateur Radio Service. The EC approved a plan developed by Hq. staff to enhance on-the-air privileges of Novice class licensees. An essential part of the plan is to attract larger numbers of newcomers without destroying incentives to upgrade and without disrupting present activities of higher-class licensees. The ARRL Board has endorsed the plan by mail vote, authorizing the filing of a petition for rule making with the FCC.

The plan includes limited **Novice use of RTTY, packet radio and SSB,** in addition to Morse code, and limited UHF operation. See pages 9 and 52.

Ham Radio Science Project Could Be Aboard Shuttle

Michelle Allen, KA9FUL, of Fort Wayne, Indiana, may someday have her ham radio experiment as part of a Space Shuttle mission. Michelle is one of 200 students to win regional awards in the Space Shuttle Student Involvement Project, a national competition sponsored by NASA and the National Science Teachers Association. Designed (with some help from science teacher Ron Dvorak, W9HRC) to improve communications between the Space Shuttle and ground control, her project calls for transmitting on two different HF bands instead of the VHF and UHF frequencies now used by NASA. In March, Michelle went with the other regional winners to NASA's Marshall Space Flight Center in Huntsville, Alabama, to present her proposal. If she wins one of the national awards, NASA officials may adopt her project for use in the Space Shuttle program. Michelle, 17, has been licensed since age 12 and has held an Advanced class ticket since age 13. This fall, she plans to attend DePauw University.



Members of the Gadsden (Alabama) ARC, K4JMC, know the meanings of teamwork and fraternity. Recently, they gathered at the QTH of fellow member Steve MacMillan, WB4JXD, to help him put up a 50-foot tower complete with a four-element, 20-meter Yagi topped off by a 15-meter Yagi, with a 2-meter ground plane atop that. With club President Dave Waits, K4VMV (shown here), taking care of the aerial work while a ground crew gave instructions and encouragement, the project was completed in a single day.

Malicious-Interference Bills: Round 2

Efforts in Congress to put more teeth in the enforcement of malicious interference have intensified. Another **bill making malicious interference a federal offense has been reintroduced** into Congress by Rep. Jim Bates (D-CA). The new House bill, HR-2479, has language similar to the Goldwater bill that was reintroduced into the Senate earlier this year as S-66. The new Bates bill presently has 13 cosponsors, but hams can help add to that list by soliciting support from their congressional representatives. Watch *QST* and *The ARRL Letter* for developments.

Exam-Credit Question Answered

The widespread confusion over the value of the Certificate of Completion in the Volunteer Examination Program has been settled. In a May letter to the ARRL, Raymond Kowalski, Chief, Special Services Division, FCC Private Radio Bureau, clarified the matter by saying that **the Certificate could be used only for code credit and for evidence of the right to operate under newly acquired privileges.** Kowalski added that the FCC would be willing to consider a petition from the amateur community to change the Rules so that elements already passed need not be retaken.

FCC Okays Some Spread-Spectrum Activities

The Commission recently opened the door wider for amateur experimentation with spread spectrum. Frequency-hopping and direct-sequence modes, subject to some constraints, have been authorized on frequencies above 420 MHz. The use of the new privileges, authorized in General Docket 81-414, will be delayed a year, however, so the amateur community may develop operating standards. In the meantime, **special temporary authorizations (STA) will be readily available to amateur experimenters.** Some exploratory work on amateur uses of spread spectrum is under way on STAs by members of the Radio Amateur Research and Development Corp. (AMRAD).

When residents of the Holiday Lodge Nursing Home in Longview, Texas, think of friends and family, they probably think of Josiah "Cy" Brown, K5UPN. Saturday afternoons and Tuesday evenings, Cy swings into action on the Golden Years Net, passing messages for Holiday Lodge residents to friends in other nursing homes and to family members. The net has about 50 members, and welcomes newcomers. Look for him on 7235 kHz at 1 P.M. Saturdays and on 3873 kHz at 7:30 P.M. Tuesdays Central Time. *(photo by Steve Earley, Longview Morning Journal)*

When it came to finding a power source for his radio shack in Nebraska back in the early '30s, Homer P. Schulz, WØHNP, made the most of what he had. At the side of the structure is an old Saxon automobile that Homer converted to drive a 32-V generator to charge a battery that ran the ham station's dynamotor. The dynamotor, in turn, supplied 350 V for the transmitter. The windmill out back was used as a wind-powered generator that supplied 6 V to charge batteries for the family's electric lights in the house. It was also used to charge the battery for a broadcast radio.

League Lines

In response to a petition filed by ARRL (RM 4880), the FCC has proposed to allow F2A (FM telegraphy) in the 10-meter repeater subband, 29.5 to 29.7 MHz. This would allow FM repeaters to identify using that mode. The Notice of Proposed Rulemaking (NPRM) in Docket 85-168 was released on May 31, 1985. The FCC asks for comments on any adverse effects this proposal may have on amateur operation. Comments are due by August 14, 1985. Formal comment requires the filing of an original and five copies to: Secretary, FCC, Washington DC 20554. Copies of the NPRM are available from ARRL Hq. for an s.a.s.e. with 39 cents postage affixed.

At the meeting of the ARRL Executive Committee in May, the EC discussed the repeater coordination docket, PR Docket 85-22. The Executive Committee expressed a preference for mandatory coordination of repeaters; for open repeaters having priority over closed repeaters in the coordination process; and for regional coordination in preference to a national coordinator, whether it be an existing organization or an umbrella organization organized for the purpose. Hq. staff was directed to continue preparation of draft comments on this docket; if the anticipated extension of time for filing comments materializes, the full Board will have the opportunity to review the draft at its July meeting. Complete minutes of the Executive Committee meeting appear in Moved and Seconded, this issue.

Listen for the National Boy Scout Jamboree station, K2BSA, at Fort A.P. Hill, Virginia. From July 24 through 30, they'll be operating on most HF bands. A special QSL will be sent to all who send an s.a.s.e. to the Youth Department at ARRL Hq.

Club Challenge for the '80s: We've upped the stakes. High-frequency transceivers will be given to three clubs. ARRL-Affiliated clubs are divided into three size groups: small, medium and large. In each group, the club that recruits the most new ARRL members will receive one of the following: ICOM IC-735, Heath HW-5400 or Kenwood TS-430. So in addition to the $5 commission for every new ARRL member, your club can earn a state-of-the-art transceiver! Contact Hq. for details. (Thanks to the manufacturers that donated this equipment.)

Prospective Volunteer Examiners who have not completed their accreditation process are invited to contact the ARRL/VEC office. Prospective VEs should have received an updated VE Manual in April.

VE Accreditations will be renewed this summer. The validation stickers will expire in three years, or on the VE's license expiration date, whichever is first. All ARRL-accredited VEs are eligible for renewal.

This fall, ARRL members in the Atlantic, Dakota, Delta, Great Lakes, Midwest, Pacific and Southeastern Divisions, and CRRL members, will choose directors and vice directors to begin new terms January 1, 1986. Nominations are now open. Complete details appear in this month's Happenings column.

The DXCC Branch has an opening for an Assistant DXCC Manager. Primary responsibility is checking QSL cards and making proper DXCC record entries. Some processing of applications brought to Hq. "in person" is involved. The Assistant Manager is responsible for managing the DXCC Desk in the absence of the Manager. Applicants for this position should have a General class (or higher) Amateur Radio license. A high degree of accuracy and neatness in record keeping is essential. Some interest in DXing and DX call signs helpful. Anyone interested in this position should contact Don Search, W3AZD, DXCC Branch Manager, ARRL Hq.

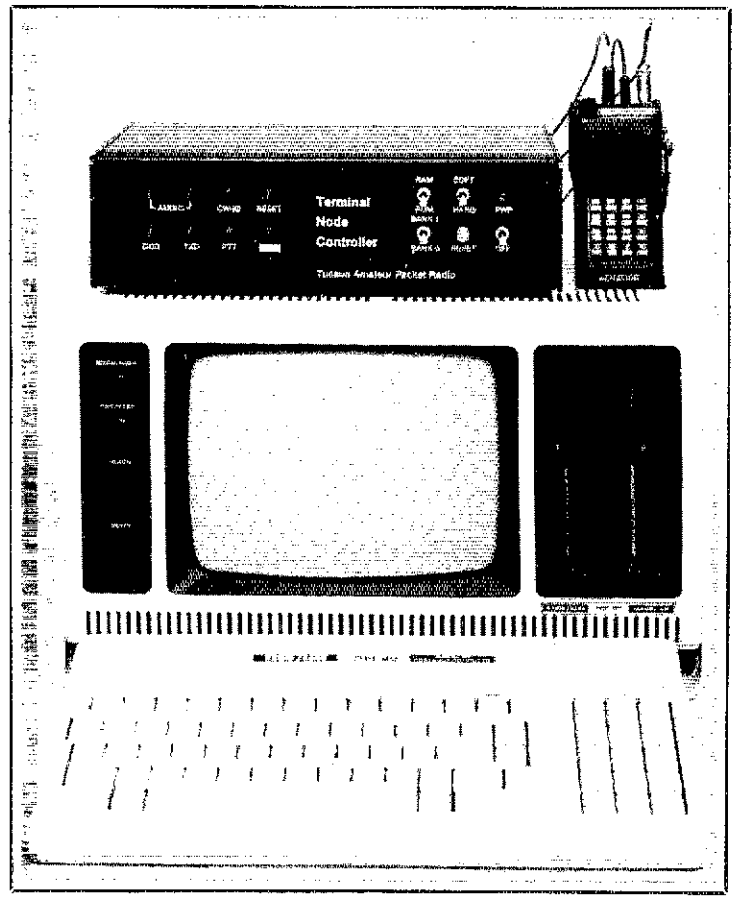
The Contest Branch has an opening for an Assistant Contest Manager. Primary responsibilities are processing contest logs and preparing contest editorial material for QST. The Assistant Contest Manager prepares the Contest Corral and Special Events columns for QST, and assists in proofreading contest score tabulations. Applicants must have an Amateur Radio license. Good organizational skills, and good oral and written communications skills are very important. Some experience with word processing would be helpful. Contact Mike Kaczynski, W1OD, Contest Branch Manager, at ARRL Hq.

What's All This Racket About Packet?

Packet radio is growing *fast.* What's it like? Read on.

By Harold Price,* NK6K

This is an article about packet radio. If you don't know what packet radio is, that pronouncement won't mean much to you. "High Speed CD/CSMA Digital Communications in the Amateur Radio Service, Theory and Applications" isn't a real grabber either, so "this is an article about packet radio" will have to do. This article will have a slant different from most previous articles about packet radio. It will not discuss what you will be able to do with packet in the future, but what you can do with packet *now:* how to use the *existing* networks, which of several frequencies in your area are being used for packet, what packet controllers are available and what you can expect when you get on packet radio.



After we discuss what packet does, there will be some theory—an explanation of how packet does what it does (there's no such thing as a free lunch). Those of you who want to dig deep into technical topics should consult the bibliography at the end of this article.

A final word of warning: This is a sales pitch! The goal is to get you interested enough in packet radio that you will get involved. Whether you visit a friend's packet-equipped shack, see packet in action at a radio store or Field Day site, go to local packet-radio meetings, or jump in and buy or build a packet controller, you'll learn far more by doing than by reading.

Executive Summary

Packet radio, or simply "packet," is the common name for a digital communications mode in Amateur Radio that provides error-free communications. It is designed to allow automatic linking of systems for cross-country networks. Packet uses high speeds; 120 characters per second is standard on the 2-meter band, and a recent development permits 960 characters per second on the 220-MHz band. Below 30 MHz, 30 characters per second is used. Assuming that you already have a radio and a computer or terminal, it will cost you between $180 and $500 (higher cost for more "bells and whistles") to get on packet radio. This is the cost of a *terminal node controller* (TNC), a box that connects the data-generating device to the radio. In other words, packet allows hams to exchange information much faster than before with no errors at a reasonable cost.

What Is Packet?

Packet is usually character communication. Letters and numbers entered on a keyboard or from a computer are sent from one amateur station to another. On the surface, this sounds no different from RTTY, which has been around in Amateur Radio for many years. Packet radio has three major characteristics and several beneficial side effects that make it stand out from other amateur digital communications modes.

Packet radio guarantees perfect reception.

Information sent via packet is checked to see that it was received exactly as it was transmitted. Data is automatically retransmitted until it is accurately received. There is only a very small chance (one in millions) that bad data will sneak through.

Packet permits a single frequency to be shared by several simultaneous conversations.

This also makes possible a bit of magic called a "simplex repeater"—a repeater with its input on the same frequency as its output.

Packet allows for "routing" information among stations, so that any packet station can be part of a linked set of "repeaters."

*1211 Ford Ave., Redondo Beach, CA 90278

For example, there is a set of packet stations in California that allows information to be sent from San Diego to Sacramento, a distance of 480 miles, on 145.01 MHz. Before users of mega-linked VHF/UHF FM repeater systems start chuckling at this "paltry" distance, consider that each station on the packet link uses a single frequency, a single antenna and a single transceiver. Stations do not require additional telemetry, diplexers, duplexers, circulators, link radios or large amounts of money. The packet-radio link can also support multiple simultaneous conversations between the ends of the path, as well as between points in the middle. Similar packet-radio "networks" exist in Florida, the Northeast and Mid Atlantic states, and in several Midwestern states.

Like the man says on TV, "And what would you expect to pay for all this? Don't answer yet, there's more ..."

Packet allows computers to speak directly to each other in their "native tongue."

Most personal computers use the ASCII code, which has 256 separate characters. Baudot, the code most often associated with the term "RTTY," has 32 characters and a trick called "shifting," which allows an additional 26 characters to be recognized. Transmitting ASCII computer characters over Baudot RTTY causes serious problems for computer users. Packet radio can transmit ASCII characters with no restrictions or shifting.

Packet is fast.

Packet is faster than Baudot RTTY because of technical standards, equipment availability, convention and regulatory issues. For whatever reason, you won't see much Baudot above 100 words per minute (WPM). On the other hand, you won't see much packet below 360 WPM on HF or below 1440 WPM on VHF. We are starting to see packet at 11,500 WPM on 220 MHz and above, and packet has been sent experimentally at 300,000 WPM on the 70-cm band. I've taken a small liberty in expressing packet radio speeds in WPM; the actual speeds in bits per second (bit/s) are 300, 1200, 9600 and 250,000, respectively. You say that you can't type 300,000 words per minute, or even 360? Keep reading—packet isn't just for typists.

Packet provides "non-realtime" communications.

What this means is that you and the person you are talking to don't have to be home at the same time. Much of the present use of packet radio is leaving messages for others on a centrally located *bulletin board.* A bulletin board is a message-storage device, usually maintained at the home of a local ham. If the person you want to talk to isn't on the air when you are, you can leave a message for him or her on the bulletin board. The message can be about anything: plans for the breakfast meeting tomorrow, the fact that you worked the Clipperton DXpedition on 160 meters, your new antenna, etc. Although similar systems have been available on traditional RTTY systems, packet lends itself nicely to bulletin-board operation. Because packet is fast and many users can share the same channel, a properly designed mailbox can share the frequency with several non-mailbox conversations, or several mailboxes can be on the frequency at the same time without mutual interference.

Packet-Radio Frequencies

Packet is in use on many bands, with the most concentrated activity being on 2 meters. The national packet community is attempting to get the frequencies from 145.0 MHz to 145.1 MHz allocated to digital use, with at least the channel at 145.01 MHz available throughout North America. The following is a list of areas where official action by that area's frequency coordination body has set aside 145.01, 145.03, 145.05, 145.07 and 145.09 MHz for digital communication: Alaska, Northern California, Southern California, Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, Minnesota, New Hampshire, New Jersey, New York, North Carolina, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Utah, Vermont, Virginia, Washington, West Virginia.

The Florida Repeater Council (FRC) has coordinated 145.01 MHz as the statewide 2-meter packet frequency. A request for 145.03 .05, .07 and .09 MHz is pending. Other states with action pending include Arizona, Illinois, Missouri, Nebraska and Oklahoma.

Many areas have activity on frequencies other than 145.01 MHz. These include Southern California, 145.36 MHz and 146.745/.145 MHz; Salt Lake City, 146.10/.70 MHz; southern and central Illinois, Iowa, east Missouri and Michigan, 147.555 MHz; southern Wisconsin and northern Illinois, 144.95 MHz.

If you are in doubt about what frequency to use, listen on 145.01 MHz.

On HF, 14.103 MHz and 10.147 MHz are the popular packet frequencies. HF packet stations transmit at 300 bauds, using a 200-Hz shift (Bell 103 standard).

Packet is information transfer.

Because of these characteristics, packet lends itself well to connecting a central store of information, usually called a *host system,* to a local network of users. For example, in Southern California we have a host run by WB6YMH that is kept stocked with the latest Amateur Radio information available. Electronic versions of the *ARRL Letter, Gateway* (the ARRL packet-radio newsletter), the *W5YI Report, AMSAT Satellite Report* and newsletters from several other organizations are made available via packet radio and the host system to any suitably equipped amateur in the area.[1] A typical issue of the *ARRL Letter,* around 20,000 characters, would take about an hour to send at the standard RTTY speed of 60 WPM. At the standard VHF packet rate of 1200 bit/s, it takes about 3 minutes.

Now, what would you pay for all of this? Wait, there's more ...

Packet is 97.1(b).

Part 97 of the FCC rules under which we live states the purpose of the Amateur Radio Service. One of the subparagraphs contains these words: "Continuation and extension of the amateur's proven ability to contribute to the advancement of the radio art." One of the better recent examples of amateurs advancing the radio art is the current activity in packet radio. Packet didn't originate in the Amateur Radio Service, but we have taken the basic idea and have shaped it into things that didn't exist before, or which have a slant different from what has been tried before. We have also added the traditional amateur touch—extremely low cost. Amateur-designed and -built packet-radio controllers flew in official weather planes through the eye of a hurricane. Army and Navy MARS stations are integrating amateur packet-radio technology into their activities. Several commercial manufacturers have taken the amateur-designed controllers and have begun to sell them both in and out of the amateur market.

Packet is satellites.

AMSAT-OSCAR 10 is an excellent medium to use for packet radio. Large amounts of data have been sent across the continent via OSCAR 10. Using a special packet device called a *teleport,* a packet station in northern Canada was connected through the satellite to a station in Los Angeles; data was then relayed through another packet controller to a station in San Diego. The UoSAT-OSCAR 11 satellite carries a packet-radio controller that can store 120,000 characters and retransmit them later to any other point on the globe. PACSAT, an amateur satellite currently under development, will use packet radio to store up to 4 million characters for relay between stations.

Packet is international.

The packet-radio protocol, AX.25, is now accepted as an international standard.

[1] *Gateway,* the ARRL packet-radio newsletter, is available from the ARRL. U.S. subscriptions are $6 for ARRL members and $9 for non-members.

Packet Operating Tips

Because it breaks up a data stream into short sections called frames, packet looks, to the operator, like full-duplex communications. Full duplex means both parties can speak at the same time (similar to a telephone call). This is analogous to "full-break-in," or QSK CW. Most amateurs who have had previous exposure to keyboard-based communications are used to RTTY, which is half-duplex—only one side talks at a time. Most packet controllers can be adjusted to display characters from the other station only when you aren't typing yourself; this prevents your characters from being mixed on the screen with incoming characters. Sometimes, a full-duplex packet conversation can be very natural, with rapid exchanges of ideas. At other times, it can be very confusing, with the answer to one question coming in while another question is going out. Different areas of the country have come up with various ways to make a packet conversation appear more RTTY-like.

Once a "connection" is established (refer to the article text) you may begin typing. Some areas use K, BK, O or > at the end of a thought to say, "Okay, I'm done. It's your turn to transmit." Other areas simply put a blank line between thoughts to invite the other station to respond.

That's about all there is to a packet conversation. Most TNCs send a packet after you press the ENTER or CR key. It is considered polite to use this key when you reach the end of a 40- or 80-character line, rather than continuously typing and letting lines wrap around the edge of the screen.

To end a conversation, some areas use SK at the end of a line; others may add U DISC. This is short for "I'm done talking. If you're done talking, go ahead and disconnect." You can then tell your TNC to break the connection, freeing your and the other station's TNC for a new conversation.

If your TNC is so equipped, you will occasionally see a message like

CONNECT REQUEST: NK6K.

This means NK6K has attempted to connect to you. This is like the "call waiting" feature on some telephones; you may disconnect from your current conversation and connect to the new station, or you may simply ignore the attempt. In any case, the other party will have received a "station busy" message, so the operator will know that you are on the air, but not available.

The best way to get started, as always, is to listen for a while, and then jump right in. It is simple to monitor the channel, or "read the mail." On the TAPR/Heath/AEA/Kantronics TNCs, simply type MON ON at the CMD: prompt. You'll see all the traffic on the channel, with the call signs of both stations added to the beginning of each message.

When you are ready to make a packet-radio contact, keep these suggestions in mind:

1) Transmit only short, infrequent CQ or QST packets, and don't route them through several repeaters.

2) Remember that you are sharing a channel; don't start long program or message transfers if there is already a lot of activity on the frequency.

3) Move to a frequency with no digipeaters on it whenever you can connect directly to the station that you want to work.

4) Have fun!

Amateurs worldwide are working together on future standards and applications. Papers from Japan and Germany appeared in the *Proceedings of the Fourth ARRL Amateur Radio Computer Networking Conference,* and North American papers were presented at last year's packet-radio meeting in Sweden. Three amateur satellites, JAS-1, Phase III-C and PACSAT will all use the same basic access methods. These satellites involve many parts of the world, including Canada, Germany, Japan, the U.K. and the U.S.

Packet is digital.

Experimentation with non-character communications has just started. That makes this a discussion of the future, which I said I wouldn't do till the end, but ...

Packet is not limited to character communications. Take two SSTV units with digital outputs, plug them into packet controllers, and send absolutely error-free pictures. Better yet, store the pictures on the local host system for retrieval anytime. Digitized voice can be sent over packet radio. Several voice repeaters could share the same high-speed digital network for cross-country linking. Using packet techniques and digital compression technology, medium-scan TV that approaches fast-scan quality can be sent at 56,000 bit/s and can be routed over high-speed packet nets with other traffic. You're putting us on, right? Nope. Check the cover; this isn't the April issue.

The Hard Part

Here's the technical part, snuck in at the middle. Don't worry, it will be over quickly. The secret of why packet can do all these amazing things is buried down in the bowels of the *protocol.* The protocol is a language spoken by the computer in your packet controller. The protocol is complex; the description of it takes many pages of nearly incomprehensible computerese, and several books have been written about it. Fortunately, you need never know how it actually works, just as you don't have to know how to alloy copper and zinc to pound brass. After all, you've just paid for a computer to understand the protocol for you. The protocol used by most amateurs is called AX.25, and probably represents the largest number of specific rules ever voluntarily agreed to by a large number of hams.

What the packet technique does is break the data sent to it into small pieces called *packets.* Several *addresses* are added to the front of the packet. An address is usually an amateur call sign. There are always at least two addresses: that of the sending station and that of the intended recipient. There may also be some addresses of stations that are supposed to repeat the packet. A Frame Check Sequence (FCS) is added to the end of the packet. The FCS is the answer to a calculation that is performed on the rest of the information in the packet. That's a packet.

The breaking up of the data into small parts allows several users to share the channel; packets from one user are interleaved with packets from another user. The address section allows each user to separate things intended for him from things intended for other users. The addresses also allow each packet to be relayed through many stations between its source and its eventual destination. The FCS allows the receiving station to make sure the data has been received correctly. The same calculation is performed on the data by the receiving station as was performed by the sending station that placed the FCS in the packet in the first place. If the FCS calculated by the receiving station matches the one sent by the transmitting station, the data is correct.

Computerized Radiograms

Traffic handlers will have recognized by now that this is the computerized equivalent of what they have been doing since the beginnings of Amateur Radio. Station of Origin, To address, a Check Number and formal procedures for relaying a message are all part of packet radio. Packet is putting the "RR" back in "ARRL."

The last piece of the pie is the acknowledgment procedure. When a packet is sent out, the sender expects an acknowledgment (ACK) that the packet was received correctly. If the ACK is not received, the packet is retransmitted. The receiver only ACKs the packet if it was received with a correct FCS. This protects a packet conversation from fades, static, collisions (when two packet stations transmit at the same time), adjacent-

channel interference and other problems common in amateur communications.

What Does It Look Like?

So far we've talked about what packet can do for you and about how it does it. But what does a packet contact look like? In the following examples, we'll look at the procedures used by the TAPR, AEA, Heath and Kantronics TNCs. Other TNCs follow similar, but not identical, procedures.

First, you must tell the TNC your call sign. For example:

```
MYCALL NK6K
```

is the command to enter a call sign. Most TNCs allow you to change your call sign at any time and have a way to remember it while the power is off.

As in all other modes of Amateur Radio, packet allows you to "read the mail" or monitor channel activity. This is called the *monitor mode,* and looks like this:

```
WA6JPR>WB6YMH: HELLO SKIP, WHEN IS
THE NEXT OSCAR 10 PASS?
WB6YMH>WA6JPR: HANG ON WALLY, I'LL
TAKE A LOOK.
```

The call signs of the stations involved appear as "from>to," and the contents of the packet appear after the ":". In this manner, you can monitor all traffic on the frequency. You can also watch for a station calling CQ, which might look like this:

```
WB6HHV>CQ: MIKE IN SAN DIEGO LOOKING
FOR ANYONE IN SIMI VALLEY.
```

You can send a CQ by entering the *conversation mode* of the TNC. You go to the conversation mode by typing:

```
CONVERSE
```

You can then type your CQ:

```
MIKE IN SAN DIEGO LOOKING FOR ANYONE
IN SIMI VALLEY.
```

Your TNC adds your call as the FROM address, and CQ as the TO address. The receiving station's TNC adds these addresses to the front of the displayed text.

You answer a CQ or establish a contact by using the CONNECT command. This "connects" your TNC to another station and begins the acknowledgment procedure discussed earlier. An example of a connect command is

```
CONNECT W6IXU VIA WA6OZJ, K6TZ, WB6DAO
```

This asks for a connection between you and W6IXU routing through (via) three other stations. When the connection has been established, the TNC notifies you by printing

```
***CONNECTED TO W6IXU
```

This means that the computer in your TNC has exchanged some preliminary information with the other TNC and is ready to proceed. If the other station had already been in a connection with a third TNC, you would get a busy signal:

```
***W6IXU BUSY
```

If W6IXU is not on the air, your TNC would make several attempts to establish the connection and then print a message telling you that it has not succeeded.

Assuming you get connected, everything you send to your TNC will now be sent to W6IXU with all the error checking and retransmission just described. Each time you hit the ENTER or RETURN key, a packet is formed and sent. Packets received from the other station are displayed between the lines you enter, much as if a full-duplex RTTY QSO were taking place.

When you are done with the conversation, you disconnect by entering CONTROL-C and typing DISC.

The commands and scenario above are all you need to know to carry on a packet-radio QSO. There are many other options (around 60) and several other combinations of connected and monitor modes, but they are like the 40 knobs, switches and meters on most modern HF rigs; there are operators who constantly twiddle, and those who only use the push-to-talk switch or the key.

So What Are You Waiting For?

We've only touched briefly on what can be done with packet and mentioned even less the technical details of how it works. For some, packet is an end to itself—experimenting with new ways to transfer data. For others it is just a tool—a new way to pass traffic, spot tornadoes, run a parade, score points on Field Day or meet new people. To find out more, look into any of the references listed at the end of this article. Or, wait for the second part of this article, which describes a TNC in detail. See you on packet!

Bibliography

AX.25 Amateur Packet-Radio Link-Layer Protocol. Newington: ARRL, 1984.

First ARRL Amateur Radio Computer Networking Conference. Newington: ARRL, 1981.

Fourth ARRL Amateur Radio Computer Networking Conference. Newington: ARRL, 1985.

Johnson, L., "Join the Packet Radio Revolution." *73 Magazine,* Sept. and Oct. 1983, and Jan. 1984.

Morrison, M., and D. Morrison, "Amateur Packet Radio" *Ham Radio,* July and Aug. 1983.

Rinaldo, P., "ARRL Board Approves AX.25 Packet-Radio Link-Layer Protocol," *QST,* Dec. 1984.

Second ARRL Amateur Radio Computer Networking Conference. Newington: ARRL, 1983.

Tannenbaum, A., *Computer Networks.* Englewood Cliffs, NJ: Prentice-Hall, 1981.

Third ARRL Amateur Radio Computer Networking Conference. Newington: ARRL, 1984.

The 1985 ARRL Handbook for the Radio Amateur, pp. 19-21 to 19-31. Newington: ARRL, 1984.

New Products

FLEXLOC CABLE TIES

☐ Is there an Amateur Radio station that does not have a multitude of cables running all over the shack? If it exists, it's got to be novel! How do you keep the cables in neat bundles? Here's one way—Flexloc cable ties. Ideal for bunching cables, their quick-release lock enables you to use them again and again.

The ties are made of tough, flexible, type-66 nylon and have a tensile strength of 50 pounds. Each 10-inch-long, black-colored strap is self-locking and has a ribbed backing that permits adjustments to handle cable bundles of up to 2¾ inches in diameter.

Flexloc cable ties are available in packages of 20 for $7. You can purchase them from Visual Departures, Ltd., 1641 Third Ave., Suite 202, New York, NY 10128, tel. 212-534-1718. For more information, contact Phil Kemelor at 212-840-1661.—*Paul K. Pagel, NIFB*

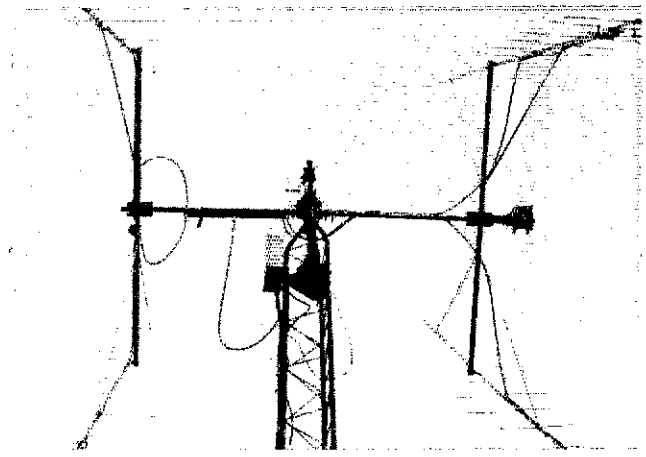
AMPRO PC SOFTWARE

☐ An Amateur Radio series of software for the IBM PC and compatibles and other MS-DOS machines is being offered by AMPRO Software. Four packages are available: DXCC, 5-Band DXCC, WAZ/5-Band WAZ and the WAS/5-Band WAS awards. Each package includes complete documentation.

These packages are not meant for use as logbooks. They are a means of keeping an organized record of progress toward the acquisition of one or more of the awards, and a means of listing selected information. All programs contain complete data bases and a data editor. A cross-reference data base is included in the DXCC and 5-Band DXCC packages; this data base is automatically searched if the prefix entered is not valid. If found, the cross reference is displayed.

These programs require the use of one disk drive and 256 kbytes of RAM. Access to a printer is not necessary, but is preferred. The PC-DOS program versions run in full color or monochrome; the MS-DOS versions are monochrome only. The disks are not copy protected. For hard-disk owners, a batch file is provided to install the programs automatically. The price of each disk is $29.95 plus $2 shipping and handling; Maryland residents should add 5% state sales tax. To order or obtain more information, contact AMPRO Software, 101 Maple La., Annapolis, MD 21403. —*Paul K. Pagel, NIFB*

A Basic Approach to Moonbounce



Is moonbounce an esoteric mode beyond the reach of most amateurs? No! Recent advances in amateur equipment have brought EME even closer to the mainstream of Amateur Radio.

By Jim D. Stewart,* WA4MVI

A simple but effective earth-moon-earth (EME or moonbounce) station is now within the reach of most amateur experimenters. With the advent of very sensitive GaAsFET receiving preamplifiers and commercially available high-gain Yagis, many VHF operators are enjoying successful EME QSOs with commercial equipment and relatively small antenna arrays. VHF DX via other modes, such as meteor scatter, sporadic E, troposcatter or ducting, is usually limited to around 1600 miles, and you must wait for Mother Nature to provide a band opening. Worldwide DX contacts via moonbounce, still affected by certain conditions of nature, are limited only by mutual moon visibility.

I'm not going to present an exhaustive "how-to" article on building your own station. Rather, I want to whet your appetite and show you, in general, what is involved. There's more to getting on EME than putting an antenna on your roof and calling "CQ Moonbounce," but I hope to remove some of the mystery that shrouds this mode. Specific information may be found in the reference material listed at the end of this article. I'll also tell you how to get in touch with active EME operators. Contact them for advice. You'll find that most are anxious to attract new blood into the facet of Amateur Radio that they enjoy so much, and will be exceptionally generous in sharing their experiences with you.

What Kind of Equipment Do I Need?

A block diagram of an EME station is presented in Fig. 1. There are as many different arrangements as there are operators, but most follow the format shown. The station can be as simple or as elaborate as you wish. A lot depends on your technical ability and on how much time and money you're willing to invest. I believe that 2 meters is the best band for a beginner to try, so this article is slanted in that direction. Much of the information, however, applies to any band.

The basic station might consist of a VHF multimode rig or an HF transceiver with transmit and receive converters (transverters). Both methods have been used successfully. A good-quality HF receiver with passband tuning, several IF CW filters and an audio filter are desirable. Many EME operators prefer the HF transceiver/transverter route to take advantage of these features. Multimode transceivers are available from the major manufacturers, such as Yaesu, Kenwood and ICOM. Sources of commercial VHF transverters and converters are listed in Table 1. Construction articles detailing transmitting and receiving converters are listed in the references at the end of this article.

A high-power amplifier is necessary for EME operation. Although the legal limit of 1500-W output is desirable, many QSOs

Table 1
Suppliers of Equipment of Interest to EME Operators

Receive and Transmit Converters

Advanced Receiver Research, Box 1242, Burlington, CT 06013.
Microwave Modules, imported by Hans Peters, VE3CRU, Box 6826, Station A, Toronto, ON M5W 1P3, Canada.
Spectrum International, P.O. Box 1084, Concord, MA 01742
The VHF Shop, 16 S. Mountain Blvd., Rte. 309, Mountaintop, PA 18707.
SSB Electronics, imported by The VHF Shop.

High-Power Amplifiers

Henry Radio, 2050 S. Bundy Dr., Los Angeles, CA 90025.
Fred Merry, W2GN, 35 Highland Dr., East Greenbush, NY 12061.

Mast-Mounted Preamps and TR Sequencers

Advanced Receiver Research.
Angle Linear, P.O. Box 35, Lomita, CA 90717.
Landwehr, imported by Henry Radio.
Mutek Ltd., imported by The VHF Shop.
SSB Electronics, imported by The VHF Shop.

Note: This is a partial list. The ARRL and *QST* do not endorse specific products.

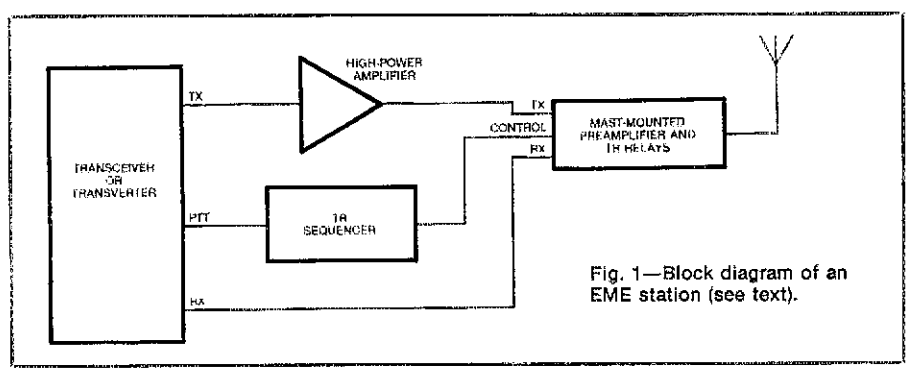


Fig. 1—Block diagram of an EME station (see text).

*20 Country Club Dr., Greer, SC 29651

have been made with amplifiers operating in the 500- to 1000-W range. There are few high-power amplifiers available commercially or surplus (see Table 1), so many operators "roll their own."

Good transmission lines are a must at VHF and above. EME signals are extremely weak, and every watt of RF delivered to the antenna really counts. Most operators locate their EME arrays on short towers, as close to the shack as practical, to minimize line loss (more on antennas later). Hardline, preferably with a corrugated jacket for improved flexibility, is desirable for the transmit line, especially above 2 meters. Surplus ¾-inch, 75-Ω CATV Hardline has excellent characteristics and can be used. Thoroughly check surplus transmission lines before use. Type-N connectors are recommended for use on 144 MHz and up. Leave the "UHF" connectors on your low-band gear.

You'll need at least one high-power RF relay to switch your antenna from transmit to receive. A suitable relay will have Type-N connectors and will be rated for at least the output of your power amplifier. Beware: Relays are usually de-rated as frequency increases. A relay rated for 1 kW at 30 MHz may be rated for only half that power at 144 MHz. These relays may prove difficult to find. Surplus relays with Type-N fittings are often available at flea markets, in ham ads, or from other amateurs interested in VHF/UHF work. It pays to get to know other amateurs interested in EME; they often know where to find hard-to-get station components. Transco, Amphenol and Dow Key are three popular manufacturers of high-power VHF relays.

Received EME signals are extremely weak, so a tower-mounted preamplifier is recommended to reduce the system noise figure to a minimum. Many EME operators find it convenient to mount the preamplifier and antenna relays in a weatherproof box near the top of the tower. The basic arrangement is shown in Fig. 2. Full construction details may be found in the references, and some manufacturers listed in Table 1 can provide ready-to-go remote preamplifier/switching boxes.

Most authorities recommend that two transmission lines be run to the antenna—separate lines for transmit and receive. The transmit line should be Hardline, as discussed before, but the receive line may be RG-8 coaxial cable, or Belden 9913. The relays should be arranged so that they must be energized to receive. This method provides good isolation between the preamplifier and the transmitter, makes it impossible to transmit into the preamplifier if a relay or control line fails and offers some assurance that the final amplifier will transmit into a load if a relay or control line fails.

The remote preamplifier that we have been discussing should be a low-noise GaAsFET type. Generally, the lowest noise figure available will mean the best sensitivity, but in practice, a noise figure of 1 to 1.5 dB is good on the 2-meter band.

GaAsFETs are susceptible to damage from RF and stray pulses, so care must be taken to protect them. The 12-V dc line powering the preamp can be made from RG-58 or other shielded cable to prevent unwanted voltages from entering on the power input line. A separate power supply should be used to power the relays to prevent transient spikes from reaching the GaAsFET line. Many multimode transceivers transmit briefly when they are first turned on, so you must be sure that you can never, however briefly, transmit into your preamp and receiver.

TR switching must be accomplished in the proper order to avoid equipment failures. The station switching control box should be set up so the antenna relays are switched before transmitter power is applied to avoid "hot switching" the relays or transmitting into no load. Similarly, RF should be removed before the relays return to the receive position.

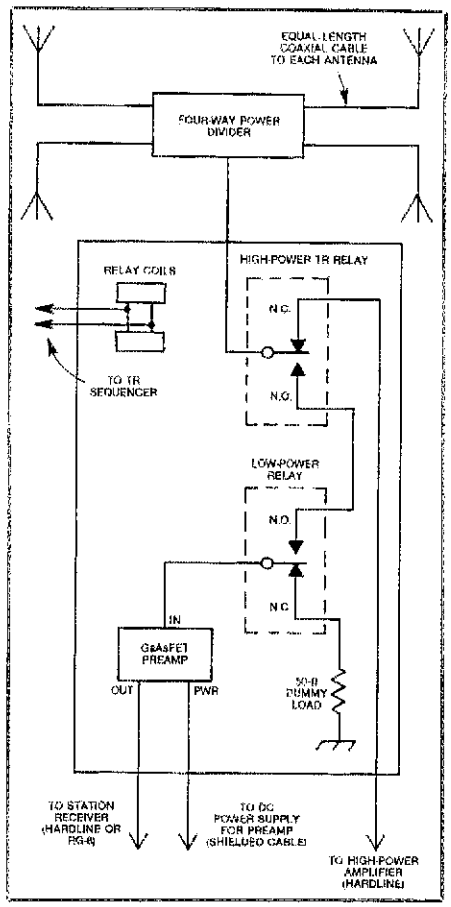


Fig. 2—A weatherproof tower-mounted preamplifier is important in EME work. Usually, the station TR switching is also mounted at the tower.

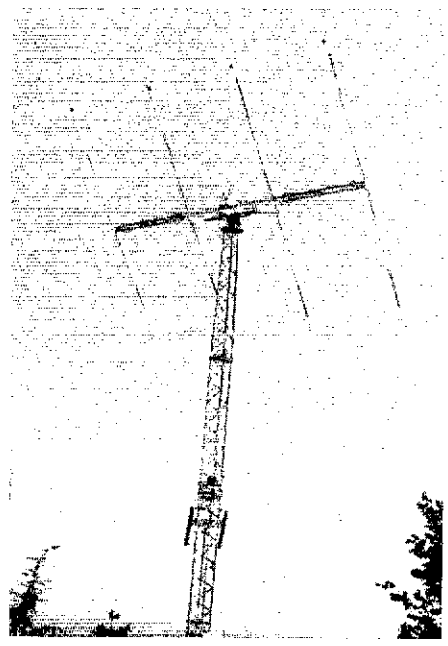


Fig. 3—This 2-meter EME array at I2ODI is built from 16 long-boom Yagis. Arrays like this are great to have, but smaller antennas can work, too.

What Kind of Antenna Will Work?

A simple array of four Yagis, aimed visually at the moon, is a good way to begin. If you keep the array on a short tower near the operating position, you will be able to aim the antenna visually. You can even use an "arm-strong" method for pointing.

Antenna arrays can be as simple or as elaborate as the builder desires. The dish antennas often associated with EME work are generally used at 432 MHz and above; a dish of adequate gain would be 35 to 40 feet in diameter at 144 MHz. Yagis are the most popular antennas at 144 MHz, but quads, collinear arrays and quagis are also used. Fig. 3 shows a 2-meter EME array carried to extremes, but many successful contacts have been made with antennas like that shown in Fig. 4.

Fig. 5 shows the details of a simple but effective EME antenna system. The minimum recommended antenna array gain for 144-MHz EME work is about 20 dB. You may use commercial antennas such as the long-boom, high-performance Yagis manufactured by Cushcraft and KLM, or you may build your own. You will probably save yourself some disap-

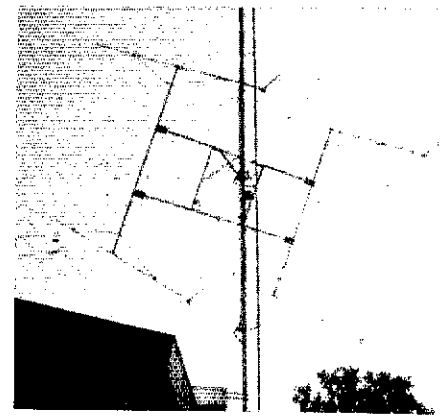


Fig. 4—K7KOT has incorporated his EME array into his existing antenna system by side mounting it on a tower.

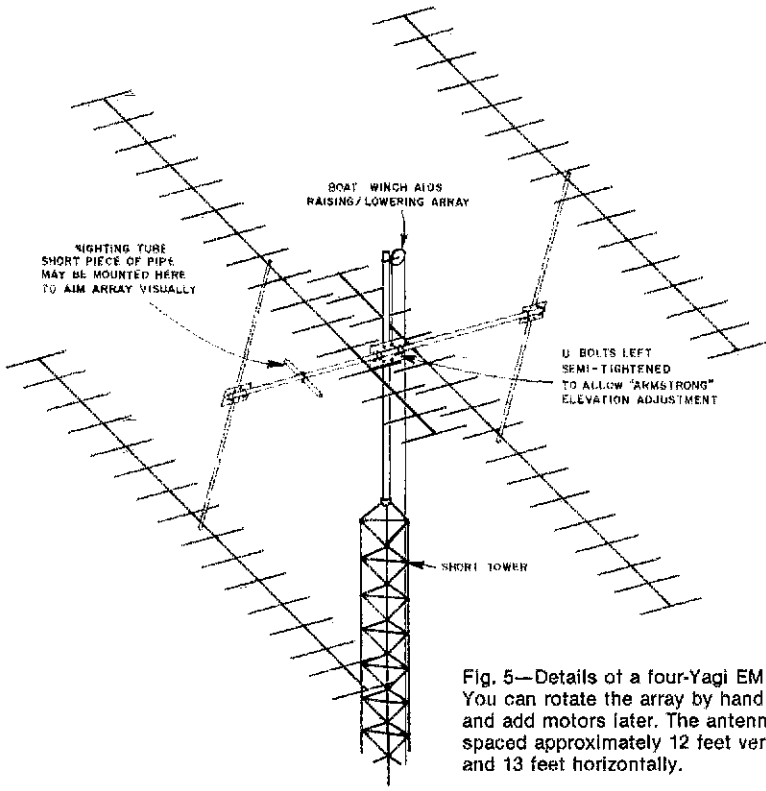


Fig. 5—Details of a four-Yagi EME array. You can rotate the array by hand at first and add motors later. The antennas are spaced approximately 12 feet vertically and 13 feet horizontally.

it closest to the earth. At this time, path loss is lowest and you may hear your signal echo off the moon about 2.5 seconds after releasing your key. It is not necessary to hear your own echoes to have a QSO. Often the suggested antenna gain of about 20 dB will not be quite enough to hear your own echoes, although many stations with larger arrays can copy you. You should be able to hear many of the larger stations with an array of four Yagis with about 20 dB of gain. Listen for activity, especially on those days listed in Table 2. If you can hear stations, chances are good that your system is working.

Operating Techniques

Almost all EME work is done on CW. Like most of the specialized areas in Amateur Radio, EME has its unique problems, so a unique operating style has been established to enhance communications. I'll present the basics here. EME is an extremely weak-signal mode, so experience first with meteor scatter and SSB/CW DX modes on VHF is very helpful. Patience is required above all; such factors as Faraday rotation can cause signals to return out of polarization and nothing will be received for long periods.

pointment if you ask knowledgeable EMEers for antenna recommendations before you begin. The antenna array is often the most difficult part of the system to assemble, so take advantage of other amateurs' experiences and do the job right the first time.

How Do I Find the Moon?

Antenna-aiming accuracy is essential for successful QSOs with a small system. With a multiple-antenna array, beamwidth is narrow, and you need to know exactly where your antenna is pointed if you are to work anybody. This isn't like using a three-element tribander on 20 meters, where you can point anywhere between north and south and still hear a station to the east.

For starters, you can visually sight the moon and point your array by hand; motors for azimuth and elevation can be added later. As you become more sophisticated, you can use a home computer to track the moon or learn how to use *The Nautical Almanac* to predict its location.[1] This is necessary during periods when the moon is hidden by clouds, or when the sun and moon are close enough together that the sunlight obscures the moon.

The array can be tested and calibrated and the complete receive system "tweaked" by aiming first at the sun. (Caution: Never look directly at the sun!) The sun radiates radio noise, which can be readily received and used for testing. This noise varies from time to time, but the level usually stays constant for short periods.

Aim the completed EME array at the sun. With the receiver AGC off, rock the array from side to side and up and down until the signal peaks on the S meter or on a VOM connected across the speaker output terminals. The main electrical lobe of the antenna isn't always the same as the mechanical center of the array, so peaking the antenna on sun noise will help you to determine where your antenna is actually pointed.

Once this is done, the position of the sun can be noted with respect to one of the antenna booms, or you can use a 2-inch-OD pipe, about 2 feet long, for a "boresight tube" to line up the array (just like a telescopic sight on a rifle). With the array peaked for maximum sun noise, hold a piece of paper near the rear end of the tube and move the boresight around until the sun casts a symmetrical spot of light on this paper. When the spot is symmetrical, the boresight is aligned with the main antenna lobe. Never look at the sun through the boresight tube!

If you can see the moon through the boresight, then your array is zeroed-in. The moon will appear to move very quickly because of the earth's rotation, and realiming will probably be needed every 15 to 20 minutes, depending on the array beamwidth.

For several days each month, the moon is at perigee, the part of its orbit that places

[1]*The Nautical Almanac for the Year 1985*, available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. Price: $10.

Table 2
Suggested Times for EME Operations for July-Dec., 1985

Date		Time (UTC)	Date		Time (UTC)
July	13	1200	Nov.	2	0700
	14	1300		3	0800
	20	1800		9	1300
	21	1900		10	1400
Aug.	10	1100		23	0100
	11	1100		24	0100
	17	1700		25	0100
	18	1800		30	0600
Sept.	1	0600	Dec.	1	0700
	7	1000		7	1200
	8	1100		20	2300
	28	0400		21	2400
	29	0400		22	0000
Oct.	5	0800		23	0100
	6	0900		28	0500
	12	1400		29	0600
	13	1500			
	26	0200			
	27	0200			

Good Times for Echo Testing (Moon near Perigee)

Date		Time (UTC)
June	29	0200
July	27	0000
Aug.	18	1900
Sept.	19	2100
Oct.	16	1900
Dec.	14	2000

Several days either side of date given should also be good.
These periods were selected to provide windows of mutual visibility between stations in the U.S. and Europe, low noise and when activity will probably be highest. Times are beginning times, and activity should continue for 4 to 5 hours after time shown.
Suggested frequencies: 144.000-144.020 MHz and 432.000-432.020 MHz.

Table 3

Signal Reports Used on 144 MHz

T—Signal just detectable.
M—Portions of call copied.
O—Complete call set has been received.
R—Both "O" report and call sets have been received.
SK—End of contact.

Table 4

144-MHz Procedure—2-Minute Sequence

Period	*1½ Minutes*	*30 Seconds*
1	Calls (W6XXX DE W1XXX)	
2	W1XXX DE W6XXX	M M M M
3	W6XXX DE W1XXX	O O O O
4	RO RO RO RO	DE W1XXX K
5	R R R R R	DE W6XXX K
6	QRZ? EME	DE W1XXX K

Faraday rotation usually changes, so some reception will be possible during a one-hour test on 2 meters.

When you have checked your system and completed some receiving tests, it's time to contact an experienced EME operator and attempt a QSO. You can usually find someone who will attempt a QSO if you check into the EME net (see sidebar). If you can't operate HF, look in The World Above 50 MHz column in *QST*, check the results of the ARRL EME Contest, or obtain a copy of one of the EME newsletters for an idea of who is active with a big signal, and write a letter asking for a schedule. These sources are explained elsewhere in this article.

Operating times and procedure must be agreed upon in advance and a frequency selected. The usual procedure on 144 MHz is for each station to transmit for two minutes and listen for the next two minutes; the easternmost station begins by transmitting the first two minutes of the hour. This sequence continues for one hour or until the QSO is completed. Clocks must be calibrated carefully with WWV or at least with each other.

Two-meter EME QSOs follow a set procedure. See Tables 3 and 4. Call signs of the stations are repeated during the first minute and a half of each two-minute sequence. Once an operator hears his call sign, he will send a signal report during the last half minute. If he hears nothing, then nothing is sent during the last half minute.

If complete call signs are copied, an O is sent as the report; if portions of calls are heard, an M is sent. Experienced operators sometimes use the RST system if signals are very strong. Once you hear your report from the other station, discontinue sending call signs (except as required by FCC for identification) and begin filling the first 1½ minutes of your 2-minute transmit periods with RO RO RO RO. This indicates "Roger my report. Your report is O." Send O until you hear an RRR from the other station. Many finish a QSO by sending 73 73 73 SK SK SK. Discussion with the other operator prior to beginning the test should help clarify QSO procedure.

That's the end of our overview of EME operation. If you think you would enjoy putting together a station, read the referenced articles and books for more information. Most important, contact active EME operators and ask for help. Don't be bashful! Most would jump at the chance to help you get on the air "off the moon." With some work, you can join that exclusive club of operators who have QSOed via the ultimate long path!

Getting In Touch

EME enthusiasts have a well-developed system of exchanging information, and you can tap into this network to get in touch with active operators who can help you get started.

Nets

Every Saturday and Sunday, EME operators gather on 14.345 MHz to exchange information and arrange schedules to work each other. The 432-MHz-and-above EME Net meets at 1600 UTC each day, while the 144-MHz group meets at 1700 UTC.

The Central States VHF Society conducts a net each Sunday evening on 3.818 MHz at 9:30 P.M. CST (0330 UTC). Although this net is a general-interest VHF net, many active EMEers attend. In addition, active VHFers gather informally on 3.818 most nights of the week.

Newsletters

Several monthly newsletters cater to the EME operator. You can find a lot of good information in these newsletters, and it would be worth your while to subscribe if you are interested in EME. They are

2-Meter EME Bulletin, c/o Gene Shea, KB7Q, 417 Stadhauer, Bozeman, MT 59715.

VHF/UHF And Above Information Exchange, c/o Rusty Landes, KAØHPK, P.O. Box 270, West Terre Haute, IN 47885.

KCØW's VHF + Update, P.O. Box 11023, Reno, NV 89510-1023.

Terms Commonly Used by EME Operators

apogee—that point in the moon's orbit where it is farthest from the earth.
az-el mount—an antenna mount that allows adjustment of both azimuth and elevation.
declination—refers to the moon's position, north or south of the earth's equator. Northern declinations occur for several weeks each month and are usually good periods to operate because of reduced background noise radiation from sources in space. These sources often mask the low-level signals returning from the moon.
Faraday rotation—a rotation of the polarization plane of radio waves when the waves travel through the ionosphere. Echoes will often return out of polarization with the receiving array. The polarization of a returning signal slowly rotates and will line up with the receiving array after some period.
perigee—that point in the moon's orbit where it is closest to the earth.
polar mount—a type of antenna mount whereby the axis of rotation is aligned with the North Star. Used by some operators, primarily those with dish antennas.
sked weekend—when most operators tend to operate each month because conditions are favorable (see Table 4).
sun noise—radio noise from the sun, which varies with solar activity. This noise can be used to test EME systems, but it can also mask echoes from the moon when the sun is close enough to the moon to be in the main lobe of your antenna.
universal window—a common aiming point in the sky, where stations can see the moon at the same time.

Bibliography

General Reference Books

The ARRL Antenna Book, 14th ed. Newington: ARRL, 1982.

The 1985 ARRL Handbook for the Radio Amateur. Newington: ARRL, 1984.

Jessop, G. R., *VHF/UHF Manual*, 4th ed. Hertfordshire, England: Radio Society of Great Britain, 1983. Available from ARRL.

Orr, W. I., *Radio Handbook*, 22nd ed. Indianapolis: Howard W. Sams & Co., 1981.

Magazine Articles

Barber, A. L., Jr., "A Simplified Procedure for Locating and Tracking the Moon." *QST*, Jan. 1982.

Powlishen, S., "Stacking Yagis is a Science." *Ham Radio*, May 1985.

Reisert, J., "Requirements and Recommendations for 70-cm EME," *Ham Radio*, June 1982.

Reisert, "VHF/UHF World: Stacking Yagis." *Ham Radio*, April and May 1985.

Reisert, "VHF/UHF World: VHF/UHF Exciters." *Ham Radio*, April 1984.

Reisert, "VHF/UHF World: VHF/UHF Receivers." *Ham Radio*, March 1984.

Reisert, "VHF/UHF World: 220-MHz EME Requirements." *Ham Radio*, Sept. 1984.

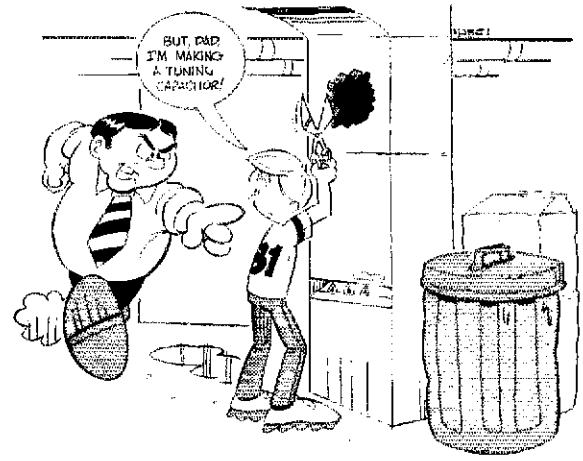
Shuch, H. P., "Quiet! Preamp at Work." *Ham Radio*, Nov. 1984.

Tynan, W., "A VHF/UHF Primer—EME." *QST*, Nov. and Dec. 1981, and Jan. and Feb. 1982.

Jim Stewart, WA4MVI, an Extra Class amateur, was first licensed in 1962. He holds a BS in chemistry and is currently employed by FAA. Jim holds 50- and 144-MHz WAS, as well as 50, 144 and 432-MHz WAC awards. He is an ARRL Technical Advisor, specializing in propagation and EME.

• *Beginner's Bench*

The Fine Art of Improvisation



Improvising in the ham workshop may lead to new ways for solving electrical and mechanical problems. The net result is often a savings in time and money!

By Doug DeMaw,* W1FB

"I gave up on building ham gear because parts are hard to find and they cost too much." Ever hear that comment? Perhaps you've said it to yourself in silent despair. Actually, parts are not hard to find, and most of them need not be purchased at top price. But, there are *some* items that are very expensive and hard to locate when we attempt to buy them new. It is conceivable that we might have to spend $15 for a tuning capacitor and a vernier drive, when the circuit with which it will be used contains only $3 worth of small parts. Prices of items such as tuning capacitors, drive mechanisms, cabinets, slug-tuned coils and meters (purchased new at nonsurplus prices) can discourage even those builders who have a large Amateur Radio budget. The cost, plus the present-day agonies of being socked with back orders and "out of stock" notifications from mail-order dealers, does tend to make us think parts are hard to obtain.

What alternatives do we have? The ingenuity of a true experimenter must be summoned from within if speedy solutions to these common problems are to be found. In decades past, it was a regularly practiced art among hams to solve design and procurement problems by using materials on hand. Most hams were inveterate experimenters when I became involved in Amateur Radio. It was considered a challenge to come up with new electrical and mechanical ideas, then share them with other amateurs. In those days, it was often a stimulating learning experience to get on the air and talk about circuits and projects. Each of us has the potential to build radio equipment, to find shortcuts to design objectives and to enjoy using something we built ourselves. Let's consider some practical ways to use parts in applications for which they were not designed. Perhaps some of these concepts will solve a design problem for you.

Experimental Tuning Methods

Transmitters and receivers require some type of signal source, and generally this local oscillator (LO) is tunable. The conventional techniques for changing a VFO frequency are by means of a fixed-value inductor and variable capacitor or a fixed-value capacitor and a variable inductor, or by employing a VVC (voltage-variable-capacitor) diode. A quality double-bearing tuning capacitor that rotates smoothly is not only hard to find these days, it can be bulky and very expensive. Much of our miniature homemade equipment would be more practical if a tuning capacitor could be avoided for changing the oscillator frequency.

How might we contrive a simpler, less expensive method for tuning a VFO? I developed an interesting circuit for use in a very compact receiver (Fig. 1) that qualifies as a simple, inexpensive tuning technique. I had some reservations about

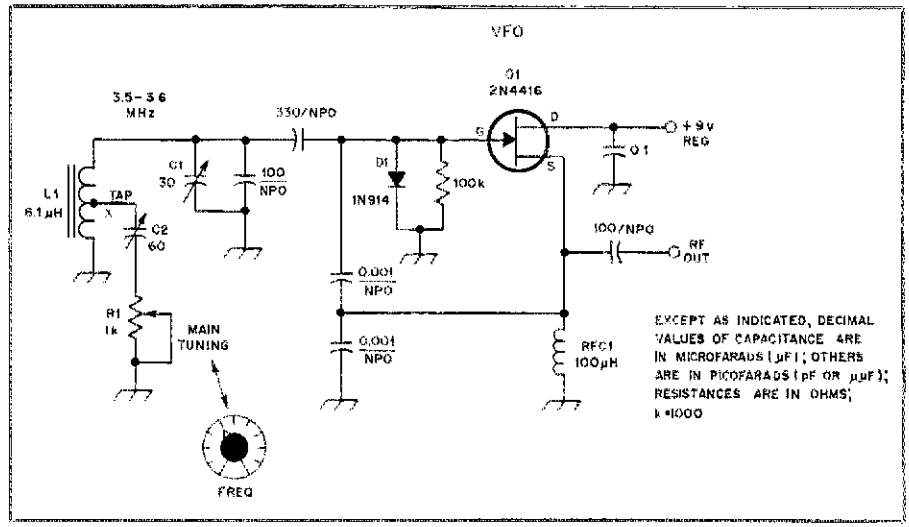


Fig. 1—Typical circuit for a VFO that uses a 2N4416 or MPF102 FET. Tuning is by means of R1 in series with C2. C2 sets the frequency spread provided by R1. This arrangement is useful when an air-variable capacitor and vernier drive are not desired. It can lead to a very compact VFO assembly. The tap position on the coil (L1) and the maximum capacitance provided by C2 determine the maximum tuning range available.

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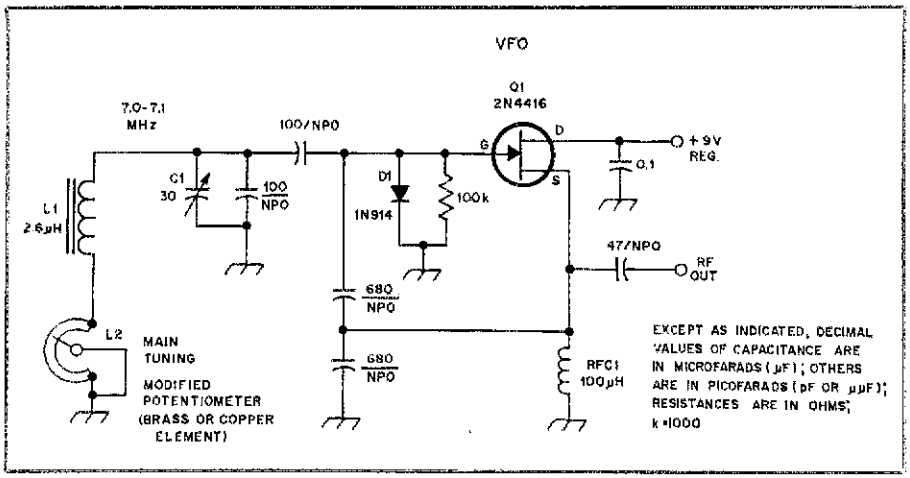

Fig. 2—A variation of the circuit of Fig. 1. In this example, the tuning mechanism is a potentiometer that has been modified to become a small variable inductor (see text).

how it might work, but after breadboarding a test circuit, I was pleasantly surprised with the results. For lack of a better name, I call it "reactance tuning." Fig. 1 shows the details of the test circuit in which I tried the idea. R1, which is a high-quality Allen Bradley (A/B) potentiometer, is located close to C2 and L1 in order to keep the leads from R1 as short and direct as possible.

Why does this system work? Well, as R1 is adjusted, the presence of the capacitance of C2 (a trimmer) is more prominent in the tuned circuit. The series combination of C2 and R1 form a capacitive reactance and resistance that cause a frequency shift as R1 is adjusted. The smaller the value of resistance at R1, the lower the operating frequency, because the capacitance of C2 will be more effective.

What are the bad features? No innovation is necessarily perfect, and this applies to the technique illustrated in Fig. 1. The tuning is nonlinear. That is, the frequency is spread out at the maximum-resistance end of the R1 range, and it is somewhat compressed at the minimum-resistance end. Also, if a poor-quality control is used at R1, you may hear a slight scratching noise as the control is adjusted, while listening to the output of a receiver in which this VFO is used. It should not cause a problem if we use the VFO in a transmitter.

The amount of frequency shift available depends on two things: the position of coil tap X on L1 of Fig. 1, and the setting of the trimmer capacitor, C2. The farther the L1 tap is above ground, the greater the frequency change as R1 is adjusted. Similarly, the greater the capacitance of C2, the larger the frequency change. I had no trouble covering all of the 40-meter band when the coil tap was close to the high end of L1. In a practical application, it is best to limit the frequency change to 25 or 50 kHz. This provides better bandspread when R1 is adjusted. A vernier-drive mechanism can be coupled to R1 if frequency excursions greater than, say, 50 kHz are desired.

I did not observe any degradation in VFO frequency stability when comparing this tuning method with that of variable-capacitor tuning while using the same oscillator module. There is, however, a point in the tuning range of R1 where the loaded Q of the VFO tuned circuit will take a dip. When this happens, the VFO output will drop slightly and the output waveform linearity will change. In most practical applications, you will not be able to detect this effect.

As an alternative to the use of a vernier drive attached to R1, we might consider using a bargain-priced 10-turn, carbon-composition control with a suitable 10-turn counter dial. Wire-wound controls must be avoided because they are inductive.

Another Tuning Trick

I tried another idea that I had in mind for a number of years. The circuit for this one is given in Fig. 2. L2, a modified carbon control, is fashioned by removing the metal cover from a standard-size potentiometer, then removing (carefully) the semicircular carbon element from inside the control. I was able to snap this element loose by prying it up near the tabs of the control. The thin phenolic base material broke easily. I used this element as a pattern and cut out a new element from flashing copper. Brass would work, also. Silver plating would help to ensure minimum corrosion, but it is not necessary to add silver plating if the control will be used regularly.

The new element is glued in place, and the ends of the insert piece are soldered to the two outer lugs of the old control. Be careful to avoid getting epoxy glue on the upper surface of the metal element, or erratic operation will result.

Refer again to Fig. 2. L2 is a small variable inductor we made from the potentiometer. It comprises a part of the overall circuit inductance by virtue of its being in series with L1. As L2 is adjusted, the VFO frequency will change. The higher the operating frequency of the VFO, the greater the frequency change caused by L2. Also, the higher the C-to-L ratio of the VFO, the more effect you will observe when L2 is adjusted. The frequency shift obtained with this method is substantially less than with the circuit of Fig. 1, at least with the circuit values given. A 10-kHz shift was observed.

Incremental band-segment selection can be had with either circuit (Figs. 1 and 2) by adopting the method shown in Fig. 3. S1 is used to add capacitors to the VFO tuned circuit, and R1 or L2 can be used in the manner described previously. Perhaps a miniature DIP switch can be added to operate as S1 when compact equipment is being built. The values of capacitors C3, C4 and C5 will determine the coarse tuning range. Trimmers may be substituted for these fixed-value capacitors, which will enable you to have the tuning ranges overlap.

Simple, Homemade Tuning Capacitor

Large frequency changes are possible if we use a low-capacitance variable capacitor that is connected to the high end of a VFO tuned circuit (junction of C1 and L1 of

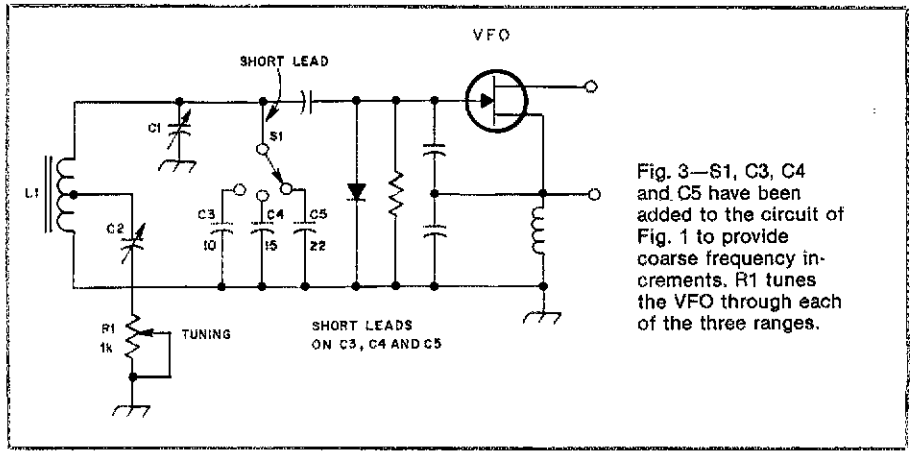

Fig. 3—S1, C3, C4 and C5 have been added to the circuit of Fig. 1 to provide coarse frequency increments. R1 tunes the VFO through each of the three ranges.

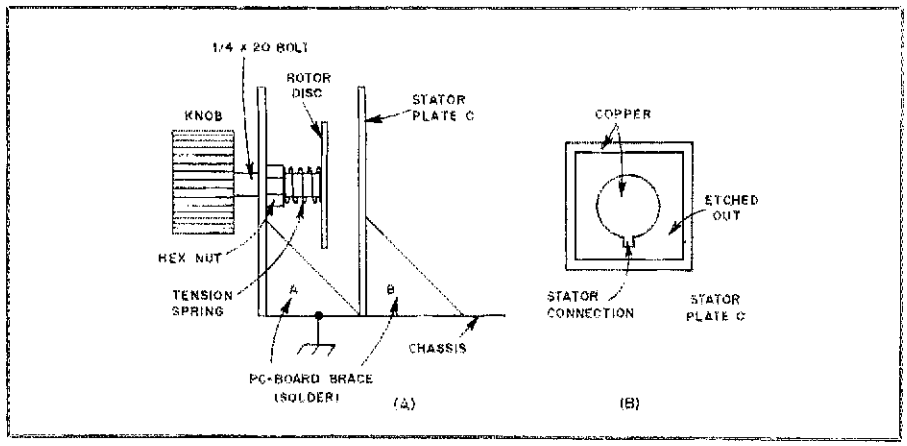

Fig. 4—Mechanical details for a homemade disc tuning capacitor. A tension spring ensures mechanical stability of the rotor portion of the variable capacitor. Side brackets also help to keep the unit mechanically rigid. The detail at B shows how the stator disc is etched on PC board material.

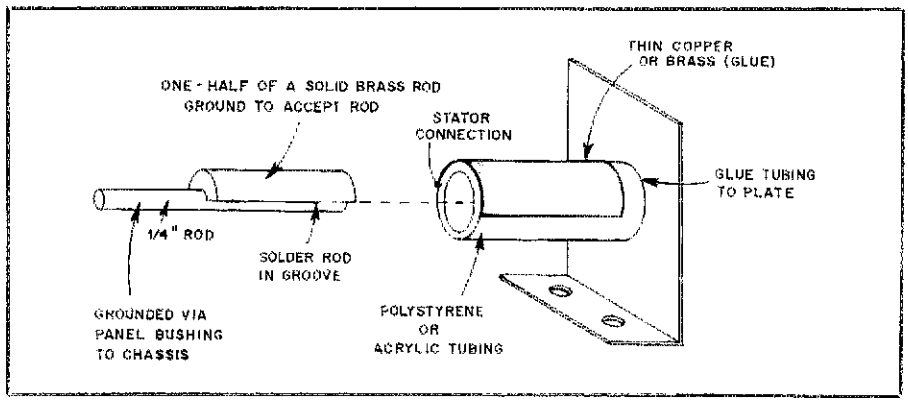

Fig. 5—A cylindrical format provides still another tuning device that can be made at home. The rotor unit is semicircular brass or copper to which a ¼-inch-diameter tuning rod has been soldered. The stator section is a piece of plastic tubing to which thin copper or brass sheeting has been glued (see text).

Fig. 1). A simple mechanism is illustrated in Fig. 4. It is one that I developed during my search for simple VFO tuning methods. The drawing at A of Fig. 4 shows a side view of the assembly I constructed. A piece of ¼-in × 20 iron bolt is used as the tuning shaft. The front plate of the tuner is a piece of copper-clad PC board. The hex nut is soldered to the inner surface of this end plate, as shown. A disc of copper or brass serves as the capacitor rotor. It is soldered to the end of the bolt that is opposite the knob. I used a 1-inch-diameter disc, and made certain it was at an exact right angle to the bolt when I soldered the two pieces together. A spring is used between the disc plate and the front-plate bearing nut to prevent wobbling and undue backlash. PC-board braces are soldered (four each) to the front bracket and stator-plate bracket to ensure physical stability.

Drawing B of Fig. 4 shows how I made the stator plate. It is a piece of PC board with an outer border and disc that were provided by etching with ferric-chloride solution. Glass-epoxy circuit board is recommended in the interest of high dielectric quality and physical strength. A piece of thin Teflon® sheet is glued to the surface of the stator disc to prevent short circuiting of the stator and rotor discs. Polyethylene sheeting is suitable if you have no Teflon on hand. The capacitance range I obtained with this unit was 0 to 18 pF with the 1-inch diameter disc plates. The closer the plates are to one another, the greater the capacitance and the faster the tuning rate. The rotor disc is grounded by means of the bolt-to-nut connection and by virtue of the front-end plate being grounded. Those skilled in machine work should be able to improve on this design. The disc-tuning method is by no means a new concept. VHF cavities and amplifiers were tuned by this technique for many years. But, I don't recall seeing it applied to HF circuits in this manner.

Another Capacitor Idea

A cylindrical tuning capacitor can be fashioned as shown in Fig. 5. The rotor is slipped inside the stator tubing. When the metal half-rod of the rotor is immediately adjacent to the metal half-round outer conductor of the stator tube, maximum capacitance will exist. The rotor shaft is rotated by means of a knob or vernier drive to operate this capacitor. The larger the two half-round conductors (circumference and length), the greater the maximum capacitance of the unit. The mechanical aspects of this device can be improved markedly by those of you who are adept at building mechanical gadgets. Certainly, a fine assembly could be turned out by a craftsman. The point being made here is that this is just another method for constructing a homemade variable capacitor. There are many other unique ways to construct home-built tuning capacitors, but we shall not go into a lengthy discussion about them.

Generating Innovative Ideas

I have been asked, "How do you come up with so many unusual gadgets?" I think the best reply I can offer is to say that examination of a conventional component should suggest numerous ways to simplify it at a savings in cost. Some inventors do not generate new ideas. Rather, they pick up some ordinary object, such as a paper clip, then ask themselves, "What can I do to improve this thing?" We might also ask ourselves, "What don't I like about this paper clip?" The next step is to devise a new paper clip that no longer has the design fault. Bingo! A new patent can result! This general philosophy can be applied to making our own radio components from readily available materials. You can try your ideas, and you need not be ashamed if they don't work the first time or even at all.

In Conclusion

When you are working with the circuits of Figs. 1 and 2, it is important that the Q of L1 be as high as you can make it. If the Q is quite low, the addition of R1 or L2 could cause the VFO to cease oscillating at some point in the tuning range. Therefore, I suggest that you use a T68-6 toroid core for frequencies above 4 MHz. The wire size should be as large as can be wound easily on the toroid core. This will reduce the coil resistance and enhance the Q. The same rule applies if you use a slug-tuned inductor: The core should be for use in the upper part of the HF spectrum. High-quality capacitors should be used also. The NP0 units specified are entirely suitable, and will ensure minimum VFO drift. Silver-mica capacitors can be used, but will cause considerably more drift than will the NP0 ceramic units.

Should you develop some noteworthy circuit innovations, please consider sharing them with others through the pages of *QST*. Detailed descriptions can be submitted as articles. Short explanatory narratives may be just right for the Hints and Kinks column.

Construct the "Ultimate" DC Power Supply

Here's a useful device that will deliver a wide range of voltages at very high current.

By Douglas Rowlett, PhD,* WB5IRI, and Linda Rowlett, PhD,* N5FST

Much of today's equipment comes without a built-in ac-operated power supply. Sometimes, several different dc voltages are needed. A ham could deplete the equipment budget providing separate power supplies to run the gear in the shack. Also, many of today's transceivers and amplifiers consume large amounts of current—18 to 20 A for a typical HF transceiver, and 20 to 25 A for a typical 160-W VHF amplifier.

For several years, we operated our Kenwood TS-120S from a 12-V automobile battery. A trickle charger kept the battery up to snuff, and we never had to worry about hum on the signal. However, we did worry about dangerous battery fumes accumulating in the shack during charge cycles, the potential for damage from spilled or leaked battery acid and the never-ending problem of voltage regulation. A 12-V battery in good condition will not deliver its rated voltage for very long under a heavy current draw: A drop of even 1 V causes a disproportionate drop in power output from solid-state power amplifiers. When we acquired an amplifier for our VHF hand-held transceiver, the problem became acute: Our 150-W amplifier became a 105-W amplifier when used with the battery, but when we used a friend's regulated power supply (13.8 V), the amplifier provided 170 W of output!

We needed a supply that would allow us to run the HF transceiver and the VHF amplifier simultaneously. This dictated a 50-A device. We also wanted a power source that would allow us to experiment with the newer solid-state devices on the market, as well as operate additional equipment.[1] This meant we needed a variable-voltage supply with good regulation. No commercial equipment could give us these features at a reasonable price: The so-called "amateur use" power supplies are rated at 50 A for intermittent service, and their voltage ranges can be varied by only a few percent (usually from 11 to 15 V). The solution was to "roll our own."

Design Objectives

We began our project by specifying the criteria the supply would meet:

1) Voltage regulation on the order of 0.01% for any selected voltage from no load to full load.

2) Voltage variable from 0.1 to 50 V.

3) 100% duty cycle at 50 A.

4) Adjustable current limiting from 1 A to 50 A.

5) Adjustable overvoltage protection (OVP).

6) Thermal protection, including an adjustable, thermostatically controlled fan and power-supply shutdown in the event of a serious overheating problem.

7) Voltage and current metering, as well as front-panel monitoring of the control and protection circuits.

8) Cost must be kept down by using as many surplus "junk box" parts as possible without sacrificing reliability.

9) Troubleshooting and servicing must be easy.

With these goals in mind, and after reading the literature and breadboarding various circuits, we developed the design shown in Fig. 1. The boxes around the diagram sections indicate major subassemblies contained on separate circuit boards or on the main heat sink. There is nothing sacred about this layout.

The box at the bottom of Fig. 1 contains the voltage-regulator circuit (except for pass transistors Q5-Q20, inclusive, and the third driver transistor, Q3, which are located on the main heat sink) and the current limiter. The box at the top of Fig. 1 contains the schematic diagram for the OVP circuit and the fan thermostat. Those components not contained within the boxes are mounted directly on the power-supply chassis or on the front panel.

Voltage Regulator and Current Limiter

The voltage regulator and current limiter circuits are taken directly from Gottlieb's book, *Regulated Power Supplies.*[2] This text is a "must" for anyone interested in the fundamentals of voltage and current regulation: It contains a vast amount of practical and theoretical information, including numerous circuits that can be used directly or modified to suit the designer's needs.

Refer to Fig. 1. Note that the regulator uses two ICs (U1 and U2) and four transistors, Q1-Q4 (Q3 is located on the main heat sink). U1, a CA3130 op amp, serves as the error amplifier, and U2, a CA3086 transistor-array chip, serves as the preregulator and voltage reference source. As shown in Fig. 2, the transistors within U2 are connected in an unconventional manner to yield an impressive circuit. The voltage-reference source is comprised of transistors Q_a, Q_b and Q_c within U2. Although Q_a and Q_b are shown here as a forward-conducting diode and a Zener diode, they are, in reality, bipolar transistors. Zener diodes Q_d and Q_e are also bipolar transistors within U2. The reason for this configuration, according to Gottlieb, is that the base-emitter junctions of ordinary transistors make fine Zener diodes. The transistors within an IC array display sharper knees, have lower dynamic impedances, and generate less noise than do discrete components. Transistor Q_c is employed as a shunt element for Q_a and Q_b. Q_d and Q_e provide preregulation for the voltage-reference source. They also provide the dc operating voltage for the error amplifier, U1.

The voltage regulator used here compares the output of the supply with a reference voltage. Whenever the supply output tries to change, as when a load is applied or removed, the regulator senses the change, compares the difference to the voltage-reference source and adjusts the drive to the pass transistors. U1 drives Q1, which, in turn, drives the Darlington-connected pair, Q2 and Q3 . Thus, when U1 detects an undervoltage condition at the output of the supply, it reduces drive to Q1, providing more base drive to Q2 and Q3 (and, consequently, the 16 series pass transistors, Q5-Q20). Conversely, when U1 detects an overvoltage condition at the output of the supply, it increases drive to Q1, shunting some of the base drive for Q2 and Q3 to ground. This deprives the series pass transistors of some of their base drive,

[1]Notes appear on page 30.

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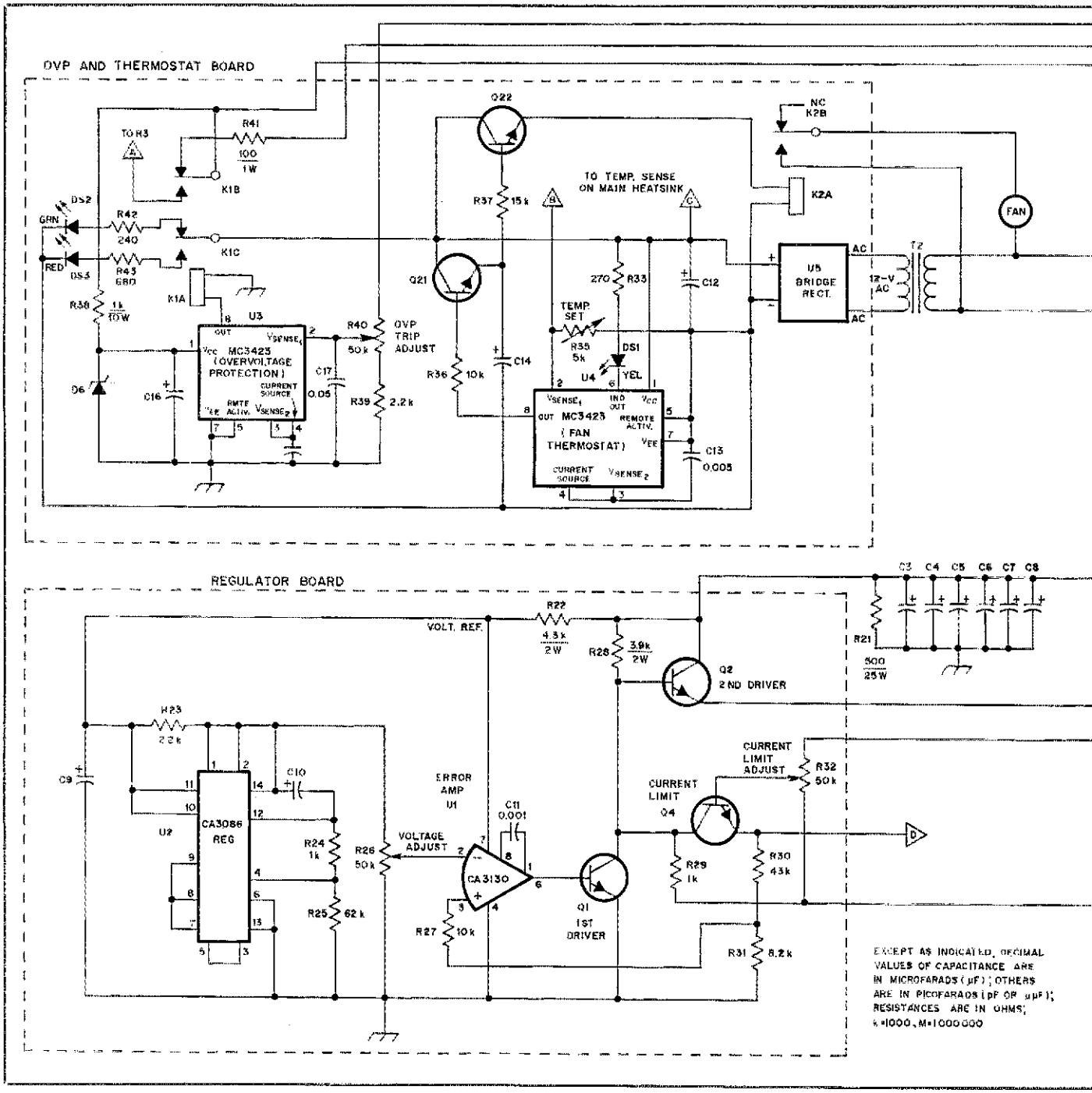


Fig. 1—Schematic diagram of the 0.1-50 V, 50-A adjustable power supply. The three boxes represent the two main circuit boards and the main heat sink. All components shown outside the boxes (with the exception of S2, which is located on the main heat sink) are mounted on the power-supply chassis or on the front panel. All capacitances are in microfarads, and all resistors are ½-W carbon-composition unless otherwise noted.

C1—80-μF, 100-V electrolytic.
C2—3000-μF, 100-V electrolytic.
C3—C8, incl—5600-μF, 100-V electrolytic.
C9—100-μF, 100-V electrolytic.
C10—5-μF, 35-V electrolytic.
C11—0.001-μF, 25-V disc ceramic.
C12—2600-μF, 20-V electrolytic.
C13—0.005-μF, 25-V disc ceramic.
C14—330-μF, 35-V electrolytic.
C15—0.1-μF, 25-V polystyrene.
C16—15-μF, 25-V electrolytic.
C17—0.05 μF, disc ceramic, 50-V.
D1-D5, incl.—5-inch, 75-V, 50-A stud-mounted diodes (FBL-00-061) or equiv.).
DS1-DS3—Amber, green and red LEDs, ¼-W.
DS6—13-V, 5-W Zener diode.
D7—Silicon-controlled rectifier, 75-V, 75-A (FBP-00-008 or equiv.).
D8—Silicon-controlled rectifier, 400-V, 6-A (RS 276-1020 or equiv.).
F1—30-A slow-blow fuse.
K1, K2—DPDT miniature relay, 12-V coil, 125-V contacts (RS 275-213 or equiv.).
L1—Filter choke, 30-mH, 50-A (BA-362 or equiv.).
Q1-Q2—2N2102 or equiv.
Q3—2N3055 or equiv.
Q4—TIP3055 or equiv.
Q5-Q20, incl.—2N3772 or equiv.
Q21-Q22—2N2222 or equiv.
R26, R32, R40—50-kΩ, 1-W, linear taper panel-mount potentiometers (RS 271-1716 or equiv.).

causing their collector-emitter impedances to rise. This results in a voltage decrease at the supply output to the level determined by the voltage-reference source and R26, the voltage-adjust potentiometer.

Q4, R4 and R32 make up the adjustable current-limiting circuit. Current limiting commences when Q4 receives sufficient base-emitter voltage to render it conductive. This eliminates any further increase in the base current of Q1 and Q3.

Gottlieb's original circuit used Q3 as the

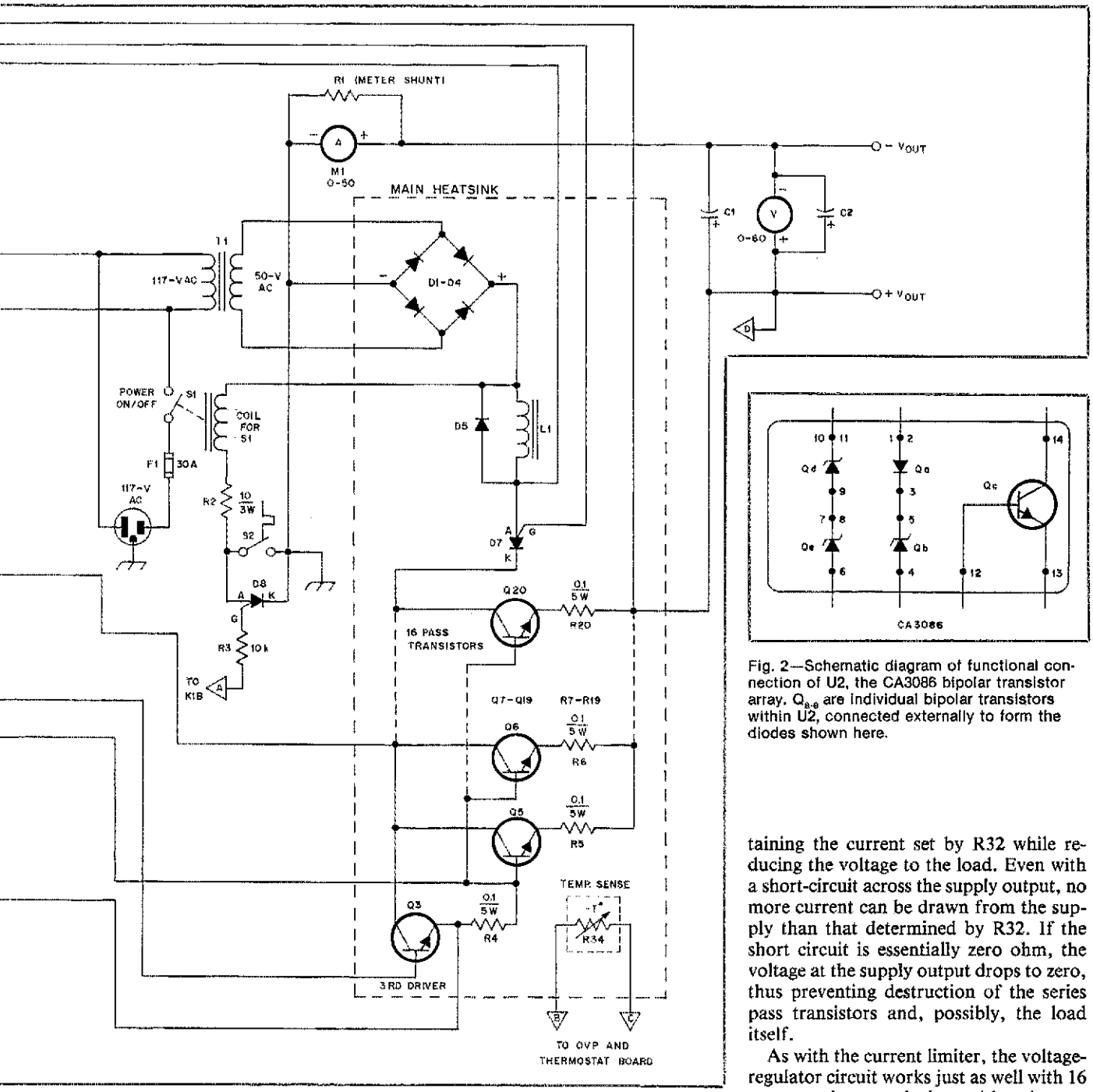


Fig. 2—Schematic diagram of functional connection of U2, the CA3086 bipolar transistor array. Q_{a-e} are individual bipolar transistors within U2, connected externally to form the diodes shown here.

R34—10-kΩ, ¼-W NTC thermistor (WEP FR1007A or equiv.).
R35—5-kΩ, 10-turn, PC-board-mount potentiometer.
S1—Circuit breaker-type switch: contacts 125-V ac, 30-A; coil 12-V dc, 1.75-A (FHC-01-001-2 or equiv.).
S2—Thermostat switch, stud-mounted, normally open contacts close at 124° C (FKA-124-017 or equiv.).
T1—50-V, 50-A power transformer, 120-V ac primary surplus transformer; see text for details.
T2—12.6-V, 300-mA transformer, 120-V ac primary.
U1—CA3130 op amp or equiv.
U2—CA3086 bipolar transistor array or equiv.
U3, U4—MC3423 overvoltage-protection IC or equiv.
U5—50-V, 1-A bridge rectifier.

series pass element in a 1-A adjustable supply. We have modified his circuit by using Q3 as an additional drive element for the series pass transistors, and have experienced no problems in the conversion. Q4 still functions well as a current limiter. When the current drawn by the load connected to the supply reaches the level set by R32, Q4 maintains the voltage to the load while also maintaining a constant current. If the load tries to draw increasing amounts of current, Q4 causes an automatic shift from a constant-voltage mode to a constant-current mode of regulation, thus maintaining the current set by R32 while reducing the voltage to the load. Even with a short-circuit across the supply output, no more current can be drawn from the supply than that determined by R32. If the short circuit is essentially zero ohm, the voltage at the supply output drops to zero, thus preventing destruction of the series pass transistors and, possibly, the load itself.

As with the current limiter, the voltage-regulator circuit works just as well with 16 pass transistors as it does with only one. Voltage regulation approaches 0.005%, while hum and noise output remain close to the $< 250\ \mu$V RMS specified by Gottlieb. For example, at 13.8 V, the variation in voltage between 0 A and 50 A is 0.1, which is certainly as good as most of the power supplies available from commercial suppliers.

Pass Transistors

When pass transistors are chosen, the two most important parameters are the maximum current rating and the maximum dissipation of the devices. The 2N3772s we use are rated at 20 A and 200 W. It appears that the current rating presents no problem, since three 2N3772s can handle 50 A. However, three devices would be destroyed

quickly under a full load drawn from this power supply because their maximum safe dissipation rating would be exceeded. By applying Ohm's law, we can calculate the maximum power in watts to be drawn from the supply (50 V × 50 A = 2500 W). Using this figure, one might get by using only 13 pass transistors (13 × 200 W = 2600 W). However, such a choice would cause the transistor to run at the limits of their safe operating ranges under full-load conditions. This would probably result in early failure.

A more conservative approach is to use enough pass transistors to ensure that at maximum load conditions no single device comes close to its 200-W limit. With 16 pass transistors, each device dissipates only 156 W at full load. In addition, each transistor carries only a little over 3 A at full load, assuring long life. (One could, of course, use more transistors to provide an even larger margin of safety, but that would mean a larger heat sink. Finding a heat sink large enough to dissipate 2500 W and hold 16 TO-3 transistors is difficult enough!) Finally, each pass transistor has a 0.1-ohm, 5-W resistor in its emitter lead to ensure that no single device draws more than its share of the current.

Overvoltage Protection

U3, an MC3423 overvoltage-protection IC, is ideal for use in a power supply of this type.[4] It is inexpensive, readily available, and reliable when operated within specified voltage limits. A small amount of the unregulated voltage from the supply is drawn off just before D7 and regulated by R38, C16 and D9 (a 13-V, 5-W Zener diode) to provide operating voltage for U3. R39 and R40 set the voltage at which U3 triggers. While the MC3423 was designed to fire an SCR placed across a power-supply output, thereby shorting the supply and blowing a fuse, we found that it can sink enough current to drive a small relay. Thus, when an overvoltage condition exists, U3 energizes K1, a 12-V DPDT device the size of a 16-pin IC. Gate voltage for D7 normally passes through half of this relay (K1A), enabling voltage from the power transformer to reach to the filter capacitors, the voltage regulator and the series pass transistors. When K1 is energized, however, voltage is removed from the gate of D7 and applied to the gate of D8. This grounds the coil of S1 and trips the internal circuit breaker, thus shutting down the supply.

When K1 is energized, it also removes voltage (through K1B) from the green LED on the front panel, and applies voltage to the red LED on the front panel, presenting a visual display to indicate that an overvoltage condition exists. Normally, both LEDs would extinguish when the circuit breaker trips, and the only indication you would have of an overvoltage condition is that the supply has turned off. Should D8 or the circuit breaker fail, the green LED on the front panel would still go out but the red LED would stay lit. Gate voltage for D7 would still be removed in such a situation, thus cutting off dc voltage to the filter capacitors, regulator and pass transistors and, once again, effectively shutting down the supply.

Thermal Protection

Any power supply that provides 50 A is going to generate a lot of heat: Some way must be provided for removing it if the pass transistors are to survive. One method is to use a large enough heat sink to radiate the excess heat into the surrounding air. However, such a heat sink would be extremely large, expensive and difficult to find. An alternative method is to use a combination of heat sinking and forced-air cooling, so that the effectiveness of a smaller, more practical heat sink is increased by the passage of air over it. We decided to use the latter method of cooling and mounted a surplus muffin fan so that it blows air directly over the pass transistors and the heat sink (see Fig. 3). As added protection in case the fan fails, switch S2, a normally open thermal switch mounted on the heat sink, closes at 124°C, thus grounding the coil of S1 and causing the circuit breaker to trip if things get too hot.

Fortunately, the OVP IC makes a versatile thermostat if the OVP trip potentiometer is replaced with an NTC (negative-temperature-coefficient) thermistor, and the voltage across U4 is held constant. Because NTC thermistors decrease in resistance as the temperature rises and increase in resistance as the temperature falls, U4 is fooled into seeing an overvoltage condition when the temperature of the thermistor (R34) falls to the trip level determined by R35. When U4 is triggered, it supplies drive to Q21 and Q22, which then energize K2. U4 could drive K2 directly, but using Q21 and Q22 allows the insertion of C14, which holds the fan on for about one minute after U4 turns off. This cools things down further and prevents constant cycling of the fan as the thermistor resistance rises and falls. Increasing the value of C14 increases the delay time; decreasing its value shortens the delay time. When U4 turns on, it energizes the yellow front panel LED (through pin 6) at the same time that it keys K2 through pin 8. If the yellow LED lights, but the fan does not immediately rotate, a failure has occurred in Q21, Q22, K2 or the fan. This visual indicator should make troubleshooting the thermostat circuit easier.

A constant voltage for U4 is provided by T2, U5 (a 1-A bridge rectifier in a 4-pin DIP package) and C12. This circuit also provides voltage, through the appropriate dropping resistors (R33, R42 and R43), for the red, green and yellow LEDs on the front panel.

Construction

Power-supply layout is not critical, as long as good construction practices are followed and thought is given to parts placement to ensure efficient heat removal. We recommend the use of a well-ventilated steel case, rather than a plastic one, because of the transformer weight and the heat sink, and because good RF shielding is needed if the supply is to power transmitting equipment. Make certain that air can circulate around the transformer, regulator board, filter capacitor, bleeder resistor and series pass transistors.

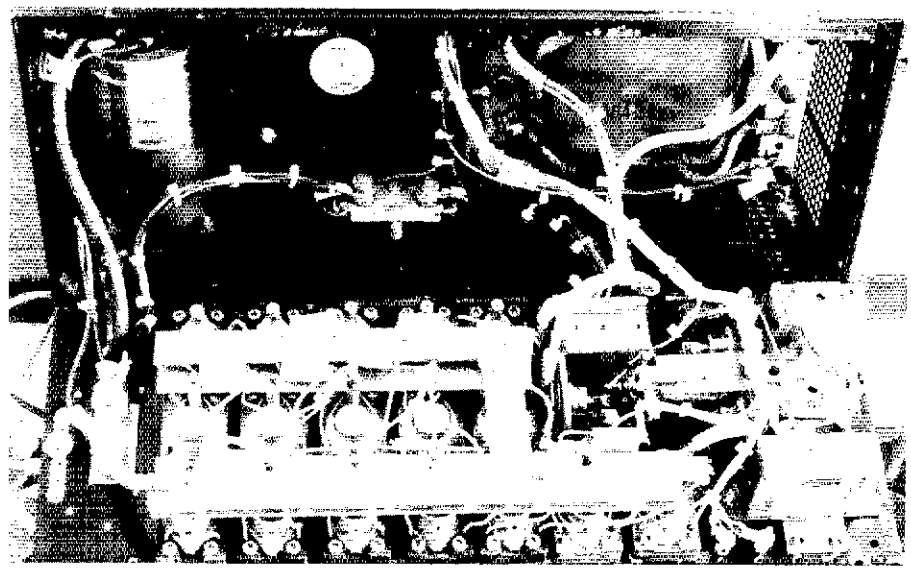


Fig. 3—Rear view of the power supply with the hinged heat sink lowered to expose the component layout. Heat sink, left to right: positive (lower) and negative (upper) output terminals; bus-bar deck with Q3 and Q5-Q20, incl., and their associated current-equalizing resistors; diodes D1-D4 and D8 (mounted on brackets); D7 (upper-right corner) and choke L1 (lower-right corner). Thermistor R34 is mounted on stand-off insulators between the bus-bar deck and L1. Main chassis, l-r: C2, fan, meter shunt (in front of fan) and T1.

We were fortunate to obtain a "junker" commercial power supply from a local company. Many parts used in this project came from that unit. The chassis and heat sink proved to be the most valuable acquisitions, next to the power transformer, as they allowed a neat layout and had ready-made mounting brackets and tapped holes for securing parts. As you can see (Fig. 3), the heat sink is hinged at the bottom to make access to the pass transistors easier, a feature worth incorporating into any project using this many solid-state devices.

The bus-bar arrangement shown in Fig. 3 for connecting the pass transistors consists of two stacked decks of steel-bar stock separated by threaded nylon spacers. The bottom deck connects the paralleled collectors of the pass transistors together through their mounting screws, while the top deck connects the ends of the paralleled emitter resistors. Most connections are made with no. 6-32 machine screws and lock washers into drilled and tapped holes on the heat sink and bus-bar decks. Individual transistor base and emitter connections are made with no. 18 stranded wire, supported by standoff insulators. Don't forget to insulate the pass transistor mounting screws from the heat sink (which is at chassis ground) with plastic or fiber washers and sleeves.

The components mounted on the right side of the heat sink are D7, L1, D1-D5, D8 and R34. With the exception of the thermistor, which needs to be mounted on the heat sink to sense the temperature, these components can be mounted anywhere in the power supply. We placed them on the heat sink because there was room for them there, but as long as they have adequate ventilation they should not run hot enough to require heat sinking. Remember to make all connections that will carry the full-load current of 50 A with as heavy a gauge wire as possible. This reduces resistance and heating losses to a minimum. We recommend at least no. 6 stranded copper wire for this purpose (or heavy, steel bus bars).

You can see (Fig. 3) that we used three pieces of no. 12 stranded wire in parallel for the negative line going from the main rectifier to the ammeter shunt and back to the negative output of the supply. This provides a heavy conductor. We also used two parallel pieces of no. 10 stranded wire to carry the current from each side of the transformer to the main rectifier, L1 and D7. Short pieces of no. 6 stranded wire connect D7 to the pass transistor bus-bar deck, and the emitter bus bar to the positive supply output terminal.

Short lengths of steel bus bar connect the filter capacitors. This was a matter of convenience rather than necessity: No. 12 wire and crimp-on ring connectors would have served just as well.

We recommend sockets for all ICs to make troubleshooting easier and to eliminate ruining a part through the application of excessive heat during soldering. The CA3130 comes in an 8-pin TO5 package. A round socket for it may be hard to find, but the CA3130 is also available in an 8-pin DIP package (CA3130AE or CA3130E).

Transistors Q1, Q2 and Q3 have small heat sinks attached to them on the regulator board (Fig. 4). These transistors run slightly warm during operation. Heat sinks were included to improve transistor life expectancy.

Parts Substitution

We have made an effort to include only those components that one could expect to find easily, that would be available for years to come or for which equivalent parts exist.

There are few critical parts in the power supply other than the ICs. The CA3086 and CA3130 are standard RCA devices. The MC3423 IC is a Motorola device, available from numerous suppliers, including Radio Shack. Other than these parts, which should be exactly as specified, most components can be changed, within reason, to suit the builder's needs or budget.

For example, T1 can be any transformer that suits your primary and secondary voltage requirements and will deliver the current you wish the supply to provide. The surplus transformer we used weighs over 100 pounds, has a 117-V primary and a 50-V secondary, and will deliver 80 A in continuous service and 100 A in intermittent service. This is overkill, but the transformer cost (nothing) makes its use here more understandable. There is no need to attempt to duplicate this transformer when building your power supply: Just find one that will meet your requirements. Unfortunately, big transformers are expensive to buy and difficult to scrounge, especially ones that will handle the kind of current we're dealing with here. You can use two transformers in parallel to produce the needed current. Another solution is to rewind a transformer to provide the desired voltage and current.

Before you decide on a transformer, you must carefully examine the primary circuit (mains) you will be using. Most residential 117-V ac circuits have 15-A circuit breakers; however, 2500 W at 117 V equals over 21 A. Thus, if you build this power supply and attempt to draw the rated current while it is plugged into a typical 15-A circuit, you will most certainly trip the breaker. If it doesn't trip, you'll be wise to check your main breaker box to find the problem. Most modern residential wiring can handle 20 A, and you can replace the breaker with one rated at that value. Consult a licensed electrician if in doubt. Peak loads may cause the breaker to trip even at 20 A, however. A better solution is to install a 117-V line that will deliver 25 A without too much voltage drop. Better yet, install a 234-V line and choose a transformer with a 234-V primary. At full load, the line voltage to our supply drops from 120 V to 113 V; we have noticed no degradation in performance.

D7 can be any SCR that will handle at

Fig. 4—Regulator board. Q1, Q4 and Q2 are mounted with their attached heat sinks across the top of the board. U1 and U2 are mounted in the middle of the board, with C9 between them.

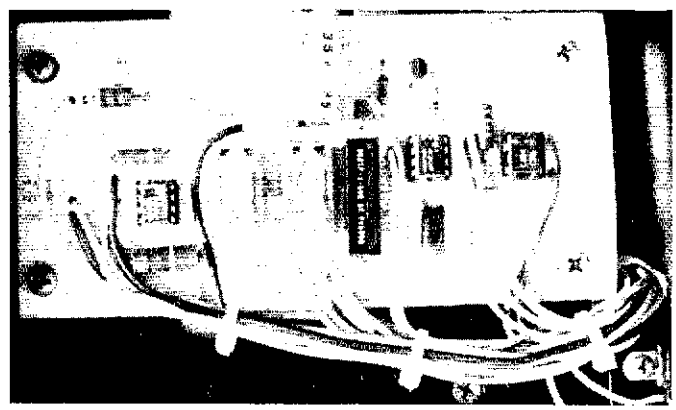


Fig. 5—OVP and thermostat board. Layout from left to right is U5, U4, R35, K2, K1 and U3. D9, C15 and C16 are mounted below U3. C14 is mounted below K2, while Q21 and Q22 are mounted below U4 and R35, respectively. R38 can be seen on a bracket on the main chassis in the upper-left corner of the figure.

least 50% more than the rated voltage and current of the supply. For a 50-V, 50-A supply, D7 should be rated at a minimum of 75 V and 75 A *in continuous service.* Check the manufacturer's specifications for maximum ratings, as well as minimum and maximum gate-voltage and gate-current ratings. You may have to adjust the value of R41 to drop the gate voltage to the proper level. The resistors and capacitors associated with the regulator and control circuits should be as close as possible to the values shown in Fig. 1.

You can operate the fan thermostat, U4, between 5 and 35 V, and T2 should deliver a voltage between these limits that will provide at least 300 mA. However, if you substitute a voltage value for T2 other than the one specified in Fig. 1, you will have to adjust the values of the voltage-dropping resistors for the LEDs, as well as select a different relay for K2 (see manufacturer's data sheets for the proper values). If the substitute relay draws more current than the one we used, you may also have to choose a heftier transistor for Q22. Remember, the K2 contacts carry 117-V ac to operate the fan. Be certain the relay you choose can handle this voltage at the current required by your fan. The same rules apply to K1: Any relay with contacts that will handle the D7 gate voltage and the voltage of T2, and whose coil can be safely driven by U3 (no more than 200 mA at 2 V > U4's Vcc), should work fine. If the only relay available falls outside these parameters, a transistor driver similar to that used for U4-K2 will be needed.

Q1-Q22 can be substituted in a similar fashion, as long as *all* the operating specifications of the substitution devices meet or exceed the specifications of the transistors shown in Fig. 1. The exceptions to this rule are the 16 pass transistors, and this applies only if you desire to change the full-load power rating of the supply or, because of heat-sink limitations, to change the number of pass transistors used. For example, the 2N3055 is a popular, inexpensive transistor often used as the series pass element in amateur power supplies. However, it is rated for a collector current of only 15 A of collector current (150-W dissipation), which would necessitate using 22 2N3055s to do the same job as 16 2N3772s. Sixteen 2N3055s would safely handle a power supply of only 1600 W (32 A at 50 V, continuous duty). If you consider using substitute devices, you must consider the total current to be drawn and the total power to be delivered or dissipated. When you operate your 50-V adjustable power supply at, for example, 13.8 V, the difference (36.2 V) must be dropped by the pass transistors and is dissipated as heat. Thus, your power supply will run hotter at lower voltages than at higher voltages for the same current draw. These rules apply to the other transistors in the supply, especially Q1-Q4. Warning: Not all so-called equivalent transistors have the same power capability as those specified in this article. Check carefully!

Operation

Before you plug the line cord into the wall outlet, turn the voltage-adjust and current-limiting-adjust front-panel controls to their lowest settings (minimum voltage and maximum current limiting [0 V and approximately 1.5 A]). Then turn the OVP control to its highest setting (trip voltage of 50). We wired our front-panel controls so that minimum voltage, maximum current limiting, and minimum OVP trip voltage occur with all front-panel controls turned fully counterclockwise. Thus, for this step, the OVP control would be set fully clockwise, while the other two controls would be set fully counterclockwise.

Now plug the unit into the wall socket and turn on S1. The green LED should light, the ammeter should read approximately 0.75 A, and the voltmeter should read zero. The fan may or may not turn, depending on the setting of the thermostat control. Slowly rotate the voltage-adjust control clockwise; the voltage should rise smoothly to 50. If it does not, make voltage checks from the ac line, through T1, D1-D4, L1 and D7. If voltage is present up to but not past D7, determine whether gate voltage is being supplied to D7. If gate voltage is present, but no voltage is being passed through D7, then D7 is faulty. If no gate voltage is present, check R41 and K1. If voltage is present up to the collectors of Q2 and Q3, check U1 and U2 (by substitution) and Q1-Q3. Finally, if the voltage still will not pass the regulator, check Q4. It is possible that if Q4 is shorted, current limiting will be so tight that the supply will perceive the minimal draw of the regulator and pass transistors as a short circuit, thus causing the output voltage to fall to zero.

Once the regulator is working properly, adjust the supply to about 1.5-2 V above the voltage you wish to provide to the load. For example, if you want to operate your HF rig at 13.8 V, set the voltage-adjust control to 15.5 V. Now *slowly* rotate the OVP-trip-adjust potentiometer in a counterclockwise direction until D7 trips. Wait until the supply has bled down to 0 V, then turn the voltage-adjust control about a quarter turn counterclockwise before turning S1 on again. (This ensures that the supply voltage will be less than the OVP trip voltage when S1 is turned on.) Adjust the supply voltage to 13.8. If for any reason the supply voltage rises to 15.5, U3 will trigger, removing gate voltage from D7 and tripping S1, thus shutting down the supply.

Now turn off the supply and connect a load to the positive and negative terminals. If the load is a piece of electronic equipment, make sure that its power switch is turned off before turning on S1. If you have connected your HF transceiver, for example, turn on S1, ascertain that the voltage is 13.8, and then turn on the rig power switch. Turn the current-limiting potentiometer to the midpoint of its range. Key the transmitter into a dummy load, and ascertain that the supply is delivering full current to the load (about 18-20 A for most solid-state transceivers) and that the voltage remains steady. There should be no perceptible drop in voltage at this load level. Turn the current-limiting potentiometer slowly counterclockwise until the voltage just begins to drop, then back it up just a bit, to the point where the voltage remains at 13.8.

Finally, set the fan thermostat. There are two methods you can use: a thermometer or touch. Apply a load that draws substantial current (at least 20 A) to the supply and wait for the heat sink to warm up. You can then place a thermometer on the heat sink to measure the temperature or you can rely on feeling the heat sink to determine how hot it is. When the heat sink reaches 130°F or becomes uncomfortable to hold your hand on for longer than a few seconds, adjust R35 until the fan starts turning. When the fan turns, the yellow LED on the front panel should light. When the heat sink cools enough so that the thermistor turns U4 off, the yellow LED will go out, but the fan will continue to run for about a minute longer.

Final Remarks

Our power supply has been running continuously for several months and has performed flawlessly. Often we operate our VHF station and HF station at the same time, and we have had no problems with overheating or voltage stabilization while pulling nearly 50 A from the supply at 13.8 V. Only two glitches have appeared. One was caused by VHF energy getting into the supply when running 175-W output on 2 meters. The output from the supply would drop several volts every time the amplifier was keyed. The solution was simple: We placed a couple of 3-inch loops in the ac power cord and secured them with a twist-tie. This formed an effective RF choke. The other problem was caused by RF from operation on 20 meters getting into the OVP circuit and tripping S1 each time the transmitter was keyed. A 0.05 μF bypass capacitor (C17) from pin 2 of U4 to ground cured that problem.

We would like to express our appreciation to Barry G. Brubaker, N5FAB, for valuable assistance in parts procurement, and to Mark W. Schneider, WB5RDK, and Robert H. Fuglaar Jr., N5BXP, for allowing us to "pick their brains" about power supplies and voltage regulators in general.

Notes

[1] D. Peters and R. S. Larkin, "Power FETs: Trend For VHF Amplifiers," *Ham Radio*, Jan. 1984, pp. 12-23.

[2] I. M. Gottlieb, *Regulated Power Supplies*, 3rd ed., (Indianapolis, 1981), Howard W. Sams & Co., pp. 326-327.

[3] I. N. Cousins, "Overvoltage Protection for 13.8-V Power Supplies," *QST*, Oct. 1983, pp. 37-40.

What Does QSK Really Mean?

The term "QSK" is frequently misunderstood, even by experienced operators. Let's have a close look at QSK and learn what it does and does not mean.

By J. R. Sheller,* KN8Z

Today's radio amateurs are bombarded by advertising about "QSK transceivers," "QSK amplifiers" and "QSK devices." What are the desired parameters of these devices? What do we really mean when we refer to "QSK" or "full-break-in CW?" Let's examine what QSK is and how it works. We shall also examine what you should expect from any device designated as QSK.

QSK is an international Q signal. When used as a question, it means, "Can you hear between your signals, and if so, can I break in on your transmission?" Over the years, the term QSK has been used less as a Q signal on the CW bands and more as a description of equipment performance and techniques. Let us look at the history of QSK in Amateur Radio.

Some History

Shortly after amateurs moved from spark to CW, some innovative operator thought it would be advantageous to hear *between* the dots and dashes being transmitted. Thus was born the idea of QSK, or full-break-in CW.

Over the past 50 years, many schemes have been devised to accomplish QSK operation. These include using separate antennas for transmitting and receiving, outboard TR switches that use vacuum tubes and outboard TR switches that employ vacuum relays. These ideas have merit, but usually create more problems than they solve. The separate-antenna idea is fine if you have the space for two antennas and if your receiver has exceptionally good automatic gain control (AGC). Unfortunately, this method of achieving QSK becomes troublesome in the presence of high RF power.

The vacuum-tube TR switch works at low-power levels, but suffers from "suck out" (signal attenuation on receive) and often causes BCI and TVI. An outboard vacuum-relay TR switch performs well, but is complex and expensive. It requires elaborate protection to prevent "hot switching" of the relay contacts. Additionally, the vacuum-relay system produces additional clicking noise during transmissions, which is distracting to some operators. The first quantum leap from the Stone Age of QSK occurred with the introduction of the Signal One transceiver in the late 1960s. This transceiver had a good QSK system (using vacuum relays) and worked rather well "barefoot." Within two years of the introduction of the Signal One, Dick Ehrhorn, W4ETO, introduced his Alpha series of linear amplifiers, which provided high-power QSK CW for the first time.

In the late 1970s, many more QSK full-break-in transceivers appeared on the market. Today, because of the use of PIN diodes, many new transceivers are capable of full-break-in CW. It is safe to assume that within several years, all HF amateur transceivers will contain QSK as a standard feature.

Technical Parameters

QSK, as we view it today, is the ability to hear between your own dots and dashes without sacrificing the receiver performance characteristics of the transceiver front end. The criteria for an acceptable QSK system should be defined as follows:

1) When you are receiving between the dots and dashes of transmitted CW, attenuation of the received CW signal should not exceed 1 dB.

2) The basic receive specifications—selectivity, cross modulation, third-order intercept, noise floor, ultimate rejection and sensitivity—should all remain the same, with or without the unit operating QSK or an outboard QSK device being in the line.

3) The transmitted CW waveform produced by a QSK transceiver, or passed through a QSK amplifier or QSK switch, should show no changes in its pattern from what the same system would produce in a non-QSK configuration.

4) To allow use with AMTOR, any QSK switching system should have a clean switch time from transmit to receive, or receive to transmit, of less than 20 ms.

5) A QSK transmitted signal, whether from a QSK transceiver, through a QSK amplifier or through an outboard QSK TR switch, should be spectrally clean.

6) The third-order products of a high-power QSK system should be the same whether the system is used with or without the QSK feature.

A Few Practical Examples

The state of the amateur art in QSK switching systems can be divided into two types: PIN diodes and vacuum relays. With the exception of the Signal One, the majority of the modern transceivers use PIN diodes for their high-speed TR switching. The Signal One uses a properly protected and sequenced vacuum relay for the output TR switching.

In high-power linear-amplifier applications, with power levels exceeding 500 watts of RF, full QSK is usually accomplished by properly sequenced high-speed vacuum relays. These relays must also be fully protected to prevent "hot switching." The exception to the use of vacuum relays in high-power QSK is the QSK 1500 PIN-diode switch, which uses high-power PIN diodes in place of vacuum relays to accomplish high-speed RF switching.

QSK Switching Using Vacuum Relays

The best example of a vacuum-relay QSK system is found in the Alpha amplifiers by ETO. The following discussion of circuitry relates to an Alpha 77D linear amplifier. The vacuum relays used by ETO in these amplifiers have a switching time of 1-2 ms and, when fully closed, they can handle in excess of 10 A of RF current (5 kW of RF power into a 50-ohm load). As is typical of all vacuum relays, however, they cannot survive if switched under load. Switching a relay while it is in the act of carrying current is called "hot switching." Hot switching a vacuum relay will destroy it!

The secret for using vacuum relays to perform high-speed, high-power RF switching is to provide a proper sequencing and timing circuit. Fig. 1 shows a block diagram of the basics of the ETO circuit. Please note that the box designated "QSK Board" contains over 50 active components

*Design Electronics Ohio, 4925 S. Hamilton Rd., Groveport, OH 43125

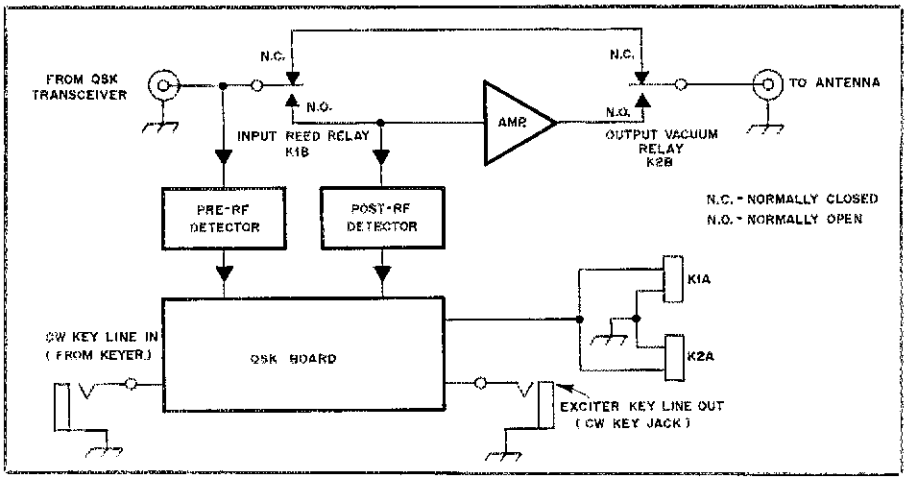


Fig. 1—Block diagram showing a simplified arrangement for the QSK system used in the ETO amplifier.

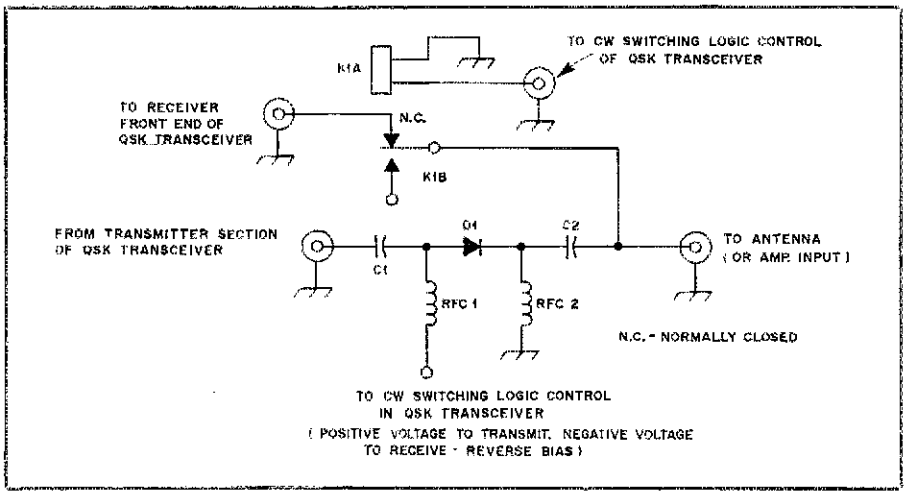


Fig. 2—Basic PIN diode TR switch for QSK operation. This is a simplified version of the circuit used in the Kenwood TS-930S transceiver.

that integrate and distribute the information for proper timing and sequencing. Refer to Fig. 1 to follow this sequence of events:

1) Relays K1 and K2 are in the normally closed (receive) position.

2) The CW key line is closed by means of a key or keyer.

3) The pre-RF detector looks for the presence of RF from the exciter. If RF is present, the sequence stops until the pre-RF detector informs the QSK board that all RF is gone.

4) The QSK board now commands K1 and K2 to close, provided that *no* RF is present at the pre-RF detector.

5) Only now will the exciter-key-line-out be closed. Thus the exciter can *only* be keyed if *both* K1 and K2 are closed *first*.

6) When the CW key line opens (key contacts open), relays K1 and K2 will open *only* if *no* RF is present at the post-RF detector.

This sequencing procedure is for one key closure and one key opening. It prevents either the input reed relay or the output vacuum relay from hot switching. A proper CW waveform is maintained because the exciter cannot generate RF until the amplifier relays are fully closed. This method of sequencing vacuum relays for QSK is quite complex, but offers excellent reliability. The major objection to the use of vacuum relays for QSK CW is the clicking of the relay as it follows each dot and dash.

Using PIN Diodes for QSK Switching

Present-day QSK transceivers (except the Signal One) use PIN diodes for the output RF-switching function. PIN diodes have several characteristics that make them ideal for high-speed RF switching. These include: the ability to be hot switched, small physical size, lower cost than vacuum relays, totally silent switching, and fewer active components required for proper sequencing and timing. Today's popular QSK transceivers that use PIN diodes are all TEN-TEC models; Kenwood TS-930S; Yaesu FT-1, FT-980 and FT-757; the ICOM 751; and the Drake TR5.

A thorough discussion of PIN diodes and their operation as RF switches is beyond the scope of this article. Fig. 2 shows a block diagram of how a PIN diode might be used in a low-power (150-200 W) QSK transceiver. We will use this diagram to discuss the basics of how a PIN-diode switch works.

In receive, the signal path is from the antenna through reed relay K1, then to the receiver front end. During receive, PIN diode D1 is reverse biased with a dc voltage of 60 to 100. The receive signal sees a very high impedance toward the transmitter section and a very-low-impedance path to the receiver front end.

When the CW key is closed, the logic inside the QSK transceiver causes the following sequence to occur:

1) K1 opens.

2) The receiver front end and IF stages are muted.

3) Forward dc bias is applied to D1, reverse dc bias is removed, and D1 is turned on.

4) CW RF is generated and passes through while enroute to the antenna.

This type of PIN-diode switch has proven to be excellent for full-break-in QSK in modern transceivers. The only difference when this type of QSK switch is used is a slight change in the CW weighting when switching from semi-break-in to full QSK. I have not found this to be a problem; it is only an observation that at present remains unexplained.

Presently, there is only one QSK device that uses PIN diodes for high-power (1500-W) QSK switching—the QSK 1500. This unit is designed to replace the TR switching in a conventional (non-QSK) linear amplifier with PIN-diode switches, thus allowing any amplifier to operate full QSK. A block diagram of this unit is shown in Fig. 3, while Fig. 4 shows a scope photograph of the QSK 1500 at the 1380-W level. The CW waveform (at 58 WPM) is enclosed in the 525-V reverse blocking voltage. The receive time between dots at 58 WPM is 8 ms. This type of scope pattern is typical of PIN-diode RF switches, whether in a 200-W transceiver or a 1500-W amplifier.

The timing and sequencing of these PIN-diode switches is basically a turn-on, turn-off sequence, which is activated by the paddle. In the case of AMTOR, the computer software generates the TR commands that activate the PIN-diode switches. Hot switching is not a problem with PIN diodes, because of their extremely fast switching times. The major concern for the timing and sequencing of RF PIN-diode switches is, therefore, one of switching too fast and distorting the RF waveform being switched.

Summary and Conclusion

In the coming years, most, if not all, transceivers will offer full-break-in QSK as

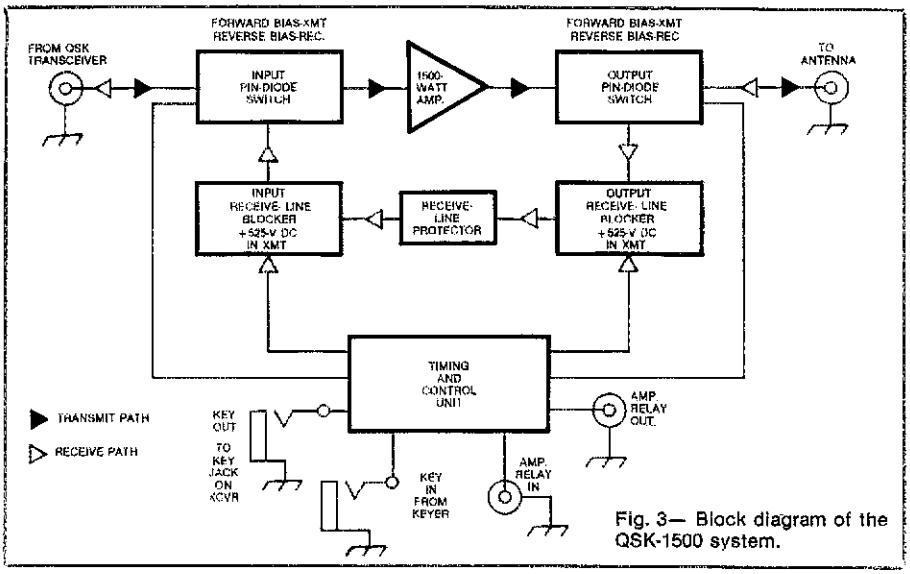


Fig. 3— Block diagram of the QSK-1500 system.

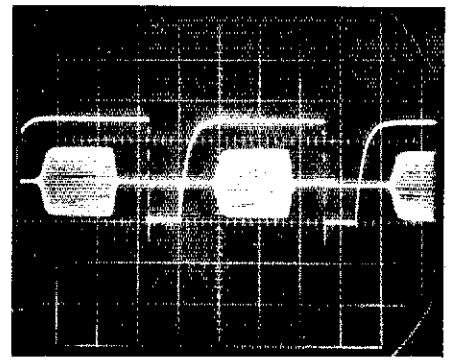


Fig. 4—Oscillograph of the RF envelope of a string of dots being transmitted at 58 WPM. The power level is 1380 W. At 58 WPM, the receive time between pulses is 8 ms. The built-in delay time between turn-on of the 500-V blocking potential and the start of the CW envelope is 7 ms. The CW dot is 21 ms in duration, and the built-in delay between the end of the dot and turn-off of the blocking voltage is 7.5 ms. No distortion is seen on the CW waveform.

Test Specifications†

Transmitter: TS-930S.
Amplifier: Drake L7.
QSK unit: QSK 1500.
Scope: Tektronix 556 dual trace.
Wattmeter: Bird 43 with scope coupler.
Load: Bird Termaline, 2 kW.
Keyer: Accu-Keyer II.
RF power: 1380 W.
Keyer speed: 58 WPM.
Vert. scale: 200 V/cm (X-10 probe with 20-V scale).
Horiz. scale: 10 ms/cm.
†May 3, 1984 by Dr. J. R. Sheller

a standard feature. Since these fast-switching radios offer many new opportunities, not only for full-break-in CW but also for AMTOR, we amateurs must have some yardstick by which to judge what a true QSK device is. We must reject those QSK devices that excessively attenuate the received signal, cause electronic "garbage" to be generated in the spectrum, turn our linear amplifiers into high-power oscillators, or make our transmitted CW sound like a bad valve in a vintage automobile. The common sense definition of QSK and full-break-in can, therefore, be stated in one sentence: A QSK device is one that (1) switches fast enough to allow the operator to hear between his own transmissions, without degrading the transmitted or received signal, and (2) generates no additional spurious radiation in the radio spectrum.

Bibliography

Boomer, James K., "PIN Diode Transmit-Receive Switch." *Ham Radio,* May 1976, pp. 10-15.

Campbell, E. L., "Variations in T-R Switch Performance," *QST,* May 1956, pp. 23, 150.

Kenwood TS-930S Service Manual. Tokyo: Trio-Kenwood, 1982.

Operating and Technical Manual, Alpha 77DX. Canon City, CO: ETO, Inc., 1980, pp. 16-20.

PIN Diode Designer's Handbook. Lexington, MA: Unitrode Corp., 1982.

The 1985 ARRL Handbook for the Radio Amateur. Newington: ARRL, 1984, pp. 4-11 to 4-13, 19-5 to 19-10, 29-1 to 29-13 and 34-6 to 34-10.

John R. "Doc" Sheller was first licensed in 1967, as WN8ZCT. He became very active as a contester later on as WA8ZDF. He served as a member of the ARRL DXAC from 1974 to 1977, and as chairman in 1975. Doc Sheller is a Life Member of the ARRL, has his 5BDXCC, and made the DX Honor Roll in 1975. He served as an ARRL Assistant Director from 1975 through 1977.

Doc graduated from the Ohio State College of Dentistry in 1968. He lists two specific claims to fame: (1) chief sponsor of the CW DXCC award and (2) the inventor of the QSK 1500 high-power PIN-diode switch. His main Amateur Radio interests are DXing, contesting, antenna building, experimenting and technical writing. QST

Strays

HAVE YOU JUST COMPLETED A PROJECT?

☐ ARRL is always on the lookout for informative technical articles on what's happening in Amateur Radio. Contact the ARRL Hq. Technical Department and outline your project. Call 203-666-1541 or send your outline or manuscript to Chuck Hutchinson, Technical Editor, ARRL, 225 Main St., Newington, CT 06111.

THE LONG AND SHORT OF OUR METRICS POLICY

☐ *QST* and other League publications no longer routinely use metric equivalents. When a dimension is more naturally expressed in metrics, we use that system. For most dimensions, however, we use the U.S. Customary system. A complete conversion table appears in *The 1985 ARRL Handbook for the Radio Amateur.*

QST congratulates...

☐ ARRL Technical Advisor Al Markwardt, W5PXH, of Richardson, Texas, on receiving the IEEE Communications and Vehicular Technology Society Award.

☐ the following radio amateurs on 60 years as a member of ARRL:

- John S. Erickson, AD4N, of Jensen Beach, Florida
- Roy McCarty, W9KA, of Ft. Lauderdale, Florida.

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

- Lem Holland, W4QI, of Siler City, North Carolina
- Clyde Lee, N4PL, of Holly Hill, Florida
- Lester H. Miller, W9OFL, of Waupun, Wisconsin

I would like to get in touch with...

☐ anyone with information on the use and modification of the General Radio 1606 RF Impedance Bridge. George M. Churpek, N6FL, 839 Cambon Cir., Ojai, CA 93203.

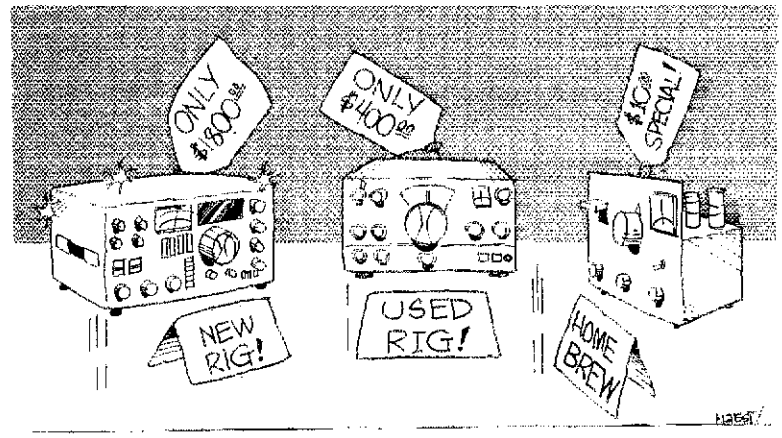
Next Month in *QST*

If you've been meaning to brush up on your BASIC programming techniques, an August *QST* article will help you do just that. Along the way, you'll be designing a practical contest duping and logging program.

Also in August, you'll find a novice's (note the small "n") guide to operating on a repeater, along with a look at the always-interesting 160-meter band. Wait; there's more: a look at the heart of a packet radio system—the terminal node controller—along with a run-down on using packet for public service.

• *First Steps In Radio*

Equipping Your First Ham Station



Part 19: You've learned the theory and acquired the needed code speed, and you'll soon be on the air. Now's the time to buy your ham gear and prepare for that first QSO.

By Doug DeMaw,* W1FB

New equipment? Used ham gear? Or homemade transmitters and receivers? These are important questions you'll ask yourself when considering the task of putting together an Amateur Radio station. Each of you will want to get maximum benefit from the money you invest, and you will not want to make an error in judgment. Such a mistake in equipment choice could waste money, and the thrill of being a new ham could easily disappear if the gear performed poorly.

In this final installment of our series, let's examine the many avenues that are open to us when collecting the necessary items to send and receive communications effectively. The choices open to you are directly related to dollars: There is a definite cost difference between homemade, used and new gear.

Building Your Own Equipment

Some of you are technically skilled. Perhaps you work in the electronics industry and feel comfortable designing or duplicating circuits. In fact, the very reason you have worked for a ham ticket is to be licensed to test transmitters of your own design. That was my motivation when I obtained my license many years ago. You may be more interested in the technology than in operating and ragchewing. If so, you will get many rewards from being an amateur.

But, what about those of you who have no background or special skills in electronics? Building anything other than the simplest of circuits could cost you valuable time and dollars, and you could end up with a unit that works poorly or not at all. For you, I recommend that the building of complex gear be limited at first to kits that are provided by manufacturers with good reputations. Kit building is fun, and it can be educational if you pay attention to the features of the parts and how they work in a circuit.

Assuming that you still want to build some of the station equipment, select uncomplicated things for your first attempts to construct items of convenience or necessity. This list contains a few units that can be easy to build and get working, provided you have a suitable *QST* or *Handbook* presentation to follow.

1) Transmatch (aka antenna tuner or antenna matcher)
2) Field-strength meter for antenna testing
3) Antennas (most popular types)
4) SWR (standing-wave ratio) indicator
5) RF power meter
6) Electronic CW keyer (avoid complex memory keyers)
7) Audio processors for microphones
8) Outboard CW filters (passive or active types)
9) One- or two-transistor transmitters (QRP—low power)
10) Crystal-controlled frequency markers (100, 50 or 25 kHz)

Most of these projects can be completed in an evening or two, and there will be satisfaction connected with the successful building and use of such accessories for your station. As you build more and more simple ham equipment, your skill, knowledge and confidence will increase. This will help you to upgrade your license class. It will also prepare you for some of the more complicated home-constructed circuits.

The Used-Equipment Market

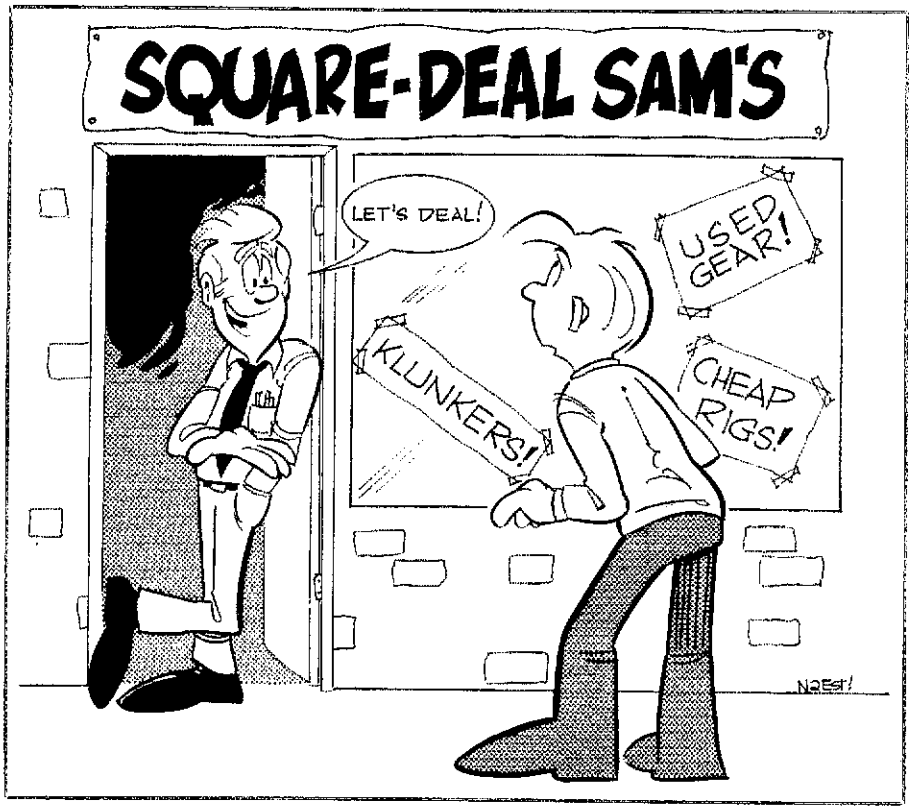
Some of you may prefer to think of used gear as "previously owned equipment," which has a nicer sound. But, no matter what expression you adopt, there are certain dangers lurking in the second-hand-equipment market. Some of the available used gear has "bugs" in it, and that is why the owner decided to get rid of it. This is a chance we must take whenever we purchase second-hand apparatus.

There is money to be saved by avoiding the purchase of new ham gear. Your best opportunity for not being "stung" is to buy the equipment from someone you know and trust. Ask to borrow the item for a day or two while you make up your mind concerning the purchase. Alternatively, you may request a written money-back guarantee for within, say, 10 days of delivery.

My second suggestion is to purchase your used equipment from an established, reputable ham-gear dealer. Be sure there is an option to return the unit if it does not function properly. Several organizations advertise used, reconditioned amateur equipment. Check the ads in *QST*.

The worst-choice plan calls for buying used equipment from classified ads, on-the-air trader nets and trader bulletins. Under these circumstances, you are dealing on a

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



one-to-one basis with unknown persons; therein lies the gamble. *Caveat emptor* is strictly the rule in this "let the buyer beware" game!

Good Things About Used Gear

Most used equipment operates properly. Rather than spend $1200, for example, when buying a new super transceiver, we may select an 8- or 10-year-old clean (well-cared-for) transceiver for as little as $300. Among the older units that can serve you well as a Novice or Technician are

1) Yaesu FT-101B, EE or E series
2) Drake TR-3 or TR-4 transceivers
3) Kenwood TS-520
4) Ten-Tec Triton 4 and its successor
5) Heath SB-100 or SB-101.

None of these units contains digital frequency readout, but you can do just fine with the analog dials and built-in crystal calibrators. After all, Amateur Radio succeeded marvelously for decades before digital readout was conceived! Certain sophisticated features, such as passband tuning, IF shift, speech processing, memories and outboard redundant VFOs, are missing, but you don't need them to communicate over the airwaves.

Are Transceivers Necessary?

We are the products of a trend toward transceivers that began some years ago with the Collins KWM-series rigs. I must confess that they are a convenience, and provide a more compact station layout than we would have if we chose separate transmitters, receivers and VFOs, as in the old days. But, if you can get a super deal on "separates," don't pass it up for the sake of convenience. A good surplus military receiver, such as the R-390 or 51J1, will work very nicely for you. You may also purchase older civilian receivers like the Collins 75A2, 75A3 or 75A4 for reasonable cost.

For CW transmitters, you may consider a Johnson Viking II, Johnson Valiant, Heath SB-400 (also works on SSB) or one of the old Collins 32V-series AM/CW transmitters. The major inconveniences in using a separate transmitter and receiver is that you will need to (1) employ an antenna changeover relay (controlled by the transmitter), (2) connect a receiver muting line and (3) perhaps use an external VFO for frequency control. Judicious shopping could net you a complete ham station in the 100-W class for as little as $300. The fancy rig can always come later, after you gain experience and learn from other hams the names and model numbers of modern rigs they feel are reliable and cost-effective. You may visit other amateur stations and try the various rigs, thereby developing a first-hand impression of features and performance before laying out money.

Purchasing New Equipment

Today's dealers for new amateur gear attempt to dazzle us with ads that instruct us to "call for prices." Some offer toll-free 800 numbers for this purpose. Personally, I find this annoying, for when I'm considering a new rig I want to compare prices for comparable units of different makes or models. Making several phone calls is time consuming, to say the least. Mail-order purchasing has, however, become a way of life in the USA, and we are almost forced to accept it.

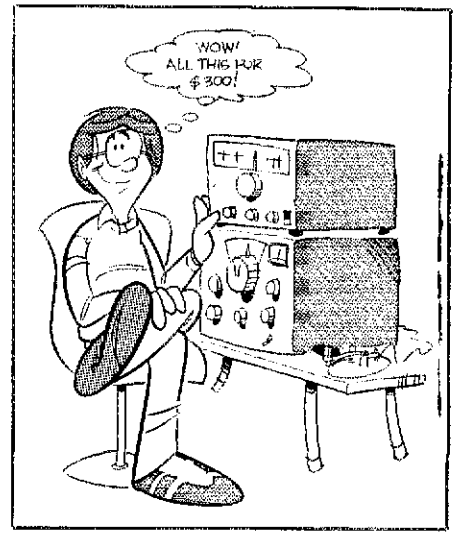
One of the problems relating to mail-order sales is that the dealer you select may be 3000 miles from your location. This makes it difficult and costly to return defective equipment, and new units do come through from time to time in an inoperative condition.

Getting factory service, for foreign-made gear in particular, may be traumatic for you under certain conditions. The quality of the service varies with the manufacturer. It can take weeks to have a warranty repair made, which leaves you high and dry without a rig. Buying a mail-order rig can save money, and the unit may never break down while you own it. But, few of us would consider purchasing a new car from a dealer 2000 miles away! It is an "iffy" proposition, and you should be aware of it. I would definitely check the reputation of the mail-order dealer you decide to become involved with. Many of them have excellent track records in dealing squarely with their customers. Those who advertise in *QST* are screened and approved before their ads are accepted, so you're generally on safe ground with them.

If you have a dealer within driving range of your QTH, I suggest you make an effort to buy from him or her. It's much easier to have problems resolved face-to-face with someone you deal with on a regular basis.

Which Accessories Are Really Necessary?

A new amateur may be told that all manner of additional "goodies" are necessary for his or her ham setup. Knowing which units are essential to routine operating may be difficult for the newcomer. Take, for example, the Transmatch. You may be told that one is needed no matter what type of antenna you are using.



Some hams believe that an SWR reading should be 1:1 at all frequencies. A Transmatch will fool your transmitter into "thinking" an SWR of 1:1 exists, and that is great!

Most antennas exhibit a low SWR over a very narrow range of frequencies within a given amateur band. But no one will know you have an SWR of even 2:1, and many tube-type transmitters can operate effectively at an SWR of 2:1 or more. The shortfall may be, with some solid-state rigs, that the transmitter power will decrease automatically as SWR increases. This is done to prevent the power-amplifier transistors from being destroyed by the effects of high SWR. Your solid-state transmitter may show a power-output drop of only a few watts when the SWR is 2:1, and the difference may not be discernible in the receiver of the other operator. A tube rig will work just fine in the presence of a fairly high SWR.

If you have dipole, vertical or beam antennas that have been adjusted for a low SWR in your favorite parts of the bands, and assuming your feed system uses coaxial cable, you should not need a Transmatch. If, on the other hand, you elect to use a so-called multiband dipole that has tuned, open-wire feeders, you will need a Transmatch and a balun transformer to ensure a low SWR between the transmitter and the feed line: The Transmatch will not correct for a mismatch at the antenna feed point.

If you wish to use electronic keying rather than a straight key or "bug" key, you will want to obtain a keyer or a keyboard keyer. Check the *QST* Ham Ads for a used Curtis, Autek or MFJ keyer. You will also need a CW paddle (key). Beware of keyers that have built-in paddles. Most of them have sloppy mechanical characteristics, and learning to send good CW with those units can be a dreadful challenge. In general, the better the mechanical quality of the paddle, the better your sending. A WW II surplus J-38 straight key is hard to beat for quality in a hand key, as some call them. Whichever key you choose, it should have a heavy base so that it doesn't slip about on the operating table when you are using it.

External audio filters can be very useful for reducing the effects of interference from stations that are nearby in frequency. If your receiver already has a narrow (250-Hz) CW filter in the IF circuit, you may not realize much benefit from a sharp audio filter. But, a great improvement in reception can be had when using a good CW outboard audio filter with older rigs that have no CW filter, or one that is 600 Hz wide. An audio filter will also "lift" weak signals out of the noise to make an otherwise unreadable signal Q5. Your operating preferences (DX or ragchewing) will probably dictate your need for this accessory. These thoughts are applicable to most station accessories. You should evaluate your operating situation versus the style of equipment you have chosen, then decide whether you should invest in additional items. Good circuits for many accessory units are contained in the *ARRL Handbook*.

Need a Copy of This Article or a Previous Installment?

Although each issue of *QST* is protected by copyright, we would like to make it as easy as possible for readers to obtain copies of each installment of First Steps in Radio. Provided that copies are made *for the personal use of an individual, or of a Novice class*, ARRL hereby grants permission for photocopies to be made of any article in this series. If your club plans to teach a Novice class, feel free to make a sufficient number of copies for students' personal use. If you are missing one or more installments, back issues are available for $2.75 apiece from the Circulation Department, ARRL Hq., 225 Main St., Newington, CT 06111.

The Final View

It has been a pleasure to walk with you through these 19 installments of First Steps in Radio. I thank all of you who wrote me concerning the series. I hope our presentations have led some of you to that first amateur ticket, and that many who were Novices have been able to upgrade after studying the basic theory we have covered. Congratulations to all of you, and may your first ham station be a thing of pride and utility! QST

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 June issue were:

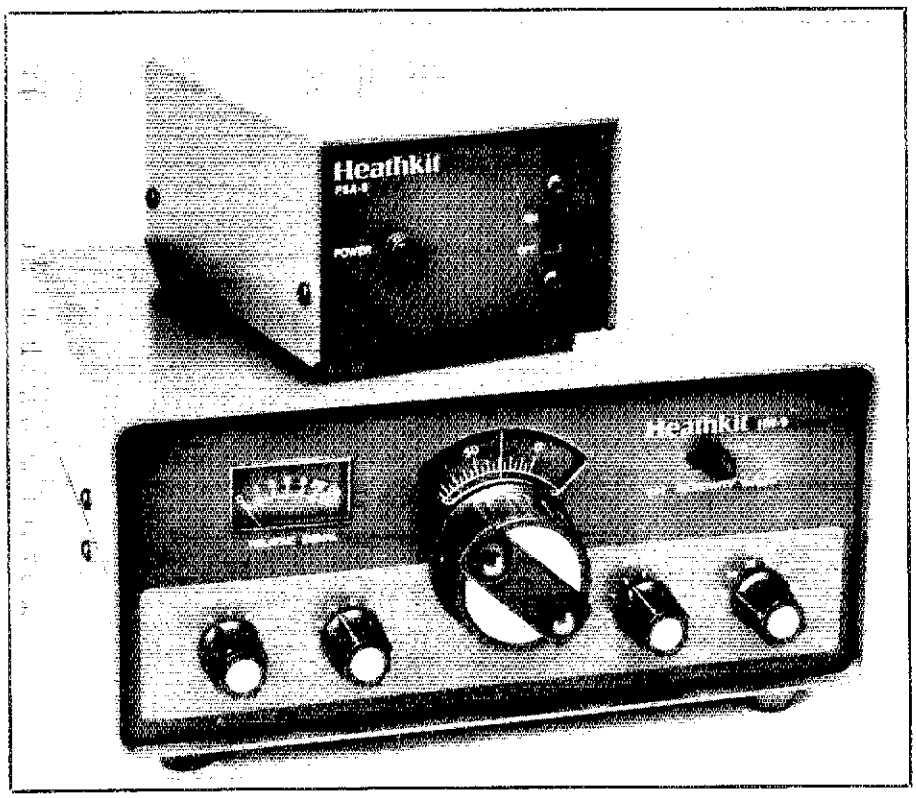
- "Putting the Azden PCS-3000 on Packet" by Frank Roberts, VE3FAO
- A review of Jordan Asailovic's book, *Videodisc and Optical Memory Systems*, by Maureen Thompson, KA1DYZ
- A "TAPR TNC Modification for 12-V Use" by Robert Ball, WB8WGA.

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.

Conducted By Bruce O. Williams, WA6IVC
Assistant Technical Editor

Heath HW-9 Deluxe QRP CW Transceiver

A compact HF transceiver for low-power CW operation, the Heathkit HW-9 covers the lower 250 kHz of the 80, 40, 20 and 15-meter amateur bands. With the optional HWA-9 accessory band pack installed, the transceiver also covers the 30, 17 and 12-meter WARC bands, and the lower 250 kHz of the 10-meter band.



Circuit Description

Receive Signal Path

During receive, the incoming signals pass from the antenna connector through a low-pass filter on the TR (transmit/receive) circuit board. The BAND switch selects the proper filter. A diode switch routes this filtered signal through a band-pass filter. The resulting signal is combined with a premixed injection signal in a Mini-Circuits Labs doubly balanced mixer to produce an 8.83-MHz IF signal. There is no RF amplifier stage in the receiver section. An amplifier is not needed; in fact, one would only limit the receiver dynamic range.

The 8.83-MHz IF signal is routed through another diode switch, then amplified and passed through a four-pole IF filter. The signal is amplified again before it is routed to the product detector. An AGC (automatic gain control) voltage is produced at this point to keep the second IF amplifier operating linearly.

The product detector converts the 8.83-MHz IF signal to audio, which then passes through either a wide or a narrow active audio filter. An audio-frequency amplifier then amplifies the filtered signal to drive an 8-ohm speaker or a set of headphones.

Transmit Signal Flow

During CW transmissions, an 8.8307-MHz signal is coupled to the second mixer (the same MCL model mentioned earlier), where it is combined with the premixed injection frequency from the oscillator circuit board to produce the desired transmitter signal. This signal is then filtered (by the same band-pass filters that are used in the receiver section) before it is preamplified and applied to the power amplifier.

The power amplifier is made up of two transistors in parallel. To reduce harmonic radiation, the output is filtered by the proper low-pass filter for the selected band.

Oscillator Circuit Board

All frequency-determining circuits are located on the oscillator circuit board. The VFO uses an FET in a Hartley oscillator that operates between 5.9993 and 5.7493 MHz. The higher frequency corresponds to the low-frequency end of the band. VFO output is buffered, filtered and fed to the first mixer, a dual-gate MOSFET.

The RIT circuit is in parallel with the main tuning capacitor in the VFO. A diode is used as a voltage-variable capacitor. Switching transistors apply voltage to the diode through

Heath HW-9 QRP CW Transceiver, Serial No. 01-52413

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency coverage: 3.5-3.75, 7.0-7.25, 10.0-10.25,* 14.0-14.25, 18.0-18.25,* 21.0-21.25, 24.750-25.0,* 28.0-28.25 MHz.* (* Indicates band coverage provided by HWA-9 accessory).	
Mode of operation: CW.	As specified.
kHz per turn of knob: 40.	As specified.
Frequency display: Analog dial.	As specified.
Frequency resolution: 5 kHz per division.	As specified.
Frequency stability: Less than 150 Hz/h drift after 30-min warmup.	2-kHz drift in first hour, less than 200 Hz/h thereafter.
S-meter sensitivity (μV for S9 reading): Not specified.	80 m, 32; 40 m, 30; 30 m, 34; 20 m, 34; 17 m, 40; 15 m, 42; 12 m, 50; 10 m, 175.
Transmitter power (output): 4 W; except 10 m, 3 W.	80 m, 7; 40 m, 6; 30 m, 7; 20 m, 6; 17 m, 6; 15 m, 5; 12 m, 5; 10 m, 4W.
Harmonic suppression: 35 dB minimum at rated output.	42 dB (see Fig. 1).
Spurious suppression: 40 dB minimum at rated output.	42 dB (see Fig. 1).
Receiver sensitivity: Less than 0.5 μV for 10-dB S/N.	

	80 m	*20 m*
Noise Floor (MDS) dBm:	−130	−128
Blocking DR (dB):	124	122
Two-tone 3rd-order IMD DR (dB):	99	88
Third-order intercept (dBm):	18.5	4

Receiver audio output at 10% THD: 1 W into 8-ohm load.	1 W.
Color: Two-tone brown and gray.	
Size (HWD): 4.25 × 9.25 × 8.5 in.	
Weight: 4.7 lb.	

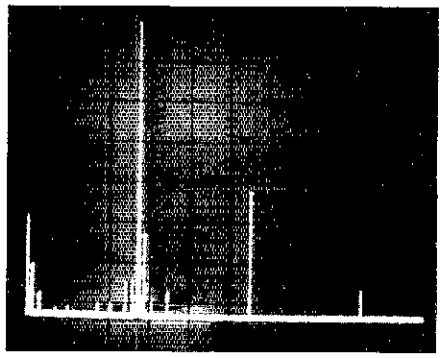


Fig. 1—Worst-case spectral display of the Heath HW-9. Vertical divisions are each 10 dB; horizontal divisions are each 5 MHz. Output power is approximately 4 W at 14.05 MHz. All spurious emissions and harmonics are at least 42 dB below peak fundamental output. The HW-9 complies with current FCC specifications for spectral purity.

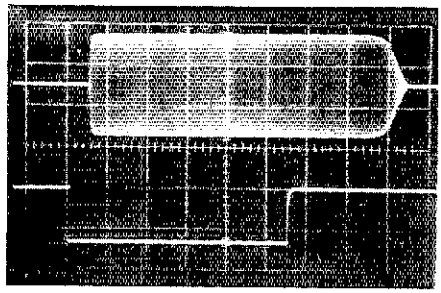


Fig. 2—CW keying waveform of the HW-9. Upper trace is the RF envelope; lower trace is the actual key closure. Each horizontal division is 5 ms.

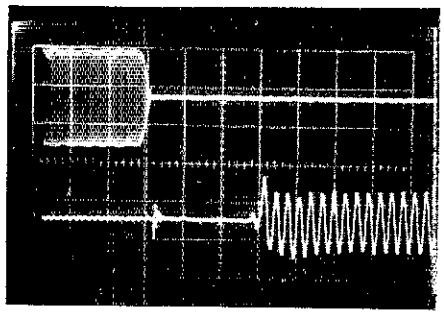


Fig. 3—Receiver turnaround time for the HW-9. Upper trace is the transmitter RF envelope; lower trace is receiver audio. Each horizontal division is 10 ms. The slight ripple on the waveforms is caused by the testing procedure.

an internal adjustment on transmit or a front-panel adjustment on receive.

In addition to the VFO, an HFO (heterodyne-frequency oscillator) feeds the first mixer. The HFO is a crystal-controlled oscillator that uses eight crystals and two transistors. One transistor is used for the bands 80 through 20 meters; the other is used on the remaining bands. The appropriate crystal and transistor are selected by switching diodes. The HFO output is buffered before it is applied to the first mixer.

Output from the first mixer supplies the premixed injection signal mentioned earlier. The first-mixer output is band-pass filtered. Diode switches steer the signal through the appropriate filter.

An interesting BFO circuit is also found on the oscillator circuit board. This circuit produces an 8.8314-MHz output in the receive mode, and an 8.8307-MHz output in the transmit mode. To do this, an FET is used as a VXO (variable crystal oscillator). BFO output feeds the product detector during receive. On transmit, two additional buffer stages are used; these are switched off during receive. Output level for transmit is controlled from the front panel and feeds the second mixer.

Other Circuitry

Circuits for keying, receiver muting and sidetone generation are located on the TR circuit board. The metering circuit is also on this board. The meter, mounted on the front panel, serves as an S meter on receive and indicates relative output power on transmit.

Construction

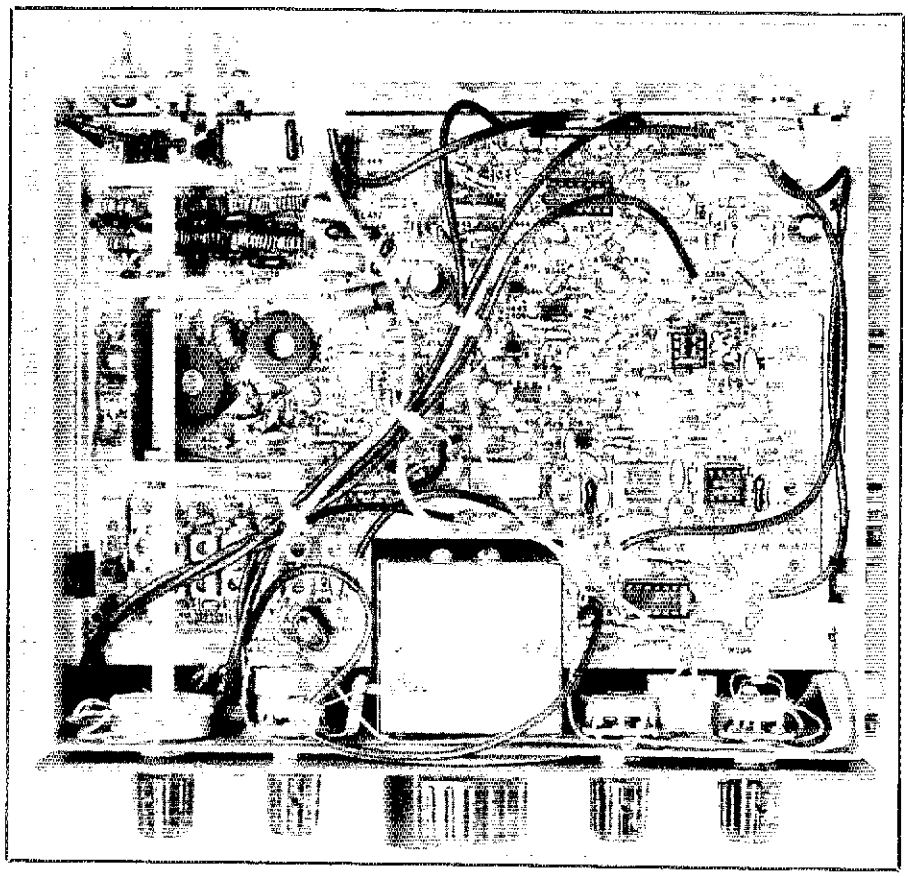
My son Scott, KA1MDH, did most of the work on the oscillator board. He had no difficulty following the instructions in the manual. I finished the project. The only tricky part was winding transformers T401 and T404; but even that was no great problem. The larger-than-life drawings in the illustration booklet combined with the text in the manual make it very clear how to proceed.

A word of caution is in order. Do not use the cable diagrams in the illustration booklet as a template to prepare cables. Use the measurements given—the drawings are not full-size. You will find a ruler line printed at the bottom of the appropriate pages of the assembly manual.

Parts are crowded in places on the TR board. That proved to be no inconvenience, however. The finished board makes you feel proud that you put it all together.

I did have two problems during the mechanical assembly, both in the VFO chassis area. My first difficulty appeared when I turned the tuning knob and noticed dial slippage. The main tuning-capacitor drive worked fine with the VFO shield off, but there was a bind when the shield was put in place. I decided that the vernier drive was defective and called the Heath technical assistance number given in the front of the manual. The friendly technician told me the cure. It was easy: Loosen the setscrews on the vernier drive and seat the main-tuning capacitor shaft a bit farther in. That pulled the sides of the VFO chassis a bit closer together. (The VFO chassis is a U-shaped piece.) The VFO shield then slid easily over the chassis and—voilà!—no bind!

That cured my ailments with the VFO chassis. But when it came time for VFO alignment, the second problem appeared. The VFO operated intermittently. It took a while to discover that the intermittent operation could be cured by placing a ground jumper from ground to the VFO chassis. Curious—that chassis contains only the vernier drive and main tuning capacitor. The VFO chassis is fastened to the main chassis by four no. 4-40 flat-head screws. The main chassis has countersunk holes so that the screw heads are flush. On the back of the main chassis, each screw is secured by a star washer and nut. (The VFO chassis then slips over the



A bottom view of the HW-9.

screws and is secured by another star washer and nut combination.) The problem was that the no. 4 star washer was contacting the beveled screw head, preventing a solid mechanical contact between the screw and the main chassis. The solution was quite simple—replace the no. 4 star washers with no. 6 star washers! Then, the flat-head screws could be brought tightly against the chassis. Had I noticed this situation during assembly, it would have saved a lot of time and effort.

One further word of caution. Make sure the mounting hardware for the oscillator board is tightened. I had problems with frequency "jumps" before tightening the mounting nuts. Don't overdo it—just fully snug will do.

Operation

On-the-air operation with the HW-9 couldn't be easier. Set the band switch for the desired band, dial up the frequency and you are ready to transmit. Amenities like sidetone, break-in, RIT and a selectable-bandwidth audio filter make the HW-9 a joy to use.

My first two QSOs with the HW-9 were with FM7WD on 40 meters and 3D6AK on 20 meters. Scott put it through its paces on the 80-meter Novice band—even worked another Novice who was running an HW-9!

Keying tends to be heavy. That is no problem at speeds below 35 WPM. Between 35 and 40 WPM, the code elements begin to run together. If you operate at those higher speeds, you should use a keyer with a weight control. QSK in the HW-9 works fine. As shown in Fig. 3, the receiver requires 30 ms to become active after the transmitter turns off. At 20 WPM, a dot (or the space between elements) is 60 ms. There is some thumping with the audio gain at higher settings during QSK operation. Scott finds it easier to time his CW sending by setting the delay so the receiver activates at the end of a word space. For that reason, I did not use the QSK very much, even though I enjoy that style of operation.

As mentioned earlier, there is no RF amplifier stage in the receiver. That does not seem to limit reception, however. One evening I heard an East Coast DXer call CQ on 40 meters; a UA3 answered. The East Coaster called CQ again. Again, I clearly heard the UA3 calling. Nothing more heard from the CQer.

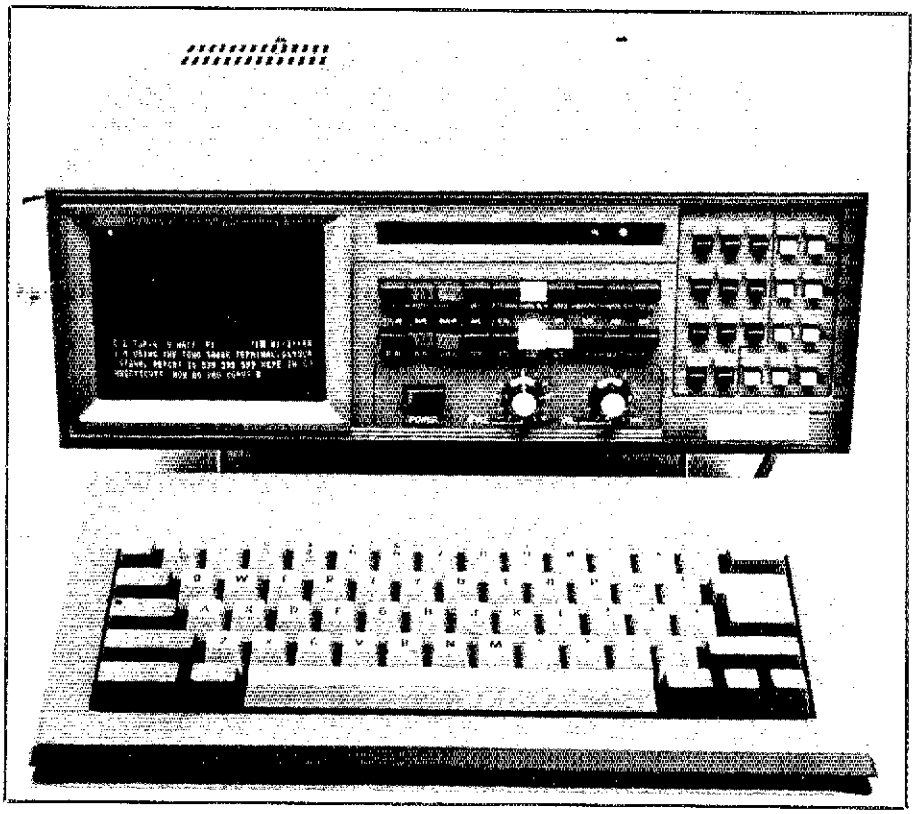
Scott said he'd like to have the front-panel bands indicated in megahertz rather than in meters (he logs frequency of operation); I agree. But that is a minor matter.

The main transceiver remains in our shack, as does my half-legal-limit amplifier (in case an operation from Bouvet Island should come on the air). For now, we use the HW-9 for fun and sharpening our operating skills. The HW-9 will be our vacation and portable radio.

The HW-9 is available from the Heath Company, Benton Harbor, MI 49022, tel. 616-982-3411. Price class: HW-9 transceiver, $250; HWA-9 accessory band pack, $40; PSA-9 accessory ac power supply, $40. *—Chuck Hutchinson, K8CH*

TONO EXL-5000E

☐ The Amateur Radio manufacturer's challenge today is to produce equipment that packs the most capability into the smallest, least-expensive package. Tono has met that challenge admirably with their EXL-5000E RTTY/CW/AMTOR terminal.



TONO EXL-5000E

Price class: $650.
Power supply: 110-120/220-240 V ac 50/60 Hz or +13.8 V dc at 2 A.
Dimensions: 14¼ × 13¾ × 4¾ in.
Speed: Morse—5-100 WPM; RTTY—12-600 bauds (300 bauds max. with internal modem).

The EXL-5000E contains all that one needs to operate RTTY (either Baudot or ASCII code), CW and AMTOR in one unit. A detached keyboard is provided for text entry and control of some of the operating modes and options. Display of the unit's status and the received text is produced on a built-in, 5-inch (diagonal) CRT. The display is sharp, and the characters are well formed. Characters on a screen this size are necessarily small, but a composite-video output is provided for attaching an external video monitor if a larger display is desired. A printer with a Centronics parallel interface may be connected to the EXL-5000E for hard-copy output.

Features

The flexibility provided by the front-panel controls is something you will quickly learn to appreciate! When first seen, the array of front-panel switches is rather daunting, but once the switches have been set to select the operating mode, most of them need not be adjusted further. With these controls, you can select the mode (RTTY, CW or AMTOR), frequency shift, mark frequency, signal polarity and several special-purpose options. A front-panel keypad is used to enter the time and operating speed, manually shift the Baudot case, select the AMTOR mode (A, B or "L") and select other options.

RTTY high- and low-tone modems are included. The high-tone mark frequency is 2125 Hz, and the low-tone is 1275 Hz. The received-signal space frequency is selected for 170-, 425- or 850-Hz shift, with a FINE tuning control provided for nonstandard shifts. The AFSK output is on the same frequencies, except that the FINE tuning control has no effect on the output audio frequency. The CCIR Rec. 476-3 frequencies of 1615 and 1785 Hz are available in AMTOR mode.

Received text is displayed in 40-character lines on the top 10 screen lines, with optional end-of-line word wrap-around. Just below the received-text area is a status line displaying the mode, speed, case, date/time and several characters showing the options in effect. Below that is a four-line area for the transmit type-ahead buffer, which is 160 characters long.

A bar-graph LED display is used for tuning in received signals. This display consists of two five-segment bars, one for the mark tone and one for the space. The number of segments that are lit indicates the received-signal frequency error. First adjust your receiver for maximum illumination of the mark display, then adjust the FINE tuning control for maximum on the space display. This control adjusts the frequency of the space filter for signals that are not shifted exactly by the selected amount. Outputs for an X-Y oscilloscope tuning indicator are also provided.

Speeds of up to 300 bauds are possible using the Tono's demodulator. RTTY demodulators capable of such speeds usually are a compromise between high-speed capability and sufficient selectivity at the lower speeds. Tono, however, provides a front-panel switch that changes the

demodulator filter Q to a more optimal value for the desired reception speed. Since 300-baud operation is a rarity on the HF bands, it's nice to see that Tono didn't degrade the low-speed performance to achieve 300-baud capability.

Outputs provided include AFSK audio, with a rear-panel level control, and FSK, CW and PTT keying lines. All of the output keying transistors are isolated from the internal circuitry via optoisolators, providing a measure of protection against abusive voltages that might be connected to those lines. An internal speaker may be used to monitor the received signal after the internal AGC action has processed it, or to listen to the output of the mark or space filter.

Operation

After you've selected the proper demodulator frequencies, signal polarity and, for RTTY, speed and code, reception is simple. I was skeptical of the LED tuning-indicator usefulness, but the one on the Tono is *almost* as good as a tuning 'scope. Tuning in a signal with less than 20-Hz error is easy after a little practice. As a test, an X-Y oscilloscope was connected, and the 'scope display was checked after tuning in a signal via the LEDs. In only a few cases did the 'scope display show that any improvement in tuning could be achieved.

The RTTY demodulator is as good as any I have seen. Watching the Tono produce perfect print as it tracks a signal through a deep fade on HF is a joy! In general, if a signal can be heard, it can be demodulated. The performance on CW is less outstanding, but this is largely because of the inherently poor machine-readability of on-off keyed transmissions.

One benchmark of a CW receiving machine is its ability to "lock on" to the incoming signal. The machine must determine the speed of the Morse signal before it can decode it. Again, the Tono does this well. As you tune across different signals, the time it takes for the EXL-5000E to determine the signal speed and to begin producing readable copy is hardly noticeable. There is no need to specify the received-signal speed range—the Tono determines it automatically. For very high speeds, reception is improved by selecting a high-speed mode via a front-panel switch, but the overlap between the high- and low-speed ranges is large enough to make this a non-critical control.

Transmission of text can be on a character, word or line basis. In the character mode, each character is transmitted as it is entered. The word mode buffers the text until a space or carriage return is entered, giving you a chance to correct any misspellings or typing mistakes. In the line mode, the text is held until a carriage return is entered.

Transmitted text may be automatically formatted into line lengths of 64, 72 or 80 characters. The Tono will insert a carriage-return/line-feed sequence when the end of a line has been reached.

Control of the PTT keying line can be automatic or manual. In the automatic mode, the line is keyed whenever the Tono has text to send. This can occur when you begin entering text or when, having specified that text should be buffered, you release the buffer for transmission. In the manual mode, you execute a keyboard control sequence to key the PTT line on and off. Other outputs are independent of the PTT line. That is, you can select manual PTT control and generate normal outputs without ever keying the transmitter PTT line, if you so wish. This has several uses, not least of which is allowing QSK transceivers to control the TR switching from the CW keying output without being overridden by the PTT line.

As an apartment dweller, I was concerned about RFI from the Tono. It's hard to imagine any setup more susceptible to RFI problems than mine, in which the antennas were located less than 6 feet away from the Tono. Fortunately, the RFI protection is very good. The only effects I noticed were some S2 "birdies" on 15 meters and a slight tearing of the Tono's display when transmitting a 100-W signal on 40 meters. A decent antenna system would have eliminated such problems.

"Bells and Whistles"

The presence of a dedicated microprocessor within the EXL-5000E makes possible a number of complex functions. Examples of these are RTTY SELCAL operation and timed transmissions. SELCAL operation consists of entering a text string which, when received, will enable printing of received text until a terminating text string is received. During the time that SELCAL reception is enabled, the REMOTE output on the rear panel is keyed. This output may be used to turn on a device of your choice, such as a printer, tape recorder or, perhaps, a bell to signal an incoming message. A timed transmission may be programmed to occur at any time within the next 30 days, a feature that is interesting, if not particularly useful.

Complaints

By now, you know that I am impressed with the EXL-5000E. Still, there are a few things that could stand improvement. Foremost among these is the size of the transmit type-ahead buffer. When 160 characters (four lines) of text have been entered into the buffer, no more text is accepted. The 160-character limitation is bad enough, but no indication is given that the buffer is full! This might not be a problem for a touch typist, but we "hunt and peck" types aren't looking at the screen to see the lines filling up! A larger type-ahead buffer and some indication that it is full would be an improvement.

Although the controls on the EXL-5000E provide a great deal of flexibility, they can become annoying at times. During the period of this review, most of the operating was done with a Kenwood TS-930S running in the FSK mode. The polarity of the TS-930S FSK input requires that the Tono's output polarity be inverted via the front-panel switch during RTTY operation. When you are switching to AMTOR mode, the output mode must be normal and the *input* must be inverted because the Tono expects the rig to be in USB mode for AMTOR operation. While USB is normal for AMTOR, the TS-930S receives in a LSB mode while in FSK. Couple this with the number of other switches that must be actuated to select the proper mode and you have a complex procedure.

To illustrate, switching from Baudot RTTY to AMTOR mode L with the above setup, you must (1) set the IN switch to reverse, (2) set the OUT switch to normal, (3) set the MODE switch to select TOR C and (4) use the two-key sequence on the front- panel keypad to select mode L if it hasn't been selected previously. It tends to inhibit rapid mode switching! It would be nice (but probably expensive) if the microprocessor could store the standard settings for each mode and electronically switch the circuits upon receipt of a one- or two-key command.

Although CW reception works well, there is one annoying problem. The internal audio filter used in the CW mode drifts in frequency. This drift makes it necessary to tweak the receive frequency often. There is no adjustment on the Tono to set the center frequency of the filter, so all tuning must be done with the receiver. The filter is so sharp that even a 20-Hz error degrades reception.

You might expect to receive a fat manual with a piece of equipment this complex, but, in fact, the manual is pretty skimpy. All of the controls and operating modes are mentioned in the manual, but there are few details and fewer examples. You will have to experiment a little to determine how to use some of the controls and options. No schematic diagram is supplied.

The EXL-5000E was apparently designed by active amateurs. Aside from being a high-tech marvel, it is a clean, fun and valuable operating tool. In short—it's a winner. The EXL-5000E is available from Amateur-Wholesale Electronics, 8817 SW 129th Terr., Miami, FL 33176, tel. 305-233-3631.—*Jon Bloom, KE3Z*

New Products

CMOS CHOPPER OPERATIONAL AMPLIFIER

☐ Teledyne Semiconductor recently announced a proprietary CMOS IC—the TSC900 low-power, chopper-stabilized operational amplifier. The TSC900 is designed for battery-operated systems or systems for which minimum supply power is available. The low, 200-μA maximum supply current, 5-V maximum offset voltage and 0.05-μV/°C drift specifications make the '900 attractive. This device is pin compatible with the 7650/7652 op amp, and is available in 8- and 14-pin DIPs.

Other specifications of the '900 include 120-dB minimum open-loop voltage gain, 110-dB common-mode rejection and 120-dB power-supply-rejection ratio. Slew rate is typically 0.2 V/μs, and the unity gain bandwidth is 0.7 MHz. Noise over the range of 0.1 to 1.0 Hz is 0.3-μV Pk-Pk. The TSC900 is internally compensated for unity gain operation. An output voltage clamp reduces circuit gain to prevent output stage saturation. This eliminates overload-recovery time delay. When the 14-pin DIP device is used, the internal chopping oscillator may be overridden.

Pricing and additional information are available from David Gillooly, Marketing Manager, Teledyne Semiconductor, 1300 Terra Bella Ave., P.O. Box 7267, Mountain View, CA 94039-7267, tel. 415-968-9241. —*Paul K. Pagel, N1FB*

Hints and Kinks

Conducted By Bob Schetgen, KU7G
Assistant Technical Editor

A UNIVERSAL EQUIPMENT STAND

☐ Following a long period of scrimping and saving, I finally acquired a Radio Shack® Model DMP-100 printer for use with my home computer and RTTY gear. With the purchase out of the way, the next logical step was to hook everything up and test the new gear—only where to set this new piece of equipment, which suddenly seemed quite large. My operating desk was out of the question: With two HF rigs, Transmatch, power supply, 2-meter gear, computer and other miscellaneous equipment already in place, space was at a premium. Another desk would not fit in my shack.

A trip to my workshop produced several pieces of scrap ½-inch Aspenite and, a few hours later, the Universal Equipment Stand (Fig. 1) emerged. [My local lumberman informs me that Aspenite is a composite sheet made from large wood chips and an exterior-grade glue. It is made by many different lumber mills.—Ed.] The stand is very stable (even on a carpeted floor) and can support much heavier loads than the average printer. A large box of tractor-feed paper fits neatly under the stand at my station, with the paper fed through the slot in the stand top.

Any available material can be used for this project. The dimensions can be scaled up or down to meet your need, and plywood could be substituted for Aspenite if a smoother finish is desired.—*Jim Fiedler, N9CLQ, Seneca, Illinois*

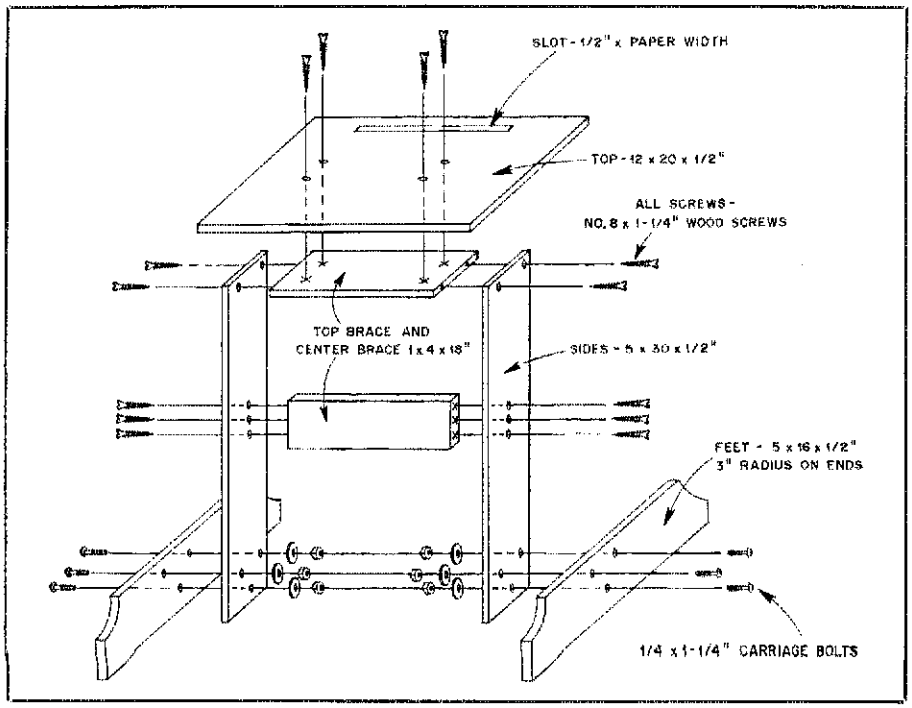


Fig. 1—Construction details of the Universal Equipment Stand from N9CLQ.

EASY FRONT-PANEL DECORATION

☐ The plastic "ribbon" (see Fig. 2) used for decorative striping on autos can make your next homebuilt project as attractive as any commercial product. The striping is tough and has a very strong adhesive. It comes in a wide range of colors and designs. (How else could you get the panel of your next project to look chrome or gold plated?) A package intended to decorate an auto usually contains more than is needed for the job. You can probably get scraps from a body shop without charge. Auto parts shops sell the complete kits at a reasonable cost.—*Sam R. Scheltens, PA2SAM, Sappemeer, The Netherlands*

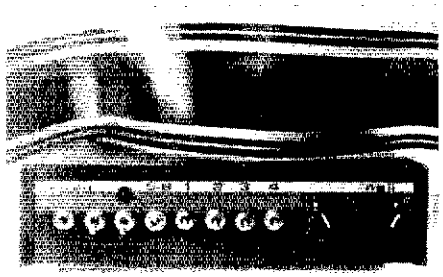


Fig. 2—A sample of automotive striping (colors are black, red and white), and a project finished with a similar material (colors are white, blue and black).

ENLARGING CHASSIS HOLES

☐ Have you ever wanted to use a hole saw to enlarge an existing hole? Consider a mobile-antenna installation or panel-meter hole where a replacement part needs a larger hole than the original. Since there is no center to guide a hole saw, most people resort to a pencil mark and a file. This requires a lot of elbow grease, and the results are often less than pretty. Here is an often-used trick that may be helpful the next time you face this problem.

First, get the correct hole saw for the new hole and a scrap block of plywood (it splits less easily than solid wood) that is somewhat larger than the new hole. Drill through the plywood, place the wood over the old hole, clamp it in place, and use it as a guide to drill the new hole. See Fig. 3.—*John W. Ronski, WA1RAE, Niantic, Connecticut*

[A similar technique can be used with circle cutters. Cut a piece of plywood that is much larger than the new hole size. Mark the center of the wood and use a compass to draw a circle, which is the same size as the old hole, on the wood. Line up the circle with the existing hole, clamp the wood in place, and cut the new hole by drilling through the center marked on the wood.—Ed.]

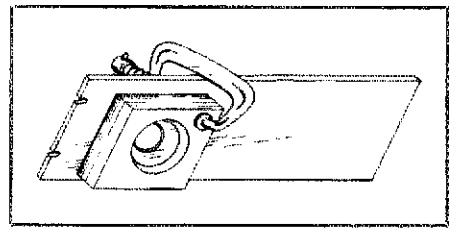


Fig. 3—A guide block clamped over the panel allows one to cut a new, larger hole accurately.

CONDUCTIVE SPRAY COATINGS

☐ RFI from computers in the shack continues to be a problem for many hams. Much of the interference comes from the data cables that connect the various components, but many computers have plastic cabinets that provide no barrier to the HF and VHF components of digital signals.

There are two conductive aerosol sprays available from the Miller-Stephenson Chemical Co. (6348 Oakton St., Morton Grove, IL 60053, tel. 312-966-2022). MS480 (clear) provides 30 dB of attenuation up to 100 MHz, and 45 dB at 1 GHz. MS485 (black) provides 45 dB up to 100 MHz, and 60 dB at 1 GHz. I have used these products with good success. They are available through local paint dealers or Miller-Stephenson.—*Dennis N. Widdows, W9VHN, Tucson, Arizona*

Technical Correspondence

Conducted By Jerry Hall, K1TD
Associate Technical Editor

THE LOOP TRANSMITTING ANTENNA

☐ I recently received my copy of February 1985 *QST* with the article on the antenna contest.[1] I feel compelled to write this letter to correct statements made about the loop. The article said the gain approaches that of a dipole, when in fact it considerably exceeds the gain of a dipole. In free space, the patterns of a dipole and a loop are the same. When the loop is mounted close to ground, the gain increases to 8.16 dBi for a perfect ground, somewhat less for a poor ground. Over good ground, the gain (considering efficiency) would be as shown in Table 1.

For horizontal polarization, there is virtually no difference between good ground and poor ground. For vertical polarization there is only 2-dB difference at 12°, and above 18° the poor ground will provide increased signal over good ground. This subject is covered in more detail in a book I have just published.[2]

On the lower bands where short-range communication is predominant, the loop is a big performer. On long-haul DX, the gain is about the same as a vertical (a very good vertical), but there is much less signal fading when using the loop. Several larger loops are operational in Florida and are providing excellent performance on 40, 80 and 160 meters.—*Ted Hart, W5QJR, P.O. Box 334, Melbourne, FL 32902*

Table 1
Gain of the Copper-Loop Antenna†

Frequency (MHz)	*Gain (dBi)*
29	7.96
24	7.76
21	7.56
18	7.06
14	5.96

†This data applies to a loop of 10-ft circumference.

THE CW DEMODULATOR REVISITED

☐ My April *QST* article featured a demodulator for use with a computer.[3] Subsequent correspondence indicates that some additional information may be helpful. In the article, discussion of "practical" CW speeds up to 60 WPM refers to automatic copy on the computer. Can the 75-Hz-bandwidth filter pass intelligence at such a code speed? For background information on what bandwidth is needed, the reader is referred to *The 1985 ARRL Handbook*, pages 9-7 and 9-8. The formula given there states that the necessary bandwidth is equal to the baud rate multiplied by a numerical factor, K. For machine recognition, K = 1 may be used; for copying manually, K = 3 is minimum, and K = 5 will perhaps sound better. The speed in WPM can be converted to bauds by dividing by 1.2. From the above formula, using K = 1, the theoretical maximum speed that can be used with a 75-Hz filter is 90 WPM. So it is not unreasonable to expect automatic copy at 60 WPM. If the project is constructed primarily for use with a computer, a wider bandwidth filter is *not* recommended.

The article was not very explicit on the use of the headphone output on the demodulator. One obvious use is to listen to the filtered CW output while manually copying at slower speeds. The output gradually loses its "crispness" at speeds above 20 WPM. The primary use of the headphone output is in centering the CW tone from the receiver in the filter passband. Momentary switch S2 is used if the tone is completely outside the passband. While S2 is depressed, the filter output will be heard in one ear and the unfiltered audio in the other. The receiver is tuned with your other hand until the desired station is heard in both ears. The switch is then released, the receiver is fine-tuned to center the tone, and the computer should start to copy. At this point the user may monitor the filtered or unfiltered CW from a loudspeaker or headphones, or may prefer to silently watch the copy on the computer. An audio amplifier will be required to drive a loudspeaker from the CW Demodulator headphone output.—*Joe Evans, AA4AB, 7903 N.W. 69th Ave., Tamarac, FL 33319*

WINTERTIME STATIC ON ANTENNAS

☐ Early Sunday morning during last winter's 160-meter contest, we had our first snowstorm of the season at WØAIH/9. Our 160-meter antenna system includes extended double Zepps, a ¾-wave sloper and an array of 170-ft verticals. About 1 A. M., we noticed some arcing in a rotary antenna switch from the sloper position to the center arm. The rate accelerated to the point where discharges were occurring about every three seconds across a gap that indicated a charge of about 3 kV. The sloper was removed and grounded.

Soon arcing was heard again, now in a Zepp tuner. Our Zepps are fed with 200 ft of 600-ohm open-wire line, with a large air-wound inductor across the feed line, link coupled to the receiver. Arcs were dancing across the coil, indicating a voltage difference of 4.5 kV. All this was happening during periods of reception! I went outside and closed the double-pole knife switch to ground the Zepp, and heard a crackling noise in the distance. Through heavy snow, continuous blue arcs could be seen near the top of one of the grounded 170-ft towers!

After a couple of hours, the electrical activity subsided. During this time, noise levels were about S-9 + 10 dB, not unusual for a bad night on 160 meters. (Occasionally the noise level would drop to S0 for periods up to 10 minutes, then quickly rebuild to S9 plus, with no visible change in storm intensity.) We have had many snowstorms during contests, with similar noise levels, but never these static discharges. Humidity and water content of the snow were not particularly low; winds were moderate and steady.

Receivers in use at the time were Drake R-4Cs. The front end of one receiver absorbed many arcs off the sloper, with no apparent damage. Solid-state rigs would probably have suffered severely.

We have always been careful to ground our antennas during the thunderstorm season, and now we will be equally careful in the winter. We are also installing RF chokes from our feed lines to ground to dissipate static charges during operating periods.—*Paul D. Husby, WØUC, 1697-C Fulham St., St. Paul, MN 55113*

SWITCHED-CAPACITOR FILTERS

☐ The paper on digital switched-capacitor filters in July 1984 *QST* was interesting, informative and well written.[4] I offer suggestions for improvement in two areas. First, the usual problems with mixing the digital ground (for the clock input to the R5609) and the analog ground (for the audio signal to be filtered) can be overcome, in part, by using a suitably fast optocoupler.

Second, the "problem" by which the filtered audio output contains the clock frequency need not be a problem at all! This is because the output at pin 2 of the R5609 switched-capacitor filter is actually a small negative voltage at half the clock frequency. Rather than leave this unconnected (as shown in Fig. 2 of the original article), it can be used to buck out the undesired waveform. This is preferable to filtering, which will have different effects at different frequencies. A typical schematic diagram is shown in Fig. 1, with the gain from pin 4 of the R5609 set so that it is about 1/18 that from the filtered audio output, pin 2.—*Irwin Feerst, P.E., 368 Euclid Ave., Massapequa Park, NY 11762*

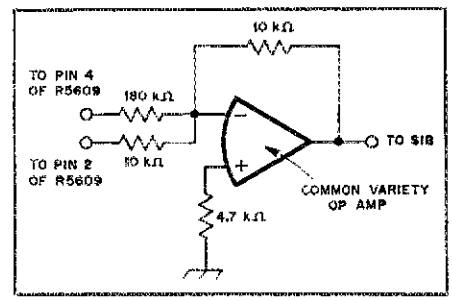


Fig. 1—Suggested circuit for bucking the clock frequency out of the filtered audio output of a switched-capacitor filter.

RECEIVER DYNAMIC RANGE AND BLOCKING

☐ While pursuing the art of homebrewing over the past 15 years, I watched closely the

[1] J. Hall and B. Schetgen, "Six Winners Emerge from the ARRL Antenna Competition," *QST*, Feb. 1985, pp. 44-47. Also see Feedback, *QST*, May 1985, p. 47.
[2] T. Hart, *Small High Efficiency Antennas, Alias The Loop* (Melbourne, FL: W5QJR Antenna Products, 1985).
[3] J. Evans, "High-Performance CW Demodulation," *QST*, April 1985, p. 23.
[4] R. R. Schellenbach and F. Noble, "Digital Switched-Capacitor Filters—A Practical Construction Project," *QST*, July 1984, pp. 11-15.

QST Product Review column to see how my designs and homemade gear would compare with manufactured equipment. Recently, however, I was forced to forsake the art, and I purchased a moderately priced used but recently new transceiver. To choose the best unit for my situation, I naturally turned to the old Product Reviews. I read all the relevant reviews spanning slightly more than the past 10 years. Taken together, the reviews revealed some facets concerning receiver dynamic range and blocking which I had overlooked.

Somewhat more than 10 years ago, the ARRL launched a campaign aimed at improving receiver dynamic range. The manufacturers took notice and improved their gear accordingly. Nowadays, many manufactured units sport receivers with dynamic range in the vicinity of 90 to 100 or more dB, while simultaneously obtaining very low noise floors. The builder at home, armed with only simple designs, readily available components and rudimentary test equipment, finds it quite a challenge to build receivers with such high dynamic ranges and low noise floors. As a result, the question often arises: What dynamic range would prove acceptable, given today's bands and a casual operating style?

Reading the reviews together, I discovered that receiver performance often became acceptable, at least for those in W1AW's neighborhood (also known as the rock garden), when the dynamic range in dB reached the mid-80s. Of course, a front-end attenuator often helped on-the-air performance. Fortunately, such a level along with a low noise floor is easily obtained with a variety of simple circuits and easy-to-get components.

Also, reading the reviews together, I often wished for more information on those receivers for which blocking measurements were unavailable because of receiver oscillator noise. In such cases the results of the blocking tests were listed simply as "noise limited." I suspected that in many cases the receiver refused to show signs of desensitization even for unduly large blocking signals. Of course, not all "noise limited" receivers proved to be good on-the-air performers. I remember vividly one reviewer commenting that oscillator noise problems in one unit proved so severe that the receiver was useless on the low end of the 40-m band.

So what figure of merit might clarify the performance of receivers in terms of oscillator noise? Perhaps one suggested by Tom Thompson, WØIVJ, would do: Specify the level of the blocking signal, tuned to, say, 25 kHz from the received frequency, at which the signal because of oscillator noise becomes equivalent to the noise floor. Of course, the generated noise will depend on the displacement frequency of the perturbing signal, and the sensitivity to changes in displacement frequency will vary from unit to unit. Nevertheless, such a figure of merit would allow one to decide whether or not oscillator noise might prove troublesome in a given situation.—*James Coakley, KXØN, 1128 Green Cir., Boulder, CO 80303*

ELECTRICAL SAFETY

☐ I was interested in the article by Doug DeMaw, W1FB, in December 1984 *QST*.[5] Older rigs, such as the Heath SB-400 and the Johnson Viking Ranger transmitters, exhibit a not-always-recognized electrical safety hazard *if the chassis remains ungrounded* (see Fig. 2). This same ac input circuitry was also used frequently on test equipment made 20 to 25 years ago.

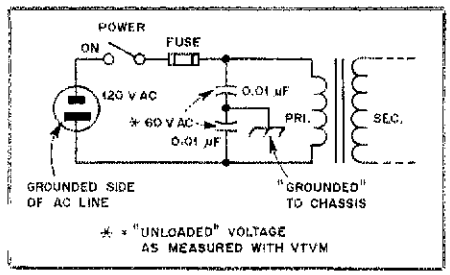


Fig. 2—The old-style method of bypassing the ac power line to the chassis of electronic equipment. While the method does aid in reducing or preventing RFI, it also presents a safety hazard, as discussed in the text.

If the radio is equipped with an ac plug having only two prongs, both sides of the ac line may be bypassed to chassis "ground" with capacitors having a value as high as 0.01 µF. These capacitors form an ac voltage-dividing network that places the equipment chassis at a nominal 60 V ac above actual ground, when measured with a VTVM. If "loaded" by the touch of a person's hand to a chassis mounting screw or metal front-panel control knob, the ac voltage on the chassis is still high enough to "bite" the unwary. Though not high enough to cause a fatal injury, feeling this unexpected voltage might indirectly cause a minor injury from reflex action when rapidly pulling the hand or fingers away. [A danger also exists if you work outdoors on damp or wet ground with coaxial cable, the shield of which is connected to such an ungrounded chassis.—Ed.]

The solution, of course, is to ground the chassis to a true ground system, that is if the owner doesn't want the two-prong plug replaced with a grounded three-prong plug. Grounding the chassis won't disturb the ac line voltage balance, because 0.01-µF capacitors have about 265 kΩ of reactance at the 60-Hz line frequency.—*Jack Wichels, W7YF, 710 Alder St., Edmonds, WA 98020*

☐ Doug DeMaw's shocking experience, related on page 19 of December 1984 *QST* reminds me of an old trick (see note 5). When testing an HV transformer, do *not* apply 117 V to the primary. Use a filament transformer to get a 6.3-V ac source for testing, and hook this to the primary of the transformer under test. You can then test the secondary voltage(s) in comparative safety, still observing all of the proper precautions.

Of course, this will not give you an accurate reading of the secondary voltages available from the unit under test. Your voltmeter will read about 5 to 6 percent of what the transformer would deliver with 117-V ac on the primary. Knowing this, you are aware of what you have to contend with when you run a test under full voltage on the primary.

Doug also mentions the possibility of a short between a winding and the transformer frame. I regularly make an ohmmeter check between all leads and the transformer frame. A friend bought a second-hand oscilloscope and became suspicious when he saw that the power transformer was insulated from the chassis. A voltage check between the transformer frame and the chassis showed the full high voltage to be present. A former owner had done a "cheap and dirty" repair to correct a short between the high-voltage winding and the frame.—*Julian N. Jablin, W9IWI, 9124 N. Crawford Ave., Skokie, IL 60076*

[5]D. DeMaw, "First Steps In Radio—Part 12: The Amateur and Electrical Safety," *QST*, Dec. 1984, pp. 19-22.

Feedback

In the Product Review presentation of the Ten-Tec Century/22 HF CW Transceiver (*QST*, May 1985, pp. 41-43), the receiver specifications should be listed as follows:

	80 m	*20 m*
Noise floor (dBm)	−131	−123
Blocking DR (dB)	112	109
Two-tone IMD DR (dB)	82	81
Third-order intercept (dBm)	−8	−6.5

Reference is made to the item, "Radiation Hazards," appearing in the Technical Correspondence column for May 1985 *QST*, page 46. This item was adapted from RSGB's *Radio Communication*. References to recent ARRL-published material were omitted. See the sidebar story on p. 35 of April 1985 *QST*, "Microwave Radiation Safety," written by ARRL Technical Advisor David Davidson, W1GKM. Also see the section headed "RF Power—Hazardous?" on pp. 7-7 through 7-9 of *The Satellite Experimenter's Handbook* (ARRL, 1984).

In "How to Perform AC-Circuit Analysis," May 1985 *QST*, typographical errors exist on p. 21. In Fig. 4, Step 11 (last line) should show

$\cos(+157.38°) = -0.923$.

In the right-hand column above Fig. 4, the numerator of the equation in the fifth line should be

$(15.5\angle +75°)\ (18.7\angle -74.5°)$.

In addition, the third line from the bottom should read:

$= -1.64\angle -19°$ A (inductive)

These corrections apply to the article, "Multiband Trap and Parallel HF Dipoles—A Comparison," pp. 26-31, May 1985 *QST*. The deck should begin with the sentence, "Traps have a decided effect on antenna *bandwidth* and performance." The caption for the graph on p. 26 should read, "Fig. 1 —Antenna SWR as a function of the transmission-line loss. Curves are plotted for SWR values of 2.0 to 1 and 2.5 to 1 at the input of the transmission line." The correct form of Eq. 1 is

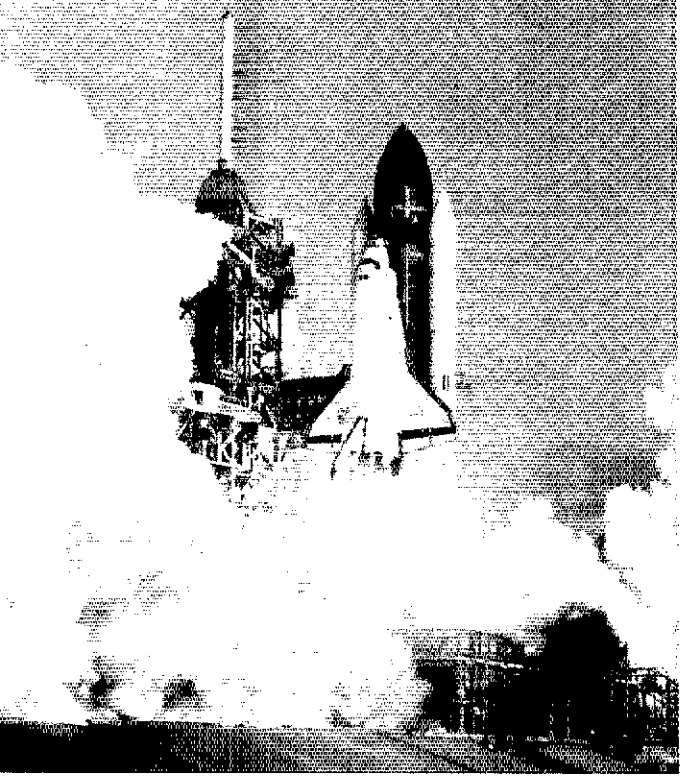
$$f = C_f \left[\frac{\%f}{100} + 1 \right]$$

The correct form of Eq. A1, p. 30, is

$$R_a = 1618 \left[\frac{f\ell}{984} \right]^{2.736}$$

This line should be inserted between Eqs. A12 and A13, p. 31:

For $X_t < 2000$ (trap not near resonance),



Two More Hams Poised for Flight

With the emphasis on involving young people, you can be a part of the second historic ham-in-space mission—just by tuning it in!

By Paul Courson,* WA3VJB and Bill Tynan,** W3XO

For the first time ever, two Amateur Radio operators will attempt to communicate with us from space, and it's going to happen this month. Astronaut Tony England, WØORE, plans to take a 2-meter hand-held radio with him for the Space Shuttle *Challenger's* mission 51-F, tentatively set for July 12. Also among the crew will be astronaut John David R. Bartoe, W4NYZ. Both men, along with former Novice Gordon Fullerton (Shuttle commander for this flight), are expected to take the mike for contacts with earthbound hams.

Tony is taking the ham rig along because he wants to show young people they, too, can take part in space experimentation. Local ham clubs across the country are inviting youth groups, especially school students involved with the Young Astronaut Program, to try to hear, see and possibly communicate with the *Challenger* ham station. *See?* You read it correctly. For the first time, amateur television is to be part of a space flight.

Slow-scan TV pictures are to be sent from *Challenger* when Tony is tied up with Shuttle Spacelab duties. There will be a 15-WPM Morse code ID between pictures, with Tony's call sign and "Challenger" to be sent by an automatic device. The primary downlink frequency is 145.550 MHz. When Tony or other crew members have spare time, the automatic SSTV unit will be unhooked, and a microphone plugged into the hand-held radio for two-way QSO attempts.

*Public Information Officer, ARRL
**Contributing Editor, ARRL, P.O. Box 117, Burtonsville, MD 20866

NASA is keeping preferred uplink frequencies a guarded secret in response to Tony's desire to talk to groups of young people. Local Amateur Radio clubs that have expressed an interest in bringing students into the ham-in-space project applied to receive a list of uplink frequencies. The qualification guidelines included a promise to be willing to help those youngsters get their ham licenses!

Having to "apply" to talk to the *Challenger* station may at first have seemed to be a bother, but those who planned the mission decided it was the best way to make use of the astronauts' very limited free time.

White House to be Involved?

The Young Astronaut Program is part of the White House Office of Private Sector Initiatives. Director of Curriculum Dr. Kerry Joels estimates that as many as 50,000 young people have signed up with thousands of chapters in local communities. Dr. Joels is very enthusiastic about Amateur Radio's ability to involve the general public—especially young people—directly with space projects. In addition, of course, their participation in the *Challenger* ham-in-space mission is likely to begin a long-term relationship that promises to bring many youngsters into Amateur Radio.

There is a chance President Reagan may also take part in this month's Amateur Radio space effort. The Young Astronaut Program has strong White House backing, and the President may wish to reinforce that support in some way while encouraging others, like Tony England, who are trying to get young people interested in technology and Amateur Radio.

Over the past 60 years, Amateur Radio has been fortunate to be included on many other ventures into the unknown. A few of us remember the thrilling sound of hams speaking from Little America during Admiral Byrd's visits to Antarctica in the 1920s and '30s. And while it was exciting to us in our warm ham shacks, more important was the vital role Amateur Radio played in furnishing a communications link between expedition members and their families during their long isolation. NASA planners who considered whether to allow Amateur Radio on space missions took into account the backup communication capability it would provide if a spacecraft's system should fail.

Perhaps no single event in the annals of Amateur Radio has captured the imagination of so many as the first operation of a ham from space, when astronaut Owen

Garriott, W5LFL, took his portable 2-meter transceiver with him on *Columbia* Shuttle mission STS-9. NASA's approval of the December 1983 Garriott operation is clear evidence that it sees Amateur Radio as an important educational and scientific tool. Garriott's hand-held VHF rig was completely independent of Shuttle systems, and involved an antenna mounted in a spacecraft window. Tony England will be using that same antenna for this flight. The Motorola radio is modified for the SSTV system, which includes cameras and monitors furnished by Panasonic and a slow-scan converter provided by Robot Research.

Working Shuttle Slow-Scan

The slow-scan TV transmission from *Challenger's* amateur station will be in compatible color, with each frame sent first in black and white, then with color information added. This will enable those with monochromatic equipment to receive fine black-and-white pictures. Each complete frame will require about 12 seconds to complete. You may be thinking that SSTV on 2-meter FM is an unusual mode. The use of FM will eliminate all Doppler problems caused by the rapid motion of the spacecraft, which would ruin reception if the SSTV was sent as it is on the HF bands.

In a recent conference-style telephone call, astronaut England spoke with representatives of the League, NASA, AMSAT and the media. He said his workload with the Spacelab requires him to be on duty for virtually all passes over the U.S. and Europe. NASA has agreed to announce the status of the amateur station on the Shuttle radio one pass ahead of time, however. This lets us know whether SSTV is being sent automatically, or whether someone has some spare time to man the mike for two-way conversations with earthbound hams and youth groups.

This free-form schedule for operating opens up several exciting possibilities to introduce Amateur Radio to people who may want to become hams. Those youth groups meeting with local radio clubs will already have had an orientation discussion about how we communicate, so their role will be one of actually observing. But how about the scanner enthusiasts and the SWLs? Each will be following the Shuttle flight to monitor this nongovernmental, nonmilitary, noncommercial communications effort from space. Amateur Radio stands to gain a lot from the visibility likely to come from this latest ham-in-space project.

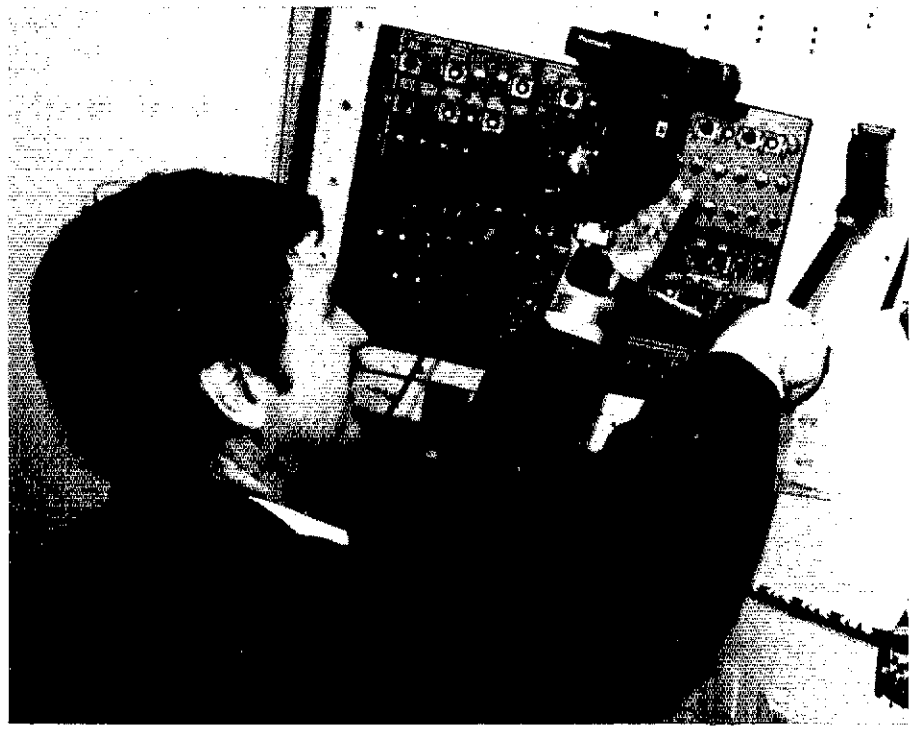
Media Opportunities Galore

Owen Garriott's Amateur Radio operation was covered widely in the newspaper, radio and TV media. It was newsworthy because it was a first. Not only was there coverage at the network level, but you probably found your local television or radio station interviewing a ham in your community about the flight and about Amateur Radio. That's the kind of positive visibility we need for growth. You still have a chance to bring your local media into this mission because so many reporters are anxious to find a local angle to this national story. This mission is particularly noteworthy because the Amateur Radio operation will reach so many more people. Contact your local media soon, and explain how you can help them develop just the kind of story they're looking for.

NASA ham clubs will be retransmitting *Challenger* two-way communications with ground controllers. The status of the amateur station will be announced on that radio link. (See Table 1 for the amateur frequencies likely to be used for this relayed audio.) W1AW will provide bulletin updates with the latest information on the Space Shuttle ham operation. Since these outlets are on a variety of bands, shortwave listeners and VHF scanner enthusiasts can become involved. You might consider working with these groups to promote Amateur Radio.

Best of all, there's the thrill of hearing the Shuttle ham station directly from space. Here is another chance for individual amateurs and groups to put our best foot forward. How well we do will directly affect our efforts to persuade more young people to enter our hobby and pursue technical careers.

You can help in this vitally important effort to bring Amateur Radio to the forefront once again. As the second ham-in-space mission flies overhead, we hope you'll be in on the action.



NASA Astronaut Tony England, W0ORE, adjusts the bracket on a specially modified Panasonic television camera during preflight testing in the Shuttle Trainer at Johnson Space Center, Houston, Texas. SSTV is among the Amateur Radio operations Tony and Astronaut John David Bartoe, W4NYZ, plan to perform during the Space Shuttle *Challenger* mission this month. *(photos courtesy NASA)*

Table 1

Planned Frequencies for Shuttle Communications Retransmissions

By retransmitting regular Shuttle-to-ground communications, Amateur Radio clubs at NASA Centers will be providing mode information to all who have an interest in the operation. Also, we will learn the status of the amateur station one pass ahead of time.

NASA/Goddard ARC, WA3NAN
Greenbelt, Maryland
3.860-MHz SSB (evening/night)
7.185-MHz SSB (daytime)
14.295-MHz SSB (continuous)
21.390-MHz SSB (as available)
147.450-MHz FM* (continuous)

NASA/Jet Propulsion Laboratory ARC
Los Angeles/Pasadena, California
224.040-MHz FM
145.460-MHz FM

Marshall Space Flight Center ARC
Huntsville, Alabama
145.430-MHz FM

NASA/AIMS
San Francisco Bay area, California
145.580-MHz FM
7.270-MHz SSB

*This VHF outlet is designed to serve a 100-mile radius from Washington, DC.

Destination: MARS

The Military Affiliate Radio System needs a few good hams. An interview with a MARS director shows where you can fit in.

By John F. Lindholm,* W1XX

Amateur Radio and the military have enjoyed a long association to the benefit of both. To those amateurs committed to providing an adjunct to the military communications mission, MARS is their cup of tea. This concept of service-to-country is embodied within the bases and purpose of Part 97 of the Commission's Rules: "Expansion of the existing reservoir ... of trained operators, technicians, and electronic experts."

Each of the military services sponsors a MARS program—Army, Navy-Marine Corps and Air Force—with thousands of radio amateur participants. ARRL has long recognized the high value of disciplined radio communication provided by the MARS programs and, through the medium of *QST*, has continued to bring this message to potential MARS members.

Recently, we had a chance to talk with the Director of Navy-Marine Corps MARS, Arthur R. Delperdang, K4KBI, about the program and the opportunities available to radio amateurs.

This typical, neat and well-appointed Air Force MARS station, AFB2FR, is owned and operated by Kenneth Scott, WA4KAU, of Ft. Lauderdale, Florida. Ken is also manager of the Central/South America Phonepatch Net under the call sign AFF2SP.

QST: Many readers may be thinking at this point, "I've heard about MARS before, but thought it was a planet in our solar system." Just what does MARS stand for?

Delperdang: MARS stands for Military Affiliate Radio System. After World War II, in November 1948, the Secretaries of the Army and Air Force issued a joint directive establishing MARS for their respective services. The name at that time stood for Military Amateur Radio System. In 1953, a joint Army and Air Force council on communications met with representatives of the ARRL to discuss matters relating to the MARS program. One recommendation was to change the program name to Military Affiliate Radio System, as this would more closely describe the relationship between amateur operators and the military. This recommendation was accepted, and that has been the program name ever since.

QST: What does MARS do?

Delperdang: MARS is a Department of Defense-sponsored program organized to provide adjunct communications for military and/or civil disaster officials during periods of emergency. Other important functions of MARS are to (1) assist in effecting normal communications under emergency conditions, (2) handle morale and quasi-official record- and voice-communications traffic for armed forces and authorized U.S. Government civilian personnel stationed throughout the world, (3) create interest and provide a means of training members in military communications procedures and (4) provide a potential reserve of trained radio communications personnel for military duty when needed. Under DOD sponsorship, the Army, Navy-Marine Corps and Air Force each conduct a MARS program, each having its own MARS Chief. As such, each MARS service is organized and operates in a slightly different manner. However, the basic mission and functions are the same for all. There are various special message-traffic and phonepatch networks operated by each MARS service, all of which support the welfare and morale role of MARS. This traffic is important to the mission of MARS, as it exercises the various MARS communications networks set up to provide emergency communications support. In addition, this traffic provides message-handling experience as we train in military procedures, thus creating a reserve of trained radio communications personnel.

QST: So MARS started after World War II?

Delperdang: No, it goes back even further than that. The Army Amateur Radio System (AARS) was established in 1925. MARS, as we know it today, evolved out of the AARS. Its purpose then was to train radio operators in military communications procedures. Prior to World War II, over 8000 Amateur Radio operators received military

*Manager, Membership Communications Services

communications training in this manner.

QST: I have flat feet. Can I still join MARS?

Delperdang: You certainly can, John. Physical handicaps will not disqualify you for membership in MARS so long as you can meet certain membership criteria and fulfill the minimum participation requirements. The criteria for individual membership in MARS are (1) be 14 years of age or older and be a citizen of the United States, or have been lawfully admitted to the United States for permanent residence under the provisions of Chapter 12 of Title 8, United States Code; (2) possess a valid Amateur Radio operator's license, issued by the U.S. Federal Communications Commission or other competent U.S. authority, which will remain valid for a minimum of one year subsequent to the date of application; (3) possess a radio station capable of operating on a minimum of two MARS frequencies within the 2-30 MHz range. Each MARS member is expected to participate a minimum number of hours per calendar quarter for continued membership. For Navy-Marine Corps MARS the minimum is 18 hours. I might add, after six months of continued membership the individual becomes eligible to participate in the "Excess Equipment Program."

QST: Could you explain that?

Delperdang: Under procedures established by the DOD, MARS, in accordance with its status as a mission activity within the Military Departments, is authorized to receive and issue to qualified MARS members excess DOD and civilian Federal Agency property for operational and experimental purposes. I will say, however, there is very little good equipment currently available for issue, and if the only reason you plan to join MARS is to fill your shack with equipment, you will be very disappointed.

QST: What frequencies and modes do MARS members operate on?

Delperdang: Many frequencies used by MARS are 100-200 kHz above and below the amateur bands. As our programs expand, however, the demand for additional frequencies also increases, and it is becoming more and more difficult to find spectrum space near the amateur bands. We try to hold our day-to-day operations on those frequencies near the amateur bands, and operate the more exotic circuits on frequencies further removed from the amateur bands where it is possible to obtain operating authority. As to modes of emission, all modes currently authorized for use by U.S. amateurs are also used by MARS. All affiliate members start out being assigned to an SSB, voice or CW circuit operated close to an amateur band for their basic training and, depending on their interests and desires, move on to other circuits such as radioteletype or slow-scan television.

QST: Does MARS have VHF repeaters, or are all operations still on 80-meter CW?

Delperdang: MARS operates VHF FM repeaters in most major metropolitan areas and other areas where there are enough members to have one.

QST: How do MARS operations differ from normal amateur communications?

Delperdang: As a MARS member, you would be assigned to specific circuits, or networks. Operations on these nets vary and, normally, you are authorized to operate only during times those nets are in operation. Most VHF FM repeaters, however, are open and may be used any time a formal net is not in session.

MARS Addresses

For the address of your state MARS director and an application, write first to one of the following addresses.

Director, CONUS Army MARS
C COM 7th Signal Command
Ft. Ritchie, MD 21719

Chief, Navy-Marine Corps MARS
NAVTELCOM
Washington, DC 20390

Chief, Air Force MARS
AFCC/XOP
Scott AFB, IL 62225

QST: I bowl every Wednesday night. Will my MARS commitment interfere with that activity? I guess I want to know what is expected of me as a MARS member.

Delperdang: As I stated earlier, each member is expected to participate in MARS activities a minimum number of hours per calendar quarter. Depending on the specific MARS service, 6 to 12 hours must be spent participating on HF circuits and 2 to 6 hours participating in other MARS-related activity. The specific time and network assignment would be between you and your area coordinator or state director, based on your desires and capabilities.

QST: Can I run phonepatches?

Delperdang: Yes, you can. Each MARS service operates radiotelephone networks between the United States and many overseas military bases. Once accepted into the MARS program, and depending on the needs of the program, you could be assigned to one of these circuits. In addition to the radiotelephone networks, Navy-Marine Corps MARS operates an "Afloat Specialty Network," which provides phonepatch service to U.S. military ships while they are in international waters.

QST: I'm active in the ARRL National Traffic System and occasionally hear of messages "via MARS." What is a "refile" and how does it work?

Delperdang: A refile is a personal (third-party) message that was originated, in this case, by a MARS service and was handed over or refiled into the Amateur Radio Service. This is generally done when it is impractical for the message to continue to its destination via MARS circuits. MARS messages must be converted into amateur format before refile is effected. Personal messages can be refiled from the Amateur Radio Service into MARS networks, but the message must be able to meet MARS message criteria. The refile of MARS official administrative traffic into the Amateur Radio Service is forbidden.

QST: Can I send messages overseas and even to people outside the military?

Delperdang: Normally, only personal messages addressed to and/or from armed forces personnel, U.S. government personnel overseas and their dependents are allowed. Even then, the message must be addressed to an authorized APO or FPO address. MARS cannot accept messages addressed to personnel aboard ships.

QST: Can I send a message for a member of one branch of the service through MARS of another branch?

Delperdang: Yes. There is no restriction on one MARS service handling messages for a member of another branch. All MARS services work together. Messages are routed to the network that can provide the most reliable service.

QST: Can amateurs take messages into NTS for military personnel overseas?

Delperdang: Yes. As I mentioned before, messages for military personnel overseas may be refiled into MARS circuits as long as they are addressed to an authorized APO or FPO address. I must qualify that statement by saying there are many countries where MARS is not permitted to operate or where we just don't have MARS stations. Of course, MARS cannot provide message service to those locations.

QST: Who pays the postage for messages with no local outlet?

Delperdang: The Department of Defense pays the postage for those few messages that cannot be delivered any other way. As you might imagine, every effort is made to avoid mailing messages, and this is one of the reasons for the amateur refile operation.

QST: What kinds of messages cannot be sent via MARS?

Delperdang: In general, all restrictions placed on message handling by Amateur Radio operators also apply to MARS personal messages. In addition, some message restrictions unique to MARS concern

serious illness or death. Messages concerning the initial notification of serious illness or death of the immediate family of the message addressee may not be handled via MARS. Legislative matters, military operations, casualty information relating to enemy action or any information pertaining to military unit designation, strength, composition, function or logistical matters are prohibited. Additionally, any message that may result in financial or material gain to any party to the message may not be handled via MARS network, nor will messages deemed to be an obvious attempt to avoid postage fees be accepted by MARS stations originating traffic.

QST: Is training in electronics through correspondence courses available to MARS members?

Delperdang: Becoming a MARS member establishes eligibility for receiving unclassified correspondence courses from the various military education and training offices. New MARS members become eligible to receive correspondence courses upon successful completion of an initial basic trial and training period, and if they meet all other normal membership requirements.

QST: What happens if I join and decide I don't like it or can't meet the commitment? Can I get out, or do I have to wait till my hitch is up?

Delperdang: There is no obligation placed on MARS membership. You may resign any time you want.

QST: What is the most touching human-interest story you can recall where MARS played an important role?

Delperdang: As we conduct our various programs each has its own "heroic" event, and it would be impossible to place one above the other. I am sure there are many unsung heroes, those members who choose not to advertise the event they were involved in. MARS is a part of Amateur Radio, and we are all aware of its many civic contributions. The individuals who make up MARS are among the most patriotic and unselfish people I have had the pleasure to know and work with. The story about MARS members themselves, the amount of time and money they unselfishly expend in pursuit of their "hobby"—this is truly the greatest human-interest story I can think of.

QST: Where do I sign up?

Delperdang: Potential members should first contact the area coordinator or state director responsible for MARS operations in their area. Names and addresses can be obtained from any MARS member or by writing to the MARS Chief of the service you are interested in joining (see sidebar). You will then be provided with the necessary application and mailing address. Upon approval of the application, you will be given a MARS call sign and assigned to a MARS training net. Then, it's just a matter of time before you'll be on to bigger and better things. QST

Let's Publicize Ham Space Achievements

Four years after the launch of the Russian *Sputnik*, the first man-made object in space to orbit the earth, American radio amateurs launched a satellite that transmitted on an amateur band: OSCAR I (*O*rbiting *S*atellite *C*arrying *A*mateur *R*adio), launched December 12, 1961. Since that time, an additional 20 amateur satellites have been designed and built by Amateur Radio organizations around the world, and lofted into space. December 12, 1986, will be the 25th anniversary of this milestone in Amateur Radio history. It should be commemorated by the Amateur Radio community worldwide. What better way to do this than for the U.S. Postal Service to issue a commemorative postage stamp?

You can help bring this about. Just send a letter to the United States Postal Service, attention of the Citizens Advisory Committee on Commemorative Stamp Issues, Washington, DC 20260. State that you would like to see a commemorative stamp issued to celebrate the 25th anniversary of the first launching into space of an Amateur Radio communications satellite, recommending the first day of issue be Dec. 12, 1986. The letter should: be all on one page, be double spaced, focus solely on the space stamp, avoid uncomplimentary comparisons with other postal commemorations and be received in Washington by July 15. Your letter may have extra pages of drawings, history, etc., as attachments. — *Dr. Norman L. Chalfin, K6PGX* QST

It Seems to Us ...
(continued from page 9)

taste of HF phone were enough to discourage upgrading, why would anyone ever go from General to Advanced?) Ten meters is a good band for local communication, with enough opportunity for DX to whet the appetite. (In this connection it's worth noting that 15 other countries permit Novices to operate 10-meter phone, including such major ones as Australia, the Federal Republic of Germany, the Netherlands, Spain and Sweden. Tens of thousands of U.S. hams had enjoyable chats with overseas Novices on 10-meter phone during the last sunspot maximum. Regular observers of the 10-meter band will recall that even at the sunspot peak, the U.S. 10-meter Novice band was seldom crowded with signals.) We envision 10-meter gateways to the packet radio network, to permit Novice participation in this burgeoning activity. Best of all, the Novice 10-meter expansion can be accomplished with a minimum of surgery to the FCC regulations, and a minimum of inconvenience to other licensees; 28.3-28.5 MHz has been a part of the U.S. phone band since last September 1, but activity has been extremely sparse even during contests and band openings because we're all so used to starting our scan of the band at 28.5. It has been League policy to favor "Techs on 10" since 1969, so earning 10-meter privileges with a 5-WPM code test is hardly a new thought.

Ten meters also provides an opportunity for Novices to contact other local hams on the air, which could be a boon for local clubs and for making Novices a part of the mainstream of local activity. However, this is more likely to be accomplished effectively on VHF FM. This, too, is hardly a radical concept; the League has supported Novice privileges on 220 MHz since 1975. Such an allocation would give Novices an opportunity to perform public-service communication, and to be exposed early to this important part of the Amateur Radio scene. The idea behind the 1240-MHz proposal is that the Commission may not be able to take immediate favorable action on our 220-MHz request, in view of changing government requirements in this shared band. Suitable equipment is becoming available for the 1240 MHz band, but activity has not developed to the point where it would be difficult to accommodate lots of newcomers.

While it was necessary for the League to file quickly to get Novice enhancement on the "front burner" at FCC, in the weeks and months to come there will be plenty of opportunity for fine-tuning. Once the FCC assigns a file (RM) number to the petition there will be an opportunity for public comment. If the Commission then decides to proceed with a Notice of Proposed Rulemaking based on the petition, there will be yet another opportunity for comment. It's quite conceivable that the Board, in light of member input, might authorize a response to such an NPRM that, in effect, amends the proposal. But we hope the basic elements of this dramatic Novice enhancement proposal will survive and move quickly through the Commission's administrative processes. The sooner we can make Amateur Radio more attractive to newcomers, without compromising the entrance requirements which are so important to maintaining a quality Service, the sooner the future of Amateur Radio will be assured.—*David Sumner, K1ZZ*

Happenings

Conducted By Bruce S. Hale, KB1MW
Manager, Regulatory Information Branch

- *24 MHz Arrives At Last*
- *New Modes on 160*
- *Some Land Mobile Users May Get 421-430 MHz*
- *ARRL Opposes Elimination of Examination Waiting Period*

League Members to Choose Board Representatives

Newington doesn't dictate what the League will and will not do—you do! As a Full member, your voice determines the direction of ARRL policy. This fall, members of the Atlantic, Dakota, Delta, Great Lakes, Midwest, Pacific and Southeastern Divisions will choose directors and vice directors to represent their interests on the ARRL Board of Directors for two-year terms beginning January 1, 1986. Similarly, the members of the Canadian Radio Relay League will choose their president and vice president this year. These officers automatically serve as director and vice director, respectively, of the Canadian Division, ARRL.

ARRL Divisions

The policies of the League are established by 16 directors, who are elected on a geographic basis to represent their divisions and constituents on the Board (see page 8 of any *QST* for a list of the divisions, directors and vice directors). These directors serve for two-year terms, with half standing for election in alternate years. Just as in national or state politics, the voters/members have the privilege and responsibility either to decide they like the actions of their incumbent representatives and support them actively for reelection, or to decide that other representatives could do a better job and work for the election of those representatives. At the same time directors are elected, vice directors, who can fill in when the director is unable to serve, are also chosen.

Call for Nominations

Nominations are now open for director and vice director in the Atlantic, Dakota, Delta, Great Lakes, Midwest, Pacific and Southeastern Divisions for the two-year term beginning January 1, 1986. (For details on the elections in Canada, see Canadian NewsFronts, this issue.) From now until August 20, at noon, League Headquarters will accept nominating petitions signed by 10 or more Full members of a division, naming a Full member of that division as a candidate for director or vice director.

The candidate must submit information (on a form provided by Headquarters) that will allow the Executive Committee to determine the eligibility of a candidate in accordance with the Articles of Association and Bylaws, and a statement of not more than 300 words setting forth the candidate's qualifications. The statement will be included with the ballot mailed to members and 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 this statement will be grounds for disqualification by the Executive Committee.

The nominee must hold at least a Technician class amateur license or a Canadian Amateur Certificate, 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 immediately prior to 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 ARRL and (3) are free from conflicts of interest.

Balloting Will Follow

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. (You must be a licensed radio amateur to be a Full member.) The ballots will be mailed not later than October 1, and, to be valid, must be received at Hq. by noon on November 20. A group of nominators can name a candidate for director or vice director, or both, but there are no "slates" as such—each candidate appears on the ballot in alphabetical order. 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 director are transferred to the vice director in the event of the director's death, resignation, recall, removal outside the division or inability to serve, careful selection of candidates for vice director is just as important as for director.

Nominating Form

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 upon request:

Executive Committee
The American Radio Relay League
Newington, CT 06111

We, the undersigned, Full members of 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 1986-1987 term.

(Signature ..... Call ....
City ..... ZIP .... Date ....)

Nominees, or indeed any member, may obtain a copy of the Articles of Association and By-Laws, along with a pamphlet outlining the duties and responsibilities of elected League officials.

Absentee Ballots

All ARRL members who are licensed by the FCC or DOC but are temporarily residing outside the U.S. or Canada are eligible for Full membership. Those 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. Members with APO and FPO addresses should take special note of this provision; in the absence of information received to the contrary, ballots will be sent to them based on their postal address.

Even within the U.S., Full members temporarily living outside the ARRL division they consider home may have voting privileges by notifying the secretary prior to September 10 giving their current *QST* address and the reason that another division is considered home. If your home division is in the Atlantic, Dakota, Delta, Great Lakes, Midwest, Pacific or Southeastern Divisions, but your *QST* goes elsewhere, please let the ARRL secretary know, as soon as possible, but no later than September 10, so you can receive

a ballot for your home division. Canadians temporarily living outside Canada who wish to participate in the Canadian election should write to the CRRL office as shown in Canadian NewsFronts, this issue.

The Incumbents

These persons presently hold the offices of director and vice director, respectively, in the divisions conducting elections this year:

Atlantic—Hugh A. Turnbull, W3ABC, and George W. Hippisley, K2KIR.

Dakota—Tod Olson, KØTO, and Howard Mark, WØOZC.

Delta—Clyde O. Hurlbert, W5CH, and Robert P. Schmidt, W5GHP.

Great Lakes—George S. Wilson III, W4OYI, and Allan L. Severson, AB8P.

Midwest—Paul Grauer, WØFIR, and Richard Ridenour, KBØZL.

Pacific—William J. Stevens, W6ZM, and Kip Edwards, W6SZN.

Southeastern—Frank M. Butler, Jr., W4RH, and Evelyn Gauzens, W4WYR.

Petitions need 10 or more signatures of Full members (it is wise to have several more), and are due at 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, November 20. The new term will begin at noon, January 1, 1986.

For the Board of Directors:
June 1, 1985
Perry F. Williams, W1UED
Secretary

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24 MHz ARRIVES AT LAST!

The 12-meter (24 MHz) band has been released to U.S. General, Advanced and Extra Class amateurs. A Report and Order in Docket 84-960, released by the Commission on April 26, 1985, finalizes the process that began at WARC '79. The effective date of the Order is June 22, 1985, and the 30-meter (10-MHz) allocation becomes permanent at the same time.

Full power (1500 W PEP output) is permitted on the 24-MHz band, 24.890-24.990 MHz. The subband 24.890-24.930 MHz is limited to CW and digital modes only. In the subband from 24.930-24.990 MHz, CW, phone, FAX and SSTV is permitted. On the 10-MHz band, (10.1-10.15 MHz), power continues to be limited to 200 W PEP output, and CW and digital modes are the only ones allowed.

In addition to the 24- and 10-MHz allocations, the Commission granted the ARRL request for a modification to Section 97.112 of the Amateur Rules. That Section provided an exemption so that operators could be paid to operate an amateur station transmitting bulletins and code practice on all medium- and high-frequency bands, and if the station was on the air at least 40 hours per week. ARRL requested that this be amended to read "at least six" HF and MF bands. ARRL claimed that the addition of the new WARC HF bands created a significant burden with respect to the League's obligation to transmit code practice and bulletins via W1AW on "all" HF bands. FCC agreed that this amendment was warranted.

The 420-430 and 902-928 MHz allocation matters proposed in Docket 84-960 will be dealt with in a further Report and Order at a later date.

Please remember that amateurs operating in these new bands must avoid interference to the Fixed Service outside the United States.

NEW MODES ON 160

On April 25, 1985, the FCC released a Report and Order authorizing amateurs to use digital, FAX, slow-scan television and narrow-band FM on 160 meters. The effective date of the Order was June 17, 1985.

The Report and Order finalizes a process that began in February 1984, when the ARRL filed a petition with the FCC requesting that the FCC authorize digital modes on 160. Responding to the petition in October 1984, the FCC released a Notice of Proposed Rulemaking in PR Docket 84-959, and proposed to allow digital modes, FAX, SSTV and narrow-band FM on 160. After the required comment period, the FCC has adopted the proposed rule changes.

FCC has chosen to authorize these new emission types without specifying exclusive subbands. ARRL has volunteered to develop a band plan, and the FCC urges amateurs to adhere to the ARRL band plan.

In both the original NPRM and the Report and Order, the FCC cautions amateurs that this proceeding does not in any way affect the outcome of Docket 84-874, the proposal to allocate 1900-2000 kHz to the radiolocation service.

ARRL COMMENTS ON "MICROWAVE ACCESS"

ARRL has filed comments in PR Docket 85-23, the so-called "microwave access docket." In this Docket, the FCC proposed to add new microwave frequencies to the list of frequency allocations in Part 97. Several errors were made in the original proposal, for the most part concerning the relative status of services sharing a band under ITU rules. ARRL comments draw the attention of the FCC to the errors. For example, in 220-225 MHz, both ITU and FCC Part 2 allocations show the Fixed, Mobile and Amateur Services as co-primary, yet restrictions in the amateur table proposed in 85-23 are those used to protect a primary service from interference from a secondary service. In the 10-GHz band, nongovernment radiolocation services are clearly secondary to the amateur service in the Part 2 rules, yet 85-23 shows the reverse.

ARRL comments also repeat the League's request that the 1.2-GHz allocation be released to the U.S. Amateur Satellite Service *as soon as possible*, to allow U.S. amateurs to use AMSAT-OSCAR 10 when it is operating Mode L. League comments support the FCC proposal to favor voluntary band plans over FCC-imposed subband restrictions.

Reply comments in this Docket were due May 10, 1985, and we are awaiting FCC action. For more details on the original proposal, see Happenings, April 1985 *QST*.

LEAGUE OPPOSES ELIMINATION OF EXAMINATION WAITING PERIOD

In Docket 85-21, the FCC proposes to eliminate the 30-day waiting period presently required before an applicant may retake a failed amateur exam. Each VEC would then be free to set its own waiting period, or to require no waiting period at all.

On April 8, 1985, ARRL filed comments opposing this amendment. ARRL comments stated, "The present rule is not something that can or should be left to VECs to establish for their own programs, since to do so would be to encourage the establishment of short waiting periods at the expense of program integrity." The League has requested that the waiting period be set at 27 days, to allow regular scheduling of exams at four-week intervals.

The FCC also proposed eliminating the requirement that advance public notice be given for test sessions involving fewer than five candidates. ARRL also opposed this amendment on the grounds that it could lead to abuse, or potential perceived abuse, of the VE Program.

ARRL comments again raised the question of credit for Certificates of Successful Completion, and suggested that if the FCC seriously wishes to improve the Volunteer Examiner Program, the question of credit for written examination elements should be answered immediately.

For more details on the original Notice of Proposed Rulemaking, see Happenings, April 1985 *QST*.

ARRL REPLIES TO CABLE LEAKAGE INCREASE PROPOSAL

On May 15, ARRL filed reply comments in Mass Media Docket 85-38. This proposal, if adopted, would increase permissible cable signal leakage levels in the 54-216 MHz band. For details on the Docket, see Happenings, May and June 1985 *QST*.

According to ARRL, "No leakage increase is desirable nor justifiable." The League cited cable companies' failure to adhere to, and the Commission's failure to enforce, already existing FCC cable rules. ARRL comments show the relationship between increased leakage levels and increased ingress problems with cable systems, and show that well-engineered and properly maintained cable systems are capable of operating far below present leakage levels without undue financial hardship to cable operators.

The National Cable Television Association (NCTA), on the other hand, has presented a 1980 advisory committee report, and Capital Cities Cable Company comments in Docket 21006, as evidence of its need to increase signal leakage levels. Docket 21006 dealt with interference from cable systems to aeronautical stations, and Capital Cities admits that the Docket did not address the effect of leakage from cable systems to terrestrial communications.

The League again took exception to the FCC's comparison of CATV leakage and RF emissions from computers and other incidental-radiation devices. In concluding its reply, the League states, "To permit an in-

crease in such limit, regardless of the subjective obligation of cable operators to 'promptly' eliminate interference, and thus to increase incompatibility and interference potential, makes little sense. There is no evidence in the record that cable companies cannot meet present leakage limitations."

Copies of ARRL reply comments in this proceeding are available from Hq. for a large s.a.s.e. with 56¢ postage affixed.—*Katherine Hevener, WB8TDA*

LAND MOBILE USERS MAY GET 421-430 MHz IN THREE MAJOR CITIES

With only the vaguest rumors preceding the official word, FCC has issued a Notice of Proposed Rulemaking in General Docket 85-113 that would amend Part 2, making Land Mobile a primary service in 421-430 MHz in Detroit, Cleveland and Buffalo. The three cities have less Land Mobile space allocated to them than most cities their size because of their proximity to Canada and complexities of the sharing arrangements involving former TV channels. Amateur use of these frequencies near these cities is already scheduled to be on a case-by-case basis after adoption of rules proposed in PR Docket 84-960. The worldwide primary allocation of the frequencies, and the plan in effect in Canada, is to the Fixed and Mobile Services. Amateurs above Line A, roughly 75 miles from Canada on average, will be able to operate in 420-430 only after coordination with Canada.

Amateurs in some additional areas near Cleveland and Buffalo not north of Line A will have to avoid interference both to Canadian and to American Land Mobile Services if Docket 85-113 is adopted as proposed. Land Mobile stations in the following counties would become eligible to use some of the 421-430 MHz frequencies: Macomb, Oakland and Wayne Counties, Michigan; Lorain, Medina, Summit, Geauga, Lake and Cuyahoga Counties, Ohio; and Erie and Niagara Counties, New York.

Adoption of the rules proposed in Docket 85-113 does not mandate immediate change. There must still be separate rulemaking action in Parts 22 and 90 before Land Mobile can start applying for frequencies. ARRL filed comments opposing the change on May 28, 1985. The reply comment deadline has passed, and we are awaiting Commission action.

ORANGE COUNTY HAMS WIN EXEMPTION FROM $1200 TOWER FEE

In a dramatic turnaround, the Orange County, California, Board of Supervisors has exempted licensed radio amateurs from a new antenna ordinance that requires a costly use permit for any antenna more than 45 feet high in many residential areas of the county. The new antenna ordinance now applies to amateurs only when their antennas exceed 70 feet in height.

Under the new ordinance, anyone except a licensed amateur must pay fees of up to $1200 for permission to put up any antenna that is more than 10 feet above the height limit for buildings (35 feet in most residential areas). The original ordinance contained no exemption for amateurs, and when Orange County amateurs became aware of the ordinance, they were quick to act. Frank McGill, the county planner who drafted the original ordinance, listened to the amateurs' concerns and agreed to draft an amended version of the ordinance that would allow amateurs to put up antennas as high as 70 feet without going through the use permit process.

With about 50 amateurs present, the Planning Commission approved the amended version of the ordinance on April 29, and the entire package of zoning code amendments (including the modified antenna ordinance) was approved by the county Board of Supervisors on May 8.

Perhaps a key factor in county officials' willingness to amend the antenna ordinance was the fact that no one appeared at either meeting to speak against the 70-foot provision for licensed amateurs. The local amateurs, on the other hand, conducted an extensive campaign to educate county officials about Amateur Radio.—*Wayne Overbeck, N6NB*

Be a Contributor to the Goldwater Scholarship Fund

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

If your contribution is $25 or more, we will list your name and call in *QST*. If your contribution is $100 or more, in addition to your name and call appearing in *QST*, you will receive a signed photograph of the Senator, suitable for display in your ham shack. And for contributions of $1000 or more, in addition to the above, we'll put your photo in *QST*.

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: The Scottsdale Amateur Radio Club; Paul G. Dalman, WA3CHW; John L. Hiles, KA5TVH; Rochester Amateur Radio Assn., K2JD; Robert McDonough, K4HHW; Paul Hudson, WA6AVJ; in memory of John Varthy, W9EXA; in memory of Frank Startzell; in memory of John E. Finn; in memory of Thomas Gentry, W5RG; Outlaw chapter of 10X International, in memory of Ken "Fuzzy" Clapham, W5FZN; Robert J. F. Brunn, SM0BRU/W4; Washington, DC Chapter, QCWA; Dr. Larry Price, W4RA; Allen B. Graves, KB4JGO; Dr. Glen J. Radcliffe, W5UKK; Alamo Repeater Assn., in memory of Ken "Fuzzy" Clapham, W5FZN; The McMahan Foundation; The Ozone Club, in memory of "Shaw" Shalkhauser, W9CI, and Ken Thompson, K4RO; Chelsea Communications Club; Kenneth M. Miller, K6IR; Leslie L. Sterling, K7GL; Edward A. Hayes, W7SA; Curtis E. Oakes, Jr., W6SSM; C. M. Feero, VE7FJB; and Woody Fugate, W4JDU.

SECTION MANAGER ELECTION NOTICE

To all ARRL members in the New Mexico, Alabama, Western Massachusetts, Alaska, Santa Barbara, Kansas, Tennessee, Michigan, East Bay and Delaware Sections: You are hereby solicited for nominating petitions pursuant to an election for Section Manager. Incumbents are listed on page 8 of this issue.

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

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

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

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

(Signature.... Call ... City ... ZIP ...)

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

Petitions must be received at Headquarters on or before 4 P.M. Eastern Local Time, September 6, 1985.

Whenever more than one member is nominated in a single Section, ballots will be mailed from Headquarters on or before October 1, 1985. Returns will be counted November 19, 1985. SMs elected as a result of the above procedure will take office January 1, 1986.

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, 1986.

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 Field Services Manager.

You are urged to take the initiative and file a nominating petition immediately.
Richard K. Palm, K1CE
Field Services Manager

SECTION MANAGER ELECTION RESULTS

The following elections were conducted for a two-year term of office beginning July 1, 1985:

Balloting Results

In the Nevada Section, Joseph D. Lambert, W8IXD, received 119 votes; E. J. Silva, K7HRW, received 111 votes; and Lawrence E. Vosper, KB7VT, received 41 votes. Mr. Lambert was declared elected. In the Northern New Jersey Section, Robert R. Anderson, K2BJG, received 931 votes; and Jack D. Wilk, N2DXP, received 165 votes. Mr. Anderson was declared elected. In the Utah Section, James R. Brown, NA7G, was declared elected (K3FR withdrew his candidacy after ballots were mailed out). —*Arline Bender, WA1VMC*

Moved and Seconded ...

MINUTES OF EXECUTIVE COMMITTEE
No. 418
May 18, 1985

AGENDA

1. Approval of Minutes of March 23, 1985 meeting.
2. FCC Matters
2.1 Preliminary discussion of an ARRL role in the call sign issuance process.
2.1.1. Remarks by Ray Kowalski, Chief, Special Services Division, Private Radio Bureau, FCC, concerning the Bureau's views on the call sign program
2.2 Discussion of Options Paper circulated by the Executive Vice President in reference to PR Docket 85-22, Repeater Coordination
2.3 ARRL position with respect to PR Docket 85-105, Automatic Control of Amateur Stations above 29.5 MHz
2.4 Consideration of the recommendations of the Committee on Biological Effects of RF Energy for ARRL comments in the Further Notice of Proposed Rulemaking, General Docket 79-144
2.5 ARRL position re General Docket 85-113, to permit Land Mobile use of the 421-430 MHz band in Detroit, Cleveland and Buffalo
2.6 Discussion of an ARRL position toward additional privileges for the Novice Class license
2.7 ARRL position in reference to PR Docket 85-104, To permit telephony operation in the 7075-7100 kHz band in the Caribbean
2.8 ARRL position toward the further rulemaking in General Docket 84-902, alternative frequency proposals for the Los Angeles County Sheriff
2.9 ARRL position re General Docket 85-129, field disturbance sensors in 1.6-10 MHz
3. Progress report on ARRL Development Program
4. IARU matters
4.1 IARU Proposal No. 182, concerning the admission of the Association Gabonaise des Radio-Amateurs into the Union
5. Local antenna/RFI matters
6. Report on plans for the 1985 ARRL National Convention
7. Recognition of new Life Members
8. Approval of Conventions
9. Affiliation of Clubs
10. Report on Board action items
11. Confirmation of dates and places of meetings for the remainder of 1985
12. Other business

Pursuant to due notice, the Executive Committee of the American Radio Relay League met at 8:30 A.M. Eastern Daylight time, Saturday, May 18, 1985, at the Rochester Marriott/Thruway Hotel, Rochester, New York. Present were President Larry E. Price, W4RA, in the Chair; First Vice President Leonard M. Nathanson, W8RC; Executive Vice President David Sumner, K1ZZ; Directors Thomas B. J. Atkins, VE3CDM, Paul Grauer, WØFIR, William J. Stevens, W6ZM, and Hugh A. Turnbull, W3ABC. Also present for all or part of the meeting were Secretary Perry Williams, W1UED; Directors Linda S. Ferdinand, N2YL, Tod Olson, KØTO, and George S. Wilson, III, W4OYI; Vice Director Stephen A. Mendelsohn, WA2DHF; and Counsel Christopher D. Imlay, N3AKD.

1) On motion of Mr. Atkins, the Minutes of the March 23, 1985 meeting were accepted as issued by the Secretary.

2.1) Mr. Sumner presented an Interim Report, Feasibility Study, ARRL Assistance to FCC in the issuance of Callsigns.

2.1.1) At the invitation of the President, Mr. Raymond Kowalski, Chief, Special Services Division, Private Radio Bureau, FCC, joined the meeting to discuss the callsign matter from the Bureau's perspective. He departed from the meeting at 9:31 A.M. On motion of Mr. Stevens, the study of ARRL callsign assistance to FCC was continued, with a report to be made to the Board in July.

2.2) A discussion of options for the ARRL relative to PR Docket 85-22, Frequency Coordination of Repeaters, followed. The Executive Committee expressed a preference for mandatory coordination of repeaters; for open repeaters having priority over closed repeaters in the coordination process; and for regional coordination in preference to a national coordinator, whether it be an existing national association or an umbrella organization assembled for the purpose. There have been assurances that the ARRL request for extension of time (until after the Board meeting) for comments will be granted by FCC. Whereupon, on motion of Mr. Stevens, the staff was directed to continue preparation of draft comments for consideration by the full Board at the July 24 meeting following the guidelines established herein. The Executive Committee was in recess from 10:30 to 10:37 A.M.

2.3) The Committee next considered the League position with respect to PR Docket 85-105, automatic control of amateur transmissions above 29.5 MHz. On motion of Mr. Nathanson, staff was instructed to file comments reaffirming the League's original proposal in RM-4879, emphasizing that it was desirable for automatic control to be available for third-party communications via digital modes above 29.5 MHz without extending the same relief to simplex autopatches.

2.4) The Executive Committee reviewed a draft document prepared by staff on recommendation of the ARRL Committee on the Biological Effects of RF Energy. On motion of Mr. Stevens, it was voted that the staff prepare comments in response to the Further Notice of Proposed Rulemaking, General Docket 79-144, in accordance with the draft comments supporting the Amateur Radio exclusion from RF exposure rules recently adopted by the FCC.

2.4.1) On motion of Mr. Nathanson, it was further ordered that the response being drafted by the Bio Effects Committee, to the Milham article in the British medical journal, *The Lancet*, be reviewed by the Executive Committee before its submission in the name of ARRL.

2.5) The Committee next focussed its attention on General Docket 85-113, which proposes to grant primary status in 421 to 430 MHz to land mobile stations operating in Buffalo, NY, Cleveland, OH and Detroit, MI. Though the Amateur Service is secondary in this band, and amateur operation within 75 miles of Canada is to be subject to prior coordination, the Committee believes the proposal is premature at best, since new blocks of frequencies in the 800-MHz range, recently made available for land mobile in these cities, have not yet been occupied. Accordingly, on motion of Mr. Stevens, the staff was directed to file comments in opposition to General Docket 85-113.

2.6) Enhanced privileges for Novice Class licensees—to make Amateur Radio attractive to large numbers of prospective amateurs—was the next topic. It was decided to recommend expansion of the existing 28-MHz Novice band to permit Morse code, RTTY and data up to 1200 bauds in 28.1-28.3 MHz; Morse and single-sideband voice in 28.3-28.5 MHz. (To make this feasible and acceptable, a plan would have to be developed to replace the existing worldwide network of 28-MHz beacons between 28.2 and 28.3 MHz with a single-frequency time-sharing network similar to the one that is being operated successfully on 14.1 MHz by the Northern California DX Foundation.) The League would propose to permit Novice use of all voice and data modes including Morse in the 220-225 MHz band with 25 watts output. Novices would be permitted to use repeaters but not to be control operators or sponsors of these devices. A new addition would permit Novice operation in 1246-1260 MHz with privileges like those suggested for 220 MHz, except power would be limited to 5 watts output because of concerns about inexperienced persons' inadvertent exposure to RF energy at close range. The present rules limiting operators of other license classes to Novice power levels in the Novice bands would be deleted, to avoid reducing the privileges of those operators already licensed to operate in those bands. On motion of Mr. Stevens, it was ordered that a mail vote of all directors be conducted as soon as possible to authorize a petition for rulemaking to FCC setting all this in motion. The Committee was in recess for lunch from 12:20 to 12:45 P.M.

2.7) On motion of Mr. Stevens, the ARRL will file comments in support of the proposal that U.S. amateurs outside the 48 contiguous states (those in the Caribbean) be permitted to use phone in 7075-7100 kHz, as is already possible in Alaska, Hawaii and the Pacific territories (PR Docket 85-104).

2.8) With respect to the Further Notice of Proposed Rulemaking in General Docket 84-902, which proposes alternative frequency relief for the Los Angeles Country Sheriff, the Committee, on motion of Mr. Turnbull, ordered the filing of comments opposing any consideration of 220-225 MHz as one of the alternatives.

2.9) On motion of Mr. Turnbull, the Committee directed the filing of comments in General Docket 85-129, a proposal to allow extremely low power operation in 1.6-10 MHz of field disturbance sensors on a non-interference basis to existing services. (While there appears to be little potential for such devices to interfere with amateurs, the potential for disruption to a security device by a nearby HF station should not be overlooked by FCC or their users.)

3) ARRL Development Manager Bill Lazzaro, N2CF, joined the meeting at 1:30, for a progress report on the development program. Membership campaigns, youth programs, recruiting results and membership projections were among the topics. Mr. Lazzaro departed from the meeting at 2:19 P.M.

4.1) On motion of Mr. Stevens, the Secretary was directed to cast ARRL's vote in favor of the admission of the Association Gabonaise des Radio-Amateurs as the Member Society for Gabon in the International Amateur Radio Union.

At 2:40, the Committee was in recess until 4:45 P.M., to permit attendance at the ARRL Forum of the ARRL Atlantic Division/New York State Convention.

5) A report on local antenna/RFI matters was presented by Counsel Imlay. There was also a brief progress report on the ARRL request for a decree of Federal preemption re amateur antenna structures, PRB1, on which action by FCC is expected in the next few months.

6) Mr. Wilson, as host director, presented a report on plans for the 1985 ARRL National Convention to be held in Louisville, Kentucky, October 4-6.

7) On motion of Mr. Nathanson, the names of 38 newly elected Life Members were recognized, and the Executive Vice President was directed to list their names in *QST*.

8) On motion of Mr. Grauer, the Committee approved the holding of the following ARRL conventions:

West Virginia State	July 6-7, 1985	Weston
Oklahoma State	July 26-28, 1985	Oklahoma City
Northern Florida Section	August 3-4, 1985	Jacksonville
Nebraska State	April 5-6, 1986	Kearney
Michigan State	April 11-12, 1986	Saginaw
Oklahoma State	May 17-18, 1986	Wagoner
West Gulf Division	September 1986	Austin, TX
Dakota Division	September 19-21, 1986	Moorhead, MN/Fargo, ND

9) On motion of Mr. Stevens, the affiliation of the following clubs was approved (Category I unless otherwise noted): Avra Valley Repeater Association, Marana, AZ; Bass Hill Repeater Group, Wilton, ME; East Coast Amateur Television Inc., Melrose,

(continued on page 69)

Conducted By Ellen White, W1YL/4
19620 SW 234 St., Homestead, FL 33031

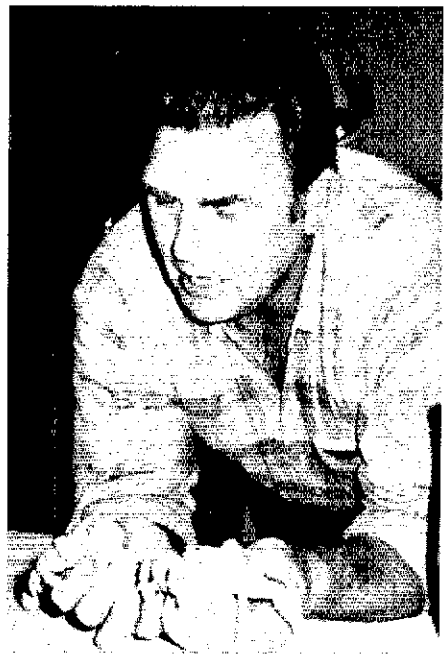
FOØXX/Clipperton '85—In Brief

The cover story for the July 1954 issue of our journal concerned FO8AJ, the very first of several DXpeditions to Clipperton, an island in the East Pacific at 10°N lat, 109°W long belonging to France. Now, 31 years later, we find that the same burning desire to achieve a particular goal was successfully assuaged in April of this year by an international group of superior operators who overcame the disappointments of 1984 and triumphed over extraordinary hazards to provide the excitement of the chase for hams worldwide.

While we await the "official story" (and just as important for some of the faithful, the "official cards!"), we can briefly highlight the six-plus days of operating, which netted nearly 31,000 contacts in 130 different DXCC entities, 160-10 meters—with almost 100 satellite contacts! (Enroute, maritime mobile contacts accounted for an additional 4342 exchanges.) The cost of the operation was approximately $60,000. However, the actual figure would have been much higher but for the active sponsorship of manufacturers and retailers, and very strong primary support from the Northern California DX Foundation (NCDXF).

The problems unique to Clipperton have changed very little from the early '50s. There's no harbor, but there is a very wild surf. The island is surrounded by coral reefs that can slash a body to shreds. Man-eating sharks abound, making it almost impossible to run a boat up to the shore. Some interesting variations were noted, however. The 1954 report warned of wild pigs with tusks that drive men into the surf; while the 1985 expedition was almost eaten alive by pumpkin-colored land crabs and made no mention of the wild swine (see WA7NIN photo).

The initially planned XF4 landing permission specified landing on San Benedicto Island only (so as not to conflict with the planned Mexican DX Club XF4 operation). This proved to be an impossibility—it entailed scaling a 200-ft, sheer cliff! For three days, the ship sat offshore from Clipperton, waiting for appropriate landing conditions. The tensions were unbearable, but the size of the sharks deterred a swimming assault on Clipperton.



The hit of the show at Fresno was WA7NIN with some real, *live* Clipperton denizens.

Clipperton QSO Recap

	160	80	40	20	15	10	OSCAR
CW	287	1225	2800	3895	2584	351	8
Phone	23	3094	2581	8558	4173	1208	90

Random comments by WA7NIN on behalf of the group: "An annoying operating tactic seems to have developed. Obviously the pileups were fierce. But, numerous would-be contactees would give just two letters of the suffix. This meant the operator had to reaffirm who he was working, doubling the time of the contact. Perfectly timed tail endings were superb. And, of course, there was nothing worse than a poorly timed one. Although the group preference was for other than working by call district, the QRM was so fierce that occasionally this tactic had to be used.

"On-the-air queries slowed down the rate (When are you going to 160?). The booby birds and frigate birds are not as nice as their names, and their accuracy is formidable. The land crabs are cute, but are not edible (although they tried to eat the operators!). The heat was high, and so was the humidity. Food was great at the start, but in 3-4 days the crew was down to a survival diet. Boat food was excellent both ways. Being on the island was akin to being in a time warp. The expedition found just two types of flies, the land crabs, frigate and booby birds, and one roach—all without fear of man. The lagoon was nearly dead, although there was some fish in this seemingly closed system.

"A helicopter (from a fishing vessel) landed, providing a few minutes of apprehension. It turned out that one of the 'copter crew was a ham, who brought down ice, cold beer and vegetables. Take equipment that could be considered expendable—water, salt and spray are potent destructors of gear. There were no medical emergencies, except for the intensity of the sun. We used no. 15 sunscreen; without it, an hour in the sun would net almost second-degree burns.

"The basic rigs were ICOM 745s. Good planning led to good packaging, right down to verticals being marked for phone and CW use, making it easy to unpack and set up effectively once landfall was accomplished. Operator styles preferred? Whoever wanted to operate could operate; no preset scheduling was followed."

The first contact took place at 2309Z April 1, and the group departed the island at 1310Z April 13, 1985. The following W6BDN side commentary seems particularly appropriate.

"While tuning the band looking for FOØXX, I came across a likely candidate delivering the appropriate text, tone and tempo. As I waited for verification, the operator yelped, "QRX, QRX, there's a crab crawling up my legs!" No further ID required; *that's* Clipperton!"

Along with you, the reader, we await with great anticipation the official results of Clipperton 1985.

Recapping the Clipperton story at Fresno were (l-r) F9LX, W6OAT, FO8GW, W6RGG.

FIRST WAC

An interesting "extra" to the Fresno DX Convention this past April was a chat with W6TSQ. In the course of conversation, your column editor discovered that Sam earned the very *first* IARU-issued WAC award over a half-century ago, as W2BOZ of the Bronx, New York in 1930. This durable DXer has 345 total overall, with 288

worked on 40 meters, 242 worked on 80, and over 300 apiece on 15 and 20. Oh yes, all of this has been accomplished with dipoles only!

Thanks to the research by N1CIX/JH1VRQ, we also discovered that prior to 1930 the WAC award was issued by ARRL. The first *ARRL-issued* WAC award was awarded to Brandon Wentworth, 6OI, at Stanford University, California, in 1926.

Further details on WAC qualification are available for an s.a.s.e. from the ARRL International Secretariat, Box AAA, Newington, CT 06111, USA. 1985: the 60th Anniversary Year of the International Amateur Radio Union.

THE GRAY ZONE

Signals on 75 meters at my QTH are oftimes on the borderline between reality and illusion. (Is this really the Gray Zone?) A commonly given signal report is S6 and R3. With the noise level at S5 or worse, "readable with considerable difficulty" is a somewhat optimistic report. Nonetheless, contacts are made, reports exchanged, and QSL cards are sent and received.

At the Fresno DX Convention: W6TSQ, holder of the first WAC Award (as W2BOZ) issued over a half-century ago. See text for additional details. *(W1YL photos)*

Under these conditions, I worked Larry, FM5BH, in Martinique. The pileup wasn't too awful, and about every other word was actually understandable. FM7 is the accustomed prefix, but I was *absolutely* sure (well, almost absolutely sure) that he signed FM5. While listening to the pileup and awaiting my opportunity, Larry contacted several stations who were appreciably closer and no doubt more favorably situated. Several of these stations giving him 5 × 9, 5 × 9 + 20 dB, etc. reports addressed him as FM7BH. Surely, they could hear better than I. Was it FM7 and not FM5? Could I be wrong? I listened and listened. By the time he went QRT, I still wasn't 100% sure.

Somehow, I just couldn't send a card to W3HNK with a possibly erroneous call sign. Checking the '84 *Callbook* (my latest), I saw there was an FM7BH. The first name was Laurent. That could be Larry. There were no FM5s. Checking the various available QSL listings didn't produce his call. Checking the *QRZ DX* QSN reports yielded an FM5BH; good omen. I then found a repeat listing. Okay. Whoops, here's an FM7BH??

Finally, I remembered reading something about the new French call signs. Browsing through my collection of ham literature, I found it. Under the new system, the call is clearly FM5! How did those others go wrong? I guess that's Gray Zone DXing.—*Marty Levin, W6BDN*

W6AM a Silent Key

Don Wallace, a ham whose career spanned all that *was* and *is* Amateur Radio, joined the ranks of Silent Keys on May 25, 1985, at the age of 86. From his 6OC operating, beginning in 1912, through his 9ZT and W6AM days, Don represented the epitome of the enthusiastic DXer, as related in this column in August 1981. We'll all miss Don's positive thinking, his dynamic personality and his CW expertise. The loss to all of us is incalculable.

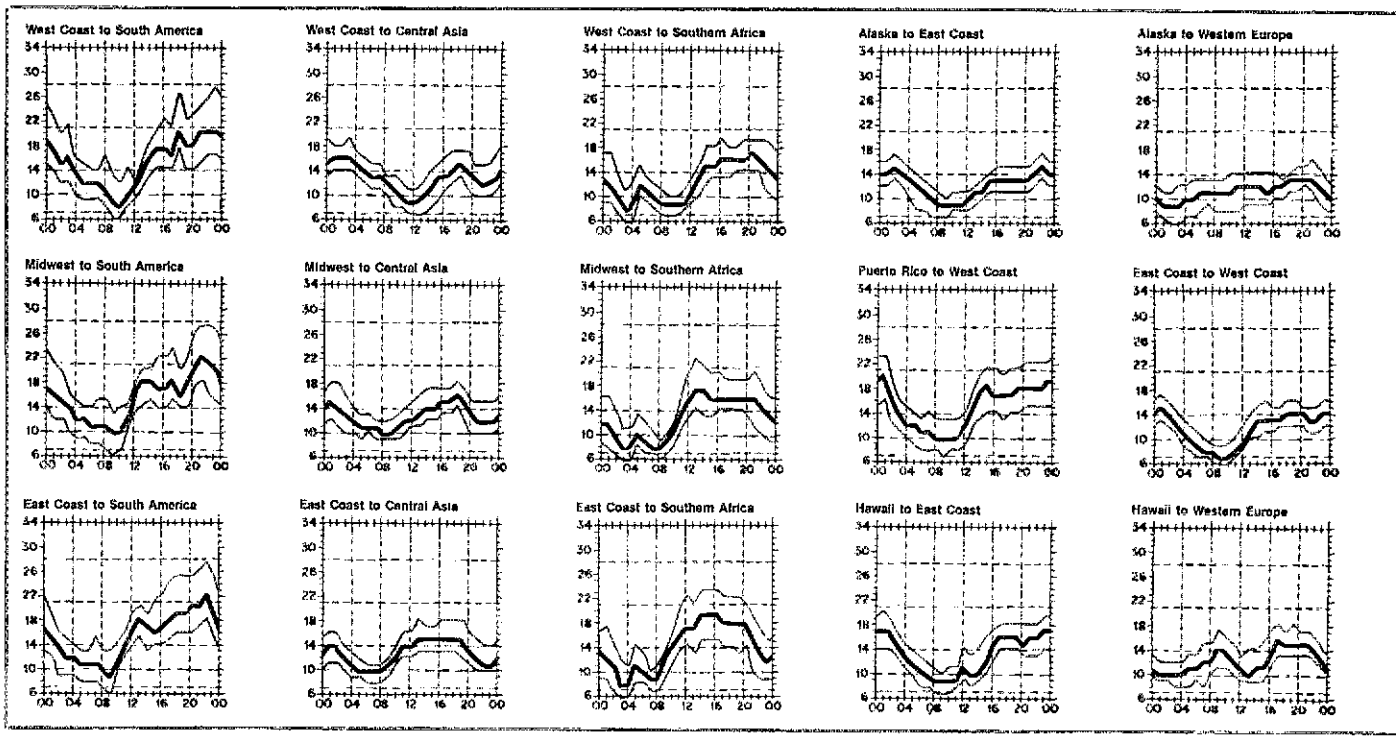
DX ADVISORY COMMITTEE

Who's who on the DXAC? Here they are, by ARRL Division:

Division	*Member*
Atlantic	N2SS
Canada	VE3QA
Central	N9MM
Dakota	WØSFU
Delta	K5OS
Great Lakes	K8DB
Hudson	W2QM
Midwest	WØSR
New England	K1MM
Northwestern	W7GN
Pacific	K6SSJ (Chairman)
Roanoke	W4FRU
Rocky Mountain	NØRR
Southeastern	W4VQ
Southwestern	N6RJ
West Gulf	K5DB

THE CIRCUIT

☐ **YS1UL:** Sad news received from WAØJYJ that Bob, YS1UL, is now a Silent Key after a short illness. Bob was an active DXer and president of the YS DX Club. The club is taking memorials to be donated in Bob's name to the local orphanage. Contributions go to the YS DX Club, P.O. Box 05-43, San Salvador, El Salvador.



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

Troster's Tips for Easy Listening

Be sure you can hear the DX station *before* you start calling. Blind calling works once in a while, but mostly it just creates QRM and advertises the fact that you are a semi-lid. Also, many ops are in there calling because they hear others calling. What happens if the station comes back to *you*? You can't hear him, and he is standing by for you. Maybe you will luck out and work him. More likely, someone will come on and say he is calling you, and you will say something brilliant like "You were 5-9, but someone turned on an electric razor, and now I can't copy you." Perhaps it is all part of the DX game, but wouldn't a good operator really like to hear the station he is working? And, wouldn't it cause less grief and QRM for everyone if you were sure you knew you had the DX station tuned in *before* you began calling? More next month from W6ISQ.

☐ **CEØAA:** Still haven't received your San Felix card? Address your comments to the Radio Club of Chile, Box 700, Santiago de Chile, Chile.

☐ **ON4NC:** Christian notes that the May "How's" coverage of him showed his surname in error. It should read Nolf.

☐ **H-R:** W1ELR writes that it took him 28 years to attain Honor Roll status with low power (90-W input to a homebrew TX). Over his 30-year interest period, he feels that the Hq. Awards Committee and the DX Advisory Committee have conducted the DXCC in the fairest manner possible. Cliff continues to find the chase exciting and rewarding; good operating practice and friendship by and for all—his concept of DX. (This in response to W5DV's tongue-in-cheek March comments in this column.)

☐ **160:** N1ACH reports a very good 160 season, with 30 new ones worked since mid-December. Craig has now achieved Top Band DXCC with 110/126.

☐ **75 Meters:** Something to keep in mind for the next time this band is open, says KDØJL, is relatively recent news that IARU Region 1 has enlarged the DX "window" to cover 3775-3800 kHz.

QSL Corner

Administered By Joanna Hushin, KA1IFO

Here is some information for those of you who would like to QSL direct to the station location or to a QSL manager. It is passed along as we receive it and, therefore, may not be accurate. The call sign in parentheses is the QSL manager.

CE3BYL (WØEFK)
CN8EL (W2PD)
CT2AK (W3HNK)
CT2FH (W4JVU)
CX2CZ (CX2SA)
EL2FJ (JF2QHC)
GBØBRN (G3JWY)
HC1OT (W2KF)
HH2CQ (WD4IKI)
HIØA (W2KF)
HK5ISX (NJ5X)
HR5SB/2 (WBØMZB)
JW5AWD (W6CNA)
J73RM (VE3DFD)
J87J (K4UEE)
ON7TN (KA3IQM)
SW2SY (SV2SV)
TE1W (KE5KK)
YV4DSB (KR2K)
VP2MGD (W2RQ)
VP2VAA (NP2AB)
VP2VEG (WØDVZ)
V2ACW (WB4OSN)
V3C (N5DDY)
ZC4CZ (G4MGQ)
ZF2HI (KZ2E)
ZV9ZZ (PY5IW)
3B8FP (IK8DYD)
4S7NMR (KZ8Y)
5B4LP (KA3FIB)
5H3HM (VE5VJ)
5T5RY (F6FNU)
5W1EJ (WØWP)
5X5BD (DJ6SI)
7X2CR (ISØLYN)
8P6JQ (W8NCJ)
8Q7AZ (KZ8Y)
9Z4F (VE7RW)

QSL Manager Volunteers

KA3DSW
WA2MBQ
KA3LNN
AC2F
WA2YMX

Special Notes

☐ KZ8Y is not manager for 4S7ZHR.

☐ W1KDD is not manager for P42J.

☐ SU1XJ is a pirate.

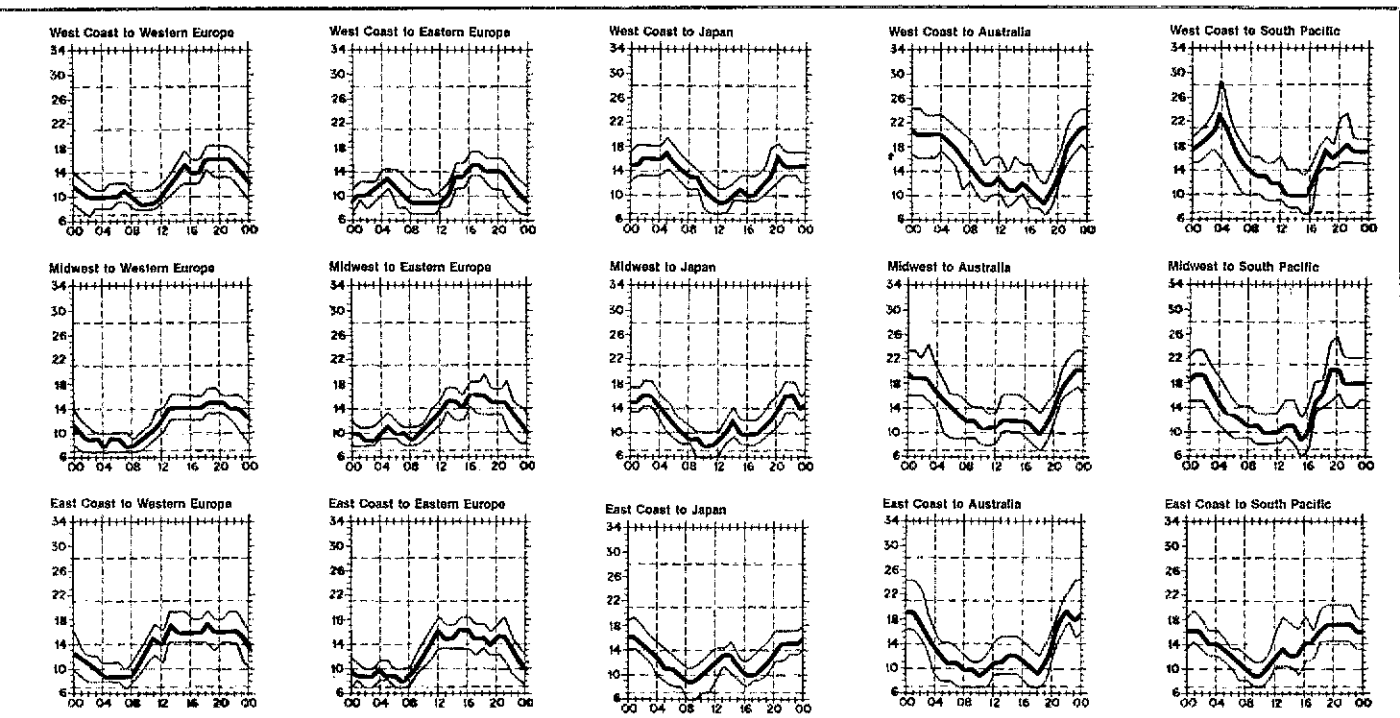
☐ The new address for the Radio Amateur Association of Greece is P.O. Box 3564, Athens Central, Greece.

☐ QSL Corner, June 1985 *QST*, page 55, contains information and addresses for ARRL Incoming Bureaus. QSL Corner, March 1985 *QST*, page 61, contains information on the operation of the ARRL Outgoing Overseas QSL Service. For additional information on bureau operations (Incoming and Outgoing), send an s.a.s.e. to ARRL QSL Bureau, 225 Main St., Newington, CT 06111.

Helpful Information

All QSLs for NG84O, the official Los Angeles Olympics station, have been mailed to those who provided an s.a.s.e. or s.a.e./IRC. Remaining cards are enroute to bureaus. Logs are in the possession of K6LAE, Dick Mannheimer, 650 Westholme Ave., Los Angeles, CA 90024. Dick also has a large supply of blank cards on hand.

Please note that printer-damaged cards were mailed inadvertently. Replacements can be obtained by returning the faulty card or providing call, time, date and band to K6LAE with an s.a.s.e. Please do not send to NG84O. Mny tnx.—*NG84O*



the lowest curve (optimum traffic frequency, or FOT). See April 1983 *QST*, page 63, January 1977 *QST*, page 58, September 1977 *QST*, page 35, and January 1979 *QST*, page 11, for a complete explanation. The horizontal axis shows Coordinated Universal Time (UTC); the vertical axis, frequency in MHz. Data are provided by the Institute for Telecommunication Sciences, Boulder, Colorado. These predictions, for July 15 to August 15, 1985, assume a sunspot number of 22, which corresponds to a 2800-MHz solar flux of 80.

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 April 1 through April 30, 1985. An s.a.s.e will bring you the rules and application forms for participation in the DXCC program.

New Members

Mixed

DKØAK/101 HC2FN/106 JK1UNZ/108 JA3VOT/177 SP7EWL/105 5T5RY/119 W3FGS/106 K5PG/108 K8MNG/185
DL6MAW/100 I5UNA/206 JO1BMV/154 JHØEVL/109 VK6AHI/100 AD1S/KH5/101 AA4H/303 K6EW/100 KX8A/106
DLØBO/104 JM1SZS/109 JA2MNB/215 JAØHXV/109 XE1JCL/161 KA1JKM/100 KA4AXS/101 N6IBP/109 NA8L/125
EA5CHT/118 JH1MFN/106 JF2UOP/114 OE5KE/244 YU2ZZ/110 KA1PE/105 KC4OP/209 W6ZQK/111 KY9P/102
FG7CB/FS/119 JH1OVY/170 JI2UDK/106 OK3WW/259 YU3DX/219 N2WK/103 KE4NG/163 N7CFG/100 WB9TFJ/106
HA5HH/112 JH1QDB/109 JA3RRN/288 OY6FRA/124 YU7BJ/242 KB3J/120 N4FKZ/IØ/124 W7DK/109 WB9VLV/107
HB9CMM/126

Radiotelephone

CP8IH/110 EA7DTY/132 JA2MNB/203 OK3WW/190 PY3WW/148 5T5RY/118 K3BEQ/201 KE4SQ/119 W8MLK/150
CX1AW/126 FG7CB/FS/116 JA3RRN/211 OX3KM/101 PZ5ES/110 6Y5KG/100 KK3W/130 N4FKZ/IØ/115 WA8OLM/101
EA5AEN/107 I2OGC/130 JA3VOT/177 OZ1AUW/110 VE3NUP/110 AK1L/251 W3UM/272 W4DGH/106 WB9TFJ/106
EA5CHT/113 IT9HLO/311 LU4DM/106 PA3DEY/110 VE6VW/212 KB1AY/102 AA4H/219 W4JZA/103 KAØEDE/102
EA5DHE/157 JO1BMV/118 OE3IPW/130 PY3JC/249 XE1JCL/161 K2HMY/101 K4KST/102

CW

DF4XG/108 G4LKM/109 JO1BMV/128 PY1QN/108 W1GNR/252 AA4H/110 N6IBP/102 WA7HCE/104 KU9C/100
DK7HP/113 HB9QM/202 JH6HSW/110 SMØHEP/139 KB3J/108 K4ZIN/100 NQ6U/100 W8IRT/108 KY9P/100
DL6MAW/100 I5UNA/184 OK3WW/221 VE3MWX/187 N3AQQ/171 WI4E/100 WE6V/119 W8UAB/101 N9EJL/104
G3RDU/103 JH1OVY/170 PA3CKO/153 ZS2WV/118 W3UM/199 K6MBV/100

RTTY

CE3CEW/102 YU2OH/102 KT1N/100 W1DA/100 W2JGR/103

160 Meters

KA1PE/105 W2OKM/101 W5TO/101 W8ILC/101 WØZV/100

5BDXCC

VO1CV KO1R F6FHO K3TZV LU8EKC UK2GDZ W9NUF NE8R VE5YA
N8BJQ ZL4OD K9FD OE5KE 8P6OV KC8PG K1IU K5JUC OK3WW
W1GNR KB8KW JA3FYC W9IU KC8YM SP2FAP WB8RJX RZ3DX W1VKQ
UD6CN W9WAQ YU3AN UK2FAA W4FX KC8EU

Endorsement

Mixed

A71AD/294 JJ1DWT/302 SMØKV/352 KA1KD/251 KI3L/294 WB4CSK/260 KM6B/316 KA8CMR/166 KG9Z/213
DK4DC/200 JH1BSR/295 SP6RT/332 KB1HY/155 KO3N/227 WB4KRH/294 NQ6U/131 KB8BS/307 KQ9O/176
DK8AX/289 JA2APA/315 SV1IW/295 W1DGC/302 W3ACE/317 WI4E/131 W6ALQ/262 KB8LH/288 N9EJL/184
DL1NP/154 JI2MBN/180 VE2DPJ/259 W1ENE/307 W3UJ/309 WW4J/161 W6BL/240 KC8MK/146 N9OK/303
DL7MAE/295 JJ3AFV/240 VE3BHZ/307 W1GDQ/325 WA3JLD/176 K5EE/294 W6KFV/290 KV8Y/289 N9RF/301
DL8UI/322 JA4ESR/250 VE3DR/309 W1NH/265 AA4AM/207 K5GKC/233 W6NLG/302 N8ATR/276 W9DH/337
DL9GAU/136 JA5AUC/311 VE3JGC/W4/200 W1OGZ/183 K4CNW/290 K5RSG/307 W6PN/340 N8CQA/136 W9FR/321
DL9TJ/300 JA5NG/297 VE3MV/302 W1PNR/295 K4IBP/309 K5YY/339 W6TC/326 N8FUL/125 W9HLY/347
EA3DBO/134 JH5FQO/282 VE4AS/318 W1WEF/300 K4PR/288 KE5AX/290 WB6DXU/325 W8ANM/251 W9MYG/290
EA8IR/188 KL7KJ/252 VE4MT/153 W1XK/238 K4PT/265 KU5I/250 WB6WKM/280 W8LKG/303 W9NX/128
EL2AM/227 KP4AZ/290 VE6VW/220 WA1NSJ/266 K4TO/328 N5FW/316 K7RS/255 WA8FCH/135 W9OKL/290
F2GL/317 KP4EQF/308 VE7DX/307 K2HPV/130 K4ZIN/228 W5GC/344 K7ZR/326 WA8IMO/215 WA9BXB/175
F3AT/352 LA8PF/260 VE7ML/274 K21BW/250 KB4HF/230 W5MCH/203 KX7J/272 WB8KFG/276 WB9ZNB/201
F8RU/335 NL7P/282 XE1VIC/249 KA2CFH/218 KC4ZH/250 W5ODD/289 W7CUS/227 WB8LFO/275 KØRQF/290
G3KDB/328 OZ5CV/296 YU2AKU/309 KB2HZ/300 KN4F/250 W5TZN/225 W7FP/315 WB8RJX/304 KØTLM/280
G4GIR/280 OZ9PP/319 YU3LF/250 KV2Y/280 N4IB/291 W5WF/147 W7GUR/311 WB8WZT/201 KCØDA/225
HB9AHL/320 PY3EM/283 YV5DFI/327 KW2P/306 NF4A/325 W5YU/328 W7NCO/332 AG9S/285 KDØJL/154
HB9NU/301 PY3ZZ/208 4X4UH/290 KY2D/135 NQ4T/161 WA5IPS/250 W7QN/194 K9AWK/336 KGØE/290
HK3YH/280 PY4DD/280 4Z4XW/174 W2AXZ/290 W4NM/125 WB5MJK/200 WA7CGR/232 K9IW/308 KKØC/303
HZ1AB/314 PP5YC/318 AB1U/300 WA2AOG/252 W4NZR/200 WB5PLD/269 WB7CLU/301 K9JF/330 N0DJJ/152
I2ZZZ/327 PY7ZZ/324 AE1T/259 WB2ELV/207 W4PRX/295 K6DR/248 K8NA/317 K9ZO/310 N0EL/321
I7WL/333 SM4JSF/134 K1AP/307 AF3E/323 W4RNP/310 K6LQA/329 K8OXB/289 KA9FYZ/175 W0CD/312
I7ZPB/344 SM6CTQ/320 K1NLQ/258 K3BEQ/301 W4WXZ/300 N6VR/319 K8ZTT/292 KB9VF/261 WA0IDK/312
IKØAZG/229 SM6CVX/333 K1VR/318 KA3DDT/261 W4YKH/322 NG6W/267 KA8ANQ/201 KC9JH/244 WBØYJT/150
JA1RLV/316 SMØHEP/239 KA1A/278

Radiotelephone

A71AD/294 I1XA/285 SM6CTQ/304 K1NLQ/252 KI3L/282 K5GKC/226 W6KFV/131 KB8LH/285 AG9S/283
CT2FH/154 I2ADN/222 SMØHEP/233 KA1ION/124 KO3J/226 K5RSG/293 W6NGZ/125 KC8MK/146 K9IW/303
DF7QD/249 IKØAZG/224 SV1IW/287 N1AIS/178 W3ACE/313 KC5ZA/205 W6ORD/305 KV8Y/286 K9JF/293
DK5BH/301 JH1BSR/295 VE3CKP/296 N1CWB/125 WB3GOP/300 N5FW/303 WB6VIN/259 N8ATR/276 K9JSK/126
DK8AX/284 JJ1DWT/293 VE3MV/302 W1ENE/283 AA4AM/199 NI5D/146 W7FP/315 N8BGE/225 KC9ZZ/128
DL7MAE/278 JA2APA/315 VE7DX/296 W1PNR/295 K4PR/252 W5GC/344 W7GUR/305 N8BSB/202 KU9I/310
DL8UI/319 JA5NG/281 VE7ML/264 W1VKQ/311 K4TO/312 W5ODD/208 W7LZG/159 W8ANM/251 KV9V/151
EA3TT/317 JH5FQO/282 XE1VIC/249 W1WS/225 KC4ST/250 W5YU/327 W7PLK/167 W8GG/220 N9EJL/159
EA7EU/239 KL7KJ/246 YC3BRY/150 WA1NSJ/251 KC4ZH/250 WB5CBJ/300 W7QN/154 W8PCA/311 W9DH/325
EL2AM/227 NL7P/277 YS9HH/125 AC2J/199 KN4F/227 WD5JFM/231 WB7CLU/300 WA8IMO/215 W9OKL/290
F3DE/157 OE1PC/306 YV5DFI/327 K21BW/235 KT4P/301 K6EID/300 WB7WQE/248 WB8KFG/276 W9ZGP/202
F8RU/335 OZ8EA/254 ZL1ARY/331 K2YIY/317 W4KHL/174 K6RNI/306 K8CW/310 WB8LFO/275 KØTLM/275
G4GIR/252 PP5YC/315 ZP5MJO/246 KB2BC/175 WA4IAX/175 K6TEH/177 K8NA/314 WB8WZT/186 W0PT/304
G4HLS/134 PY2OB/307 ZS6JM/354 KV2Y/268 WA4TJW/123 KM6B/314 K8WOW/259 WD8NMV/259 W0UQD/322
HB9NU/301 PY3CM/200 5B4MF/187 W2YTO/300 WB4VQO/255 N6NA/342 K8ZTT/281 WD8NNB/134 WAØGUD/250
HK3YH/262 PY3EM/277 AB1U/258 WA2AOG/208 WD4AIE/202 NG6W/233 KB8BS/304 WD8PUG/289 WD8AWL/294
I1FNX/313 SM5VS/300

CW

DL7MAE/264 JA1UQP/280 JA6BSM/305 K1AP/211 KI3L/260 W4WJ/300 N6VR/254 K7ZR/294 K8ZTT/204
DL9TJ/228 JE1JKL/300 PA3DBG/157 K1TG/176 K4PR/157 K5EE/277 W6MND/127 W7KZK/144 WA8YTM/175
EA8IR/132 JJ1DWT/214 SM6CNX/158 W1FZ/302 KC4HN/149 N5FW/288 W6OB/203 K8CW/308 K9BIL/251
G3KDB/271 JJ3AFV/204 SM6CTQ/268 W1OGZ/178 N4AVB/135 W5ODD/263 W6TC/304 K8QXB/250 K9IW/296
G4GIR/206 JA4ESR/197 VE7DX/207 K2HPV/125 W4MPY/259 K6EID/156 W6TVP/175 KB8BS/228 W0PT/260
IK1CJT/158 JA5AUC/251 AB1U/178 AF3E/152

160 Meters

HB9AMO/126 K1MM/150 K2UU/128 WØCD/127

5BDXCC Award

Effective July 1, 1985, the cost for the 5BDXCC plaque will be $25. This reflects the increase in the price of recently ordered plaques.

Satellite DXCC

Contacts made via AMSAT-OSCAR 10 will be accepted for the Satellite DXCC Award. A recent change in DXCC rule 1(f) removes the requirement that contacts be made through polar sun-synchronous satellites of altitudes less than 1500 miles. Credit is retroactive. The Satellite DXCC certificate is a non-endorsable, one-time-only award. Applicants must submit forms CD-164 and CD-253. Forms are available from ARRL Hq. for a business sized s.a.s.e with 44 cents postage.

Correspondence

Conducted By Bruce Kampe, WA1POI
Information Services Assistant

THE TECH/GENERAL LICENSE MANUAL

☐ I have been teaching ham radio class for 14 years; seven of those years have been here at the local college. Over 700 hams have graduated from my class. I have just reviewed the *Technical/General Class License Manual.* I like it! It will be used for a textbook in my class.—*Wilse G. Morgan, KL7CQ, Anchorage, Alaska*

☐ I just purchased your new *Technical/General Class License Manual.* I am sure with its help I can upgrade shortly.

If the final exam is anything like the questions in your manual, it should not be too bad. I was looking for more details in Chapters 1 through 9, but since I have other technical books it should be no problem. Your *License Manual* is an excellent preparation guide. Overall, you have done an excellent job.—*Alex Hougasian, KA3HFO, Neola, Pennsylvania*

☐ Someone sure put a lot of work into the *Technician/General Class License Manual.* We Novices appreciate it.—*Norm Barber, KA7UIM, Sumner, Washington*

SPLATTER

☐ Reading this section in April 1985 *QST,* I came to see the letter of Jefferey Breitner, KA8NCR, regarding the high power in use by hams.

I would like to point out to Mr. Breitner, that *power in itself does not cause splatter.* It is very easy to recognize and correct a splattering transmitter, whether it has an amplifier or not. You do this by checking an oscilloscope as the microphone level is increased. When you start seeing flat-topping in the oscilloscope signal, this is when splattering begins. So, at this point, you lower the mike gain one step, and you will still have 100-percent modulation without splattering.

I have been a ham radio operator for 32 years with licenses from four countries: Cuba, CM5MD; Nicaragua, YN1JMD; Brazil, PY7JD; and the USA, PY7JD/W4 and KB4GVB. In all those years I have learned many good and bad things about transmitting techniques. You can have a 1-kW amplifier and cause no splatter; on the other hand, you can have a 100-W transmitter and splatter all over the band.—*Jose M. Delgado, PY7JD/W4, Hialeah, Florida*

☐ The letter from KA8NCR (April issue) is the latest in a long series of equally ill-founded proposals to punish transgressors by penalizing those who obey the rules. Any regulation that limits power output will promptly be flouted by the inveterate violators, and the only ones affected will be the law abiding.

Has the FCC ban on 10-meter amplifiers resulted in any marked reduction in their illegal use in the 27-MHz range? Of course not. All it has done is to deprive amateurs of one of their privileges. So it is with all such misguided efforts.

As to his suggestion about the 3-500 Z's, I should have thought that every amateur knew that that ancient instrument of torture, the dreaded Wouff Hong, is a far more efficient instrument with which to administer such punishment.—*David Mann, K2AGZ, Kinnelon, New Jersey*

CW AT THE BOTTOM OF THE SEA

☐ While standing watch on board a U.S. nuclear submarine submerged in the Atlantic last year, I had a unique experience I thought many readers might enjoy.

I was "manning the phones," or wearing a sound-powered headset, in one of the compartments one night. While playing with the push-to-talk button, I noticed that the running machinery around me produced an audible hiss on the circuit. Out of boredom and a longing for my radio many miles away, I started depressing the button to send "Morse code" with the hissing sound. I called "CQ CQ CQ DE KR2K K" several times. After the last CQ I heard, much to my surprise and pleasure, "KR2K DE KA1JLQ KN." It seems my friend Dave at the other end of the submarine had heard my CQ and answered for the first underwater phone circuit QSO. It soon caught on and several other hams on board started doing the same. Can I now start working for my WAC award: "Worked All Compartments"?—*MM1(ss) Robert Vandevender II, KR2K/1, Kittery, Maine*

SHUTTLE AUDIO

☐ I just want to send a note in appreciation of the WA3NAN Goddard ARC for their efforts on the retransmission of the Space Shuttle audio for the April/May flight. Since it appears that the news agencies do not feel the Shuttle is worthy of their efforts, only with the efforts of groups like the Goddard ARC are people interested in NASA activities able to "keep in touch" with what is happening.

Listening to the transmissions, I felt as if it was 1969 again, and we were on our way to the moon! A big, hearty thank you to all involved!—*Russell A. Grokett, Jr., WA4EFH, Orange Park, Florida*

NEW *QST* FORMAT

☐ I cannot tell you how happy I am with the new format in the current issue of *QST.* For the first time in many years, I enjoyed reading the articles. That is not to say that I did not enjoy reading previous material, but my ability to read the new type size and layout with ease and little eye strain is the basis for my comment.

Thanks again, and I am certain that my thanks are shared by many other oldtimers.—*W. D. Rollick, W4IGE, Sharpsburg, Georgia*

HAM SCOUTS

☐ In July, the Boy Scouts of America will hold a National Jamboree at Camp A. P. Hill, Virginia. Ham radio will play a part in that event. Activity with the Boy Scouts gives us a perfect opportunity to sow seeds for growth. I ask you to encourage all hams to extend that extra personality in demonstration QSOs with the Scouts. Following the Jamboree, seek out local youth activities to "show off" our interesting hobby. Many of us began Amateur Radio because of Scouts. The Scouts used to require Morse code proficiency for advancement! Now there are a wide variety of "technical" challenges to balance the outdoor program. To compete, Amateur Radio needs to spark interest, which only amateurs can supply. Let's reach out. Be interested and show an attractive vitality to encourage new growth.—*Lary Eichel, K2NA, Fairfax, Virginia*

[Editor's note: Listen for K2BSA on all HF bands between July 24 and 30th. A special QSL card will be sent to all stations submitting an s.a.s.e.]

STANDARD PHONETICS

☐ With the exception of being told "your license has expired" there are probably no more devastating words for an active DXer to receive than "Sorry, but you're not in the log!" after seeking a QSL. This is especially true when the contact represents one from the "ten most needed" list.

Luckily, I've been spared this disappointment, thanks to the use of the standard phonetics when giving my call sign. Thinking back to the recent San Felix expedition, I wonder how many amateurs might have "outsmarted" themselves by using words and phrases that are so easily lost in translation. While the use of standard phonetics was emphasized, and since the operators were very limited in their understanding of English, I was amazed to hear some of the phonetics that were being used. One very common word used by many stateside stations was "Spain" for the letter "S." One of my Spanish speaking friends alerted me of the fact that, to the Latin American ear, "Spain" is quickly interpreted as "España," and in the heat of a DX pile-up or the quickness of a one-time shot from a long list, the letter "E" goes into the logbook never to be matched when the QSL cards are prepared! I'm sure there are many other examples like this. So, let me make the time-worn plea: "Standard phonetics only!" If the call happens to be XXXUSA, better to use "Uniform, Sierra, Alfa" rather than "United States of America," or it might end up as "Estados Unidos de America." EUA? "Sorry, but you're not in the log!"—*Billy N. Stokes, KI4EW, Staunton, Virginia*

[Editor's Note: Spanish phonetics are in the References chapter of *The ARRL Operating Manual.*]

PERSONAL REPLY

☐ Personal letters were written to five editors of Amateur Radio publications as the expirations were near, explaining why I would *not* renew my subscriptions. My reason was that illegal incidental radiation has obliterated the HF amateur bands. Not one word was received from the editors—except a personal letter from *QST* advising as to what steps are to be taken. Only *QST* will be renewed. —*Allen H. Johnston, W4FII, Myrtle Beach, South Carolina*

Canadian NewsFronts

Conducted By Harry MacLean, VE3GRO
163 Meridene Crescent West,
London, ON N5X 1G3, Tel. 519-433-1198

On the Kruzenshtern

One year ago last month, Claude Brunet, VE2ZZ, of Trois-Rivieres, Quebec, had an experience he won't easily forget. The Tall Ships were on their way to help Quebec celebrate the 450th anniversary of the explorer Jacques Cartier's first visit to Canada. Somehow, a Radio-Canada news team had wrangled an invitation to go aboard the Soviet Tall Ship *Kruzenshtern*. Now they were looking for a radio amateur to provide a link between themselves and their people back on shore. Could Claude gather up his radio gear and meet the *Kruzenshtern* off the Gaspe Peninsula, some 550 miles away? Tomorrow? Claude said yes.

The *Kruzenshtern* turned out to be 375 feet long and 46 feet wide—definitely no small ship. Originally named the *Padua*, it was built by the Germans in 1926. After World War II, it was given to the Soviets, who used it for oceanographic work and, later, for training sea cadets.

Off the Gaspe, despite strong winds and heavy seas, Claude managed to get his gear aboard. He was allowed to set up his station in an unused classroom just behind the captain's quarters. Ship's power turned out to be 230 volts. Luckily, Claude had brought a converter. Then came the problem of antennas.

Claude Brunet, VE2ZZ, aboard the Soviet ship *Kruzenshtern*.

Somehow, they were strung among the four masts, the rigging and the 36,600 square feet of canvas that moved the ship along.

During the next six days, the *Kruzenshtern* headed up the St. Lawrence River to Quebec City. Claude operated 16 hours a day, sometimes on 80 or 40 metres and sometimes on 2 metres through Quebec's extensive linked repeater system. DOC had given Claude special permission to relay stories and news reports written by Radio-Canada people onboard ship for the Radio-Canada people back on shore. The stories and reports were recorded right off the amateur bands and replayed on commercial broadcast stations throughout Quebec. Of course, it was all outstanding publicity for Amateur Radio.

What does Claude remember most about his experience? The food on board the Soviet ship. No caviar, and definitely no vodka to wash things down, not even after a hard days' operating. The *Kruzenshtern*, with its 200 young sea cadets aboard, was a dry ship!

CRRL ELECTION NOTICE

Who decides what CRRL, the Canadian Radio Relay League, Inc., will do or not do? You do. As a Full member, you choose the people that represent you on the CRRL Board, the people who will determine the direction that CRRL will take.

The CRRL Board has seven members. Five members, CRRL Regional Directors, are elected on a geographic basis in even-numbered years. The other two members, the CRRL President and CRRL Vice President, are elected at large in odd-numbered years.

This fall, CRRL members will choose a President and Vice President to represent their interests on the CRRL Board for a two-year term that begins on January 1, 1986. Under CRRL By-laws, candidates for CRRL President and Vice President must (1) reside in Canada, (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. Further information can be found in the CRRL By-Laws, available on request.[1]

Nominating petitions, to be valid, must carry the signatures of 10 or more Full Members of the League residing in Canada. It is advisable to have more than 10 signatures. Photocopied signatures are not acceptable. Signatures must be on the petition.

Petition forms are available from the CRRL Headquarters office in London, Ontario, but are not required. The following form is suggested:

(Place and date)

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

We, the undersigned Full members of CRRL, the Canadian Radio Relay League, Inc., hereby nominate ... (name and call) as candidate for CRRL ... (President or Vice President) for the next two-year term of office.
(Signatures ... Calls ... Addresses with postal codes ...)

Nominations close at noon EDT August 20, 1985. Eligibility of candidates will be determined shortly after that. If only one eligible candidate is nominated for an office, that candidate will be declared elected. If more than one eligible candidate is nominated for an office, a balloted election will take place. On or before October 1, 1985, the CRRL Assistant Secretary will send ballots to all those who were Full members of CRRL on September 1, 1985. The ballots will carry a copy of the CRRL By-laws that govern the election and candidates' statements, up to 250 words in length. Marked ballots will be accepted at the CRRL Headquarters office in London, Ontario, until noon EST November 20, 1985, and be counted shortly after that. Results will be announced on W1AW, through the *CRRL News* bulletins and in *QST*.

The next two years will be important for CRRL. CRRL will need the best possible leadership. You are urged to take the initiative and file a nominating petition immediately.
B. Robert Benson, Q.C., VE2VW
CRRL Counsel and Assistant Secretary

[1]Under ARRL By-laws, the CRRL President automatically becomes the ARRL Canadian Director and the CRRL Vice President automatically becomes the ARRL Canadian Vice Director. Thus, these elections also determine who will represent CRRL members on the ARRL Board.

ONTARIO AMATEUR SUED

In what is believed to be the first case of its kind in Canada, an amateur is being sued for allegedly interfering with nonradio equipment. Jack Ravenscroft, VE3SR, of Kanata, Ontario, was served with a $35,000 suit after a neighbour complained that Jack's 20-metre transmissions repeatedly turned on a microwave oven and spoiled the sound from an electronic organ. Most amateurs believe that if this were to happen to them, they would be adequately protected by the law. This view is naive. There is always the possibility that an unsympathetic judge, unfamiliar with appropriate precedents or with Amateur Radio, could rule against an amateur. This would lead to costly appeals and an uncertain outcome.

It is very important that Jack not lose this case. A loss could open the way for others, anywhere in Canada, to take similar action against amateurs. CRRL Counsel Bob Benson, Q.C., VE2VW, did supply legal background for the case, and CRRL Ontario Director Ray Perrin, VE3FN, did file an affidavit in Jack's favour. However, to ensure a win, what Jack really needs is several thousand dollars to cover his legal costs. Unfortunately, no Canadian amateur organization, not even CRRL, is in a position to cover these costs. But *you* can help. Three Ottawa amateurs headed by Ralph Cameron, VE3BBM, have started a Jack Ravenscroft RF Susceptibility Defence Fund. Please send your donation to the fund in care of Ottawa Amateur Radio Club, Box 8873, Ottawa, ON K1G 3J3.

DOC NEWS

☐ DOC has informed CRRL of a new reciprocal-operating agreement with 9Y, Trinidad and Tobago. The agreement took effect on April 1.

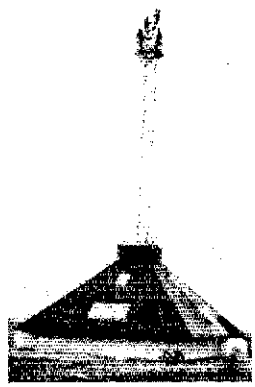
IARU News

Conducted By Richard L. Baldwin, W1RU
President, IARU

YU4EZC, YUGOSLAVIA

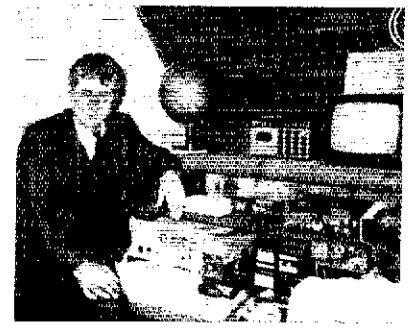
The Zenica Radio Club, YU4EZC, has some 800 members, 200 of whom are active in the three areas of HF/ VHF—direction finding, microcomputers and the construction of amateur gear. The other 600 members are students and SWLs.

In April, we visited their new $40,000 clubhouse, which had been open for just a week prior to our arrival. It was financed with contributions from the town, which supports the club because of its educational activities, and through funds raised by the club. The club earns some income from giving certain technical courses for which fees are charged and earns other income by having some of its members act as consultants to various electronics enterprises in the area. The clubhouse is to be used as the headquarters for contest operation and for experiments in meteor scatter and moonbounce.



The clubhouse and integral tower of YU4EZC. The building was especially designed for the club by a local architect, and provides not only radio operating space, but also a lounge, kitchen and dormitory sleeping area. It's located on high ground with a commanding view of the countryside.

The operating position at YU4EZC, with IARU Region 1 Chairman PAØLOU (seated) and YU7NQM, a member of the Region 1 Executive Committee, looking over his shoulder.



Here's the rest of the YU4EZC operating position, with Zenica Radio Club President YU4VSB.

ASIA TELECOM '85

One of the things IARU tries to do is keep IARU visible at conferences and other international meetings where there may be individuals who make some of the decisions at ITU conferences that affect us. Such a meeting was Asia Telecom '85. Held in Singapore during May, this conference was a series of forum discussions and equipment exhibitions relating to various exotic methods of modern communication. The IARU exhibit at the Asia Telecom was organized by David Rankin, 9V1RH, IARU Region 3 chairman, with considerable help from Colin Richards, 9M2CR, and members of the Singapore Amateur Radio Transmitting Society. Hundreds of visitors had an opportunity to watch an AMTOR setup in operation, as 9V1ITU had numerous QSOs with Japan, Australia and Indonesia.

Among the many distinguished visitors to the IARU stand at Asia Telecom '85 was ITU Secretary General Richard E. Butler, with whom we have the most cordial relations. *(W1RU photo)*

This is well-known DXer OH2NB, who is this year celebrating his 80th birthday. He is the Grand Old Man of Finnish Amateur Radio, having been on the air since 1922. The first Finn to make DXCC and to be a member of the DXCC Honor Roll, he served as president of SRAL, the League of Radio Amateurs in Finland. Under his leadership, many new achievements for Amateur Radio in Finland were realized. In recognition of his long service to Amateur Radio, in February of this year he was made Honorary President of SRAL. Congratulations, OH2NB!

KARL CELEBRATES ITS 30th

The 30th anniversary ceremony of the Korean Amateur Radio League was held April 28 in Seoul, with the attendance of several honored guests including Director General Park and Immediate Past Director General Lee of the Korean Radio Regulatory Bureau and JARL President Shozo Hara JA1AN. During the ceremony, Director General Park presented Mr. Hara with a letter of appreciation signed by Minister Lee Ja-Hon of the Ministry of Communications in recognition of "his outstanding contribution to promoting friendly relations between the Republic of Korea and Japan through his efforts to expand radio contacts, exchange of visits, and technical cooperation between radio amateurs of the two countries."

JA1AN receives a letter of appreciation from Director General Park of the Korean Radio Regulatory Bureau.

On Line

Conducted By Stan Horzepa, WA1LOU
75 Kreger Dr., Wolcott, CT 06716
CompuServe ID no. 70645,247

Software Previews

The quantity of software for Amateur Radio applications continues to grow. Major software products receive publicity in new-product announcements and product reviews in the various ham radio periodicals, so there is no point in telling you about Doctor DX here. Instead, I will preview four software packages written by some ham radio entrepreneurs. Working out of their garages, these hams cannot afford much advertising and will not get much publicity, so this is their day in the sun.

HAMCOM

HAMCOM is an IBM® PC CW and RTTY program that sends and receives Morse code at 1 to 100 WPM; Baudot at 60, 66, 75 and 100 WPM; and ASCII at any baud rate, word length, parity and number of stop bits. The program also provides code practice.

Split screens for transmit and received text, in any user-selectable ratio, are provided along with a reverse video status line. High-capacity, type-ahead buffers are available, and both received and transmitted text can be saved to disk and/or printed. Files can be transmitted from disk as well.

HAMCOM is available on diskette, and requires a radio modem and an IBM PC with PC DOS 1.1, 64 kbytes of RAM, a serial port and a double-sided disk drive. For more information, send an s.a.s.e. to Emile Alline, NE5S, 773 Rosa Ave., Metairie, LA 70005.

RTTY/ASCII/CW Software Package

Use your TRS-80® Model I, III or 4 to transmit and receive Baudot, ASCII and Morse code with this software package. This machine-language program is compatible with all popular radio modems, and operates at Baudot and ASCII data rates of 45.5, 50, 57, 74.2, 75, 100, 110, 134.5, 150, 300 and 600 bauds. Morse can be sent and received between 5 and 125 WPM. Random code practice is also available.

The program has many features, including status line and split-screen display of transmit and received text. A SELCALL monitor and SELCALL WRU permits hands-off operation. The user may compose or insert text into the transmit buffer while in the receive mode. A keyboard type-ahead buffer is independent of the other transmit buffers. Three modes of transmission are available: transmit as you type, transmit a word after the spacebar is pressed, and transmit a complete line after the enter key is pressed.

The program is available on cassette (requiring 32 kbytes of RAM and Level II BASIC) or diskette (requiring 48 kbytes of RAM and a disk drive) from Clifton J. Turner, Jr., WB5KCQ, 6319 Boeuf Trace, Alexandria, LA 71301.

The Contester

The Contester turns a Commodore 64® computer into a CW contest machine. This BASIC program logs and dupes each contest QSO, and generates CW from the computer keyboard via a one-IC, one-transistor interface connected to a transmitter. The Contester can log and dupe 3000 QSOs for contests in which you can work a station once in a contest, or 1000 QSOs per band (for as many as six bands) for contests in which you can work the same station on each band. CW may be sent at 5 to 50 WPM. Fifteen standard contest messages may be sent via a single keystroke, and messages may be programmed to suit each contest format.

I used the TRS-80 Model 100 version of The Contester and can attest to its quality; the quality of the Commodore 64 version is probably similar. The program is available on diskette and includes the schematic for the interface. The interface is also available, wired and tested or kitted. Send an s.a.s.e. to Pete Smith, N4ZR, 2003 Sarazen Pl., Reston, VA 22091, for more information.

Super Morse 64

Super Morse 64 is a four-part Commodore 64 Morse code self-training course. Part 1 of the program allows you to enter a character, and the computer produces audible Morse. Part 2 tests you by generating random five-character groups. Part 3 provides an FCC-type code examination. Part 4 allows you to enter up to 400 characters that are transferred into audible Morse by the computer. In each part, the speed and pitch of the code generation is selectable. Super Morse 64 is available on diskette. For more information, send an s.a.s.e. to Fernando Ardavin, KA4RBV, 1254 Sweet Pine Dr., Norcross, GA 30093.

PX Extra

Jim Pearce, N6ESV, has made his Commodore 64 Hamdisk available to readers of this column. Hamdisk contains ham radio programs that Jim has either written or converted for the C-64, including Dupe, a high-speed contest duping-and-logging program set; DXCC, a DX call sign and DXCC awards-tracking program set; WAS, a five-band worked-all-states award program set; MINIMUF, a propagation-prediction program; and Contest Calendar, a perpetual ham radio contest calendar. To obtain a copy of Hamdisk, send a blank diskette and a stamped, self-addressed disk-mailer to Jim at 4104 Earnscliff Ave., Fair Oaks, CA 95628. Documentation is included on the diskette.

Big Blue Software

Four IBM PC programs are made available in this installment of PX.

Program number 74 is a Morse code practice program submitted by Emile Alline, NE5S. It requires DOS 1.0, 64 kbytes of RAM, BASICA and a disk drive.

Program number 75 is a Morse code receive-and-transmit program submitted by Nathan Janco, W5FUR. It requires 64 kbytes of RAM and a disk drive.

Program numbers 76 and 77 were submitted by Mike Donehoo, KB4DT. Number 76 is a logging program with data saved on diskette. Number 77 is a contest-logging program for ARRL Sweepstakes.

To obtain a listing of any PX program, send a business-size s.a.s.e. with 39 cents postage to ARRL, Dept. PX, 225 Main St., Newington, CT 06111. Use a separate s.a.s.e. for each program request and write the PX program number of the desired program at the lower left-hand corner of the s.a.s.e. Please do not send correspondence other than PX requests to Dept. PX.

MORE HAM BOARDS

More and more Amateur Radio landline bulletin board systems (BBS) are coming on line every month. Here are a few more that you can dial up.

The Amateur Radio Commodore Club (ARCC) Computer Newsletter BBS serves as the house organ of the ARCC and is open for use by all licensed hams using all types of computers. It operates 24 hours per day at 612-431-1149 (300 bauds, 8-bit word length, 1 stop bit, no parity). The BBS features a message base, three news menus, private mail, feature articles and computer programs for downloading. The system operator (SYSOP) is Carl Estey, WAØCQG.

• Bald Hill Tech Control is dedicated to Amateur Radio and computer enthusiasts, and has an impressive list of message boards. The BBS operates at 300 bauds and may be accessed by dialing 516-736-2208, 1800 to 0800 EST weekdays and 24 hours per day on weekends. Norm Sternberg, W2JUP, is the Bald Hill SYSOP.

• *73 Magazine* has a BBS on line that is devoted to ham radio. It operates at 300 and 1200 bauds between 1700 and 0800 EST/EDST weekdays and 24 hours per day on weekends. The number to call is 603-924-9809.

LONG LIVE SINCLAIR!

The Sinclair Amateur Radio User Group (SARUG) is a British organization that acts as a focal point for the exchange of information concerning the use of the Sinclair line of computers in Amateur Radio. SARUG publishes a 16-page newsletter, five times per year, that contains Sinclair programs, circuits, ideas, product reviews and news. An airmailed sample issue may be obtained by sending $2 or 6 IRCs to SARUG coordinator Paul Newman, G4INP, 3 Red House La., Leiston, Suffolk IP16 4JZ, U.K.

The World Above 50 MHz

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

A New Tool for VHFers

Wouldn't it be wonderful to have ready access to up-to-the-minute news on schedules, new grid squares on the band and planned contest operations without having to wait for magazine columns or newsletters to arrive in the mail? The mechanism to provide such a capability is available right now, and it's called packet radio. Yes, I know what many may be thinking. Packet is just another form of RTTY that computer buffs are playing with. That's what I thought until I borrowed a TNC and checked into one of the local bulletin boards. The information that flowed onto my computer screen gave me all kinds of ideas as to the potential of this mode. I won't attempt to delve into the technical details of packet radio here. *The 1985 ARRL Handbook for the Radio Amateur* contains a good description of how the system works. What I will do is try to illustrate how VHFers may be able to use this new mode as a tool to help accomplish what we like doing most: working weak-signal DX on the bands above 50 MHz. HF DX enthusiasts will find these concepts equally useful to their favorite pursuit.

While bulletin boards are filled mainly with items of interest principally to packeteers and computer "hackers," there is no limit to the kinds of information they can contain, as long as it meets the usual standards for Amateur Radio communication content in terms of pecuniary interest, etc. We must be ever watchful of what we put on the air, no matter what mode of transmission is being employed.

Most packet operation is currently a local proposition, using 2-meter FM with 145.01 being the most common frequency employed at present. One of the things packet does best, however, is provide an automatic means to pass data from one station to the next for as far as the chain of stations extends. It's called "digipeating." Sounds like the early days of Amateur Radio and the basis for the founding of the American Radio Relay League!

Even today, in these relatively early days of the mode, a message can be put into a packet station in the Washington area and, within hours, appear on a computer screen in Boston. When planned intercity, high-baud-rate networks go into operation, a far greater volume of data will be able to be relayed much more rapidly than at present. Then, there is PACSAT, the orbiting mailbox now being built by AMSAT for expected launch sometime in 1987. When that bird goes into orbit, it will provide the capability to relay huge quantities of data to any suitably equipped amateur station in the world. Even without these future facilities, packet data can be (and is being) exchanged over great distances on the HF bands, although at the relatively slow rate of 300 bauds. Current practice on 2 meters is to use a baud rate of 1200.

A popular HF band for packet operators is 30 meters. Its propagation characteristics, most of the day, make it an ideal part of the spectrum for tying together relatively widely scattered points. Once the data arrives in each area, whether by way of a VHF relay network, satellite or HF, it can be put on local bulletin boards. This capability provides rapid, wide access to a vast amount of information. Many bulletin boards, in addition to being able to be read by any suitably equipped amateur station, provide the means for anyone to insert messages. Thus, the capability already exists for VHFers to post information of particular interest to others with simular interests.

How does one go about taking advantage of this potentially valuable new tool? First, pick up some of the fundamentals of packet radio from the *ARRL Handbook*. The League publication *Gateway* is a fine source of information on current packet activities. The first piece of equipment needed to get going is a computer or terminal. The next is a terminal node controller, or TNC. The TNC connects between the computer or terminal and the radio equipment. It handles all of the protocol, or "handshaking" between the computer and the radio, as well as that used to establish and maintain contact between stations.

Several TNCs are currently available. One is offered, in kit form, by the Tucson Amateur Packet Radio Corporation (TAPR), a nonprofit group. TAPR has recently announced a new version, the TNC 2. It's more compact and less expensive than their initial effort, the TNC 1. Heath has also come out with a kit based on the TAPR TNC 1. AEA and Kantronics have built and tested units similar to the TNC 1. A somewhat different approach is taken by GLB, which markets a TNC that depends to a great extent on software in the associated computer rather than employing firmware built into the TNC.

These technicalities aside, the message I would like to get across is the uses to which we VHFers can put packet radio. But, in addition to being a useful tool, packet radio can be fun as well. The basic mode may also prove useful for meteor scatter, as large amounts of information can be exchanged during a meteor burst. During the Perseids last summer, W3OTC and WØRPK completed a 6-meter meteor-scatter contact between Maryland and Iowa, demonstrating the potential of packet in this application.

I am sure active VHFers will find many uses for this new, useful and exciting mode of amateur communication.

ON THE BANDS

6 and 2 Meters—It shouldn't seem like much by the time you read this, but the big news as these lines are being written is the aurora of April 20. The event was very widespread and reportedly affected all bands through 70 cm. N4MM in Boyce, VA, 50 miles west of the DC area, turns in a list of fifteen 6-meter contacts, including four new grid squares and fourteen 2-meter QSOs, which netted seven new grids. The log turned in by K2QR is quite illustrative of the extent of the opening. Dick worked a total of thirty-five 2-meter stations and heard a like number. To the east, his best DX was VE1UT in FN63, and to the west, WB9MSV in EN50 and AA9D in EN52. Most signals ran above 57A. A 1¼-meter QSO was almost made with this conductor, but signals in both directions were too weak to be certain of reports and grids. Results between us were a little better on 2 meters, however.

Aurora was a little new to KD9JQ Buffalo Ridge, IL, near Chicago. Chuck has been at that QTH since August 1984, having previously been KA7IXS Phoenix. This aurora session enabled him to add two states, bringing his 2-meter total to 29. He also upped his grid-square roster to 106. After first noticing the buzz signals at 2115Z, Chuck went on to work 51 stations in 19 states and 32 grid squares. To the east, his best DX was W3HQT/1 in FN54; to the south, WA4LIT in EM64; and to the west, NØLL in EMØ9. Another good contact was K4HWG in FM18. Heard, but not worked, was WØKJY in Colorado. K5SW, Muskogee, OK, was also in on this one. Sam lists 20 stations worked on 2 meters, with the best DX being K2LWR FNØ2 and WØRTZ in DM79. He says most stations, including the latter, peaked up beween 40 and 45 degrees, but that WD4DGF peaked for a time at 60 degrees. K5SW's 2-meter grid-square total now stands at 152.

WA5DBY writes from Fort Worth that the Eta Aquarids shower lived up to the predictions of W9IP, mentioned in this column in April and May. Gerald says the shower peaked at his location at 1530Z May 5. This was somewhat later than pegged by W9IP, who, incidentally, agrees. Mike believes that the ecliptic longitude published for the shower is somewhat in error. He now places the peak between 0000Z and 0900Z May 5, when the radiant was not visible here in North America. It may have produced some super results for Europeans, however. Word from that part of the world would make interesting reading. W9IP runs a strip-chart recorder connected to an FM broadcast receiver tuned to 90.5 MHz, and can get a pretty good idea of the progress and intensity of meteor showers. WA5DBY says that, at the shower's best, California and Arizona stations were thick with signals running S9 and over on bursts lasting 5-10 seconds every other minute. There were so many stations calling that it was difficult to pick anyone out. The only station he worked was K6PVS. With so many active 6s and 7s attending the West Coast VHF Conference that weekend, it is difficult to imagine what it would have been like on a normal weekend! WA5DBY further notes that everything heard lay along an east-west path. Gerald also concurs with W9IP's prediction that the ionization would be at a quite high altitude. This fact is supported by the presence of stations from the Los Angeles area, a distance of about 1200 miles. W9IP/2 reports making four contacts during the shower: WA8SUX in EM70, KB9NM in EN55, K5SW in EM25 and K5YY in EM35.

In 6-meter news, WA5IYX, San Antonio, noted 4s and 5s on—what appeared to be F2 backscatter—during the afternoon of April 3. Later, between 2200 and 2217, Pat heard the HC2FG beacon. The thing that makes this particularly interesting is that it occurred 27 days after the South American F2 opening of March 7. Pat

2-Meter Standings

For WAS holders, listing is WAS number, call, state, call areas worked and grids worked. For others, call, state, U.S. states worked, call areas worked and grids worked. Call areas are the 10 U.S. call areas plus KH6 and KL7, plus each VE and XE call areas plus DXCC countries not located within the continental limits of the U.S., Canada or Mexico. Grids are those Maidenhead designators worked since the VUCC Award was instituted, January 1983. In order to make the standings a true reflection of stations currently active on 2 meters, those not reporting activity within the past two years have been dropped. They will be reinstated upon written presentation of continuing activity. WAS holders are listed in any case. Compiled May 15, 1985. Deadline for next update is November 1, 1985.

WAS Holders

1	K0MQS*	IA	—	—
2	K5CM*	OK	—	—
3	N0JA*	MO	—	—
4	K9HMB*	IL	—	—
5	K1WHS*	ME	—	—
6	WA4MVI*†	(1)	—	—
7	K5JL*	OK	—	—
8	WA9DOT*†	WI	—	—
9	WB0ZXU*	IA	—	—
10	K9CA*	IA	—	—
11	W0SD*	SD	—	—
12	W0RRY*	(2)	—	—
13	K5GW*	TX	—	—
14	WB5LUA*	TX	23	—
15	K4GL*	SC	23	—
16	W0VB*	MN	14	—
17	WB5LBT*	LA	20	—
18	K4PKV*	NC	—	—
19	W0RWH*	MO	23	—
20	W8IDU*	MI	23	—
21	K1MNS*†	NH	48	—
22	WB9VEN*	IL	—	—
23	K5FF*	NM	16	—
24	W5FF*	NM	16	—
25	W7FN*	WA	—	—
26	W1JR*†	MA	31	109
27	WB0QMN*	CO	—	—
28	WB4EXW*	NC	18	—
29	K9KFR*	IN	—	—
30	K3VGX*	PA	—	—
31	SM7BAE*		21	—
32	WA7BJU*	OR	—	—
33	VE7BQH*†		57	—
34	W6PO*	CA	—	—
35	WA3VSJ*	PA	27	—
36	WA6LPK/KL7*	AK	20	—
37	WB0YSG*	NE	—	—
38	N7NW*	WA	—	—
39	W5LUU*	TX	—	—
40	W4HJQ*	KY	—	—
41	K5UGM*	TX	—	—
42	W5UN*	TX	—	—
43	WA4LYS*†	FL	49	—
44	WA1JXN/7*†	MT	58	—
45	W5JTL*	MS	14	—
46	WA0ANH*	MN	—	—
47	WA4NJP*	GA	—	—
48	W5HM*	NM	—	—
49	W7CI*	AZ	26	—
50	N5KW*	OK	13	—
51	WB0TEM*	IA	23	—
52	WD0FOY*	IA	23	—
53	W0RWG*	MO	16	—
54	WB5ERD*	TX	—	—
55	W4WD/7*	UT	—	—
56	KE5C*†	TX	—	—
57	WA4CQG*	AL	—	—
58	WB9CAS*	IL	—	—
59	W2CNS*	NY	28	—
60	Deleted	—	—	—
61	K0ALL*	ND	19	—
62	K9XY*	WI	29	—
63	K1FO*	CT	18	98
64	W4DFK*	VA	—	—
65	WD5CRK*	OK	—	—
66	WB8PAT*	OH	39	—
67	KX0O*†	CO	30	103
68	W7HAH*†	MT	35	43
69	K7KOT	WA	—	—
70	KB8RQ	OH	—	—
71	WA7BBM	AZ	—	—
	K1GVM*	MA	49	34 —
	K1BKK*	VT	43	14 —
	WA1OUB*	NH	40	19 104
	WA1JOF*	MA	40	19 —
	K1PXE	CT	35	13 —
	N1AIS	MA	34	12 —
	W1AIM*	VT	32	11 —
	K1VMI	CT	31	12 —
	W1GXT	MA	30	11 —
	KA1YQ	MA	30	11 —
	KA1DHO	MA	28	11 33
	WA1LOU	CT	25	11 —
	KA1BRD	CT	24	11 —
	W1HDQ	CT	24	7 —
	K2OS*†	NY	49	17 —
	W2PGC*	NY	47	16 —
	WA2GSX*†	NY	46	27 —
	K2QR*	NY	45	28 66
	WA2PVV*	NY	40	13 —
	K2TXB*	NJ	39	— 117
	W2RS	NJ	37	13 —
	W2BLV	NJ	37	12 —
	W2ORI	NY	37	10 —
	W2CRS	NY	37	8 —
	WB2CUT	NJ	36	13 —
	K2OVS	NY	36	12 —
	WA2TIF	NY	36	11 —
	NB2T	NY	35	12 —
	WA2FGK	NJ	35	11 —
	K2GK	NY	34	11 91
	W2MPK	NY	31	11 —
	W2HRW	NJ	29	— —
	W2DWJ	NJ	27	11 —
	N2BJ	NY	26	11 51
	KA2BTD	NJ	26	10 —
	K2YCO	NY	26	10 —
	KE2N	NY	25	11 55
	W2WW	NY	24	10 44
	WA2DKB	NJ	23	11 —
	AB3D*	DE	48	22 —
	WB3JHP*	MD	45	19 —
	K3MD*	PA	42	26 112
	W3XO	MD	37	12 38
	W3RUE	PA	37	11 24
	K3QCQ*	PA	37	8 —
	WA3HMK	PA	37	— 100
	W3IWI	MD	36	36 —
	WA3FYJ	PA	36	10 96
	W3ZZ	MD	35	12 100
	WB3LJK	MD	35	11 45
	W3CLQ	PA	35	10 —
	WA3DMF	MD	32	11 34
	W3OTC	MD	29	9 —
	W3LNA	PA	29	8 43
	W3IWU	PA	28	11 —
	WA4DGF*	TN	49	26 145
	KC4EG*	KY	41	13 —
	WA4PCS	KY	40	11 —
	WB4NMA	GA	40	10 —
	W4GJO	GA	39	11 —
	WA4DKH	KY	39	11 —
	K4CAW	NC	38	12 —
	W4HHK	TN	38	9 —
	W5HUQ/4	FL	38	9 —
	W4CPZ	SC	37	11 19
	W4ISS	GA	37	8 —
	K4KAE	SC	36	13 —
	WS4F	GA	36	11 85
	W4FJ	VA	34	8 —
	WA4OWC	FL	33	10 —
	WB4KNF*	TN	31	11 33
	WB4NXY	KY	31	9 —
	N4VC	TN	31	8 —
	W3ZR/4	FL	30	9 77
	K1FJM/4	FL	29	9 —
	NI4Z	FL	21	9 —
	K4LFF	GA	19	9 56
	WB4RUA	GA	17	6 40
	K5WE*	OK	47	21 130
	W0RRY/5*	OK	47	13 —
	K5SW	OK	47	12 152
	W5RCI	MS	47	10 —
	W5AGO*	OK	45	11 —
	W5UWB*	TX	44	15 —
	W5HN	TX	42	12 —
	WA5DBY*	TX	40	11 —
	KB5MR	OK	38	11 124
	W5HFV	OK	38	10 —
	NR5O	OK	38	9 109
	WB5JAR	AR	37	10 —
	AA5V	OK	36	9 —
	K5YY	AR	34	8 129
	K5VVV	TX	31	10 —
	N5BBO	TX	31	10 —
	K5DHU	TX	30	10 29
	WA5IYX	TX	27	9 —
	W5DFU	OK	26	7 —
	W5NZS	OK	25	7 —
	WA6MGZ*†		47	46 141
	W6XJ*		29	12 —
	WB6NMT*		28	13 —
	K6PVS*		24	— —
	K6JYO*		23	7 —
	WA6LHD		16	6 35
	K6QXY*		14	11 —
	K6GAO		9	6 —
	WA8LLY/6		9	4 14
	N6CA		8	3 —
	WA6HXM		6	3 16
	WA7JUO*	NV	45	16 —
	KB7WW*	OR	32	10 —
	K7ICW*	NV	23	9 —
	WA7JTM	AZ	21	6 —
	N7BHC*	UT	21	6 —
	N7EIJ	ID	13	6 —
	WA7EPU	AZ	12	6 —
	K8EUR	OH	41	11 —
	K8WKZ	MI	39	14 —
	K8RZB	OH	39	10 —
	W7EKI/8	OH	38	8 —
	WB2DIN/8	WV	36	13 —
	KJ8S	MI	34	10 —
	KB8SG	MI	27	8 —
	W8CAP	MI	26	11 —
	W9BQZ	IL	47	21 —
	W9UD	IL	45	12 —
	KB9NM	WI	43	14 —
	WB9MSV*	IL	42	12 158
	W3EP/9	IN	41	13 105
	N9KC	IL	41	11 130
	N9AQ	IL	40	10 124
	K9SM	IL	36	8 —
	KD9JQ	IL	29	— 106
	N9CUE	IN	27	10 28
	N9CEX	IL	26	9 —
	W9YCV	WI	18	— 18
	W0EMS	NE	48	11 —
	WA0TKJ*	KS	47	25 131
	K0DAS*	IA	47	13 —
	N0LL	KS	46	10 140
	W0OHU	MN	45	12 —
	W0PN	MN	43	11 52
	WB0DGF	NE	43	10 85
	KF0M*	KS	42	10 141
	WA0SJR	MO	41	9 —
	KC0QR	NE	40	11 113
	W0RAP	IA	39	10 —
	K0TLM	MO	38	10 97
	KM0A	MO	38	10 70
	W0PW	CO	38	9 —
	W0FY	MO	38	— —
	WB0SIL	MO	36	13 —
	WB0ZKG	IA	36	10 —
	WA0VJF	KS	34	11 59
	W0RWC	IA	34	8 —
	K0UDZ	SD	33	10 —
	N0AJU	NE	32	9 102
	KC0QR	NE	31	10 —
	WB0ZAH	MN	29	9 79
	WB0YZN	NE	28	9 66
	KC0OG	NE	25	8 60
	W0KEA	CO	18	6 —
	VE1UT	NS	38	17 —
	VE1AHM	NB	21	10 —
	VE2DFO*		48	30 —
	VE3EMS		38	11 —
	VE3FN		37	11 —
	VE3DSS*		37	12 —
	VE3ASO*		35	12 —
	VE3FKX		35	10 —
	VE3DTQ		31	12 —
	VE3EQQ*		20	16 —
	VE4MA		14	9 —
	VE4UX		8	5 —
	WA1JXN/C6A*		23	28 —
	KG6DX*		22	— 67
	PA2VST*		28	— —

*One or more contacts were made via EME
†WAC
(1) WAS completed in NC; now in SC.
(2) WAS completed in IA; now in OK.

also notes a particularly good tropo session to Florida, Georgia and Alabama April 4, involving UHF TV Channels up to 54 and 2 meters. He was particularly astonished to get a good signal from Channel 22 in Savannah. WA5IYX didn't spend all of his time watching the tube, however. He also took a break to work an Alabama station on 2 meters to up his state total to 27.

Six-meter E_s is beginning to do its thing just as this is being written in mid-May. WD4FAB in the Orlando area reports a very good opening to the 1s, 2s, 3s and 8s Monday evening, May 6. From the other side of the country, K6JZK in Orange County says the same evening produced a two-hour opening to the upper Northwest, beginning about 0230Z May 7. Among Duffy's contacts was his first RTTY exchange on this band, a teleprinter QSO with WB7AJP.

Ed Rodrigues, NP4GD, writes that he and KP4EOR will be aiming attended beacon transmissions Northeast this summer on 50.109, 144.190 and 432.105 MHz. Hours of operation are 1800-0200Z Monday through Friday and 1100-0200Z weekends. All transmitters run substantial power and should be sufficient to be heard if openings to KP4 occur. The beacons can be broken to establish contact. In case that doesn't work, Ed's phone numbers are 809-768-5842 (home) and 788-2625 (work).

The Higher Bands—N3FL reports that a 23-cm beacon has been put on the air in the Baltimore/Washington area (FM19). Fred says that the beacon signs K3IVO and is on 1296.073 MHz. It puts out 1 W to a 2-dBi horizontal antenna, and was built jointly by him and W3IP. Those hearing the beacon are urged to send reports to N3FL or W3IP. QSLs will be sent in response.

WB5ITT says that 70-cm operators along the Gulf Coast have recently been experiencing QRM from something they have dubbed "the cricket." The source of this signal, which is often noted on 432.1, is a French-built radiolocation system now is use in offshore oil exploration. Chris urges anyone having problems with interference from transmissions of this nature to contact Steve Gomez, KE5O, at 409-835-4132 after 1700 Central Time. It might also be good to drop a note to League Headquarters.

Among the problems facing builders of multi-Yagi arrays are phasing lines and power dividers. Particularly on bands above 220 MHz, they must be very accurately made and employ low-loss cable and high-quality connectors. The new 9913 cable is recommended for phasing lines, but finding connectors for it can be difficult. WA6MGZ operates a service under the name of "Z Comm," which supplies phasing lines using 9913 along with crimped-on Type N connectors as well as power dividers of various types. For information, contact Chuck Smallhouse, 803 Mora Dr., Los Altos, CA 94022, or call 415-948-1778 after 1700 Pacific Time.

K2UYH says, in a recent issue of his *432 and Above EME News* that he has devised a way to have 70-cm and 23-cm feeds in the same dish and still be able to rotate the 70-cm feed. Al found that the feeds can be offset considerably from the center of focus without materially affecting gain. According to information he found in one reference, the 70-cm feed can be offset by up to 6 feet before more than 1 dB of gain degradation results. He ended up with his W2IMU circular-feed horn for 23 cm offset slightly to above center, and the rotator and feed assembly for 70 cm a few inches below it. The result was that the boresight for the 23-cm system is 1.5 degrees below center and that for 70 cm is 6 degrees above. These errors are easily compensated for by appropriately adjusting the dish's elevation for operation on the two bands. QST

Washington Mailbox

Conducted By Katherine Hevener, WB8TDA
Information Services Assistant, ARRL

The Ins and Outs of the Volunteer Examiner Program

This is a test. For the next 60 seconds, this column will test your knowledge of the VEC System. So grab a pencil and an 807. Seat yourself comfortably in your ham shack, and let's get going.

For each statement below, write T if the statement is generally true, or F if it is generally false.

1) Examiners are required to publicly announce only examination sessions in which they plan to administer elements 1(B), 1(C), 3, 4(A) and 4(B) to five or more candidates.

2) An amateur Extra would be disqualified from administering tests to students in an Amateur Radio course he or she teaches on an uncompensated basis.

3) Elements 2, 3, 4(A) and 4(B) must be designed by accredited Advanced and Extra Class volunteer examiners, or be obtained from the VEC.

4) To design a written test means to select the specific questions from the question lists for a particular exam.

5) Elements 1(B) and 1(C) must be prepared by Advanced and Extra Class VEs, respectively, or obtained from the VEC.

6) Candidates for Elements 1(A), 1(B) or 1(C) are required to demonstrate their ability only to receive the international Morse code.

7) VEs may require candidates to demonstrate their ability to copy the international Morse code by using the traditional one-minute solid copy or modern comprehension test format.

8) Blind applicants may demonstrate their ability to receive the international Morse code by copying the information in Braille and then communicating it to the examiner(s).

9) Candidates for the General class license who do not hold a valid ticket must only pass Elements 1(B) and 3.

10) Candidates for the Advanced class license who hold a Certificate of Successful Completion for Elements 1(B) and 3 must be tested only on Element 4(A).

11) Applicants pass the Technician/General and Advanced class examinations by correctly answering 37 of the 50 questions on the tests. Extra Class applicants must correctly answer 30 of the 40 questions on their exams.

12) The passing score for a comprehension-type code test is 70 percent or better.

13) Candidates must wait 30 days before being reexamined for any code or written Elements failed.

Answers

1) False. Volunteer examiners are required to publicize examination sessions for these Elements regardless of the number of candidates being served (97.26[a]). The FCC has, however, proposed in PR Docket 85-21 to amend this section to only require public announcement for examination sessions consisting of the above-mentioned elements for five or more candidates. VECs are no longer required to give a 30-day notification of upcoming test sessions to the FCC Field Operations Bureau.

2) False. However, to avoid any appearance of a conflict of interest, it is recommended that he/she open the test session to individuals who have not participated in the class. On the other hand, "Any person who owns a significant interest in, or is an employee of, any company or other entity which is engaged in the manufacture or distribution of equipment used in connection with amateur radio transmissions, or in the preparation or distribution of any publication used in preparation for obtaining amateur station operator licenses, is ineligible to be a volunteer examiner for purposes of administering an amateur radio operator examination. However, a person who does not normally communicate with that part of an entity engaged in the manufacture or distribution of such equipment, or in the preparation or distribution of any publication used in preparation for obtaining amateur operator licenses, is eligible to be a volunteer examiner" (97.31[b]).

3) False. Element 2 must be designed by the volunteer examiner administering this test. However, Elements 3, 4(A) and 4(B) must be designed by the VEC until January 1, 1987. At that time, the VEs may legally design tests for these elements (97.27[c]) and [d]).

4) True (97.27[d]).

5) False. Section 97.27(b) indicates that Elements 1(B) and 1(C) must be prepared by VEs who hold the Amateur Extra Class license. These VEs may elect to obtain the examinations from the VEC.

6) True. While Section 97.27(b) indicates that candidates must demonstrate their ability to send and receive the International Morse code, the Commission, in a public notice dated August 22, 1977, stated that their experience was that the receiving test alone is adequate proof of both sending and receiving ability.

7) True. The Commission gives VEs the latitude to formulate the telegraphy examinations (PR Docket 83-27 and "Instructions to the VEC").

8) True. According to Section 97.27, "Special procedures may be employed in cases of physical disability." In fact, VEs must make a specific effort to accommodate handicapped candidates. For instance, questions that will not adversely affect handicapped candidates' test performance (e.g., questions involving diagrams may be a poor choice for blind candidates) must be selected. Persons with a hearing impairment may use a vibrating surface or a flashing light for the telegraphy examination. If hand coordination is difficult for writing purposes, the candidates may dictate their answers to one of the VEs to write down. VEs may read the questions to print-handicapped applicants.

9) False. To fulfill the General class licensing requirements, every candidate must complete Elements 1(B), 2 and 3 (97.23). However, candidates who hold a Novice or Technician class license need only be tested on those elements required for the General class license that have not yet been passed (97.25[a]).

10) False. The Certificate of Successful Completion of an Examination can be used as exam credit only for the telegraphy elements. Candidates must wait for their license to be issued or be reexamined on all written Elements not required for the class of license they currently hold (97.25[b]).

11) True (97.29[b]).

12) False. Section 97.29(c) indicates that candidates are required to prove only their ability to receive the code at a prescribed rate of speed. Thus, the criteria for passing the comprehension-type code exams may vary among VECs. The ARRL VEC's standard for passing is 70% or better.

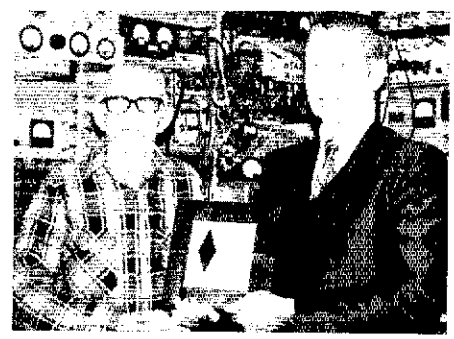
13) True (97.26[h]). The Commission has, however, proposed in PR Docket 85-21 to eliminate this requirement.

[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.]

Strays

CW MAGAZINE AVAILABLE

☐ Are you a CW enthusiast? Then *Morsum Magnificat* may be for you. This quarterly Dutch magazine is dedicated to all aspects of Morse telegraphy. More information on the magazine and its international (English) edition may be obtained by writing to M. Hellemons, PAØBFN, Holleweg 187, 4623XD, Bergen op Zoom, The Netherlands.



Congratulations to Leroy May, W5HN (left), of Dallas, Texas, on receiving an ARRL 60-year membership plaque. West Gulf Division Director Ray Wangler, W5EDZ, visited Leroy's shack to make the presentation.

The New Frontier

Conducted By Bob Atkins, KA1GT
103 Division Ave., Millington, NJ 07946

Sky-Noise Temperature

In previous columns, I have discussed the fact that the atmosphere (particularly the water vapor and oxygen components) absorbs microwave energy, leading to attenuation of signals. This absorption also leads to another phenomenon—varying sky noise due to reradiation of microwave energy by oxygen and water vapor.

Fig. 1 shows the variation in sky-noise temperature due to atmospheric absorption as a function of frequency for a number of different antenna-elevation angles. The lower the angle of elevation, the more atmosphere the antenna will see and the greater the amount of noise that will be received. The effect of sky noise is to reduce effective receiver sensitivity, especially where satellite or EME operation is concerned, since unwanted sky noise is added to the wanted signals received by the antenna. The contribution of sky noise to overall receiver sensitivity may be calculated using the standard receiver sensitivity formula (see, for example, *The 1985 ARRL Handbook*, p. 23-11), where sky noise is one of the factors (along with galactic noise, sun noise) summed to obtain the effective antenna temperature.

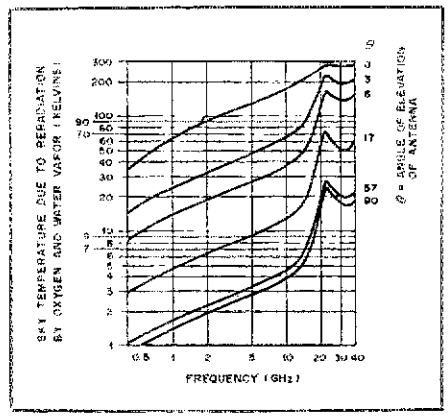


Fig. 1—Variation in sky noise due to oxygen and water vapor reradiation as a function of frequency and antenna elevation angle.

10-GHz NEWS

Dennis Lusis, W1LJ, of ARRL Hq., has been doing quite a bit of experimentation along the Connecticut shoreline on 10-GHz wide-band FM. He recently devised a simple method of feeding a 25-in-diameter aluminum "snow-sled saucer" for use as a high-gain antenna. The feed consists of a soup can, a few small pieces of aluminum tubing and an inexpensive, surplus 10-dB X-band horn. Gain is estimated at 30 dB, with a total cost of $12 (including the soup, which happened to be clam chowder!). An added benefit of the feed system is that it can be instantly disassembled by loosening three wing nuts, and folded up for simple transport to mountaintops via backpack. Details of the antenna/feed system will be featured in the upcoming *ARRL UHF/Microwave Book*.

W1LJ also notes some interesting 10-GHz propagation. While optimizing his dish feed, he noticed that a vertical beam heading of 5-10 degrees above the other station provided approximately 5 dB over the direct path. Thinking the cause was a skewed antenna pattern, Dennis removed the dish feed and noticed the same phenomenon while using only the 10-dB horn. The path between W1LJ and Jon, WB1DNL, of the ARRL Lab, was approximately 1 mile over flat, unobstructed terrain, with the ambient temperature around 80 degrees. Strong air-convection currents could be seen rising up from the ground underneath the path. Following the dish alignment, WB1DNL turned his antenna completely around, toward a mountain approximately 1 mile away. The two stations were able to make a reflection-scatter QSO, with signals running from 0 to 20 dB over the noise. Equipment on both ends were 15-mW Gunnplexers, running 75-kHz-deviation FM with 30-MHz IFs. Dennis and Jon will be more than glad to set up skeds with other Northeast 10-GHz WBFM operators.

On a final note, W1LJ should have his X-band beacon operating by the time of this printing. The beacon consists of a Mitsubishi DRO running 20 mW out to a 12-dB slotted-waveguide antenna. It will run tone-modulated WBFM, emitting a steady tone for 10 seconds and then ID. The keying circuit is a novel one designed by Jon, KE3Z, also of the ARRL Lab. Initially, the beacon will be installed in Newington, at approximately 1200-ft elevation, until a better site is found. Please send reception reports to W1LJ.

CORRESPONDENCE

In the 50 or so New Frontier columns I have edited, a wide range of microwave topics have been discussed. Even so, I am sure there are subjects that you, the reader, would like to see covered that have not yet appeared. If so, please drop me a line with your suggestions, and I'll do my best to include them in future columns. Any outside input is most welcome.

FM/RPT

Conducted By Stan Horzepa, WA1LOU
75 Kreger Dr., Wolcott, CT 06716
CompuServe ID no. 70645,247

Mail Call

A lot of mail gets delivered here in downtown Wolcott, and a lot of that mail is the result of this column. Most of the FM/RPT mail is supportive, although not necessarily in total agreement with the views expressed here. The following is a sample of what the mail has wrought recently.

VE/RPT

I must admit that I never cease to be astonished over the numbers of repeaters in Canada. It seems to be a status symbol for individuals or clubs to own a repeater. According to DOC, there are 531 licensed amateur repeaters in Canada (and certainly some unlicensed ones installed at individual amateur residences ... using the amateur's call sign). This works out to be one repeater for every 43 (or fewer) amateurs. In the National Capital Region alone, there are twelve 2-meter repeaters, and four of these operate autopatches. The use of repeaters varies from hardly ever to a low percentage of use, when averaged over the day.

While the numbers of new repeaters in areas already full of repeaters has perhaps reached a peak, we see a new problem on the horizon: private simplex autopatch base stations. Some of those who intend to install such systems have applied to the (St. Lawrence Valley Repeater) Council, but I expect that only those who intend to install their system on a high location will apply. Undoubtedly, there will be, before too long, a proliferation of simplex systems installed in the homes of individual amateurs, so that they can use their telephones from anywhere within a local coverage area ... I think we should discourage this activity, at least in areas where there are already ample autopatch repeaters. On the other hand, since simplex frequencies are also under-used, if simplex users are prepared to share, we could put a whole lot of them on one simplex channel, each with its own access code.—*John S. Belrose, VE2CV, St. Lawrence Valley Repeater Council*

Highlights of the Dayton Frequency Coordinators' Council

No straw vote was taken, but the tenor of

discussion seemed to greatly favor a confederation of area coordinators over the idea of a national coordinator. ARRL support of such a confederation was thought to be a very good idea, but suggestions of ARRL involvement, beyond supporting such an organization, were greeted with strong and general disapproval.

A committee was organized to investigate and report on the proper organization of a national database and the hardware necessary to support it. The database will be comprehensive enough to provide both support to the area frequency coordinators and a full, up-to-date base for the annual ARRL *Repeater Directory*. Coordination of the committee will be handled by WB4VVA.

ARRL has agreed . . . to fund and publish a newsletter (for coordinators).—*John L. Hackman, WB4VVA, Michigan Area Repeater Council*

Get Down

After reading your May '85 column (220 and 450) . . . how well I know what you mean. I just moved to northeastern Alabama from Miami. There were no 2-meter pairs (15-kHz system) open anywhere in south Florida. 220 (and) 440 were getting a nice population, finally! In my new area, 2-meter activity is good, with some 220 and 440 in the larger cities (Huntsville, Atlanta, Chattanooga). As an alternative to going up in frequency, "try down." Recently, several of us have been using 6-meter FM simplex with good results, and I'm thinking of building a repeater. 220 and 440 don't propagate well in mountain areas.—*Mark Cobbeldick, KB4CVN*

Let Your Fingers . . .

I use the title page of my ARRL *Repeater Directory* to record information I use a lot, but don't want to memorize:

- the speed dialing codes on our repeater, especially the codes for police, sheriff and state patrol
- the frequencies of repeaters in towns I get to a lot
- police/fire phone numbers of nearby towns
- call letters and names of hams I don't meet frequently enough to remember.

I make this all neat and transfer the information into new editions by typing on self-adhesive labels that are left over from my computer operations.—*Dick Ellers, K8JLK*

REPEATER LOG

According to reports received in April, repeaters were involved in the following public-service events: 5 weather emergencies, 2 medical emergencies, 8 vehicular emergencies, 3 fire emergencies, 1 search and rescue, 18 public safety events, and 23 drills and alerts.

The following repeaters were involved (followed by the number of events): WA1EDC 1, K1FFK 2, KG1O 1, WA1GTT 1, WA1QMI 1, WA2ZWP 2, K4HY 1, K4ILW 1, WB4UDS 11, WD6AWP 4, W6JBT 1, WB6QHB 1, W6RHC 1, WA6ZTT 3, K8DDG 8, WB8GDY 1, WD8IEL 6, W8VTD 5, N9DGQ 1, NB9P 1, W9TTT 1, WAØFYA 2, WDØHWT 1, WØTA 1.

In Training

Conducted By John Foss, W7KQW
Training Manager, ARRL

WHERE HAVE ALL THE NOVICES GONE?

More than half the Novices neither upgrade nor renew their licenses. Unfortunately, no one knows how many never get on the air—even once. The number must be substantial, however, if the correspondence we receive at your League Headquarters is any indication. These hams have spent enough time and have worked hard enough to pass their license examinations. Then, they drop Amateur Radio completely, probably within the first year after they receive the Novice license. Why?

Three reasons are often cited: (1) They can't afford the equipment; (2) they become bored with CW; (3) the Novice bands are so crowded they can't make a contact. Are these the *real* reasons so many Novices quit? We think not.

The real reason, perhaps, is that they can't find an Elmer. (It might be more accurate to say that no Elmer has found them.) Most people are a bit shy and somewhat reluctant to do something they don't feel comfortable doing. A newly licensed Novice seldom, if ever, feels comfortable the first time he/she sits down at a key, flips on the transceiver and puts a signal on the air. Is the rig tuned properly? Is the antenna the right length? Can I really send well enough to make a contact? (It *is* a bit embarrassing to become so disconcerted at the prospect of your first contact that you forget your own call!)

The bottom line is that most newly licensed hams need someone sitting beside them through their first few contacts—if for no other reason than to reassure them that they are doing everything correctly, and that they have not made a tuning error that will destroy the transceiver or burn down the house (ridiculous as these possibilities might be)! If you consider this a bit of an exaggeration, you may have forgotten your worst fears during your own first contact.

After the first few contacts, the Elmer won't be needed every day—or even every week. But he/she should be available, for a few months at least, in case the new ham has a question or a problem. Also, the Elmer is often needed to encourage the new Novice to upgrade to Technician or General. Few Novices remain interested in ham radio more than a year or so unless they can use a mode other than CW. (Even only a small minority of Extra Class hams confine themselves wholly to CW.)

If this diagnosis is valid, two courses of treatment lie open. First, the club or instructor might assign an Elmer to each graduating Novice (after obtaining the Elmer's permission, of course). Second, if the FCC permitted some additional Novice privileges such as digital communications, the urge to get on the air might be sufficient to overcome the obstacles. Third, the instruction program might concentrate on bringing the new licensees to the Technician or General levels, where many modes of operation are permitted now.

Both approaches, we think, are valid. Those having the Elmer will not be nearly so frightened about the prospect of their first contact. Those with a Technician or higher license can use a hand-held rig and a repeater, with far less concern about doing things right than usually applies to a CW contact.

The problem of "expensive" equipment is, for some new hams (expecially teenagers and senior citizens), all too real. The obvious solution is the availability of a club station, which such licensees may use until they acquire enough money to buy their own equipment. Normally, the only cost, under those circumstances, is the club dues. Most new hams can afford that. Simply providing access to a club station—if only for an hour or two per week—is sufficient to keep them enthusiastic about ham radio. This is especially so if an Elmer is present at the station while they are operating—a good idea under any circumstances.

Many clubs are now providing access to a station; many more would be able to do so with just a bit of effort. Permanent locations for a club station nearly always are available, rent free or nearly so. City halls, fire stations, civil-defense centers, libraries and Red Cross buildings all have been used successfully for this purpose.

Admittedly, sometimes it is difficult to obtain enough experienced hams to serve as Elmers for newly licensed Novices. But it need take only an hour or so per week of the Elmer's time, and only for three or four weeks. After that, it shouldn't require more than an hour or two per month. After six months, an hour or two per year is usually enough.

Few hams are really so busy that they can't Elmer one Novice or Technician. (The estimated time required is a total of 20 hours over the course of a year. That averages out to less than half an hour per week. Technicians usually require even less time.)

Clubs having problems finding enough Elmers might promise each Elmer who accepts that he/she won't be asked again for five years. Nevertheless, soon after beginning such a program, your club probably will have more volunteers for Elmering than it has new hams to Elmer—even considering that the number of new hams almost certainly will increase significantly under the new Volunteer Examiner program. *Many hams find Elmering to be so* much fun that they do it year after year. There's every chance that at least half of your club's Elmers will do the same!

YL News and Views

Conducted By Jean Peacor, K1IJV
Country Club Dr., Monson, MA 01057

Life Begins at Forty

Three years ago, when Carol Lee was 40, she earned her Novice call, KA2PQG. Her interest in radio had been kindled earlier in the year by her father, Marvin Lee, who originally held a call in 1918 (2BMZ). Various reasons kept him inactive for the next 60 years, but at the age of 83 he successfully passed the General exam and is now KA2OAU. Carol was a resident of central New Jersey while studying for her license, and was fortunate in having two Elmers, W2SJU and K2YJE, as well as other members of the Metuchen Radio Club to provide help and encouragement.

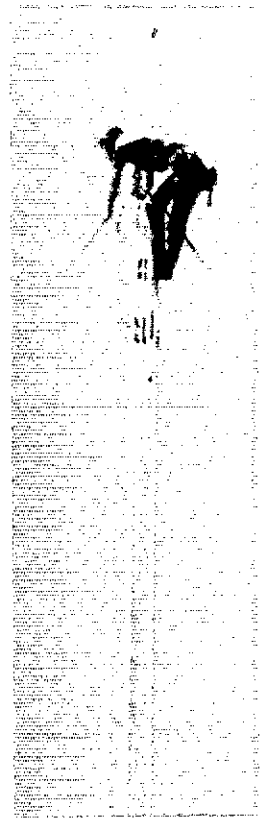
Carol met Dave Metzger, WG4T, on 40-meter CW. A romance developed and resulted in her moving to Kents Store, Virginia, where she became an official XYL in January 1984. Dave and Carol took their vows at the Richmond Frostfest, with the Reverend Norman Preston, K4PRQ, presiding.

Some Unusual Activities

After upgrading to General class with its attendant phone privileges, Carol became intrigued with the possibility of combining Amateur Radio with another love—bicycling. Carol covers between 25 and 40 miles on a typical bike ride, and does this several times a week.

After experimenting with various equipment, she arrived at her present setup: an IC-2AT coupled with a tiny MFJ linear amplifier. The latter is powered by a separate battery pack about the same size as the 2AT. She uses an ICOM speaker/mike, which sits in a holding rack on the handlebars when not in use. The antenna, mounted on the rear rack of the bike, completes the station. Using this setup, Carol easily works through repeater stations located over 50-plus miles away. Extra batteries are always carried in case of need.

Earlier this year, Carol, out "doing her thing," was accidentally discovered by a roving photographer while enroute to Fredericksburg to visit a ham friend (a 56-mile, 5-hour trip). This resulted in a fine newspaper article entitled "The Talk of the Road." She had talked with, but never met, Frank Brooks, W4UMC, in Fredericksburg, so she ventured forth via bicycle/mobile, keeping in radio contact with him for directions along the way.



Carol, KA2PQG, ready to go to work (left) and with guy wires at 125 feet. *(photos courtesy KB4JNI)*

An Ambitious Tower Project

Carol and Dave have recently completed the first leg of a challenging tower project. The tower has been completed at 150 feet, and a 10-foot mast and first antenna (a 28-foot KLM for 2-meter sideband) have been installed. This will be followed soon by a 22-foot Cue Dee for 2-meter FM and two inverted Vs for HF. What makes this special? Carol is the one who does the climbing.

Building a sectional, guyed tower was a new experience for both Dave and Carol. Before the project began, they decided it would be a team effort. It was logical that Carol would be the climber because she has done tree work and has no problem with heights. Dave is less interested in heights, and his superior arm strength was better suited to pull all the 40-pound sections up to Carol. In general, Carol reports, all went well. She did run into a snag at 40 feet, while still learning to maneuver the T-bolts of the gin pole around the diagonal bars of the tower. Another problem occurred at 80 feet as she tried to connect the uncooperative ninth section. In both cases, Dave reluctantly scaled the tower and lent a helping hand.

Carol celebrated the tower's completion by giving it a good test. She climbed the tower, set the mobile 5/8-wave mag mount on top of the post, connected her 2-AT and joyfully brought up repeater stations for miles around.

Carol has been a bicycle enthusiast for several years, but prior to her life beginning at 40, I doubt that her wildest dreams would have pictured her bicycle/mobile, much less erecting a 150-foot tower. Carol is presently waiting for a new call, as she recently upgraded to Advanced. You'll be hearing her on HF CW as well as VHF FM and SSB as she uses all those new antennas.

A YL MARCO POLO—W7QYA

Florence Majerus, W7QYA, of Lewiston, Montana, is not just well traveled—she is a YL Marco Polo. Flo has flown around the world, visiting most countries in Europe, the Middle East, North Africa and Asia, as well as Australia, New Zealand and Oceania. She has traveled throughout South America by plane, bus and train. She's journeyed across the Sahara and the jungles of Africa, and has visited Mexico several times. In the course of her travels, Flo found that the magical words *Amateur Radio* opened the doors to good friendships and better understanding in just about every country she has visited.

DXing, per se, is not necessarily Flo's main interest in Amateur Radio. Making friends is—whether it be with someone in the next county, the next state or in another country. She has made many good friends since first becoming licensed in 1950, and has visited with many of them.

In 1972, Flo visited the USSR and enjoyed meeting and visiting with Alec, UA3BW, with whom she had had many QSOs. She also met Felix, UA3BK, at that time. Her latest journey, to the USSR and China last fall, provided the opportunity for a friendship reunion with Felix.

While in Moscow, Flo and her roommate for the trip, Eve, accepted an invitation from Felix to spend an evening with him and his family at his home. Felix speaks English very well, and the other family members were eager to practice theirs. The delicious dinner and stimulating conversation, the reunion of friends and the warmth of the hospitality extended made it a most memorable evening.

Flo and her OM, Mel, were living in Juneau, Alaska, when she first got interested in Amateur Radio and became licensed. She earned her Extra Class in 1968. Her extensive travels also include most of the United States. Flo has a private pilot's license and has flown over most states west of the Mississippi River. And, she's done considerable backpacking into remote areas. Nowhere seems too far for her to go!

Coming Conventions

†July 5-7—Dakota Division, Rapid City, SD
July 6-7—Georgia State, Atlanta
July 13-14—Indiana State, Indianapolis
July 19-21—Iowa State, Des Moines
July 26-28—Oklahoma State, Oklahoma City
August 2-4—Rocky Mountain Division, Jackson WY
August 3-4—North Florida Section, Jacksonville
†August 9-11—Southwestern Division, Long Beach, CA
August 25—Illinois State, St. Charles
September 6-8—Melbourne, FL
September 6-8—Midwest Division, Omaha, NE
September 6-8—West Gulf Division, San Angelo, TX
September 21-22—Virginia State, Virginia Beach
September 27-28—CRRL, London, Ontario, Canada

ARRL NATIONAL CONVENTIONS
October 4-6, 1985—Louisville, Kentucky
September 5-7, 1986—San Diego, California
July 10-12, 1987—Atlanta, Georgia
August 19-21, 1988—Portland, Oregon

†At press time, Amateur Radio exams are scheduled to be given at these conventions. For other exam opportunities see Hamfest Calendar.

DAKOTA DIVISION CONVENTION
July 5-7, Rapid City, South Dakota

The 50th Anniversary of the Black Hills ARC will be celebrated at the Dakota Division Convention, being held at the Howard Johnson's Motor Lodge, I-90, Exit 59. Hours: Saturday, 8 A.M. to 5 P.M. Banquet at 7 P.M.; Sunday, starting at 8:30 A.M. with a breakfast/brunch, exhibits open at 9:30 A.M. Registration on Friday from 4 P.M. to 7:30 P.M., followed by a social hour. Admission at the door $7.50.

Flea market, forums, women's activities and fun for everyone. QSL display board. VE exams start at 1 P.M. on Saturday. Walk-ins on a space-available basis. Motels and camping in the area. Talk-in on 34/94 and information on the SD Evening Net 3870 kHz.

For further information, write to Gene Bauer, KXØU, 713 Blaine Ave., Rapid City, SD 57701, tel. 605-343-5165.

WEST VIRGINIA STATE CONVENTION
July 6-7, Jackson's Mill

The 27th Annual West Virginia State ARRL Convention will be held at the Jackson's Mill 4-H Camp near Weston. This convention features net meetings, DX forum, ARES/RACES meetings, technical forums, MARS meetings, amateur gear auction, flea market, and much more. For those who preregistered, VE exams will be given at 8 A.M. Saturday.

Registration and lodging information: WV State Amateur Radio Council, 103 Cleveland Ave., Nitro, WV 25143.

Camping information: Chuck McClain, K8UQY, Rte. 4, Box 161, Grafton, WV 26354.

Talk-in on 144.79/145.39.

INDIANA STATE CONVENTION
July 13-14, Indianapolis

The 1985 Indiana State Convention/Indianapolis Hamfest will be held at the Marion Fairgrounds at southeast intersection of I-74 and 465. Flea market setup 8 A.M. Saturday, close at 5 P.M. Commercial vendors' setup 10 A.M., open to 5 P.M. Gates open 6 A.M. Sunday, Commercial Bldg., 8 A.M. Free camper facilities and hookup available on the grounds. Motels close by. Security provided both nights. Technical forums and banquet. Professional food services on the grounds. Gate ticket of $5 also entitles you to free parking. For further information, contact Indianapolis Hamfest, P.O. Box 11776, Indianapolis, IN 46201.

IOWA STATE CONVENTION
July 20-21, Des Moines

The Des Moines Radio Amateur Association will sponsor the Iowa State Convention /Electronic Fair at the Airport Hilton Inn. This event will be a showcase for the latest in satellite television, computers, Amateur Radio and electronics. Featured will be 50 booths crammed with high technology. Admission fee, $2; $3 for flea-market parking. Banquet Saturday evening, $15 per person. The featured banquet speaker will be former FCC Commissioner Nick Johnson, NØEAJ, host of *New Tech Times* on public television and professor at the University of Iowa. Technical seminars will be held both days featuring excellent programs for computer and satellite enthusiasts, Amateur Radio operators and spouses. Additional details available from the Des Moines Radio Amateur Association, P.O. Box 88, Des Moines, IA 50303.

OKLAHOMA STATE CONVENTION
July 26-28, Oklahoma City

Hear ye, hear ye! Due to circumstances within our control, our 12th (can ya believe it?) Annual Ham Holiday and ARRL State Convention will unfold at the comfortable Lincoln Plaza, again including the now-famous Hospitality room under the aegis of MORI (Mid-Oklahoma Repeater Inc.).

New this year is the family ticket: each co-resident immediate family member over 12 may be admitted for half price: with preregistration (by July 10 please) at $8/head and door cost at $10. The family member is $4/5 each in addition with a full registration. The catch-(12) is that the family ticket is ineligible for any random awards. No confirmations or refunds.

Bring the ladies to 4445 Lincoln Blvd., within view of the State Capitol Complex, for flower arranging, personal security, and surprise pastimes and the usual Hi-Q programs for you OMs.

Come see the endangered species of "Amateur Radio Dealers" and find what bargains they'll bring. Fleas will be available in their own Market Saturday only, 0900-1700 (a table may be registered for your fleas, in advance only, for $5 each). Send checks or money orders (no cash) to CORA, P.O. Box 60093, Oklahoma City, OK 73146. Talk-in will be on 34/94 repeater courtesy of the Central Oklahoma VHF ARC. Y'all come.

How to Register for Upcoming Exams

August 2-4, North Florida Section (Jacksonville, Florida): Walk-in exams will be given on Saturday, August 3, in the afternoon.

NORTH FLORIDA SECTION CONVENTION
August 3-4, Jacksonville

The ARRL North Florida Section convention will be held with the 12th Annual Greater Jacksonville Hamfest in downtown Jacksonville at the riverside Civic Auditorium. Activities will include walk-in license exams on Saturday afternoon, various forums including packet radio and women's programs, and a large indoor swap/exhibit area. Ample parking will be available, including nearby overnight parking for travel trailers and motor homes. While in the area, plan also to see some of the nearby attractions of our city and state. The Jacksonville Zoo is always interesting and the beaches relaxing. Fort Caroline, Fort Clinch and Kingsley Plantation all provide insight into earlier times, and historic St. Augustine is a short drive south. The site is easily accessible from I-95, and talk-in will be on 16/76. Our hotel is the Jacksonville Hilton, with special rates and connecting bus service. Registration is $4. Further information may be obtained from Hamfest Assn., P.O. Box 10623, Jacksonville, FL 32207.

ROCKY MOUNTAIN DIVISION CONVENTION
August 2-4, Jackson, Wyoming

What other convention can offer the scenic beauty of Yellowstone and Teton Parks, great fishing on Jackson and Jenny Lakes, thrilling raft rides down the Snake River, scenic horseback rides in the heart of the Rockies, or the fun of the famous "Million Dollar Cowboy Bar"? Come to the 53rd WIMU Hamfest at the Virginian Motel, and see for yourself. We may not be the biggest, but we are the **Best in the West.** There will be great fun for all in this vacation paradise, including family activities, swapfest and dealers. Mobile, homebrew and software competitions. For special room rates, call 307-733-2792 and mention hamfest. For more information contact Ken Kopp, KØPP, P.O. Box 848, Anaconda, MT, 59711, tel. 406-797-3340.

SOUTHWESTERN DIVISION CONVENTION
August 9-11, Long Beach, California

We're Talking big! The ARRL SW Division convention will be held aboard the RMS *Queen Mary*. Hotel Queen Mary guests receive free admission to the Spruce Goose exhibit and the *Queen Mary* tour. There is plenty of parking with limited RV spaces nearby.

Exhibits will open all three days. The keynote banquet speaker will be Senator Barry Goldwater, K7UGA, with master of ceremonies Roy Neal, K6DUE, of NBC. The breakfast speaker will be film producer Dave Bell, W6AQ. Technical program speakers include David Sumner, K1ZZ, Chris Imlay, N3AKD, Lew McCoy, W11CP, Julian Macassey, N6ARE, Russ Andrews, K6BMG, Chip Angle, N6CA, Harold Price, NK6K, Al Lee, W6KQ1, Jerry Boyd, KG6LF, Gordon West, WB6NOA, Tom O'Hara, W6ORG, Mike Hiehle, W6RZ, and Bill Buchanan, KF6TE. In addition, the FCC Forum will be conducted by Engineer-in-Charge Larry Guy and the ARRL Forum moderated by Director Fried Heyn, WA6WZO. There will be many other activities and prizes such as women's program, t-hunt and other contests. If you plan to operate the *Queen Mary* station, W6RO, you must have your license in hand.

Advance registration (postmarked by July 15) is $6, $7 at the door; banquet (prime rib), $25; women's luncheon, $10.50; and Sunday breakfast, $10. Make check payable to HAMCOM and mail to P.O. Box 91313, Long Beach, CA 90809. For the room discount at Hotel Queen Mary ($85 double/$69 single) mention HAMCON. Other nearby lodging includes Queensway Bay Hilton and Hyatt Regency.

Hamfest Calendar

Administered By Marjorie C. Tenney, WB1FSN
Convention/Travel Coordinator

[*Attention*: The deadline for receipt of items for this column is the 15th of the second month preceding publication date. Hamfest information is accurate as of our deadline; contact sponsor for possible late changes. For those who send in items for Hamfest Calendar and Coming Conventions: Postal regulations prohibit mention in *QST* of prizes of any kind and games of chance such as bingo.]

†**Arizona (Flagstaff)—July 26-28:** The Amateur Radio Council of Arizona will present Hamfest '85 at the Fort Tuthill Fairgrounds, off I-17, south of Flagstaff. Hours: Friday, 12 to 6 P.M.; Saturday 8 A.M. to 6 P.M.; Sunday, 8 A.M. to 3 P.M. No admission charge. Swapmeet, forum, commercial exhibits. FCC exams on Saturday. Refreshments, camping—self-contained RVs. Talk-in on 447.150/442.150 and 22/82. For further information, contact Lee Pemberton, WB7BXB, 1420 E. Bethany Rd., Phoenix, AZ 85015, tel. 602-234-1280.

British Columbia (Oliver)—July 26-28: The Okanagan International Hamfest will be held at Oliver Centennial Park. Saturday, 9 A.M. Activities Saturday, 1 P.M., Sunday, 2:30 P.M. Women bring your hobbies/crafts, etc., for sale or display. Potluck supper, Saturday, 6 P.M. (Please note the change). Talk-in on 34/94 and 76/76. Further info: Lota Harvey, VE7DKL, 584 Heather Rd., Penticton, BC V2A 1W8.

†**Illinois (Downers Grove)—July 14:** The DuPage ARC Hamfest/Computerfest will be held on Sunday at the Downers Grove American Legion Post 80. Large outdoor flea market and swappers row. Indoor commercial exhibits available. VEC exams. Plenty of parking, food and drink available. General admission $3. Tickets available at the gate only. Gates open at 8 A.M. Talk-in on 52. For more information, send s.a.s.e. to W9DUP, P.O. Box 71, Clarendon Hills, IL 60514, or call 312-971-3294 between 8 A.M. and 9 P.M.

Illinois (Springfield)—July 27-28: The Kiowa ARC Pow Wow, formerly the Breakfast Club Hamfest, will be held at the Bridgeview Beach Park, Exit 88 off I-55, 5 miles south of Springfield. The Pow Wow, located in a beautiful Land of Lincoln setting, will be open from 12 noon until 9 P.M., Saturday and 8 A.M. to 4 P.M. on Sunday. Food available on grounds and at nearby locations. Major motels, Safari and KOA Camp Grounds nearby. Flea market space available. No parking available for campers at the park. Advance tickets $1 each. For further information, write Charlie Brown, WA9ARY, 3341 So. 5th St., Springfield, IL 62703.

†**Illinois (Belvidere)—July 28:** The Belvidere Hamfest, sponsored by the Big Thunder ARC, will be held at the Boone County Fairgrounds from 7 A.M. to 2:30 P.M. Donation $2.50 in advance, $3 at the door. Buy and swap, meet old friends and make new ones. Overnight camping; fee for electricity only. Talk-in on 147.975/375 and 52. For further information, contact Jim Grimsby, W9HRF, 210 Oak Lawn La., Poplar Grove, IL 61065, tel. 815-765-2573.

Indiana (LaPorte)—July 14: The combined LaPorte-Michigan City Amateur Radio Clubs will sponsor their summer hamfest on Sunday at the LaPorte County Fairgrounds, State Road 2, west of LaPorte, 8 A.M. to 2 P.M. Paved outdoor parking; indoor tables by reservation, 40¢/ft, to Box 30, LaPorte, IN 46350. Donation at the gate, $3.

Indiana (Indianapolis)—August 4: The WA9SNT ARC will hold its annual swapfest at ITT Technical Institute, 9511 Angola Ct. (across 465 from Pyramids), from 8 A.M. to 4 P.M. Flea market setup begins at 6 A.M. Admission: $2; students, $1; Flea market space, $1 additional. Large flea market, electronics equipment auction, refreshments available. Talk-in on 146.94 and 3910 A.M. For additional information, contact Dave Johnston, K9HDQ, c/o ITT Technical Institute, 9511 Angola Ct., Indianapolis, IN 46268, tel. 317-875-8640.

†**Iowa (Cedar Rapids)—August 4:** The Cedar Valley ARC, Inc. 11th annual hamfest will be held at Hawkeye Downs Exhibition Bldg., from 7 A.M. to 3 P.M. Admission is $3 in advance, $4 at the gate. Tables, $7; electricity, $2. Manufacturers and dealers welcome. Ample parking, overnight camping area, picnic facilities, privately run concession stand, Cedar Rapids Airport nearby. Talk-in on 16/76, 223.34/4.94 and 52. For advance tickets, tables or general information, write to CVARC Hamfest, 2818 Southland St., SW, Cedar Rapids, IA 52404. Dick Isard, WBØVVZ, Chairman.

†**Kentucky (Georgetown)—August 11:** The Central Kentucky ARRL Hamfest, sponsored by The Bluegrass ARS, will be held Sunday, 8 A.M. to 5 P.M., at Scott County High School, Longlick Rd. and U.S. Rte. 25. Talk-in on 76/16. Technical forums, FCC exams and exhibits in air-conditioned facilities. Outside flea-market space, no charge. Tickets $3.50 in advance and $4 at the gate. For more information or tickets, send s.a.s.e. to Scott Hackney, KI4LE, 629 Craig La., Georgetown, KY 40324.

Maine (Wilton)—July 20: The Bass Hill Repeater Group is hosting a free flea market at Cushing School. Indoor site available if rain. ARRL/VEC testing—call classes. Talk-in on 147.18 and 52. Contact Paul Gooch, KY1C, P.O. Box 533, Wilton, ME 04294 or Thomas R. Knight, KY1E, Box 504, W. Farmington, ME 04992, for further information.

Maryland (West Friendship)—July 28: The Baltimore Radio Amateur Television Society presents its BRATS Maryland Hamfest and Computerfest on Sunday at the Howard County Fairgrounds, Rtes. 144 and 32, adjacent to I-70. Over 175 tables in indoor exhibit area. Tables along the wall, with access to ac power, are $20 each or 4 for $75. Tables in the center of the floor are $10 each, with special rates for booths of 12 or 16 tables. Tailgating is $3 per space, with no advance reservations permitted. Dealer setup begins at 2 P.M. Saturday. Overnight security provided. Motels nearby. RV hook-ups available on the grounds. Free walk-in VE examinations will be given with no advance registration required. For further information or for table reservations, write to Mayer Zimmerman, W3GXK, BRATS, P.O. Box 5915, Baltimore, MD 21208.

Michigan (Petosky)—July 20: The Straits Area ARC announces its Twelfth Annual Swap 'N' Shop, to be held at the Emmet County Fairgrounds. Doors open from 9 A.M. to 2 P.M. General admission is $2.50; single table $3. Talk-in on 07/67 and 52. Refreshments available; lunch from 11 A.M. to 1 P.M. Free RV parking Friday night for self-contained RVs, also Petosky State Park nearby. For further information, contact Joe Werden, WD8MJB, Chairperson, P.O. Box 444, Conway, MI 49722 or tel. 616-347-8693. S.a.s.e. appreciated.

Michigan (Manistique)—July 27-28: The Manistique ARA will host the 37th Annual Upper Peninsula Hamfest. For further information, write Manistique ARA, Att: Debra K. Barton, 509 Range St., Manistique, MI 49854.

Michigan (South Haven)—August 4: The Black River ARC Annual VHF Picnic and Swap and Shop will be held on Sunday, from 10 A.M. to 3 P.M., at the West Side Allegan County Park, near Glenn (10 miles north of South Haven via I-196, Exit 30). Admission is $2. Free table or trunk sales. Picnic tables, Lake Michigan beach, playground and ample parking available. No food vendor in park. For more information, contact Ed Alderman, KI8Z, 56500 48th Ave., Lawrence, MI 49064, tel. 616-674-3567.

Minnesota (Iron)—July 7: The Iron Range ARCs will be holding their Range-Wide Hamfest, from 10 A.M. to 4 P.M., at the Clinton Community Center, Hwy. 37, 13 miles east of Hibbing, 6 miles west of Hwy. 53. Tickets are $1; tables $2 each. Talk-in on 147.15 and 146.79. Food, picnic area, playground and tennis courts. For more info, send an s.a.s.e. to Teresa Dell, KAØCDO, Rte. 1, Box 284, Iron, MN 55751, tel. 218-744-5212.

†**Montana (Essex)—July 19-21:** The Glacier-Waterton Hamfest, sponsored by the Hellgate ARC, will be held near Glacier National Park, Hwy. 2, 10 miles east of Essex. Advance admission $7; at the door $8. Seminars, swap tables, auction, transmitter hunts, CW contests, cake contest, entertainment for all. Barbeque, breakfasts, and much more. Camping facilities on site. Hotels and motels nearby. Private camp ground reserved for this three-day event. Talk-in on 52. For further information and advance tickets, contact Glacier-Waterton Hamfest, c/o Bob Black, KC7HP, 647 Artemos, Missoula, MT 59803, tel. 406-543-4894.

†**Missouri (Washington)—July 21:** The 23rd Annual Zero-Beater ARC Hamfest will be held at Bernie H. Hillermann Park, from 8 A.M. to 3 P.M. FCC exams, free flea-market space. Limited rental space available under pavilion, advance reservation advised. Sandwiches, dinner and refreshments available, free parking. Talk-in on 84/24 and 52. For further information, write to Zero Beater ARC, Box 24, Dutzow, MO 63342.

†**Nebraska (Victoria Springs)—July 27-28:** The Central Nebraska ARC will sponsor the Victoria Springs Steakfry at Victoria Springs, NE State Recreational Area. Registration $5; ages 6 to 12, $2. Amateur exams, swap tables, tour of Cedar Canyon. Saturday evening supper and songfest; Sunday morning breakfast, charcoal-grilled steaks at noon. Church on Sunday morning. MARS meeting. This is a family camping hamfest; reservations not required. Info from Nebraska Net, 3980 kHz, 7:30 A.M. Talk-in on 40/00 and 16/76. Tel. 308-527-3396 and 308-942-5555.

†**New Jersey (Augusta)—July 20:** The Sussex County ARC will sponsor SCARC '85 at the Sussex County Fairgrounds, Plains Rd., off Rte. 206. Doors open at 8 A.M. Registration $2. Indoor tables, $7 each; tailgate space, $5. Food and refreshments. Acres of free parking. Talk-in on 90/30 and 52. For further information, call or write to Donald R. Stickle, K2OX, Weldon Rd., RD 4, Lake Hopatcong, NJ 07848, tel. 201-663-0677.

†**New York (Poughkeepsie/LaGrange)—July 13:** The Mt. Beacon Hamfest, sponsored by the Mt. Beacon ARC, will be held at the Arlington Sr. High School, from 8 A.M. to 3 P.M. Admission $2; women and children free. FCC exams (preregistration required via WB2KMY, tel. 914-471-0946). Auction at 2 P.M. Tailgating space, $3 (1 free admission); table, $4 (1 free table and admission). Hot food and beverages. For further information, contact Julius Jones, W2IHY, RR 2, Vanessa La., Staatsburg, NY 12580, tel. 914-889-4933.

†**New York (Alexander)—July 14:** The Batavia Hamfest, sponsored by the Genesee Radio Amateurs (GRAM), will be held at the Alexander Firemen's Grounds, Rte. 478, from 6 A.M. to 5 P.M. Admission is $3 in advance, $4 at the gate. Breakfast at 6 A.M., chicken barbeque, flea market, OM/YL programs, free camping (electric $2), 52 check-in contest, VEC exams given. Commercial exhibits open at 9 A.M.. Hot-air balloon launch. Talk-in on 144.61/5.31, 224.10, 444.05 and 52. Further information from GRAM, P.O. Box 572, Batavia, NY 14020. For tickets: Knute Carlson, N2DRX, 26 Burke Dr., Batavia, NY 14020, or tel. 716-343-6770, Dave.

North Carolina (Cary)—July 20: The 13th Annual Mid-summer Swapfest, sponsored by the Cary ARC, will be held from 9 A.M. to 3 P.M. at the Lion's Club Shelter, near Cary High School. No admission or commission. Buying, selling, bartering. Open auction. Lunch. Talk-in: 80-30 mi, 28/88; 30-2 mi, 75/15; 2-0 mi, 52. For further information: Cary ARC, P.O. Box 53, Cary, NC 27511.

†**North Carolina (Asheville)—July 27-28:** The WCARS Hamfest and Computer Fair, sponsored by the Western Carolina ARS, W4MOE, will be held Sat., from 8 A.M. to 5 P.M., and Sun., from 8 A.M. to 3 P.M. Admission in advance is $3.50; at the door $4. McElroy CW Proficiency Test, forums, WCARS/VEC exams—all classes (walk-ins accepted), free parking, food on premises, RV parking (no hook-ups). Talk-in on 31/91, 16/76 or 52. Further information from Earl Elliott, KI4UO, 17 Emory Rd., Asheville, NC 28806,

†ARRL Hamfest

tel. 704-253-0386 (h), 704-667-7580 (b). For tickets: Marvin Solomon, KI4EA, 14 Carjen Ave., Asheville, NC 28804, tel. 704-258-1165.

Ohio (Lancaster)—July 14: The Lancaster and Fairfield County ARC will hold its annual hamfest on Sunday at the Fairfield County Fairgrounds, from 8 A.M. to 4 P.M. This year's hamfest is in memory of the late Ted Riley, WB8VOA. Admission $3 in advance or $4 at the door. Tables (limited) are $4 in advance or $5 at the door. Space for your table, $3 advance, $4 at the door. Talk-in on 03/63 and 52. Refreshments available, plenty of parking. For more information, write to Lancaster ARC, Box 3, Lancaster, OH 43130.

†**Ohio (Bowling Green)—July 14:** Ham-A-Rama, the 21st annual Swap and Shop sponsored by the Wood County ARC will be held at the Wood County Fairgrounds, from 8 A.M. to 4 P.M. Tickets are $2, or 5 for the price of 4 in advance. Trunk sales and food available. Advance table rentals $5 to dealers only. Saturday setup available until 8 P.M. For more information, or dealer rentals send s.a.s.e. to: Wood County ARC, c/o Craig Henderson, N8DJB, 7368 Scotch Ridge Rd., Pemberville, OH 43450, tel. 419-352-4465. K8TIH talk-in on 78/18 or 52.

†**Ohio (Wellington)—July 20:** NOARSFEST, sponsored by the Northern Ohio ARA, will be held at the Lorain County Fairgrounds. Setup late afternoon, Friday, July 19; gates open on 20th at 8 A.M. Donation in advance $2.50, at the door $3. Indoor commercial tables, $10, flea market, $3 per car space. FCC exams, mobile clinic, flea market, commercial dealers, alternative activities for women and nonhams. Software dealers are expected to respect copyright laws. Food, beverage, limited overnight parking (no hookups). Talk-in on 10/70. Information on 144.55/145.15. For further information and advance tickets, write to NOARSFEST, P.O. Box 354, Lorain, OH 44052. Dealers contact John Paul Jones, WA8CAE, 4612 Timberview Dr., Lorain, OH 44053, tel. 216-282-4256.

†**Ohio (Warren)—August 18:** The 28th annual Warren Hamfest will be held at Kent State University (Trumbull Campus). The 5-acre flea market opens at 6 A.M.; dealers (indoors) opening at 8 A.M. Advance tickets $2.50 until August 1. At gate, $3. License exams will be given. Activities for the women. DX forums, programs, demonstrations, speakers and ARRL booth. Flea-market spaces are $2 per 10-ft space. Breakfast and lunch served on the grounds. For more information, tickets, spaces, contact WARA, P.O. Box 809, Warren, OH 444782, c/o KD8KJ.

Oregon (Eugene)—July 20-21: The 10th annual Lane County Ham Fair will be held at the Oregon National Guard Armory, 2515 Centennial, with doors opening at 8 A.M. both days. License exams at the Boy Scout Bldg. starting at 9 A.M. both days. To register mail FCC Form 610, copy of present license, $4 check payable to ARRL/VEC and give day preference to Robert Olson, 1450 Holly Ave., Eugene, OR 97401, tel. 503-345-8218. Walk-ins accepted if space available. Major ham equipment suppliers, computer demos, technical seminars, swap tables, women's activities. All-day snack bar, free parking for RVs (no hookups). Saturday potluck supper, 6 P.M., each family to bring hot dish and salad or desert. Registration required for all licensed amateurs and adults. For general information and tickets, contact Byron Rainwater, KT7T, Treas., P.O. Box 10694, Eugene, OR 97440, tel. 503-484-1078. Make checks payable to Lane County Ham Fair.

†**Pennsylvania (Greenburg)—July 28:** The Foothills ARC will hold its 17th annual Greensburg Hamfest at the Nevin Arena on Sunday. Tickets are $2 or 3 for $5. Indoor tables, $5, tailgating, $2. Refreshments. Mobile check-in on 78/18. For further information, advance registration or tables, write FARC, Inc., P.O. Box 236, Greensburg, PA 15601 or contact John Lawrence, WB3KJH, 228 Tremont Ave., Greensburg, PA 15601, tel. 412-374-5828.

Pennsylvania (Pittsburgh)—August 4: The South Hills Brasspounders' and Modulators' 48th annual hamfest will be held at the Community College of Allegheny County, from 8 A.M. to 4 P.M. Forums on RTTY, packet radio and OSCAR, flea market. For further information, contact Bill Gardiner, N3DXE, 4756 Child Dr., Pittsburgh, PA 15236, tel. 412-885-2157, evenings.

Saskatchewan (Regina)—August 2-4: Commemorating Saskatchewan Heritage 1985, the Regina ARA is hosting Saskatchewan Hamfest '85 at the Wascana Institute of Applied Arts and Sciences, South Campus. Registration Friday from 1 P.M. to 6 P.M., Saturday from 8 A.M. to 5 P.M. Technical talks, CRRL and CARF forums, women's program, contests, commercial exhibits, flea market, tours. Talk-in on 146.46/7.06, 28/88, 72/12 and 52. Banquet and dance on Saturday, 6:30 P.M., at University of Regina, College West. Flea market and tours on Sunday from 8:30 A.M. to noon. Preregistration $10, at the door $25. For further information, write Registrar-Hamfest '85, P.O. Box 153, Regina, SK S4P 2Z6.

South Carolina (Charleston)—July 13-14: The Charleston Hamfest, sponsored by Charleston ARS, will be held at the Omar Shrine Temple on East Bay St., Saturday 8:30 to 4, Sunday 9 to 4. General admission is $5 (12 and under free), includes admission to Hospitality Room (7:30-11 P.M. Saturday). FCC exams Saturday. Buffet available both days. Talk-in on 19/79. Flea market tables, $5; commercial booths, $40. For information, contact Hamfest Committee, P.O. Box 70341, Charleston, SC 29405, or call 803-747-2324 or 554-8058.

†**Texas (Austin)—August 2-4:** Austin SummerFest '85, sponsored by the Austin ARC and Austin Repeater Organization, will be held at the Marriott Hotel, I-35 and U.S. 290 East. Registration begins at 6 P.M. Friday; swapfest, 7 A.M. Sunday; sessions, 8 A.M. Saturday. Advance admission is $5; at the door, $7; under 18 years, free. Summer meeting of Texas VHF-FM Society; technical sessions; volunteer exams; women's events, including mini arts and crafts fair; swapfest; dealer displays; hospitality suite. Swapfest table reservations (limit 2), $1 each. Talk-in on 34/94. Registration: Austin SummerFest, Box 13473, Austin, TX 78711. Hotel reservations: Austin Marriott Hotel, 6121 I-35 North, Austin, TX 78752, tel. 512-458-6161.

Texas (Levelland)—August 4: The 20th annual Northwest Texas Emergency Net Picnic and Tailgate Swapfest will be held in the City Park. Co-sponsored by the Hockley County ARC, this is a family event. Bring your own picnic basket. Talk-in on the Levelland 2-meter repeater 28/88. Y'all come.

†**Virginia (Berryville)—August 4:** The 35th Annual Winchester Hamfest, sponsored by the Shenandoah Valley ARC, Inc., will be held at the Clark County Ruritan Fairgrounds, Rte. 7, from 7 A.M. to 3 P.M. Admission is $3, women and children, free. Donations from major manufacturers, VE exams (limited walk-ins). Breakfast snack bar and chicken barbecue. Women's activities. Tailgaters and limited tables, $5. Talk-in on 22/82 and 52 simplex. For further information, contact Joann Blaker, tel. 703-869-4878.

†**West Virginia (Wheeling)—July 21:** The Triple States RAC will present its 7th annual Wheeling Hamfest and Computer Fair at Wheeling Park on Sunday, from 8 A.M. to 4 P.M. Dealers, 5-acre flea market, free parking, refreshments, ARRL, SWOT, SMIRK, AMSAT booths. Admission, $3; children under 12 free. Indoor displays, tables available, but reserve space in advance. Contact Jay Paulovicks, KD8GL, RD 3, Box 238, Wheeling, WV 26003, tel. 304-232-6796 or TSRAC, Box 240, RD 1, Adena, OH 43901, tel. 614-546-3930.

Wisconsin (Eau Claire)—July 13: The Eau Claire ARC will hold its annual hamfest on Saturday, at the 4-H buildings, from 8 A.M. to 4 P.M. Talk-in on 31/91 and 52. Free tables and coffee. Tickets, $2 in advance; $3 at door. For info, tickets, send s.a.s.e. to Gene Lieberg, KA9DWH, 2840 Saturn Ave., Eau Claire, WI 54703.

Wisconsin (Oak Creek)—July 13: The South Milwaukee ARC will hold its annual Swapfest on Saturday, at the American Legion Post #434, 9327 South Shepard Ave, from 7 A.M. until about 4 P.M. Parking, picnic area, sandwiches, liquid refreshments available on grounds. Overnight camping available. Admission $3. The Milwaukee Volunteer Core Group will conduct Amateur Radio exams during the day. Talk-in on 146.94 MHz. More details, including a map, may be obtained from the South Milwaukee ARC, P.O. Box 102, South Milwaukee, WI 53172-0102.

Wisconsin (Oshkosh)—July 26-August 2: The Oshkosh ARC, in conjunction with the SOLAR Assn., will host EAA hams for the 1985 convention. Information throughout the convention will be available via the 147.945 repeater, or by stopping at the EAA Ham Shack Hospitality site. Look for red ARRL flag. Ground communications will be run on 146.40 simplex. For further information, contact Forest Schafer, WD9IWL, 417 Willow St., Omro, WI 54963.

Wyoming (Douglas)—July 12-14: The 1985 Wyoming Hamfest will be held at the Wyoming State Fair Grounds. This year's event is being jointly sponsored by the Great Plains Repeater Assn. and the High Plains ARC. Distributor displays, indoor flea market (tables available), license exams, seminars, auction, banquet, breakfast and much more! Ample RV parking with or without full hook-ups. Plenty of motels. For full information and info on advance registration, send s.a.s.e. to Doug DesEnfants, WA7WXQ, North Star Route, Torrington, WY 82280.

[*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.]

(continued from page 52)

MA; Hotshots Amateur Radio Club, Crestwood, KY; Overbrook Amateur Radio Club, Philadelphia, PA; Palmetto Amateur Radio Club, Hollywood, FL; Rocky Point Schools ARC, Rocky Point, NY (Category III); Second Area Young Ladies ARC, Stone Ridge, NY (Category II); Sky High Amateur Radio Club, Lecanto, FL; Southern Piedmont Amateur Radio Club, Clarkesville, GA.

With this action, the League has the following number of active affiliated clubs: Category I, 1750; Category II, 12; Category III, 176.

10) The Executive Vice President presented a report in chart form, showing the status of action items resulting from the Annual Board Meeting.

11) The committee confirmed the next regularly scheduled meeting will be held on August 24 at the Camelback Marriott Inn, Scottsdale, AZ.

12.1) On motion of Mr. Atkins, the following are authorized as additional signers of checks on behalf of ARRL: for the Executive Vice President—Perry Williams; for the Treasurer—John M. Proctor.

12.2) Mr. Williams reported on the proposed U.S. commemorative postage stamp honoring the 25th anniversary of the launch of the first Amateur satellite, OSCAR 1 on December 12, 1961. The stamp will again be considered by the Citizens Stamp Advisory Committee at its meeting July 26. The staff will seek support for the idea among prominent citizens in and out of the Government during the next two months. There being no further business, the Committee adjourned at 6:45 P.M.

Respectfully submitted,
Perry Williams, W1UED
Secretary

LIFE MEMBERS ELECTED
May 18, 1985

Thomas J. Althoff, K2TA; Alan Ames, N2ALE; James K. Andrews, KD8VF; Jonathan B. Andrews, WA2YVL; Melvin L. Belknap, KB5DN; Susan Benua, WB2OSY; Hugh C. Blair, 9M2HB/N4FMA; Mary Ann Broshofske, KAØAJF; Don A. Brusch, K7UN; Deborah Burgess, N7FVH; Judy Curtis, WB3AIQ; John G. DePrimo, K1JD; Peter C. Demou, WA1YUT; Thomas E. Diggs, W6ZTG; Allen W. Dye, WDØAFD; Jay S. Falk, KT2E; Brian David Hamerski, KF6HI; Leonard L. Holmes, W8MCD; Ronald L. Jackson, WA6ZJF; Charles D. LaForge, KW8E; Lucille Lackore, NØCLS; Robert I. Macomber, WB1AQA; David M. Mitchell, KH6UN; Dillon L. Parks, Jr., WD5KCD; Charles G. Richardson, K9PRL; Marjorie A. Robertson, KA4HEN; Michael P. Schulhof, K1OK1; Randall Sherman, KH6MD; Charles A. Shingleur, N5HNM; David N. Smith, WB4NVQ; Michael M. Staunton, EI3DY; Daniel Stevens, KL7WM; Alford R. Taylor, Jr., KN3U; Albert S. Uhl, N8CMA; Robert W. Wilson, KA1XN; Bruce A. Wineman, KA9KJM; Walter W. Witherington, Jr., WD6EFH; George G. Woodard, NY4R.

Silent Keys

Administered By Marvis Bogatz

It is with deep regret that we record the passing of these amateurs:

N1BMY, Richard E. Baird, Lynn, MA
K1DZI, William A. Kolouch, Jr., Vernon, CT
W1EGQ, Lionel B. Clark, East Hartford, CT
W1IIQ, Ellis F. "Bing" Miller, Wolfeboro, NH
WA1OYL, Wesley G. Collins, Windsor, CT
K1QAZ, Delsanio J. Schiavo, Lehigh Acres, FL
N2AV1, Earl "Bill" Bowen, Fanwood, NJ
WA2GNQ, Hugo Cavaioli, East Hampton, NY
WB2LAO, Norman R. Fisher, Tuckerton, NJ
W2LQG, Ballard F. Jolley, Edison, NJ
W2PDU, Paul L. Field, Sr., Blue Point, NH
W2RQF, Benjamin J. Frommer, Moravia, NY
K2UKV, Stephen H. Quick, Roslyn, NY
W2VBA, John A. Solewski, Middletown, NJ
W2VPO, Gustave Odeane, Hasbrouck Heights, NJ
*WA2ZHA, Arnold J. Linzner, Ridgewood, NY
W2ZRV, Kenneth A. Sovocool, Clay, NY
*K3AO, Richard Vincent, Bryantown, MD
WA3AWO, James W. Lieb, Loretto, PA
W3BS, Karl G. Krech, Ocean City, NJ
W3CDS, Russell W. Frederick, Mount Penn, PA
W3GEX, Joseph F. Eckert, Jr., Quakertown, PA
KA3HAY, Jane P. Vincent, Seaford, DE
W3ITW, Joseph L. Bowen, Pottstown, PA
W3MCX, William E. Emerich, Reading, PA
WD4ARP, Vernon N. Simmons, Jr., Chesapeake, VA
K4CU, Phillip Wittmann, Sr., Mobile, AL
W4DRP, Charles B. Roessler, Falls Church, VA
K4EWB, John W. Swiggett, Jr., Kannapolis, NC
W4GUH, Melvin W. Jacobson, St. Petersburg, FL
KA4HFA, Charles T. Leary, Fort Walton Beach, FL
W4JOP, Hugh C. Henline, Ocala, FL
K4KLZ, Kenneth Haile, Sun City Center, FL
W4MFB, Leolin E. Long, Osprey, FL
WA4PNW, Philip J. Lapadura, Margate, FL
W4SSK, Dana D. Hazen, DeLand, FL
KB4W, Charles V. Wilson, Beaufort, SC
W5ATG, Ernest E. Cross, Dodd City, TX
WA5BQL, Bryan A. Maples, Bentonville, AR
N5DKK, Hartman L. Hall, Houston, TX
KA5DXJ, John W. Bohrer, Sr., La Luz, NM
WD5HPV, Corris W. Neyhard, Elm Mott, TX
W5JOG, Freddie R. Carlisle, Electra, TX
W5MMH, Ernest Detwiler, Wagoner, OK
W5RYD, Alfred E. Heineken, Albuquerque, NM
W5SWW, James G. Stroufe, Jr., Oklahoma City, OK
W5WBZ, Ramon L. Hettinger, Converse, TX
WB5YAR, Ronald D. Burnett, Wagoner, OK
K5ZOV, Felton "Doggie" Martin, Commerce, TX
N6AHS, Paul R. Ransom, Ojai, CA
W6AM, Don C. Wallace, Rancho Palos Verdes, CA
W6BJW, Sanford W. Herrick, Auburn, CA
W6BZU, Norman Peterson, Concord, CA
K6CHU, Lester E. Morford, Paradise, CA
W6GVT, Harlan G. Martin, Indio, CA
WB6IDJ, David A. Gilmore, Torrance, CA
W6MUO, Richard J. Saunders, Oceanside, CA
W6ONL, Michael J. Schaffer, Sacramento, CA
W6POQ, Theodore W. Kelso, Escondido, CA
W6QNX, Everett A. Sherman, Thousand Oaks, CA
W6RBK, Elmer Holman, Oakland, CA
K6YZU, William R. Petty, Dunsmuir, CA
KF6ZQ, George J. Prockish, Fresno, CA
W6ZQ, Joseph P. Frank, Mountain View, CA
W7AO, Glenn H. Means, Prescott, AZ
W7DRZ, John Gabica, Boise, ID
W7HQT, Louis J. Foley, Las Vegas, NV
K7IBX, J. Merl McCormick, Phoenix, AZ
W7IRL, Edward R. McAuslan, Riverton, WY
*WA7JCW, Allan B. Harris, Seattle, WA
W7KRL, Oliver C. Mitchel, Tucson, AZ
W7LL, H. Clifford Allen, Palm Beach Gardens, FL
W7LT, John A. Peel, Milwaukie, OR
WB7OLM, James F. Field, Spokane, WA
W8CQ, Franklin "Dusty" Dunn, Royal Oak, MI
WB8CVG, Russell E. Berry, Barboursville, WV
WD8DQF, Alvin F. Schaub, Detroit, MI
K8GGI, Morris Mahunik, Youngstown, OH
W8IWG, Malcolm J. Stevens, Harper Woods, MI
W8JMX, Ralph H. Ott, Elyria, OH
W8MMQ, Boris Kozel, Cleveland, OH
W8NRS, Stanley P. Jay, Columbus, OH
WD8OCH, Carl R. Hanson, Akron, OH
WD8PKG, Louie H. Baker, New Carlisle, OH
WD8REN, Norman W. Gottschalk, St. Marys, OH
W8SHV, Richard W. Smith, Pittsburgh, PA
WB8SMF, James A. Maxton, Fairview Park, OH
KA8TAY, Charles F. Weigand, Akron, OH
W8TL, Sidney J. Dowding, Mount Clemens, MI
WB8ZHV, John J. Hayes, Toledo, OH
WA9EBW, Raymond R. Brandt, Fort Wayne, IN
WA9JKU, Paul O. Poole, Odin, IL
W9KCW, H. Leevane Weaver, Apache Junction, AZ
W9MEF, Carl A. Shedlock, Sr., Hudson, FL
WB9MVZ, Stanley P. Kowalski, Two Rivers, WI
K9SNF, Herman S. Kruzel, Chicago Heights, IL
K9ZXQ, Robert J. Sturdevant, Arlington Heights, IL
WAØAOF, William Voeck, Sr., Englewood, CO
WØKYB, Joel L. Schmolke, St. Louis, MO
AJØM, Clarence J. Lank, Shell Knob, MO
WØRBY, Margaret C. Cones, Carthage, MO
WØRRU, Odell G. Reames, Clifton, CO
WØWC, Cecil C. Segar, Webster City, IA
VE1RO, Camille Maillet, Ottawa, ON
VE2AMG, Georges Magnan, Longueuil, PQ
VE3DCQ, Ronald W. Telling, Windsor, ON
VE3MM, Andrew W. Todd, Mississauga, ON
VE3NO, Bruce W. Woodall, Toronto, ON
VE4HP, Harold D. Cleve, Winnipeg, MB
VE4JA, A. Jackson McCrea, Winnipeg, MB
VU2JA, Joe A. Faithful, Bangalore, India

*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

July 1935

☐ We won't get more frequencies at the Cairo conference (scheduled for 1937) just by asking, says the Editor, because of hundreds of commercial stations registered in bands adjacent to ours. But our Cairo Committee will work to come up with good arguments and statistics to support our case.

☐ Super-regeneration is not deserving of its bad reputation, says W2HLM, who lists its good points such as "flat" a.v.c., uniform audio response, and ability to receive a signal in the presence of ignition and other noise. All if properly designed and handled, of course.

☐ W9DRD applied receiver bandswitching principles to his exciter unit and, thus, can select 80 through 10 meters from the front panel.

☐ This issue features portable gear, natural enough as we enter summer activities. W3LW's design includes voice and c.w. capability, an all-wave receiver and radio or phono entertainment with loudspeaker output. W6EQL uses a 6-volt storage battery and a genemotor for plate supply. W3ECP assembled transmitter, receiver and monitor plus some tools in a 28-lb. unit.

☐ The deluxe model is described by W9BOE—really a mobile lab with the vehicle clad in copper for shielding, and including ionosphere measuring gear for Crufts Lab in addition to ham capability.

☐ Raytheon's RK-20 design has been so well received they've brought out a big brother, the RK-28. Up to 250 watts output, and suppressor grid modulation at lower powers.

☐ Two-letter calls are now assigned by F.C.C. only to former holders of such a call sign, which will make them marks of distinction (or old age!).

☐ VE2BC and W7HR add to our knowledge of controlled-carrier 'phone systems—the former in biasing the suppressor grid being modulated, and the latter biasing the grid of a plate-modulated amplifier.

☐ Like to try those new *metal*-shell tubes? This issue has specs on the first types released.

☐ San Diego is holding a world exposition, and show station W6USA is demonstrating ham radio to thousands of visitors.

☐ High winds and icing regularly devastated long-wire antennas at New England's highest (6284 feet) ham station, W1XR, so work is now concentrated above 50 Mc.

☐ In the 'phone-c.w. contest sponsored by the League to promote intercommunication and harmony between the two modes, W1EZ was top telegraphy score, while W1SZ racked up the most points on voice.

☐ During July and August you can get a year's membership plus a *Handbook* for only $3.

25 Years Ago

July 1960

☐ The tightening of police radio-communications standards has released considerable amounts of commercially "obsolete" f.m. gear, ideal for 2-meter ham use. K9OJV describes the goodies and their highly effective use in the Chicago area.

☐ Plot your v.h.f. antenna vertical pattern without transmitting a signal, say K2LMG and W2YBP. Connect the beam to a receiver and simply (more or less) track the solar noise. They provide measuring formulas and the sun's latitude variations as helps.

☐ A newcomer's first receiver, usually low-cost, does okay on 80 and 40 meters, but W1ICP says it needs a crystal-controlled converter for the three higher-frequency bands to achieve satisfactory results, like the design he describes.

☐ For older receivers, W1SGN suggests investing $3 in surplus crystals to build a half-lattice filter. Properly aligned, results are practically guaranteed.

☐ Hail the cootie key—better known as the sideswiper—thought up originally as an inexpensive substitute for the conventional bug. KØOSA built one from scratch, and details his design.

☐ It won't hold a beam, but K4URX's lightweight 35-foot utility mast is built from inexpensive lumberyard materials and can be erected or taken down by one man.

☐ What's h.f.s.s.? High frequency satellite scatter, of course. K2QBW and K3JTE claim to have bounced their sigs off *Sputnik's* ionized trails for an abbreviated QSO, and "Rafe" solicits more participation in investigating the theory (which is not accepted by most scientists).

☐ The Editor echoes the thanks of the Board of Directors to all volunteers in the League structure. The real strength of A.R.R.L. lies in the accomplishments of these volunteer leaders.

☐ A new answer sheet, with blocks to be marked with soft-lead pencil, will enable Commission personnel to grade amateur written examinations more rapidly.

☐ "Mighty pretty" is the only way to describe the visual results of applying the principles outlined in W5ECP's treatise on lacing and cabling wiring.

☐ Under XYL pressure, VE7XZ housed his rig in a handsome console of 2 × 2 framework and fir plywood, installed in the shared den.

☐ The mighty Mississippi overflowed its Illinois banks in April, and area amateurs rallied once again to provide vital emergency communications. —*W1RW*

Conducted By Michael R. Riley, KX1B
Public Service Manager, ARRL

How to Increase the Effectiveness of Your Local Weather Net

The forecasters agree that it looks as if there is some potential! Charts, computer printouts and forecasts plot the path of a frontal system through southern Indiana and into Ohio before evening, to put an end to the sunny, warm day. Mid-morning conversations among forecasters at the National Weather Service (NWS) office in Columbus and control operators for the Central Ohio Severe Weather Net set the stage for activity that may be expected. All is ready. Expectations of things to come are heightened with the alert from NOAA weather radio: The National Severe Storms Forecast Center is issuing a Tornado Watch for this area!

Moments later, a net control operator issues a DTMF tone, placing the Central Ohio Radio Club's 146.76 repeater into subaudible tone, bringing normally quiet monitors to life with a repeat of the NOAA bulletin. Hams are advised to stay tuned to the frequency, and are told to expect some activity later in the afternoon. Other net control operators confirm the alert and, by telephone, arrange a schedule for operation.

Toward the end of the workday, the radar pictures on local cable television begin to portray the storm's entry into Ohio. Although it is still two hours distant, four control operators note the storm's position and begin to drive toward the weather office at Port Columbus International Airport. On arrival, they're briefed on present weather conditions and what to expect. They take a look at the radar—this is a big one! They power on the Central Ohio Severe Weather Net control console, located in the operations center of the weather office. The scanner and COR-activated cassette recording equipment is readied to log coming nets. One of the two VHF transceivers is tuned to the Dayton 146.64 repeater to monitor the Dayton area net, controlled through Vandalia Weather. The second rig is checked on 146.76, headsets plugged in and push-to-talk foot pedals tested. Logsheets are prepared; maps of Ohio, the Columbus coverage area and plotting maps for spotting locations are readied for use. The scanner on top of the radar console is brought out of emergency-alert mode, so that the radar operator can directly monitor conversation already present on the repeater about the coming storm.

Vandalia's beginning to see some action! Large hail, high winds and a funnel are reported. Locations are plotted on our maps, and discussion follows on the potential track of this part of the storm through Columbus. 146.76 begins to grow quiet, as hams await what they know will come.

Meteorologist-In-Charge Lew Ramey has brought in additional staffers for his side of the operation. Their generator is started, and all power is cut over to the generator. He gives the word, "Guys, we'd better get started . . . looks like it's getting closer."

A DTMF signal from W8FEH (Columbus Weather Service Office operator) places 146.76 back in subaudible to alert receivers in spotters' homes and cars, and in fire departments throughout the area. The reset beep changes accordingly, to indicate an emergency, and the net is on. Locations of check-ins are plotted, as spotters make for predetermined locations with excellent vantage points for watching the oncoming storm. It's a hurried atmosphere, but one that has been felt before.

Meanwhile, activity continues to build at Dayton. Vandalia Weather issues a tornado warning based on a ham spotter's sighting. This is announced calmly for general information as the net waits. Stations two counties west of Columbus are first to report the turbulent clouds, hail and winds that will fill the air this evening. The storm is here!

A call from a police agency is received—a public report of a funnel. A quick check by net control produces a ham spotter very near that location. He reports some "junk clutter" moving through with no rotary motion and no damage. It's a visual look-alike, but not a funnel. Another false alarm is logged, and the sirens are kept quiet because of the presence of this trained spotter.

As activity now reaches full speed, the logger and control operator maintain a terse, professional demeanor—knowing that their attitude and speed will set the pace for the net. Their key concern is to get reports of severe weather into the forecasters. As the severity increases, they indicate to the net that they're now looking for emergency traffic only—reports of hail greater than ½ inch, winds over 50 mi/h or severe conditions. Updates and indications from the radar position, which are relayed to the ham console in the form of tracings from the screen, and briefings from meteorologists, augment the television monitor on radar, which sits behind the ham console. Occasionally, these are broadcast for the safety and information of spotters and other monitoring stations. It's up to net control to know where the spotters are located and whether they should be moved to a safer spot.

A third control operator now selects another repeater on the backup rig, in order to monitor another weather net more directly affected by the storm. At times, questions to the other net, and reports from it, can be taken directly at the weather office over this second frequency. Warnings for counties in the path of the storm can also be relayed to local repeaters, so they have a head start in their own spotting activities. Warnings are rebroadcast by W8FEH, so that these other nets, the spotters and safety agencies, who also monitor the progress of the storm through 146.76, can be constantly updated.

Should there be a hit or actual touchdown, several hams who are involved in the safety field are asked to report immediately to the scene and relay information on the damage. From these initial reports, provided in minutes by the nearby spotters, other organizations, such as Central Ohio ARES, the DSA ham communicators and others, can start their own emergency functions. Damages are logged for the NWS reports as well. While this is going on, however, the primary concern is to track the storm and continue to watch its progress and threat.

The effectiveness of Amateur Radio severe-weather nets has been proven for years. Particularly useful in providing ground-based, trained observations of conditions for the National Weather Service during thunderstorms and severe weather conditions, there are varieties of these nets across the country. Our experience of great cooperation with the National Weather Service office at Columbus indicates that in order to be most effective, several elements and practices must be in place:

1) There must be a clear understanding that amateur networks and communicators are there to assist the NWS. They are the experts in this area; amateurs are the volunteers.

2) There must be a strong feeling of cooperation and trust between amateurs and local weather personnel. Amateurs need to remember that the volunteer spotter nets are only as good as their last report: accuracy, professionalism and restraint go a long way toward creating a trustworthy track record. This is achieved only through training.

3) Amateurs must be ready to activate and perform on a moment's notice.

4) To be most effective, the net control point should be located at the National Weather Service Office, if there is one in your area. If not, steps should be taken to establish a direct interaction with NWS personnel, perhaps through a relay station to a net that is located at your office, or through some prearranged system. With direct location, reports can be quickly acted upon, clarified and interpreted. Again, we must remember that we are the guests of the weather office and behave accordingly.

5) We've never heard of a tornado that stopped because it reached a governmental boundary. They're distinctly apolitical—and so must be the weather net. Several organizations have political boundaries that limit their effectiveness. Now is the time, in making preparations to improve your weather spotting, to figure out how to eliminate that impediment from your weather spotting. Club-affiliation questions are never raised—the more spotters, the better we perform.

While the purpose of our net is to act as the eyes and ears of the National Weather Service, we have, over the years, come to be regarded as a primary and immediate source of information to public safety agencies, utilities and to the scanner-owning general public. We chose to actively promote this service through publicity and through expanded training.

For years, hams had been gathering annually at the onset of tornado season to review operation of the net and refresh training on severe spotting. Because several amateurs were directly involved with fire and police departments, they suggested to the NWS that these agencies be included, as they certainly could use the same training! After discussion we decided to expand our training sessions and make them a first-class effort. A mailing list of police, fire and disaster agencies in the coverage area of the Columbus Weather Office was compiled, and invitations went out. Messages over the state's police computer system confirmed the invitation. Our training was adjusted to accomplish three goals:

1) Spotting severe weather and providing accurate reports (either by Amateur Radio or telephone).

2) Showing the safety agencies what service and concern is put forth by the National Weather Service and by the ham radio nets, while showing how these agencies could benefit directly.

3) Pointing out safety and preparedness hints that safety agencies should adopt and use to provide their best service possible.

While we specifically avoided duplicating a "how to handle a disaster" session, we did point out that the preparedness for severe weather we were promoting would go a long way toward their being able to properly handle the aftermath. We secured safety people (who were also hams) and stressed what equipment and internal procedures should be ready, how to receive and act on warnings, and how to benefit from monitoring the weather net. Our first auditorium-ful of 400 hams and safety officers was an indication of their sincere interest in this training. We followed this interest with a professional seminar presentation, a professionally produced slide show, a film from the National Weather Service and recognized guest speakers. The businesslike presentation drew their praise and respect. Videotape recordings of the seminar, re-edited in post production, made excellent training tapes for personal appearances, both before Amateur Radio clubs, and before police and fire department training meetings.

Successive years of seminars have stayed with the same theme, although with varied speakers, format and concentration, so as not to become repetitive. The active cooperation and encouragement of the local weather office staff has been a key factor in the success of the seminars and the open house of the weather office that follows. Our latest venture has been to expand the session further with invitations to security and safety directors of the area's major corporations and plants. Their interest also lies in providing protection for the large numbers of people under their responsibility.

The net result of this system is a better-trained amateur spotting force—one that's enthusiastically encouraged by the local weather staff. Another result is some excellent PR for Amateur Radio and increased interaction between hams and the safety agencies who now monitor the nets regularly. Yet another rewarding aspect is the level of dedication portrayed by individual hams who readily participate and actively promote this service.

The first step is to introduce yourself to your local weather service office, and indicate your willingness to participate. The second is to strive for a professional attitude in the conduct of your net, training and spotting. The result is a real feeling of worth to yourself and your community. —*G. Stanley Broadway, N8BHL*

QSL S.a.s.e.?

ARRL Headquarters has recently received inquiries about the legality of amateur radiograms requesting individuals to send self-addressed, stamped envelopes to the League's incoming bureaus. It is the opinion of the staff at Headquarters that such radiograms are legal and do not violate any FCC rule against facilitating the regular business affairs of any party. There is no charge for the use of any ARRL incoming QSL bureau. The QSL bureau volunteers get no compensation by virtue of receiving a stamp and/or envelope. The s.a.s.e. requested by an ARRL incoming QSL bureau belongs, at all times, to the amateur sending the s.a.s.e. The s.a.s.e. is held by the bureau only for such time as it takes to fill the envelope with the sender's cards. Cards already the property of the sender are put into the sender's envelope, and everything is sent back to the sender. No material compensation, paid or promised, is given to or requested by any ARRL incoming QSL bureau.—*ARRL Regulatory Information Branch*

In early May, radio amateurs provided communications for the 1st Pittsburgh Marathon. W3LBV passes the word that the wheelchair entrants are on the course . . .

. . . while N3DHC keeps a close watch on the runners as they pass Checkpoint 14.5. *(photos by KC3ET, submitted by N3BPB)*

ARRL SECTION EMERGENCY COORDINATOR REPORTS

For April, 38 SEC reports were received, denoting a total ARES membership of 17,414. Sections reporting were: AK, AB, CO, EMA, ENY, EPA, ID, KS, KY, MDC, ME, MI, MN, MO, MS, NE, NFL, NYC/LI, OK, ORG, PAC, SC, SCV, SD, SDG, SFL, SJV, SNJ, SV, TN, UT, VA, WA, WI, WMA, WNY, WPA, WV.

Reports were not received by the following Section Emergency Coordinators: AL, AZ, AR, BC, CT, DE, EBAY, GA, IA, IL, IN, LA, LAX, MAR/NFD, MB, MT, NC, ND, NH, NNJ, NM, NTX, NV, OH, ON, PQ, RI, SF, SK, STX, VT, WIN, WY.

SEC monthly reports for July should be received in the Public Service Branch at ARRL Hq. no later than August 12. Reports received after the 12th will be entered as time permits.

Transcontinental Corps April 1985

July TCC reports should be received in the Public Service Branch no later than August 12.

Area	Successful Functions	% Successful	TCC Function Traffic	Total Traffic
Cycle Two				
TCC Eastern	90	75.0	461	974
TCC Central	76	84.4	353	708
TCC Pacific	No report received			
Summary	166	79.7	814	1682

Cycle Four

TCC Eastern	141	94.0	682	1387
TCC Central	53	88.3	315	669
TCC Pacific	82	88.3	267	—
Summary	276	83.5	1264	2056

TCC Roster

AA4AT, KD7EY, N1BHH, KA8CPS, KK3F, WA2FJJ, WD4FTK, N4GHI, WB3GZV, KB2HM, K8OZ, W8PMJ, KT1Q, W8QHB, W1QYY, KW1U, KB3UD, AF8V, N2XJ, WB8YDZ, ND5T, KT6A, KU6D, K6UYK, K6YBV, W6INH, VE6CHK, KR7L, KF7R, KD7EY, WB7WOW, K7OVK, KB7FE, NØIA, WAØOYI, W1EFW, N1ER, W1ISO, KN1K, W1NJM, N1NH, KA1T, N2DC, W2FR, W2GKZ, W2RQ, W2XD, N2YL, K2ZM, W3ATQ, N3COY, WB3GZU, W3PQ, K3RZR, KQ3T, KB3UD, WA4CCK, WD4FTK, N4GHI, AA4GL, K4JST, N4KB, WB4PNY, WB4UHC, W4UQ, K4ZK, W8PMJ, AF8V, N8XX, VE3AWE, W4JL, WA4JTE, WF4X, N5AMK, N5BT, W5CTZ, W5KLV, KD5KQ, WB5QYE, KD5RC, K5UPN, KV5X, WB5YDD, K9WJ, W9JUJ, KAØEPY, N5BB, WB5CIC, W5GHP, K5GM, K5OAF, N5TC, K5TL, KV5X, KW9J, WB9NVN, WB9UYU, KB9X, W9HI, KSØJ.

National Traffic System
April 1985

July NTS reports should be received in the Public Service Branch no later than August 12.

Net	*Sess.*	*Tfc.*	*Avg.*	*Rate*	*% Rep.*	*% Rep. to Area*
Cycle Two						
Area Nets						
EAN	No report received					
CAN	30	625	20.8	.391	100.0	
PAN*	57	433	7.6	.319	95.9	
Region Nets						
1RN	60	497	8.3	.390	91.0	100.0
2RN	51	283	5.6	.285	71.0	100.0
3RN	30	338	11.3	.500	97.0	96.7
4RN	60	631	10.5	.470	76.0	100.0
RN5	60	709	11.8	.406	85.5	100.0
RN6	54	252	4.7	.261	—	100.0
RN7	60	442	7.4	.440	81.9	100.0
8RN	60	405	6.8	.367	95.0	80.0
9RN	60	330	5.5	.286	79.0	100.0
TEN	60	461	7.6	.333	79.4	100.0
ECN	No report received					53.3
TWN	55	245	4.5	.309	73.0	87.8
TCC						
TCC Eastern	90	1435				
TCC Central	76	1061				
TCC Pacific						
Cycle Three						
Area Net						
EAN	30	381	12.7	.629	86.1	
Region Nets						
1RN	29	110	3.8	.290	67.0	90.0
2RN	29	257	8.9	.567	86.9	70.0
3RN						86.6
4RN						93.3
8RN						90.0
ECN						86.6
Cycle Four						
Area Nets						
EAN	30	1472	49.0	1.398	93.3	
CAN	30	1019	33.9	1.083	98.3	
PAN	30	1044	34.8	1.051	100.0	
Region Nets						
1RN	56	498	8.9	.490	94.9	100.0
2RN	60	274	4.6	.373	84.0	83.3
3RN	30	295	4.8	.430	96.2	93.3
4RN	61	731	12.0	.580		93.3
RN5	60	633	10.6	.573	87.6	98.3
RN6	59	572	.2	.560	96.0	100.0
RN7	60	487	8.1	.789	89.3	100.0
8RN	54	403	7.5	.396	84.0	100.0
9RN	58	620	10.7	.568	91.8	98.3
TEN	60	364	6.1	.395	78.1	98.3
ECN	No report received					90.0
TWN	54	347	6.4	.395	82.5	100.0
TCC						
TCC Eastern	141	2069				
TCC Central	53	984				
TCC Pacific	82	267				

*PAN operates both cycles one and two.
[1]TCC functions not counted as net sessions.
[2]Section and local nets reporting (215): ATNM AEND AENB AENZ AENV AENY AENX WAEN AENK (AL), APSN ATN (ALB), BCEN (BC), SCN/SB NCN SCN/1 SCN/2 SCN/V RTTY/V SCN/SB NCTN (CA), DTN DEPN SEN (DE), QFN FMSN GN QFNS FMTN FPTN FAST TPTN FPON SEFTN SWFTN PEN PRVAN SPARC PBTN DEN ENMC GCVTN LSTTN NFPN QFNS SVTN TPTN VEN (FL), GSN GSBN GCN (GA), PTN (HI), ITN ILN ISN (IL), ICN QIN ITN IRN (IN), KSBN KPN KWN KMXI KMWN CSTN QKS QKS-SS KS-RTTY (KS), MKPN KTN KYN KNTN CARN KYPON NKARC TSTMN WTEN 3ARES 7ARES 11ARES (KY), EMRI EMRIPN EMRISS EM2MN HHTN CITN NEEPN (MA), AEN CMEN MPSN PTN RACES SGN YEAR (ME), MTN MITN QUIN MACS UPN MNN (MI), MSN/1 MSN/2 MSSN MSN/RTTY MSPN/N MSPN/E MNAMWXNT PAW (MN), MON MOSSB H8N MEOW PTN RRARBN ARESN MCARES NEMOE LAOZFM CMEN SARN LARES TCN CCAN JCCCN CVE LAOZCW (MO), CCEN MTN (MT), NCEN NCMN CN CSN CNCTN PCTN RARS CFARS THEN PETN M2MEN (NC), GSPN GSFM MCEN MSOVTP NHN (NH), NJM SJVN220 SJVN MCN NJSN SWARN NJN/E NJN/L NJM OBTTN NJN (NJ), NYSM NYS NYDON WON SCVHFTN NCVHFTN BAVFTN NLI-CW OCTEN CNYTN STAR MFN NYSPTEN ESS QNET BSN BRSN OARCN (NY), OTWN NWOSN STN OPEN QCWA63 ONON EATIN STN NON (OK), OPN OSN2 OSND OSN OLN KTN TIN (ONT), OSN WCN OHNN OARES BSN PTTN LBLARES THN (OR), QSN (QUE), SCSSBN CN CSN CNN LC2MN GPD2MN A2MN BR2MN YC2MN (SC), TNCWNT TNPNT TNVHF TRSY (TN), TSN TEX TTN DFW NET (TX), BUN UCN (UT), VTN VSBN VSN VN/E VN/L VLN (VA), VSN VTN (VT), EWTN NTN NWSSBN PSTS WARTS WSN (WA), WVN WVFN WVMDN WVRN WVNN WVARN WVHN (WV), WINC WINS (WIN).

July section and local net reports should be received in the Public Service Branch no later than August 12.

Public Service Honor Roll
April 1985

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.; (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 qualify for the Public Service Honor Roll 12 consecutive months, or 18 months out of a 24-month period, will be awarded a special PSHR certificate from Hq.

July reports submitted for this column should be received at ARRL Hq. no later than August 12. PSHR reports should be listed separately from Section News reports.

179
W7LRB
155
WB7WOW
163
KBØZ
146
WA4QXT
143
K4SCL
142
VE4AJE
141
KAØEPY
140
VE4RO
136
KA1EXJ
135
KD8VF
KK4F
131
WB1HIH
127
KD7ME
124
WB2OWO
123
KW1U
121
W7VSE
120
K7VW
117
WX4H
W4PIN
114
KD8RD
WA4EIC
113
KB2HM
WA4PFK
VE7BNI
WB6SRX
112
WD8MIO
111
K4ZK
N4GHI
WØOYH
KD8KY
110
KC4VK
KA2NYR
109
WD4KBW
AA4AT
N4EXQ
108
W2MTA
N2XJ
WA4JDH
KA8OMM
KZ8Q
107
WF4X
ND2S
KB1AF
106
WF6O
WB4WYG
NG4J
WB4FDT
K4JST
WB1GXZ
105
WB8JGW
AK1E
104
W9JUJ
KA8GJV
103
W9FZW
K1ABO
KS5V
WB2VUK
102
WAIFCD
KB4GPN
101
KT5Y
KA8CPS
WØIKT
KB4OZ
WB2MCO
100
AA4HT
VE3BDM
WA2FJJ
WY4T
KI1M
99
KAØARP
KB4WT
KJ3E
KB5EK
98
AL7W
W4ANK
97
N5AMK
N4KFU
K4VWK
N8EFB
WBØTED
WB2IDS
KA4BCM
N1CPX
KA1KPS
KA1GWE
96
VE3WM
W4CKS
WD5GKH
WB2EAG
95
WB4YQP
KA1T
K2ZM
N8AEH
94
N4PK
K8CMR
AF8V
KAØBWM
93
WB2UVB
KB7FE
292
K5OAF
KJ9J
K9SI
WD8RHU
KV5X
K2ZVI
91
WA4CCK
N4KSO
N8AWH
W3YVQ
W2PKY
90
WD8OUO
KA2BHR
KA2MYJ
KC3Y
89
VE4LB
W9DM
WA7GQO
VE3DPO
WD8KQC
WA6ZUD
88
KJ3T
WB2RBA
N2AKZ
WØKK
87
KR7L
KB7FE
KB1PA
WB1CPB
86
W7JMH
WB2QMP
W5CTZ
85
KD4KK
N6HYM
VE3GT
N8EVC
K7OVK
WA1YNZ
84
WB4VMX
WD4ALY
83
NT4S
K8ND
82
WB4ADL
KA4RSC
W1TN
K3NNI
AE5I
KD7EY
81
KB9LT
WAØTFC
80
VE4IX
N6CVF
KA2UBX
N6CVF
79
WA1DXT
N8CLS
NIØR
77
KF4JA
N6BKE
KØGP
76
K2YQK
WA4EYU
KA4ERP
W1RWG
W8QHB
75
WBØGXT
KL7IJG
KG2D
N1BJW
74
WB8QBZ
K4ZN
KA9FFO
N7GXP
KA4GUS
WDØBOX
73
WD4HBP
KA7AID
KY1E
W7LG
NØDZA
72
NIØO
KY4U
N7BGW
WØFRC
W7LNE
KF7R
WØLAE
71
K6YD
WA8GMT
KC2TF
WA3UNX
WD6BZQ
KA5AZK
70
KB4LB
KA4YHS
K2HNW
69
WØOUD
VE2FMQ
N1BYS
KAKDJ
NBØD
KCØOO
W5KLV
KAØBCB
68
N4DAS
VE2EDO
W4FMZ
KA4YEA
WD4PBF
WA2ERT
67
WB5YDD
WA2KOJ
NE8X
KD6FR
66
N5DFO
N9EJO
KB4BZA
KA4MTX
WA8WJZ
65
KY8Y
KA4IUM
K8JDI
WD4BSC
64
N1BGW
VE3KK
63
WDØGUF
W7GHT
KØCY
NØEVC
KR4V
WA4RNP
WD8PAF
KA4SKV
VE7EDN
62
WBØWNJ
NOØN
WD4NYL
WD8KBW
KA8KHS
KA1KTH
61
KA7KAI
W4HON
KX2T
KB1PB
60
AA4GL
W4ZJY
WA4JTE
WA8DHB
WD8EIB
WA7VTD
KA5SPT
N2BFG
56
N5EZM/T
57
KA6HIK/N
56*
KA2OPG/T
52
VE7FB
48
KA1BBU/T
46
KA8GGZ/T
KA7RFD/T
44
W1YOL/T
43
KA8VOZ/N
41
KA2CQX/T
WA2MGV/T

Brass Pounders League
April 1985

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 the standard ARRL form.

July reports submitted for this column should be received in the Public Service Branch at ARRL Hq. no later than August 12. BPL reports should be listed separately from Section Traffic reports.

Call	*Orig.*	*Rcvd.*	*Sent*	*Dlvd.*	*Total*
W3CUL	741	897	1422	84	3144
WAØHJZ	0	1313	30	800	2143
NØBQP	31	1246	72	771	2120
WD4IIO	598	113	630	63	1404
KA9CPA	18	1265	89	28	1400
KD8KY	603	287	301	10	1201
W3VR	361	301	423	17	1102
WA4JDH	0	501	445	7	953
KW1U	1	531	386	17	935
H24H	1	408	415	16	840
W9JUJ	1	384	375	3	763
N4PL	55	266	308	40	669
K6UYK	45	328	278	10	661
KAØCZW	31	305	99	209	644
N4GHI	35	259	329	14	637
W8BO	4	275	340	5	624
WF4X	9	335	267	11	622
KB5W	4	311	278	5	598
KA1EXJ	18	280	238	35	571
K3RC	361	31	172	5	569
WA4QXT	44	228	243	45	560
W7VSE	3	282	248	10	543
WA9BFV	4	257	285	12	542
N4EXQ	30	233	230	40	533
WD8MIO	29	221	275	1	526
WØBMA	4	219	243	16	518

BPL for 100 or more originations plus deliveries:

K1ABO	218
KF4JA	126
W4PKP	125
KY8Y	122
KI4ZW	112
W7LRB	110

Independent Nets
April 1985

July reports submitted for this column should be received at ARRL Hq. no later than August 12.

Net Name	*Sess.*	*Tfc.*	*Check-Ins*
Amateur Radio Telegraph Society	60	543	354
Clearing House Net	27	91	269
Early Bird Net	30	960	313
Empire Slow Speed Net	30	78	388
Golden Bear Amateur Radio Net	30	149	1863
Hit and Bounce Traffic Net	30	476	639
IMRA	26	946	1569
Midwest RTTY Net	52	61	212
North American SSB Net	26	60	180
NYSPTEN	30	65	513
20-Meter Interstate Traffic Net	30	215	292
7290 Traffic Net	48	565	2737

Results, 12th ARRL 10-Meter Contest

Start with unexpectedly good propagation. Add a thousand or so eager contest enthusiasts, and toss in a few openings. The result? Some mighty pleasurable operating!

By Michael B. Kaczynski,* W1OD and Edith Holsopple,** N1CZC

The 28-MHz band is well known for its extreme variations. During solar maximums, long-distance propagation is so efficient that a few watts of RF output can provide astounding signal strengths. When the bottom of the solar cycle is approached, 10 meters may go completely dead. These periods are occasionally punctuated by some north-south path openings, usually involving very long skip.

To the uninitiated, the above quote, taken from *The ARRL Handbook for the Radio Amateur,* makes 10 sound like a boring place to be when the sunspots go away. As I'm sure many 10-meter enthusiasts will agree, the years surrounding sunspot minimums can also be the most exciting time to work the band—you never know what you'll hear, or when you'll hear it!

The 12th running of the ARRL 10-Meter Contest, held December 8-9, 1984, wasn't a record breaker. For the majority of the 709 log entrants representing 68 sections and 50 DXCC countries, however, the band was in relatively good shape considering the solar-flux level (76-77). It's interesting to see how the level of solar flux affects participation (See Fig. 1).

The solid line represents the number of entries we received, while the broken line indicates the corresponding solar-flux level. Our graph of solar-flux information begins in 1979, near the peak of Cycle 21. As can be seen from the graph, the level of solar flux directly affects the number of entries we receive.

In 1980, for instance, as the solar flux approached 260, we suffered a slight decrease in participation. Conditions on this weekend were actually *too* good, with the maximum usable frequency (MUF) approaching 50 MHz. Six-meter operators were treated to worldwide propagation, while conditions on 10 weren't quite as good as the year before.

As solar-flux levels decreased to between 160 and 170 (1981-1982), the MUF approached 28 MHz—10 meters was at its Cycle 21 peak. Participation reflected this peak, as over 1600 entries were received in each of these years. Where there is a peak, however, there must also be a valley. From 1982 until the present, sunspot activity has been in a downslide. Hence, MUFs have been dropping, resulting in fewer extended openings and less activity on 10 meters.

This shift in conditions has also wreaked havoc with the leader boxes, with only six of 1983's winners represented. K4XS and AA2Z (numbers one and two, respectively) were the only mixed-mode W/VE participants to top the 200-k mark,

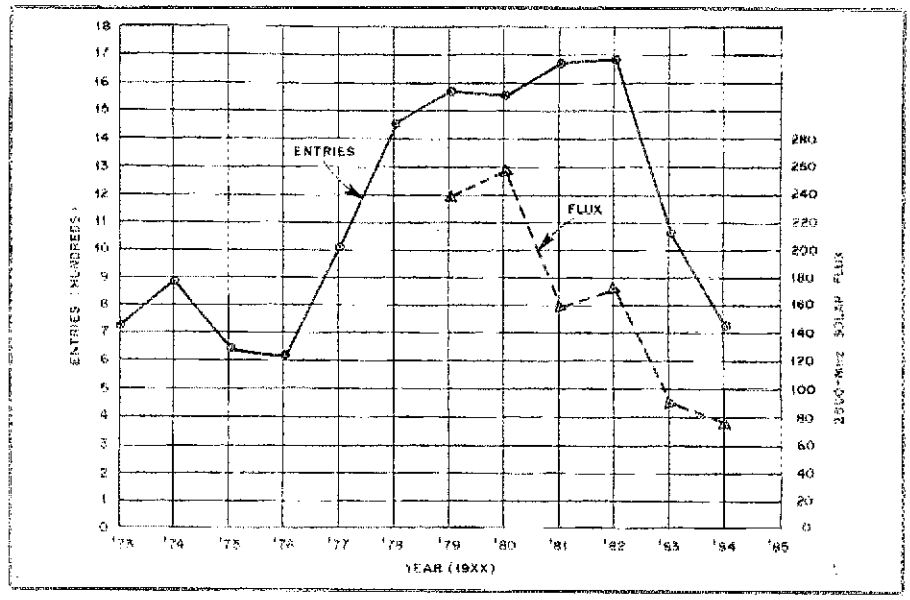


Fig. 1 — Correlation between 10-Meter Contest entries and 2800-MHz solar flux. The solid line corresponds to entries, while the dashed line represents solar flux.

with KE5CV and N2RM hot on their tails. TI1C, operated by TI2CF, was the undisputed DX champ, with five times the score of the number-two entry of VK2WU.

Fours and fives, with the exception of W9WAQ (number eight), dominated the CW scene. W5XZ managed to edge out K1ZX/4 by just over 6000 points (about 3% of his total score) for the top CW spot. N4AR, the only repeat top-ten stateside finisher on CW, slipped from a top berth in '83 to number five in '84. EA6KZ was the only DX station represented in both this year's and last year's CW box. He moved up from number six to number three.

Phone was by far the most popular mode in the 1984 10-Meter Contest. N5AU (WB5VZL, opr.) and KE5FI dominated the competition, scoring over 200,000 points each. K1IG operated the only repeat phone station in this year's standings (as well as the only New England station), K1NG, to a fifth-place finish. LU1BR moved up from number seven in 1983 to number three in '84. TI1W, operated by TI2KD, headed the DX portion of phone competition.

For the second year in a row, K5LZO placed second in the stateside multioperator category. In 1983, 'LZO and crew were edged out by W5VX. This year, NR5M and team put in an outstanding effort for top spot, with almost 395 k. That score would have placed number three in 1983, when scores were almost *double* those of this year. LU4US copped top ranking in the DX multioperator category, defeating second-place LU1E by 90 k. The guys from down under, VI3EZ, placed number four, with 1983's number-four station, GW8GT, coming in fifth. N4BP/C6A rounded out the DX multioperator top five.

During the contest, some stations reported generally good conditions, while others, especially those in the upper latitudes, observed no openings at all. North-south paths clearly proved the most reliable, as was evidenced by large scores from southern stations.

*Contest Manager, ARRL
**Assistant Contest Manager, ARRL

Top Ten—W/VE

Mixed Mode		CW	
Call	*Score*	*Call*	*Score*
K4XS	283,584	W5XZ	182,952
AA2Z	223,680	K1ZX/4	176,648
KE5CV	186,340	WC4E	117,000
N2RM	173,250	N4VZ	89,960
K3ZO	144,600	N4AR	86,436
AA4DV	116,476	K4BAI	64,512
K4VX	107,260	KD4U	59,620
KF3M	89,100	WD4AHZ	56,964
WB7FDQ	87,898	W9WAQ	55,000
K8MN	87,368	KJ4X	53,900
		NO4R	53,900

Top Ten—W/VE

Phone		Multiop	
Call	*Score*	*Call*	*Score*
N5AU (WB5VZL)	257,894	NR5M	394,752
KE5FI	239,616	K5LZO	226,780
K3KG	191,226	W0AIH/9	216,678
W0XK	146,452	WT4A	172,018
K1NG (KI1G)	117,040	N2EOC	141,260
WI4K	102,480	K5RVK	136,364
N4MM	99,698	W6VLD	130,248
K3ZJ	98,640	K8ZE	128,316
N2BJ	98,328	W4WWW	126,420
NC9C	94,068	KA1ZD	91,988

Top Five—DX

Mixed Mode		CW	
Call	*Score*	*Call*	*Score*
TI1C (TI2CF)	454,800	EA5CF	26,432
VK2WU	82,665	YV7QP	22,796
YU3MA	34,080	EA6KZ	18,496
DL6RAI	20,520	F3JL	13,320
XE1VV	20,400	ZS6BCR	12,772
Phone		**Multiop**	
TI1W (TI2KD)	176,956	LU4US	330,120
NP4CC	160,208	LU1E	239,316
LU1BR	139,048	N4BP/C6A	177,408
LU4DM	116,604	VI3EZ	147,266
KG4DX	96,792	GW8GT	41,490

W7FGT, in Arizona, noted all modes of propagation: short path, long path, scatter, transequatorial and backscatter. At some times, Gustav added, antenna direction didn't seem to make much difference.

From Africa, ZS6BCR took advantage of conditions on Friday evening to work numerous W1s and W2s. Chris also reported good short-skip openings from his Pretoria QTH, but no takers.

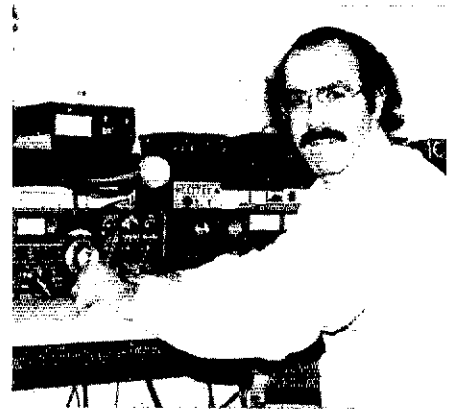
GW4BLE reported two stateside openings from his QTH, and YU3MA noted hearing some U.S. stations for a short period, but no JAs. Australians, as well as several stations from the Caribbean, were heard from Yugoslavia.

All this goes to show that even in a "dead" band contest, there is a payoff for those hearty souls who tough it out. Punctuated by openings, 10 meters can hardly be described as a dull place to be. Low expectation enhanced the surprise of DX QSOs. KØSCM reported a fantastic opening on Sunday morning. KA5KWX had good openings to all parts of the U.S., South America and the Pacific, as well as an unusual number of nighttime openings.

Novices were an unusual treat this year. Like an ice-cold drink on a hot summer day, Novice QSOs were welcomed by those who occasionally strolled the Novice bands, seeking to raise their totals by 8-point bursts. The Novices who provided the refreshing boosts reported few takers in "their" territory. Our thanks to those brave souls for hanging in there. See you in lucky number 13, to be held on December 13-15, 1985.

SOAPBOX

One of the better signals heard came from a nearby electric fence (K4JHT). Conditions were poor, but surprising how a CQ would bring them out of the woodwork (N4UH). Amazing how a "dead" band comes to life during a contest (W2DW). The propagation was downright *weird* (KF3M). I had so much fun this year that next year I plan to operate the whole 48 hours. Who needs the F layer? E layer and troposphere worked fine (WA2TBA). My score went up about 1 k from last year when I used a vertical. This year, I used a beam (KV1L). Band conditions were extremely bad this year. I couldn't even hear the ops across town! (KS6Q). Band conditions weren't all that bad considering MUF. Great contest, lots of fun (NC6T/NF6H). Now I know how the "Maytag Repairman" feels. On Sunday afternoon, a couple of high-speed ops came by, but chose not to slow down from about 30 WPM so I could work them. I guess this isn't a Novice contest, although scoring indicates that it should be (KA5PVB/N). The contest this year was an exercise in being in the right place at the right time! Stations would boom in for 2 or 3 minutes, then fade away. This was a very good test of operator skills and endurance (N5EZA). I worked 185 QSOs in one hour. Who says we need sunspots? (KØSCM). The band was in and out most of the time. I had no time to really operate, as I was babysitting 2 grandkids and a pooch, both days. I enjoyed what time I had (KR9G). 'Tis really stinko when one's 160 test score



Mitch, WB1GQR, took top honors from the rare VT Section.

is better than one's 10-meter score! (K8MN). I got a new rig two days before the contest. That, plus better propagation, tripled my 1983 score (KA5KWX). I always did prefer to ferret out the weak, scratchy ones rather than work a "bundle of boomers." My receiver is 23 years old and the transmitter is 26 years old. I'm still using the original tube in my final (KØVV). Unscientific propagation report: "Propagation is at its best when Daddy has to babysit." Zeros boycott the contest? Were they part of the sunspot conspiracy? This is my lowest score since 1978 (KA6BIM). I was very pleased to work LU8DQ with just 5-W output and a simple vertical antenna (WA2HSQ). You have to suffer through the bad times on 10 to appreciate the higher activity at the sunspot peak. The conditions this year were reflected in the smaller-sized envelope and smaller postage I used to send in my results (WB2AMU). I really enjoyed my first contest. I picked up 3 new states and 2 new countries. It was unreal how all the signals vanished when Sunday football started on television (KB4KEM). Sunday afternoon, I was faced with an important decision. Do I contest or do I ski? Since the skiing conditions were much better than propagation, I shut down the rig and headed off to the mountains. I figured

A look at the guys from Down Under. (From left) VK3s DMU, DXI, FY and ASE, operated VI3EZ to the largest score from Oceania. Not shown in the picture are VK3EW and VK3COF.

DX Continental Leaders

Continent	*Mixed Mode*	*CW*	*Phone*	*Multiop*
Africa	—	ZS6BCR	5L2AK	—
Asia	JH2KKW	JA1YWX	CT2FH	JG1ZUY
Europe	YU3MA	EA5CF	F6KBF	GW8GT
North America	TI1C	HH2VP	TI1W	N4BP/C6A
Oceania	VK2WU	AH6AZ	ZL1ANJ	VI3EZ
South America	—	LU1EWL	LU1BR	LU4US

Division Leaders

Division	*Mixed Mode*	*CW*	*Phone*	*Multiop*
Atlantic	N2RM	K3TG	K3ZJ	KB3A
Canadian	VE3CWE	VE3DZV	VE3CVX	VE3SAU
Central	W9XT	W9YYG	WB9FOL	W0AIH/9
Dakota	K6DMO	KNØV	WBØMWJ	—
Delta	WM4Z	W5XZ	N4BSN	—
Great Lakes	K8MN	N4AR	NC9C	K8ZE
Hudson	KA2AEV	W2LPV	N2BJ	N2EOC
Midwest	K4VX	WØIZ	WØXK	KØFA
New England	AA2Z	K1VUT	K1NG (KI1G)	KA1ZD
Northwestern	NG7P	W6KZV/7	N7ABJ	KE7C
Pacific	N6NF	N8BJQ/6	K6HNZ	—
Roanoke	AA4DV	KJ4X	N4MM	K4YTZ
Rocky Mountain	KA5FSB	WØETT	W5HI	—
Southeastern	K4XS	K1ZX/4	K3KG	WT4A
Southwestern	WB7FDQ	W7FGT	K6SVL	W6VLD
West Gulf	KE5CV	NJ5N	N5AU (WB5VZL)	NR5M

Greg, N9CIW, and his "disaster area" finished number two on phone in Illinois.

out my effective radiated power (ERP) for this location in northern VT: rare section—+20 dB; crummy propagation—–30 dB; power-line noise—–10 dB; result—–20 dB. Now I have a good, solid excuse for my low score (WB2JSJ/WB1GQR). The weak-signal work was a lot of fun. I'm looking forward to an increase in sunspot numbers next year (CT2FH). I have been enjoying Amateur Radio for over 4 years, and I hope to enjoy ham life forever (JE7BIZ). I regret that I couldn't make a contact with any DX station (JK1RJQ). I suppose I'm not the only one to complain about the propagation, or am I just spoiled? Anyhow, I don't have to send a dupesheet this time (EA8ZI). The band was crazy this year. I heard about a dozen other Ws, but I guess you had lots of QRM (DL6RAI). I'm 17 years old and this is my first experience ... Great! (EA5EVS). I'm a 52-year member of ARRL (OZ8T). We had great fun. The band isn't dead yet. It gets absolutely freezing up here on the summit of Mt. Donna Buang at night. We'll be back next year (VI3EZ/p).

WD9GYX used this setup to make over 200 QSOs from the Illinois Section.

Scores

DX scores are listed by continent and country according to the ARRL DXCC list. U.S. and Canadian scores are listed by call area and ARRL section. Single-operator scores are listed first, followed by multioperator. Each line score lists call sign, score, QSOs, multipliers and entry class (A = Mixed Mode; B = CW Only; C = Phone Only; D = Multioperator).

DX

Africa

A22ME	3780	105	18-C
EA8ZI	24,752	238	52-C
5L2AK	28,224	252	56-C
ZS6WB	18,984	226	42-C
ZS6BCR	12,772	103	31-B

Asia

JA1ZLO (JF2IWL, opr.)	9144	254	18-C
JA1YWX (JR4NIV, opr.)	9120	152	15-B
JH2KKW	5768	155	14-A
JO1CRA	5004	139	18-C
JO1NZT	4752	108	11-B
JH9CAV	2224	115	8-A
JE7BIZ	2184	138	7-A
JA2BNN	1602	89	9-C
JO1ITV	828	69	3-B
JE3GAR	630	45	7-C
JJ1EEA	510	38	5-A
JP1TRJ	410	41	5-C
JN1KKN	380	38	5-C
JO1QZI	324	27	3-B
JH1MTR	288	18	4-B
JE7SLC	168	28	3-C
JH8JYV	144	10	4-A
JJ1OSP	126	15	3 A
JA1JGP	120	18	2-A
JE1ARQ	80	7	4-A
JA1OP	68	17	1-B
JA2SAP/1	60	5	3-B
JE1TTO	44	11	2-C
JK1RJQ	30	10	1-A
JA1AAT	54	6	3-A
JO1MCC	18	9	1-C
JA6GGD	8	2	2-C
JG1ZUY (JA6-9330, JI2GUT, JM1LPN, JO1NAH, oprs.)	32,778	512	27-D
JA6YAI (JE6MQW, JF6s OBZ, PPQ, JR6s EZE, GAG, oprs.)	22,800	405	24-D
JA2YKA (JA9s SSY, XXS, JE2VYM, JF2DQJ, JG2s MTC, VTD, JG3OET, JI2JXR, JJ1BTC, JL3LDL, oprs.)	19,090	342	23-D
JH1YDT (JF2UHV, JF3HBS, JH4UTP, JI1QPU, JH1WMU, JO1HSX, JR6KDV, oprs.)	14,250	311	19-D
JA7YFB (JE7MOY, JF7s GOK, JHT, JH7s XKI, XMO, JH0QNT, JN1RON, JR7s GYC, JLU, LCI, OEF, QYB, RLB, oprs.)	13,536	283	18-D
JA1YCL (JHs 8MHZ, 0UG, JL1QOC, JO1GAD, oprs.)	12,870	366	15-D
JA7YFH (JE7s HMC, JWU, WOH, XTQ, JG2XUR, JO1HBF, JR7s MPT, VOL, oprs.)	7920	192	15-D
JA1YXP (JI2DLF, JN1OTG, JN1SBT, JO1BKL, JR4HOV oprs.)	5434	197	11-D
JA6YDH (JE6s PSL, VFJ, JF6GQC, JR6s PKJ, QHK, oprs.)	6880	162	16-D
JA8YAK (JA9VSX, JH0s FBO, MVU, TJU, oprs.)	3740	119	11-D
JA7YWD (JE1XGQ, JO1ENT, JR0NLK, oprs.)	1666	75	7-D
JA8YBR (JF6DEA JH5GLL, oprs.)	1134	64	7-D
JA7YCQ (+JR7MZC)	632	59	4-D
RA9UAD	40	10	2-C
VU2NCX	2400	60	20-C
4X6IF	2760	60	15-A
9B4DN	688	43	8-C

Europe

CR7NH (CT4NH, opr.)	6400	105	40-C
CT1TM	3192	57	28-C
CT2FH (K1RZ, opr.)	34,060	262	65-C
DL6RAI	20,520	187	38-A
DL1HBT	7296	76	24-B
DJ1ZU	1976	42	19-A
DJ3HJ	1920	60	16-C
DL8PC	1054	31	17-C
DF5EO	1044	29	18-C
DA2ER (W9UI, opr.)	870	29	15-C
DL2OM	828	23	9-B
DL7UB	350	14	7-A
DL1TH	280	10	7-B
DL8AAM	12	3	2-C
EA5CF	26,432	118	56-B
EA5CGU	7224	34	43-C
EA3RU	6450	129	25-C
EA3EGI	5858	128	23-C
EA5EVS	3904	44	33-C
EA3NU	2790	93	15-C
EA3CCN	2774	73	19-C
EA3ELZ	2289	53	21-C
EA2CR	1530	45	17-C
EA4CFN	640	20	16-C
EA2CY	646	19	7-C
EA7BYM	364	14	13-C
EA1AWW	308	14	11-C
EA3ELM	300	15	10-C
EA5FAG	192	12	8-C
EA3ERT	188	59	16-C
EA7DZL	144	8	8-C
EA3BOX	140	10	7-C
EA6KZ	18,496	136	34-B
EA6SX	11,022	200	33-C
EA6VQ	4582	79	29-C
F6KBF (F6IIR, opr.)	24,544	208	59-C
F3JL	13,320	90	37-B
F6AOJ	7392	88	42-C
F6BVB	1360	34	20-C
GW4BLE	14,144	136	52-C
GW8GT (G3OAY, GWs 3KYA, 4TTU, 5NF, oprs.)	41,490	281	55-D
HG5AAP	1600	50	16-C
HG5AAS	1596	42	19-C
HG4XX	1394	41	17-C
HA5LZ	468	13	9-B
HA3GJ	156	13	3-B
I4CSP	1450	29	25-C
I2LVN	218	12	9-C
LA9ZV	168	14	6-C
OH1ZAA	760	19	10-B
OK1DBM	2958	52	17-A
OK1TW	1634	44	19-A
OK1DMA	512	25	8-A
OK1KZ	220	15	5-A
ON4JJ	300	15	10-C
OZ5EV	1260	42	15-C
OZ1DKG	224	8	7-B
OZ8E	160	8	5-B
OZ8T	72	8	4-A
PA3CEF	2552	29	22-B
PI4DEC (PAs 2FAS, 3AWW, 3CZW, 3DJL, 0BOE, 0TUK, oprs.)	16,920	188	45-D
SM6LWH	320	10	8-B
SP9PRO	100	10	5-C
SP6AGD	24	4	3-C
SP6DVP	2	1	1-C
UZ6LWZ (UA6s LRT, 150-1240, oprs.)	1800	47	18-D
UP2BGB	4	2	1-C
Y26DO	648	27	9-A
Y21WM	192	16	6-C
Y23WM	160	8	5-B
Y24MB/A	80	8	5-C
Y22HF	48	7	3-A
YO8KOD	500	25	10-C
YO6DDF	12	3	2-C
YU3MA	34,080	215	60-A
YU7SF	352	11	8-B
YU3NP	50	5	5-C

North America

N4BP/C6A (+N4UM)	177,408	865	72-D
FM7WH	280	10	7-B
HH2VP	6264	54	29-B
HP1AVY	11,968	187	32-C
KG4DX	96,792	654	74-C
AL7CQ	128	8	4-B
NP4CC	160,208	1054	76-C
TI1C (TI2CF, opr.)	454,800	1862	100-A
TI1W (TI2KD, opr.)	176,956	1066	83-C
XE1VV	20,400	194	40-A
ZF2AG (N8AG, opr.)	81,472	608	67-C
ZF2IK	5832	81	18-B

Oceania

N7ET/DU7	1068	133	3-A
AH6AZ	7872	82	24-B
KH6SP (WB3HVS, opr.)	5060	87	22-A
VK2WU	82,665	603	55-A
VK2BQQ	1472	46	8-B
VI3EZ (VK3s ASE, COF, DMU, DXI, EW, FY, oprs.)	147,266	885	67-D
YB5AQD	552	46	6-C
ZL1ANJ	18,832	214	44-C

South America

CE5EMZ	30,100	430	70-C
CE3AEZ	2806	61	23-C
LU1BR	139,048	764	91-C
LU4DM	116,604	738	79-C
LU1VK	64,740	415	78-C
LU4LAV	55,728	387	72-C
LU1EWL	10,368	81	32-B
LU4US (+LU1UDZ)	330,120	963	140-D
LU1E (LUs 2DSL, 3AJW, oprs.)	239,316	1142	98-D
PP2ZDD	77,672	511	76-C
PS7KM	7626	93	41-C
PY2AC	4576	44	26-B
ZY5CA (PY5CA, opr.)	3172	61	26-C
PY1APS	224	8	7-B
YV5JEA	55,536	534	52-C
YV7QP	22,796	139	41-B

W/VE

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Connecticut

AA2Z	223,580	1063	80-A
W1WEF	70,338	458	57-A
N1CC	45,100	302	55-A
K1KI	44,240	395	56-A
K1BV	16,464	185	42-A
K1YRP	14,720	120	40-A
K1EM	12,342	161	33-A
KB1H	5616	108	26-C
KB1IZ	4150	83	25-C
K1SSO	3456	72	24-C
KA1ZD (+K1ZZI)	91,988	567	61-D
KA1MDH (+K8CH)	640	13	8-D

Eastern Massachusetts

K1VUT	52,416	251	52-B
WA2TBA	49,128	344	46-A
WB1AEL	34,944	206	42-B
KV1L	28,272	181	36-B
KA1DWX	25,284	144	43 B
W1FM	12,028	139	31-A
W1AX	10,744	76	34-A
KA1CLV	8700	72	29-B
KQ1F	7936	62	32-B
KR1B	4656	59	24-A
KB1KM	2280	37	15-B
WA1PLK	64	8	4-C
AE1B (+AB1X, KG1V)	27,416	204	46-D

Maine

N1ATO	67,160	381	48-C
KB1CV	24,720	167	40-A
KM6FC	22,080	218	48-A
KA1OR	17,538	160	37-A
K1BZ	5820	71	30 A
W1MGP	1804	41	22-C
KC2TXI	256	16	8-C
WB1GLH	168	7	6-B
KB1U (+N1AFC)	37,920	306	48-D

New Hampshire

K1TR	13,596	103	33-B
KM1H	10,034	173	29-C
W1END	9548	75	31-B
W1UCI	960	35	12-A
KA1X (+AK1L)	46,242	334	63-D

Rhode Island

K1NG (KI1G, opr.)	117,040	665	88-C
KA1TS	44,268	434	51-C
KC3MB	29,044	274	53-C

Vermont

WB1GQR	49,678	421	59-C
W3SOH	7384	89	26-A

Western Massachusetts

N3ADQ	18,444	174	53-C
K1SF	13,528	178	38-C
WA1ZAM	8464	91	32-A
N1CKW	2370	51	15-A
KA1XN	1064	31	14-A
KQ1V	71,154	509	59-A

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Eastern New York

N2BJ	98,328	723	68-C
N2BZP	22,448	238	48-A
N2EGR	11,014	181	47-C
WB2KEX	13,816	157	44-C
W2KHQ	10,788	92	29-B
W2DW	5760	74	30-A
AA2Y	4300	43	25-B
WA2JQK (+WA2UKP)	30,141	257	51-D

New York City-Long Island

WB2PWR	52,608	411	64-C
KA2AEV	45,594	304	51-A
KS2G	21,952	224	49-C
W2KZE	18,424	188	49-C
WA2SUH	17,850	175	51-C
WB2AMU	13,268	103	31-B
W2MOY	12,680	130	40-C
W2GKZ	10,024	101	28-A
WB2HTW	9540	120	38-C
N2DNY	5248	62	32-C
N2CPE	3120	65	24-C
WB2DLA	3072	48	16-B
WA2ATL	2610	48	15-C
WA2HSQ	2516	37	17-B
K2OVS	2000	50	20-C

Northern New Jersey

W2FCR	87,636	654	67-C
W2HN	26,208	168	52-A
W2LPV	13,888	63	28-B
KK2G	9616	117	24-C
W9NTU	5208	93	28-C
KT2D	4116	89	21-A
WA2UDT	3688	53	21-A
WA2SSH	2280	44	20-A
N2EOC (N2BOW, N2CEI, oprs.)	141,280	783	70-D
KC2GE (+WB2PSD)	59,236	427	59-D

Southern New Jersey

N2RM	173,250	826	77-A
WA2PPN	50,344	406	62-C
W2PAU	18,860	150	41-A
NC2V	9360	78	30-B
NF2G	8234	117	23 A
N2AWC	60	5	3-B

Western New York

NA2A	24,932	271	46-C

KA2KAG 16,992- 118- 36-B
KW2J 14,632- 118- 31-B
WA2MNM 8000- 100- 40-C
W2FXA 7600- 101- 25-A
WB2FBP 3568- 69- 26-C
WB2TKD 2444- 47- 26-C
KB2SE 1760- 44- 20-C
KB2NU 1632- 33- 17-A
KK2S 1216- 32- 19-C
NA2Q 24- 5- 2-A
KD2AL 6- 3- 1-C

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Delaware

AC3T (KA3B, opr.) 79,200- 600- 66-C
KC3AM 19,720- 158- 58-A
N3CDV 5016- 75- 33-A

Eastern Pennsylvania

W3ARK 43,488- 266- 48-A
W6GMZ 39,900- 319- 50-A
AK3M 34,900- 349- 50-C
N3BNA 23,828- 199- 37-A
KQ3V 20,448- 213- 48-C
N3DXG 18,128- 168- 48-C
KA3LCF 10,112- 158- 32-C
W3HMR 8450- 153- 25-A
AE3J 7458- 83- 33-A
KT3F 6048- 84- 36-C
WA3TQJ 4212- 80- 26-A
K3QQ 3608- 53- 22-A
K3EBZ 2442- 52- 22-C
WA3JXW 2128- 50- 19-A
W3ADE 1488- 31- 12-B
AC3D 1476- 41- 18-C
KH6CP/3 720- 22- 10-A
KA3NDF 72- 4- 3-B
N3CZB 28- 4- 2-A

Maryland-District of Columbia

K3ZO 144,600- 758- 75-A
K3ZJ 98,640- 685- 72-C
N3II 62,988- 463- 68-C
K3TC 47,800- 318- 50-A
N3AOE 35,840- 640- 56-C
K3TG 34,200- 171- 50-B
K4CGY 25,200- 242- 50-A
W3PWO 22,770- 207- 55-C
W3GN 13,650- 195- 35-B
N3CDA 9576- 114- 42-C
WA3EEE 8262- 162- 51-C
WB3BRF 7680- 101- 32-A
W3TFA 3024- 42- 18-B
NN3SI (W4KM, opr.) 2958- 48- 17-A
W4KM 2184- 43- 13-A
KA3MFT 1120- 80- 14-A
KA3NAJ 700- 19- 7-B
WA3YJA 672- 24- 14-C

Western Pennsylvania

KF3M 89,100- 538- 66-A
K3UA 2646- 63- 21-A
W3HDH 1904- 38- 17-A
WA3GQU 1260- 35- 18-C
KB3A (+ W3KHQ) 30,282- 255- 49-D

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Alabama

WZ4F 88,310- 455- 63-A
KA4AJA 5544- 99- 28-C
KB4FAI 2376- 31- 18-B

Georgia

K3KG 191,226-1099- 87-C
WI4K 102,480- 732- 70-C
N4VZ 89,960- 346- 65-B
K4JPD 75,530- 580- 65-A
K4BAI 64,512- 288- 56-B
K4EZ 50,526- 255- 63-A
K4DLI 29,904- 267- 56-C
KB4GID 16,704- 114- 36-B
N4KUJ 10,660- 130- 41-C
K4KG 10,120- 115- 44-C
WD4DSS 7200- 58- 30-B

Kentucky

NC9C 94,068- 702- 67-C
N4AR 86,436- 343- 63-B
WA4QMQ 72,468- 563- 61-A
KD4U 59,620- 270- 55-B
NO4R 53,900- 243- 55-B
WR4F 35,496- 305- 58-C
KB4GEJ 22,102- 137- 43-A
KI4DC 10,864- 97- 28-B
W4RHZ 4560- 60- 19-B
WD4CRG (+ N4DIT) 56,442- 409- 69-D
KA4KJG (+ KA4KJH, KE4NS NN4H, WB4VFW) 39,360- 273- 60-D

North Carolina

AA4DV 116,476- 549- 74-A
KF4HK 41,328- 328- 63-C
WD4OHD 19,610- 171- 37-A
WD4AVY 18,942- 231- 41-C
N4UH 15,088- 184- 41-C
N4KVF 5460- 78- 30-A
KS4S 2414- 50- 17-A

Northern Florida

K4XS 283,584-1356- 84-A
WC4E 117,000- 443- 65-B
KA4YIW 29,640- 197- 38-A
KT4D 20,706- 203- 51-C
W4WKO 20,244- 196- 42-A
WT4A (+ K0OO, KF4W, KB4HF) 172,018- 842- 77-D
WD4IIO (W4s ILE, WPD, WD4FNX, opr.s) 25,080- 193- 33-D

South Carolina

KJ4X 53,900- 240- 55-B
WD4EOG (WA1MKE, opr.) 38,304- 342- 56-C
WA4LDU 8484- 101- 42-C
NU4B 2624- 40- 16-B
K4YTZ (AA4AM, KA4KXM, KB4MX, KC4ZJ, KD4RH, oprs.) 81,344- 523- 62-D

Southern Florida

K1ZX/4 176,648- 618- 71-B
WD4AHZ 56,964- 303- 47-B
N4JHN 28,032- 210- 48-A
KI4IW 14,220- 158- 45-C
WW4W 11,760- 147- 40-C
WV4Y 4560- 51- 20-B
WK4F 4554- 69- 33-C
W4HVU 2350- 47- 25-C
K3DG 1624- 35- 14-A
N4GPY 690- 23- 15-C
W4WWW (+ KA4s EEF,IQZ, KD4S, KR4X, W4UEA) 126,420- 748- 70-D
N4EJW (+ N4EJV) 75,354- 453- 57-D

Tennessee

N4BSN 72,670- 559- 65-C
WM4Z 24,800- 170- 50-A
K4JHT 16,320- 160- 51-C
K4XO 11,716- 100- 29-B
N4FNB 10,212- 138- 37-C
K4PR 3648- 53- 24-A

Virginia

N4MM 99,698- 631- 79-C
VE3JGC/W4 10,496- 125- 41-A
W4TMN 10,332- 126- 41-C
N3OS 10,080- 80- 30-B
K4RDU 8528- 81- 26-B
W4JVN 8528- 104- 41-C
KE4GX 7392- 99- 33-A
WU4G 6162- 79- 39-C
W4YE 5896- 67- 22-B
KB4KEM 800- 17- 10-B
N4EUK 728- 26- 14-C
KC4HN (+ KF4YH, N4JGE) 68,376- 413- 66-D

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Arkansas

WA5TCL 62,192- 598- 52-C
KA5PFO 22,264- 242- 46-C
W5EIJ 2680- 46- 20-A
N5DDI 1216- 32- 19-C

Louisiana

W5XZ 182,952- 594- 77-B
WB9AZQ/5 8736- 111- 39-A

Mississippi

KA5KWX 19,188- 120- 39-B
N5FDF 4,364- 147- 38-A

New Mexico

NC5O 17,280- 108- 40-B
W5HI 16,848- 162- 52-C
KA5FSB 7950- 138- 25-A
N5DVY 6776- 83- 28-A
W7LHO 6048- 54- 28-B
N5EZA 3078- 58- 19-A

Northern Texas

N5AU (WB5VZL,opr.) 257,894-1417- 91-C
KE5CV 186,340-1040- 77-A
K5QHD (KY5N,opr.) 59,808- 459- 48-A
NI5N 25,840- 170- 38-B
AD5F 23,088- 140- 39-B
K5ZD 15,631- 230- 49-A
KB5UL 10,044- 79- 31-B
KA5PVB 176- 8- 4-B

Oklahoma

N5AFV 4140- 39- 23-B
K5DEC 98- 7- 7-C
N0IN (+ W3AS) 29,842- 266- 43-D

Southern Texas

KE5FI 239,616-1248- 96-C
WA5IYX 29,700- 270- 55-C
KC5CP 29,070- 253- 57-A
N5HFR 28,224- 504- 56-C
W5ASP 11,220- 157- 30-A
W5LLU 5456- 88- 31-C
N5AF 4746- 72- 21-A
K5HIM 1152- 24- 2-C
NR5M (+ KE5IV, N5JJ) 394,752-1563- 96-D
K5LZO (+ KA5SBS, WB5RUS) 226,780- 964- 85-D
K5RVK (+ W5ASP) 136,364- 775- 73-D

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East Bay

N6GRM 5700- 101- 30-A
K6SIK 2508- 57- 22-C
K2GMY 1036- 37- 14-C
KS6Q 96- 12- 4-C

Los Angeles

K6SVL 82,236- 623- 66-C
N6HC 60,306- 448- 57-A
K6EID 46,008- 316- 54-A
W6CN 5712- 136- 21-C
K6DMN 4374- 81- 27-C
KA6GDX 2080- 80- 13-C

Orange

NC6T (NF6H, opr.) 33,432- 198- 42-B
W61MD 15,756- 100- 39-B
KA6SAR 11,632- 95- 29-B
K6PVS 7380- 90- 41-C
WA6GFR 884- 26- 13-A
W6VLD (K6TXA, KB6EKL, KR6U, N6KN, W3CEQ, WA6DPQ, WA6HJK, oprs.) 130,248- 729- 87-D
WB6WUW (+ AC6O, KB6A) 18,360- 168- 34-D

Santa Barbara

WA6FGV 28,980- 232- 42-A
W6SWM 14,382- 153- 47-C
NV6I 7992- 107- 36-A

Santa Clara Valley

N6NF 55,120- 372- 52-A
K6HNZ 41,040- 360- 57-C
N6RZ 28,808- 277- 52-C
WA6TKT 13,756- 159- 38-A
K6YA 12,896- 161- 31-A
KJ6Z 4140- 50- 23-A
N6UW 3650- 50- 25-A

San Diego

W6ZT 23,856- 140- 42-B
KF6BB 4988- 86- 29-C
KF6KE 3024- 63- 24-B
K6HAI (KW6V, KA6UCO, KF6NW, W6s EHR, JXA, PKW, Z8E, N6JFV, WB6LLO, oprs.) 11,594- 122- 31-D

San Francisco

K6JFY 6300- 63- 25-B
KD6GC 496- 21- 8-A

San Joaquin Valley

KA6BIM 18,816- 192- 49-C
N8BJQ/6 6900- 65- 25-B
WA6YAB 1908- 33- 18-A
KA8UCC/6 240- 7- 6-B

Sacramento Valley

WD6CQH 120- 6- 5-B

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Arizona

WB7FDQ 87,898- 502- 71-A
WA7KLK 54,786- 397- 69-C
W7FGT 36,120- 215- 42-B
KX7J 12,284- 121- 37-A
KD7YO 6080- 105- 29-C
W7YS 4000- 50- 20-B
WB7APW 1740- 29- 15-B
N7CEE 1086- 21- 13-A

Idaho

KA7T 3432- 39- 22-B
W7GCL 252- 12- 6-A
W7IWU 28- 4 2-A

Montana

KE7X 15,912- 102- 39-B

Nevada

K6MQX/7 6858- 88- 27-A
W7ABX 1440- 36- 20-C

Oregon

KA7KDU 8448- 127- 24-A
N7AKQ 3990- 83- 21-A
W7GUR 2618- 58- 17-A
W7MLJ 928- 29- 16-C
WA6PVA (+ NI7T) 12,628- 154- 41-D

Utah

W7TE 5512- 53- 26-B
WA7ADK 3294- 61- 27-C

Washington

NG7P 33,558- 188- 51-A
WA7UQV 25,628- 204- 43-A
W6KZV/7 20,338- 121- 41-B
N7ABJ 13,320- 185- 36-C
W7QN 5400- 52- 25-B
KS7L 4544- 67- 16-B
N7ETC 2408- 43- 14-B
W7IEU 1344- 28- 12-B
W7DFO 1152- 24- 12-B
W7DRA 156- 13- 3-B
WA7UVJ 136- 17- 2-B
W7PSS 44- 11- 2-C
KE7C (+ WB7OJV) 14,960- 170- 44-D

Wyoming

NC7O 3024- 36- 21-B
KC7KC 1456- 26- 14-B
KB7M 64- 8- 4-C

8

Michigan

N8CXX 34,776- 322- 54-C
K8MPF 22,512- 187- 42-B
KC5DV/8 14,356- 194- 37-C
K8KUH 7644- 98- 39-C
K8CV 7296- 88- 32-A
N8CSY 5580- 93- 30-C
W8WVU 5100- 47- 25-B
WB8MDG 3570- 78- 17-A
K8LJQ 2860- 46- 13-B
N8CQA 2852- 33- 23-A
KA8PLH 224- 13- 4-B
K8SIA 120- 6- 5-B
K8ZE (+ W8MNL) 128,316- 758- 68-D

Ohio

K8MN 87,368- 422- 67-A
N8RA 43,974- 349- 63-C
W8FN 43,264- 208- 52-B
K8WW 34,560- 192- 45-B
W8KKF 25,960- 236- 55-C
NJ8L 23,300- 184- 50-A
NA8W 14,352- 184- 39-C
WD8BOK 13,608- 162- 42-C
KV8Q 13,440- 101- 32-B
KA8RBQ 6400- 100- 32-C
W8NPF 5400- 75- 36-C
K8JT 4554- 67- 23-A
N8EKS 4094- 56- 23-A
WA8GLF 2736- 38- 18-B
WB8VUU 2650- 53- 25-C
WA8RCN 2368- 37- 16-B
KC8YR 1840- 40- 23-C
WA2AZG 1504- 26- 16-A
AD8W 990- 33- 15-C
WD8KTM 72- 6- 6-C
W8LT (K3JT, KD8NS, NZ4K, oprs.) 74,760- 450- 60-D

West Virginia

N8APA (+ N8ABW) 21,736- 209- 52-D

9

Illinois

W9VA 69,502- 424- 59-A
W9YYG 68,304- 293- 56-B
WD9DZV 48,552- 314- 51-A
WD8GYX 32,752- 203- 46-A
AG9E 25,080- 285- 44-C
NA9J 25,080- 190- 33-B
WD9EXD 23,392- 188- 43-A
N9CIW 22,776- 292- 39-C
W9QWM 19,890- 186- 39-A
AD9K 6820- 110- 31-C
KR9G 4588- 62- 37-C
N9EVW 2944- 61- 23-A
W9ZGP 2852- 62- 23-C
KA9QYA 2412- 67- 18-C
KY9F 1840- 46- 20-C
W9FSD 1296- 27- 12-B
W9REC 1292- 34- 19-C
W9HOT 1248- 34- 16-A
WB9NHV 682- 31- 11-C
KA9SLM/9 420- 14- 7-B
KB8AC 182- 12- 7-B
KC9DL (+ KG9ZI) 25,994- 265- 41-D
W9CA (+ N9AIB) 15,820- 168- 35-D
K9EAX (+ WB9VVW) 9516- 122- 39-D

Indiana

W9RE 55,754- 357- 61-A
WB9FOL 49,014- 389- 63-C
N8DE 43,554- 356- 61-A
KU9N 17,028- 198- 43-C
KB9C/9 13,300- 175- 38-C
W9NZW 4698- 81- 29-C
K9VQK 3752- 67- 28-C
KB9C 1800- 29- 15-B

Wisconsin

W9XT 86,552- 490- 62-A
W9WAQ 55,000- 250- 55-B
WA1UJU 46,644- 333- 46-A
N9CQO 24,360- 174- 35-B
W9OP 22,896- 286- 36-A
W9GIL 17,628- 140- 39-B
KC9L 17,100- 225- 38-C
N9AW 12,648- 146- 31-A
KW9D 12,644- 108- 29-B
N9KS 10,740- 155- 30-A
WA9TZE 9432- 82- 36-A
WB9HGS 6808- 71- 23-B
KD9ET 4464- 68- 24-A
W9HE 3400- 50- 17-B
KD9GS 1824- 40- 16-A
WØAIH/9 (WØUC, KØFVF, oprs.) 215,678-1029- 77-D
N9EJL (+ KC9XF) 42,504- 427- 44-D

0

Colorado

WØETT 19,092- 111- 43-B
ACØS 14,008- 103- 34-B
WØIZV 4980- 83- 30-C
KØOST 1408- 21- 16-B
KØDNR 1394- 41- 17-C
KOØT 924- 33- 14-C

Iowa

KBØPR 84,420- 670- 63-C
NEØP 43,350- 338- 51-A
WØEJ 38,700- 387- 50-C
WØIZ 38,544- 219- 44-B
KDØHY 36,822- 361- 51-C
KØVV 32,880- 274- 60-C
KØLCI 20,580- 142- 35-B
NØEFG 15,308- 178- 43-C
WØPPF 14,570- 156- 47-C
WBØCHS 9144- 127- 36-C
KØEVC 4980- 83- 30-C
KMØQ (+ KAØs ONA, SBW, KJØI, NØDYP) 13,200- 147- 33-D

Kansas

KSØU 30,080- 160- 47-B
KØEW 10,608- 136- 39-C
WØAWP 6148- 52- 29-B
NØLL 1232- 22- 14-B

Minnesota

KNØV 31,920- 190- 42-B
K6DMO 19,968- 216- 39-A
AJØN 9000- 90- 25-B
KØVW 2368- 50- 16-A
KAØQAV 960- 35- 6-B

Missouri

WØXK 146,452- 893- 82-C
K4VX 107,260- 788- 62-A
NØFQW 14,756- 238- 31-C
WØJRP 13,510- 141- 35-A
WØQBX 11,440- 143- 40-C
WØHBH 7876- 99- 22-A
KAØDHB 5400- 86- 25-A
KØFA (+ WBØs OQV, SQY, KØs FA, LAF, KQØZ, NØAQC, KAØs ELU, PGL) 36,900- 410- 45-D

Nebraska

KØSCM 41,030- 333- 55-A
KVØI 30,832- 261- 41-A
KBØYK 3420- 58- 19-A
KØSW 2700- 50- 27-C
WØOLL 702- 27- 13-C

South Dakota

WBØMWJ 31,376- 296- 53-C

VE

Maritime-Newfoundland

VE1BNN 77,376- 496- 78-C
VO1AW 5562- 206- 27-A

Quebec

VE2DTI 3348- 62- 27-C
VE2QO 594- 27- 11-C

Ontario

VE3CVX 85,680- 612- 70-C
VE3CYX 48,360- 372- 65-C
VE3FWQ 46,332- 429- 54-C
VE3DZV 15,540- 110- 35-B
VE3LUG 13,992- 106- 33-B
VE2AEJ/3 11,532- 91- 31-B
VE3AAV 6592- 103- 32-C
VE3CWE 5916- 76- 29-A
VE3OMU 2720- 34- 20-B
VE3OHG 1620- 54- 15-C
VE3FEA 1404- 34- 18-A
VE3SAU (VE3s FHU, NPB, OAF, O3N, oprs.) 13,860- 154- 42-D

Saskatchewan

VE5XU 1230- 82- 15-A

Alberta

VE6CPP 740- 31- 10-A
VE6CCL 96- 7- 4-A

British Columbia

VE7DVV 288- 12- 6-B
VE7ZZZ (VE7s EPN, WWW, oprs.) 100- 10- 5-D

Checklogs

K5RF, KA2NMP, YZ1DG, Y37XC, Y37OM, ZL2BDG

Rules, 1985 ARL UHF Contest

Grid squares are now exchanged in all ARRL-sponsored V/UHF contests. The ARRL UHF Contest is, therefore, an excellent opportunity to work toward the very popular VUCC award. If you have any questions about grid squares, consult January 1983 *QST*, page 49, for a complete introduction. The rules for this year's contest are the same as last year's. Be sure to mail your logs early and in a separate envelope from any other contest entries. Send an s.a.s.e. to ARRL Hq. and specify which contest summary sheet you need.

Note: ARRL is now accepting applications for VUCC on the microwave bands. These are single-band awards. To qualify, you must work at least 10 grid squares on 2.3 or five grid squares on 3.4, 5.7 or 10 GHz. An s.a.s.e. to Hq. will bring you application information and the name of the closest awards manager who will process applications. GL!

Rules

1) **Object:** To work as many amateur stations in as many 2° × 1° grid squares as possible using authorized amateur frequencies above 220 MHz and all authorized modes of emission.

2) **Contest Period:** Begins 1800 UTC Saturday, Aug. 3, and ends at 1800 UTC Sunday, Aug. 4. Entrants may use as much of this time as they wish.

3) **Categories:**

(A) *Single operator:* One person performs all operating and logging functions, as well as equipment and antenna adjustments.

(1) *Multiband.*

(2) *Single band:* Single-band entries on 220, 432 and 1296 MHz, and 2.3-GHz-and-up categories will be recognized both in *QST* score listings and by 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. See also Rule 8 (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 three points for each complete 220- or 432-MHz QSO. Count six points for each complete 1296-MHz QSO. Count 12 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: W1AW works W3CCX in FN20 on 220, 432 and 1296 MHz. This gives W1AW 12 QSO points (3 + 3 + 6) and also three grid-square multipliers. Final score is 12 QSO points × 3 multipliers, or 36.

6) **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 is permitted. Contacts with aeronautical stations do not count. A portable or mobile station may not be counted for more than one QSO per band, even if the station is moving. However, a station that changes locations may be contacted for additional grid square multipliers, but not for QSO points.

(D) A transmitter, receiver or antenna used to contact one or more stations under one call sign may not be used subsequently during the contest period under any other call sign (with the exception of family stations where more than one call is assigned to one location by the FCC/DOC). The intent of this rule is to accommodate family members who share a rig, not to manufacture artificial contacts.

(E) All equipment and antennas used by entrants must be owned and operated by amateurs. Use of nonamateur-owned gear is not prohibited, but use of such equipment places the entrant in a separate category, ineligible for awards.

(F) While no minimum distance is specified for contacts, equipment in use must be capable of real communication (i.e., able to communicate over a distance of at least 1 km).

(G) Contacts made by retransmitting either or both stations, whether by satellite or terrestrial means, are prohibited. Frequencies regularly occupied by a repeater in a locality may not be used for contest work, even if the repeater is turned off.

(H) 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.

(I) 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.

7) **Reporting:** Entries must be postmarked no later than September 4, 1985. Official forms are available for an s.a.s.e. from ARRL Hq., and all entrants are strongly urged to send early for a set.

8) **Awards:**

(A) Single operator

(1) Top-single operator score in each ARRL Division.

(2) Top single operator on each band (220, 432, 1296, and 2304-and-up categories) in each ARRL Division 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 W3HQT has the highest single-operator multiband score in the Atlantic Division and his 432-MHz score is higher than any other Atlantic Division single op's, he will earn both a certificate for being the single-operator Division leader *and* an endorsement sticker for 432 MHz.

(B) Top multioperator score in each ARRL Division where significant effort or competition is evidenced. Multioperator entries are *not* eligible for single-band awards.

(C) Additional certificates may be awarded where significant effort or competition is evidenced.

9) **Disqualification:** See January 1985 *QST*, page 72.

Strays

KEYS TO SUCCESSFUL DXing

[] What's the most important factor in working DX? Operating techniques, says Warren Ash, AK2H, of Kingston, New York. And he should know. In five year's time, Warren achieved 5BDXCC and 5BWAS with low power and inexpensive equipment. Here are a few ingredients Warren says can make a big difference in your operating success:

- a working knowledge of propagation—enough to know when to work a station from a specific geographical location on any particular band.
- patience to do extensive tuning before ever touching the key.
- enough stamina to put in some weird hours without seriously affecting your normal activities.
- an ability to copy CW in your head at speeds of up to 35-40 WPM.
- an understanding of how a DX station is working a pileup. For example, what stations is he working, and when?
- experience working contests. They bring out stations you rarely hear under normal operating conditions.

Don't think that only the "big guns" can work rare DX. Using Warren's techniques, you can too.

ATTENTION STAR-GAZING HAMS

[] The Independent Space Research Group, which is developing an orbiting amateur space telescope, is establishing a list of radio amateurs interested in participating in the program. For details, contact James C. Morris, III, N4LJX, 2233 Sanford Ave., SW, Roanoke, VA 24014.

FCC CRACKDOWN ON PIRATES

[] Some commercial fishermen in Puget Sound, Washington State, may find themselves on the end of a hook—the FCC's—if they persist in using amateur frequencies. In response to increasing complaints from amateurs, the FCC has stepped up monitoring and enforcement efforts in the area, particularly on 2 meters, to stop commercial fishermen who are using amateur instead of authorized marine frequencies in their communications.

Contest Corral

Conducted By Edith Holsopple, N1CZC
Assistant Contest Manager, ARRL

JULY

1

Canada Day Contest, June *QST*, page 85.

3

West Coast Qualifying Run, 10-35 WPM, 0400Z July 4 (9 P.M. PDT July 3). W6OWP prime, W6ZRJ alternate. Frequencies are approximately 3.590/7.090 MHz. Underline one minute of the highest speed you copied, certify that your copy was made without aid and send to ARRL for grading. Please include your full name, call sign (if any) and complete mailing address. A large s.a.s.e will help expedite your award or endorsement.

4-5

Six-Meter Invitational Net Activity Day Contest, June *QST*, page 85.

12

W1AW Qualifying Run, 35-10 WPM, 0200Z July 13 (10 P.M. EDT July 12). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 174.555 MHz. See July 3 listing for more details.

13-14

West Coast 160 Bulletin Summer SSB Contest, June *QST*, page 85.

IARU Radiosport Championship, May *QST*, page 82.

Colombian Independence Contest, June *QST*, page 85.

19-21

World-Wide VHF Prefix Contest, sponsored by *CQ Magazine*, from 0000Z July 20 until 0000Z July 22 (48 hours). Use all authorized bands from 50 MHz through 1296 MHz (6 meters through 23 cm). Use all modes; no repeater or satellite contacts. Exchange consecutive serial number and call sign. Multipliers are the prefixes worked per band. Count 1 point per QSO on 50, 70 or 144 MHz; 2 points per QSO on 220 and 432 MHz; 4 points per QSO on 1296 MHz. Work stations once per band, regardless of mode. Multiply total QSO points times the total number of prefixes worked (the sum of the prefixes worked per band). Classes are single operator, single band; single operator, multiband; single operator, single band, low power; single operator, multiband, low power; multioperator, single band; multioperator, multiband; portable (with temporary power source); FM only. Low power is defined as 25-W PEP output or less. Certificate to every entrant. Send entries to SCORE, P.O. Box 1161, Denville, NJ 07834, or to *CQ*, 76 N. Broadway, Hicksville, NY 11801.

QRP Summer Contest, sponsored by the DL Activity Group CW, from 1500Z July 20 until 1500Z July 21. CW only, 160-10 meters. Classes are: A—less than 3.5-W input, single operator; B—less than 10-W input, single operator; C—less than 10-W input, multioperator; D—QRO stations, more than 10-W input, to contact QRP stations. Class C stations may operate full time; classes A, B and D must break for 9 hours. Exchange RST, QSO number and input, adding x if crystal controlled. QRO stations add /QRO. Operation is limited to one class per band, VFO or crystal controlled. No more than three crystals may be used on one band. Contact each station once per band. Count 1 point for QSO with own country, 2 points for QSO with own continent, 3 points for QSO with DX (outside own continent) per DXCC list. JA, PY, VE, W and ZS count separately. Count 1 multiplier for each country and 1 for each DX QSO. Multiply points by multipliers on each band, then add band results. Crystal-controlled stations double total result. Submit a separate log for each band. Logs must be received within six weeks of the contest. Send logs (include 1 IRC for results) to Siegfried Hari, DK9FN, Spessartstrasse 80, D-6453 Seligenstadt, Fed. Rep. of Germany.

SEANET Contest, CW, sponsored by the Philippine ARA. Work Southeast Asia stations, from 0000Z July 20 until 2359 July 21. (Phone portion will be held August 17 and 18.) 160-10 meters, single operator, single band; single operator, multiband, and multioperator, multiband categories. Send signal report and serial number beginning with 001 on each band. SEANET country prefixes: A35 A51 AP BV BY C21 DU FK8 FR FW8 HS HL HS H44 JA-etc. JD1 KA KC6 KH2-through-Ø KX6 P29 S2 S79 T2 T3s VK-all VQ9 V85 VS6 VU2 VU7 XU XV5 XW8 XX9 XZ2 YB YJ8 ZK ZL-all 3B6-through-9 3D2 4S7 5W1 8Q7 9M2 9M6 9M8 9N1 9V1 1Z9. Contacts with SEANET countries count 2 points on 20-15-10 meters, 5 points on 40 and 80 meters, and 10 points on 160 meters. Double the preceding point values for bonus prefixes: DU HS YB 9M2 9M6 9M8 9V1 V85. (SEANET to SEANET contacts count 1, 3 and 6 points, respectively.) Contacts within one's own country do not count. Multipliers are the number of SEANET countries worked ×3 for others, (×2 for SEANET to SEANET countries). Send 2 IRCs for results. Send your entry so that it arrives before October 20 to SEANET CONTEST, CARL, P.O. Box 304, Cebu City, Philippines 6401.

24

W1AW Qualifying Run, 10-35 WPM, 2300Z (7 P.M. EDT) July 24. See July 3 and 12 listings for more details.

26-28

County Hunters CW Contest, sponsored by the Mobile Amateur Radio Awards Club, from 0000Z July 27 until 0200 July 29. Work stations once per band. Work portables/mobiles again as they change county. Stations on county lines count as one QSO, but multiple multipliers. Exchange serial number, category (P for portables, M for mobiles), signal report, county and state (for U.S. stations), province or country. Suggested frequencies: 3.575 7.055 14.065 21.065 28.065 MHz. Portables and mobiles call CQ below 7.055 and 14.065 MHz; others spread out above those frequencies. Count 1 point for QSOs with fixed stations, 3 points for portables or mobiles. Multiply QSO points by total U.S. counties worked for final score. Mobiles and portables calculate their scores both on a state-by-state basis and overall for awards. Mail logs by September 2 (include a large s.a.s.e. for results) to Jerry Burkhead, N6QA, 7525 Baltic St., San Diego, CA 92111.

Armadillo Run, sponsored by the Texas DX Society, from 0000Z July 27 until 0200Z July 29. Runs concurrently with the CW County Hunters Contest. TDXS will activate all New Mexico and Oklahoma counties; the object is to work as many of these counties as possible during the contest period. Final score equals the total number of above counties worked. Ties will be broken by NM and OK QSO count. Only single-operator entrants operating from their own stations are eligible to compete. Exchange and frequencies are the same as for the County Hunters CW Contest. Operation by the TDXS mobiles will be generally restricted to 14.055-14.075 MHz. Certificates for entrants working at least 50 counties. A plaque will be awarded to the entrant working the most counties. Mail entry/QSL by August 31 to Dennis Motschenbacher, KZ5M, P.O. Box 82, Thompsons, TX 77481.

AUGUST

3-4

160 Meter SSB Contest, sponsored by the 160 Meter Wild Bunch, from 0000Z August 3 to 2359Z August 4. Single operators only. Exchange RST and state, country or province (charter members include your number with the exchange). Count 10 points per QSO. Multiply by the total number of states, countries and provinces worked. Add 20 multiplier points for each mobile station worked, 3 multiplier points for each charter member worked and 2 multiplier points for each honorary member worked. Add 10 multiplier points for working club station VE7WCV. Awards. Send logs by September 6 to R. J. Koziomkowski, KA1SR, 5 Watson Dr., Portsmouth, RI 02871.

YO DX Contest, sponsored by the Romanian AR Federation, from 2000Z August 3 until 1600Z August 4. No rules received for 1985; these are 1984 rules. 80-10 meters, phone and CW. No crossmode QSOs. Classes: Single operator, single band; single operator, multiband; multioperator, multiband. Exchange signal report and ITU zone. YO stations will send two letters indicating their county. Count 2 points per QSO with own continent, 4 points for different continent and 8 points for YO stations. Multiply by sum of YO countries and ITU zones worked per band. Mail entries by September 4 to RARF, P.O. Box 05-50, R-76100 Bucharest, Romania.

ARRL UHF Contest, page 78 this issue.

6

West Coast Qualifying Run, 10-35 WPM, 0400Z August 7 (9 P.M. PDT August 6). See July 3 listing for more details.

10

W1AW Qualifying Run, 10-35 WPM, 0200Z August 11 (10 P.M. EDT August 10). Refer to July listings for more details.

10-11

European DX Contest, CW, sponsored by the Deutscher ARC, from 0000Z August 10 until 2400Z August 11. (Phone contest, September 14-15; RTTY contest, November 9-10.) Work stations once per band; 3.5, 7, 14, 21 and 28 MHz only. Entry classes: Single operator, all band and multioperator, single transmitter. Multi-single stations must remain on a band for at least 15 minutes, except for a quick QSY to work new multipliers. Single operators may operate a maximum of 36 hours. The 12 hours of off-time may be taken in one to three periods and must be noted in the log. Non-EU stations work EU only. Exchange signal report and serial number. W/K stations also give state. Count 1 point per QSO and 1 point per QTC (explained below). Multiply by number of EU countries worked per band. European Country list: C31 CT1 CT2 DL EA EA6 EI F FC G GD GI GJ GM GM-Shetland GU GW HA HB HBØ HV I IS IT JW-Bear JW-Spitsbergen JX LA LX LZ OE OH OHØ OJØ OK ON OY OZ PA SM SP SV SV5-Rhodes SV9-Crete SV-Athos T77/M1 TA-European part TF UA-1346 UA2 UA-Franz Josef Land UB UC UN/UK1N UO UP UQ UR Y22-99/DM YO YU ZA ZB2 1AØ 3A 4U1-Geneva 4U1-Vienna 9H1. The multiplier on 3.5 MHz may be multiplied by 4, the multiplier on 7 MHz by 3 and the multiplier on 14-21-28 MHz by 2. A QTC is a report of a confirmed QSO that has taken place earlier in the contest and later sent back to an EU station. QTCs may be sent only by non-EU stations to EU stations. A QTC contains the time, call sign and QSO number of the station being reported (e.g., 1300/DJ1QQ/134). A QSO may be reported only once, and not back to the originating station. A maximum of 10 QTCs to the same station is permitted; the same station may be worked several times to complete this quota. Only the original QSO, however, has QSO point value. Keep a uniform list of QTCs sent. For example, QTC 3/7 would indicate that this is the third series of QTCs sent, and that seven QSOs are reported. Awards. List 40 QSOs or QTCs per sheet. Use separate logs for each band. Dupe sheets must be submitted for bands with more than 200 QSOs. Deadlines: CW—September 15; phone—October 15; RTTY—December 15. Mail to WAEDC-Committee, Postbox 1328, D-8950 Kaufbeuren, Fed. Rep. of Germany.

17-18

New Jersey QSO Party

KCJ Single-Operator CW Contest

Alaskan QSO Party

23

W1AW Qualifying Run

24-25

All Asian DX Contest, CW, June *QST*, p. 85.

GARTG World-Wide RTTY Contest, May *QST*, p. 88.

Standard Contest Guidelines

1) Make sure your log details the date, time, band, call sign and complete exchange sent and received, for each QSO claimed for contest credit.

2) Your summary sheet should indicate your score, including how you figured it, and a declaration that you followed FCC/DOC regulations and the contest rules. Your name, call sign and complete address should be typed or printed in block letters.

3) Crossband, crossmode and repeater contacts are usually not permitted. Contacts with the same station on different bands are usually permitted.

4) Your log should be checked carefully for duplicate QSOs and if more than 200 QSOs are made, dupe sheets should be included with your entry.

5) Your log may be considered a checklog or disqualified if it is incomplete or if too many errors are detected by the contest committee.

6) Avoid standard net frequencies.

7) International contests generally offer awards to top scorers from each U.S. call area and each country; state QSO parties to each state/province.

8) Your summary sheet should include the following statement: "I have observed all competition rules as well as all regulations established for Amateur Radio in my country." The declaration should be signed and dated.

Special Events

Conducted By Edith Holsopple, N1GZC
Assistant Contest Manager, ARRL

Winnipeg, Manitoba, Canada: In celebration of the Parks' Centennial, XJ4RMP will be operated from Riding Mountain National Park on the HF bands. Other stations will be operating using the XJ4 prefix, including XJ4AEX on CW near 14.012 MHz. Operation will be from **June 29** through **August 29**. To QSL, send an s.a.s.e. to VE4AKN, 15 Jupiter Bay, Winnipeg, MB R3T 0W5, Canada.

Lower Fort Garry, Manitoba, Canada: The Manitoba DX Group will operate XJ4LFG from the Lower Fort Garry National Historic Park during Canada Day Weekend, **June 29-30** and **July 1**. Frequencies: phone—7.200 and 14.250 MHz; CW—7.100 and 14.075 MHz. Special QSL cards available via the Manitoba DX Group, P.O. Box 28, Group 322, RR 3, Winnipeg, MB R3C 2E7, Canada.

Torrington, Wyoming: High Plains ARC will operate K7YPT at Historic Fort Laramie 0000-2400Z **July 4**. Frequencies: phone—3.900 3.850 7.250 14.250 14.300 21.300 21.360 28.550 MHz; CW—50 kHz up from lower band edges. Certificate for a business-sized s.a.s.e. to K7YPT, RR 2, Box 303, Torrington, WY 82240.

Kansas City, Missouri: NØEVC will be operated from the Soldiers and Sailors Liberty Memorial at the Kansas City Spirit Festival, **July 4-6**. Operation will be on 40 meters, RTTY and phone. QSL via NØEVC.

New London, Connecticut: Submarine Base station KISSN will be operated by members of the KISSN Club Station, Tri-City ARC, RASON and SCRAMS to honor the return of the world's first nuclear submarine *USS Nautilus* (SSN-571) to New London. Operation will be 1400Z-0100Z daily **July 4-6** in the lower 20 kHz of the General class phone and CW bands on 80-10 meters, and the center of the Novice bands. QSL via Tri-City ARC, P.O. Box 686, Groton, CT 06340.

Sidney, Nebraska: Members of West Nebraska ARC will operate in conjunction with the City of Sidney's centennial celebration. Operation will be from 0000Z **July 4** until 2400Z **July 9**. Frequencies: phone—3.982 7.280 14.280 21.280; CW—3.725 7.125 14.060 21.120. Commemorative QSL via KAØAND.

Eleanor, West Virginia: WA8VPN and friends will operate on **July 5-7** to celebrate the 50th anniversary of the Town of Eleanor, which was named in honor of Eleanor Roosevelt. Operation will be on 2, 10, 15 and 20 meters. For a certificate, send a large s.a.s.e. to Bob Anthony, WA8VPN, Box 62, Eleanor, WV 25070.

Hannibal, Missouri: The Hannibal ARC will operate from the Tom Sawyer Days celebration in Mark Twain's boyhood town **July 6-7** 1500-2100Z daily. Frequencies: phone—7.245 14.290 21.400 28.770 MHz; CW—7.125 and 21.125 MHz. For certificate, send a large s.a.s.e. and your QSL card to HARC, WØKEM, 2108 Orchard Ave., Hannibal, MO 63401.

Traverse City, Michigan: The Cherryland ARC will operate KA8QVH to commemorate the National Cherry Festival. Operation will be daily from 1100Z **July 7** through 0200Z **July 13** in the center portion of the 80-10 meter General bands, phone and CW, and Novice bands. For a certificate, send a large s.a.s.e. with your QSL to Ed Irwin, KA8QVH, 346 Peninsula Trail, Traverse City, MI 49684.

Hampton, Virginia: The Southern Peninsula ARC will operate K4IHU from 1800Z **July 8** to 1800Z **July 9** from the waterfront during the 375th anniversary of the oldest continuous English-speaking settlement in America and the scheduled arrival of the replica of the ship *Godspeed* from England. Frequencies: phone—3.930 7.285 14.305 21.385 28.685; CW—3.705 7.085 14.085 21.085 28.185. Certificate for QSL with s.a.s.e. to SPARK, Inc, P.O. Box 4128, Hampton, VA 23664.

Ripon, Wisconsin: The Green Fox ARC will operate in celebration of the City of Ripon during the annual "Riponfest." Operation will be from 1400Z **July 13** until 0200Z **July 14**, and 1400-2300Z **July 14** in the lower 20 kHz of the General class portion of 15 and 20 meters. QSL via the Green Fox ARC, Box 314, Ripon, WI 54971.

Los Alamos, New Mexico: The Los Alamos ARC will operate WD5JRO to commemorate the 40th anniversary of the first nuclear detonation at the Trinity Site near Alamogordo, New Mexico. Operation will be 1700-0500Z **July 13** and **14**, on 80-10 meters. Look for them on the lower parts of the General class phone and CW bands and in the Novice bands. A certificate will be issued on receipt of your QSL. S.a.s.e. to WD5JRO, LAARC, P.O. Box 787, Los Alamos, NM 87544.

Waynesboro, Virginia: The City Parks and Recreation Department and the Valley ARA will operate KI4BR from Ridgeview Park in celebration of "Summer Extravaganza." Operation will be from 1700Z **July 13** and **14**. A certificate will acknowledge QSO and receipt of QSL. S.a.s.e. to KI4BR, P.O. Box 565, Waynesboro, VA 22980.

Battle Creek, Michigan: Southern Michigan ARS will operate W8DF/8 during the Seventh World Hot Air Balloon Championship at the W. K. Kellogg Regional Airport, **July 13-21**. Operation will be on phone in the center portions of General class 80-10 meters, and CW in the Novice bands. For a special QSL, send an s.a.s.e. to P.O. Box 934, Battle Creek, MI 49016.

Iowa City, Iowa: The University of Iowa ARC will operate WØIO during the flight of STS-51F/*Spacelab 2*, in commemoration of the second mission of the Plasma Diagnostics Package (PDP), their free-flying recoverable spacecraft and part of the scientific payload of *Spacelab 2*. Operations will correspond with the flight of the Shuttle on **July 15**, and will be postponed if the flight is rescheduled. WØIO will be active on 7.230 14.275 21.380 and 144.20 MHz from 1700 to 2300Z each day the Shuttle is in space. Certificate available for large s.a.s.e. and QSL to WØIO, U of I ARC, 4900 Engineering Bldg., Iowa City, IA 52242.

Ottumwa, Iowa: The Indian Hills Community College ARC will operate WAØIUQ, from 2200-0400Z daily during the Ottumwa Hot-Air Balloon Races, **July 19** and **20**. Frequencies: 3.960 7.260 14.260 MHz. Commemorative QSL cards to all who provide an s.a.s.e. with their QSL card. QSL via the *Callbook* address for WAØIUQ.

Fishers Island Sound, New York: Tri-City ARC will operate from Flat Hammock Island **July 20**, from 1300 to 2000Z. Look for KA1BB in the lower 20 kHz of the General class phone and CW bands of 40 through 15 meters, and the center of the 40-meter Novice band. QSL via Tri-City ARC, P.O. Box 686, Groton, CT 06340.

Sunnyvale, California: Lockheed Missiles and Space Co. ARC will operate station WA6GFY to celebrate the 28th anniversary of the club founding. Operation will be 1500-1900Z **July 20** on 14.285 phone; and 7.130 CW; and OSCAR-10 CW. Send an s.a.s.e. for QSL and certificate to LERA-ARC, P.O. Box 504, Bldg. 160, Sunnyvale, CA 94086.

Marysville, Michigan: The Eastern Michigan ARC will operate K8EPV to commemorate the annual Port Huron to Mackinac Island Yacht Race, **July 20** and **21**. Operation will be 1400-0200Z both days. Frequencies: phone—3.910 7.235 14.235; CW—3.710 7.110 21.110. Certificate for your QSL and s.a.s.e. to K8EPV, 654 Georgia, Marysville, MI 48040.

Molokai Island, Hawaii: The Kauai ARC will operate KH6F from a leper settlement in Kalawao County, Hawaii. Operation will be **July 25-28** on 80-2 meters, phone, CW and FM. QSL for s.a.s.e. or IRCs to KH6F, P.O. Box 675, Koloa, HI 96756.

Davenport, Iowa: The Davenport RAC will operate WØBXR during the Bix Biederbeck Memorial Jazz Festival, 1700-2200Z **July 26**, 1500Z-2300Z **July 27 and** 1600Z-2200Z **July 28**. Operation on phone and CW, 80-10 meters, 10 kHz up from lower end of General class band edges. Certificates for your QSL and s.a.s.e. via Davenport RAC, 2131 Myrtle, Davenport, IA 52804.

Somerset, New Jersey: K2NJ will be active to commemorate the first reunion of volunteers involved in the 1984 Olympic Torch Run. Operation will be **July 27** and **28**, 30 kHz up from the bottom of each CW band and 10 kHz up from the lower edges of the General class phone bands. Commemorative QSL cards available via Box 308, Quakertown, NJ 08868.

Moscow, Kansas: The Wichita ARC is sponsoring the Moscow Blowout on **July 27** and **28**. Station WØSOE will be active on the General phone bands, 5-10 kHz from the bottom edges. QSL via WØSOE.

Greenville, Ohio: The Treaty City ARA, W8UMD, will operate the Annie Oakley Station 1400-2200Z **July 27** and 1600-2200Z **July 28**. Frequencies will be 3.910, 7.235 and 14.285 MHz. Send QSL and s.a.s.e. for certificate to TCARA, P.O. Box 91, Greenville, OH 45331.

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 July 15 to make the September issue. For the convenience of those wishing to operate, please include the name of the sponsoring organization, the location, dates, times(Z), frequencies and call sign of the special-event station. Requests for donations will not be published.

Strays

I would like to get in touch with...

☐ other amateurs using auxiliary/remote control operation. Tom Workman, KØTW, Rte. 9, Box 688, Tucson, AZ 85743.

☐ fellow FT-980 owners. Ron Bardarson, N2FIA/6, 474 Ardis Ave., San Jose, CA 95117.

☐ air or ground radio ops from the WW II 373rd, B-24 Bomber Squadron, 14th Air Force, China. Glenn A. Roberts, KU7Z, Rte. 2, Box 101, Hazelton, ID 83335.

☐ members of the Flying Hams' Club or other pilot-hams. Mike R. Craft, G4NSN, 25 Rosedene Ave., Greenford, Middx UB6 9SB, England.

QST congratulates...

☐ John Smith, K3SLJ, of Pottsville, Pennsylvania, on being named Distinguished Citizen for 1985 by the Greater Pottsville Winter Carnival Association.

☐ William H. Rawson, K2AX, of Dover, New Jersey, on being named Elmer of the Year by the Northern New Jersey Chapter of the Quarter Century Wireless Association.

☐ J. D. "Doug" Leitch, WA5VUX, of Beaumont, Texas, on receiving the Ralph James Award in recognition for outstanding contribution to the Petroleum Division of the American Society of Mechanical Engineers.

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*.

Affiliated-Club Coordinators	May 1985, p. 71
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Section News

Administered by Steven Ewald, WA4CMS

The ARRL Field Organization Forum

CANADA

ALBERTA: SM, E. Roy Ellis, VE6XC—A/SM: VE6AMM. SEC: VE6XC. STM/NM/DEC: VE6ABC. Still no license plates with our call signs but they tell us its just around the corner. Grande Pr club doing FB job on VE6 magazine. Print quality has improved and the smaller print has lowered mailing costs. VE6NM has requested more articles for VE6. ADS has given ok to NARC for the proposed 2m rptr at Hqs.

BRITISH COLUMBIA: SM, H. Ernie Savage, VE7FB—B. C. Public Service Net 3758 kHz, 0130Z - NM, VE7DDF Ford, Asst. NM VE7BJE Jas. Check-ins 5191 High 235 Low 95. B. C. Emergency Net, 3650 kHz 0200 Check-ins 684 QTC 157 QTR 653 minutes. After years of faithful service as Asst. NM and net recorder Tom, VE7BNI, states, "Your Net Recorder and assistant Net Manager since 1981, is planning to retire on October 31, 1985 due to old age and the onset of rigor mortis. This notice will give the Net Manager lots of time to find a new, fresher man for the job." Sorry to hear this news Tom. Maple Ridge Hamfest 85 July 13-14 new location bigger and better. VE7EJU Chris age 15 and NCS BCEN. He and his Father just passed their Class "A" examination. Congratulations to all that passed the last DOC examinations. 73. Traffic: VE7BNI 305, VE7CDF 120, VE7EDN 60, VE7XA 27, VE7FSP 15, VE7EGM 11, VE7FB 11, VE7EJW 8, VE7BZI 6.

MANITOBA: SM, Jack Adams, VE4AJE—SEC: VE4FK. NMs: VE4LB, VE4VJ, VE4AFO, VE4TE, VE4ANR. Band conditions have been very unstable this past month, however traffic is up slightly. Nice to have Bob, VE4RO, back home from short stay in Brandon Hospital. Bob is our kingpin for Tenth Region Traffic Handler, Net and traffic reports. MEPN QNI 964 in 30 sessions QTC 18. MMN-QNI 511 sessions 30 QTC 38. MTN-QNI 223 sessions 29 QTC 44. Traffic: VE4AJE 83, VE4ATE 31, VE4LB 25, VE4AFO 22, VE4ADD 18, VE4FK 15, VE4BI 14, VE4GB 12, VE4DT 9, VE4HK 5, VE4DS 4, VE4NE 3, VE4CF 2, VE4MG 2, VE4RO 80.

ONTARIO: SM, Larry Thivierge, VE3GT—BM: VE3LST. PGL: VE3AR. SEC: VE3GV. STM: VE3BDM. TC: VE3EGO. The Royal Navy Amateur Radio Society (RNARS) is celebrating their 25th anniversary with a get to-gether in Halifax on the weekend of July 19-21. The Society is a very active group with world-wide adherents. Any amateur who currently serves in, or has served in, the RN or one of the Commonwealth navies can become a full member. Membership total is about 2,700 with 75 in Canada. A Canadian RNARS net is active on 14-135 kHz at 1900Z every Sunday. With the new reporting deadline, thanks to all for getting your activity reports to me early. Each report is important and appreciated. VE3FGU advises that OSND has shifted to 7045 kHz for the summer months, at 2000Z to beat the QRN. The "Sir Walter Raleigh" which will circumnavigate the world during the next four years for "Operation Raleigh" will operate on the amateur bands as GB2SWR/MM. VE3SB has upgraded his equipment with a new TS-930 for HF and a TR-2600 for VHF activities. North Shore ARC is sporting a new, attractive club logo which was designed by VE3CEU. Congratulations to VE3HNH, new EC for St. Catharines. VE3SSO is the new call sign at the Bronte Senior Citizens complex, replacing the old call VE3XSC. The Elgin Amateur Radio Society has been formed and meets the first Thursday of each month (Sept. to June) at 2000 hours at the Hilltop Motel. Club officials are VE3KGA VE3EGQ VE3JER VE3HSY VE3MGC VE3LSU. VE3MGY was named London ARC's amateur of the year. VE3BUO, A/NM of the OPN is a new member of CARTG. VE3KCZ is up and running on RTTY. New amateurs are: VE3OZB VE3OZP and VE3NGZ. VE3PCS is the newest amateur in Chatham. Kathy resides at the Chatham Public General Hospital and will be using her new call along with the call VE3PGH, that of the hospital's new amateur radio station. Traffic: VE3GT 243, VE3DPO 192, VE3GNW 133, VE3KK 117, VE3KCZ 100, VE3BDM 93, VE3CYR 83, VE3AJN 78, VE3GFN 58, VE3KXB 56, VE3FGU 50, VE3WM 38, VE3WV 23, VE3BAJ 19, VE3EWD 18, VE3MCO 14, VE3BB 13, VE3WG 9, VE3OER 7. (Mar.) VE3KXB 14.

QUEBEC: SM, Harold Moreau, VE2BP—STM: VE2EDO. BM: VE2ALE. PIO: VE2YW. TC: VE2ED. NM: VE2EDO. The Happy Gang Net was 12 years old on the 24th of June. I wish everyone a good summer and let's see you again in action in the fall. Prompt retablissement a VE2VI, qui est hospitalise. Avec regret, je dois vous annoncer le deces de VE2ZR. A tous une bonne saison d'ete et j'espere vous revoir reprendre les activities a l'automne. Traffic: VE2EDO 76, VE2BP 51, VE2EC 36, VE2EKC 33.

SASKATCHEWAN: SM, W. C. Munday, VE5WM—SEC: VE5CU. STM: VE5HG. BM: VE5WM. OBS: VE5JA. NMs: VE5EX, VE5NJ, VE5AEM, VE5AEJ, VE5BAF. Net reports: MJARC 2 Meter - 29 sessions, 215 QNI; RARA 2 Meter - 29 sessions, 529 QNI, 2 QTC; SPN - 30 sessions, 1250 QNI, 23 QTC. Regina Hamfest, August 2nd, 3rd and 4th will feature a number of interesting speakers, including Department of Communications Ottawa, VE7BC/BY1PK, VE4AB, VE6ABC and VE6VW. Official opening of the Regina Clubs Amateur Radio Station, VE5NN, will take place during hamfest. Remember Field Day June 22nd and 23rd. Traffic: VE5BAF 41, VE5AGM 24, VE5WM 6.

ATLANTIC DIVISION

DELAWARE: SM, John Hartman, WA3ZBI—STM: W3DKX. SEC: W3PQ. PIO: N3DIP. PSHR: K3JL & W3DKX. Starting in June the Delaware Amateur Radio Club will be meeting at the Christiana Presbyterian Church. SARA helped again with the Gorgetown, Oak Orchard Crop Walk, those helping were KC3JM, WA3WIY, WB3DUG, W3FKT, KA3LWJ, KA3IXV, WA3ZBI, K3PFW, WA3VIT, K3JL, W3CDY and W3FEG. Congratulations to N3AZW, Andy, on his upgrade to General. DTN QNI 399, QTC 49 in 22 sessions. DEPN QNI 62 QTC 13 in 4 sessions. SEN QNI 49 QTC 5 in 5 sessions. Traffic: W3PQ 90, W3QQ 70, WB3DUG 48, W3DKX 48, WA3WIY 29, WA3ZBI 23, K3JL 18, KA3IXV 13, WA3DUM 12, KC3JM 8, W3FEG 5, KC3FW 4, N3AXH 4.

EASTERN PENNSYLVANIA: SM, Jim Post, KA3A—ASM's: KC3LM, KA3GHT, K3FD, WA3PZO. SEC: WA3PZO. ACC: KB3NE. TC: W3FAF. PIO: W3AMQ. STM: KB3UD, K3MWA, KB3LR, WA3JRL, N3AIA. Nets:

Name	Freq	Time Daily	QNI	QTC	Sess.
EPA	3610	0000/0300Z	487	182	59
EPAEPTN	3917	2300Z	601	175	31
PTTN	3610	2330Z	326	154	31
ATN	146.67	2000 R W/F	50	04	9
D3ARES	145.37	1930 R M	82	16	4
D5ARES	146.865	2100R S	76	4	5
D6ESN	147.00	2000 R TU/TH	124	35	8
PWA/ARES	147.715	2000 R SUN	109	2	5
MARC/ARES	147.060	2030R SUN	65	3	4
MARCTN	147.060	2030 R M/W/F	187	43	12
INDEPENDENT					
PFN	3958	2200Z	154	63	31

This month I would like to acknowledge our hard working net managers. EPA, AA3B; EPA EPTN, WA3EHD; PTTN WB3EPU; ATN, KC3CY; D3ARES, W3VA; D5ARES, N3BFL; D6ESN, WA3CKA; PWA ARES, KA3JOL; MARC/ARES, N3DSX; MARCTN, KA3HBK. Highlights of the past month included a trip to the York ARC annual dinner. My host was Bill Boyer, W3AMQ, our PIO. This was a joint event with the Keystone VHF Club, that honored six of their members with life memberships. They were, John Shaffer, W3SST, John Zepp, W3FLD, George Gable, W3EDO, Raymond Shant, W3ACT, George Moran, W2DGZ and Frank Bair, W3GDI. This honor has been given to 20 people in the last 30 years. Welcome EC for Snyder, Don Girton, WB3GDH, and the new EC for Monroe County, Asher Resh, N3EFW, who is replacing Laing, KB3TS, as the new EC for Monroe. Also welcome to Steve Phillips, KO3B as an OBS. Another trip for the SM was a visit to Penn wireless. Hosts at this trip were John Thomas, our EC, W3FAF and Dave Heller, W3TX, one of our ADs. There are still a few EC positions open: Adams, Dauphin, Schuylkill, and Delaware. Why not consider filling of of these important positions. Traffic: N3COY 328, KA3DLY 190, AA3B 107, KB3UD 104, KA3IME 91, W3KAG 88,W3JKX 88, WB8KPE 72, N3CD 70, W4UQ 64, WA3GLX 60, KA3JOI 52, WA3EHD 51, N3AIW 46, W3AQN 34, KC3LY 32, W3ADE 29, WA3CKA 29, N3AZQ 23, W3PWV 21, W3VA 19, W3FAF 15, K3QXC 14, KB3TS 13.

MARYLAND-DC: SM, Karl R. Medrow, W3FA—Lots of clubs participating in Public Service Events or planning them. A good show for ham radio! Your SM likes your written note or radiogram with general interest items for Section News reporting. W3MSN left 2 trees standing for his antenna, has pared down to 2 XCVRS, and cannot get his grand kids interested in the hobby! KA3R, OO, is holding his own. K3CHP just finished those inside chores. W3ZNW has a good midwest RTTY net going. KC3D vacationed at the Arizona dude ranch—it figgers! KA3DUE and WA3TOY report on the Public Service events. N3ECM is looking to rejuvenate the Antietam Radio Assn. KC3Y has the NSN working a Festival. K3OMN reports the MtARC exams WB3BMR to extra, KA3EMV, KA3LQQ to advanced, WB3FUM, N3EGS to General, KA8VTN to Tech plus one new General. FBI SoMdARC congrats WA3UMI N3EEW to advanced, KA3KIQ, KA3MWD to General and Techs KA3MWL, KA3MWM, KA3NUK and KA3NMM. MEPN Net Certificates to WA8ALI, WB3BFK and W3BRZ. Congrats to all. W3FZV is vacationing. W3LDD is about to and WA2ERT says an outing with the Boy Scouts does not count as a vacation. W3DFW is enjoying retirement! KC3DW is doing yeoman service on the higher nets. KK3F wants the BPL to be made easier. KA3EWV did not see a leprechaun in Ireland suitable as a net member. K3TKJ and K3AP showed Delmarva ARC Packet Radio so says WB3FUE. KJ3E's new hamshack is almost ready. K3NNI is a certified Bee-Keeper. WB3BFK has a chauffer driven van. W3DQI is an alternate MEPN Director. Don't forget KA3IID is an Eastern Shore man too! W3YVQ put in "around the clock duty" at WA3NAN, and he liked the State WX report exercise as well as the 2 meter turnout for the RACES gang. W3OYY thinks about those fond old PON days. With the nets: Net/Manager Sessions/Traffic QNI Average. MEPN/KJ3E 31/198/29. Top X: KJ3E, WA8ALI, KK3F, WD4LRG, KA3CDQ, W3LDD, WA2ERT, W3FA, K3ORW and KB3WL. MSN/KC3Y 30/69/11.5. Traffic: KK3F 302, KJ3E 208, KC3DW 203, KC3Y 155, W3FA 128, W3YVQ 108, K3NNI 68, W3LDD 36, WB3BFK 29, WB3FUE 29, WA2ERT 28, W3DQI 22, W3FZV 19, W3ZNW 19, KA3EWV 14, K3MR 7, KC3D 6, KA3IID 4. (Mar.) W3ZNW 34.

SOUTHERN NEW JERSEY: SM, Richard Baier, WA2HEB—SEC: K2QIJ. STM: WB2UVB. ACC: K2IXE. TC: W2IJX. SGL: W2XQ. PIO: VACANT. BM: WB2UVB. OOC: KB2MY. Another reminder. The Southern New Jersey Bulletin Net meets every Monday and Thursday evening at 6:30 and again at 7:30 P.M. local. Our BM WB2UVB announces the latest ARRL bulletins from League Headquarters. In addition, Gene will announce the latest section news and run the very popular Westlink tape during the net. Please try to give a listen, I think you will be very glad that you did. Give a listen on or around 3.950 MHz and listen for WB2UVB. Since I have some room this month, I am listing some more of our section's computer bulletin board systems (BBS). Usually these boards contain a wealth of various information on many different subjects. Unless otherwise noted, the protocol to use will be 8N1 and the transmission rates will be 300 baud. All boards listed are open to anyone who wishes to examine them. Happy modeming! 73.

STARS (Wenonah)	(609) 468-5293
NOMAD (McKee City)	(609) 645-7908
Citadel (Bricktown)	(201) 477-7263

Traffic: WB2UVB 179, W2IML 56, K2SB 32, WA2MGV 15, WA2HEB 15, KA2CQX 8.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA — Leadership Officials meeting at Tupper Lake enjoyed the Packet Radio demo by KD2AJ and KA2MLQ from Clinton County. Did you know there are over ten thousand licensed radio amateurs in the forty countries of WNY? About three thousand are League Members. About 120 have League appointments! DO YOU? The League needs your active support. On an average, there are two hams for every one thousand population in WNY. Lots of room for public service! Public Service Honor Roll: KA2BHR KG2D WA2FJJ VE2FMQ WB2IDS WA2KOJ W2MTA WB2OWO WB2RBA ND2S KX2T KA2UBX. Officers: Auburn KA2HUO N2DTG WA2ITJ K2ZOD; RAWNY KA2IWJ W2CUU KA2EXI KD2V.

Net	QNI-QSP-QND	Net	QNI-QSP-QND
NYS/1*	290-178-030	Blue Line	231-024-022
WDN/M*	252-061-030	NYS/4*	384-192-030
Mike Farad	206-050-030	OARCN	049-004-004
NYPON*	674-337-030	Black River	294-003-030
NYSPTEN	513-065-030	CNYTN*	294-051-030
ESS	386-078-030	OCTEN/L*	316-035-030
OCTEN/E*	662-063-030	STAR*	009-006-004
Q Net	362-007-030	WDN/L*	451-109-030
WDN/E*	478-099-030	NYS/5*	336-196-030

*NTS Net. ARES Nets: Western New York third Sunday 3955 kHz at 2000; Lewis Co. 1800 Sun. 147.015/600; St. Lawrence Valley Mon. 1930 on 146.91/-600. NA2C reports very successful exams sponsored by LARC and Salt Lake City DX Association . . . 17 VE assisted . . . 27 of 41 passed (63.4%). Owego hamfest was again a FB WX success with 1100 in attendance! K2QR, Technical Coordinator for WNY, was awarded the Southern Tier Ham-of-the-Year plaque for his efforts in training novices and other achievements. Upcoming HAMFESTS: Batavia July 14, Newark Valley Traffic Handlers Picnic August 10, Finger Lakes at Trumansburg Ausut 24, HAM-O-RAMA at Niagara Falls Convention Center September 14, Elmira September 28, Syracuse October 5. Appointments: (DEC) WB2NAO Northern, WA2AIV Western, (OES) WB2NAO (ORS) KA2FSP, (PIA) KA2BCH W2GIR, (EC) KA2CMQ St. Larance, K2CWD Broome, WA2DHB Livingston, W2EWO Tioga, K2LKH Ontario, WA2OVT Chemung, WA2SEF Hamilton, W2TFL Delaware. TNX to WB2NAO the host for the April 10 meeting at Tupper Lake. Empire State Games will be held in the greater Buffalo Area this year. Contact WA2PUU or WB2IDS if you can help, August 7 to 11. 150 w meter HTs and ops are needed to cover the eighteen hours each day, with scads of "venues". (Jim gets the Sync Swim.) Traffic: WB2IDS 394, WB2OWO 379, W2MTA 367, WA2FJJ 305, VE2FMQ 233, ND2S 233, WB2QIX 154, KX2T 88, W2FR 80, KA2BHR 79, KG2D 71, KA2UBX 53, WB2RBA 49, K2YAI 49, N2EVG 35, WA2KOJ 31, W2UYE 26, W2GJ 14, KA2DQA 10, WB2KGT 10, N2FBK 8, AF2K 8, W2PPS 8, W2ZOJ 8, K2IUT 6, WB2NAO 5, WA2DEP 2, KC2SJ 2. (March) K2KIR 20, N2FBK 18, K2VR 7. (Feb.) W2FR 78.

WESTERN PENNSYLVANIA: SM, Otto L. Schuler, K3SMB—ASM: WN3VAW. STM: AC3N. SEC: WA3UFN. PIO: WB3IZJ. SGL: K3HWL. TC: K3LR. OO Coor: KJ3Q. BM: WN3VAW. WPACW QNI 320, QTC 145, Sess 30, WPAPTN QNI 588 QTC 158, Sess 30. WAP2MTN QNI 385,

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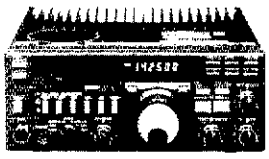

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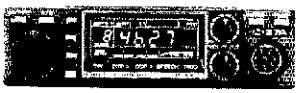

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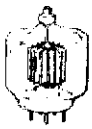

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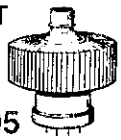

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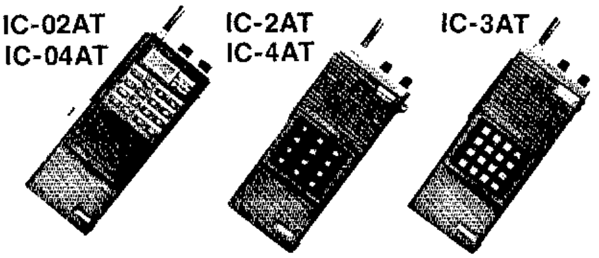

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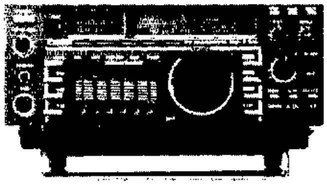

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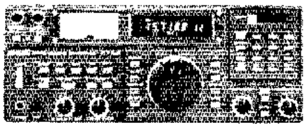

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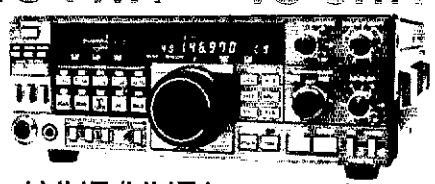

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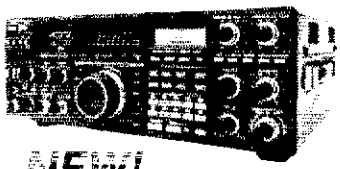

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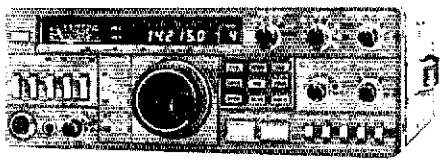

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[illegible]

QTC 50, Sess 30, NWPA2MTN QNI 525, QTC 5, Sess 30, PFN QNI 153, QTC 80, Sess 30. Our sympathies are with the families of K3QHY & KA3FEH. New Novices are KA3MUO, MUP, MUQ, MUR, MVC & MVB. Techs KA3HWB, LZE, BOJ, JRT, NWD, FXB, MVB, MUD, WB3IUU & KA8VMG. General WB3IFI, FKB, KA3LXR, MJG, GQP, HVE, NWS, BRK, MLJ, LGU, MRC, NWF and K8UQQ, advanced WB3BNP. Extra N3DLJ. Congrats to all. The tests where given by the BVARA and also by Steel City ARC. I would appreciate reports from VE Teams, South Hills Brass and Modulators, Inc. officers for 1985 are Pres. W3IQD, V.P. K3MPJ, Treas. N3AEV. Directors W3MML, W3LDB, W3QNI, Trustees WA3PBD, WA3WNT & N3DXE. I would like to have more people join the traffic nets especially if you live in area that has only a few operators to handle traffic. Too often messages have to be either mailed or sent back due to no outlet in the area traffic is intended for. The handling of traffic can be very rewarding and has many facets and you meet some very interesting people who want to know all about this hobby. It is the best PR we can get. The March of Dimes used us for communications and it was a success. Please be sure to send your groups to me and the ARRL Hq, so that our section gets credit for the Public Service that we all do. I am changing the pattern of this column starting next month to get more room for section news. Net frequencies and times will only be listed every three months and top level section appointees bimonthly. With a limited amount of space it is necessary. Traffic: W3EGK 334, KA3ETC 210, KQ3T 179, W3OKN 152, K3SMB 96, WA3DBW 86, WA3UNX 77, WA3QNT 75, W3NGO 65, KB3DT 66, W3RUL 49, W3KMZ 45, KC3JQ 44, W3VI 44, WN3VAW 30, N3FM 28, W3KUN 27, KQ3M 24, W3MML 24, N3CYV 16, W3GUK 11, KN3B 10, KA3LGU 7, KA3EGE 6, K3LTV 5, KB3L 2.

CENTRAL DIVISION

ILLINOIS: SM, David E. Lattan, WD9EBQ—SEC: W9QBH. STM: KB9X. OOC: W9TT. BM: K9ZDN. SGL: W9KPT. ACC: WB9SFT. TC: N9RF. ASM: K9ORP.

Net	Freq.	Times (Z WIN)	QNI	QTC	Sess.
ILN	3690	0030/0400 Dy	617	306	61
ITN	3705	0100 Dy	328	82	30
ILPN	3915	2230 Dy (X SN)	—	—	—
NCPN	3915	1300 Dy (X SN)	432	68	26
NCPN	7270	1815 Dy (X SN)	382	70	26
IEN	3940	1600 SN	93	2	4
IARES	3915	2230 1+3 SN	55	0	2
ISN	3905	0000 Dy	846	186	31

No reports were received from 9RN or D9RN this month. D9RN was represented 100% to CAND. Illinois stations were W9HOT WB8RFB AB9E KC9YN W9NXG and KW9J. TC N9RF has been busy giving TVI programs to area radio clubs. His presentation includes a mathematical method of determining the TVI margin of an amateur radio station, and a discussion of software he has written to make the calculations easy. At this time two ATC appointments are in the making. If you are interested in serving amateur radio through your technical skills, contact N9RF. Logan County EC WB9CWE reports that the 147.225 repeater in Lincoln has been changed over to RTTY operations. Area hams are encouraged to check in and learn its features. SM WD9EBQ represented ARRL at a meeting of Illinois VOLAG (volunteer agencies active in disaster). The Illinois river flooding which resulted in many counties receiving a federal disaster declaration was discussed. As always, radio amateurs played an important role in handling disaster related communications. SEC W9QBH reports the following changes in ECs over the last six months . . . in Marion County WB9QEG replaced W9VO who moved; W9KPT retired as EC of long standing in Sangamon Co and is followed by K9CNP; in Kankakee Co, N9EJK replaced KT9J; in Will Co. N9DIX has replaced N9AOP; for Cook Co, WA9WDE replaces WD9JLF; in Perry Co. WB9UEA has retired, and is replaced by WD9EEG; and in Morgan Co. we have a new appointment in W9OES. Many thanks to those who are leaving EC posts for their hard work and dedication, and welcome aboard to those who are taking over the reins. TRAFFIC HANDLERS . . . A recent occurrence within our section has pointed out the importance of accountability in traffic handling. When you accept a message for relay or delivery it is imperative that you record who the message was received from so that the message path can be traced back to the originator if needed. Messages should be kept on file for a period of one year after handling for accountability purposes. Traffic: WA9BFV 542, KW9J 445, W9HLX 188, KB9X 167, WB8RFB 162, W9HOT 157, W9NXG 156, KA9EWN 127, W9JIJ 124, KC9YN 65, KD9K 62, N9EWT 32, KZ9I 31, ND9V 29, NC9T 25, W9LNQ 22, KB9QX 18, WD9HQW 17, KA9BBV 14, W9KR 14, WB9TVD 12, WA9SID 11, K9QEW 10, W9KPI 10, N9CLB 9, W9VEY/M 9, WA9RUM 8, WD9CJB 7, N9ELU 5.

INDIANA: SM, Bruce Woodward W9UMH — SEC: WB9ZQE. STM: W9JUJ. SACC: K9TUS. STC: K9PS. SGLC: WA9VQO. SOBC: KC9TA. SPIO: K9DIY. SRC: N9WB. SHC: WA9FUD. SOOC: KJ9G. Net Managers: ITN KD9DU, QIN KJ9J, ICN KW9D, IRN KB9SU, VHF W9PMT, IWN KA9ERC.

NET	FREQ	TIME/DY/UCT	QNI	QTC	QTR	SESS
ITN	3910	1330/2130/2300	3192	458	2482	90
QIN	3656	2430/0000/0300	549	289	1582	88
ICN	3708	2315	99	30	519	24
IRN	3629	0000	193	106	1024	30
IWN	3910	1310	1693	0	398	30
IWN	VHF	Bloomington	1096	0	300	30
IWN	VHF	Kokomo	1107	0	187	30
IWN	VHF	Ligonier	415	0	450	30

Hoosier VHF Nets for April QNI 6312, QTC 176, Bulletins 104, QTR 6380 in 151 sessions for 19 nets. 9RN cycle four QNI 361, QTC 240, QTR 965, ses 60 in 100% Stns: W9EI W9FC N9HZ KJ9J W9JUJ WA9QCF WB9UYU K9WWJ. D9RN 330 messages in 1152 minutes. IN 58% Stns: K9CGS W9JUJ N9DWU KA9EIV. CAND 625 messages in 30 sessions. D9RN 100% Stns: N9DWU W9JUJ. Appointments: Emergency Coordinator KC9ED for Lawrence County, KA9JML for Dubolse County. OBS Coordinator KC9TA, ORS WB9PFZ, ATC WB9TOW, PIA WB9PFZ. Silent Keys: KX9X, Seymour In.; WB9SVR, Terra Haute In. It was a pleasure to work W9INX, the special sevents station for the 75th anniversary of the Boy Scouts of America, Fort Wayne Area Council. The station was set up and operated by ACARTS. They had two HF stations and a two meter station on the air. Over 2000 young scouts had an opportunity to see amateur radio in action thanks to WD9HII and others. We must all try to interest young people in amateur radio. We are pleased to note that the Columbus ARC has completed their application to become a Special Service Club. I have received 160 postcards — 128 favor 15kh, 28 20 kh, 151 favor section RC, 50 are owners or trustees, 110 are users. The results support our present position. Traffic: W9JUJ 763, W9CNE 237. KJ9J 233. WB9UYU 110. W9EI 92, KA9FFO 70, W9JZV

59, KB9HH 56, N9AEI 48, K9DFK 46, W9UMH 45, WA9QCF 43, W9QYY 39, WD9DWD 36, KW9D 33, K9KTB 29, K9PS 29, KA9EIV 25, WB9OZZ 22, KD9ER 22, W9PMT 22, WB9PFZ 20, N9DYC 20, WB9AWI 17, K9DIY 15, KK9N 10, W9EHY 9, W9ZGC 9, K9BRF 8, W9DKP 8, WB9VPG 8, WB9OFG 8, WD9ART 7, WA9OKK 7, N9DHX 6, W9BTZ 6, WA9CHY 5, WA9JNC 4, KA9LAU 4, K9SBW 2, W9XD 2, WD9GWM 1, W9BDP 1, WB9AJY 1, K9GDE 1, WB9TOW 1, WB9ZQE 1, KB9SU 1, KD9DU 1, W9RTH 1, K9ILK 1, W9UPI 1, KM9B 1, KA9ERC 1, W9HZ 1, N9DWU 1.

WISCONSIN: SM, Richard R. Regent, K9GDF — ACC: KA9FOZ. BM: KA9CPA. OOC: NC9G. PIO: K9ZZ. SEC: W9OAK. SGL: AG9V. STM: K9UTQ. TC: K9GDF. July begins my second year as SM, your ideas and suggestions have been appreciated, please keep them coming. Four Lakes ARC Swapfest was a success, their group also holds three annual Amateur courses, gives ARRL VEC exams and is a SSC. Ozaukee RC pleased 600 visitors with 7th annual Cedarburg Swapfest. Green Fox ARC provided communications for Riponfest and parade. Governor's Conference had 223 QNI on 2 meters and 131 QNI on 75 meters for 36% increase over last year, with 62 counties represented. WSSN Manager, N9BDL, welcomes everyone and gives beautiful certificate for QNI. NWTN Manager, W9JSF, doing fine job, encourages NCSs and promotes traffic. KB9WC answers Amateur Radio questions from listeners during half-hour WCWC-AM Spectrum Show. KW9O reports 35 Amateurs in his Albany area will form club. Milwaukee Repeater, 146.91, Friendship Committee listens to greet newcomers, has severe weather net procedures and wants suggestions to improve. Wisconsin Amateur Packet Radio Association organized by WA4COY, PO Box 1215, Ford du Lac, 54935, collecting info of Wisconsin packet radio stations. K9GDF gave VEP talk at Falls ARC. Congratulations to K9HEK on earning 6-meter VUCC. Radio-active W9CBE received 500-prefix award. South Milwaukee ARC Swapfest, American Legion Post in Oak Creek with walk in exams; Eau Claire ARC Hamfest, 4H Barns on Fairfax Street; and Sheboygan County ARC Swapfest at Wilson Town Hall, all on July 13th. Milwaukee Circus Parade, July 14th, needs more operators, contact WB9SMM. Association of North American Radio Clubs convention at Howell Avenue Red Carpet, Milwaukee, on July 19-21, free exhibits; teletype, computers, propagation and shortwave seminars; Voice of America to broadcast on site. Field Day logs must be postmarked by July 23rd. Oshkosh ARC Picnic after EAA Show at Wittman Field; and Riverland ARC Swapfest at Onalaska Community Center, both on July 27th. Silent Keys WD9AOD and WA9TLB. New Portage EC KD9NV talks at CWRA and coordinates emergency government. NB9H is new Northwest DEC. Madison upgrades, N9FCI Advanced, KA9SWE Technician and new Novice KA9TMX. K9SAO sons passed Novice and daughter is studying. W9BCC aced Advanced after 38 years as General. KA9BAC, wife of K9FHI, takes General exam and both enjoyed attending classes. W9ZTP, New Berlin, wants to hear from ARRL Examiners to organize September test. KC9EW, Gary, wondered why he didn't receive DX QSLs for over a year, finally asked for League help. Gary was pleased to soon receive over 400 delayed QSLs from clogged Bureau, including his 280th country—a rare card from South Orkney Island. BPL to KA9CPA.

BWN	3984	6 A.M.	WD9IID	1313-1435-26
WIN-E	3662	7 P.M.	WB9ICH	240-138-30
NWTN	34/94	6:30 P.M.	W9JSF	354-81-30
WIN-L	3662	10 P.M.	KC9CJ	139-67-30
WCWTN	31/91	6:00 P.M.	N9DHT	590-54-30
WSSN	3645	6:30 P.M.	N9BDL	129-27-31
XPO	3925	12:31 P.M.	WA9YVC	290-20-20
WNN	3723	6 P.M.	KA9OBP	118-14-27
BEN	3985	Noon	WB9ESM	—
WSBN	3985	5:30 P.M.	WA9ZTY	—

Traffic: KA9CPA 1400, WA9WYS 253, W9CBE 235, W9YCV 210, K9GDF 196, WD9IID 165, KA9OBP 138, WB9ICH 117, WB9YPY 114, N9BDL 110, W9UCL 107, KA9BHL 105, W9JSF 101, W9YT 93, W9IEM 90, K9AKG 85, N9DHT 82, W9LDO 75, WSDND 72, AG9G 65, WB9ESM 61, WA9YVC 47, KG9B 43, N9BCX 43, N9BGE 42, KA9RII 40, W9FDY 38, K9UTQ 37, KA9BHK 36, WB9PKL 35, WB9JSW 29, K9FHI 27, N9DCF 27, W9ODV 26, WB9NRK 25, WD9DNQ 21, KA9JTY 16, KY9P 8, W9NGP 8, KV9U 6, KA9NOT 6, K9JPS 4, W9UW 3, AA9Y 2, (March) KA9NOT 6.

DAKOTA DIVISION

MINNESOTA: SM, George Frederickson, Jr., KCØT — SEC: KAØARP. STM: KDØCI. The first issue of the newly revamped MSN Newsletter was recently mailed out to some 150 individuals or clubs. I hope that everyone of you has a chance to review this fine publication. It certainly can do what this somewhat limited space can't, and that is cover alot of ground. KAØEPY has put a tremendous amount of effort into this, however he wants input to give it the wide coverage we all hope it will provide. It will be issued quartterly on the 15th of April, July, October and January. The deadline on input will be the 8th. It may surprise you to know that only 28% of the licensed amateurs in our division are members of ARRL. If you know of someone who is not a member, or a club that is not ARRL affiliated, let is enlighten them on what ARRL membership is all about. The stronger we are in numbers under a unified banner, the more clout we can carry. If you received a questionaire from KØTO, fill it out and mail it in. If you see an ARRL official at a hamfest or club meeting, get to know him or her. If something is bugging you about our hobby, discuss it with them. That is what we are there for. NET NEWS: Look for an expansion soon on MSN/RTTY. With all the stations that are active on that net, there should be a few potential NCS stations. Piconet has started its summer sched for afternoons, running Monday thru Friday from 3-6 PM until September. Our "Ham of the Month" for April is NDØA of Sleepy Eye. Remember, if you have a nomination for this award, contact KCØT, KAØARP or myself (KDØCI). The criteria is outlined in the April 85 *QST* on page 90. Recent upgrades include: to Novice KAØUPB, to Tech KAØTCQ and KAØUKK, to General KAØOZF, to Advanced NØEYM NØFPB WDØHFF WBØJOF KAØKTB KAØKWM and WØUDP, to Extra WBØMHK and KDØWE. Congrats to all of you! A reminder to submit all SARs and PSHRs as well as net summaries to me no later than the 5th of the month. My mail-in date is the 7th folks! I will take late reports, however they go in with the next months list. Our deepest sympathies to family and friends of KØTBH and KØVPJ who became silent keys during April. Finally, information on all upcoming hamfests should be in the Hamfest Calendar of *QST*. Be sure your info is in to HQ well in advance. Other sources of info include MSPN and the MSO. 73 de KDØCI....

NET	FREQ.	TIME	QNI/QTC/SESS	MGR
MSN/1	3685	6:30P	237/93/30	WØEHI

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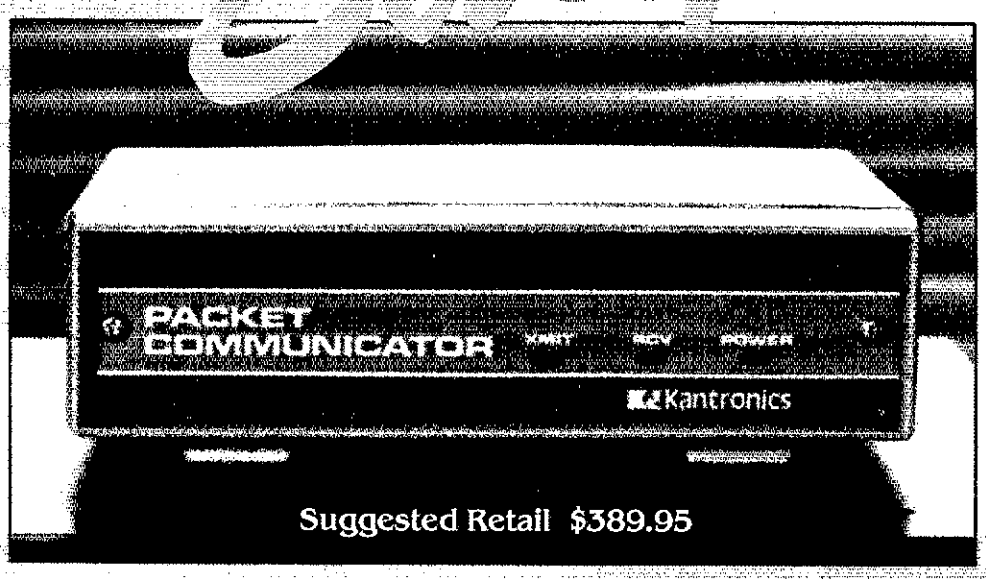


Suggested Retail $389.95

Kantronics Packet Communicator™

Kantronics wants you to join one of the fastest growing segments of Amateur Radio today . . . Packet Radio. With the Kantronics Packet Communicator we've made getting on Packet as easy as getting on RTTY.

The Kantronics Packet Communicator is a fully assembled and programmed terminal node controller ready for operation. Simply connect the Packet Communicator to the Serial TTL or RS232 port of your computer, and the microphone and external speaker jacks of your transceiver. The power supply, cables, and most connectors are included.

Because the Kantronics Packet Communicator uses internal microprocessors for protocol and signal processing, the operator simply follows procedures and commands outlined in the operators manual.

Any communications or terminal program, like those used with telephone modems, can be used to set up the computer to communicate with the Packet Communicator. Special Packet Terminal (PacTerm™) programs for many popular personal computers will be available soon from Kantronics.

The Kantronics Packet Communicator has both the AX.25 and Vancouver protocols, making it compatible with most existing Packet terminal node controllers. Added features include both Bell 103 and 202 tones, and the ability to use the unit as a 1200 baud radio modem without special protocols.

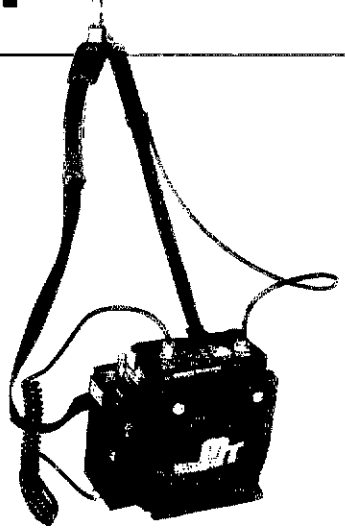
Error free data communication via computer makes Packet Radio technology exciting, and the Kantronics Packet Communicator lets you get in on the action.

For more information contact your local Kantronics dealer, or write Kantronics.

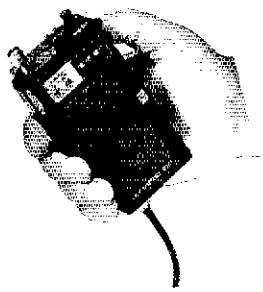
Kantronics

New 2 Meter FM Multipurpose Transceiver

Hand held MT-20A unit for Hi/Low 1.5/150 mW use with BA-2 Nicad Rechargeable Battery.



MULTIPURPOSE TRANSCEIVER



Portable transceiver puts out 10 Watts...Ideal for amateur participation events such as emergencies ...athletic events...marathons.

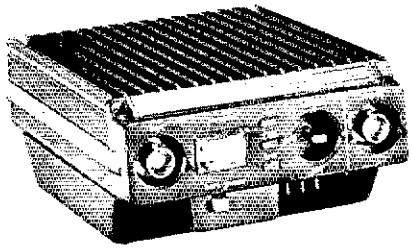
The new MT-20A transceiver can be used as a 10 W portable unit with carrying case, LA-20 Linear Amplifier and rechargeable Nicad Battery.

Easy to read thumbwheel digital switches provide complete coverage of the 2 meter band in 5 kHz steps.

In **mobile** operation, the MT-20A transceiver provides 20 W output when used with the LA-20 Linear Amplifier and plugged into the vehicle cigarette lighter through an SD-1 adapter.

Use hand held transceiver for all functions... Thumbwheel Frequency Selector...Built-in S Meter ...Microphone...Speaker.

For **base** operation, the MT-20A transceiver provides 20 W output with the LA-20A Linear Amplifier, or can be used with any linear amplifier connected through the SD-1 Adapter.



MT-20A **SPECIFICATIONS**

■ General

Frequency	: 144-148 MHz in 5 kHz steps
Emission type	: (FM)
RF output impedance:	50ohm unbalanced (BNC socket)
Power source	: 8.4V DC (5.5-11V DC)
Current drain	: 150mA Max. on reception 25mA on reception with no input signal 550mA Max. on transmission
Dimensions/weight	: Main unit (without battery pack) 118mm(H) x 60mm(W) x 38mm(D)/250g Battery pack (Model BA-2) 40mm(H) x 60mm(W) x 33mm(D)/120g
Repeater device	: Built-in : – 600kHz transmit down shift switch + 600kHz transmit up shift switch
Illuminated Dial	

■ Receiver

Circuitry	: Double-conversion Superheterodyne
Sensitivity	: Better than 1μV for 30dB S/N
Selectivity	: Greater than ± 7.5kHz/ – 6dB Greater than ± 15kHz/ – 60dB
Image rejection	: Better than – 60dB
Audio output	: 200mW (8 ohms)

■ Transmitter

RF output power	: High 1.5W Low 150mW
Modulation	(FM)
Spurious emission	: Better than – 60dB
Microphone	: Electret condenser Microphone, built-in (Impedance 2K ohm)

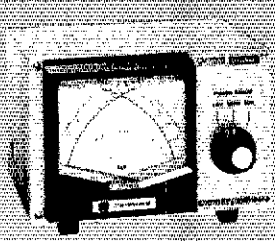
The new LA-20 2 meter linear amplifier provid 20 W (at 13.8 VDC) of stable transmitting pow using high performance transistors.

LA-20 **SPECIFICATIONS**

■ General

RF output power	: 20W (13.8V DC – 1.5W input) 10W (9.6V DC or Nicad – 1.5W input)
Power source	: 13.8V DC—DC power supply 9.6V DC—Nicad battery, Model BA-4/BA- (Optional)
Dimensions/weight	: 53mm(H) x 100mm(W) x 140mm(D) 550g (Without Nicad battery)

SWR & POWER CROSS NEEDLE METERS



Top Quality

CN-720B
Frequency Range: 1.8-150MHz
Power: 3 Ranges (Forward, 20/200/2000 W)
(Reflected, 4/40/400 W)

CN-620B
Frequency Range: 1.8-150 MHz
Power: 3 Ranges (Forward, 20/200/2000 W)
(Reflected, 4/40/400 W)

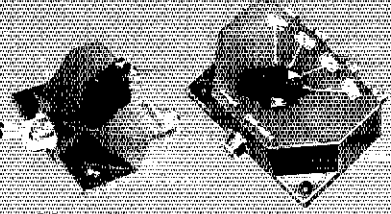
CN-630 and CN-630N (N Type Connector)
Frequency Range: 140-450 MHz
Power: 2 Ranges (Forward, 20/200 W)
(Reflected, 4/40 W)

	CN-410M	CN-460M	CN-465M
Frequency Range:	3.5-150MHz	140-450 MHz	140-450 MHz
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

All Models Back Lit, with mobile bracket.

	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

COAXIAL SWITCHES
PAT. No. 59-000803



	CS-201 2position	CS-201G 2position	CS-401 4position	CS-401G 4position	CS-4 4position
Frequency:	600 MHz	1.3 GHz	800 MHz	1.3GHz	1.3 GHz
Connectors:	SO-239	N type	SO-239	N type	BNC type
VSWR:	Below 1.1.2				
Insertion Loss:	Less than 0.2 dB				

POWER SUPPLIES

PS-310M	Max 31A/Continuous 24A 3 VDC-14.6 VDC Variable
PS-310MD	Max 31A/24A Continuous 13.8 VDC Fixed Plus sub-DC outlets; Max 5.6A/5A Continuous 3 VDC-14.6 VDC

Heavy Duty Power Supply
PS-560MD
Max 56A/44A Continuous Plus sub-DC outlet 10.6/10A 1 VDC-15 VDC

Advanced Multi Torque Antenna Rotator

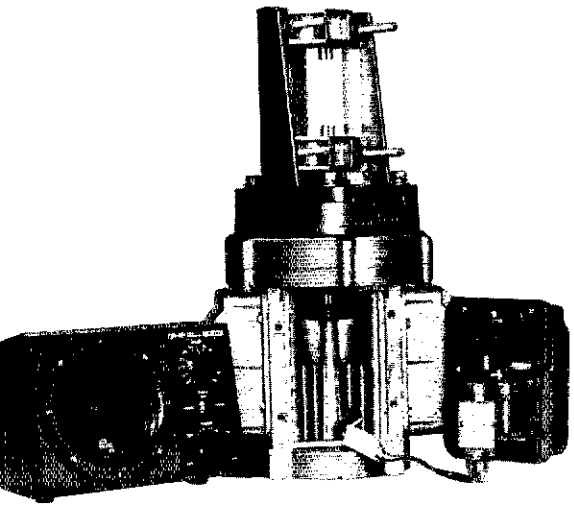
MULTI TORQUE ROTATOR

Each motor is equipped with a Super Wedge and Clutch brake system (Slip clutch type) that works independently from the main frame gear train and protects the rotator mechanism from excessive torque.

The main frame and reduction gear train have been designed to withstand maximum wind loading.

Maximum brake power is 18,300 lbs/in when 4 motors are installed.

Low voltage (24 VAC) motors...Low cost 6-wire control cable.



The rotator frame can house up to 4 motors to increase torque and load capacity, and can be installed on the same base as a TELEX unit.

Wind Load	MR-750E/PE	MR-300E
1 Unit	16.1 Sq Ft	5.92 Sq Ft
2 Units	21.5 Sq Ft	11.84 Sq Ft
3 Units	26.4 Sq Ft	17.75 Sq Ft
4 Units	30.0 Sq Ft	23.67 Sq Ft

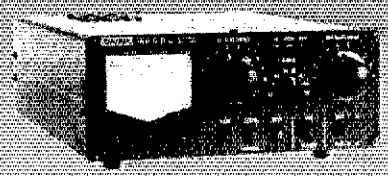
Specifications

■ Rotator Unit

		MR-750E/PE	MR-300E
Rotation time	60 Hz	58 seconds (60 Hz input)	33 seconds (60 Hz input)
	50 Hz	70 seconds (50 Hz input)	39 seconds (50 Hz input)
Output torque Brake power	1 motor	610 lbs/inch (700 kg/cm) 5,200 lbs/inch (6,000 kg/cm)	220 lbs/inch (250 kg/cm) 1,700 lbs/inch (2,000 kg/cm)
	2 motor	1,200 lbs/inch (1,400 kg/cm) 9,600 lbs/inch (11,000 kg/cm)	440 lbs/inch (500 kg/cm) 3,500 lbs/inch (4,000 kg/cm)
	3 motor	1,800 lbs/inch (2,100 kg/cm) 13,900 lbs/inch (16,000 kg/cm)	650 lbs/inch (750 kg/cm) 5,200 lbs/inch (6,000 kg/cm)
	4 motor	2,400 lbs/inch (2,800 kg/cm) 18,300 lbs/inch (21,000 kg/cm)	870 lbs/inch (1,000 kg/cm) 7,000 lbs/inch (8,000 kg/cm)
Rotation angle		375 degrees	
Permissible mast size		1½ ~ 2½ inch (38 ~ 63 mm) < diameter >	
Control cable		6-wire cable 0.5sq—1.25sq (AWG16/18/20 etc.)	
Continuous running		5 minutes Max. permissible	
Dimensions		15.6" H x 8.43" W x 8.43" D (397 mm x 214 mm x 214 mm)	
Unit weight		16.5 lbs (7.5 kg) < with 1 motor unit fitted >	

■ Controller Unit

	CR-4 (for MR-750E/MR-300E)	CR-4P (for MR-750PE)
Power source	117 V AC (50/60 Hz)	
Power consumption	200 W (with 4 drive motors)	
Motor running voltage	24 V AC	
Dimensions	4.9" H x 7.1" W x 6.9" D (125 mm x 180 mm x 175 mm)	
Weight	9 lbs (4 kg)	
Operation	Manual	Manual/Pre-set



ANTENNA TUNERS

	CNW-518	CNW-419	CL-680 (no metering)
Frequency Range:	3.5-30 MHz (8 bands)	1.8-30 MHz (17 bands)	1.8-30 MHz (17 bands)
Power Rating:	1 kW CW (50% duty)	200 W CW (3.5-30 MHz) 100W CW (1.8-3.4 MHz)	200W CW (3.5-30 MHz) 100W CW (1.8-3.4 MHz)
Output Impedance:	10-250/25-100 ohm (On 3.5 MHz)	10-250 ohm	10–250 ohm

AUDIO FILTERS

AF-606K & AF-406K

Four stages of filtering...variable bandwidth over broad range...razor sharp CW reception...built-in speaker.

The AF-606K adds PLL Tone Decoder circuitry. PLL locks onto the desired CW signal and reproduces it with utmost clarity.

ELECTRONIC KEYER **DK-210**

Sharpen your "fist" with Daiwa precision!

POWER AMPLIFIERS

	LA-2035	LA-2035R	LA-2065R
Band:	144-148 MHz	144-148 MHz	144-148 MHz
Input Power:	0.5-3 W	0.5-3 W	0.5-5 W
Max. Output Power:	30 W plus	30 W plus	60 W plus

Please call or write for technical literature.

Dealer inquiries invited.

DAIWA® U.S.A. INC.,
1908A Del Amo Blvd.
Torrance, CA 90501
(213) 212-6057 TELEX 887631

MADE BY DAIWA INDUSTRY CO., LTD., TOKYO, JAPAN

MSN/2	3685	10:00P	207/50/30	KAØEPY
MSSN	3710	6:00P	244/28/28	KAØODQ
MSN/RTTY	3620	7:00P	82/4/12	WAØLUT
MSPN/N	3929	12:00P	507/92/30	WBØWNJ
MSPN/E	3929	5:30P	1016/150/30	WDØBGS
MNAMWXNT	3929	6:15P	423/259/24	WDØBAC
PICONET	3925	9:00A	No report	WDØBAC

Traffic: WAØTFC 279, WBØWNJ 239, KAØEPY 230, WØEHI 181, KAØARP 159, KTØI 109, KDØCI 94, NØCLS 54, KØCVD 54, KBØWV 50, KAØODQ 45, WDØHDD 43, KCØT 34, WBØUKI 34, WDØBGS 32, KTØR 32, W9DM 31, WDØCQF 22, WDØGUF 21, NØJP 18, KN9U 18, NØBEI 17, WØHZU 17, KØOGI 16, KCØNL 15, KAØBFP 14, WBØFMI 14, KAØAJF 12, KØCSE 12, WAØONJ 10, KBØCD 8, NØEWA 8, NGØY 8, WØKYG 3.

NORTH DAKOTA: SM, Joe Gregg, KNØA—I hope everyone in the section will forgive me for missing the deadline in last month's QST. My wife and I had our 4th son right at deadline time and things were very hectic at our house. Summer is a good time to think about VHF modes. Look for thermal inversions, sporadic E and meteors. Summer is a time to play and have fun in the sun, but don't forget the local ham club. Life goes on summer or no, so don't make the club officers be the only ones present at the summer meetings. Check your QST mailing label to see when your membership ends and renew early. Do you know any members of the local club who are not members of the ARRL? If so, suggest to them to join up. Every person counts.

SOUTH DAKOTA: SM, Fredric Stephan, KCØOO—The Crazy Horse Amateur Radio Club already has sixteen new members and is only six months old. Meetings are every second and fourth Wednesday evening. Location varies for the club but always near or in Custer City. Reports are in for the BCN, BHN, CCEN, NJQ net and the Walworth County Emerg. net. Individual station reports have been received from NBØD WAØVRE WBØOMF KCØOO WØHOH WØYMU WØYMB WØMZI among others. This is the time of year especially when your help is needed for emergency communications planning, practice and actual emergency situation usage. Contact your local ARRL emergency coordinator or write or talk with our SEC WØYMB in Mobridge. We hope to see you this first part of the month in Rapid City, S.D. for the annual Dakota Division Convention. It should be perfect for a short vacation as well as a hamfest. It will be held at Howard Johnson's just off I-90, Exit 59, close by the Rushmore Mall on July 5, 6 and 7, 1985. Bring your QSL card for the display. For more info contact KXØU and NFØT. Have a safe trip. Best DX.

DELTA DIVISION

LOUISIANA: SM, John "Wondy" Wondergem, K5KR—SEC: KA5PFB. ACC: K5DPG. SGL: KD5SL. OO: WB5TPG. TC: N5JM. West La. ARC officers: Pres: WB5NAA. VP: W5YZL. Sec: N5CB. Treas: WB5IFS. Their club recently ARRL affiliated with 30 members. The Leesville VHF repeater, WB5NAA/R has recently been relocated to give much greater coverage. The Baton Rouge Hamfest enjoyed a jammed house on Saturday. Clyde, W5CH, our Delta Division Director, presented ARRL Charters of Affiliation at the hamfest to the West Central La. ARC and to the Radio Amateur Service Club of Baton Rouge. They joined the 24 other ARRL affiliated clubs in the La. Section. Is your club affiliated? The basic requirement is 51% ARRL membership. There are lots of perks and advantages plus financial sweetners for your club's treasury. Interested? Contact Leo, WB2TRN, at ARRL Headquarters. The Central La ARC sends out a monthly bulletin called the BRASS KEY. It's edited by Sonny, KE5KT, and is absolutely tops with all kinds of info presented in a real attractive layout. It contains several pages of gossip, fleas, and the latest activities. No wonder they enjoy a reputation for pulling together and getting things done. Traffic reports: N5ANH & KE5PP.

MISSISSIPPI: SM, Paul Kemp, KW5T—SEC: AL7GQ. STM: KB5W. ACC: KC5VD. VHF COORD: N5DWU. Thanks to NF5Q for fine job as VHF Coord. Welcome N5DWU to position as VHF Coord. Correction to last month's column, KE5WO appt EC for Claiborne Cty. New appt: WB5OYK DEC for Dist E. Fine Hamfest in Jackson. Enjoyed seeing everyone. It was a pleasure to see W5BW recognized for 70 years as member of ARRL. Congrats Tom for fine achievement. Hope everyone met W8RC and N3AKD at the League table. Recent upgrades at JARC test session. Extra: WB5SXK. ADV: KA5HTF, WB5EOW, GEN: N5HTQ, KA5QVA, KA5UTQ, KA5SYS. TECH: KA5TMQ, KA5OQX. Our sympathy to the family of K5MWR who became Silent Key. CAND: (W5KLV) 30 sess QTC 625. RN5 (KB5W) 60 sess QTC 646. DRN5 (WB5YDD) 60 sess QTC 709. MTN (K5OAF) 30 sess QNI 125 QTC 45. MSBN (KW5T) 30 sess QNI 2562 QTC 43. GCSBN (W5JHS) 30 sess QNI 1036 QTC 17. MMN (WB5RMW) 30 sess QNI 724 QTC 6. MLEN (KE5WP) sess 4 QNI 73. CAEN (NF5Q) 4 sess QNI 84. Traffic: KB5W 598, N5AMK 506, K5OAF 241, KT5Z 98, W5WZ 50, W5LSG 42, KW5T 20, KK5K 6.

TENNESSEE: SM, John C. Brown, NO4Q—ASM/ACC: WA4GLS. OO/AA: W9FZW. PIO: WK4V. SEC: WA4GZQ. SGL: WA4GZZ. STM: NG4J. TC: W4HHK. Your Section Manager has a bit of red face in that he incorrectly referred to John Rickard last month as Max Patterson. Not close at all, but he is the new amateur that walked into the amateur exam session at Jackson with no ticket and left after having completed the requirements for an advanced class operator. His call is KJ4CA. Welcome John. Some time ago it was indicated that the Section Emergency Coordinator asked to be replaced. There were several people who applied for the position. A tentative selection had been made and that person had been approached. I was advised that your incumbent SEC had been getting some real good reports from his doctor and so had his XYL and I should query him in regards to continuing as the SEC. The reports were correct and WA4GZQ will continue for the remainder of his term. The current year would not be as bad as last. Many thanks Les for a continued fine JOB. The SM is reminded as he looks at the new repeater directory of the many hours spent by a past frequency coordinator and his team, Sam Kirby, WB4HAP. He has been awarded the Certificate of Merit for this fine job at the Knoxville hamfest. Congrats for a "Job Well Done." Little return for the many hours of your time. The Section traffic is as follows: LF Sessions 78, QNI 4536, QTC 161; VHF Sessions 72, QNI 2093, QTC 573; CW Sessions 50, QNI 277, QTC 69; RTTY Sessions 22, QNI 151, QTC 3. Three operators were awarded CW net Honor Roll certificates for this period: K9IMI, W4DDK and NG4J. Congrats to them. Congratulations to the Short Mountain Repeater Club for becoming ARRL affiliated. Benefits are MANY. Individual station activity for this period is as follows. Traffic: NG4J 206, W9FZW 174, KA4RSC 154,

K4WWQ 57, W4DDK 20, W4PFP 18, NN4S 15, K4JGW 15, W4TYV 14, KI4V 12, KB4UQ 11, WB4YPO 10, W3HET 9, WA4GZQ 9, NM4W 8, KE4LS 7, W4EWR 7, W4PSN 6, W4MRD 5, K4UMW 4, N4KQX 2. (Mar.) NG4J 330.

GREAT LAKES DIVISION

KENTUCKY: SM, Rosie Perciful, KA4SAA — STM: Ray Smith, WB4ZDU. New Appointments: ACC-Mike Bruce, KA4BCM, Owensboro and ATC-A, Jeff Harris, AA4FQ, Utica. Beginning next month, the KY SECTION NEWS will alternate between net and traffic info and news of other interests. Keep sending your traffic reports to WB4ZDU each month but they will be combined and printed in this column every second month. Public Service Events: April 20, 9 Lexington Hams provided communications for the Ha-Penny Horse Trials at Masterson Station Park and April 27, 5 Lexington Hams provided como for the March of Dimes Walk-A-Thon.

NET	QNI	QTC	SESS	MGR
MKPN	1072	111	30	KA4SAA
KTN	1041	72	30	KA4SKV
KYN	157	47	30	KZ8Q
KNTN	278	75	38	KB4OZ
CARN	200	23	23	WB4FEW
KYPON	63	6	4	WA4AVV
NKARC	46	6	4	KA4RKS
TSTMN	526	42	30	KZ8Q
WTEN	51	3	4	WD4IXS
3ARES	13	7	3	KA4BCM
11ARES	59	7	9	KB4OZ
7ARES	78	4	4	WD4PBF

Traffic: WA4JTE 220, KA4SAA 71, KB4OZ 63, KA4BCM 53, WD4BSC 39, KC4WN 38, KA4SKV 37, WB4ZDU 37, WA4NOG 20, W4WQV 17, WA4SWF 17, WA4AVV 14, WA4MXD 14, K4HOE 12, WD3PBF 12, KA4MTX 10, WD4CQF 8, KA4GBZ 7, WD4IXS 6, WA4YPQ 6, W4PKX 2.

MICHIGAN: SM, James R. Seeley, WB8MTD — ASM: WA8DHB. SEC: WB8BGY. STM: WD8RHU. ACC: K8SB. PIO: KC8K. SGL: N8CNY. TC: W8YZ.

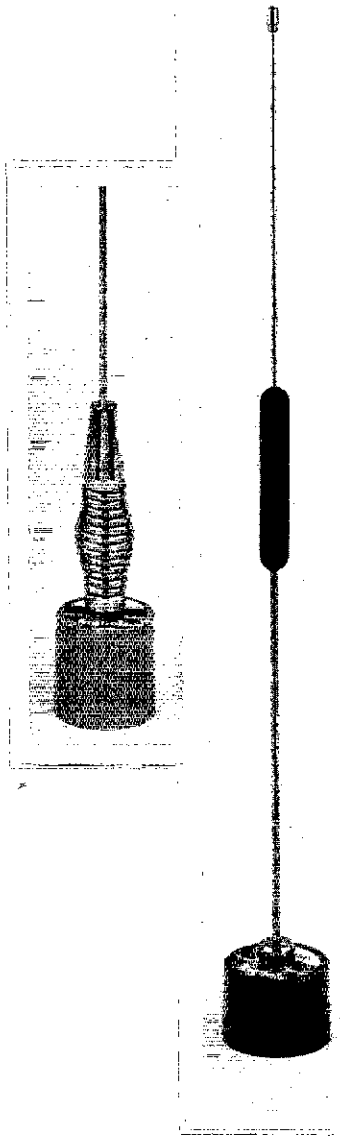
Net	Freq.	Time	QNI	Tfc	Sess.	Mgr.
MITN*	3953	1900	565	322	30	WD8EIB
QMN*	3663	1800**	772	226	87	W8UE
MACS*	3953	1100**	303	154	30	K8LNE
UPN*	3922	1700	916	86	34	WA8DHB
GLETN	3932	2100	771	65	27	WB8AXI
MNN*	3722	1730**	213	41	55	KA8NCR
WSSBN	3935	1900	949	30	30	K8MSJ

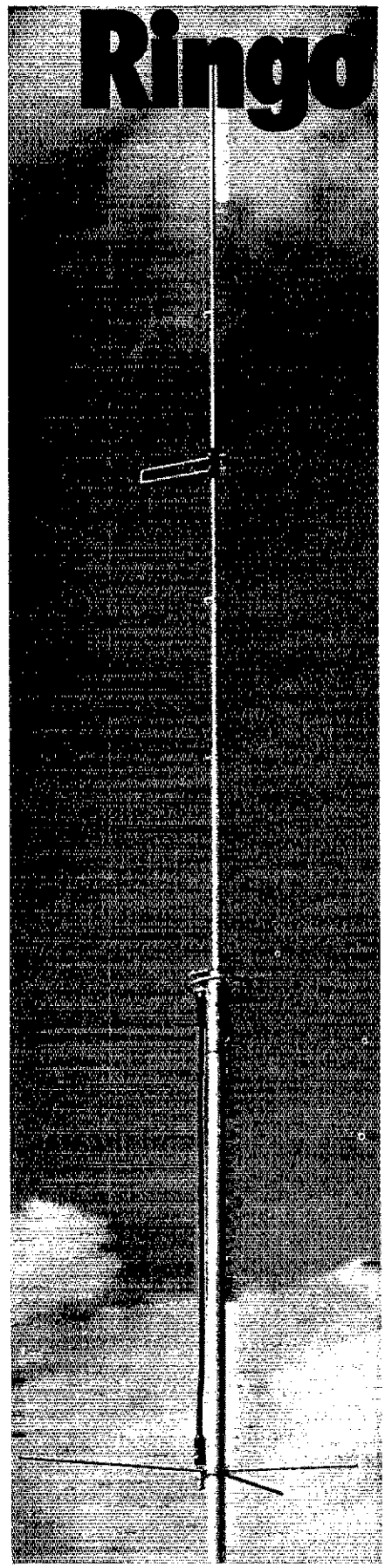
*NTS nets. Times local. **QMN late, 2200; MNN late, 2000; MACS Su, 1300. ARES Net, Su, 3932, 1730. 3932 is MI HF emer. freq., 1932 alt. Silent Key, with deep regret: WA8SYZ. New EC's announced by SEC WB8BGY: Livingston, N9AKZ; Oakland, N8EQD; Branch, KS8D; Kent, KB8GO. STM WD8RHU announces the re-appointment of KA8NCR to the MNN NM post, with sincere thanks to WD8OUO for so capably filling the gap for two months. TASYL (the Auto State Young Ladies) announces new officers: Pres, KI8V; V.P. KA8IKA; Sec'y WA8VXE; Treas. WA8YPY. Copper Country RAA also has a new slate: Pres. N8FHF; V.P. W8FWG; Sec'y N8BYR. Upgrades: to General, KA8VOZ; to Advanced, WD8EIB. Heartiest congrats to the Saginaw Valley ARA for its nomination for the distinguished President's Volunteer Action Award. Although SVARA did not end up among the finalists, the nomination iself is a great honor, as atested by a Michigan Senate Concurrent Resolution of congratulation and praise issued on April 23rd. All MI amateurs can share pride and pleasure in this most noteworthy happening. The Cadillac swap was a good one this year. It was my first appearance at this event in several years. The hospitality was warm, attendance was up, and the overall quality of goodies on display at this gathering (in common with other MI swaps I've been to recently) seemed somewhat improved. Are we gradually running out of boat anchors? (!) Traffic: KA8CPS 682 (BPL), W8QHB 350, AF8V 282, WD8KQC 233, WD8OUO 151, WA8YMH 110, WD8RHU 99, K8GXV 80, WA8DHB 77, N8CNY 67, W8IHX 63, W8RNQ 62, WB8MTD 54, WD8MJB 50, K8OCP 43, W8SCW 40, WB8YDZ 38, K8UPE 35, KA8VOZ 31, WB8BHP 19, K8ZJU 16, W8YY (3 ops) 15, W8YZ 12, W8URM 11, NJ8R 9, W8EOI WD8PAF 8, KB8TD 7, N8CQA 6, KA8NCR WB8WJV 5.

OHIO: SM, Jeffrey A. Maass, K8ND—ASM: KF8J. SEC: K8AN. STM: WB8MZZ. ACC: K8US. BM: W8ZM. TC: KB8MU. OOC: AD8I. PIO & SGL: N8CVK.

Net	QNI	QTC	Sess.	Time(Local)	Freq.	Mgr
BN			60	1845,2200	3.577	WD8KFN
BNR	248	159	30	1800	3.605	W8EK
BSSN	370	319	58	0945,1915	3.885	N8AKS
ONN			30	1830	3.708	KD8VF
OSN	322	113	30	1810	3.577	N8AEH
OSSBN			90	1030,1615, & 1845	3.9725	WB8MZZ
OSSN	207	223	30	0646	3.577	KA8GJV
O8MN	264	16	30	2100	50.16	WD8CTX

The Ohio Traffic Handlers Picnic will be held this year on August 4 from 9 AM until 5 PM in the Central Ohio area. This year we will expand the event to make it more of an "ARRL Section Picnic," with everyone (traffic handler or not) invited to bring the family and a picnic lunch for a social event. Details are uncertain as of this writing, but contact me for late information as it develops. Y'all come! Hamfests: July 14 is busy with *three* events—Canton Hall of Fame, Lancaster, and Wood County (Bowling Green). The NOARSFEST is July 20, and from there you can go to the Wheeling Hamfest on July 21. The ARRL Board of Directors is scheduled to meet July 25-26, so now is the time to send your inputs to Director W4OYI and Vice Director AB8P. Their addresses are listed on page 8 of this issue of *QST*, and they need you to tell them what to do! The Central Ohio ARES will again operate an Amateur Radio exhibit at the Ohio State Fair, (August 2-18) introducing the public to our hobby by demonstrating a typical station: ragchewing, DXing, etc. If you or your club would like to assist by signing up for a four-hour shift or two in return for a free pass to the Fair for the day, contact W8BKO or K1LT. This is an excellent chance for your club to help promote Amateur Radio! (If you can't make the Fair in August, why not set up a portable station as part of your community's July 4 celebration?) The Kettering Medical Center ARC has begun the West Central Ohio ARES net (Wed/8 PM/145.11-repeater) in cooperation with DEC W8ILC with the intention of promoting cooperation among the many fine public-service oriented groups in the Dayton area. Survey: everyone reading this please send me a radiogram so that I know you're out there! The Findlay RC has graduated a record crop of new Novices: 15 from their last class: Congratulations! The ARES Forum at the Dayton Hamvention went well, as always. Some interest has been shown in a similar "NTS Forum" or perhaps an "ARRL Field Organization Forum": comments? I have begun sending a monthly "Section News Update" to the editors of club newsletters. It contains late-breaking news and some additional details that may get trimmed by my line quota here in *QST*. Am I on *your* club's mailing list?





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The best combination of gain, bandwidth and low angle radiation for simplex or repeater operation.

Quick easy assembly and installation

Mount anywhere with compact dimensions and neat appearance

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Complete FM band coverage

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ARX220B 220-225MHz
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CS147M 144-174MHz Magnetic Mount
CS220M 220-225MHz Magnetic Mount
CS450M 435-470MHz Magnetic Mount

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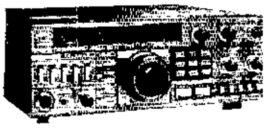

TS 430S

Now a general coverage receiver/ham band transceiver at an affordable price. Ideal for mobile, and portable use.

Sug. Retail $899.95

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TM211A/411A

Ultra compact FM mobile transceivers featuring Kenwood's innovative DCS system. 25 watts with many features.

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VB-2530 25W Amp	$99.95
HMC-1 Headset w/VOX	39.95
SMC-30 Speaker mic	34.95
ST-2 Base Charger for TR2600	89.95
MS-1 Mobile Charger for TR2600	42.95
DC-26 DC-DC Conv. for TR2600	19.95
PB-26 Ni-Cd Batt. for TR2600	34.95
TU-35B Encoder for TR2600	34.95
LH-3 Leather Case for TR2600	37.95
SC-9 Soft Case for TR2600	19.95
EB-3 Ext. Batt. Case for TR2600	14.95
BT-3 Batt. Case for TR2600	11.95
AX-2 Shoulder Strap w/Antenna Base for TR2600	29.95
PB-21 Ni-Cd Batt. for TH21/41	17.95
DC-21 DC-DC Conv. for TH21/41	19.95
BT-2 Batt. Case for TH21/41	7.95
EB-2 Ext. Batt. Case for TH21/41	14.95
SC-8T Soft Case for TH21AT/41AT	9.95
TU-6 Encoder for TH21/41	24.95
AJ-3 BNC Adapter for TH21/41	6.49

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TS 930S

Still a very popular top-of- the-line transceiver.

Available at Reduced Price!

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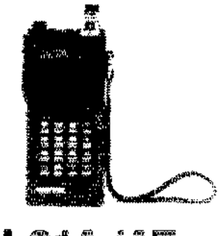

TH-21A/AT & TH-41A/AT

Pocket size performers. Measures only 2.24"(W) x 4.72"(H) x 1.1"(D).

TH-21A . . . . . Sug. Ret. $199.95
TH-21AT . . . . Sug. Ret. $229.95
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State-of-the-art amplifiers.

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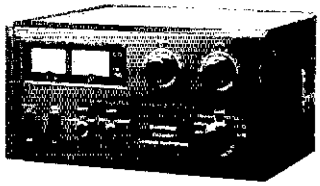

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160-15M linear amplifier using popular 3-500Z's!

Special Low Price!!!

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Serious radio for the serious operator. Many new features.

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ASTRON POWER SUPPLIES

High quality at an attractive price. Output voltage 13.8VDC.

Model	Cont. Duty Amps	ICS Amps	Net Cost	Your Cost
RS-7A	5	7	$64.95	$49.95
RS-10A	7.5	10	79.95	59.95
RS-12A	9	12	89.95	69.95
RS-12M	RS-12A w/switchable volt and Amp meter		111.95	85.95
RS-20A	16	20	115.95	89.95
RS-20M	RS-20A w/switchable volt and Amp meter		137.95	109.95
RS-35A	25	35	174.95	139.95
RS-35M	RS-35A w/switchable volt and Amp meter		194.95	159.95
RS-50A	37	50	253.95	199.95
RS-50M	RS-50A w/switchable volt and Amp meter		288.95	229.95

Other models also available.

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IC-751
PACKAGE DEAL

Order your IC-751 with: ICOM PS-35 internal power supply installed, ICOM FL-52A 500Hz CW filter installed and SM-8 desk mic.

All for $1489

You Save $236!

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LC-14 Vinyl Case for IC-02AT	$17.95
BC-35 Drop In-Charger	69.00
BP-2 425mA 7.2V NICAD Battery	39.50
BP-3 250mA 8.4V NICAD Battery	29.50
BP-4 Alkaline Battery Case	12.50
BP-5 425mA 10.8V Battery	49.50
BP-7 425mA 13.2V NICAD Battery	67.50
BP-8 800mA 8.4V NICAD Battery	62.50
HM-9 Speaker Mic	34.50
CP-1 Cigarette Lighter Cord	9.50
DC-1 DC OP Pack	17.50
Leather Case for IC-2AT	34.95
HS10 Headset for HTs	19.50
HS10SA VOX Unit for IC-02AT	19.50
HS10SB PTT Switch Box	19.50

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IC-02AT IC-04AT

New full-featured 2M, and 440MHz handhelds! Scanning, 10 memories and programmable subaudible tones are just a few of the MANY features of these terrific new radios. AND THEY ARE COMPATIBLE WITH ALL ICOM HT ACCESSORIES!

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Order your IC-745 with: Astron RS20A 20A power supply, ICOM SM-6 desk mic and ICOM FL-52A, 500Hz CW filter installed.

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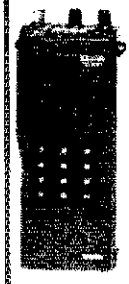

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Still the most popular, low cost/top performing handhelds around.

IC-2AT SALE PRICED $199.95
IC-3AT SALE PRICED $239.95
IC-4AT SALE PRICED $239.95

Call to Place Your Order!

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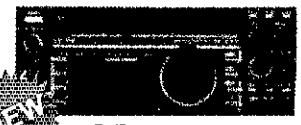

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IC-735

New compact general coverage receiver / ham band transceiver.

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NEW

IC-3200A

Dual bander 2M and 70CM. Many features. Sug. Ret. $549.00

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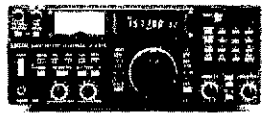

IC-R71A

Perhaps the best receiver at any price! Sug. Retail $799

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IC-271A/H

2 meter all mode with many new features. Available with higher power.

IC-271A ..... Sug. Ret. $699
IC-271H ..... Sug. Ret. $89[illegible]

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IC-471A/H

All mode, 430 – 450MHz continuous coverage. Now available with higher power.

IC-471A ..... Sug. Ret. $799
IC-471H ..... Sug. Ret. $1099

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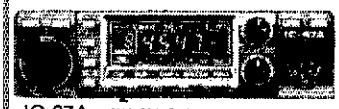

IC-27A (25W, 2M, FM) ..... Sug. Ret. $369
IC-27H (45W, 2M, FM) ..... Sug. Ret. $409
IC-37A (25W, 220MHz, FM) ..... Sug. Ret. $449
IC-47A (25W, 70cm, FM) ..... Sug. Ret. $469

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New Appointees: AG8N, EC Ashland Cty. We need more qualified Official Observer and Assistant Technical Coordinator appointees: drop me a note for info. You will notice that I have changed the format of the local net statistics in order to allow more space for news. Local Nets April 1985 (Name QNI/QTC/Sessions): ALERT 95/8/5; BRTN 216/121/30; BN 311/264/56; COARES 103/2/3; COTN 395/445/30; DATN 422/118/30; Highland ARA 88/2/4; JCTN 150/77/28; Lucas Cty/NWO 212/87/24; Medina Cty 307/63/30; NCTW 45/36/15; ONN 131/27/26; RARA 53/3/4; TSRAC 970/85/22; Tristate 436/229/30; WCTN 258/44/30; Wood Cty ARC 15/2/2. Traffic: KD8KY 1201, WB8O 624, K3RC 569, K8JDI 526, WD8MIO 360, W8PMJ 354, WB8JGW 297, W8JMD 293, K8ND 243, KD8XL 225, W8QZK 196, WD8RAO 191, KD8VF 182, NE8X 180, N8EFB 175, WB8MEK 168, N8EVC 145, KD8IC 138, N8AKS 134, KA8GJV 124, WD8RIB 120, KA8CGF 119, KA8KHS 115, K8CMR 108, N8AEH 107, WA8GMT 105, K8TVG 102, WB8DMF 100, W8EK 90, WA8SSI 87, K8DXZ 79, WB8GXT 78, WD8KBW 78, N9EJO 73, WA8HGH 68, KD8KU 62, WB8HHZ 59, NC8Q 57, W8ZOL 51, WD8JYE 48, K8AN 46, KA8SAC 46, N8FPH 45, K8LQM 44, K8DL 42, KA8TXJ 42, KW8X 42, W8BHL 40, N8FNP 40, NJ8P 40, KA8HNE 39, K8VOY 39, K8CKY 38, KA8OQF 38, N8CW 36, KA8RBQ 36, N8FWA 34, NF8B 33, KA8GGZ 33, KV8Q 33, K8EF 32, WD8EKI 32, KD8UW 32, KA8DJZ 30, WD8JAW 28, KA8JTT 28, WD8DCB 27, NK8W 27, KF8J 26, KD8TF 26, WB8KWC 25, WB8KWD 25, WA8DYS 24, N8GHS 23, WD8IKC 23, WB8NHV 22, WB8RSM 22, W8HVK 21, WB8MRL 21, WD8CSP 20, N8CJS 19, N8EEK 16, WA8HED 16, KD8SS 16, K8NJQ 14, NK8C 13, W8RG 13, N8DGO 12, N8GIM 12, KA8HBN 12, NI8W 12, KC8WH 12, NK8B 10, N2NS 10, KA8MFH 7, KD8WI 7, W8ZM 7, N8AJU 6, N8GIY 6, WA8TSX 6, KC8YV 6, W8HFK 5, WB8NTR 5, KA8MFG 5, KA8HGH 4, W8QQL 3, KA8RIX 3, N8CGM 3, WD8NED 2, N8GJF 2, W8LZE 1, K8OZ 1, KA8TNT 1, KD8WH 1.

HUDSON DIVISION

EASTERN NEW YORK: SM, Paul S. Vydareny, WB2VUK—ASM: K2ZM. SEC: AK2E. STM: WB2MCO. SGL: KB2HQ. BM: WB2EAG. ACC & SC: N2BFG. TC: KC2ZO. ATC: WA2VGM. NET REPORTS: AESN-QNI-79 QTC-0; Col/GRN ARES-QNI-69 QTC-1; EPN-QNI-56 QTC-37; ESS-QNI-376 QTC-78; NYPON-QNI-674 QTC-337; NYS/M-QNI-290 QTC-178; NYS/E-QNI-384 QTC-192; NYS/L-QNI 336 QTC-196; Schen CTY WX-ANI-367 Schen. CTY Emerg-QNI-40 QTC-4; SDN-QNI-249 QTC-102. CLUB NEWS: Albany ARA reports 17 upgrades in exam session; had annual dinner in May; new members N2FIN WA2JVB. Schenectady ARA had N2YL speak at May meeting; reports Silent Key KC2RB. West. ARA had speaker on Cable TV. WECA had election w/new officers N2EQM-VP, TNG-K2AMU, CTY Liaison-N2SP, Publ.-N2BFG, Dir. at large-WB2QJA, Treas.-WB2HQK. Empire Phone net has new manager-K2HNW and asst. mgr-WA2YBM Congrats and lets support the net and give Ted and Jack some assistance. TNX to KC2TF for his efforts. We are sad to report the passing of W2BIW, he will be sorely missed! WECA also reports WA2EVG as Silent Key. I appeal again to net managers and club editors-PLEASE get info to me so it can appear in column! Also, it is important this time of year especially to help out on the traffic nets, VHF or HF. April PSHR: WB2VUK WB2MCO WB2EAG K2ZM K2ZVI W2PKY KA2MYJ KC2TF K2HNW N2BFG KA2OPG. Traffic: WB2EAG 286, W2PKY 254, WB2MCO 201, K2ZM 145, KA2MYJ 104, K2ZVI 104, KC2TF 90, WB2VUK 86, K2HNW 82, N2BFG 37, WB2OHR 37, KA2AQV 32, W2SWA 26, KA2OPG 18, AA2Y 17. (Mar.) KA2AQV 40.

NEW YORK CITY-LONG ISLAND: SM, John H. Smale, K2IZ—ASM/ACC: WB2IAP. SEC: KA2RGI. OOC: NB2T. TC/RFI: W2JUP. STM: WA2ARC. PIO: W2IYX.
The following are traffic nets in and around the section:

NLI CW*	3830 kHz	1900/2200	N2AKZ mgr
NCVHF	6.745 rpt	1930 M-F	K2MT mgr
BAVHF	6.67 rpt	2000 M-F	WB2BNA mgr
SCVHF	5.37 rpt	2030 M-F	W2GZD mgr
ESS	3590 kHz	1800	W2WSS mgr
NYS/M	3677 kHz	1000	WB2EAG mgr
NYS	3677 kHz	1900/2200	WB2EAG mgr

*Denotes section net, all times are local, please try and help out by checking in whenever possible. LIMARC will sponsor exams on the second Sat. of each month at the N.Y. Inst. of Technology, Rt. 25A, Old Westbury, for further info contact Bob Reed, WB2DIN, 2970 Valentine Pl., Wantagh, NY 11793. WB2IAP has made up a complete sked. of events happening around the section, we would appreciate it if there is anyone interested in placing "flyers" up in local schools and shopping malls, listing the various test dates for the exams. Remember you can't go to the FCC anymore. Congratulations to the following who upgraded at the Gt. South Bay ARC VE test: to Extra: WA2AMX, WA2FUB, to Advanced: KA2UTV, KA2UAS, to General: KA2WLH, KA2POX, KA2WLJ, KA2WLL, KA2SPG, KA8DJS, WB2LEK, to Tech: KA2JYD, KA2WDJ, KA2FKG, KA2VKF, KA2KUC, KA2TZN, KA2VZX, WA2MOM. Many thanks to all those who helped in the Long Island Marathon. Suffolk County ARC held their annual flea market the first part of May. Officers for 1985 of Radio Central ARC are: WB2FXN Pres., K2SCX V.P., K2VYD Rec. Sec., N2EGO Corr. Sec., N2FK Treas., Directors N2DIA, W2GZA, WB2QYN, K2VL, K2SGH, WA2MHZ, K2RPZ, N2EUT, W2HBA. It is with deep regret that we list Herb Vines, WB2FMP as a Silent Key. W2LOS has come up with a solution to a burned out coil in the MFJ-941B, Antenna Tuner, for further info or reprints, contact him or Skip, K2UAT, and ask for a copy of the May Grumman ARC newsletter. Welcome to new Novice at Rockaway Beach JHS ARC KA2YBI, KE2N reports there are more to follow. Traffic: N2AKZ 282, K2YQK 245.

NORTHERN NEW JERSEY: SM, Robert Neukomm, KB2WI — ASM: K2BJG. SEC: WB2VUF. STM: W2XD. BM: W2FMN. RCC: W2CC. PIO: WB2NQV. TC: Open. ACCs: KK2U KY2S. SGL: W2KB. NMs: W2CC KB2HM WA2OPY WB2ANK WB2PKB WB2QMP W2RRX W2PSU.

NET	FREQ	TIME	SESS	QNI	QSP
NJM	3695	1000 Dy	29	161	99
NJPN	3950	1800 Dy	34	271	71
		0900 Su			
NJSN	3735	1830 Dy	30	111	29
NJN/E	3695	1900 Dy	30	201	104
NJN/L	3695	2200 Dy	30	142	64
OBTTN	147.12	2000 Dy	30	290	109
TCETN	147.255	1930 Dy	30	108	82
NJRTTY	147.51	Autostart	30	191	243

Uplink — Amateur Radio News call 201-735-8550. This is my "swan song" after being the SCM/SM since 1977. It is time to hang up the boxing gloves. It has been a wonderful experience and I've made a large host of friends as a result. I want to say a great big "thank you" to all those who have worked with me for their job well done. Amateur Radio has great things in the years to come — packet radio is going great guns, RTTY is no longer a small "elite"

KENWOOD

...pacesetter in Amateur radio

"DX-traordinary"

TS-930S

All band HF transceiver/ general coverage receiver.

The TS-930S (with or without automatic antenna tuner) is a high performance DX and contest transceiver delivering superior features and field-proven performance. Compare the TS-930S with other HF rigs in its price class and see why no other rig comes close!

160-10 meters, with 150 kHz-30 MHz general coverage receiver.
An innovative, quadruple "UP" conversion digital PLL synthesized circuit provides superior frequency accuracy, stability, plus greatly enhanced selectivity.

Non-volatile operating system.
Kenwood transceivers retain all micro-coded operating functions even when the lithium memory back-up batteries fail.

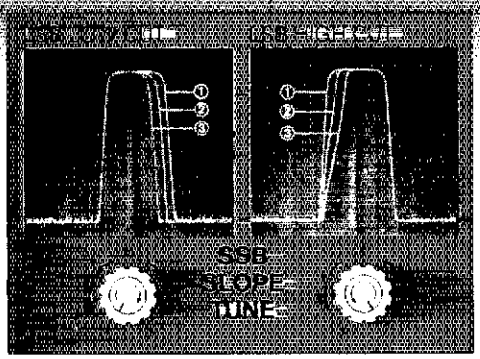
Easily modified for HF MARS and CAP operation.

All solid-state, 28 volt final amplifier for lowest intermodulation distortion.

Power input rated at 250 watts on SSB, CW, FSK, and 80 watts on AM.

Full break-in or semi-break-in CW.

CW VBT and pitch controls.
CW Variable Bandwidth Tuning control tunes out interfering signals. The CW pitch control shifts the IF passband and simultaneously changes the beat frequency pitch.



- **SSB slope tuning—Another Kenwood First!**
  Allows independent adjustment of the low and/or high frequency slope of the IF passband, for best interference rejection.
- **IF notch filter.**
- **Tunable audio filter built-in.**
- **RF speech processor.**
- **Dual mode noise blanker.**
- **Dual digital VFOs.**
- **Eight memory channels.**
- **AC power supply built-in.**
- **Built-in automatic antenna tuner (optional).**
  Covers 80-10 m. *Another industry first by Kenwood!*
- **Fluorescent tube digital display.**
- **Excellent receiver dynamic range.**
- **One year limited warranty.**

Optional accessories:
- AT-930 automatic antenna tuner
- SP-930 external speaker, with selectable audio filters
- YG-455C-1 (500 Hz) CW filter
- YG-455CN-1 (250 Hz) CW filter
- 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, MC-80, MC-85 desk microphones
- TL-922A linear amplifier (not for CW QSK)
- SM-220 station monitor
- PC-1A phone patch
- SW-2000, SW-200, SW-100 SWR meters
- HS-4, HS-5, HS-6, and HS-7 headphones.
- LF-30A low-pass filter

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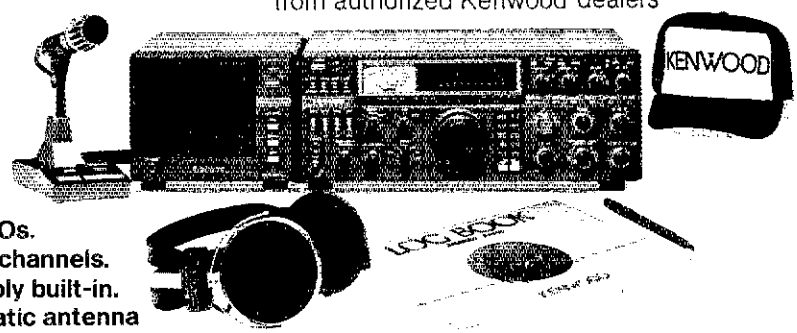

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group on the green keys as the computer age has opened up this mode tremendously. OSCAR has really gotten off the ground but there remains a challenge for us all to bring new life into our ranks. I will continue my part by holding classes for new hams and getting them on the air. I challenge ALL clubs to get "Elmer" programs going so that we don't lost these potential hams. Field Day will be history and I hope all clubs in NNJ had a great outing. Please send your club newsletters to the new Section Manager whomever he might be. Change your mailing lists Please! Thanks to our SGL W2KB, the State of New Jersey under Amendment N.J.A.C. 13:20-34 blocks of letter/number combinations have been set aside specifically for amateur radio use. The "Forty-Niner" has an excellent graphic representation of Packet Radio links that exist on 145.01 MHz. This list covers the entire eastern seaboard. BARA REPORT WA2QWM was selected outstanding member for '84. UPLINK reports elections: W2GD Pres, K2NJ VP, KD2EL Treas, WB2NOV Secy. Members at Large KC2ZA N2EKH & WB2EPW. CGNS/ METROPLEX mbr upgrades: KA2MCB & WB2MGP. KD2BE reports the FBI spoke at Springfield HS ARC & Computer Club about "Computer Hacking". Jeff also reports his new call NJ2Q. Have you invited a non-ham to your shack lately? How about getting some out to Field Day and also to all the Hamfests we have in Northern New Jersey. Please send all news to the new SM as soon as election results are in. THANKS AGAIN TO ALL and let's keep our hobby alive with GROWTH!!! 73. Traffic: KB2HM 408, N2XJ 311, WB2QMP 71, W2RRX 62, W2XD 35, KA2OIW 19, KA2RWS 16, NJ2Q 11, W2CC 8. (Mar) N2XJ 327, W2RRX 93, W2XD 39, W2CC 16, KD2BE 9. (Feb) KB2HM 579, KA2OIW 13. (Dec) KA2OIW 12. (Oct) KA2OIW 11.

MIDWEST DIVISION

IOWA: SM, Bob McCaffrey, KØCY—SEC: WA4VWV. STM: KAØX. TC: KØDAS. PIO: NØEBA. OO: KDØRT. SGL: AKØQ. BM: KØIR. ACC: WBØQAM. NMs NCØR, WØYLS, WBØAVW. Congratulations to KØAAR who has been selected as "1985 Iowa ARRL Ham of the Year." He is from Sioux City and deserves your recognition. Welcome to NØEBA as new PIO and NØBKB as new DEC for West Central ARES District. The Youth of Ham Radio was represented at Gov. Proclamation signing. In Davenport WAØOEW received the "Willis OTTO Award"—Remember to send tfc reports to KAØX. Welcome to the many new ARRL Members, let me hear from you. The IRC wants to know your feelings concerning the 15/29 kHz band plans—CVARC hamfest in August this year. "Old Thresshers" will be Sept. 30 at Mt. Pleasant. Who will host the 1986 Iowa State Convention? Still waiting for the second SSC applications!! NØBDF and WA4VWV on TV explaining SKYWARN. Nice turnout for Section Meeting at SooCY Mlnivention. Volunteer your skills to the local high schools. Thanks to all that participated in RAGBRAI/and State Convention.

Net	Freq.	UTC	Days	QNI	QTC	Sess.
TLCN	3560	2330-0300	dy	307	146	60
75 Phone	3970	2300-1730	M-S	2125	159	52

Missing two Net rpts this month as well as several SAR-NCS send in your reports so the NMS can report! Mow, mow, mow! Traffic: WØSS 199, WAØAUX 135, KØGP 125, WDØFWB 108, KAØX 59, WØYLS 92, W4JL 57, NØCWW 56, WBØAVW 50, KØCY 45, KAØADF 49, KCØXL 35, WØHTP 31, WØBW 22, WBØJFF 18, KØBRE 16, KCØSC 10, AI9D 9.

KANSAS: SM, Robert M. Summers, KØBXF—All Kansas amateurs wish Dick, WØJCP, our Vice Director for Midwest Division, a speedy recovery. For those of you not knowing, Dick suffered a heart attack recently. WØHI was on vacation last month in CF, that accounts for his late report. Wish I had a few GOOD reasons for all the MISSING reports! Net activities for the month of April are: KSBN QNI 1054 QTC 95. KPN 357/25. KWN 768/581. Down considerably from last month, guess the gardening comes first!!! KWN morning session holding QNI 719/QTC 652. CSTN 2075/75. QKS 240/72. QKS-SS 45/15. KS RTTY net QNI 12/QTC 0. Lots of public service type events taking place over the state—Salina group helping with go-cart races and a fair in Minneapolis. Jayhawk ARES operators providing communications for Piper Fun Days parade—Marathon race and demonstrating HAM radio at the booth set up for such purposes. Edwardsville Fun Day Booth, Making ready for Bonner Springs Tiblow Days events and the Wyandotte County Fair Demonstration. The Reno County Repeater Assoc. is planning to operate at the Kansas State Fair at Hutchinson. Congratulations to Mike and Jeanne, WBØLKA and WBØRYA who recently received a citation for a joint/effort HARMONIC. No FCC Involvement either. It's a boy, no less!!!! HELP A NEW NOVICE GET ON THE AIR. I have had several requests recently due to a lack of follow-up interest after code classes in some areas. HAVE a good FIELD DAY!!! Traffic: WØFRC 250, WØQBK 203, WØFIR 190, WØKL 139, KSØJ 137, WØOYH 85, WBØZEN 77, WØHI 73, WØFDJ 69, KØBXF 56, WØMYM 33, NBØZ 10, WØPB 10, WØRBO 7, WØCHJ 6, KAØE 2. (Mar.) WØHI 70.

MISSOURI: SM, Ben Smith, KØPCK—The Jefferson Barracks 1985 club officers are; Pres. WDØIIK, VP WBØBZP, Sec. KAØRNA and Treas. Andy Basch. Andy has passed Novice test and is waiting for his license. Congratulations to KQØZ who was named Ozark Amateur Radio Society Ham of the Year for 1984. It is with regret to report the following amateurs from this Section becoming Silent Keys during April. They were: KAØAWY, WBØSXP and KSØB. In cooperation with the Joplin-Jasper County Civil Defense Agency the Area ARES held an ARES meeting at Joplin Feb. 21. 108 people attended the meeting. A great job of promotion by the local ARES. Newly elected officers of the MO-Kan Council of Amateur Radio Clubs are: Pres. WBØRJQ, VP, WAØKUH, Sec. WDØGXL, Treas. KØIEW. Directors are WBØEJJ and WØAIB. Elected to the Mo-Kan Council repeater-coordination committee were: WØAT, WBØKIA and WBØLHK. New Field Appointments for the month of April were WBØENV and KAØFTS (both OBS), and the first ATC appointment in the Missouri Section goes to KAØJJX. On April 27 amateurs in the Kansas City area provided communications for the March of Dimes Walk America. 4500 individuals walked in the 32 kilometer route. Hams assisting were: WØAIR VE4VD KBØQH KAØSXY KAØSZY WBØEJJ WAØMBG WBØRHR WØOIZ WDØEIG KØUAA WDØFVM NØAAP WØBAZ and WAØJRJ. It was great to see a large number of Missouri amateurs at the Dayton Hamvention.

Nets reporting:

Net	Sess.	QNI	QTC	Mgr.
MON	60	346	170	KØSI
MOSSB	30	744	90	KT5Y
HBN	22	311	42	KØDSQ
MEOW	30	543	30	KØDSQ
PTN	9	18	9	WBØROQ
RRARBN	26	367	2	KAØLLN
ARESN	4	63	2	NØEHU
MCARES	4	47	2	WBØELT
NEMOE	13	102	1	KAØFTS

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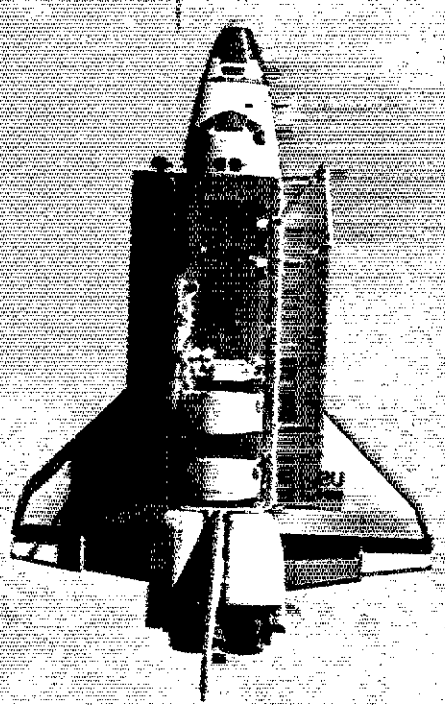

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LAQZFM	4	67	0	WØRLT
CMEN	4	77	0	KØPCK
SARN	5	60	0	WØENW
LARES	4	52	0	WBØRHC
TCN	4	50	0	KAØILO
CCAN	3	28	0	WØNUB
JCCCN	4	24	0	WØORI
CVE	13	20	0	KAØFTS
LAQZCW	4	18	0	WØRLT

Traffic: WØBMA 518, KØSI 155, AIØO 136, KT5Y 134, NDØN 79, NØEVC 70, KØPCK 69, WØOUD 52, K2ONP 49, KØDSQ 41, NIØR 40, KØORB 34, WAØYJX 25, NØBKE 22, WBØELJ 20, WBØCJB 12, WAØRHK 8.

NEBRASKA: SM, Vern Wirka, WBØQOM—SEC: Jim Sanford, NØAIH. STM: Jerry Kohn, WDØEGK. Several Omaha area amateurs are working with our section Public Information Officer, Mike Lennen KDØEV, on a project to get more exposure for amateur radio in the public schools. If you would like some help on a similar effort contact KDØEV, 5832 Western Ave., Omaha, NE 68132. The Blair optimist club has honored six Blair amateurs for their efforts in connection with communications for severe weather spotting and reporting to Washington County officials and the National Weather Service. The Scotts Bluff ARES group provided communications for a Corvette car rally. This was the first time amateur communications capabilities were utilized for the event that featured a race against the clock on the main street of Scottsbluff by several of the rally participants. Hopefully this summer your Section Manager can get back up some antennas and once again be able to check into some of the section HF nets. On the evening of April 19 a tornado roared across part of Sarpy county in eastern Nebraska. In the path was the radio station KFAB transmitter site southeast of papillion. KFAB sustained several thousand dollars worth of damage to the transmitter building and transmissions lines. All of the broadcast towers survived with no damage but a communications tower went down along with all of your Section Manager's amateur antennas. I am glad the transmitter building and my adjacent residence are made of brick so the structure remained intact but a large part of the roof was torn off. Water did get into the two 50 kW transmitters (which I could write a book about what it did and what it took to get them going again) but the amateur equipment did not get any water damage. The pre-registration deadline for the Midwest Division Convention in Omaha September 6, 7 & 8 is rapidly approaching. You are urged to get your pre-registration in as early as possible for the "Midwest 85." If you do not have a pre-registration form contact your local ARRL affiliated club and ask for one. The AK-Sar-Ben Amateur Radio Club of Omaha is looking for you September 6, 7 & 8 at the Holiday Inn Convention Center, 72nd and Grover. Traffic: KØDKM 168, WØKK 118, WBØTED 118, KAØBCB 30, KØIXY 26, KAØBWM 20, KAØIOM 19, WBØGQM 16, WDØBOX 15, KAØBOC 6, WAØBOK 6, WDØBQG 2.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Robert J. Koczur, K1WGO—STM: K1EIC. SEC: KA1ECL. BM: K3ZJJ. ACC: KG1M. OO/RFI: KA1ML. TC: W1HAD. PIO: KX1B. SGL: K1AH.

Net	Freq.	Local Time	QTC	QNI	NM
CN	3840	1900/2200	227	306	K1EIR
CPN	3965	1800 M-S	86	317	KA1BHT
NVTN	22/88	2130	44	284	WA1EMI
WCN	78/18	2030	206	460	WB1GXZ
RTN	13/73	2100	28	312	KA1JAN

Summer greetings-As of June 22, 1985 the 24 MHz or 12 Meter band was released to U.S. amateurs. Also at this time the 10-MHz or 30-meter band becomes permanent. Please check *QST* for freq. and modes. 145.55 MHz will be the primary downlink for the amateur station on Shuttle flight 51F. Launch date is set for July 15th. Tks to the following newsletters ZARC NEWS, KEY KLIX, FARA NEWS, SARC TRANS. for submitting info. for this mts. column. Congrats. to Mary WB1GXZ for another 100% rep. to 1RN. Congrats. to the Meriden ARC for the fine job of providing comm. in the 1985 Conn. Distance Classic 10K road race to benefit Easter Seals of Central CT. The MARC has supported this event in the past and I hope this continues in the future. K3ZJJ sends word that the FARA RPT. is on the air and doing well. The freq. is 146.625/.025 MHz. Bash is bankrupt after many years in the publishing business. With FCC testing proc. chgd. the end came quick. Congrats to the Newington Amateur Radio League for providing communications on April 28, 1985 during the March-of-Dimes Walkathon in the Hartford/West Hartford area. This was an 18 mile walk that raised nearly $150,000. The W1AW/R was used during this event. Steve, KA1ECL, Section Emergency Coordinator/CT needs your help. The ARES of CT is very strong but areas exist that need reps. Please contact Steve and join in, the rewards are great. See you next mth 73's. Traffic: WB1GXZ 355, W1EFW 349, KA1KPS 155, KA1GWE 131, KA1EGE 83, KA1KTH 83, KA1EIR 88, W1WP 65, W1BDN 59, KA1BHT 51, KA1JAN 48, N1BOW 34, K1AQE 31, W1YOL 20, WA1NLD 13, W1CUH 12.

EASTERN MASSACHUSETTS: SM, Luck Hurder, KY1T—ASM: N1BBT & K9HI. SEC: W1IAY. STM: KW1U. TC: KA1IU. ACC: K1AZE. PIO: WA1IDA. Nets:

Net	Mgr	Freq.	Time(Loc)/Dy	QTC	QNI
EMRI	N1AJJ	3658	1900/2200/Dy	343	310
EMRIPN	N1BGW	3880	1730/Dy	263	289
EM2MN	KA1AMR	83/23	2000/Dy	291	418
NEEPN	K1BZD	3945	0830/Sn	8	44
HHTN	WB1CMQ	04/64	2230/Dy	244	428
EMRISS	KA1EXJ	3715	1600/2030/Dy	221	244
CITN	N1YBS	645/045	1930/Dy	150	307

K1MBO proudly reports NEPRA support of the Run of the Charles Canoe Race, with packet stations in place for not 1 but 4 races! W8PS KY1D K1LLR K1MBO and others participating in the public service event. Congrats to the many clubs and individuals responsible for the large increase in exam opportunities under the ARRL VE program—and of course to the seeming multitudes who are upgrading! Are we a self-training service as per Part 97? You bet! Some of the upgrades include N1DIJ to General, N1BMO to Advanced & W2JRM and KA1JZB to Extra—FB! It is all done by the tireless efforts of people like Orleans OM/XYL team K1KED/WB1API who not only were responsible for multiple exam sessions but also for hosting a Cape Cod wrong meeting—all in the same weekend. Phew! Tech Coord. KA1IU is still working hard on the new ATC appointments. BARS working on their constitution and Novice classes. Cape Ann ARA conducting CW training nets Friday evenings on 28.160 MHz at 8 P.M. ORS K1BC topping the bulletin lists with is PBBS, with W1VTX coming in a strong second on 2 meter RTTY. KB1AF/OBS building up RTTY station and dreaming of packet! Amateur Auxiliary Coord. KA1KF reports continued strong activity FM the Aux. members. Are you in-

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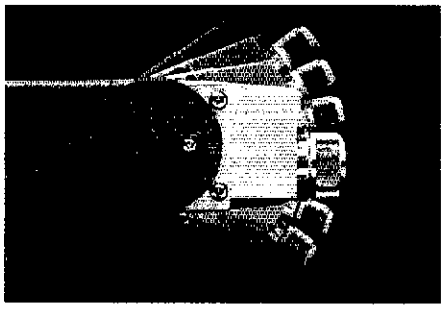

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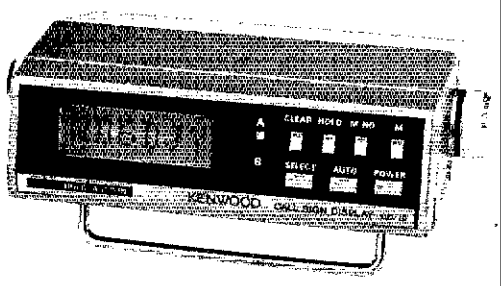

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terested in helping as an OO? Contact KY1T or KA1KF for futher info on this important public service. How many of you know what the PSHR is? Turn to the Public Service Column of QST to find out. Have you expressed your views to your section manager or division director lately? Traffic: KW1U 935, KA1EXJ 571, KY1T 341, N1BGW 259, KB1AF 239, WA1TBY 231, K1ABO 218, K1GRP 193, N1AJJ 161, WA1FCD 154, N1BHH 147, WA1DXT 139, KA1EID 97, W1CD 94, KB1PA 91, KA1BBU 76, KA1AMR 72, N1BYS 50, WB1CMQ 44, KA1KU 42, K1BZD 34, N1DDC 32, WA1SNH 31, W1DMH 30, KA1LIH 30, WA1FNM 26, KY1B 22, KA1MAM 22, N1CKN 19, KA1DJV 19, W1QLL 19, KA1KCU 17, KO1O 16, K1LCQ 11, KE1L 5, K9HI 4.

MAINE: SM, Cliff Laverty, W1RWG—SEC: KL7IJG. STM: AK1W. ACC: KY1C. BM: W1JTH. OOC: W1KX. PIO: KY1E. SGL: K1NIT. TC: K1PV. We have a new kid on the block: the Bass Hill Repeater Group sponsoring 147.18 es 147.36 Western Maine. Bill Townsend, WB1CRB, chosen one of Maine's finalists for first Teacher in Space Program WA1AKV, KL7IJG, K1OK provided comms for college and university canoe race on Kenduskeag. Fleamarket at Wilton July 20. Two recently appointed ATCs are KR2K and KA1MGR. Plenty of room for more ATCs and PIAs. K1NIT worked hard on ham license plate bill but it was killed by Chrm Danton before getting to floor. Providing comms March of Dimes Walk-a-thon were N1BCF N1CIQ N1CMZ WB1EUI WB1GOW KA1FKS WA1FMM KA1FTO W1JTH KO1L K1NIT W1SIN W1TGY (1 emerg call). Mid-Coast ARC ran Novice course. Results: new calls KA1MVH KA1MVG KA1MVF KA1MVI and 2 others waiting for calls. Now working on upgrading. St. Albans Hamfest Aug. 10-11 replacing Abbott Village. PSHR: WA1YNZ 86, W1RWG 76, N1BJW 75, KL7IJG 75, KY1E 73, KB1PB 61, WB1CBP/N 87. Traffic: KA1JOJ 201, WB1CBP/N 189, W1BMX 128, AK1W 86, W1RWG 82, KB1PB 66, N1BLZ 62, KL7IJG 47, N1BJW 31, W1KX 28, WA1YNZ 28, KY1E 26, KA1JPR 23, WB1GLH 22, W1GGB 18, W1VEH 17, KA1ENL 15, N1BME 15, KA1KFC 12, W1ISO 11, W1OTQ 8, KA1FTL 8, KA1ENM 8.

NEW HAMPSHIRE: SM, Robert C. Mitchell, W1NH—STM: W1TN. Tristate FM Net members WA1YZN, WB1GXM, W1TXN, K1TQY, K1IOJ, WA1UNN, WB8BTH, WA1VJI and W1FYR supplied communications for Vermont Yankee Disaster Drill. W1BYS back from sunny Florida. W1TN and xyl Barbara vacationed in California. KT1H received the DXCC QRP award, the first in NH reported. WA1QCQ is on 160. Appointment endorsements: ORS: K1PQV, K1UWB, KI1M, W1TN and W1NH. EC: W1FYR K1OIQ, KQ1M, KA1FKM and N1ACB. TC and OVS W1JY. STM and OES W1TN. ACC and OBS KI1M. Net Manager N1NH. It is sad to record the passing of W1IIQ, former SCM and fellow Mason. WB1DXN vacationed in Cheshire, Conn. GBARA officers: Pres. W1HJT, VP KA1JLK, Sec. KA1YJR, Treas. N1CWB. Congrats new Extras: N1DHJ, W3WDX and WB2WPM. Traffic: N1CPX 322, N1NH 190, AK1E 164, KI1M 156, K1UWB 79, W1TN 72, K6UXO 57, N1AKS 51, K1TQY 50, K1PQV 48, W1ALE 34, WB1GXM 34, W1FYR 30, KK1E 27, W1MHX 22, KA1HPO 16, K1ACL 8, W1NH 2, WB1BRE 1.

VERMONT: SM, Ralph T. Stetson III, KD1R—Congratulations to those of you who have successfully upgraded in the last month. KA1LMQ now N1DKS, and to Tex, W1ICW, Extra per IBM club bulletin. A big thanks to W1PMH of CVARC for his fine job as a lobbyist for Amateur Radio in the State Capital. Good luck on getting the license plate bill through next session. By now those Black fly bites should be pretty well healed up so let's get your FD "85" Summary sheets in. Hope everybody had a good time. Last minute update from Joe, W1KRV: VTN picnic at Joe's QTH on July 21 not 27 (sorry about the error). WA1YEH, WB1AJG among many hams here in VT combined efforts to make this year's Yankee Vernon Drill a success. Frank, W1CTM, will be submitting a complete report-watch for highlights in Public Service column. Don't forget August 10-11 BARC International Hamfest at Charlotte, VT. Whether you buy something or not it is the best little Hamfest in Northern New England. Special thanks to QFQ Green Mtn Wireless Newsletter and the CT Valley ARC, and the Central VT ARC newsletters for their inputs. Net reports April VTN 30/128/61; VSSB 30/435/98; VTRFD 5/45/9; CAR 26/630/31; VTPN 4/62/5; GMN 26/377/35; CVFM4/67/6. No Reports VT2FM, VSSN.Traffic: KT1Q 195, AE1T 85, W1KRV 75, N1ARI 54, N1COB 33, W1OAK 11.

WESTERN MASSACHUSETTS: SM, Don Haney, KA1T—SEC/SGL: WB1HIH. OO/RFI: N1CM. PIO/ACC: K1BE. STM: W1UD. TC: KA1JJM. Comms for inter-college bike race provided by WPI club on W1YK repeater. Hampden Cty ARES membership has large increase. And 36 ARES members assisted with Yankee Vernon Nuclear Plant drill. KA1KPH is new Extra and son is Tech KA1MCA. Bob's digipeater to move to Wilbraham Mtn. MARA has T-shirts and CMARA to get patches with club emblems. W1DOY wrote nice letter to CMARA from new home in Louisiana. MARA second annual flea market even more successful. UMass Club to give VE Exam session August 3. For info contact N1XZ. N1AZG had lightning strike and over $3000 damage. Look for Special Event N1BHF (Naismith One Basketball Hall of Fame) on weekend of June 29/30 from location of same name. PSHR: WB1HIH, KA1T. Traffic: KA1T 360, W1SJV 178, W1UD 162, W1KK 89, W1JP 54, WB1HIH 52, WA1OPN 34, KA1EKQ 21, W1ZPB 13, N1XZ 12, WB1HKN 7, WB1FSV 7, K1JHC 5.

NORTHWESTERN DIVISION

IDAHO: SM, Lem Allen, Jr., W7JMH — SEC: KD7HZ. STM: W7GHT. PIO: WB7PFQ. OO: KU7Y.

NET	Fq	Time	SES	QNI	QTC
FARM	3937	0200Z Da	30	1702	52
NW TFC	146.38/98	0130X Da	30	853	4
ID CD	3990	1510Z M-F	22	987	23
IMN	3635 CW	0300Z M-F	22	228	97

Club news: The Boise Club furnished comminucations on the 147.90/30 repeater for the recent/Regional Soccer Tournament, furnishing late scores, calls for Medical assistance, etc. Approximately 20 hams participated at three locations — tnx, fellows!
People and Things: 7 out of 8 participants upgraded at the VE Exams given April 20 in Twin Falls. Our Congratulations to new General KA7RTL, new Teks KA7UGT KA7SSE WB7OXB KA7QQP KA7ENV and Carol Wells.
ARRL matters: The OO function and RFI function are now separated. When interference matters show up, seek help locally from the best technically qualified hams available. A third party can do a lot more to help resolve interference problems than one of the participants.
General: Many of us are so used to putting our fingers into the works of the new Solid State rigs, we forget to be careful when servicing one of the older rigs with part tubes or all tubes. High voltages dangerous to life exist in some

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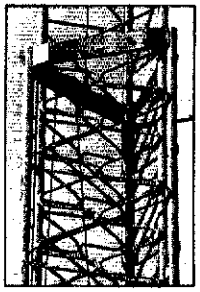


Rugged Hy-Gain antenna crank-up towers are made as no others. All steel construction and galvanizing after welding meets ASTM material standards. Giant welding fixtures assure straight and true alignment of tower sections for close tolerance crank-up guide systems. Diamond web bracing, 2.5 times the strength of ordinary "W" bracing, adds strength where tower sections meet. Open-end tubular steel legs are galvanized inside and out and permit unrestricted moisture drainage. It all adds up to long lasting, massive tower strength for antenna loads of up to 16 sq. ft. at 60 mph.

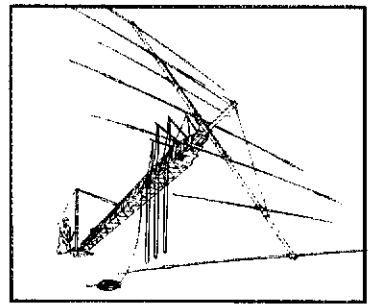
	Tower Sections	Height Extended	Height Retracted	Width at Base	Antenna Windload Limit	Weight
HG-52SS	3	52 ft. 15.8 m	21 ft. 6.4 m	16.44 in. 417.6 mm	9.5 sq. ft.-50 mph .88 sq. m-80 km/h	455 lbs. 206 kg
HG-37SS	2	37 ft. 11.3 m	20.5 ft. 6.2 m	13.75 in. 349.3 mm	9.5 sq. ft.-50 mph .88 sq. m-80 km/h	265 lbs. 120 kg
HG-54HD	3	54 ft. 16.5 m	21.5 ft. 6.6 m	19.53 in. 496.1 mm	16 sq. ft.-60 mph 1.5 sq. m-96 km/h	575 lbs. 261 kg
HG-70HD	4	70 ft. 21.3 m	21.5 ft 6.6 m	22.63 in. 574.7 mm	16 sq. ft.-60 mph 1.5 sq. m-96 km/h	1100 lbs. 499 kg

Hy-Gain crank-up towers come complete with hinged base, installation steelwork, pre-drilled rotator plate and a manual winch.

Hy-Gain crank-up towers require no guying and conform to EIA, to the Uniform Building Code, and are approved by Los Angeles (license 1095). UBC documents for building permits are available on request (specify tower model) **before** you buy the tower.

OPTIONAL TOWER ACCESSORIES

Electric winch/Remote control • Mast • Thrust bearing • Coax arms • Rotators • Tower Gin Pole



An accessory tilt-over gin pole allows one person to tilt the tower over to ground level.

FREE FREIGHT

Order any Hy-Gain tower from your dealer for factory shipment direct to you. Hy-Gain will pay the freight on the tower and any of our antennas, rotators and accessories ordered for shipment at the same time. This offer is limited to within the 48 contiguous United States.

TELEX® hy-gain®

TELEX COMMUNICATIONS, INC.

9600 Aldrich Ave. So., Minneapolis, MN 55420 U.S.A.
Europe: Le Bonaparte–Office 711, Centre Affaires Paris-Nord, 93153 Le Blanc-Mesnil, France.

rigs — be on the lookout! Use your shorting bar! Traffic: W7GHT 85, KA7KAI 67, W7JMH 42, KA7NFW 16.

MONTANA: SM, Les Belvea, N7AIK—SEC: W7LR. STM: KF7R. TC: K0PP. BM: K7KCR. ACC: WB7TWG. SGL: W7JMX. PIO: WA7GQO. OOC: open. KA7HEY and other members of the Great Falls Area ARC provided communications for their Bike-A-Thon. W7IDK reports the following upgrades at the Havre VE session: to Extra-W7RLL, W7KUH, to Adv. KA0TKG, to Tech-KA7OUP, KA7UAT, next testing in Havre will be this fall. Call changes-N7FUB now NM7Y, KA7QVY now N7GYQ, KA7TZO now N7HAE, KA7TVT now N7HAZ KA7TUI now N7HAY, KA7UVD now KE7FO. The Glacier-Waterton Hamfest will be July 19-20-21 at the Three Forks campground. WIMU Hamfest will be the first weekend in August in Jackson, WY. N7RB and W7KIX hosted the spring meeting of the Treasure State chapter QCWA with good attendance. RACOM had a productive get-together in Helena, new chairman is WA7FLG, vice-chairman is K0PP. PSHR: WA7GQO, KF7R, N7GXP.

Net	Sess.	QNI	QTC	Mgr.
IMN	22	228	97	WA7GQO
MTN	30	1657	139	WA7GQO
MSN	4	53	0	K0PP

Traffic: KF7R 93, WA7GQO 52, KA7NMA 32, N7AIK 27, WB7WVD 17.

OREGON: SM, William R. Shrader, W7QMU—STM: W7VSE. SEC: N7CPA. PIO: KC7YN. SGL: KA7KSK. STC: N7ENI. OO: N7SC. Upgrades: KA7BNP W7AAI NM7Q NM7R NM7P WA7OYY K7BSS W7LPC WA7GJR (Extra); W7DID WA7TYD WB7BZT N7GQF WB7OVQ KA7OOW WA7BGF KA4DWL (Advanced); KA7PTE KA7MFK W7AQE KA7TJT (General); KA7UMB KA7TDZ KA7QZY KA7TUP KA7VCT KA7VHE KA7UMS KA7TZT KA7VEM KA7VEL (Technician); KA7VCR (Novice). I think the above list proves that the VE program is really working. Congratulations to the whole group. KO7S made DXCC/CW. KA7IPS in finals of Miss National Teenager Pageant. New YL harmonic for KA7KDU and N7FNW. New son born to WB7REC. K7DMM married at Lake Tahoe in March. N7GYZ (General) is new sightless ham—Great Work Jerry! W7DAN is Master of Heedsport Masonic Lodge. Valley Radio Club of Eugene and Willamette Valley DX Club did well in the 51st Annual ARRL Sweepstakes in Nov. 84. VE program in Central Coast area is 4th Thurs of each month at North Bay Fire Hall in North Bend at 7 P.M. Contact WA7PHI for info. KA7GNL, WA7WLY, K7GWK and K7WPC are assisting. N7EIF is new Bulletin Station in Corvallis area. Traffic: W7VSE 543, N7FLC 230, W7LRB 204, K7OVK 192, AL7W 89, N7BGW 48, KA7AID 46, W7MLM 28, WA7VTD 24, W7LNE 18, W7HLF 18. (Mar.) KX7T 25, KX7W 22.

WASHINGTON: SM, Joe Winter, W7RWK — STM: K7GXZ. SEC: W6IIH, BM: N7IL, TC: K7UU. PIO/SGL: W7CKZ. OO/COORD: KC7FA, ACC: KD7G.

NET	Freq.	Time(Z)	QNI	QTC	Mgr.
EWTN	146.64	0030/0430	104	102	WA7CBN
NTN	3970	1900	917	62	W7UU
NWSSB	3945	0130	745	43	W7HFN
PSTS	145.33	0030/0430	170	102	W7IEU
WARTS	3970	0100	3195	191	W7SFT
WSN	3590	0145/0445	501	169	W7GB
WARNS	3940	0200	AR NEWS NET		W7CKZ

Hamfests: Tacoma Hamfair Aug. 17-18; Walla Walla HF Sept. 21-22. From the Inland Empire "REPEATER" WB7RBJ appeared before the Spokane County Planning Commissin with alternate plans for new antenna & tower regulations. Marty reported that towers already erected will be "grandfathered" into the new regulations, but new towers will be installed as follows: In all zones where permits will be issued site plans and manufacturers instructions have to be submitted for approval. Height limit is now 45', which covers all types of structures. He is working to change the limit to 75' for towers. Also excerpts from the "REPEATER". Hams in Western Montana, Central and on the Southern border of Washington B.C. and Alberta in Canada have experienced electronic interference in the 144/148 MHz band in December 1984. The Kootenai County RACES hosted a meeting in Hayden Lake, ID to discuss the problem. The Air Force and the Amateur Community were represented. Many avenues of potential causes were explored without success. The military checked their operations as well as those of other Government agencies to no avail. The interfereing signal which blanked out 2 meter communications has been observed for periods of 40, 20, 5 and 3 minutes with others of only seconds. Presently the cause has not been found. It is considered a severe potential communication hazard to civilian, amateur and possibly the military as well. The I.E.VHF Club is working on the strange problem. The Radio Club of Tacoma awards it's second Educational Memorial Scholarship to a young lady attending the Clover Park Vocational Institute in Tacoma. She was selected by the school and elected by the RCT Scholarship Committee. She attended the April 24th RCT club meeting and expressed her gratitude for the opportunity to complete her course of studies which otherwise would have been terminated. The scholarship fund is financed partially by RCT Hamfair, various activities and private donations. Traffic: WB7WOW 399, KD7ME 254, W7LG 245, KR7L 210, K7GXZ 203, W7GB 111, KR7F 82, W7IEU 55, KD7G 44, K7CTP 41, WA7BDD 33, KD7TJ 23, N7DDP 13, K7AJT 10, K7OXL 9, N7FXM 3.

PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W6RGG—ASMs: W6ZF, N6DHN. SEC: W6LKE. STM: NI6A. There was no column last month due to my being on Clipperton Island, operating FO0XX. I hope we worked you! WA6TGF reports San Ramon and Danville are working on Satellite Dish ordinances which may affect Amateur installations. Clubs are the focal point of Amateur Radio activity. Here's a list of section clubs from which I receive newsletters, their mailing addresses and repeater outputs. If you don't belong to a club, try one out! Alameda County RACES, c/o Office of Emergency Services, 2000-150th Ave., San Leandro 94578, 147.24; Benicia Amateur Radio Club, 377 W. Seaview Dr., Benicia 94510, 147.735; East Bay Amateur Radio Club, Box 6211, Albany 94706, 145.11; Hayward Radio Club, Box 111, San Leandro 94577, 145.13; Livermore Amateur Radio Klub, 1071 Innsbruck St., Livermore 94550, 147.12; Mount Diablo Amateur Radio Club, Box 23222, Pleasant Hill 94523, 147.06; North Bay Amateur Radio Association, Box 1468, Vallejo 94590, 145.31; Northern California Contest Club, 44 Toyon Terr., Danville 94526, 147.24. Traffic: W6VOM 186, WB6DOB 155, K6APW 60. (Mar.) W6VOM 163, WB6DOB 98, K6APW 36.

NEVADA: SM, L. M. Norman, W7PBV—SEC: K7HRW. STM: W7BS. PIO: K7ICW. OO/RFI: KD7BT. HOOVER DAM 50th ANNIVERSARY CELEBRATION SEPTEMBER 1985.

KENWOOD

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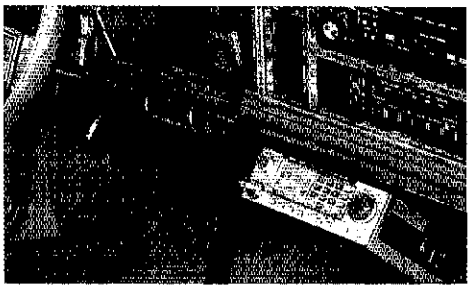
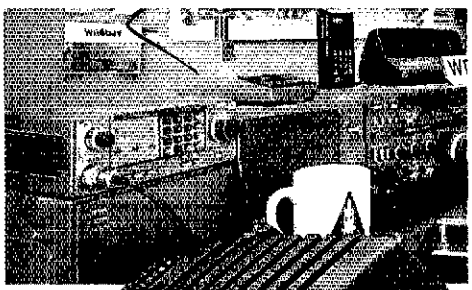
Up Front and Center!

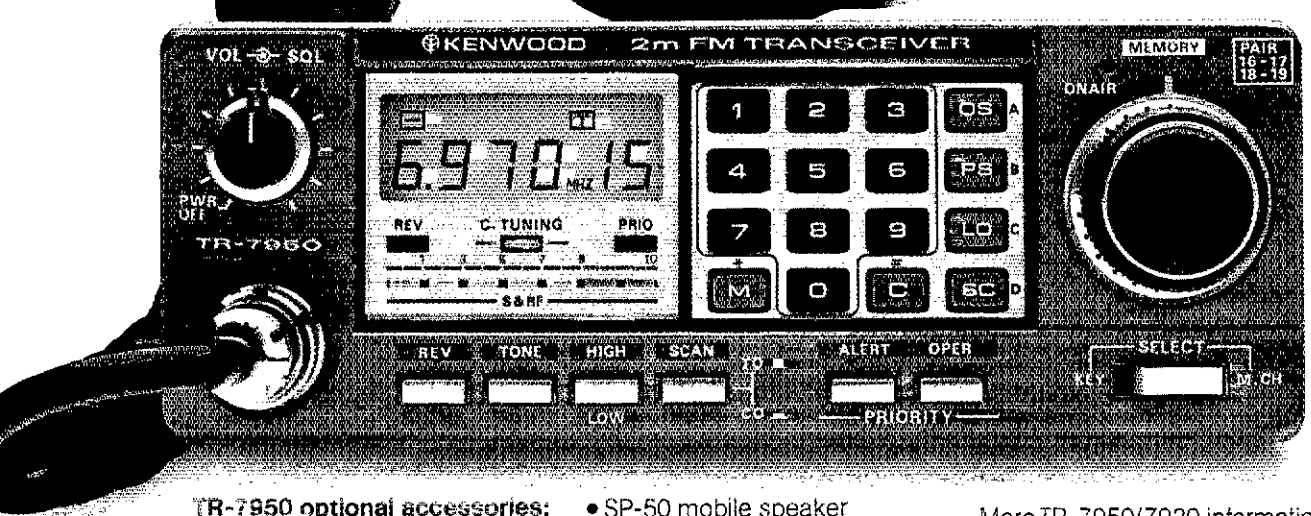
TR-7950/7930

The exceptional front-end selectivity and sensitivity, coupled with Kenwood's excellent audio section, gives you lots to hear! Compact design makes this transceiver at home in the shack or on the go!





- **Large, easy-to-read backlighted LCD readout.** Indicates receive/transmit frequency, frequency offset, sub-tone selection, memory status. An LED readout indicates S & RF units, REVERSE, CENTER TUNING, PRIORITY, and ON AIR.
- **Programmable scanning, with center-stop tuning.** Microprocessor technology allows you to scan the entire 2 meter band, or just a small portion of it. Scanning stops on the center frequency during band scan—**a Kenwood exclusive!**
- **21 Multi-function memory channels.** The TR-7950/7930 "remembers" frequency offset, and optional subtone channels. Memories 1-15 are for simplex and "normal" repeater operation. Memory pairs 16/17 and 18/19 are for "odd-ball" splits. Memories "A" and "B" store upper and lower band scan limits. The radio "beeps" when memory channel 1 is selected.
- **Extended frequency coverage.** Covers 142.000-148.995 MHz in 5-kHz steps. Repeater offsets are automatically selected in accordance with the ARRL 2 meter band plan. The front panel "OS" key may be used to allow manual changes in offset.
- **Multi-function keyboard.** The 16-key DTMF pad can also be used for direct frequency entry, subtone selection, memory address and scan programming. The keyboard is illuminated for night time use.



TR-7950 optional accessories:

- TU-79 three frequency tone unit
- PS-430 power supply
- KPS-12 fixed-station power supply for the TR-7950
- KPS-7A fixed-station power supply for the TR-7930
- SP-40 mobile speaker
- SP-50 mobile speaker
- MC-55 mobile microphone
- MC-46 16-key autopatch UP/DOWN microphone
- SWT-1 2 m, 100 W antenna tuner
- SW-100A/B power meters
- PG-3A noise filter

Model TR-7950 (45 watts) shown. TR-7930 is identical, but with 25 watts output.

Complete service manuals are available for all Trio-Kenwood transceivers and most accessories.

Specifications and prices are subject to change without notice or obligation

More TR-7950/7930 information is available from authorized Kenwood dealers.

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Compton, California 90220

Equestrian event was videotaped by KW6HF at Silk Purse Ranch. Herb wants all to know he is not the alleged criminal written up by a local paper. WA7LEE advised AD7K is doing FB, however is restricted to working about one day a week. WB7EHN advised KE7DB has upgraded. Two more repeaters west of Las Vegas, Tecopa 147.135 and Pahrump 147.030 both up .600. W7PBV and K7HRW enjoyed a meeting called by W6ZM help in Fresno. NBA show was host to over 700 Radio Amateurs at a dinner meeting. Two-Way radio show had over 200 Radio Amateur sign their registration. Las Vegas RAC assisted with both events. Traffic: W7PBV 3.

PACIFIC: SM, James Wakefield, AH6CO—KH6PI ups from Tech to Adv and KH6WG from Tech to General. Congrats! Teacher KH6AFS reports 12 new Novices from his class and a new class is now underway. New calls on Big Island are NH6DR, NH6DQ and NH6DT. The first UHF repeater on the Big Island is on with autopatch, 449.75 in and 444.75 out. Upgrades to Tech are WH6BDE, WH6BDH, WH6BDJ, KA6NLT, WH6BAI and up to General was N6EYP. KH6AFS is WAC on 160. AH6J, KH6ATT and KH6AFQ are mobile on 40. KARC Mt Kahlii rptr is back on after repair to neutral feed by KH6AJ. On Oahu KH6BM up to Extra, N2FCS to Adv, NH6DI and NH6DC to General and WH6BDB to tech. A few repeater frequencies still available in 145 portion. Contact Jules for one. Aloha. Traffic: KH6S 41, KH6HIJ 30, KH6B 26, KH6RQ 17, KH6H 9.

SACRAMENTO VALLEY: SM, Ron Menet, N6AUB—SEC: WA6ZUD. OO: NY6Z. STM: WA6WJZ. The North Hills A.R.C. hamswap appeared to be a huge success. We spoke with hams from Fresno, Redding, Reno, and the San Francisco Bay area. Most tables were overflowing with goodies with much being sold or traded by the end of the day. Congratulations to the NHARC on another fine job. Marathons, walkathons, bike rides, etc. are the rule of order again with the coming of spring. Please see that I get a report of your activities in this type of event. Upgrades: Novice, KB6IKF, KB6IFY: Extra, K6PPK. YARS provided comms for Four City Pedal Event and picnic day at UCD. All clubs have begun gearing up for Field Day in June. From the sounds of it there should be a lot of Sacramento Valley activity. Sure was good to see and meet so many of you at the NHARC hamswap. Thanks for your suggestions and comments. Traffic: N6CVF 317, K6SRF 158, WA6WJZ 120, WB6CLD 108, K6SRF 74, KA6PDG 26, KB6GNG 22, W6RFF 14, WA6ZUD 13. (Mar.) KB6GNG 10.

SAN FRANCISCO: SM, Bob Smith, NA6T—VOMARC, SCRA, and MARC are really getting into Emergency planning. Lots of activities planned in Sonoma and Marin County concerning Emergency Communications. Want to be a part of it? Check with one of these active clubs. SFRC will really have a field day, RUSSIAN RIVER FUN AND SUN, now SCRA might have to venture into the city by the BAY. HARC has no less than 10 major communications activities planned during the summer, they will need help from all the hams in Humbolt and Del Norte County. DNARC is close to having their new rptr operational at "Camp 6." Packet Radio is a reality in our Section now, contact KA6ATN in Santa Rosa if you're interested in this new form of communications. Glad to see 2 meters reunited Larry, NW6O, and "Dog," WD6DQG, after the Red Cross Coffee Club in Marin County. Congrats to Jo, WB6ZUC, on being elected the NCDXC DX'er of the Year at Fresno. Glad to see all clubs within the section participating in FD this year, hope you all had a FB time. Traffic: W6IPL 241, K6TP 71, KK1A 56, K6TWJ 55, N6FWG 43, W6GGR 8.

SAN JOAQUIN VALLEY: SM, Charles McConnell, W6DPD—SEC: WA6YAB. STM: N6AWH. TC: WA6EXV. ACC: N6ECH. Asst. SMs: W6TRP and K6YK. Congratulations to W6KPC on being named a Fellow in the Radio Club of America. The Turlock ARC is a hotbed of packet radio in the SJV. N6UR and W6TUI won prizes at the 1985 International DX Convention in Fresno. KG6LY and KB6AMM are Extra. KB6CDI is Advanced. KA6HME is General. KB6GYM and KB6GYN are Technicians. KE6SH is WF6N. KB6GYO is N6LSA. KB6HIY is N6LSC. KB6CZF is N6LTZ. WB6NON has a FT 207RA. W6QON and WA6JDB have IC 27As. N6UR and W6MEL have TS 940s. WA6YDI has a TS 430S. WB6JZH has a FT 101. Help your affiliated club by recruiting a new ARRL member. Your affiliated club will get a $2 commission and a $3 rebate from ARRL. Let's try to increase ARRL membership. In doing this you will help both ARRL and your Club. Traffic: N6AWH 165, W6SX 30, WA6YAB 24, K6PMG 18, K6RAU 5, W6DPD 5.

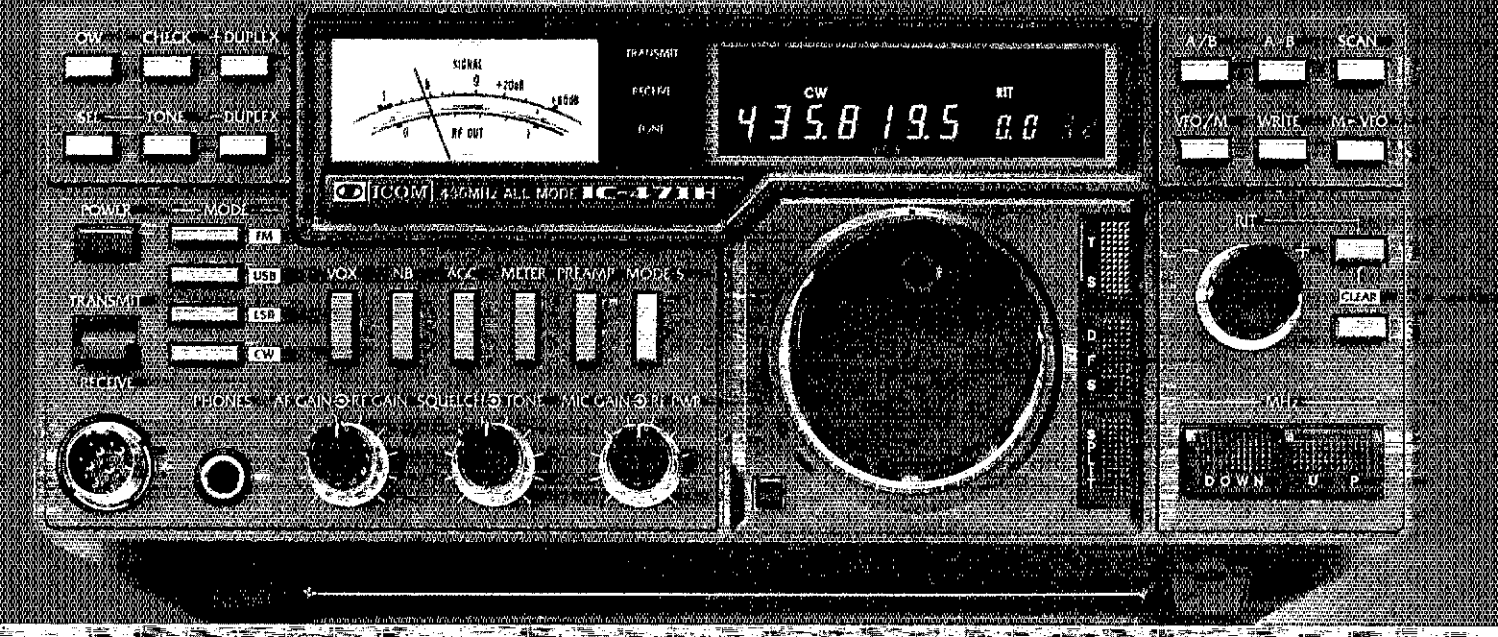
SANTA CLARA VALLEY: SM, Rod Stafford, KB6ZV. BM: W6BCY. PIO: N6BIS. TC: K6HLE. SEC: K6ITL. ACC: W6MKM. ASM: N6BN. STM: W6PHT. A reminder that we have a VEC Hotline for the SCV Section members. The 24-hour telephone number is (408) 984-8353. A recorded message will give callers information about test sessions not only the the SCV Section but also throughout the Pacific Division. Congratulations to WF6P (formerly N6FAD) who recently upgraded to Extra. It is getting very close to the time when an awful lot of radio operators will be needed for the World Police and Fire Games during the first 10 days of August. Approximately 10,000 participants will be arriving in the San Jose area to take part in events from Monterey County also the way to the Livermore area. If you can participate, please let N6FBA or WA6PWW know you're available. They can usually be found on the SVECS Net on Tuesday nights at 8:00 p.m. on WB6ADZ/R (146.115). If you would like to get involved in handing traffic, check into the traffic nets that are running in the section. They are:

NCN-1 Daily 1900 (local) 3630 kHz (1930 alternate)
NCN-2 Daily 2030 (local) 3630 kHz (1930 alternate)
NCN-VHF Daily 1930 (local) 145.490(–)(WA6EUZ/R)

NCN-2 is a slower speed net and a good place to break into traffic handling. If CW is not your ting, try the NCN-VHF net where all traffic is handled by voice. I had a Sectionwide Meeting in San Jose on June 1. It turned out to be a good work session with a number of proposals coming out of the meeting that were carried to the Pacific Division Cabinet Meeting in Marin County on June 8. Remember, if you have something you would like to discuss about ARRL policy or activities, please let me know. I get around to about 2 club meetings per week throughout the Section and it is a good opportunity for you and I to discuss anything related to League activities or programs. If you have an idea about something that we should be doing in the Section or in the Division, don't keep it to yourself. W6CF reports that he has been spending time on the 30 meter band and that it is a very good band for amateur use, he only wishes there were a few more hams using the band. WB6GFJ has been around to several of the clubs with his talk and slide presentation on Tahiti, Australia and New Zealand trip of last year. He is about to leave again for another couple of months to

ICOM UHF Transceiver

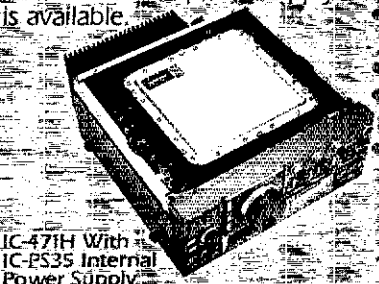
IC-471H



For Maximum UHF Base Station Performance

Whether your interest is simplex, repeater operation, or satellite work, the IC-471H 430–450MHz base station transceiver will give you maximum UHF operation.

75 Watts. The IC-471H provides 10 to 75 watts of adjustable power in all modes. This enables adjusting the drive level to a linear amplifier for higher power uses such as moonbounce. For a portable UHF station, the optional IC-PS35 internal power supply is available.



IC-471H With IC-PS35 Internal Power Supply Installed

Compare these exceptional Standard Features:

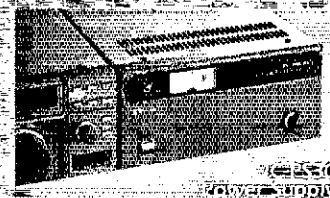
- 430 – 450MHz
- Variable tuning steps, FM 5KHz and 1 KHz; SSB 10Hz, 50Hz and 1KHz
- 32 full-function Memories with lithium battery backup
- 75 Watts, fully adjustable on all modes
- 32 built-in Subaudible Tones
- High visibility display
- Scanning systems... Memories, Modes or Programmable Band
- RIT/XIT with separate readout
- S-Meter and Center Meter
- IC-HM12 Microphone with Up/Down Scan
- 11¼"W x 4⅜"H x 12⅝"D

Optional Features. AG-35 switchable mast-mounted GaAsFET preamp, UT-15S CTCSS encoder/decoder (encoder is standard), IC-EX310 voice synthesizer, IC-SM8 two-cable desk mic and IC-SM6 desk mic. PLUS a variety of power supplies: the IC-PS35 internal power supply, the IC-PS30 system power supply or the IC-PS15 external power supply.

AG-35 Mast Mounted GaAsFET Preamplifier

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

To complete your VHF/UHF base station, the IC-471's 2-meter companions, the 100 watt IC-271H and the 25 watt IC-271A are also available.



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

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the same areas. He operates a lot from Tahiti so listen for him at 14.180 MHz during July and August. K6ITL put together a good amateur effort for the "Human Race" (that a foot race in San Mateo County). Participating were: K6ITL W6KXG KF6AB, (net control), WA6Y WA6FXC K6PJU WA6SWK W6KMK WB6IDT KF6FB W6NVO KE6HG W6JOV W6PCP and W6SER. Field Day in the Section went very well this year. San Mateo RC and Foothill ARS are to be congratulated for setting up in areas where the public could observe what was going on and ask questions. Traffic: W6YBV 145, W6KZJ 141, KA6CVM 104, W6ZRJ 14, W6PRI 13, W6CF 2.

ROANOKE DIVISION

NORTH CAROLINA: SM, Rae Everhart, K4SWN—SEC: AB4W. STM: K4NLK. BM: K4IWW. PIO: WA4OBR. ACC: WC4T. TC: K4ITL. OOSC: K1PLR. SGL: AB4W. Whew! Field Day is over? No. Practice FD all year long, and STAY PREPARED. Thanks to all for the FD messages and reports. If your club needs a PIA, contact WA4OBR. We all need to put more emphasis on publicizing our hobby. Asheville Hamfest 27/28, with exams available by WCARS/VEC. The appointment of K1PLR to OOSC brings staff to full level. Harry has a PHD in pharmacy and has been a very active OO for many years and will bring a new OO program to section. Congrats to: new ORS WB4HRR; OO NQ4T. To upgrades: KB4MZM, WD4EXK, KB4FMX, KB4ERU, KB4NOP, KB4GZS, KB4NRL, KB4MQZ, WD4HKT, N4HHQ, N4HPG, KA4YMY, KB4HIO, KB4MTS, KF4RD, KE4FZ, N4LWN, WD4LMZ, KA1CYF, KA4OCX, KI4MN now AA4IZ. RARS now has 6 packet radio stations on air. Forsyth ARC has chartered an Amateur Radio Explorer Post to get young men into ham radio. Experienced hams need to get young boys and men into hobby. The need to increase numbers is NOW. LPM was productive and good to meet League members. HQ staffer K9CH was very impressed with the efficiency of VECs in NC. Please let this SM know your exam schedules so that prospective upgrades can be guided to nearest exam location. WA4SLC organizing ARES in Beaufort Co. Congrats to W4DCW, K4JO, K4BE, K4UAS for 50 years of continuous ARRL membership. STM K4NLK reports totals for year are QNI 65,657, QTC 16,368, tfc 14,878, for an increase of over 2600 in traffic moved department. Going on a vacation this summer? DO NOT announce your plans on the air. Wrong ears with scanners may be listening. Tarheel welcome to KA1LNM, KA1LNP, WB8YWQ. Novices on 160, 1¼M phone and 30M CW? Yes, this is being proposed. We must justify our present freqs. Listen to space shuttle, WØORE on 145.55 MHz CVRA-SERA will probably discuss the ARRL 2M Bandplan vs 20 kHz plan. CVRA has a well organized and coordinated plan. If it ain't broke, don't fix it. Traffic: K4NLK 388, NJ4L 263, WB4WII 232, KA4EYF 167, N4LFX 102, WB4HRR 84, KB4IVV 78, WB4DAR 75, WB4N 75, KA4YMY 57, NT4K 53, WA4MNR 52, K4GI 50, WD4EQK 44, KB4IRR 41, WB4CYN 39, WD4CEB 36, NE4J 36, K4SWN 34, KB4FWL 33, K4JHF 33, KU4W 29, K4YJB 29, N4JRE 27, NV4F 26, N4CJJ 25, K4IWW 24, N4JEO 23, W2JDB 16, K4QXA 16, N4UE 12, K4AUI 8, AK4X 6, N4KYD 3, WR4E 1.

SOUTH CAROLINA: SM, Jimmy Walker, WD4HLZ—The bulletin network in the section has started to take shape. Our Bulletin Manager is WØIKT in Anderson, and John doubles as an Official Bulletin Station (OBS) for that city. Steve, N4PQ, covers Myrtle Beach and Dillon. Chuck, K4ZN, handles Charleston and early session of CN. We need other OBSs in the section to retransmit W1AW, Section and propagation forecast bulletins. If you live in Greenville, Columbia, Greenwood, North Augusta, Aiken, Bamberg/Orangeburg, Rock Hill, Beaufort or other areas not mentioned, know of a VHF or UHF repeater not served by an OBS and have an interest in doing OBS work, please contact me or WØIKT. The work is rewarding and the Section needs you. Traffic: K4ZN 265, WØIKT 214, W4NTO 106, W4ANK 98, WJ4P 47, WB4UDK 47, W4FMZ 46, KB4BZA 66, K4FRX 37, KA4YEA 23, KA4LRM 22, WD4FJP 20, W4DRF 11, K4LYU 8.

VIRGINIA: SM, Claude Feigley, W3ATQ — STM: WD4ALY. SEC: WB4UHC. ACC: WD4KQJ. OO: W4HU. BM: AB4U. SGL: W4THV. The usual listing of NTS nets has been omitted this month to allow room for other info. Of the 51 Affiliated clubs in the section I have received indication that only 12 clubs have submitted the 1985 annual report. Please send in your report — it's not too late. See the SM for forms. The Virginia DX Century Club is the only one with 100% ARRL membership. Also, very few clubs show that they are taking advantage of the $2.00 rebate for membership renewals or the $5.00 rebate for new ARRL memberships. Contact the ACC of SM for details. Several inquiries have been received regarding the new "Assistant Technical Coordinator" (ATC) field appointment and N4UA, in Forest, and KC4YN, Vienna, have been appointed ATCs. WB4FNW, DEC Winchester area, reports 15 hams provided communication for a search and rescue mission lasting 11 days resulting in the location of a 66 year old woman. Stns involved: WB4FNW NC4B WA4OYD KA4NYG W3HQX KE4KF K4LWG K4FON WA4FRB K4JNA NT4S W4JZC W3MMC KA2PQG W3FZT. DEC, N4EXQ, reports 26 stns provided communications for the Richmond to Williamsburg Bike-A-Thon. WD4SDC and WB4SHK installed a relay repeater for the event. Virginia QSO Party results, K4BFJ-mixed modes high score; W4FOA-high QRP; NJ4F-high CW; WB4FDT (N4YE op)-high mobile; K7CTW/1-high out-of-state. Anyone desiring to receive the "Virginia Ham" contact WB4FDT. Once again we are in the process of reviewing ALL section ARRL field appointments. To retain your appointment, it is essential that you submit monthly reports whether or not you had any activity during the month. Lynchburg club members WD4ELJ N4UA N4DTK WA4ZPF KA4ILD K4GVO WB4QXE and N4LSY provided communications for the Lynchburg Special Olympics. Interest in Packet radio continues to increase with activity in the Roanoke, Lynchburg, Tidewater, Richmond and Northern VA areas. ALL traffic handlers please note the Boy Scout Jamboree will be held July 23-31 at Fort A.P. Hill. KA4ERP is coordinating the installation of automated equipment at the site. K4JST is arranging for skeds to handle most of the traffic load by automated means. WB4LNT is arranging for the communications involved in setting-up and closing down the camp site. Over 25,000 boys are expected to attend. N4EXQ and N4GHI make BPL again and 18 stns had a PSHR count of 60 or over. Traffic 4401 with 46 stns reporting. Hope to see you at Berryville Aug. 4 and Virginia Beach Sept. 21/22. Traffic Handlers picnic will be at Glen Maury Park, Buena Vista, VA, Sunday Aug. 11. Lamar, WA4LJI, is acting as Coordinator. Traffic: N4GHI 837, N4EXQ 533, AA4AT 473, WA4CCK 213, AA4GL 211, WD4OCW 192, WB4FDT 190, WB4PNY 178, W3ATQ 177, K4JST 161, KA4IUM 156, WD4ALY 156, KB4WT 133, K4KDJ 106, KA4ERP 99, K4JM 96, WY4T 87, KR4V 76, NT4S 56, WB4VMX 56, K4VWK 48, K4KSO 47, K4GR 44, K4MTX 34, WB4EDB 33, N4DWO 31, KB4PW 29, K3RZR 21, WB4UHC

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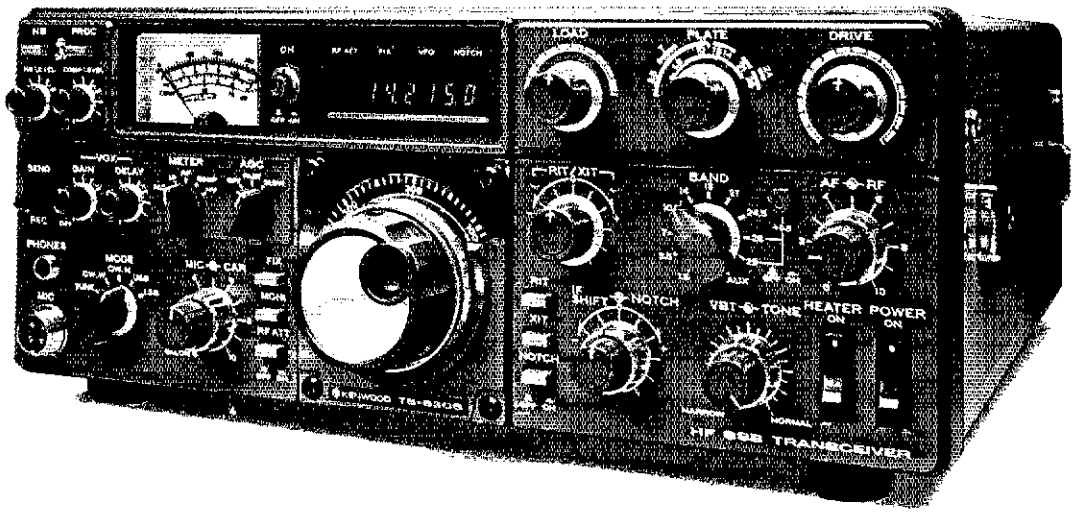

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WEST VIRGINIA: SM, Karl S. Thompson, K8KT—SEC: K8QEW. STM: KD8G. ACC: WA8CTO. TC: K8CG. SGL: K8BS. Rpt Coord: WD4KHL. KC8QQ is new EC for Clay Co. ORS members participated in public service exercise on April 4. Congrats to N8FXH and others who upgraded. Remember Ripley and Charleston HFs in August. Watch for details. Whig HF will be on July 21, at Whig Park.

Net	Freq.	Time	QNI	QTC	Sess.	NM
WVFN	3865	6:00	1014	349	30	W8YP
WVMD	7235	11:45	729	97	30	W8FZP
WVN	3567	7:00	225	175	30	W8LYV
WVRN	3640	6:30	233	63	30	KD8RD
WVNN	3730	5:30	89	34	30	KD8RD
Hillbilly	14290	Noon Su	130	12	4	W8YP

Traffic: K8TPF 204, W8YP 161, KZ8Q 160, WA3NUI 156, KD8RD 148, KA8OMM 130, N8EMQ 113, W8FZP 112, W8JWX 107, K8UQT 99, WA8FSE 82, KA8OGF 50, K8QEW 41, K8KT 41, N8GJO 32, KD8G 29, NC8G 28, WA8KCJ 23, N8FXH 20, W8CAL 7, WD8MJE 5.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Bill Sheffield, KQ0J—SEC: WB0FQB. STM: WD0AIT. ASM: ACC: WB0DUV. PIO: KA0PYH. SGL: WD0GQL. TC: NC0F. BM: W0MDT. A few changes in the Section. ASM/W. Slope W0RSG & ASM/E. Slope KA0MQA. KQ0P leaves the TC for a move to Texas. Gary made great strides in packet. We wish you the best. New TC is NC0F who moves from the OO/AA. ATC: N0BWE. The Grand Junction Swap was one of the best ever, and the VE test was very well organized. As I listen to CWXN each morning I am always amazed at the dedication of its many members . . . So join in with one of the many public service projects in your area, you will enjoy how good it makes you feel. The annual Ski Country Swaptest is July 27th, Glenwood Springs, will include annual CCARC meeting and VE test, contact ND0E. Join the caravan that always makes this one swap a fishing camping weekend. The Division Convention at WIMU, Jackson Hole, Wy on Aug. 2-4th is another event you should not miss. RMRL & ARA the two largest repeater clubs are planning a joint picnic July 7th. VE Tests: July 13th, Denver area contact W0IJR, July 20th Pueblo contact WB0YES, July 27th, Glenwood contact ND0E. W. Slope linking going well tnx to WD0GQL, K0LQF & KD0RW. 73, KQ0J. NETS: CWN: QNI 138, QTC 64, Time 506, 40 Sess. Col no totals. CWXN: QNI 2790, QTC 3558, Time 2700, 30 Sess. HNN: QNI 1677, QTC 123-inf 277, Time 1452, Sess. 30. NCTN: QNI 265, QTC 72, Time 275, 25 Sess. SCTN: QNI 62, QTC 9, Time 159, 11 Sess. Traffic: WA0HJZ 2143, N0BQP 2120, KA0CZW 644, W0ACH 496, K0RXK 470, K0JAN 371, WA0OYI 233, KB0Z 218, N0DZA 124, KD7EY 115, W0LAE 90, WD0AIT 82, WB0FFV 20, W0NFW 20, AI0W 18.

NEW MEXICO: SM, Joe T. Knight, W5PDY—ASM: W5HD. DEC: KB5XD. STM: ND5T. NMs: WA5UNO K6LL W5VFQ. TC: W8GY. ACC: W5HD. Southwest Net (SWN) meets daily on 3583/7083 at 0230 UTC and handled 175 msgs with 194 stations in. New Mexico Roadrunner Net meets daily on 3939 at 0100 UTC and handled 63 msgs with 1033 stations in. New Mexico Breakfast Club meets daily on 3939 at 1330 UTC and handled 101 msgs with 915 stations in. Yucca 2-mtr Net 78/18 handled 24 msgs with 418 checkins. Caravan Club 2-mtr Net 66/06 handled 6 msgs with 140 checkins. SCAT 2-mtr Net 86/06 handled 18 msgs with 581 checkins. Bean Feed huge success with approx. 450 attending. Council of clubs meeting also held. Vy sorry to report the passing of W5WPA, W5OZD and WB5QLO. They will certainly be missed. Flagstaff July 27, 28 and WIMU August 2, 3 & 4. Traffic: ND5T 358, W5DAD 142, W5ENI 65, N5EXC 7.

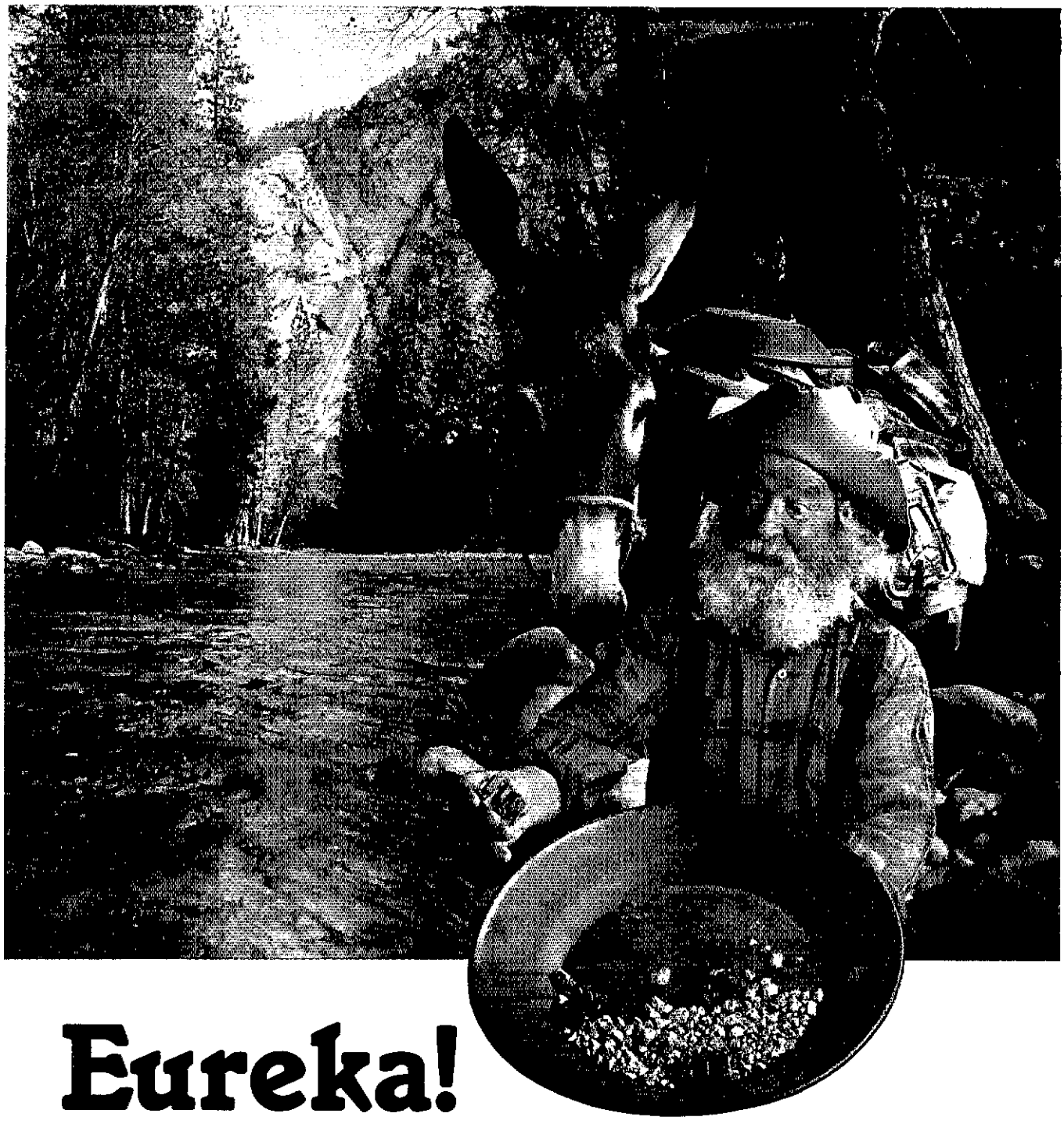
UTAH: SM, Jim Brown, NA7G—STM: W7OCX. BM: WA7MEL. OO/RFI: KD7FL. ACC: KB7XO. PIO: N7BHC. TC: K7RJ. NMs: BUN, NA7G. UCN, WA7WIB. K3FR has had to move to move to Maine for a new job; good luck, Ron, and TNX for ur leadership wrk the past 2 yrs. Bountiful Walk America on Apr 27 used Davis Co ARES hams: W7LFI, W7CWK, WA7JJL, AC7H, WB7TGI, N7IE, W7IQY. Intermountain Shrine Hospital Net meets each Sun at 10 A.M. MDT on 7240 kHz; KA7GYW is NM. Written applications will be accepted for 30 days after this issue of *QST* is published for all section leadership positions. We need active self starters willing to do paperwork! Traffic: K7HLR 264, WA7KHE 140, WA7JJL 84, WA7MEL 43, W7OCX 10.

WYOMING: SM, Dick Wunder, WA7WFC—Asst. Section Manager—KA7AWS, Steve Cochrane. Sect. Emergency Coordinator—W7TVK, Jim Anderson. I have a few Section Level appointments available. Interested parties can contact me on any of the nets or drop me a card at the address on page 8 of QST. Recent upgrades include WB7NHR to Extra, KA7NOR to ADV & KA7UPP to GEN. New Novices in Cheyenne include KA7UWL, KA7VFM, KA7VGM, KA7VGN, KA7VGO & KA7VIS. Congrats to all. Sheridan Co. ARES 2M net had 48 QNI in April. KC7AR reports the Wyo. Cowboy Net held 22 sessions with 924 QNI & 16 QTC. The Cheyenne area hams should have their ARRL VE Team in operation by the time you read this. Traffic: WB7NHR 285, W7HLA 10, KC7KC 8, KC7QE 4.

SOUTHEASTERN DIVISION

ALABAMA: SM, Joseph Smith, Jr., WA4RNP—STM: N4JAW. SGL: KA4WVU. BM: KF4VV. OO/RFI: K4ELV. The GA State ARRL Convention and Hamfest will be held in Atlanta this month, and I hope to see a lot of Alabama "hams" there. From Selma comes this report of officers: President: KA4MDX James; Vice President: WD4HOT Grover; Secretary/Treasurer: N4ELL Wallace. And from Huntsville the MARC has elected these: President: WB4WCX Oscar; V President: K4KFH Ed; Secretary: W4QAV Ed; Treasurer: W4HIY Chris. Officers elect of the BARC (B'ham) are; President; N4KGK Randall; V Pres: WD4BXH Earnest; Secretary: N4LJO Joan; and Treasurer: WA4PIZ Jim. I have received a report of a Silent Key, W4FDZ Fred W. Wright of Dadeville. News of upgrades include KA4YBH Ralph, KB4DRE George, KA5COX Tom and KA4KUF Tim all receiving advanced class. BPL: WA4JDH. PSHR: WA4JDH, KB4GPN, W4CKS, WA4RNP, WD4NYL and W4ZJY. CAND reports 625 messages in 30 sessions with DRN5 rep 100% by WA4JDH, W4CKS and WX4I. DRN5 reports 709 messages in 60 sessions with AL rep by WA4JDH, WB4IXA, W4CKS, NW4X, KC4GS, WX4I and W4WJF. Seven Three, Joe. Traffic: WA4JDH 953, W4CKS 106, W4ZJY 82, KB4GPN 64, WD4NYL 46, WB4IXA 40, WA4RNP 38, K4AOZ 38, KB4GAP 28, W4DGH 15, W4WJF 9, WB4TVY 6.

GEORGIA: SM, Eddy Kosobucki, K4JNL—SEC: WB4ABY. STM: K4VHC. ACC: WA4ABY. BM: W4BIA. OO: W4RZL. PIO: WA4PNY. SGL: W4BTZ. TC: K4UDR. The saying "Time heals all things" has proven itself to me. A new permanent work sked & all is now well with the family brings



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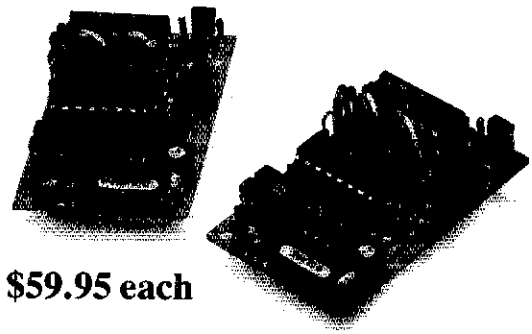

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things back to normal. Therefore I will be a nominee for the office of Section Mgr. We kick off the month with the Atlanta HamFestival/ARRL Ga State Convention at the World Congress Center on July 6-7. Sources tell me that this one will be the best ever, all under one roof. Ga SSB Asso picnic this year will be held on Sat July 20 at the Terrace Inn located on US 441 North in Milledgeville. Bring the gang & join the FB Asso. Once agn I remind all who are repeater owners, sponsors, etc. to attend the meeting in Atlanta on Sunday, July 7th during the Hamfest. It is of the utmost IMPORTANCE. According to the Albany Club their recent Hamfest was a great success & thank all for their support. Field Day is now history, don't forget to get those reports into the ARRL. The Special Olympic Committee tnx all who gave their time to furnish communications on May 24, 25, 26. If u want to see a happy bunch of kids, attend one. Tnx to the Georgia Tech ARC for putting me on their mailing list. Most clubs in the section elect officers during July & August. Please send me ur new ones. During the Kennehoochee Hamfest the Marietta gang showed how big their hearts were when a South Carolina Ham had a heart attack & they helped his young 15 year old son find a place to stay, took care of his vehicle, visited him in the hospital & just took care of everything. Tnx guys. As of June 1st WB4ABY is no longer the SEC. He had to resign due to a real heavy work sked. See u in Atlanta? Traffic: W4PIM 207, K4VHC 66, AA4TT 63, N4JWO 43, K4EV 37, K4NM 31, W9NXC 29, KF4FG 27, W4BIA 25, K4BAI 22, N4DOM 20, N4UJ 16, N4UZ 15, W4HON 12, W4FIZ 5, W4WKP 5, K4JNL 4, KA4ATM 4.

NORTHERN FLORIDA: SM, Phil O'Dwyer, WF4X—ACC: Roy, N4ADI. TC: Charlie, N4KF. STM: Ron, WB4GHU. SEC: Rudy, WA4PUP. PIO: Petey, WA4PUO. OO: Stoney, K4JJE. BM: Wimpy, KB4LB. SGL: John, KC4N. Please join me in welcoming Charlie, N4KF, as our Technical Coordinator as of 1 May. Charlie will be contacting all of our clubs and asking them to nominate a member to serve as Asst. Technical Coordinator and is also looking for other interested hams to contact him about this new appointment. Listen for ARRL Bulletins from new OBSs Chuck, WD4LBG, and Estelle, WB4K. Delighted to welcome the Lake Monroe and Clover Leaf Clubs as the latest to be approved as Special Service Clubs! With these additions, I think Roy, N4ADI, has put us on top of the heap in terms of the percentage of affiliated clubs to reach this select status with 20% of our clubs approved! How about that Dick Hill? Traffic: WD4IIO 1404, WX4H 840, N4PL 689, WF4X 622, WA4QXT 560, WA4NDA 391, KB9LT 281, WB4ADL 278, KC4VK 259. KD4KK 252, WF4Y 218, W4MGO 167, WD4HBP 154, WA4EYU 154, AA4HT 144, WD4MLQ 117, AA4FG 113, N4DY 96, N4DAS 84, WB4TZR 83, WB4GHU 71, WB4YQP 66, KF4TM 65, KB4LB 62, KF4U 61, W4GUJ 59, WD4BTQ 58, NY4E 58, N4EDH 56, W4KIX 56, N4JAQ 52, KC4FL 42, N2AOX 42, WC4D 40, KB4FIY 39, KB4MHH 34, N4GMU 29, WB4FJY 29, W4DTV 28, WA4PUP 26, N4ADI 25, KI4CQ 24, WA4SXM 24, N4JHI 21, NQ4P 16, N4ENL 12, WB4AWG 12, W4FI 12, NS4C 11, WD4EQB 11, KF4GY 6, W8IM 5, NA4F 3.

SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFK — SEC: W4SS. STM: K4ZK. TC: KI4T. BM: WA4EIC. PIO: W4WYR. SGL: KC4N. OO: W4SS. WA4EIC reports total bulletin activity of 137 bulletins received and transmitted this month. Bulletin stations reporting were WA4EIC 48, WD4KBW 24, KI4EK 10, KA4GUS 13, WT4F 12, W4ESH 8 and AA4MI 22. AA4MI has been busy writing some very informative articles — recent ones addressing amateur radio examinations and the Amateur Auxiliary. They are published in both his local club bulletin as well as Florida Skip. WB2OUK reports that Lee County ARES operated during the Florida QSO Party from Glades County on emergency power. W4LLA made 162 phone patches during April. K8BXT is back in Ohio for the summer. The Florida ARRL Information Net meets on 3940 kHz every Saturday morning at 1200 UTC. All are welcome to participate in the net or just listen — elected and appointed officials from both the Southern and Northern Florida Sections as well as the Southeastern Division are there. N4EWR, Sarasota County Emergency Coordinator received an extremely complimentary letter from the Office of Disaster Preparedness, County of Sarasota thanking him and his fellow radio volunteers for the untold hours of assistance that were provided to the citizens of Sarasota County during and following the tornado/disaster that struck South Venice on St. Patrick's Day. Congrats for a fine effort! In Lee County, K9ALX, WD9AEP, KZ8O, KY8Y, KI4ZW, K4OVC, K4GVI and WO4D provided communications for the bike races. Congratulations to Roy McCarty, W9KA who is being presented with a 60 year plaque! 73 de WA4PFK. Traffic: W3CUL 3144, W3VR 1102, W4NFK 471, KF4JA 439, K4SCL 324, KY8Y 305, WA4EIC 296, WA4PFK 296, K4ZK 264, W4PKP 254, KI4ZW 239, K4EUK 234, N4KFU 231, KJ3T 182, WB4WYG 179, K4IA 172, KA4GUS 168, WD4CHO 148, KA4NXF 123, W4YCL 105, WA4RUE 98, WO4L 92, KB4KB 72, KY4U 68, KF4RL 66, WA4HXU 63, WD4KBW 60, W4LLA 58, KA4YHS 51, KA4FZI 45, W4ESH 44, W3TLV 41, W4WYR 38, K4JI 36, K5IHH 35, KA4SIH 34, KB4EWO 33, W4SS 32, K9ALX 29, WB4GCK 27, AA4MI 24, K4BLM 20, N4KB 20, K4FQU 18, WD4NXK 13, KA9AKY 13, K4IRT 12, KD4GR 9, K8BXT 8, K9EHP 8, WV4F 7, N4ILN 7, W4MPV 6, WK4F 6, K4OVC 5, KA4GDU 5, KA4KDD 4, KB4ELQ 4, WD4MCC 3, KB4IQJ 2, N4KNP 2, KB4BLN 2, AA4IF 1. (Mar) K2GQU 34, KO4L 23, K4JI 19.

WEST INDIES: SM, Carlos Flores Roman, WP4J—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. (2330 UTC) on 146.94-600 MHz. The P.R. Amateur Radio Club organized a special tour to all amateurs and family to the radio telescope of Arecibo located on the northwest in Puerto Rico on April 20, 1985. Lots of people went to the successful event. On April 27, we had a visit from Robert Hisamoto (Bob) KL7AM and his wife Louise, KL6HCO, from Alaska. They bought a film on studies of the aurora from the University of Alaska, which was very interesting. The SM for West Indies ex NP4KA, now WP4J, met with amateurs of St. Thomas on a recent visit with WP4SCG Albert, and KP4EW Gregorio. The trip to meet with Bob Denniston, VP2VI, the president and other members of the St. Thomas radio club to talk about future activities was an enjoyable one. The group of amateurs at Humacao, on the southeast part of Puerto Rico, own the 147.195 repeater. They held an activity at the local airport where they televised free fall parachuting live on 430 MHz. One ATV station in an airplane transmitted to other amateurs with ATV in the area. Lots of spectators were watching. Our STM reports the following for WINC: Net Manager WP4CFX, Sessions 30, QND, 420 Mins., QNI 411, QTC 22 reported, passed 21, QNS WP4CFX, WP4DTQ, WP4CKI, WP4AOO, KP4FMM. Hasta Luego. Traffic: KP4DJ 19.

SOUTHWESTERN DIVISION

ARIZONA: SM, James E. Swafford, W7FF—New Section

KENWOOD

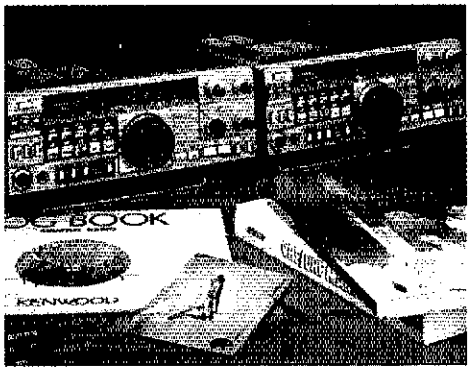
...pacesetter in Amateur radio

Matching Pair

TS-711A/TS-811A VHF/UHF all-mode base stations.

The TS-711A 2 meter and the TS-811A 70 centimeter all mode transceivers are the perfect rigs for your VHF and UHF operations. Both rigs feature Kenwood's new Digital Code Squelch (DCS) signaling system. Together, they form the perfect "matching pair" for satellite operation.

- **Highly stable dual digital VFOs.** The 10 Hz step, dual digital VFOs offer excellent stability through the use of a TCXO (Temperature Compensated Crystal Oscillator).
- **Large fluorescent multi-function display.** Shows frequency, RIT shift, VFO A/B, SPLIT, ALERT, repeater offset, digital code, and memory channel.
- **40 multi-function memories.** Stores frequency, mode, repeater offset, and CTCSS tone. Memories are backed up with a built-in lithium battery.



- **Versatile scanning functions.** Programmable band and memory scan (with channel lock-out). An "alert" function lets you listen for activity on your priority channel while listening on another frequency. **A Kenwood exclusive!**
- **RF power output control.** Continuously adjustable from 2 to 25 watts.
- **Automatic mode selection.** You may select the mode manually using the front panel mode keys. Manual mode selection is verified in International Morse Code.
- **All-mode squelch.**
- **High performance noise blanker.**
- **Speech processor.** For maximum efficiency on SSB and FM.
- **IF shift.**
- **"Quick-Step" tuning.** Vary the tuning characteristics from "conventional VFO feel" to a stepping action.
- **Built-in AC power supply.** Operation on 12 volts DC is also possible.
- **Semi break-in CW, with side tone.**
- **Optional voice synthesizer.**

More TS-711A/TS-811A information is available from authorized Kenwood dealers.

Optional accessories.

- CD-10 call sign display
- SP-430 external speaker
- VS-1 voice synthesizer
- TU-5 CTCSS tone unit
- MB-430 mobile mount
- PG-2J DC power cable
- MC-60A, MC-80, MC-85 deluxe desk top microphones
- MC-48 16-key DTMF, MC-42S UP/DOWN mobile hand microphones
- SW-200A/B SWR/power meters:
  SW-200A 1.8-150 MHz
  SW-200B 140-450 MHz
- SWT-1 2-m antenna tuner
- SWT-2 70-cm antenna tuner

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1111 West Walnut Street
Compton, California 90220

Complete service manuals are available for all Trio-Kenwood transceivers and most accessories. Specifications and prices are subject to change without notice or obligation

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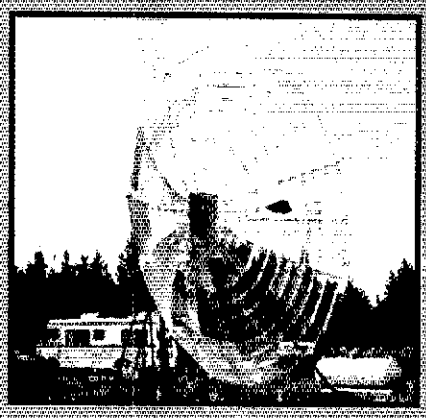
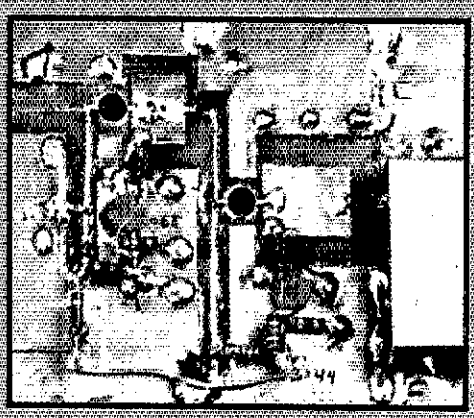
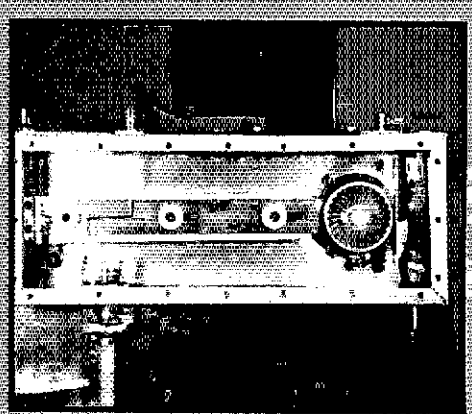
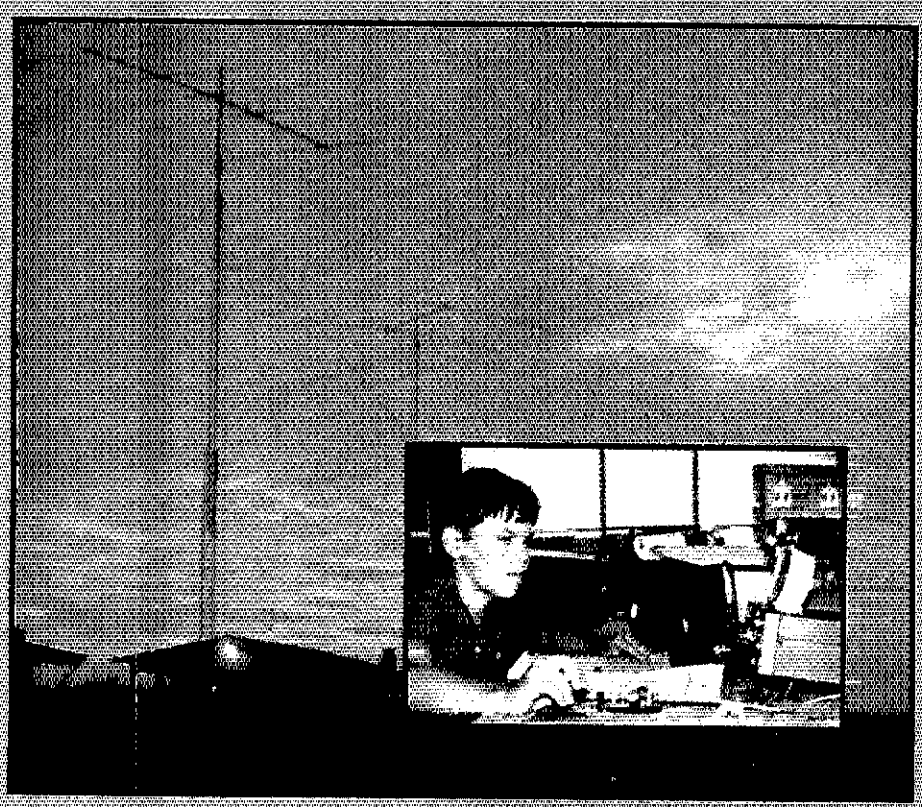
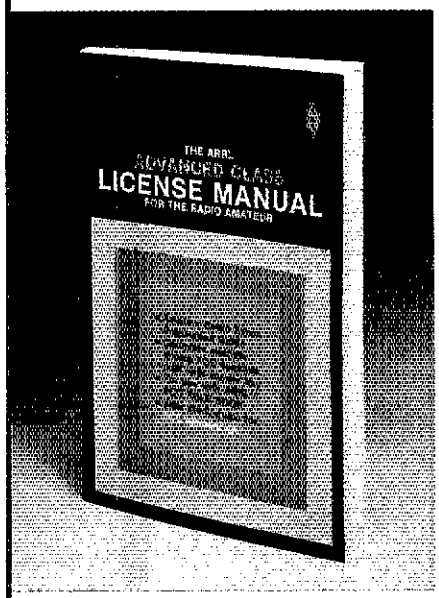




THE ARRL 1985 HANDBOOK

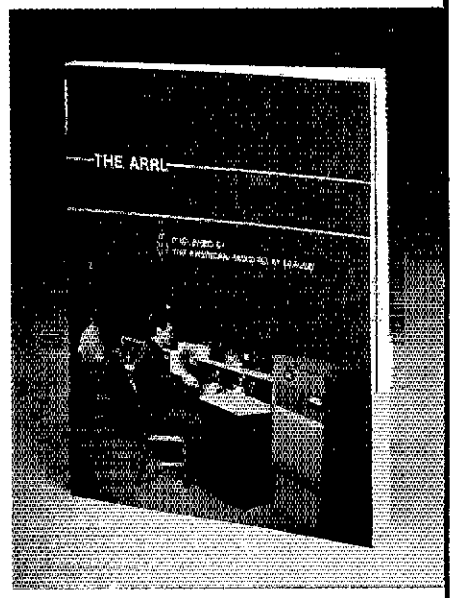
FOR THE RADIO AMATEUR



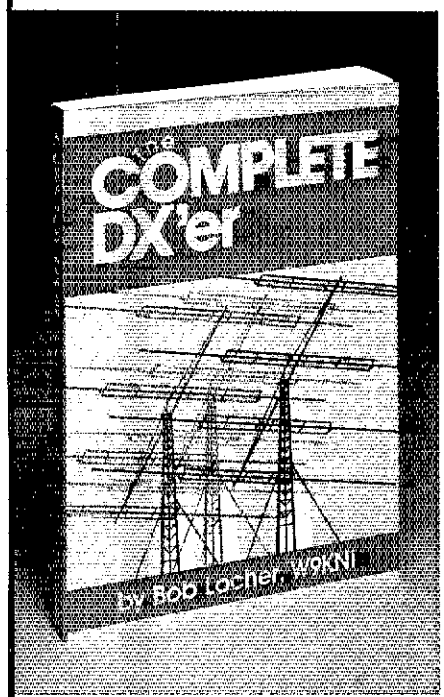

NEW NEW NEW!



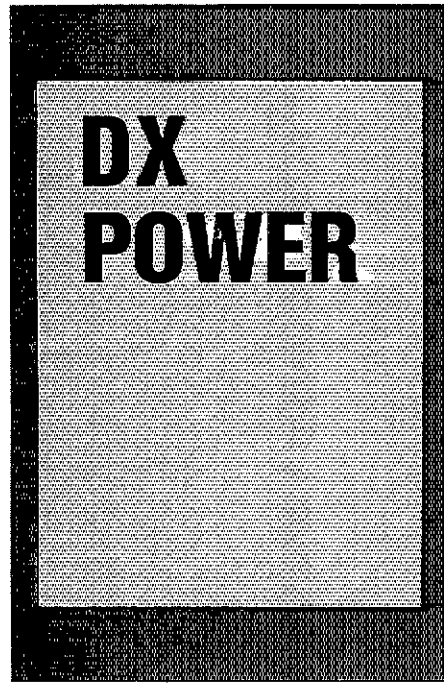
Two new ARRL publications! *The ARRL Advanced Class License Manual* is the second of our new Licensing Series. It is written for study with *The FCC Rule Book* and has the latest 500 question and answer pool. *The 2nd Edition of the ARRL Operating Manual* is heavily revised! It presents up-to-date operating trends and techniques. At your dealer or use the order form elsewhere in this issue.



TWO GREAT DX BOOKS!



The Complete DX'er by Bob Locher, W9KNI is now available from ARRL. Covers all of the important aspects of the DX'ers life both in and out of the pileups: the art of listening; the chase; the capture; the quest for the elusive QSL. Gives advice on equipment and antenna selection. Humorous and educational. $10 U.S., $11 elsewhere. 187 pages. **Coming soon:** *DX POWER* by Eugene Tilton, K5RSG Co-published by ARRL and Tab Books. Watch *QST* for details.



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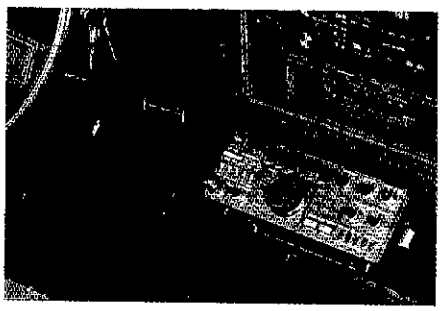
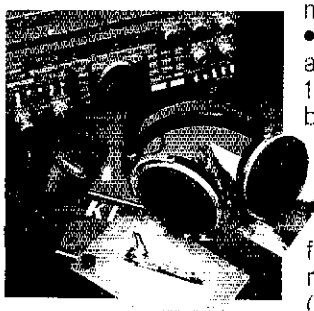
"Digital DX-terity!"

TS-430S

Digital DX-terity—that outstanding attribute built into every Kenwood TS-430S lets you QSY from band to band, frequency to frequency and mode to mode with the speed and ease that will help you earn that dominant DX position from the shack or from the mobile!

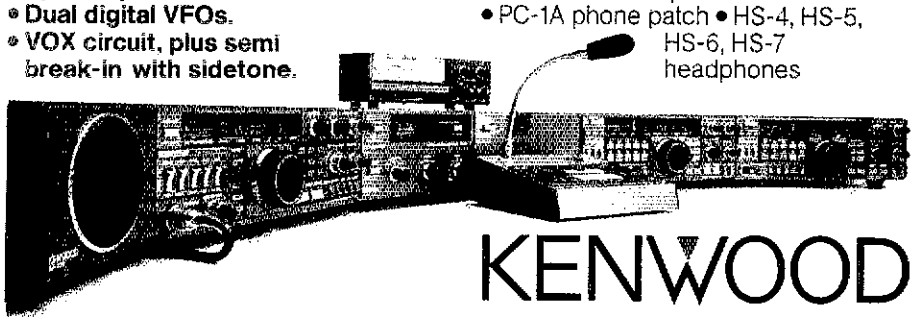


- **Covers all Amateur bands** 160 through 10 meters, as well as the new 30, 17, and 12 meter WARC bands. High dynamic range, general coverage receiver tunes from 150 kHz to 30 MHz. Easily modified for HF MARS operation.
- **Superb interference reduction** Eliminate QRM with the IF shift and tuneable notch filter. A noise blanker supresses ignition noise. Squelch, RF attenuator, and RIT are also provided. Optional IF filters may be added for optimum interference reduction.
- **Reliable, all solid state design.** Solid state design permits input power of 250 watts PEP on SSB, 200 watts DC on CW, 120 watts on FM (optional), or 60 watts on AM. Final amplifier protection circuits and a cooling fan are built-in.
- **Memory channels.** Eight memory channels store frequency, mode and band data. Channel 8 may be programmed for split-frequency operation. A front panel switch allows each memory channel to operate as an independent VFO or as a fixed frequency. A lithium battery backs up stored information.



- **Programmable, multi-function scan.**
- **Speech processor built-in.**
- **Dual digital VFOs.**
- **VOX circuit, plus semi break-in with sidetone.**

Optional accessories:
• PS-430 compact AC power supply • SP-430 external speaker • MB-430 mobile mounting bracket • AT-130 compact antenna tuner covers 80-10 meters, incl. WARC bands • AT-250 automatic antenna tuner covers 160-10 meters, incl. WARC bands • AT-230 base station antenna tuner • FM-430 FM unit • YK-88C (500 Hz) or YK-88CN (270 Hz) CW filters • YK-88SN (1.8 kHz) narrow SSB filter • YK-88A (6 kHz) AM filter • MC-42S UP/DOWN hand mic. • MC-60A deluxe desk mic., with UP/DOWN switch • SW-2000 SWR/power meter • SW-100A SWR/power/volt meter • PC-1A phone patch • HS-4, HS-5, HS-6, HS-7 headphones



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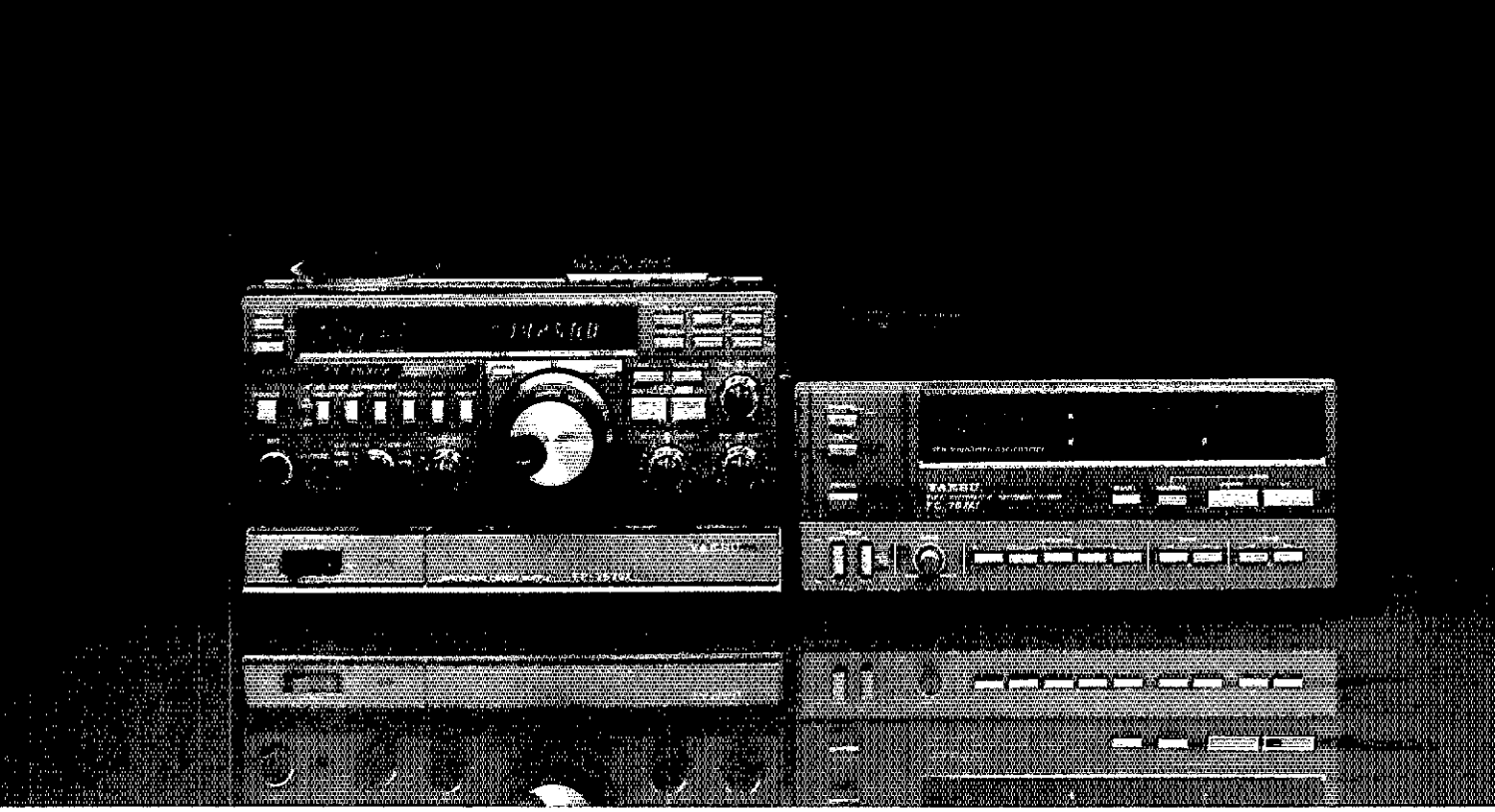


Yaesu HF radios rely on state

Some people feel the name that goes on a radio is more important than what goes into it.

At Yaesu, we let our technology speak for itself: a unique blend of engineering know-how and user suggestions that make our HF products superior.

But don't take our word for it. Take a look at our transceivers and make up your own mind.

The economical FT-757GX. A mobile transceiver that might never leave your shack.

You told us what you wanted in an HF rig that operates both in the car and at home. We've answered with the FT-757GX: a compact 12-volt transceiver with all the extras built in. Features you'd normally pay a lot more for.

As standard equipment you get AM and FM modes, electronic keyer with dot-dash memory, 600-Hz CW filter, noise blanker, AF speech processor and 25-kHz marker generator. All at no extra charge.

The FT-757GX's high-performance general coverage receiver lets you listen from 500 kHz up to 30 MHz. The transmitter covers 10 to 160 meters, including the new WARC bands. Dual VFOs and single-button VFO/memory swap make split-frequency operation easier than ever before.

Use the 8 memories to store your favorite frequencies on any of the bands. Then touch a button to jump to any programmed frequency without worrying about a bandswitch.

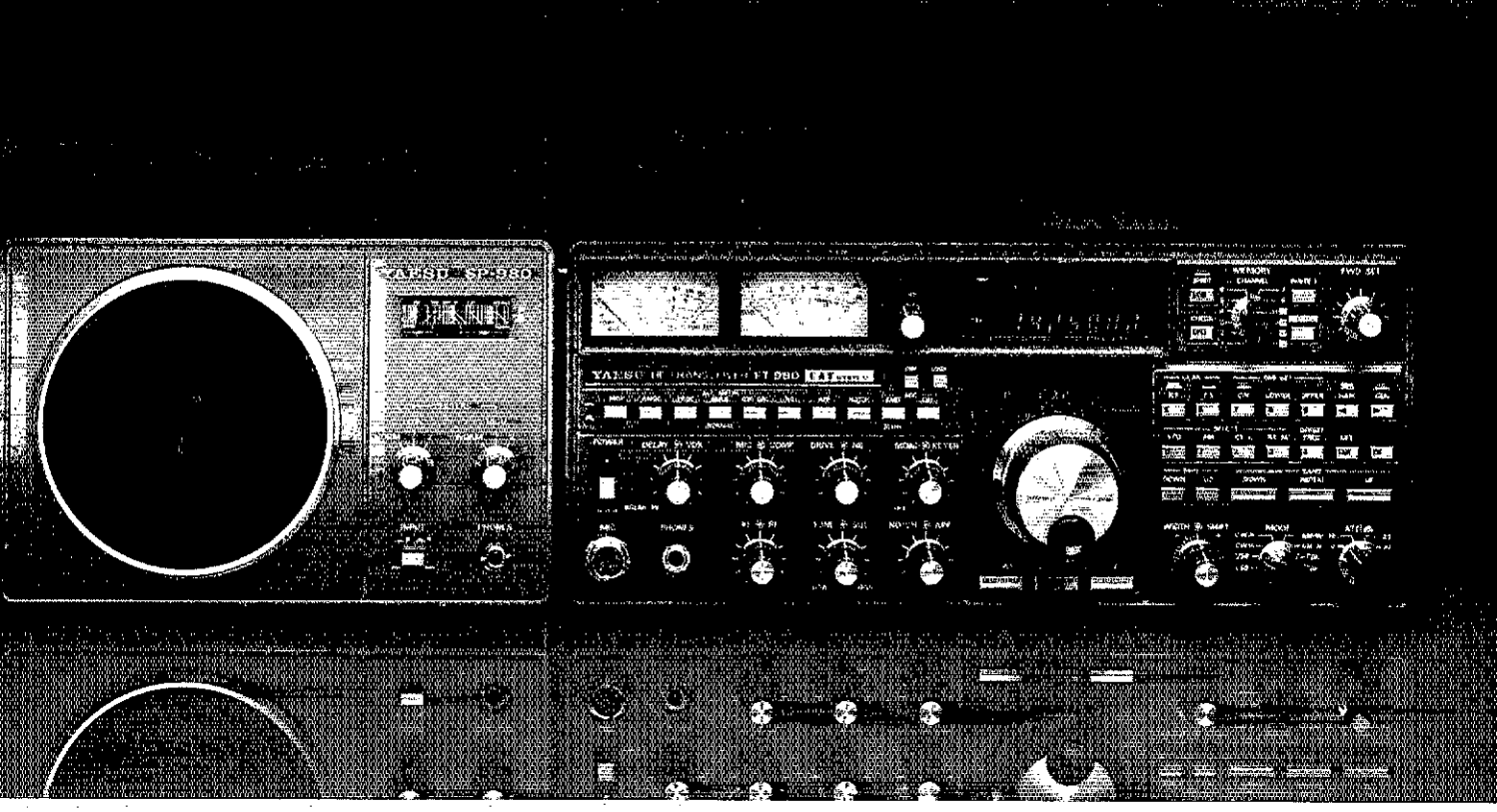
For base-station use, the space-saving FP-757GX flatpack power supply shown in the photo is ideal. With this supply, the rig delivers 100 watts output on sideband, FM and CW.

In addition, a massive heatsink permits continuous RTTY operation at full power output for up to 30 minutes. Full power for long periods does require the use of the FP-757HD heavy-duty supply.

To the right of the transceiver is the FC-757AT, a fully-automatic antenna tuner designed especially for the FT-757GX. This optional tuner stores in its memory the antenna selection and matching network settings for each band. When you operate that band again, the tuner automatically recalls the matching network settings and chooses the proper antenna.

With an optional interface unit, you can control VFO frequency and memory functions via your personal computer.

Contact your Yaesu dealer regarding MARS operation for both transceivers.



f-the-art, not state-of-mind.

The FT-980.
The cleanest signal on the air.
We know that the quality of the signal you put out is a reflection on you.

So when we designed the FT-980, we took clean output seriously. So seriously in fact, that you won't find a cleaner transmitter on the market.

Featuring a conservatively designed final amplifier that loafs at a fraction of its rated power output, the FT-980 cuts distortion levels to new lows. So you get a signal you can really be proud of.

We designed the FT-980 with complete operating flexibility in mind. But not at the expense of fundamental performance.

You can set and forget about 50% of the front panel controls.

Store your favorite frequencies and operating mode independently in each of the 12 memory channels. Review the contents of any memory location, without disturbing the QSO in progress, by using the checking function.

Going from one programmed frequency to another is simple and fast. Just touch a button to recall any channel.

You'll find the FT-980 tolerant of imperfect antennas. There's essentially no power turn-down with an SWR of 2:1 and just 25% turn-down at 3:1.

There's lots of flexibility built into the triple-conversion receiver. For one thing, there are separate front ends for ham and general coverage reception. So ham band operation is not compromised.

Multiple levels of IF filtering assure outstanding rejection of unwanted signals close to your operating frequency. And armchair copy under really brutal conditions.

The FT-980 comes ready to hook up to your personal computer. You can control operating mode, IF passband, frequency, and memory functions from a remote location. A variety of computer interfaces are available. See your Yaesu dealer for details.

State your mind.
When you visit your dealer, tell him you want the latest in HF technology. A radio built by Yaesu.

YAESU

Yaesu Electronics Corporation
6851 Walthall Way, Paramount, CA 90723
(213) 633-4007

Yaesu Cincinnati Service Center
9070 Gold Park Drive, Hamilton, OH 45011
(513) 874-3100.

appointments are: KD7PS as ATC, KA7JLV as EC, W7JPI as EC, W7YXE as SGL, and N7EH, BM. More to come. Need volunteers for PIO and ACC. Am starting to receive more Club newsletters. Thanks, guys, and keep 'em coming. The March YL luncheon in Mesa was attended by twenty-three ladies. The Sept. luncheon will be in Sierra Vista. Contact Phyllis, K7SEC. KE7FA reports the Sun City Vacation Net will meet Mondays and Fridays, 1715 UTC on 14.247 MHz, beginning May 17. Annual Club reports were rec'd from Tonto ARA, Sun City ARA, London Bridge RA, and Pima College RC. OOs W7YS, KB7VY and NJ7E sent reports. W7YS and NJ7E very active in tracking down "bootleggers" in the Flagstaff and Phoenix areas and cooperating with FCC in eliminating these unlicensed operations. Keep up the good work! W7YS also reports organization of ARRL affiliated Arizona DX Club in Flagstaff. Green Valley ARC provided communications for Annual Garden Walk there. KA6HCD WB0PYG KX7J W2RVS W2JUI KA7EVH WB7PVN KA7HDC KA7KOR KC7OZF W0EVL W7IHR WB7ORC K8TXT W8SXX W8QYM W3BXI KA7NBM W6ROD and KB7OKP all participated. WB7OHF W7US and W7FF all worked recent FO0XX Clipperton expedition on Oscar-10. KD7WM got his satellite station going on AO-10. WA7NXL became NN7A on April 26th. KB7FE made PSHR again. Your SM and XYL will be in JA-land during May. Back in June. See you next month, and keep those cards and letters coming in. 73. Traffic: Cactus Net QNI 613, QTC 92. ATEN QNI 977, QTC 207. SWN QNI 194, QTC 175. Traffic: KB7FE 146, W7EP 144, W7LVB 108, K6LL 69, KA7HEV 44, K7RDH 32, WA7KQE 31, WB7CAG 22, K7JKM 21, K7POF 19, W7KXE 16, WB3LQQ 10, K7NMQ 5.

LOS ANGELES: SM, John Walsh, N6UK—ASM: N6ZH. SEC: N6UK. ACC: KX7Q. OO/RFI: K6BMG. It is a pleasure to inform the LA Section that April was a particularly active and satisfying month. The big event was the "Quake 85" exercise. Immediately after the exercise the participating amateurs were informed that all the Fire Department facilities served were impressed by the professional way that amateurs integrated into the F.D. operations. Since it reflects well on the amateur community in general and the participating operators specifically, we quote from a note sent to us by Assistant Fire Chief Shackelford, "On behalf of the Los Angeles County Fire Department, we want to thank you for a very successful earthquake exercise. Without your assistance, the amount and smooth flow of radio traffic would not have been possible. Because of your assistance, the Fire Department was never over five minutes behind in crucial radio traffic. Again we thank you and are looking forward to a long and successful relationship with your organization. Congratulations to all who made the operation so successful: KD6BX AK6Y WB6VPV WB6MJF N6GIO W6VGQ W6NAZ W6UPN KB6GSA N6KKE WD6EGS KA6UMX KA6KIQ KA6CYQ WA6EHY KB6GVF WD6BLI W6PGM NN6Q K6PQZ W6PCI KD6CY WA6JOW and W6ORD. The executed copy of the LA Local Interference Committee has been received from the FCC. Thanks to K6BMG and best wishes to all involved. "Man-in-Motion" passed through LA. Progress on this "wheel around the world" tour was on schedule. Rick's tour through the country was aided by KD6BX (NCS), W6PGM (in the van) and W6TNB (lead car). Local TFC handlers via W6INH report approx. 20 attendees at PAS meeting in San Diego. Will confirm a new STM next month. Remember to sign up for the SW Division Convention aboard the Queen Mary. Hope you all have a great F.D. Best of Luck. ARES has seen an old activity growing. AK6Y reports several contacts by hospitals. Joint Commission on Accreditation requires hospitals to have a backup emergency communication system. They are advising hospitals to use hams. Los Angeles has 255 hospitals!! Anyone interested in this public service specialty contact SM or AK6Y. Traffic: K6UYK 661, W6INH 387, K6DD 42, W6NKE 10, WD6FWZ 8.

ORANGE: SM, Joe Brown, W6UBQ—SEC: Jim, AE6N. STM: Ernie, WA6QCA. ACC: Dave, KA6NLY. BM: George, W6DXL. OOC: Alex, W6RE. SGL: Loren, N6HIQ. TC: Will, AA6DD. Congratulations to over 150 amateur operators in the section who operated stations at Red Cross Chapter Headquarters, major hospitals, Police/Fire Command Posts and County seats during Earthquake Awareness Week. A big thanks was received from the man in Motion Courage Center, KF6I Minnesota and KE7PH/VE7ZQ Vancouver. At last report N6ANL Ray Blythe, CA was escorting Rick Hansen and his wheelchair into Arizona from the Orange Section. The ATV demonstration by Mike, K6ZSR and the SCAT Network Group (amateur television) for the Red Cross, Fire, Disaster Preparedness and Public Safety Officials was very effective. The Riverside County Chapter will enlist ATV for damage assessment. Other agencies were impressed with the possibilities of the system. Further study was ordered by County RACES. If your club does not have the Section Manager, Page 8, QST on your newsletter mailing list, please include the SM. Newsletters are the best source of information on club activities. This column must reflect the activities of the Section. PSHR: WF6O, WB6QBZ, KA6HJK/T.

Net	Freq.	Time	Sess.	QNI	Traf.	NM
SCN/1	3598	7:00 pm	30	377	250	WB6TIF
SCN/2	3598	8:15 pm	30	342	77	WB6TIF
SCN/V	146.645	9:00 pm	30	396	295	WA6QCA
RTTY/V	145.12	10:00 am	59	375	134	KA6HJK

Jim, NS6W, has resigned the Section PIO slot. At present we are accepting PIO applications. For further information on this position please call 1-714-687-8394, or drop me a line. Traffic: WF6O 284, WA6QCA 231, KA6HJK/T 187, AD6A 155, WB6QBZ 75, N6GOT 68, KA6JGF 50, N6LNI 21, W6CPB 19, K6ZCE 17, K6DD 16, W6RE 11, KB6CYD 10, W6TKV 9.

SAN DIEGO: SM, Arthur R. Smith, W6INI—BM: WA6HJJ. STM: N6GW. SEC: W6INI. PIO: KG6LF. ACC: WA6OOE. TC: N6NR. The 1986 ARRL National Conv will be held in San Diego Sept. 5-7, 1986. Good opportunity to spend your vacation in America's Finest City. Many things to see, attractions to visit. Official Bulletin Station appointments available to those who can copy off-the-air (CW/RTTY) ARRL bulletins and retransmit by voice on HF and VHF nets. Contact WA6HJJ on ARES nets. The Calif Dept of Forestry honored WB6TQF and W6INI for their many years service in the Volunteers in Fire Prevention (VIP) program. Over 150 San Diego hams have been involved in eight years. ARC of El Cajon has formed a "Legislative Review Committee," headed by WA6GDC, to monitor local government. A great idea! Who is next? The Man In Motion Worldwide Tour was supported in San Diego County by K6PD, W6INI, N6BUK, WA6RDF, N6GW and W6TET. In Imperial county by WB6PMF, KB6DL and N6IUK. The NCTN held 30 sessions, handled 66 msgs in Mar. In Apr, 29 sessions and 112 msgs. Traffic: KU6D 110, N6GW 55, KA6YJH 38, KT6A 26, WA6IIK 10.

SANTA BARBARA: SM, Byron Looney, K6FI—April was Earthquake/85 month for many clubs with the big exercise at Los Alamitos. Packet exchanges made from Los Alamitos to San Francisco, Los Angeles, Sacramento, San Diego and Santa Barbara. Paso Robles, Conejo Valley, Santa Ynez, Estero, Ventura, Santa Barbara participated in marathons, walkathons, bikathons. Poinsettia, CVARC clubs enjoying campouts. SBARC moving into Red Cross Bldg. Latest affiliated club is Condor Repeater Association . . . Welcome! Now is the time to sharpen up your ARES readiness activities. OES depends heavily on amateur radio to carry the bulk of communications in a big disaster. Can you do your part? SCN/SB operates nightly at 2100 local on 145.18. Check in and sharpen up your traffic handling capability. Traffic: N6HYM 34, K6YD 33, N6FOU 27.

WEST GULF DIVISION

NORTHERN TEXAS: SM, Phil Clements, K5PC—Asst. SM/ACC: NI5V. STM: AE5I. BM: W5QXK. RFI: WB5JBP. SGL: W5UXP. PIO: N5FDL. The tornado season came in like a lamb this year; running about a month behind the usual pattern. The experts say it will probably hang around a month later than usual also, so let's be prepared to move on any communications emergency situation. Many thanks to Audie, KB5CC, for his years of service as EC for Hood Co. He is replaced by Terry Gibbs, N5GCP; Hood Co. remains in good hands! The new Asst. Technical Coordinator appointment has been met with fantastic acceptance and great enthusiasm! To date, our new "ATC's" are N5FXX in Lubbock; KA5RGC in Sweetwater; and WB5KYK in Pampa. Thanks, and welcome aboard! Officers in the Plainview ARC: Pres/NT5T VP/KA5TIW Treas/WD5BLY. New repeater at Lake Whitney, operated by KA5QYV/EC-Hill Co. is on the air on 147.00 minus 600. Jim is very active in ARES/RACES work, and the machine fills a vital area in our SKYWARN coverage. New officers at the Garland ARC: Pres/NN5G VP/K5HW Sec/KA5AZK Treas/N5GUZ editor/N5EDI. K2SCU/EC Hunt Co. reports lots of SKYWARN activity and a lightning strike to the repeater in April. Also 6-7 new Novices predicted for the Greenville area soon. W5YR has written a series of great articles appearing in the Richardson Club newsletter in all phases of digital and new mode communications. Looks like you need to bind it all together and make a "best seller" book out of it, George! I wish everyone could read the articles, as George writes in a fine understandable style. PSHR for April: KA5AZK KD5FR N5EZM KA5SPT and AE5I. Traffic: W9OYL 165, KD5RC 146, AE5I 86, N5BT 82, KB5UL 77, KA5AZK 71, KD5FR 58, KA5SPT 47, WB5VIH 45, WB4HML 41, WA5EZT 17, NI5V 11, W5QU 10, NJ5Q 9, K5PC 9.

OKLAHOMA: SM, Dave Cox, NB5N—ASM: K5WG. SEC: W5ZTN. STM: KV5X. ACC: NJ5Y. BM: W5AS. PIO: WD5IFB. OOC: K5WG. SGL: W5NZS. TC: W5QMJ. Many new appointments have joined the field organization since the Mooreland Swapfest. Two new programs seem to be most appealing at this time, (OO/AA and ATC), possibly due to a great deal of exposure; but don't forget the many other equally important positions available, i.e. PIA, ORS, OBS, OES, EC and AEC. Contact NB5N or respective section leader listed above for details. NEW APPOINTMENTS: OO-WB9VMY; ATCs-NG5G, KA5RHU, W5IPN. Green Country Hamfest was another big success for BAARC and TARC this year. Congrats to both clubs for bringing such a fine function to eastern Oklahoma. Ham Holiday (ARRL State Convention for 1985) is just around the corner (July 26-28). BE THERE. Texoma Hamarama planning is in full swing and promises to be quite an event this year (Oct. 26-27). New net: Golden Years Net, providing liaison with nursing home residents, meets Sat. at 1:00 on 7235 and Tue. at 7:30 on 3873. Traffic: WB5SRX 198, KE5EK 183, W5AS 163, W5REC 111, KV5X 104, KD6SQ 71, W5RB 66, WA5OUV 63, WB5OHK 60, W5VXU 55, KC5OU 54, KA5FUU 51, NB5N 47, WD5IFB 45, NR5L 32, K5GBN 30, WB5LSW 28, WA5ZOO 27, W5VOR 27, W5VLW 26, WA5OGC 25, KA5TTH 25, KA5UEA 23, K5CAY 15, NG5O 12, K5ENA 11, N5PT 11, KE5MT 10, KX5W 7, ND5S 4.

SOUTHERN TEXAS: SM, Arthur R. Ross, W5KR—ASM: N5TC. SEC: KA5KRI. STM: K5QEW. ACC: KS5V. W5JOK reports that W5RPH, son of Honorary Vice President W5QKF, has won election to the Corpus Christi City Council. N5COJ is new editor for Houston ARC HARC NEWS. Brazos Valley ARC reports Scout Leader N5DIB is planning a Scout "exposition" to New Mexico; group will be made of 1st Class Scouts, 14 years or older. Tech or General Amateur Radio license (or higher); they will get a good workout providing communications for the entire camp. VE N5AF reports 11 upgrades at the February session and 8 upgrades at the April exams. DRN5 Mgr WB5YDD reports South Texas represented 100% by N5FDO W5CTZ WB5EPA WB5FQU W5KLV KD5KQ W4URN N5EFG N5AMH N5GKM N5CRU KD5CB KS5V WA5ZJY W5TFB and WB5YDD. OBS W5KLV gave 7 ARRL bulletins, 3 DX bulletins, 5 CRRL bulletins and 26 satellite bulletins 111 readings on 7 nets. The 7290 Traffic Net picnic enjoyed its annual picnic at Kerrville State Park, though attendance was down from last year; K5OWK won the Golden Nugget award, N5GKM will carry the Tin Ear Plaque with him until next year's picnic, and former SCM K5HZR received the Jimmy Dunn Award. KA5PEX says that KA5VUE is a newly licensed Novice; W0COB visited W5FFG for first eyeball QSO since the 50s; Seguin Amateurs making plans to serve in the annual July 4th parade.

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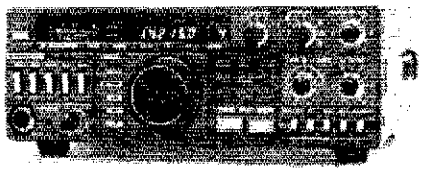

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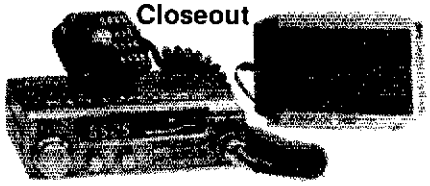

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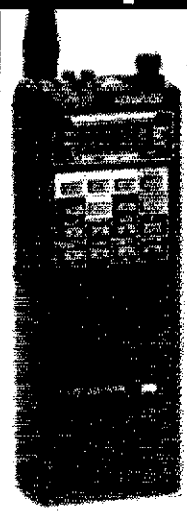

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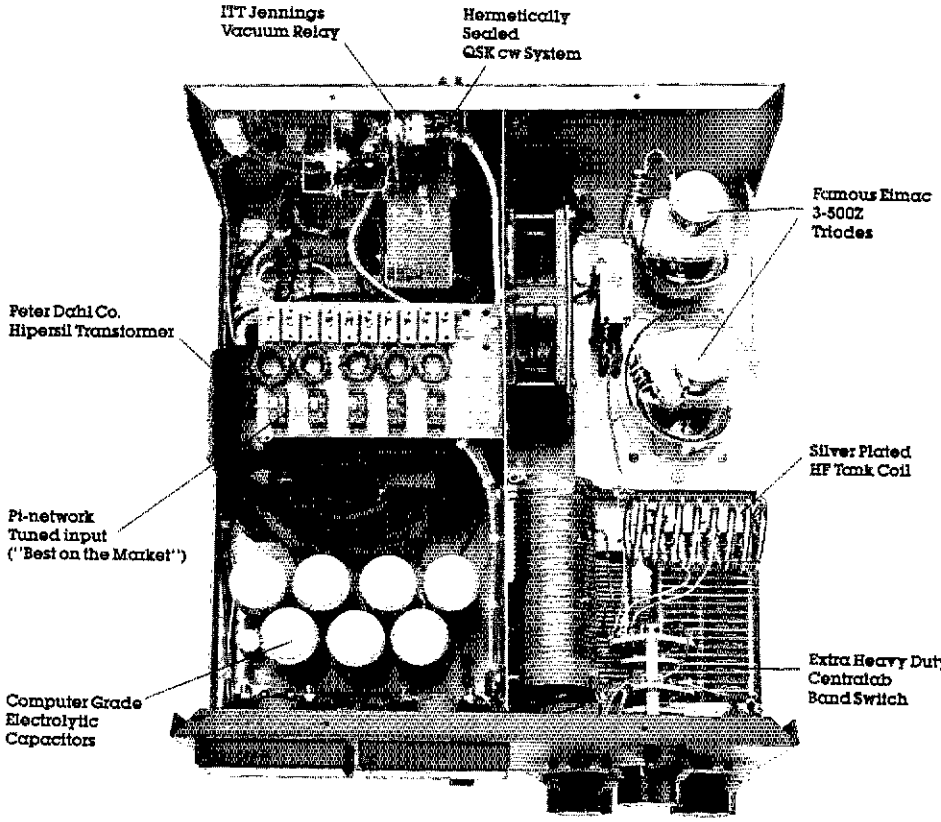

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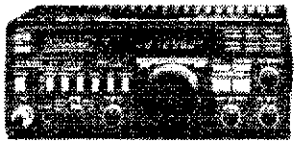

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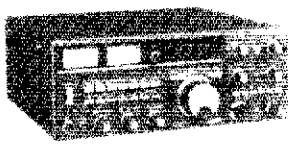

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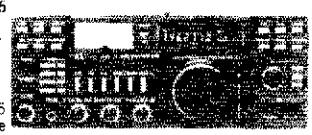

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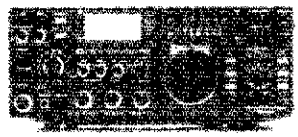

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CABLEWAVE HARDLINE Call

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RS7A	49.95	RS20M	104.95
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VHF & UHF amps . . . CALL for Quotes

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NEW! uniden® Bearcat® Regency®

Scanners

Communications Electronics,™ the world's largest distributor of radio scanners, introduces new scanners and scanner accessories from J.I.L., Regency and Uniden/Bearcat. Chances are the police, fire and weather emergencies you'll read about in tomorrow's paper are coming through on a scanner today.

NEW! Regency‡ MX7000-H

List price $699.95/**CE price $449.00**

10-Band, 20 Channel • Crystalless • AC/DC

Frequency range: 25-550 MHz. continuous coverage and 800 MHz. to 1.2 GHz. continuous coverage

In addition to normal scanner listening, the MX7000 offers CB, VHF, and UHF TV audio, FM Broadcast, all aircraft bands (civil and military), 800 MHz communications, cellular telephone, and when connected to a printer or CRT, satellite weather pictures.

NEW! Regency® MX5000-H

List price $599.95/**CE price $354.00**

Multi-Band, 20 Channel • No-crystal scanner Search • Lockout • Priority • AC/DC Selectable AM-FM modes • LCD display World's first continuous coverage scanner

Frequency range: 25-550 MHz. continuous coverage.

Never before have so many features come in such a small package. The *Regency* MX5000 mobile or home scanner has continuous coverage from 25 to 550 MHz. That means you can hear CB, Television audio, FM broadcast stations, all aircraft bands including military and the normal scanner bands, all on your choice of 20 programmable channels.

NEW! Regency® MX4000-H

List price $629.95/**CE price $394.00**

Multi-Band, 20 Channel • No-crystal scanner Search • Lockout • Priority • AC/DC Selectable AM-FM modes • LCD display

Bands: 30-50, 118-136, 144-174, 440-512, 800-950 MHz.

The *Regency* MX4000 is gives coverage in the standard VHF and UHF ranges with the important addition of the 800 MHz. and aircraft bands. It features keyboard entry, multifunction liquid crystal display and variable search increments.

NEW! Regency® Z60-H

List price $379.95/**CE price $249.00**

8-Band, 60 Channel • No-crystal scanner

Bands: 30-50, 88-108, 118-136, 144-174, 440-512 MHz.

Cover your choice of over 15,000 frequencies on 60 channels at the touch of your finger.

NEW! JIL SX-400-H

List price $799.95/**CE price $499.00**

Multi-Band, 20 Channel • No-crystal Scanner Search • Lockout • Priority • AC/DC

Frequency range: 26-520 MHz continuous coverage. With optionally equipped RF converters 150KHz-3.7 GHz.

The *JIL* SX-400 synthesized scanner is designed for commercial and professional monitor users that demand features not found in ordianary scanners. The SX-400 will cover from 150 KHz to 3.7 GHz. with RF converters. Order the following RF converters for your SX-400 scanner. **RF-1030-H** at $259.00 each for frequency range 150 KHz. - 30 MHz. USB, LSB, CW and AM. (CW filter required for CW signal reception); **RF-5080-H** at $199.00 each for 500-800 MHz.; **RF-8014-H** at $199.00 each for 800 MHz.-1.4 GHz. Be sure to also order **ACB-300-H** at $99.00 each which is an antenna control box for connection of the RF converters. Add $3.00 shipping for each RF converter or antenna control box. If you need further information on the JIL scanners, contact JIL directly at 213-926-6727 or write JIL at 17120 Edwards Road, Cerritos, California 90701.

SPECIAL! JIL SX-200-H

List price $499.95/**CE special price $189.00**

Multi-Band - 16 Channel • No-Crystal Scanner

Frequency range 26-88, 108-180, 380-514 MHz.

The *JIL* SX-200 scanner tunes military, F.B.I., Space Satellites, Police and Fire, Drug Enforcement Agencies, Defense Department, Aeronautical AM band, Aero Navigation Band, Fish & Game, Immigration, Paramedics, Amateur Radio, Justice Department, State Department, plus other thousands of radio frequencies most other scanners can't pick up. The SX-200 has selectable AM/FM receiver circuits, tri-switch squelch settings - signal, audio and signal & audio, outboard AC power supply - DC at 12 volts built-in, quartz clock - bright vacuum fluorescent blue readouts and dimmer, dual level search speeds, tri-level scan delay switches, 16 memory channels in two channels banks, receive fine tune (RIT) ± 2KHz., dual level RF gain settings – 20 db pad, AGC test points for optional signal strength meters. All in all, the *JIL* SX-200 gives you more features for the money than any other scanner currently on sale. Order your *JIL* SX-200 scanner at this special price today.

Regency® HX1000-H

List price $329.95/**CE price $209.00**

6-Band, 30 Channel • No Crystal scanner Search • Lockout • Priority • Scan delay Sidelit liquid crystal display • Digital Clock

Frequency range: 30-50, 144-174, 440-512 MHz.

The new handheld *Regency* HX1000 scanner is fully keyboard programmable for the ultimate in versatility. You can scan up to 30 channels at the same time. When you activate the priority control, you automatically override all other calls to listen to your favorite frequency. The LCD display is even sidelit for night use. A die-cast aluminum chasis makes this the most rugged and durable hand-held scanner available. There is even a backup lithium battery to maintain memory for two years. Includes wall charger, carrying case, belt clip, flexible antenna and nicad battery. Order your *Regency* HX1000 now.

Bearcat® 100-H

The first no-crystal programmable handheld scanner.

List price $449.95/**CE price $229.00**

8-Band, 16 Channel • Liquid Crystal Display Search • Limit • Hold • Lockout • AC/DC

Frequency range: 30-50, 138-174, 406-512 MHz.

The world's first no-crystal handheld scanner has compressed into a 3" x 7" x 1¼" case more scanning power than is found in many base or mobile scanners. The *Bearcat* 100 has a full 16 channels with frequency coverage that includes all public service bands (Low, High, UHF and "T" bands), the 2-Meter and 70 cm. Amateur bands, *plus* Military and Federal Government frequencies. Wow...what a scanner!

Included in our low CE price is a sturdy carrying case, earphone, battery charger/AC adapter, six AA ni-cad batteries and flexible antenna. Order your scanner now.

QUANTITY DISCOUNTS AVAILABLE

Order two scanners at the same time and deduct 1%, for three scanners deduct 2%, four scanners deduct 3%, five scanners deduct 4% and six or more scanners purchased at the same time earns you a 5% discount off our super low single unit price.

NEW! Regency® HX2000-H

The World's First 800 MHz. Handheld Scanner

List price $569.95/**CE price $359.00**

7-Band, 20 Channel • No-crystal scanner Priority control • Search/Scan • AC/DC Sidelit liquid crystal display • Memory backup

Bands: 118-136, 144-174, 440-512, 800-950 MHz.

The HX2000 scanner operates on 120V AC or 6 VDC. Scans 15 channels per second. Size 3" x 7" x 1½." Includes wall charger, carrying case, belt clip, flexible antenna and nicad batteries. Selectable AM/FM modes.

OTHER RADIOS AND ACCESSORIES

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RD95-H *Uniden* Remote mount Radar Detector	$139.00
BC 300-H *Bearcat* 50 channel scanner	$344.00
BC 20/20-H *Bearcat* 40 channel scanner	$274.00
BC 210XL-H *Bearcat* 18 channel scanner	$209.00
BC 260-H *Bearcat* 16 channel mobile scanner	$274.00
BC 201-H *Bearcat* 16 channel scanner	$189.00
BC 180-H *Bearcat* 16 channel scanner	$164.00
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Z10-H *Regency* 10 channel scanner	$149.00
Z30-H *Regency* 30 channel scanner	$169.00
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A60-H Magnet mount mobile antenna	$35.00
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Add $3.00 shipping for all accessories ordered at the same time.
Add $12.00 shipping per shortwave receiver.
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To ***get the fastest delivery from CE*** of any scanner, send or phone your order directly to our Scanner Distribution Center.™ Be sure to calculate your price using the CE prices in this ad. Michigan residents please add 4% sales tax or supply your tax I.D. number. Written purchase orders are accepted from approved government agencies and most well rated firms at a 10% surcharge for net 10 billing. All sales are subject to availability, acceptance and verification. All sales on accessories are final. Prices, terms and specifications are subject to change without notice. All prices are in U.S. dollars. Out of stock items will be placed on back-order automatically unless CE is instructed differently. A $5.00 additional handling fee will be charged for all orders with a merchandise total under $50.00. Shipments are F.O.B. Ann Arbor, Michigan. No COD's. Most products that we sell have a manufacturer's warranty. Free copies of warranties on these products are available prior to purchase by writing to CE. Non-certified checks require bank clearance.

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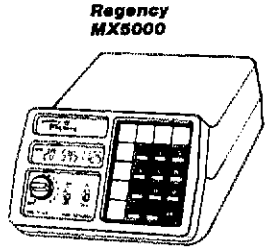

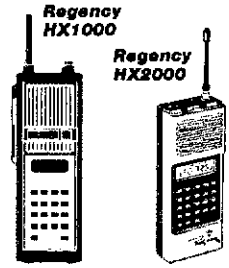

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Bearcat® 260-H

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Regular Price $274.00

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8-Band, 60 Channel, No crystal scanner

Regular Price $249.00

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COUPON COUPON COUPON

SAVE $35.00
JIL SX-200-H

Multi-Band, 18 Channel, No crystal scanner

Regular Price $189.00

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Regular Price $449.00

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Regular Price $149.00

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TH5Mk2S	385.00
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205BAS	340.00
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Dir. Kit 7-3	205.00
18HTS	439.00
18AVT/WBS	102.00
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V2S	45.00
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MOSLEY

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CL-33	265.00

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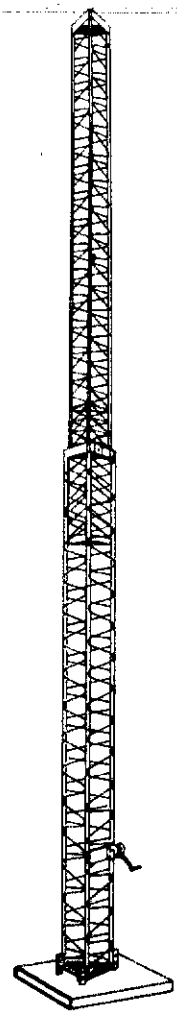

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FK4544	1169.00
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Fold-overs shipped freight prepaid. Prices 10 percent higher in western states

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25AG4 top	64.00
45G section	109.00
45AG3 top	116.00
45AG4 top	116.00
TB-3 Bearing	49.00

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Hy-Gain is now the name in crank-up towers. Shipped freight prepaid!

HG-37SS	$739.00
HG-52SS	1075.00
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RG-8/U	0.28/ft.
RG-8/U foam	0.27/ft
RG-8X	0.16/ft.

ANTENNA WIRE(solid):

12 ga. Copperweld	$0.12/ft
14 ga. Copperweld	0.10/ft
450 ohm ladder line	0.10/ft

ROTOR CABLE:

Std (6-22, 2-18)	$0.19/ft
Hvy (6-18, 2-16)	0.34/ft

BELDEN

RG-213/U	$0.40/ft
RG-8/U	0.32/ft
RG-8/U foam	0.35/ft
RG-8X	0.18/ft
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9913	0.42/ft

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1:1 Balun	$11.95
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AMERITRON RCS-8 remote coax switch, 5 pos $119.95

ROTORS

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PART TWO

New rigs and old favorites, plus the best essential accessories for the amateur.

EQUIPMENT

KENWOOD

TH21AT, 2 Mtr HT, shirt pocket size ..... In Stock
TH41AT 70 Cm HT,
Companion to TH21AT ..... In Stock
Accessories for TH21 & TH41 ..... In Stock
TS711A, 2m, All Mode 25 Watt ..... Call
SM220 Station Monitor ..... Call
TR7930, TR7950 ..... Call
TM211A, TM411A ..... Call
R1000, R2000 Gen. Cov. Receivers ..... Call
TR2600A, Spare PB26,
Battery Pack free w/Purchase ..... Call
HMC-1 Headset, with TR2600A only 19.95

OTHER EQUIPMENT

ICOM R71A 649.00
ICOM IC02AT 299.95
Tentec 2591 ..... 269.00
Mirage amps ..... less 12%
Ameritron RCS-8 remote coax switch 119.00
Dentron GLT1000C Tuner, 1KW. PEP 175.00
YAESU FT203R ..... Call

SERVICES

Alignment, any late model rig 50.00
Flat Fee Collins rebuild ..... Call

ACCESSORIES

HEIL HC3/HC4/HC5 ..... Stock
HEIL SS-2 Powered Spkr 49.50
HEIL BM10-Boom Mike/Headset 53.95
HEIL HCS Control Box/Interface 89.95
CES 510 Smart Patch 349.00
FLUKE 77
auto-ranging digital multimeter 115.00
Alpha Delta MACC-8 Surge Protector 73.00
Nye 8 wire phone patch 82.00
Shure 444D Mic 49.95
Bird 43 Wattmeter + accessories ..... In stock
Bird 4240-300 Adaptor/Connector Kit 70.00
Daiwa CN620B, 20-200, 2000W 109.95
Tripplite PR25 Regulated PS,
25A/16A Continuous 99.95
Tripplite PR40 25A Continuous 149.95
Gordon West Code Tapes 9.95
Collins 500Hz Filter, F455J05, new 95.00
Sanyo AA Nicads 2.00

KEYS

Bencher & Vibroplex ..... Less 10%

AEA

New Products In Stock
MP-1 CW-RTTY-AMTOR Interface 134.95
CP-100 (More features than CP-1) 319.95
ATU-1000
Military/Commercial Interface 1199.95
Dr. DX 89.95
Dr. QSO 79.95

Alpha Delta MACC 73.00
Master AC Control Console for Control of Entire Station or Independent Circuits. Eliminates Wear of Equipment Switches. Best circuit protection of any industry unit. Surge/Transient Protection Built-in.

OPTIONS

MBA-TOR (Includes Amtor & features) 30.00
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TH Tuning Indicator 84.00

BOOKS

Hayden, Computer Programming
for Amateur Radio 16.95

TUBES

GE6146B 11.95
GE572B 62.00
Eimac 3-500Z 99.95
GE Industrial Tubes ..... Call
GE 12BY7A 6.00

ANTENNAS

AR2XB, V2S, 2MCV-5, ISOPOLE 44.95
A3 ..... 219.95
A4 ..... 289.95
402CD 279.95
Omni 2J,
2M 1/2 Wave Mobile/Portable 39.95
Omni 400 1/2 Wave Mobile/Portable 39.95
Hustler 6BTV 129.95
G7-144 ..... 119.95
Cushcraft A147-11 ..... 49.95
215WB New, 15L, 2M Beam 79.95
A147-4 ..... 29.95
AOP-1, Complete Oscar Antenna 149.95
Butternut HF6V, 80-10 Vertical 125.00
HF2V, 80 & 40 Vertical 125.00

BARKER & WILLIAMSON

All Band B & W Dipoles ..... Less 10%

HY-GAIN

HG52SS 1099.00
Ham 4 Rotator 219.95
Ham T2X 269.95
HY-Gain accessories shipped prepaid from the factory with tower orders

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KT34A 349.95
JV2X 2 Meter Vertical 32.00
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2M14C 88.00
2M22C 119.95
2M16LBX 99.95
432-30LBX 96.00
435-18C, Incl. CS-2 ..... 116.95
435-40X 159.95
432-16LB 68.00
HF World Class Series Antennas ..... Call Don

OTHER ANTENNAS

Larsen Kulduck 17.00
Larsen Cellular Antenna ..... Stock
Valor 75-10M complete mobil antenna 79.95
Avanti ASP151 3G thru glass 2M 33.00
Anteco 2M, 5/8, Mag. Mount, Comp 25.00
Metz SW-1, SWL Ant. 5Hz. – 54Mhz. 59.95

SURPLUS

CDE 2 Pole DT Relay,
10 Amp. Enclosed (New) 5.00
2.5A/1000PIV
TCG Epoxy diode .... 29c. Each or 19.00/100
Grainwheat 12V Lamps ..... $ .50
.0015/10KV $1.95
455 KHZ IF Transformer ..... .49
3N201 ..... .95

BELDEN

9528RG8X ..... .19/ft
9913 low loss, solid center,
foil/braid shield ..... 45c/ft.
8214 RG8 Foam ..... 43c/ft.
8237 RG8 ..... 40c/ft.
8267 RG213 ..... 52c/ft.
8000 14Ga stranded copper ant. wire ..... 13c/ft.
8448 8 conductor rotor cable ..... 31c/ft.
9405 Heavy duty, 2-16 Ga. 6-18 Ga ..... 52c/ft.
9258 RG8x ..... 19c/ft.
8403 Mic Cable, 3 condctr & shield ..... 80c/ft.
100 Feet 8214 w/ends installed 45.00

ROHN

FK2548, 48ft. with guy bracket, rotor shelf,
eave bracket and M200H mast 999.00
1/4" E.H.S. Guy cable,
Rohn US, 1000 ft. 250.00
3/16" E.H.S. cable 210.00
1/4" Guy Cable, 6100# 7x7 strand 15c/ft
3/16 Guy Cable, 3700# 7x7 strand 12c/ft
Premax Ground Rods, Heavy Copper Plating,
3/8, 1/2, 5/8, 3/4 inches dia.
4-8 ft. in Length ..... Stock
3/8 x 6 E&J Turnbuckle 7.95
3/16" Wire Rope Clips ..... .40
1/4" wire clips ..... .50
Porcelain 500D Guy Insulator (3/16) 1.69
Porcelain 502 Guy Insulators (1/4) 2.99

USED EQUIPMENT

All equipment used, clean, with 90 day warranty and 30 day trial. Six months full trade against new equipment. Sales price refunded if not satisfied. Always Excellent Used Collins

POLICIES.

Minimum order $10.00. Mastercharge, VISA, or C.O.D. All prices FOB Houston, except as noted. Prices subject to change without notice. Items subject to prior sale. Call anytime to check the status of your order. Texas residents add sales tax. D'ats all, folks.

DON'S CORNER

This month, Madison moves to newer and more luxurious quarters, with our new address at 3621 Fannin St. in Houston. Those of you who visited us at our old location on McKinney will greatly appreciate the increased parking, etc. etc. We'll miss our "legendary" McKinney location, but new times demand new store space, and we fully intend to keep up with the times.

New times also demand new modes of communicating to you, our customers, and so we continue to work on our MADISON/LINE Bulletin board. We're running a little behind on getting phone lines installed, and hardware up-and-running because of the move, but we should have all that ironed out shortly.

DON

MADISON
Electronics Supply
3621 FANNIN
HOUSTON, TEXAS 77004
CALL FOR QUOTES **1-800-231-3057**

NEW TEXAS NUMBER **1-713-520-7300**
(AFTER JUNE 1)

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. This includes firms or individuals offering products or services for sale. A special rate of 25 cents per word applies to individuals seeking to dispose of or acquire personal station equipment, and to hamfest and convention announcements.

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 firms or individuals offering products or services for sale must submit a production sample (which will be returned) for our examination. Dealers are exempted, unless the product is unknown to us. Check with us if you are in doubt. You must furnish a statement in writing that you 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. 1417 Stoneybrook, Mamaroneck, NY 10543.

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.

THANK YOU for attending Warren, Ohio Hamfest. See you August 18, 1985.

ATTENTION MORSE Telegraphers - Join Morse Telegraph Club. Meet old friends, swap experiences. Morse Telegraph Club is national. There is a Chapter near you. When and where do we meet? Contact John Holman, W3INV, 1 Beth Circle, Malvern, PA 19355. 215-644-2471.

ATLAS 350XL Owners Group. Free newsletter. Send QSL with rig s/n and SASE. Know people who repair them? Information to share? Questions? Rod Sharp, N5NM, Box 2169, Santa Fe, NM 87501.

THE FLORIDA Amateur Digital Communications Association (FADCA) publishes a monthly newsletter, the FADCA Beacon, about Packet Radio. Write for a sample copy, FADCA, 812 Childers Loop, Brandon, FL 33511.

FREE QRP Info Kit. Send S.A.S.E. with two first-class stamps (U.S.) or three IRCs (DX) to: QRP ARCI, P.O. Box 354, Carlisle, PA 17013.

CQ CONTEST: VHF'ers please note! The first annual CQ World Wide VHF WPX Contest is July 20-22, 50 thru 1296 MHz. For details, logsheets, etc., write to SCORE, P.O. Box 1161, Denville, NJ 07834 or to CQ Magazine. We need your entry to make this a success!

ATLANTA HAM FESTIVAL - July 6 and 7. New location-Georgia World Congress Center in Atlanta. Everything inside including fleamarket. All Totally Air Conditioned!!! Lots of Forums, exhibitors, even the Braves will be in town. Write Atlanta Ham Festival, P.O. Box 77171, Atlanta, GA 30357 for further information.

WANTED: COLLINS equipment including linear and accessories for two complete amateur stations (10 through 2 meters). Also, parts for KW A.M./C.W. all band station transmitter from scratch, including power supply. All American Amateur Radio Club, P.O. Box 2030, Upland, CA 91785, 714-986-3515.

1985 BLOSSOM BLAST, Sunday, Oct. 6, 1985. Write "Blast" Box 175, St. Joseph, MI 49085.

HAMFESTERS 51ST Annual Hamfest, one of the Midwest's largest. Sunday, August 11, 1985. 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.

QSL Cards/Rubber Stamps/Engraving

TRAVEL-PAK QSL Kit — Converts Post Cards, Photos to QSLs. Stamp brings circular. Samco, Box 203, Wynantskill, NY 12198.

DON'T buy QSL cards until you see my free samples — or draw your own design. I specialize in custom cards. Send black and white sketch: wil give quote. Little Print Shop, Box 9848, Austin, TX 78766.

DISTINCTIVE QSL's — Largest selection, lowest prices, top quality photo and completely customized cards. Make your QSL's truly unique at the same cost as a standard card, and get a better return rate! Free samples, catalogue. Stamps appreciated. Stu, K2RPZ, Box 412, Rocky Point, NY 11778 516-744-6260.

FREE samples — stamp appreciated. Conner, 522 Notre Dame Ave., Chattanooga, TN 37412.

QSLs & rubber stamps. Top quality. QSL samples and stamp information 50c. Ebbert Graphics D-3, Box 70, Westerville, OH 43081.

EMBROIDERED emblems, custom designed club pins, medallions, trophies, ribbons. Highest quality, fastest delivery, lowest prices anywhere. Free info: NDI, Box 6665 M, Marietta, GA 30065.

QSLs — 1) Famous KØAAB custom collection. 2) Railroad employees and railfan's specials. 3) Front report styles. 4) Multiple callsigns. 5) Ham "business cards." State your sample wants. 39¢ self addressed business size envelope required. Marv Mahre, WØMGI, 2095 Prosperity Ave., St. Paul, MN 55109-3621.

QSLs Samples 40¢ (stamps OK) Fred Leyden, W1NZJ, 454 Proctor Ave., Revere, MA 02151.

INTRODUCING: Beautiful natural full color photo QSL cards, made from your color negative or slide. From $285. for 3,000 cards minimum. Free samples, stamps appreciated. K2RPZ, Box 412, Dept. NC, Rocky Point, NY 11778 516-744-6260.

QSL's by W4TG: Prices from $16 per 1000. Send SASE to PO Box F, Gray, GA 31032.

BE SURPRISED - get a variety of cards - 100 for $8 or 200 for $13. Samples $1 refundable. All three colors, fast service, satisfaction guaranteed. Constantine, 1219 Ellington, Myrtle Beach, SC 29577.

FINEST custom QSLs, large cut catalog and samples $1 refundable on first order. Ritz Print Shop P.O. Box 45018, Westlake, OH 44145.

QSL's — since 1956, free samples, Rusprint, Box 7575, Kansas City, MO 64116.

QSL samples — 25¢ Samcards — 48 Monte Carlo Dr., Pittsburgh, PA 15239.

RUBBER STAMPS and Ultragraved Business Cards. QSL card brings Free Literature! J. Glass, WB6ZTI, 14316 Cerecita Drive, East Whittier, CA 90604.

FREE, 100 QSLs with first order. Samples 50¢. Gazebo Press, Rt. 4, Box 4148, LaPlata, MD 20646.

ENGRAVING. CALLSIGN/name badges by WØLQV. SASE for price sheet. Box 4133, Overland Park, KS 66204.

CUSTOM REPORTS, QSLs and Adv. Labels. Stamp brings circular. LABELCRAFT, P.O. Box 412, W. Sand Lake, NY 12196.

NEW 3-D designs, including Space Shuttle, samples 50¢, 3-D QSL Co., P.O. Box D, Bondsville, MA 01009.

QSL's $12.95/100 UP, WA4PRE, Jim's Printing Service, 2155 Young, Memphis, TN 38104 S.A.S.E.

NEW KID on block - for QSL free samples write Kings Grove Press, Box 9, Ellersile, MD 21529. Also custom printing and SWL's. Stamp appreciated.

STAMP brings QSL catalog of new designs and samples, from $7 up. 22 years custom printing. WA6SOK, 4056 Acacia, Riverside, CA 92503.

BUMPER STICKERS, any message, $3.50. Adhesive backed call signs, 1" high for $1. 2" high for $2. 3" high for $3. Specify color. Art Service, N1BXI, 59 Maple Street, Saco, ME 04072.

CADILLAC of QSLs — Completely different! Samples $1. (refundable) Mac's Shack, P.O. Box No. 43175, Seven Points, TX 75143.

ANTIQUE-VINTAGE-CLASSIC

WANTED: Radios, parts, books, magazines before 1928. W6ME 4178 Chasin Street, Oceanside, CA 92054.

WANTED: Early Hallicrafter "Skyriders" and "Super Skyriders" with "Silver" panels, "Skyrider Commercial," early transmitters — HT-1, HT-2, HT-8, etc., other Hallicrafter gear, parts, accessories, manuals. Chuck Dachis, WD5EOG, The Hallicrafter Collector, 4500 Russell, Austin, TX 78745.

WANTED: old microphones for my mic. museum. Also mic-related items. Write Bob Paquette, 107 E. National Ave., Milw. WI 53204.

MANUALS for most Ham gear made 1937/1972, plus Kenwood. Our 1985 catalog is $1 USA and required for ordering. Over 2,000 models listed. HI-MANUALS, P.O. Box E802, Council Bluffs, IA 51502-0802.

HALLICRAFTERS Service Manuals. Amateur and SWL. Write for prices. Specify Model Numbers desired. Ardco Electronics, P.O. Box 95, Dept. Q, Berwyn, IL 60402.

WANTED: PRE-1923 radios, pre 1940 T.V. Entire collections bought. Top cash paid immediately. Phil Weingarten, 67-61 Alderton St., Flushing, NY 11374, 718-896-3545.

WANTED: radios, magazines, horn speakers, pre 1930. W6THU, 1545 Raymond, Glendale, CA 91201. 818-242-8961.

MICROPHONES and related memorabilia used in radio/TV broadcasting prior to 1960 wanted. Cash paid; trade items available. Write: James Steele, 80 Central Park West, New York, NY 10023-5206.

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. Antique Wireless Assn., Holcomb, NY 14469.

WANTED: OLD tubes, amplifiers, speakers, Western Electric, RCA, Cunningham, DeForest, McIntosh, Marantz. 713-728-4343. Maury, 11122 Atwell, Houston, TX 77096.

COLLINS WANTED!! Parts - kc dials for 32V, 75A-2 and KW-1; mine have discoloured. Need 353C-31, 353C-14, F455B60, F455FA08 and F455FA05 filters. Need Spinner Knob for 75A-4 (have the 4:1 reduction gear). Need skirted knob for 62S-1 freq. select. Want original and unmodified 310B-3 exciter. Need 35C-2 LPF. Need 55G-1 preselector for 51S-1 with manual. Want manual for KWM-1; good-excellent original, no reprint. Contact AC1Y c/o ARRL Hq. 203-667-2494 days 8-4.

WANTED: RADIOS, tubes pre-1937 for my collection. KC5PC, HCR-3, Box 418, Deer River, MN 56636.

WANTED: AN/GRA-71 Burst Transmission Keyer. New/used or parts. R Bennett, 1913 Connie Lou Dr., Las Cruces, NM 88001.

WANTED - HARVEY-WELLS Bandmaster VFO. I'll buy transmitter to obtain VFO unit. Tony, WA3GKX, 1705 Ninth Ave., Irwin, PA 15642. 412-864-4293.

WRL Globe King-500B $400. Heathkit SSB Adaptor $75. Heathkit Apache $50. Hallicrafter SX99, R46B speaker $150. Want antique National receivers old Atwater-Kents. Russell Olmsted, K4UJZ, Route 11, Murfreesboro, TN 37130. 615-893-5344.

MAKE OFER, RK4D32 tubes, W1OPZ.

WANTED: VIKING Amplifier, W2VDB, 1146 Sunrise Blvd., Rotterdam, NY 12306.

QST - 1933 to 1983 in binders - Will sell only to a ham. Very good to excellent condition. Price $560. Price includes shipping anywhere USA (ABT500LBS) 15 boxes. William D. Osborn, KH6KV, 58-041 Maika Place, Haleiwa, HI 96712.

WANTED: MANUAL for "Clough-Brengle" L-C Bridge Model 301-A. Joseph Karr, 3800 Cheyenne Ct., Racine, WI 53404.

SELL: HAMMARLUND SP-600 receiver. Good for parts. No tubes. Pickup only. $50. Mark S. Starin, KB1KJ, 457 Varney Street, Manchester, NH 03102, 603-625-1165.

GREBE MU-1 Synchrophase Receiver; Signal Electric oval hand key and sounder; Weston 799 Test Meter in wood case. Best offer. Doug, W6HVN, Box 833, Altaville, CA 95221. 209-736-4150.

NATIONAL NCX-1000 kilowatt tabletop transceiver for sale. Mint condition. $875. Steve, NØADF, 5917 Grimes Ave., South, Minneapolis, MN 55424.

KEY COLLECTOR WANTS each make and model of bug manufactured before 1935. Vibroplex, Martin, Boulter, MacDonald, etc. Also need spark and Boston keys. Need pre-1900 telegraph: humpback keys, sounders, pocket sets, miniatures, etc. Visitors welcome. Neal McEwen, 1128 Midway, Richardson, TX 75081. 73 de K5RW.

PRE-1930 QSTs. SASE for list. W8BCO, 19339 Riverview, Rocky River, OH 44116.

4D32 $25. W3AP, 215-678-4310.

QST 1964 through 1983, best offer. HQ-129X, best offer. You ship. Steve Snyder, W9TI, 81 Andrews Ct., Freehold, NJ 07728.

HALLICRAFTERS HT-9 transmitter $100. Crosley Model 608 1928 AC with speaker $150. CQ Magazines want early National and Howard receivers. Russ Olmsted, Rt 11, Thompson Lane, Murfreesboro, TN 37130, 615-893-5344.

WANTED WW2 Japanese Military Radios in original conditions also USA BC342 etc. Please send details to Tajima JA1DNQ/KD2HB care Toshiba 111 Business Park Drive, Armonk, NY 10504.

WANTED: PRE-WWII 1-kW AM transmitter, homebrew or commercial. Noninductive resistors to make balanced, 50-ohm, 1-kW load. Nagle, 12330 Lawyers, Herndon, VA 22071.

HEATH DX-60B, HR-10B, HG-10B excellent condition, $125 plus shipping. WA2SCA, Ed Parish, 617-270-2797 days, 617-456-3887 evenings.

NATIONAL HRO-5AT1 receiver, excellent condition, mint, clean, works fine. With speaker, power supply, 5 coil sets, manual. Late '30's vintage. $125 I will ship. John Flynn, WØIX, Box 325, Olathe, KS 66061. 913-764-7390.

QST, BACK to 1927 over 600 copies $90. Tony Kray, Main St., Putney, VT 05346.

AMATEUR ELECTRONIC SUPPLY - USED GEAR

★ *10 day Trial (pay only Shipping Charges)*
★ *30 day Warranty*
★ *Full Trade-in within 3 months on New Gear*
★ *Mastercard or VISA welcome - Call Today!*

AEA
AMT-1 w/Chirptext $249 w
AMP SUPPLY
LA-1000NT No-tune amp $369 w
CLIFFORD
XXRD Power supply $ 59 w
COLLINS
75S-3 Ham Rcvr $269 f
75S-3 w/tubesters 249 m
75S-3A Receiver 299 m
32S-3 Transmitter 329 m
62S-1 VHF converter 599 f
312B-3 Speaker 29 c
312B-4 Station control 189 fc
KWM-2 Xcvr 439 c
KWM-2 Xcvr (round) 499 c
516F-2* AC supply 149 mwtc
*Not sold separately
KWM-380 sn 552/blower/ mars/warc/1.8/update 4/84 1995 v
KWM-380 Xcvr sn 2205 4895 m

DAIWA
CNW-418 Ant tuner $129 f
CNW-518 Ant tuner 219 m
CNA-1001 Auto ant tuner 239 m
CNA-2002 Auto ant tuner 299 f

DRAKE
R-4A Ham Rcvr $149 v
R-4B Ham Rcvr 189 mwfc
R-4C Ham Rcvr 249 m
MS-4* Speaker 19 mwc
*Not sold separately
SC-2 2m rcv conv 59 m
SC-6 6m rcv conv 59 wf
CPS-1 Conv ps 19 mw
SCC-1 VHF calib 19 mw
CC-1 Conv console 29 mw
TC-2 2m Xmit conv 229 m
R-7 SW Receiver 699 mc
R-7/NB/4 KHz filter 779 m
R-7A SW Receiver 999 m
R-7 service manual 25 m
T-4XB Transmitter 189 mcv
T-4XC Transmitter 239 mtv
TR-4/NB Xcvr 249 m
TR-4C Xcvr 269 w
TR-4CW Xcvr 329 c
AC-3* AC supply 59 mt
AC-4* AC supply 89 mwtc
*Not sold separately
TR-5 Xcvr 399 mc
TR-7 Xcvr 569 mwf
TR-7/AUX-7 599 m
TR-7/500 Hz 599 f
TR-7/1.8 KHz 599 v
TR-7/300/500 Hz 619 m
TR-7/300/1.8/6 649 f
PS-7* Power supply 189 mwfv
*Not sold separately
PS-75 Power supply 99 m
NB-7 Blanker 49 f
SP-75 Speech proc 79 m
7077 Desk mic 29 mf
L-75 1.2kw PEP amp 569 m
MN-2000 Ant matcher 149 m
550 Rcv only terminal 229 e
7000E Terminal 249 w
TR-22 2m FM port 69 m

ETO
Alpha 76A Linear 1249 v
Alpha 374A Linear 1599 m
HAL
RKB-1 RTTY keyboard $ 49 m
ST-5000 Demod (low) 149 v
ST-6000 Demod (high) 389 c
DS-2000 Terminal 149 m
DS-3000KSR Term vers 2 389 m
ARQ-1000 Error terminal 649 m
CWR-6700 Rcv Telereader 149 m
CWR-685A Port terminal 329 c
CRI-200 Interface 189 m
HENRY
1KD-5 Linear $449 m
S-30 2m amp 59 m
IRL
FSK-1000 Demod/kyr $189 m
ICOM
IC-701 Xcvr w/ps $469 m
IC-720 Xcvr 569 m
IC-720/CW filter 599 w
IC-720A/CW/AM filts 699 m
IC-740/FM Xcvr 569 f
IC-740/FL-44/CW filt 669 f
IC-740/ssb/cw/mk/fm/kyr 729 m
IC-740/ps/2 cw filts/kyr 769 m
PS-15 Power supply 99 mw
PS-20 Power supply 159 m
SP-3 Speaker 29 m
EX-2 Relay box 29 m
AT-100 Ant tuner 229 c
Spkr/patch; 701 89 m
R-70 SW Rcvr 399 mv
IC-551/FM 6m Xcvr 389 m
IC-22A 2m FM Xcvr 89 m
IC-22S 2m FM Xcvr 99 m
IC-25H 2m FM Xcvr 239 e
IC-27H 2m FM Xcvr 289 e
IC-215 2m FM port 99 m
IC-245/SSB 2m Xcvr 189 c
IC-251A 2m Xcvr 369 mc
IC-271A 2m Xcvr 529 m
IC-280 2m FM Xcvr 149 v
IC-490A 430-440 Xcvr 389 m
SM-5 Desk mic 25 v
SM-6 Desk mic 25 v
KDK
FM-2033 2m FM Xcvr $219 m
KLM
PA15-40BL 2m 15/40w $ 59 w
PA10-70B 2m 10/70w 79 m
Echo 70 432 Xcvr 229 m
KENWOOD
R-599D/6m/2m Rcvr $239 m
TS-120S Xcvr 349 ve
TS-130S Xcvr 429 m
TS-130S/cw/ssb filts 489 m
TS-180S/DFC Xcvr 429 m
TS-180S/DFC/cw/ssb 489 f
PS-30 Power supply 99 m
TS-520 Xcvr 399 mve
TS-520S Xcvr 429 mw
TS-520SE Xcvr 449 w
VFO-520 Remote VFO 89 e
VFO-520S Remote VFO 99 m
SP-520 Speaker 19 e
TS-530S/CW filter 499 v
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SP-930 Speaker 55 ce
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R-300 SW receiver 149 f
R-600 SW receiver 229 ve
R-1000 SW receiver 269 v
R-2000/CW filter 399 m
R-2000/VC-10 VHF conv 469 c
TS-600 6m Xcvr 399 c
TS-700A 2m Xcvr 299 ce
TS-700SP 2m Xcvr 389 mc
SP-70 Speaker 19 m
TM-201A 2m FM Xcvr 239 m
TM-211A 2m FM Xcvr 249 w
TM-401A 440 FM Xcvr 239 m
TR-8400 440 FM Xcvr 249 mwc
RM-76 Microproc 49 w
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KPS-12 10A ps 65 mw
MC-50 Desk mic 29 mf
MACROTRONICS
CA-650 Interface/Apple $ 69 m
MIDLAND
13-510 2m FM Xcvr $169 e
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PALOMAR ENG
P-310X Xcvr preamp $ 99 m
PANASONIC
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579 Century/22 Xcvr 269 m
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540/CW filter/NB 319 m
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546C Omni-D series C 569 m
546C/500/1.8 filts 629 v
560 Corsair Xcvr 749 mw
560/250/500 filts 799 m
580 Delta Xcvr/cw filt 399 m
283 Remote VFO 129 m
262G Power supply 89 mcv
262M Power supply 79 m
255 Power supply 129 m
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280 Power supply 99 mw
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234 Speech proc 69 e
444 Hercules Linear 1089 m
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FT-101EE Xcvr 399 wce
FT-101EE/CW filt 429 m
SP-101 Speaker 19 m
FT-77 Xcvr 399 f
FT-707 Xcvr 389 m
FV-707DM Remote VFO 89 m
FT-901DM Xcvr 569 m
FT-902DM Xcvr 769 mv
FV-102DM Remote VFO 229 v
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FTV-650 6m Xvtr 129 m
FTV-901R Xvtr/2m/430 429 f
430 module for xvtr 169 m
FRG-7000 SW Rcvr 289 v
FRG-7700/memory unit 389 wv
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FRA-7700 Active rcv ant 19 v
FRV-7700F VHF conv 79 fv
FT-726R w/HF module 749 m
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(1) This list was prepared from an inventory taken on the date shown. The letters after the prices indicate in which store the equipment was located at that time. The quantities vary. In some cases there are several of an item; others, only one. Due to the lead and distribution time of this publication, some of the items may have already been sold by the time you see this ad. However, due to the number of trades we are involved in each day, some items are in stock that are not listed. (2) We reserve the right to sell certain power supplies and accessories only with matching transmitters or transceivers, depending on our stock situation. (3) Sometimes used gear is serviced after we receive your order. Please allow for a few days delay in shipping your order. (4) No trades on used gear. (5) Used gear policies do not apply to New Equipment special, Closeouts, etc.

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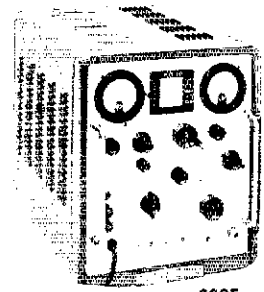

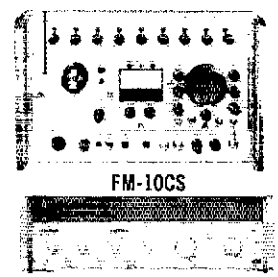

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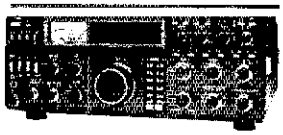

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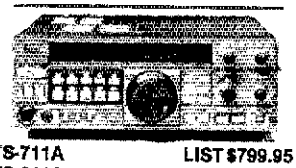

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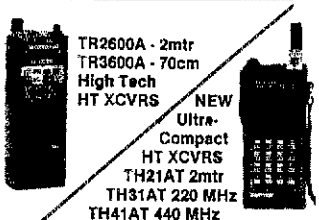

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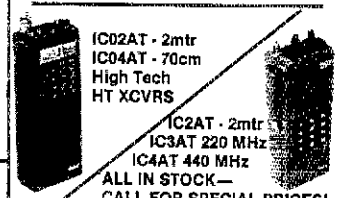

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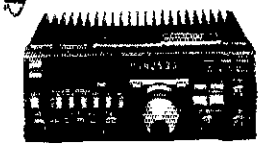

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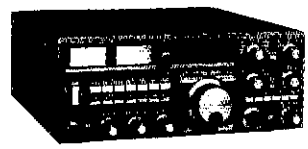

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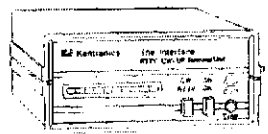

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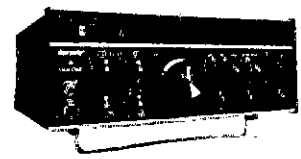

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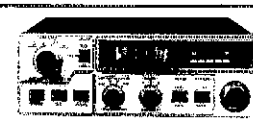

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MFJ-940B, $79.95, 300 watts, SWR/Wattmeter, antenna switch on rear. No balun. 8 x 2 x 6 in. eggshell white with walnut grained sides.
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5x2x6 in. **Use any transceiver,** solid state or tube. Operate all bands with one antenna.

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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.

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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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Roller inductor with a 3-digit turns counter plus a spinner knob for precise inductance control to get that SWR down to minimum every time.

Built-in 300 watt, 50 ohm dummy load, built-in 4:1 ferrite balun.

Built-in 2% meter reads SWR plus forward and reflected power in 2 ranges (200 and 2000 watts). Meter light requires 12 VDC. Optional AC adapter MFJ-1312 is available for $9.95.

6-position antenna switch (2 coax lines, through tuner or direct, random/ balanced line or dummy load). SO-239 connectors, ceramic feed-throughs, binding post grounds.

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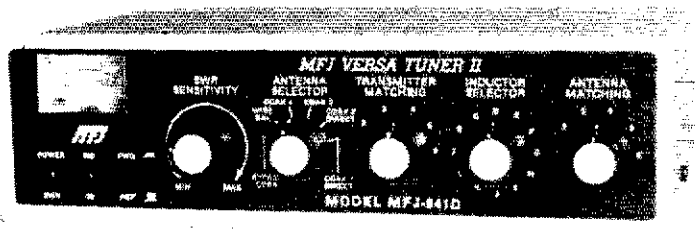

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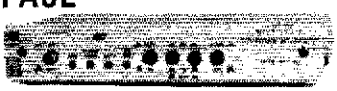

Free MFJ RTTY/ASCII/CW software on tape and cable for VIC-20 or C-64. Send and receive computerized RTTY/ASCII/CW with nearly any personal computer (VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64, etc.). Use Kantronics or most other RTTY/CW software. Copies both mark and space, any shift (including 170, 425, 850 Hz) and any speed (5-100 WPM RTTY/CW, 300 baud ASCII). Sharp 8 pole active filter for CW and 170 Hz shift. Sends 170, 850 Hz shift. Normal/reverse switch eliminates retuning. Automatic noise limiter. Kantronics compatible socket plus exclusive general purpose socket. 8x1¼x6 in. 12-15 VDC or 110 VAC with adapter, MFJ-1312, $9.95.

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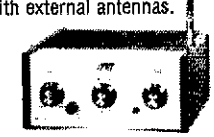

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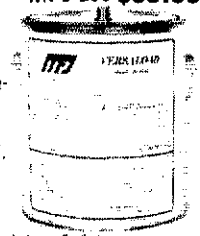

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215 WB	79.00
AOP-1 Oscar Pkg	149.95
Ringo Rangers 2M, 6M, 220, 450	39.95

Complete Line in Stock

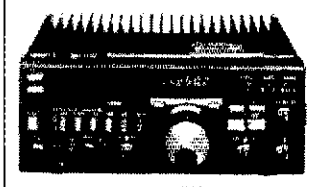
KANTRONICS

Packet Communicator	CALL
U.T.U. Universal Terminal Unit	$179.95
Interface II	229.00
The Challenger	89.95

All HamSoft HamText, AMTOR Programs in Stock—Call for Discount Price

MFJ

1229 Interface/Free Software	$159.95
1224 Interface/Free Software	85.00
1228 Interface/Free Software	59.95
989 3KW Roller Inductor Tuner	289.95
941D Full Feature Tuner	99.95
422 Keyer/Bencher Paddle	99.95



FT757GX
Call for Special Price

MIRAGE

B3016 30-160W PreAmp	$199.95
B1016 10-160W PreAmp	245.00
D1010N 10-100W 430-450 MHZ	279.95

WELZ
All New Models in Stock

ENCOMM

NEW KDK FM 240 25 Watt	CALL

YAESU

FT980 Deluxe Xcvr	$1425.00
FT757GX Gen. Cov. Xcvr	CALL
FC757AT Auto Tuner	435.00
FT757HD P.S. w/Fan	175.00
FT726R Tri-Band Xcvr	779.00
430 Module	249.95
FT209RH 2M H.T. 5W	299.95
FT203R/11	229.95

Much Much More in Stock

ROTORS

Alliance HD-73	$ 99.95
Alliance U-110	49.95
Telex CD-45 II	139.95
Telex HAM-4	229.95
Telex T2X	269.95
Ken Pro KR500	156.00
Ken Pro KR5400	255.00
Ken Pro KR5600	315.00

CABLE

Standard 8 Cond. Rotor	$ .25/ft
Heavy Duty 8 Cond. Rotor	.35/ft
RG8U 97% Shield	.35/ft
RG8X 97% Shield	.25/ft
RG 213	.45/ft

BUTTERNUT

HF2V	$119.00
HF6V	125.00

NYE

MB V A	$499.95

Send SASE for our new & used equipment list.
MON-FRI 9AM - 6PM • SAT 9AM - 3PM

WANTED: ICOM IC-402 432-MHz, SSB/CW portable rig. Contact ARRL Microwave Book Editor, 203-666-1541, ext. 296 or write to Hq.

WANTED: ALPHA 76PA K4NBN "No Bad News".

HOUSE HAM-READY: All cable, poles antennas. Beautiful mountaintop all-brick 4 bedroom, 3 full bath home and Amateur Radio site on one landscaped acre, private with huge inground pool. Located 55 miles from Washington, DC and 60 miles from Baltimore. Easy commute by Amtrak or van pools. Extremely energy efficient brick home, full basement, Radio Room and other extra rooms. Fire alarm system and intercom system stay. Must see to fully appreciate. Call or write to receive free written details of all features. $250,000. John Murray, Box 290, Jefferson, MD 21755, 301-371-7521.

MOVING TO Central Florida? Beautiful QTH, minutes from Disney World, 2,700 air conditioned square feet, lovely half acre wooded lot, prestigious neighborhood. 3 bedrooms, 2 baths, fireplace, sophisticated Radio Shack, game room, screened porch, sun deck, separate matching 600 square foot utility building ideal for workshop or in-law suite. Furnishings possible. Includes 160' Rohn 45G tower, Wilson 5 element monobanders, 10, 15 and 20 meters, inverted V dipoles, 40 & 80 meters, 13' Satellite System. Many other amenities. Superlative QTH for retiring Radio Amateur. $157,000, negotiable. Information, pictures, etc. Call Don, W4JTK, 305-298-3116 or write. Call Book Address.

ATTENTION KENWOOD & Icom Owners: Informative Separate Newsletters! 6th year! Back issues available. Send 38¢ S.A.S.E. for Free Brochure to International Radio, Inc., 364 Kilpatrick Ave., Port St. Lucie, FL 33452, 305-335-5545. Master/Visa accepted.

FOR SALE: 70' Rohn 45G tiltover tower with guys and winch. $950. Hy-Gain 205BA $220. 155BA $140. 105BA $100. (2) 3 kV 120 mFd caps $50 ea. Henry 2K xmfr $75 (new). WA4MMO, 3709 Ludgate Dr., Chesapeake, VA 23321. Ph: 804-484-9516 after 5 PM.

QST BACK ISSUES - New shipment for 1924 to date S.A.S.E. for list. New low prices. W3ZD, 520 Centennial Road, Warminster, PA 18974. 215-675-4539.

NEW EQUIPMENT In Your Future? Before you try and sell the old gear think about sending it to us, get the tax break and feel like a million. Contact WB2JKJ and the Crew at Junior High School 22 on Manhattan's Lower East Side learning English Thru Amateur Radio.

Radio Shack 21-520 dual-meter SWR indicator, $10; Clemens SG-38C solid-state signal generator, $25; ATV Research Microverter, $20; AN-PRM/10 GDO, $10; B&W FC-15 choke, $5; 2 Alpha-Delta R-T Transi-Traps, $10 each; Hamtronics 10-M preamp, $5; Heath SA-2500 antenna tuner, $400; VIC-20 with 16-kbyte expansion module, Kantronics Hamtext, $150; Videx APSIO parallel/serial Apple Interface card, $150; Dragon 64-kbyte computer with software, $100; arrow-cresting machine, $15. Paul K. Pagel, N1FB, 4 Roberts Rd., Enfield, CT 06082. Days: 203-666-1541; evenings before 9 P.M. Eastern, 203-745-1029.

2-METER HANDHELD: Newer Tempo S-1, synthesized, keypad, charger. $99. Duckie $9. Speaker mike $9. Leather case $9. J. D. Naylor, N7XX/5, 13519 Westport, Houston, TX 77079.

GULF COAST - Gulfport, MS 3100 circular ft. elevated home designed as a star, four bedroom, 2½ bath. This house designed by S. Goff, a colleague of Frank Lloyd Wright. On Bayou Bernard with boat dock, many other exquisite features—one of a kind in America—featured in Better Homes magazines, etc. Offered below appraisal of $250,000, owner financing below market possible. Great ham location of W5CH. Call Harrison Realty, 601-436-6982.

SELL HEATH Station: SB303 receiver, SB401 transmitter, SB600 spkr all $300. SB630 console $70. SB620 scan $80. SB220 amplifier $475. Filters for SB/HW: Heath 3.75 kHz $15. Heath 500 Hz $20. Fox-Tango 250 Hz $35. Viking kW Matchbox with SWR $80. 10 day money back qty. W4UKU, Jerry, 803-278-0984 or Callbook.

YAESU FT-ONE like new. With all filters and options plus service manual. $1195. Charlie, WA9HCU, 1-317-324-2279.

LIFETIME SUBSCRIPTIONS: Will transfer mine to your address. CQ, $100. Ham Radio, $100. Worldradio, $75. WA9VLK, Box 874, Kankakee, IL 60901.

PRACTICAL APPLICATIONS MATHEMATICS System on disk for C-64. Will calculate geometric shapes, linear regression, linear interpolation, and base change. A must for calculating mechanical aspects of tower and antenna construction. $29.95. MicroEnergy Systems, P.O. Box 5291, High Point, NC 27262, 919-885-0433.

QRP ARGONAUT 505 w/210 Power Supply. Excellent with manual. $185, unused since Ten-Tec rehab. Jim, KA3JMD, 717-842-2584.

COLLINS 75 S-3, AM filter installed. New bands plus 17 xtals from 4.4 to 29.8 MHz. Excellent condition. $275. Jac, KA1WI, 203-265-5572 evenings.

WANTED: MICROCRAFT Code Star or AEA Field Day code reader. Bill Hecker, KC0ET, 2645 Centennial Ct., Alexandria, VA 22311.

2-METER kW Amp excellent $375, IC-211 all mode $275, Atlas 215X, Console PS, Dig VFO $300, QRP 700 watt amp 80-10 meters $110. Steve, WA5UTO, 405-596-3487.

KENWOOD TS-830S w/Deluxe Knob, MC-60 microphone, excellent $600. Telrex TB5ES 1 yr old excellent $250. N5BCM, 7113 Gracia, Houston, TX 77076, 713-691-5774.

ATLAS 210-X with type 200 PS good condition. $285. Jac, 203-265-5572 evenings, KA1WI.

Three-acre mountain-top QTH NEAR Hendersonville, NC. Estate of K4AA. 2350 square feet, two-level house, detached two-car garage shop area. Appraised $100,000. Phone 704-891-4953 or write Betty Biggs, Box 95, Horse Shoe, NC 28742.

CUSHCRAFT A-3 $175. HD-73 rotator $75. Unused. U-ship. 404-587-4432, KC5VH.

FOR SALE: Azden PC2000 $160. RCA VoltOhmyst $25. 4CX1500B $125. SK800 socket $50. W6HHN, 415-494-1791.

NARDA 8440 R.F. Power Meter .01-12.5 GHz $95, HP-202 LF Audio Oscillator 1 Hz-100k .5% $45. K6KZT, 2255 Alexander, Los Osos, CA 93402.

HEATH HW-32A 20m SSB xcvr and Power Supply (just completed) $90; Lafayette HA-460 6m xcvr $50; Ameco TX-62 xmtr and VFO $50: All stored 15 years and in excellent condition. Freight extra. W4PPY, 804-745-3445.

WANTED - ANY old 2-meter equipment for our school - this equipment can be JUNK to be used for kids that are on Probation from the Court. I. S. Thompson, 159 S. Yuma St., Denver, CO 80223.

SELL QRP Station: Ten-Tec Century/22 50 watt CW transceiver with calibrator and keyer, Astron RS-12A power supply, MFJ-941C antenna tuner. FB condx. First $300 cashiers check. I ship surface. Dr. Martin, AH6N, 98-427 Kilihea Way, Aiea, HI 96701.

KENWOOD TS930S w/Ant Tuner (mint condition) $1400. Kenwood PC-1 Phone Patch $50. 10 meter mobil rig $100. Call Ron Gandy, 806-273-6929 or write 821 Jackson Street, Borger, TX 79007, KB5GU.

MOVING, MUST SELL at a fraction of the original cost: Mosley Triband TA33 $125, Collins KWM2 with Noise Blanker, AC/DC Supplies $450, Sams Photofact $3, Aerotron VHF/FM transceiver $125, Rotator $25, Central Electronics 100V $195, Hickock Signal and Sweep Gen $60, Tubes $1, Lampkin 103B $45, Books, Meters, much more for hobbyists, technicians, engineers. W2FUR, 1096 Laux Place, No. Belmore, NY 11710, 516-785-8876.

FOR SALE: ICOM 740, internal power supply, marker gen, keyer, 250 Hz filter, $700, K6VO, 714-551-4792.

HEATH HW-101 $175. Robot 400 $225. Heath 2K Tuner $85. TH5DX $175. KCØPT, 913-625-7141.

WANTED: DRAKE MN2700 kilowatt antenna tuner, WF4V, 403 Juniper, Port Richey, FL 33568.

TUBES FOR SALE: New additions to stockpile. Send S.A.S.E. for updated list. Mark S. Starin, KB1KJ, 457 Varney Street, Manchester, NH 03102.

KENWOOD TR-2500 hand held, MS1, SMC25, $200. AEA CP-1, $125. Wanted: Kenwood R599D with CW filter. Possibly T599D also. W9XC, 64 Ptarmigan Lane, Durango, CO 81301, 303-247-0088.

SELL MOSLEY TA-33 beam. Excellent condition, you pay shipping by truck. $125. W1WRN, 203-423-2285.

VIC 20-3K Sup/Exp., 8K Exp., Ref. Guide, Wico joystick, Commodore paddles, 3 Gamecarts., 15 tapes. $120. KE2L, 22 Gloucester Rd., Massapequa, NY 11758.

FOR SALE: ICOM 271A, all-mode, 25 watt transceiver w/internal ps, mint, $519. Jim, AD9X, 608-829-3075.

TS-530S FOR SALE, 250/500/2400 Hz filters, $530; AT-230 Antenna Tuner, $130; SP-230 speaker, $30; MC-50 microphone; Package, like new, $675. Jim Stoneback, K4AXF, 703-471-2954.

WANTED: FT902DM. Please write stating condition, price, etc. N8AFX, 808 Daniel, Ann Arbor, MI 48103.

WANTED TO BUY: used HP Signal Generators and counters VLF - Microwave, send lists and prices to John A. Ayres, 7198 S. Quince St., Englewood, CO 80112.

SCANNER: BEARCAT 220. 7 bands including 2 meter FM; a/c-d/c; many features. $199. J. D. Naylor, 13519 Westport, Houston, TX 77079.

HAMSWAP Newsletter - Now taking Free Ads. Buy/Sell/Trade. Plus equipment discounts. Must include phone. 12 issues $9. HamSwap, P.O. Box 420171, Sacramento, CA 95842.

BUTTERNUT HF6V vertical brand new never out of box. $90 delivered. S.A.S.E. for return of checks, if necessary. W8SQS.

30L1, ROUND, late, mint. $695. W8ZR, 1-414-434-2938.

COMPLETE MOBILE Unit-Atlas 210X, plug-in floor mount. Hustler antenna, base-spring, mast, all traps 10-80. Swan MMBX-matchbox-SWR bridge, mike $359. Atlas AR200 power supply $79. W4AHN, 1-704-692-6843.

FOR SALE - YAESU FT-7B, portable, mint status, $385. Holman, 4424 E. Delta, Mesa, AZ 85206.

I GIVE UP my dream of a "Texas" Linear. Everything $150. Pick up only. No shipping. Send for list. W8YBS, 6122 E. Pierson Rd., Flint, MI 48506, 313-736-9207.

COLLINS DC supplies, 516E-1 for KWM-2 negative ground, ser. #850, $75; positive ground, ser. #690, $50. W8JJO, 313-255-1947 or 616-543-4167 evenings.

YAESU FT-101ZD with CW filter, fan and manual. Like new, $455. WB7VOO, 602-298-4820.

KENWOOD TR-7400A $175. ICOM IC-22S $175. Both mint condition with manuals and all accessories. K7GFL, Ph. 1-702-456-9048.

2 METER HT: Santec ST-144 with drop-in charger and external speaker/mic. $180. Robert Bales, 318-251-0043.

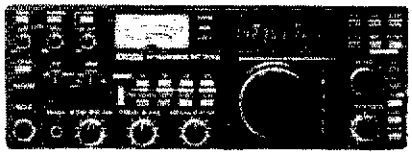
CES 500 simplex autopatch with IC-22S, IC-PS3. $285 or TR-7950 swap. K1LEC, 802-886-8121.

KENWOOD TS-520S, C.W. Filter, DG-5, VFO-520S, SP-520, Shure 444. Will not separate. $600. I ship. 517-799-1749, NB8B.

WANTED TEKTRONIX Probe for Type 190B Sig. Gen. R. Quinn, 2207 Cypress Dr., White Oak, PA 15131.

HENRY 2K3 Linear Amplifier, Kenwood TS520. Best offer. WA9IYG, 312-259-3223.

HF Equipment	Regular	SALE
IC-735 Xcvr/SW rcvr/mic	849.00	749.95
PS-55 Power supply	TBA	
AT-120 Automatic antenna tuner	TBA	
FL-32 500 Hz CW filter	59.50	
EX-243 Electronic keyer unit	50.00	
IC-730 8-band 200w PEP xcvr w/mic	829.00	569.95
FL-30 SSB filter (passband tuning)	59.50	
FL-44A SSB filter (2nd IF)	159.00	144.95
FL-45 500 Hz CW filter	59.50	
EX-195 Marker unit	39.00	
EX-202 LDA interface; 730/2KL/AH-1	27.50	
EX-203 150 Hz CW audio filter	39.00	
EX-205 Transverter switching unit	29.00	
SM-5 8-pin electret desk microphone	39.00	
HM-10 Scanning mobile microphone	39.50	
MB-5 Mobile mount	19.50	
IC-720A 9-band xcvr/.1-30 MHz rcvr	1349.00	799.95
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	779.95
PS-35 Internal power supply	160.00	144.95
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
HM-10 Scanning mobile microphone	39.50	
SM-6 Desk microphone	39.00	
HM-12 Extra hand microphone	39.50	
MB-12 Mobile mount	19.50	



IC-751 9-band xcvr/.1-30 MHz rcvr	1399.00	1199
PS-35 Internal power supply	160.00	144.95
FL-32 500 Hz CW filter (1st IF)	59.50	
FL-63 250 Hz CW filter (1st IF)	48.50	
FL-52A 500 Hz CW filter (2nd IF)	96.50	89.95
FL-53A 250 Hz CW filter (2nd IF)	96.50	89.95
FL-33 AM filter	31.50	
FL-70 2.8 Khz wide SSB filter	46.50	
HM-12 Extra hand microphone	39.50	
SM-6 Desk microphone	39.00	
CR-64 High stability reference xtal	56.00	
RC-10 External frequency controller	35.00	
MB-18 Mobile mount	19.50	
Options: 720/730/745/751	**Regular**	**SALE**
PS-15 20A external power supply	149.00	134.95
EX-144 Adaptor for CF-1/PS-15	6.50	

ICOM

Options - continued	Regular	SALE
CF-1 Cooling fan for PS-15	45.00	
EX-310 Voice synth for 751, R-71A	39.95	
SP-3 External base station speaker	49.50	
Speaker/Phone patch - specify radio	139.00	129.95
BC-10A Memory back-up	8.50	
EX-2 Relay box with marker	34.00	
AT-100 100w 8-band automatic ant tuner	349.00	314.95
AT-500 500w 9-band automatic ant tuner	449.00	399.95
AH-1 5-band mobile antenna w/tuner	289.00	259.95
PS-30 Systems p/s w/cord, 6-pin plug	259.95	234.95
OPC Optional cord, specify 2 or 4-pin	5.50	
GC-4 World clock (Closeout!)	99.95	79.95
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-551D 80 Watt 6m transceiver	699.00	599.95
EX-106 FM option	125.00	112.95
BC-10A Memory back-up	8.50	
SM-2 Electret desk microphone	39.00	
IC-271A 25w 2m FM/SSB/CW xcvr	699.00	569.95
AG-20 Internal preamplifier*	56.95	
IC-271H 100w 2m FM/SSB/CW xcvr	899.00	759.95
AG-25 Mast mounted preamplifier*	84.95	
IC-471A 25w 430-450 SSB/CW/FM xcvr	799.00	699.95
AG-1 Mast mounted preamplifier*	89.00	
IC-471H 75w 430-450 SSB/CW/FM xcvr	1099.00	969.95
AG-35 Mast mounted preamplifier*	84.95	

For a Limited time!
With the purchase of IC-271A/H or IC-471A/H get the matching Preamp* for just $1.00 extra.

Common accessories for 271A/H and 471A/H		
PS-25 Internal power supply for (A)	99.00	89.95
PS-35 Internal power supply for (H)	160.00	144.95
PS-15 External power supply	149.00	134.95
CF-1 Cooling fan for PS-15	45.00	
EX-144 Adaptor for PS-15/CF-1	6.50	
SM-6 Desk microphone	39.00	
EX-310 Voice sythesizer	39.95	
TS-32 CommSpec encode/decoder	59.95	
UT-15 Encoder/decoder interface	12.50	
UT-15S UT-15S w/TS-32 installed	79.95	
VHF/UHF mobile multi-modes		
IC-290H 25w 2m SSB/FM xcvr, TTP mic	549.00	479.95
IC-490A 10w 430-440 SSB/FM/CW xcvr	649.00	579.95
VHF/UHF/1.2 GHz FM	**Regular**	**SALE**
IC-27A Compact 25w 2m FM w/TTP mic	369.00	319.95
IC-27H Compact 45w 2m FM w/TTP mic	409.00	359.95
IC-37A Compact 25w 220 FM, TTP mic	449.00	299.95
IC-47A Compact 25w 440 FM, TTP mic	469.00	419.95
UT-16/EX-388 Voice synthesizer	29.95	
IC-3200A 25w 2m/440 MHz FM xcvr	549.00	489.95
IC-120 1w 1.2 GHz FM transceiver	499.00	449.95
ML-12 10w amplifier	339.00	299.95
6m portable	**Regular**	**SALE**
IC-505 3/10w 6m port. SSB/CW xcvr	449.00	399.95
BP-10 Internal Nicad battery pack	79.50	
BP-15 AC charger	12.50	
EX-248 FM unit	49.50	
LC-10 Leather case	34.95	
SP-4 Remote speaker	24.95	

Hand-held Transceivers

Deluxe models	Regular	SALE
IC-02AT for 2m	349.00	289.95
IC-04AT for 440 MHz	379.00	289.95
Standard models	**Regular**	**SALE**
IC-2A for 2m	239.50	189.95
IC-2AT with TTP	269.50	199.95
IC-3AT 220 MHz, TTP	299.95	239.95
IC-4AT 440 MHz, TTP	299.95	239.95

Accessories for Deluxe models	Regular
BP-7 425mah/13.2V Nicad Pak - use BC-35	67.50
BP-8 800mah/8.4V Nicad Pak - use BC-35	62.50
BC-35 Drop in desk charger for all batteries	69.00
BC-60 6-position gang charger, all batts SALE	359.95
BC-16U Wall charger for BP7/BP8	10.00
LC-11 Vinyl case	17.95
LC-14 Vinyl case for Dlx using BP-7/8	17.95
LC-02AT Leather case for Dlx models w/BP-7/8	39.95
Accessories for both models	**Regular**
BP-2 425mah/7.2V Nicad Pak - use BC35	39.50
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	29.50
BP-4 Alkaline battery case	12.50
BP-5 425mah/10.8V Nicad Pak - use BC35	49.50
CA-2 Telescoping 2m antenna	10.00
CA-5 5/8-wave telescoping 2m antenna	18.95
FA-2 Extra 2m flexible antenna	10.00
CP-1 Cig. lighter plug/cord for BP3 or Dlx	9.50
DC-1 DC operation pak for standard models	17.50
LC-2AT Leather case for standard models	34.95
RB-1 Vinyl waterproof radio bag	30.00
HH-SS Handheld shoulder strap	14.95
HM-9 Speaker microphone	34.50
HS10 Boom microphone/headset	19.50
HS-10SA Vox unit for HS-10 & Deluxe only	19.50
HS-10SB PTT unit for HS-10	19.50
ML-1 2m 2.3w in/10w out amplifier	SALE 79.95
SS-32M Commspec 32-tone encoder	29.95

Shortwave receiver	Regular	SALE
R-71A 100 kHz-30 Mhz digital receiver	$799.00	659.95
RC-11 Wireless remote controller	59.95	49.95
FL-32 500 Hz CW filter	59.50	
FL-63 250 Hz CW filter (1st IF)	48.50	
FL-44A SSB filter (2nd IF)	159.00	144.95
EX-257 FM unit	38.00	
EX-310 Voice synthesizer	39.95	
CR-64 High stability oscillator xtal	56.00	
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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TS-430S OWNERS: Scan-Loc enhances scanning feature. Audio level or squelch priority, MS & PG.S modes. $19.95 Assembled · Guaranteed · Shipped! Contact MICROCOMM, P.O. Box 1003, Mauldin, SC 29662.

55-YEAR COLLECTION tubes (inquire) W5QJT, 915-532-2509.

HEATH SB104A transceiver with matching SB-604 Speaker plus HP-1144A Power Supply. CW filter. Expertly wired. 30 day guarantee. $450. Immediate UPS shipment. Bob Eiselt, KAØAFG, 517 South Lakeshore, Spirit Lake, IA 51360, 712-336-1342.

SELL: IC-751, RC-10, Instruction and Service Manuals, $950. Earl, WØSEV, 803-877-6886.

MOVING SALE: Cleaning out shack, S.A.S.E. list. WA3ZEP.

ROSS $$$$ New Specials (July only): If you don't see what you want, send Call Letters, name & phone # for personal price quote. Over 6500 ham-related items in stock. ICOM # IC-735 PHONE, IC-45A $299.90, IC-745 $768.90, IC-04AT $285.90, IC-271A $529.90, Kenwood #TS-940S/wAT $1699.90, TH-21AT $194.90 + Extra PB-21 10¢, TR-8400 $379.90, TR-7950 $356.90, TS-430S $667.90, TM-211A $299.90, VFO-240 $139.90, TW-4000A $489, TS-780 $759.90, Yaesu #SP-107 $24.50, FT-757GX $719.90, FT-708R $219.90, FRG-7700 $369.90, FRG-8800 $589.90, FC-102 $229.90. All major lines stocked, L.T.O. Mention ad. Prices cash, FOB Preston. We close at 2:00 on Saturdays & Mondays. Ross Distributing Company, 78 South State, Preston, ID 83263, 208-852-0830.

TR7, PS7, .3, 1.8, 6.0, NB7, AUX7, FA7, RV7, 7077 Mic, Service Manual $800. TR5, PS75, .5, NB5, FA7, RV75, $725. MN7 $100. Argosy, 225 Power Supply, filters, etc. $425. 606-441-9684, WB4ZCD.

WANTED TWO items - CA-5 Adapter for Hickok 600-A Tube Tester or a Tester that will check #8950 tubes. Also need manual Eldorado 986 Microwave Counter. K4AOZ, 205-822-0585.

PLATE XFMR, UTC S-49 4200/3600/3000 VCT, 300 mA. $50 plus shipping. Some solid state H.V. diodes and capacitors. Call 952-3643, lv msg or evenings, Phil Marquis, K6HSV.

FOR SALE: Complete Hal Station including the following: KB2100, CT2200, ARQ1000, RS2100, and KG12N. All cables, manuals anc cartons. Mint. $1400. NE8Y, 906-265-5362.

ROSS $$$$ Used July Specials: (over 200 used items in stock) Kenwood TS-130S $469, TR-2400 $169.90, TS-180S $429, TR-9500 $459, TS-930S w/AT $1190, Robot 800 $299, 1200C $1089, Yaesu FT-301D $339.90, FT-101ZD $459, FT-620B $279, ICOM IC-245 $169, IC-551D/wFM $579.90, IC-701 $389.90. If this month's special is not what you are looking for send S.A.S.E. Call Letters, name & phone # for used list. Over 6,500 new ham related items in stock. Mention ad. Prices cash, FOB Preston. We close at 2:00 on Saturdays & Mondays. Ross Distributing Company, 78 South State, Preston, ID 83263, 208-852-0830.

WANTED: A DUAL-TRACE Scope 10 MHz or better. John Davis, 415 Mountainview Ave., S.I. N.Y. 10314, 718-698-3690.

FOR SALE: ICOM IC-745 w/int power supply. Also has internal keyer, FM unit, and Marker unit. Perfect condition. Used very little. $800. C-64 Hamtext $45. MFJ-1224 $45. Write Steve Genusa, WD5EAE, 2106 Park Avenue, Monroe, LA 71201.

DIGITAL AUTOMATIC DISPLAYS. All transceivers. Six ½" digits. 5" wide by 1¼" by 9" cabinet. Send $1 for information. Grand Systems, POB 3377, Blaine, WA 98230. Canadians VE7LB.

DRAKE WANTED: RV-6 or RV-4 series remote VFO. Contact G. Hawrysko, K2AWA, P.O. Box 568 Boro Hall, Jamaica, NY 11424.

HYGAIN QK-710 30/40 meter add-on kit for Explorer 14 beam. New, still in box. $84. Jay, W4QDC, 703-434-7750.

REPLACE RUSTED Antenna Bolts with Stainless Steel. Small quantities, free catalog. Elwick, Dept. 552, 230 Woods Lane, Somerdale, NJ 08083.

H.W. 101, no p.s. Trade for Drake R4B or T4XB. E. Foster, Box 503, Russell, NY 13684.

COMMODORE OWNERS: IMCT (International Morse Code Trainer) V1.4 for the 64 or unexpanded VIC. Menu-driven + documentation + random tests + (1-25 WPM) + adjustable pitch + enter characters and hear the Morse sound. 64 also has the following: 9 step by step lessons + user-defined tests + straight key simulator. 20 version $9.95, 64 version $14.95. Pa. add 6% AC3L SOFTWARE P.O. Box 7, New Derry, PA 15671.

FOR SALE: Model #32 VW 115 volt Telex Machine in perfect condition. Priced at $300. Call Bud Wood, 800-545-2800.

DRAKE L-7 2 kW amplifier, mint, $800, K8IFF, 313-676-2872.

SELL: ICOM 730, 80-10 mtrs transceiver with ICOM PS15, 20 amp power supply, DC power cord for mobile use, mikes, Drake 1000 watt low pass filter, with original manuals, all excellent. Package $450. N6FQP, Bob, 213-426-1259 after 7 PM PST.

COLLINS 75S-1, very fine, $149; 32S-1, excellent, (with 516F-2) $199. HW-32 (20 mtrs) w/ps, $55; N7DCS, 3837 SE 40, Portland, OR 97202.

TENTEC ARGOSY with optional filter, matching power supply, desk mike, keyer, $495. Yaesu FT-203R, matching VOX headset, car adapter, AEA Hot-Rod whip, $200. All mint, original owner, will insure, call N2CJO, 201-852-2516 after 6 PM EDST.

REPAIR HAM Equipment. FCC #PG-17-7358. 417-882-7479 from 11 AM-6 PM Central, not Sundays, Wednesdays. KDØBN.

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The **only** repeaters and controllers with REAL SPEECH!

No other repeaters or controllers match Mark 4 in capability and features. That's why Mark 4 is the performance leader at amateur and commercial repeater sites around the world. Only Mark 4 gives you Message Master™ real speech • voice readout of received signal strength, deviation, and frequency error • 4-channel receiver voting • clock time announcements and function control • 7-helical filter receiver • extensive phone patch functions. Unlike others, Mark 4 even includes power supply and a handsome cabinet.

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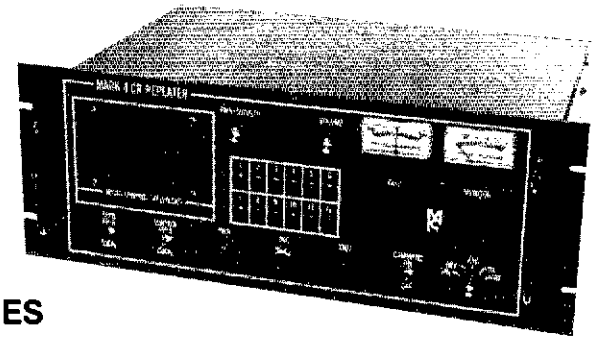
Create messages just by talking. Speak any phrases or words in any languages or dialect and *your own voice* is stored instantly in solid-state memory. Perfect for emergency warnings, club news bulletins, and DX alerts. Create unique ID and tail messages, and the ultimate in a real speech user mailbox — only with a Mark 4.



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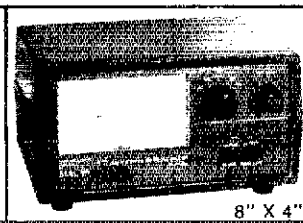

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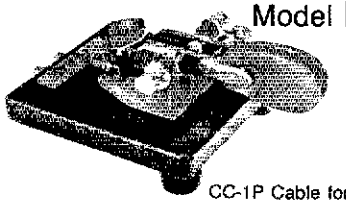
Model HK-1 HAM-KEY®



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- Dual Lever Squeeze Paddle
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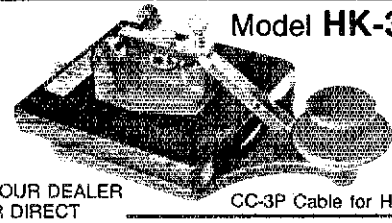

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- Battery operated

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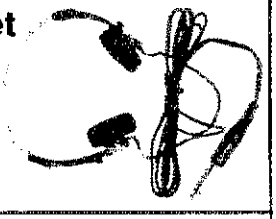

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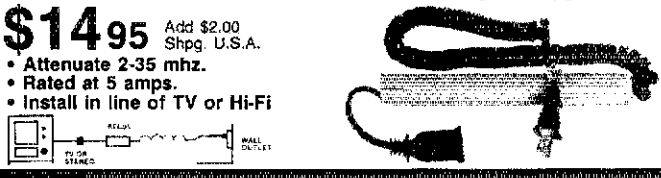

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- Attenuate 2-35 mhz.
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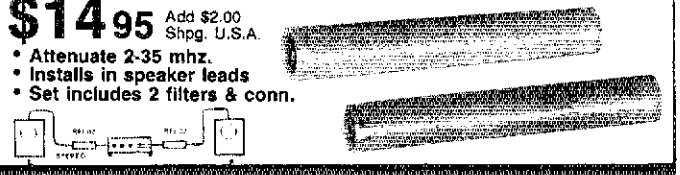

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Saturday,
July 13, 1985
9:00a.m. till 5:00p.m.

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A1015—6 Meter Amplifier
10 Watts In—150 Watts Out
All Mode Operation with Rx Preamp
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All Mode Operation with Rx Preamp
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Operates with 2 to 30 Watts Input
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C22A—1¼ Meter H/T Amplifier
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All Mode Operation with Rx Preamp

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High Power H/T Amplifier
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C1012—1¼ Meter Dual-Purpose Amplifier
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2 Watts In—40 Watts Out
All Mode Operation with Rx Preamp

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All Mode Operation with Rx Preamp

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2 Watts In—40 Watts Out
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Optional "N" Type Connectors

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All Mode Operation FM,SSB,CW,ATV
Optional "N" Type Connectors

D3010—430-450 MHz Amplifier
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All Mode Operation FM,SSB,CW,ATV
2 to 35 Watts Input

BACKED BY THE INDUSTRY'S ONLY 5 YEAR WARRANTY
See the complete line of Mirage RF Amplifiers, Peak Reading Watt/SWR Meters and accessories at your local dealer or contact:

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P.O. Box 1000
Morgan Hill, CA 95037
(408)779-7363

SEE PAGE 141

TRADE-IN'S WANTED on new latest model American made Ten-Tec 561 Corsair II. Also taking trade-ins on new model Ten-Tec 425 Titan Linear Amplifier. If you have clean American or imported Amateur gear with manuals to trade, write Bill Slep for quick quote. It will be the best deal you ever made. Slep Electronics Company, Highway 441, Otto, NC 28763.

KENWOOD TS-520, VFO-520, SP230 very good condition $525. WB2HYO, RD1, Andover, NJ 07821, 201-852-8054.

TENTEC: Omni-D, 546 and 546B, Century 21, Model 570, Macaw DPM-1 SWR, MFJ900 Econo Tuner, Argosy 525D, 544 Triton, HW16, HG10, Nye Viking 2000W low pass filter, XZ-2 Bencher Audio Filter, Ten Tec Power Supplies, Models 225, 262G, 252M, 252MO, Atlas 210X. Best offer on each. Call 212-406-4001, 201-628-1298, Bob, WB2DHK.

RETAIL STORE being liquidated by mail auction. Parts, tools, test equipment, ham supplies. S.A.S.E. to ESI, Box 328, Mesa, AZ 85201.

MADISON USED Guaranteed: Kenwood TS930S/AT $1000; TS830S $600; TS820S/CW $495; TS520S $429; TS520SE $469; TS530S $529; TS520 $395; R820/CW $495. Collins 51S-1 (Rockwell) $800; 32S-1/AC, clean $295; 75S3 $295; 32S3/AC $395; 30L1 $450; 312B4 $125; MM1 $25; MM281 $40; Alpha 70V $1800. Call HF items not listed. Prices FOB Houston, guaranteed 90 days, full trade six months new; sales price refunded if not satisfied. Madison Electronics, new address 3621 Fannin Street, Houston, TX 77004. 1-800-231-3057 (US) 1-713-520-7300, old 1-713-658-0268.

DRAKE R-4C, T-4XC, AC-4, $485; HW-12 (80M transceiver) $40; winged 32S-3, 75S-3B, 312B-3, 516F-2, $560; all postpaid. Wanted: 6M, 10M beams. Paul Husby, WØUC, 1697-C Fulham, Lauderdale, MN 55113. 612-642-1559.

INTEGRATED CIRCUITS Data Books For Sale. Business size S.A.S.E. ($0.39) for long list. Frazier, Box 972, Windermere, FL 32786.

UHF-COMPENDIUM, Volume 1, by Karl Weiner, DJ9HO, 413 pages German/European knowhow, $20 p.p., Gerd Schrick, WB8IFM, 4741 Harlou, Dayton, OH 45432.

SELL: DRAKE R7 receiver, NB7A, 1.8 & 4.0 kHz filters, AUX-7 board. Programmed for Ham and SWL bands. Just completely tuned by Drake. $825. Paul, W8HSU, 216-835-0610.

ULTRA PERFORMANCE '930S T/A. Absolutely mint 3 months new $1000 in extras AM-FM 2.1 Side Band Filter, 16 memories 10 Hz readout. Have receipts-manuals-Shure 444 mike cost $2795 sacrifice $1400 M.O. or Check FOB W6MRE Don 818-344-6309.

MADISON-REPAIR. 90-day guarantee. We can fix 1960-1980's gear with schematic. Five techs: Lots test gear. Madison Electronics, new address 3621 Fannin Street, Houston, TX 77004. 1-713-520-7300. Old 1-713-658-0268. Mastercard/VISA/COD.

HY-GAIN ANTENNA rotor. Mint condition. Half price. W8AAH, 616-843-2053.

SIGNAL/ONE CX-11A, late series, immaculate, used little, estate settlement. 150 watt output $3000. 200 watt output $3300. Will trade. Don Payne, K4ID, 615-384-2224.

COCO SOFTWARE by dataLOG! Comprehensive logbook program DXCC/WAS Database - CoCo Morse w/interface - Disk Utilities. Write or call for free catalog. dataLOG Software, WA4FNG, P.O. Box 10531, Jacksonville, FL 32247, Ph. 904-396-6572.

SELL COLLINS DL-1 dry dummy load $45. Drake DC-3 D.C. power supply $30. Vomax SP-3 speed processor and p.s. $50. Drake CC-1 console $15. Heavy duty 8 ga Rotary Inductor 160-10 $35. 75A4 800 Hz filter $75. Robot 70 E80, Slow Scan excellent $120. New 12" × 12" × 6 cabinet $25. Two meter F.M. Kenwood TR2200 $45. Call WA1TQQ, Guy S. Quartarone, 14 Cedar Way, Stoneham, MA 02180.

FREE SHIPPING, Continental USA, Mini-Quad's $139.95, Buttemut HF6V's and HF2V's $106.50, Nye MB-V-A's $468, Dipole Packages, Other Specials, Stamp for flyer, Don, Hart Eastern Communications, 1444 Darlington, Derby, NY 14047, 716-947-4840.

YAESU FT101EX w/options & YC-601 Digital Display Unit & manuals for sale. Asking $400. K3ACR, Rich, tel. 215-885-6557.

COLLINS WING 32S3 with 516F2 $325. 312B4 $125. All mint. Bill, AA6S, 209-732-7163.

WANTED: RADIO theory audio cassette tapes. NA4X, 5984 S.W. 83 St., Miami, FL 33143.

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ENGINEERING, TECHNICAL and PROFESSIONALS needed in Maine. Maine Professional Engineering Group, 1 Long Point Road, Belgrade Lakes, Maine 04918.

ELECTRONIC TECHNICIAN: Proto Type work, ability to read schematics & construct working models. Familiarity with all common instruments & microwave test equipment is especially helpful.
ELECTRONIC TECHNICIAN/PRODUCTION: Good dexterity required. If you know the fundamentals we will teach you the rest.
B&H Electronics is located 40 miles north of N.Y.C.
Full benefits. Please send your resume & all pertinent references in full confidence to, B&H Electronics Co., P.O. Box 490, Chester, NY 10918.

OPERATOR WANTED part-time for Marine Coast Station in New Haven. Exp desirable but willing to train. Telegraph license preferred, 20+ WPM desirable. Reply: WKM/West Haven, 203-937-5074.

RADIO OFFICER - FCC and USCG licenses, and 6-month endorsement required for sea-going employment. Excellent money and fringes for technically qualified person. Send resume and copies of licenses to: Box QS 2413, 810 Seventh Ave., New York, NY 10019.

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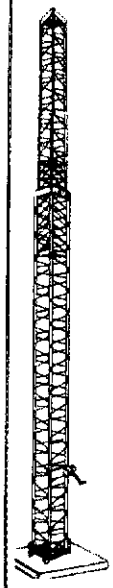
ANTENNA/TOWER SALE!



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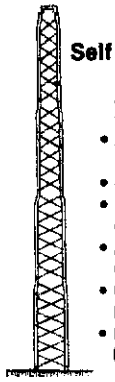
All Models Shipped Factory Direct—Freight Paid*!

Check these features:
- All steel construction
- Hot dip galvanized after fabrication
- Complete with base and rotor plate
- Totally self-supporting—no guys needed

Model	Height	Load	Sale Price
HG37SS	37 ft.	9 sq. ft.	$749
HG52SS	52 ft.	9 sq. ft.	$1099
HG54HD	54 ft.	16 sq. ft.	$1699
HG70HD	70 ft.	16 sq. ft.	$2699

Masts—Thrust Bearings—Other Accessories Available—Call! Prices Shown Are Your Total Delivered Price In Continental U.S.A.!



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Self Supporting Towers On SALE!
FREIGHT PREPAID

- All Steel Construction—Rugged
- Galvanized Finish—Long Life
- Totally Free Standing—No Guy Wires
- America's Best Tower Buy—Compare Save $
- Complete With Base and Rotor Plate
- In Stock Now—Fast Delivery

Model	Height	Ant. Load*	Weight	Delivered Price*
HBX40	40 ft	10 sq ft	164	$329
HBX48	48 ft	10 sq ft	303	$429
HBX56	56 ft	10 sq ft	385	$499
HDBX40	40 ft	18 sq ft	281	$399
HDBX48	48 ft	18 sq ft	363	$489

*Your Total Delivered Price Anywhere in Continental 48 States. Antenna Load Based on 70 MPH Wind.

Tri-Ex®

These rugged crankup towers now available from Texas Towers! All models available On Sale for tremendous savings to you!

To save on freight costs, all towers are shipped directly from the Tri-Ex factory to you!

Check these features:
- **All steel construction**
- **Hot dip galvanized after fabrication**
- **Complete with base and rotor plate**
- **Totally self-supporting—no guys needed**

Model	Height Up	Down	Wind Load	List	Sale
W36	36.0 ft	20.5 ft	9.0 sq ft	$694	$579
WT51	51.0 ft	20.5 ft	9.0 sq ft	$1154	$899
LM354	54.0 ft	21.0 ft	16 sq ft	$2010	$1599
LM470D (Motorized)	70.0 ft	22.0 ft	16 sq ft	$4195	$3199
DX86 (Motorized)	86.0 ft	23.0 ft	25 sq ft	$7200	Call

BUTTERNUT ELECTRONICS CO.

HF6V $129 Delivered (Cont. USA)

- Full Legal Power 80/10 Meters
- Optional Stub Tuned Radial Kit Model STR II $29
- Optional Roof Mounting Kit Model RMK II $49 (includes STR II)
- Optional 160 Meter Resonator Kit Model TBR 160HD $49

New 80/40 Meter Vertical Antenna HF2V $129 Delivered (Continental USA)

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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
- Non-contaminating Vinyl Jacket Foam Dielectric

Coaxial Cable Loss Characteristics (DB/100 ft)

Cable Type	Imped.	10MHz	30MHz	150MHz	450MHz
RG-213/U	50	.6	.9	2.3	5.2
RG8X	52	.8	1.2	3.5	6.8
RG-58/U	52	1.4	1.9	6.0	12.5
½" Alum	50	.3	.5	1.2	2.2
½" Heliax	50	.2	.4	.9	1.6
¾" Heliax	50	.1	.2	.5	9

HARDLINE/HELIAX™

Lowest Loss for VHF/UHF!

½" Alum w/poly Jacket ... $.79/ft
½" LDF4-50 Andrew Heliax ™ $1.69/ft
⅞" LDF5-50 Andrew Heliax ™ $3.99/ft
select connectors below.

HARDLINE & HELIAX ™ CONNECTORS

Cable Type	UHF FML	UHF MALE	N FML	N MALE
½" Alum	$19	$19	$19	$25
½" Heliax ™	$22	$22	$22	$22
⅞" Heliax ™	$49	$49	$49	$49

AMPHENOL CONNECTORS
Silver PL259.... $1.25
UG218 N Male... $2.95 UG23D N Female... $2.95

Antenna Wire & Accessories
Copperweld Antenna Wire (steel core, copper coated
Solid 12 ga..... $.12/ft 14 ga ... $.10/ft
Stranded 14 ga.... $.10/ft 16 ga... $.09/ft
¼ mile 18 ga copper-clad steel wire..... $30
6 inch heavy-duty end insulator..... $2.00/ea
Dog-bone insulator... $.79 Coax seal... $2.50

Van Gorden
1:1 Balun .....$11 Center Insulator.....$6
Dipole Kits..... D80 $31/D40 $28
Short Dipole Kits SD80 $35/SD40 $33
All-band Dipole w/ ladder line $29
Eavesdropper SWL Antenna..... $64

CUSHCRAFT

MULTI-BAND HF ANTENNAS
A3 3-el Tribander ... $219 A4 4-el Tribander... $289
R3 20/15/10mtr Vert $279 A743/A744 40mtr Kit..$75

HF MONO-BAND ANTENNAS

10-3CD	$ 95	10-4CD	$109
15-3CD	$119	15-4CD	$129
20-3CD	$199	20-4CD	$279
40-2CD	$289	D40	$149

VHF/UHF BEAMS

A50-5	$ 79	617B	$199
214B	$ 79	3219	$ 95
220B	$ 95	424B	$ 79

OSCAR/TWIST ANTENNAS

A144-10T	$ 52	A144-20T	$ 75
A147-20T	$ 63	416TB	$ 59
A14TMB	$ 29	PS4	$ 69

VHF/UHF FM ANTENNAS

A147-4	$ 29	A147-11	$ 49
214FB	$ 79	228FB	$219
A449-6	$ 29	ARX2B	$ 39

HY-GAIN

Discoverer 2-el 40-mtr Beam	**$339.00**
Discoverer 3-el Conversion Kit	**$219.00**
EXPLORER-14 SUPER SPECIAL	**$329.00**
QK710 30/40 mtr Add-On-Kit	$85
V2S 2-mtr Base Vertical	$49
TH5MK2S Broad Band 5-el Triband Beam	$419
TH7DXS 7-el Triband Beam	$479
TH3JRS 3-el Triband Beam	$199
TH2MK3S 2-el Triband Beam	$179
205BAS 5-el 20-mtr Beam	$369
155BAS 5-el 15-mtr Beam	$219
105BAS 5-el 10-mtr Beam	$149
204BAS 4-el 20-mtr Beam	$269
64BS 4-el 6-mtr Beam	$69
66BS 6-el 6-mtr Beam	$139
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

HUSTLER

6BTV 80-10 mtr Vert $129 5BTV 80-10 mtr Vert. $109
4BTV 40-10 mtr Vert .$89 G7-144 2-mtr Base..$119
G6-144B 2-mtr Base..$89

Mobile Resonators	10m	15m	20m	40m	75m
400W Standard	$16	$17	$19	$22	$26
2KW Super	$20	$22	$25	$29	$39

Bumper Mounts • Springs • Folding Masts In Stock!

MINI-PRODUCTS HQ-1
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Wing Span - 11 ft — Wind Area - 1.5 sq ft
Boom - 54 in. long — 1200W P.E.P. Input

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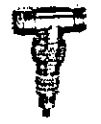
Transi-Trap Surge Protectors—In Stock Now!
Model LT 200W UHF Type.. $19
Model HT 2KW UHF Type.. $29
RT 200W Deluxe UHF Type.. $29
RT/N 200W Deluxe N Type.. $32
HV 2KW Deluxe UHF Type.. $32
HV/N 2KW Deluxe N Type.. $35



KLM

KT34A 4-el Broad Band Triband Beam	$339
KT34XA 6-el Broad Band Triband Beam	$489
40m-1 40-mtr Rotatable Dipole	$179
40m-2 2-el 40-mtr Beam	$309
40m-3 3-el 40-mtr Beam	$459
40m-4 4-el 40-mtr Beam	$649
2m-13LBA 13-el 2-mtr Beam	$79
2m-14C 14-el 2-mtr Satellite Antenna	$89
2m-16LBX NEW-16-el 2-mtr Beam	$99
2m+22C NEW-22-el 2-mtr Satellite Antenna	$119
432-30LBX NEW-30-el-432 MHz Antenna	$99
435-18C 435 MHz Satellite Antenna W/CS-2	$119
432-16LB 16-el 432 MHz Beam	$69
435-40CX 435 MHz Satellite Antenna w/CS-2	$159

ROTORS

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)	$269
Telex HDR300 Heavy Duty (25 sq ft rating)	$519
KLM EL-3000 Moon Tracker Elevation Rotator	$369
Kenpro KR400 Azimuth Rotator	$129
Kenpro KR500 Heavy Duty Elevator Rotator	$159
Kenpro KR600 Azimuth Rotator	$199
Kenpro KR2000 Heavy Duty Azimuth Rotator	$379
Kenpro KR5400 AZ/EL Rotor Package	$259
Kenpro KR5600 Heavy Duty AZ/EL Rotor Pkg	$329

ROTOR CABLE

Standard 8 cond cable $.19/ft (vinyl jacket 2-#18 & 6-#22 ga)
Heavy Duty 8 Cond cable $.36/ft (vinyl jacket 2-#16 & 6-#18 ga)

UNR-ROHN GUYED TOWERS

10 ft Stack Sections

20G $39.50	45G $112.50
25G $49.50	55G $134.50

All 20G, 25G, 45G and 55G Accessories In Stock at Discount Prices - CALL!

Foldover Towers	Model	Height	Ant Load*	Price
	FK2548	48 ft	15.4 sq ft	$899
	FK2558	58 ft	13.3 sq ft	$949
	FK2568	68 ft	11.7 sq ft	$999
	FK4544	44 ft	34.8 sq ft	$1199
	FK4554	54 ft	29.1 sq ft	$1299
	FK4564	64 ft	28.4 sq ft	$1399

25G Foldover Double Guy Kit..... $219
45G Foldover Double Guy Kit..... $249

*Above antenna loads for 70 MPH winds and Guys at Hinge & Apex.

TOWER/GUY HARDWARE

3/16" EHS Guywire (3990 lb rating)	$.15/ft
1/4" EHS Guywire (6000 lb rating)	$.18/ft
5/32" 7 × 7 Aircraft Cable (2700 lb rating)	$.15/ft
3/16" CCM Cable Clamp (3/16" or 5/32" Cable)	$.45
1/4" CCM Cable Clamp (1/4" Cable)	$.55
1/4" TH Thimble (fits all sizes)	$.45
3/8EE (3/8" Eye & Eye Turnbuckle)	$6.95
3/8"EJ (3/8" Eye & Jaw Turnbuckle)	$7.95
1/2"EE (1/2" Eye & Eye Turnbuckle)	$9.95
1/2"EJ (1/2" Eye & Jaw Turnbuckle)	$10.95
3/16" Preformed Guy Grip	$2.49
1/4" Preformed Guy Grip	$2.99
6" Diam - 4 ft Long Earth Screw Anchor	$14.95
5000 Guy Insulator (5/32" or 3/16" Cable)	$1.69
502 Guy Insulator (1/4" Cable)	$2.99
5/8" Diam - 8 ft Copper Clad Ground Rod	$12.95

PHILLYSTRAN GUY CABLE

HPTG2100 Guy Cable (2100 lb rating)	$.29/ft
HPTG4000 Guy Cable (4000 lb rating)	$.49/ft
HPTG6700 Guy Cable (6700 lb rating)	$.69/ft
9901LD Cable End (for 2100/4000 cable)	$7.95
9902LD Cable End (for 6700 cable)	$8.95
Sockelfast Potting Compound (does 6-8 ends)	$14.95

GALVANIZED STEEL MASTS

Heavy Duty Steel Masts 2 in OD - Galvanized Finish

Length	5 FT	10 FT	15 FT	20 FT
.12 in Wall	$29	$49	$59	$79
.18 in Wall	$39	$69	$89	$129
.25 in Wall	$69	$129	$189	$249

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TS-430S Most Advanced, Compact HF Transceiver

- General Coverage Receiver
- USB/LSB/CW/AM/Optional FM • 10Hz Dual Step Digital VFO • Eight Memories w/Lithium Back-up • Memory and Band Scan

KENWOOD

TS-930S Top of the Line HF Transceiver

- General Coverage Receiver • Superior Dynamic Range • All Solid State—28 VDC Final • QSK CW • Optional Automatic Antenna Tuner • Dual VFO w/8 Memories • Dual Mode Noise Blanker

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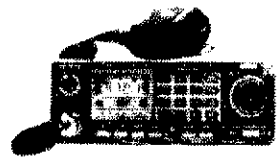

TR-7950/7930

- Large LCD Readout • 21 Multi-Function Memory • Lithium Back-up • Automatic Offset • Built-in Encoder • Memory or Band Scan

KENWOOD

TR-2600

2.5W/300 mW (Switchable) 2 Meter Handheld Transceiver

- LCD Readout • Ten Memories w/Lithium Back-up • Band and Memory Scan • Built-in Sub-tone Encoder

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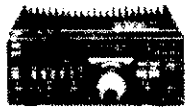

FT-757 GX

Compact General-Coverage Receiver

- General-Coverage Receiver
- USB/LSB/CW/AM/FM • Dual VFOs
- Memory/Band Scan • Speech Processor • CW Filter and CW Keyer included

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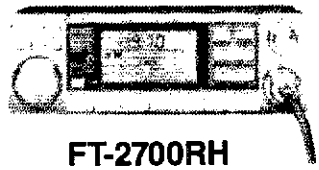

FT-2700RH

Dual Bander

- VA/VHF FM
- 144/430 MHZ
- 25 WATTS

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FT-209RH

- 5 Watts
- 10 Memories
- LCD
- Compact

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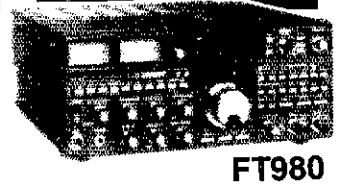

FT980

CAT SYSTEM—Computer Aided Transceiver

- Wide Dynamic Range • General Coverage • Low Noise Front End • 10 Hz Digital Readout • All Mode Transceive—CW/SSB/AM/FM/FSK!

ICOM

IC-745 HF Base

All ham band HF transceiver. 16 memories, 100KHz to 30 MHz general coverage receiver and adjustable noise blanker and AGC

ICOM

IC-27A Compact Mobile

A breakthrough in 2-meter mobile communications! Most compact on the market (5½" x1½" Hx7" D), contains internal speaker for easy mounting; 25 watts, 32 PL frequencies, 9 memories, scanning and touchtone mic

ICOM

IC-02AT

The IC-02AT 2-meter LCD readout handheld features 10 memories, 32 PL tones, scanning, keyboard frequency entry, dial lock, 3W std., 5W opt. DTMF

ICOM

IC-R71A General Coverage Receiver

The IC-R71A 100KHz - 30 MHz superior-grade general coverage receiver features keyboard frequency entry, 32 memories, SSB/AM/RTTY/CW, selectable AGC and noise blanker, and wireless remote controller (optional)

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Yaesu has serious listeners for the serious listener.

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The FRG-9600. A premium VHF/UHF scanning communications receiver. The 9600 is no typical scanner. And it's easy to see why.

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The FRG-8800 HF communications receiver. A better way to listen to the world. If you want a complete communications package, the FRG-8800 is just right for you.

You get continuous worldwide coverage from 150 KHz to 30 MHz. And local coverage from 118 to 174 MHz with an optional VHF converter.

Listen in on any mode: upper and lower sideband, CW, AM wide or narrow, and FM.

Store frequencies and operating modes into any of the twelve channels for instant recall.

Scan the airwaves with a number of programmable scanning functions.

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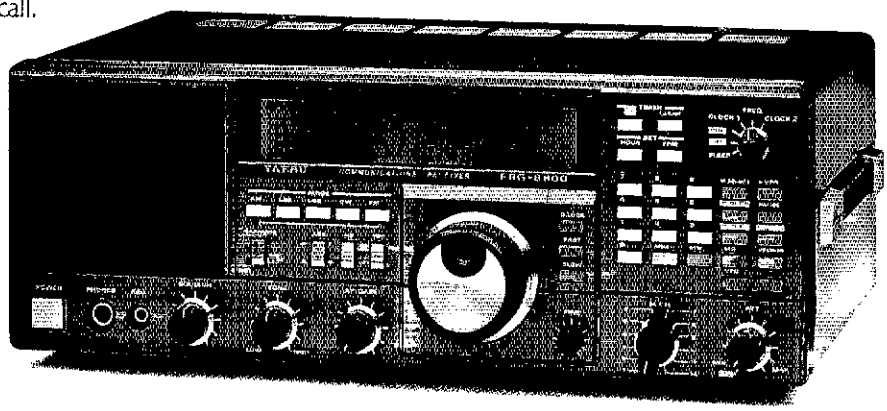

Dealer inquiries invited.

Prices and specifications subject to change without notice.
FRG-9600 SSB coverage: 60 to 460 MHz.

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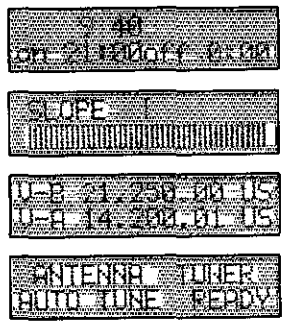
NEW!

"DX-cellence!"

TS-940S

The new TS-940S is a serious radio for the serious operator. Superb interference reduction circuits and high dynamic range receiver combine with superior transmitter design to give you no-nonsense, no compromise performance that gets your signals through! The exclusive multi-function LCD sub display graphically illustrates VBT, SSB slope, and other features.

- **100% duty cycle transmitter.** Super efficient cooling system using special air ducting works with the internal heavy-duty power supply to allow continuous transmission at full power output for periods exceeding one hour.
- **Programmable scanning.**
- **Semi or full break-in (QSK) CW.**
- **Low distortion transmitter.** Kenwood's unique transmitter design delivers top "quality Kenwood" sound.
- **Keyboard entry frequency selection.** Operating frequencies may be directly entered into the TS-940S without using the VFO knob.
- **Graphic display of operating features.** Exclusive multi-function LCD sub-display panel shows CW VBT, SSB slope tuning, as well as frequency, time, and AT-940 antenna tuner status.
- **QRM-fighting features.** Remove "rotten QRM" with the SSB slope tuning, CW VBT, notch filter, AF tune, and CW pitch controls.
- **Built-in FM, plus SSB, CW, AM, FSK.**



Optional accessories:

• AT-940 full range (160-10 m) automatic antenna tuner • SP-940 external speaker with audio filtering • YG-455C-1 (500 Hz), YG-455CN-1 (250 Hz), YK-88C-1 (500 Hz) CW filters; YK-88A-1 (6 kHz) AM filter • VS-1 voice synthesizer • SO-1 temperature compensated crystal oscillator • MC-42S UP/DOWN hand mic. • MC-60A, MC-80, MC-85 deluxe base station mics. • PC-1A phone patch • TL- 922A linear amplifier • SM-220 station monitor • BS-8 pan display • SW-200A and SW-2000 SWR and power meters.

- **High stability, dual digital VFOs.** An optical encoder and the flywheel VFO knob give the TS-940S a positive tuning "feel."
- **40 memory channels.** Mode and frequency may be stored in 4 groups of 10 channels each.
- **General coverage receiver.** Tunes from 150 kHz to 30 MHz.
- **1 yr. limited warranty.** Another Kenwood First.

More TS-940S information is available *from authorized Kenwood dealers.*

KENWOOD

TRIO-KENWOOD COMMUNICATIONS
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Compton, California 90220

Complete service manuals are available for all Trio-Kenwood transceivers and most accessories.
Specifications and prices are subject to change without notice or obligation.